



4th INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

“INTEGRATING CLEANER PRODUCTION
INTO SUSTAINABLE STRATEGIES”

Advances In Cleaner Production **CONFERENCE PROCEEDINGS**

São Paulo – Brazil – May 22nd–24th – 2013

Universidade Paulista – Campus Indianópolis



In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Conference Proceedings

May, 22nd to 24th 2013

São Paulo, SP, Brazil

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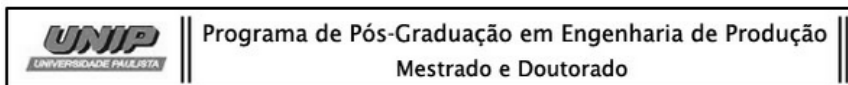
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"INTEGRATING CLEANER PRODUCTION INTO SUSTAINABILITY STRATEGIES"

São Paulo – Brazil – May 22nd-24th – 2013

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Bibliographical reference

Advances in Cleaner Production, Proceedings of the 4th International Workshop, May 22nd-24th, 2013, São Paulo / Biagio F. Giannetti, Cecília M. V. B. de Almeida, Feni D. R. Agostinho, Sílvia H. Bonilla, edited by Universidade Paulista.

São Paulo

260 p.

ISSN: 1984-8455

1. Cleaner Production
2. Proceedings
3. Sustainable Development

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Organization

PPGEP-UNIP – Post-Graduate Program in Production Engineering of the
Paulista University

NPPR – National Prevention Pollution Roundtable

UNISON – Universidad de Sonora

JCP – Journal of Cleaner Production

CETESB - Environmental Company of São Paulo State

Support Agencies

FAPESP

CAPES

Institutional Support

PNUMA – Programa das Nações Unidas para o Meio Ambiente

UNIDO – United Nations Industrial Development Organization

Red Latinoamericana de Producción más Limpia

JCP – Journal of Cleaner Production

INTA – Instituto Nacional de Tecnología Agropecuaria

ABEPRO – Associação Brasileira de Engenharia de Produção

Instituto Jatobás

Latec

Intertox

Acknowledgments

The Organizing Committee is extremely grateful to the invited speakers and their kind participation.

Donald Huisingh

University of Tennessee - USA

Arne Remmen

Aalborg University - Denmark

Mark Brown

University of Florida – USA

Simone Bastianoni

University of Siena - Italy

Jeffrey Burke

National Pollution Prevention Roundtable - USA

Javier Esquer Peralta

University of Sonora - Mexico

Carlo Vandecasteele

University of Leuven – Netherlands

Gert Hansen

Aalborg University - Denmark

Thank you the authors and to all the participants who have made this event possible.

Special thanks are addressed to the UNIP's support committee. We are sincerely grateful to students, teachers and coordinators of the UNIP's courses. We could not refrain from expressing our gratitude to the FAPESP, and CAPES for the financial support.

Special thanks are addressed to Dr. Yugo Okida, the Vice-Rector of Post Graduation and Research of Universidade Paulista, Dr. Marília Ancona-Lopez, the Vice-Rector of Graduation of Universidade Paulista, and to Dr. Marina Soligo, Main Coordinator of Post Graduation and Research of Universidade Paulista, for their unconditional support.

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Message of Welcome

On behalf of the Organizing Committee, I have the honor to welcome for this opportunity to all participants, and to express my greatest wishes that the event will serve to establish fruitful collaborations among participants.

The extensive program, the representative number of participants, the quality of the conferences and contributions allows this event to be considered the most important event held in Brazil addressing Cleaner Production. It is the consequence of contributions from several colleagues scattered in different parts of Brazil and of the World. Colleagues who are working for several years in different types of institutions: academic, business and government.

You are responsible for the size and quality of the **International Workshop on Advances in Cleaner Production**. The impact will largely depend on the interaction and discussion that will occur among you, encouraged by the organization of this event.

Welcome!

Bienvenidos!

Bem-Vindos!

I wish a fruitful participation, a pleasant stay, and that you have a good return to your home institutions. I hope also that you continue contributing to the Advance of Cleaner Production and Sustainable Development.

Biagio F. Giannetti
Conference Chair

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Presentation

The Post-Graduate Program in Production Engineering of the Paulista University (**PPGEP - UNIP**) is the organizer of **4th International Workshop the on Advances in Cleaner Production** (in São Paulo, Brazil, 2013 May 22nd to 24th) in participation with **NPPR, UNISON, JCP and CETESB**.

The International Workshop is a multi/interdisciplinary forum for the exchange of information and research results on technologies, concepts and policies based on Cleaner Production and conceived to assist the desired transition to a sustainable society.

Cleaner Production is a concept that goes far beyond the simple pollution control. It includes research and development of new processes, materials and products directed to promote the efficient use of resources and energy. Prevention must be the first approach of governments and corporations concerning sustainable development, and for this, environmental friendly strategies allied to economical robustness of products and services must be assured.

The adoption of Cleaner Production by governments, companies, and universities is getting speed with technical assistance and training programs, but it is worthy of attention that all these initiatives, even if implemented by all governments and corporations, do not guarantee the achievement of sustainable development. There is still a lack of a science, and consequently of a consolidated engineering devoted to the sustainable development. The Workshop's theme intends to stimulate the discussion of crucial importance "**Integrating Cleaner Production into Sustainability Strategies**".

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Objectives

The event has as central theme **Integrating Cleaner Production into Sustainability Strategies** with the aim to promote:

- The exchange of academic information
- The presentation of recent results
- The discussion of common problems and their possible solutions
- The increase of the contact among academic knowledge and corporative experiences
- The discussion of the event's theme "Integrating Cleaner Production into Sustainability Strategies"

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Program

Time	May 22nd, 2013 (Wednesday)	May 23rd, 2013 (Thursday)	May 24th, 2013 (Friday)
08:00 to 09:40	Reception	Oral Presentations (5A)	Oral Presentations (6A)
09:40 to 10:00	Opening Ceremony	Break	Break
10:00 to 10:30		Workshops	Workshops
10:30 to 12:00	<p>Opening Conference</p> <p>From 'Dilution is the Solution to Pollution' to 'Regional Sustainable Development' is the Solution for improved Quality of Life for All: A Long and Challenging Journey</p> <p>Donald Huisigh Tennessee University - USA</p>	<p>If We Have Wrong Measures, We Will Strive for the Wrong Things Simone Bastianoni</p> <p>Environmental Management Systems Jeffrey Burke</p> <p>Evaluacion Ambiental de los Agroecosistemas y Estrategias que Contribuyan a su Resiliencia Gloria Rótolo, Jorge Frana, Mabel Fior, Carlos C. Silva and Feni Agostinho</p> <p>Improving Cleaner Production through Brazilian Pollutant Release and Transfer Register Marcus E. M. da Matta</p>	<p>Emergy: Integrating Biophysical and Economic Values Mark Brown</p> <p>Modelling Approach for Sustainable Management Kannan Govindan</p> <p>Eco-Design as a Stepping-Stone towards Sustainable Business Models in the Circular Economy Arne Remmen and Gert Hansen</p> <p>¿Cómo Identificar Oportunidades de Producción más Limpia en las Pequeñas y Medias Empresas? Andrea Zavala</p>
12:00 to 13:30	Lunch	Lunch	Lunch

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Program

13:30 to 15:00	<p>Conference</p> <p>Life Cycle Management – Bringing People, Organizations and Product Chains into the Environmental Field</p> <p>Arne Remmen Aalborg University - Denmark</p>	<p>Conference</p> <p>Energy and the Economy: Reflections on Sustainability</p> <p>Mark T. Brown University of Florida - USA</p>	<p>Conference</p> <p>Unsustainability: A Syndrome of Human Systems</p> <p>Simone Bastianoni University of Siena - Italy</p>
15:00 to 16:30	Oral Presentations (4B)	Oral Presentations (5B)	Oral Presentations (6B)
16:30 to 16:50	Coffee break	Coffee break	Coffee break
16:50 to 18:50	<p>Plenary Presentations “Three Experiences on Integrating Cleaner Production into Sustainability Strategies”</p> <p>Promoting Cleaner Production through Higher Education Institutions as a Sustainability Strategy Javier Esquer Peralta Sonora University - Mexico</p> <p>Cleaner Production in the Sector of Waste Combustion and Sustainability of the Sector: Past and Future Carlo Vandecasteele University of Leuven - Belgium</p> <p>Highlights of Danish priorities and initiatives in Cleaner Production Gert Hansen Danish Ministry of Environment</p>	<p>Workshop</p> <p>Beyond GDP to Happiness, Wellness, Quality of Life, Living Planet and other indices: Guides for establishing Post Fossil Fuel Societies</p> <p>Donald Huisingsh University of Tennessee - USA</p>	<p>Closing Conference</p> <p>Environmental Management Systems: Providing the Best Opportunity to Integrate Cleaner Production into Sustainability Strategies</p> <p>Jeffrey Burke National Pollution Prevention Roundtable - USA</p>
18:50 to 19:50			Closing Ceremony and Cocktail

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Conferences
and
Oral Presentations

22nd May 2013

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22nd May 2013

10h30-12h00

Opening Conference

Donald Huisingh

Tennessee University - USA

From 'Dilution is the Solution to Pollution' to 'Regional Sustainable Development' is the Solution for improved Quality of Life for All: A Long and Challenging Journey

From 'Dilution is the Solution to Pollution' to 'Regional Sustainable Development' is the Solution for improved Quality of Life for All: A Long and Challenging Journey

Donald Huisigh
Tennessee University - USA

Societal progress toward more sustainable patterns is often slow and unpredictable. Frequently, crises trigger major changes from the 'business-as-usual' approaches to new 'normal behaviors.' Some of the historical crises that triggered abrupt changes will be reviewed to contextualize the resultant societal changes. A brief review will then be presented of the thirty-year history of the evolution of the prevention-oriented concepts of Cleaner Production of Cleaner Products & Services in the framework of sustainable local & regional development. Based upon insights gained from this review, the speaker will address evolving societal, ecological, technological and economic trends, which provide reason to be cautiously optimistic that in the next three decades, regional, national and global imperatives will be addressed with improvements in socially responsible values, paradigms, and strategies built upon global ecosystem and societal sustainability. The new approaches will be based upon trans-regional and trans-generational equity that goes beyond currently dominant economic indicators of success to new ones, which will include but not be limited to 'Gross National Happiness,' the 'Wellness Index,' 'the Better Life Index' and the 'Quality of Life Index.' These and related qualitative concepts will be integrated into socially, ecologically, and economically sound governmental and

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corporate policies, that are based upon 'Education for Sustainable Societies' for people of all ages. Monitoring of impacts of the new paradigms and values will be done based upon the global electronic monitoring and communication tools that are & will be available. What will be the roles, opportunities and responsibilities of individuals, families, communities, corporations, NGO's regions, nations and international organizations within the context of healthful eco-systems, globally? Will we/they have the will to act responsibly?

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22nd May 2013

13h30-15h00 Conference

Arne Remmen

Aalborg University - Denmark

Life Cycle Management –
Bringing People, Organizations
and Product Chains into the
Environmental Field

Life Cycle Management – Bringing People, Organizations and Product Chains into the Environmental Field

Arne Remmen
Aalborg University - Denmark

Different approaches to integration of management systems (ISO 9001, ISO 14001, OHSAS 18001 and SA 8000) with various levels of ambition have emerged. The tendency of increased compatibility between these standards has paved the road for discussions of, how to understand the different aspects of integration. The focus of the article is primarily to discuss three ambition levels of integration: from increased compatibility of system elements over coordination of generic processes to an embeddedness of an integrated management system (IMS) in a culture of learning and continuous improvements. At present, national IMS standards are being developed, and the IMS standards in Denmark and Spain are being analysed regarding the ambition level for integration. Should the ISO organization decide to make a standard for IMS, then it would be necessary to consider the different levels of integration in order to make a coherent standard. So far, management systems have had major focus within organizations. However, in order to create competitive advantages for the organisation and contribute to a sustainable development, the IMS has to be expanded to include the whole product chain and all the stakeholders.

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22nd May 2013

15h00-16h30

Session 4B

Room 1

Electricity from Poultry Manure: A Clean Alternative to Direct Land Application

The Main Factors that Make Up a Wind Energy Production System: Case Study of a Wind Farm Located on the Northern Coast of the Rio de Janeiro

Methodological Inconsistencies from Greenhouse Gas Estimations in the Brazilian Electricity Matrix

Emergy and Hydroelectricity

Electricity from Poultry Manure: A Clean Alternative to Direct Land Application

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Abstract

In the EU direct land spreading of animal manure is restricted to avoid excessive fertilization of agricultural areas with resulting eutrophication problems. The combustion of poultry manure in biomass power plants is an interesting alternative to direct land spreading. In this paper, the environmental impact of combustion and of direct land spreading of poultry manure are compared, considering three aspects of cleaner production: sustainable energy production and GHG emissions, pollution prevention and recycling of materials. In a life cycle perspective, it is shown that the production of electricity from poultry manure reduces the emissions of GHGs, NH₃, nitrates, SO₂ and NO_x to the environment. The reduction of the emissions and resulting decreased environmental impact is partly due to the diversion of poultry manure from land spreading and partly due to the replacement of electricity production by the combustion of fossil fuels. The combustion ash is rich in phosphorus and potassium, but low in nitrogen, so that it can be recycled as an inorganic soil conditioner. The ash is dry, odorless, and free of pathogens, which are beneficial properties compared to fresh poultry manure. Moreover, the amount of heavy metals with respect to the macronutrient phosphate, is unchanged compared to the poultry manure as it enters the combustor. Therefore, land application of the poultry manure ash has the same environmental impact as poultry manure spreading. It may be considered a means to balance the needs and use of phosphorus between regions.

Keywords: *Poultry manure, land spreading, combustion, environmental impact*

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The Main Factors that Make Up a Wind Energy Production System: Case Study of a Wind Farm Located on the Northern Coast of the Rio de Janeiro

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Abstract

One of the ways to diversify the power grid and reduce its dependence on non-renewable energy sources is through the use of systems that produce wind energy. Wind energy is defined as the kinetic energy contained in moving air masses (wind). It can be harnessed by converting the translational kinetic energy into rotational kinetic energy, with the use of wind turbines. Currently, the growing demand for wind energy is being driven by a number of factors: the context of supply and demand for energy on a global scale, environmental issues, especially climate change, and the evolution of the technology in the wind energy sector. The object of this paper is the study of a wind farm, located in the municipality of São Francisco do Itabapoana – RJ - Brazil. The objective of this research is to identify and describe in detail the main factors that make up systems that produce wind energy. This research opted to use the case study methodology since the case study analyzes an individual, family, group, or community in order to perform an in-depth inquiry so as to examine the life cycle or some particular aspect of the object being studied. During data analysis, the research perceived that a wind energy production system is composed of three fundamental factors: a region with wind potential suitable for the production of energy; energy turbines appropriate for the wind potential in the region; as well as a highly qualified management and maintenance team.

Keywords: *Wind farm, system for wind energy production, wind turbine, wind potential.*

Methodological Inconsistencies from Greenhouse Gas Estimations in the Brazilian Electricity Matrix

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Abstract

Concern about climate change is moving actions in both directions: adaptation to possible disasters that may occur and mitigation of Greenhouse Gases (GHG) emissions. In order to control such emissions is necessary to measure them accurately at first. The present study examined the concept of carbon footprint, emission GHG factors resulting from sector generation and distribution of electricity in the country available in the literature, the difference between scopes of analysis for the same product (electricity) and some practical implications. It was found that depending on the scope of analysis adopted the emission factor varied considerably, and within the same scope variations were also realized. Regarding the scope of approach, it was concluded that both are necessary: Scope 1 is indicated for the environmental management of businesses and Scope 3 for the preparation of environmental labeling of products. Moreover, there is a need for transparency with respect to the data source or the basis of calculation used in some cases and discrimination of the method adopted, if Scope 1, 2 or 3.

Keywords: *Greenhouse Gases, Carbon Footprint, Electricity, Scope, Life Cycle Assessment.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Energy and Hydroelectricity

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Abstract

The construction of hydroelectric plants is a controversial issue when negative effects are focused on, since social disruption, material or financial loss, crops, forest and soil loss, etc. On the other hand, benefits that would otherwise take years to occur, such as employment increase, arise in shorter run due to this region's development. In Brazil, the construction of "Run-of-the-river" plants, hydroelectric plants capable of operating with small or even without reservoirs, have been intensified. In 2005, 93 % of the electric energy available for consuming was generated by hydroelectricity plants and according to the national planning elaborated by the Ministry of Mines and Energy, hydroelectricity will remain the predominant source up to 2030. Global environmental benefits and costs for two Brazilian plants (Porto Primavera and Jupia) were accounted for in terms of emergy terms. The traditional emergy indicators were calculated as well as new indicators were proposed in order to evidence other aspects, such as matching between hydroelectric enterprise and region, more adequate use of water, influence of reservoir dimension and loss of ecosystem services.

Keywords: *Emergy, Hydroelectricity, Environmental accounting, Ecosystem services*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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22nd May 2013

15h00-16h30

Session 4B

Room 2

Innovative Proposals for the Architectural Design of Skyscrapers:
Recycling from a New Perspective

Thermic Curing Using Solar Heating and Water Spray

The Advancement of Sustainable Production of Low-Income
Housing

Life Cycle Assessment of Steel Framing Wall Systems: Hotspots
for Environmental Improvements and Possible Trade-offs

Innovative Proposals for the Architectural Design of Skyscrapers: Recycling from a New Perspective

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Abstract

This paper describes the earliest stages for an architectural project of a skyscraper in a site near Minas Gerais County Council, at Belo Horizonte city. It is intended to reflect about new usage and functions of tall buildings researching a bunch of alternatives by design. The article derives from a module of the course of Architecture from Federal University of Minas Gerais. The heuristic form of research is justified since the designing process is used as for investigate the main difficulties and possibilities of innovation of the project, aiming cleaner and sustainable solutions. The skyscraper will be a machine that recycles solid residual rubbish which will be collected in the neighbourhood, to whom a prospection including politic and social concept of 30 years onwards were defined by the government.

Keywords: *architectural projects, skyscraper, recycling, sustainable buildings.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Thermic Curing Using Solar Heating and Water Spray

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Abstract

The Center of Technologies SENAI for the Environment (Centro de Tecnologia SENAI Ambiental) developed a Cleaner Production Program in a cluster of concrete blocks producers in Rio de Janeiro state, according United Nations for Industrial Development Organization (UNIDO) methodology, in a period between the end of 2011 and beginning of 2012. The cleaner production diagnosis identified as an opportunity of improvement the change of the curing concrete process used by most of the companies in the cluster. The proposed process improves their productivity compared to the process they normally use: dry curing at air temperature. In the study developed in a company, it was proposed a change for concrete curing at higher temperature in a wet environment, based on reference methods. The cleaner production project suggested the use of rainwater and solar thermal system as a sustainable alternative. The cleaner production study includes the technical and economic feasibility to keep the water temperature at 60°C and the internal air temperature at 50°C inside the curing chamber. During low solar radiation days, the warming system must be kept using natural gas. This option cans double the company productivity with high standards of quality in a more sustainable process than the conventional one which uses drinking water and fossil combustible or electricity.

Keywords: *Concrete Curing, Solar Heating, Productivity*

The Advancement of Sustainable Production of Low-Income Housing

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Abstract

This work occupied to present the principles and the requirements for the construction of low-income housing on the quality, technology and sustainability. The study has been guided for the productive chain of civil construction and their links. He studied the interference of productive processes and this innovative technologically, with parameters of sustainable, proved to be the need of the establishment of a tool that would guarantee a comparative standard between these homes and the quality and sustainability. The data obtained by the survey were treated with the use of Fuzzy Logic Method. The objective of the research was achieved by research and obtained a process to ensure a comparative standardization, as to quality, technology and sustainability. The study was developed for low-income housing.

Keywords: *Production, environment; sustainability; low-income housing; construction.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Life Cycle Assessment of Steel Framing Wall Systems: Hotspots for Environmental Improvements and Possible Trade-offs

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Abstract

Purpose: Identify the processes with the highest contribution to potential environmental impacts in the life cycle of steel framing wall systems by evaluating their main emissions contributing to impact categories, and identifying hotspots for environmental improvements and the possible trade-offs. **Methods:** The research is based on the Life Cycle Assessment (LCA) study of steel framing wall systems performed by the authors. The processes that have demonstrated higher contribution to environmental impacts were identified in the Life Cycle Impact Assessment (LCIA) phase using the methodology ReCiPe and a detailed analysis was carried out on the mitigation strategies and possibilities of trade-offs. **Results and Conclusions:** The highest potential impacts in the life cycle of the steel framing wall systems can be attributed mainly to emissions coming from the production of steel and fiber cement in most part of the categories. However the highest contributions have shown to come also from fiber wood production for the categories Agricultural Land Occupation and from gypsum fiber board production for the category Particulate Matter Formation. The results of this LCA study are part of a major research on the comparative analysis of different typologies of external wall systems, which aims to contribute to the creation of a life cycle database of major building systems, to be used by the environmental certification of buildings.

Keywords: *Life Cycle Assessment, Steel Framing Wall Systems, Contribution Analysis, Sensitivity Analysis.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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22nd May 2013

15h00-16h30

Session 4B

Room 3

Development of Public Policies that Enhance the Reuse of Materials in the Brazilian Industry

System Tools Design for Diseconomy and Collaborative Social Learning of Green Sustainable Technology Managements: Networking for Eco Design Project Construction for Food, Feed and Fuel from Wastes

Corporate Social Responsibility Integrated Cleaner Production, Industry Case Study of Recife-PE

The Maintenance Function and its Impact on the Development of Corporate Sustainability: A Theoretical-Analytical Reflexion

Development of Public Policies that Enhance the Reuse of Materials in the Brazilian Industry

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Abstract

This study analyses the definition of public policies designed to encourage the reuse of waste. A multiple case study with nine Brazilian industries was performed. All these companies reuse materials in their production process, or have the potential to do so. The following elements were investigated: types of public policies, market and technology. The question that guided the research was: How to define public policies that lead to sustainability without compromising the public funds? The findings showed that the penalties imposed by the government can induce the reuse of materials. However, the low market value of the waste, the absence of a technology to reuse the material, the reduced availability or the high geographical dispersion of the waste can reduce the efficiency of those penalties. In such cases, the policy makers must analyze the waste market value and the type of technology available. For some materials the combination of these elements is enough to induce the reuse of materials. Public funds or policies are not required in such case. High sums of public resources may be needed to finance the development of new technology. But such public investment is restricted to a short period of time. Other materials only require public funds to support the workers that collect and segregate the materials. The support to these workers may be more effective than the granting of economic benefits to companies that reuse the waste. Such support may save a huge amount of public resources, as well as generate a more decent income for several poor people in Brazil.

Keywords: *Environmental sustainability, public policies, industrial waste.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

System Tools Design for Diseconomy and Collaborative Social Learning of Green Sustainable Technology Managements: Networking for Eco Design Project Construction for Food, Feed and Fuel from Wastes

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Abstract

The training, social learning and knowledge-based activities of our work has the aim at integrating the learners with situations and problems related to the small and mini enterprise product, energy and environment, with focus on pollution prevention with the use of sustainable technologies and industrial activities allowing them to act and provide solutions and projects, based on the innovative modern multimedia visual methods. In this work, we are making use of technological resources of social network available today much of the population. The system tools and methods include the use of computational tools for third-generation Web, design implementation of multimedia, collaborative online real-time implementation of reading practice, tests and exams in the home network via the Internet, use of online resources for video conference including sound, image and text, and use of social networking tools integrated with online search based on Google plus and SAP stream work. The complex system of Web server and programming language for database tools are all integrated as a platform following the philosophy of free software, open source, makes it the ideal environment for the development of system tools for bioenergy from wastes project. The experience we succeed to implement a hybrid system involving the several web servers, in cloud operating in conjunction with the open source Wuala e digital Incubator Tidia as knowledge management. However also there is a need for Google plus and sap stream work integrated with Google apps as the tools of sharing multimedia content and dynamic database. In an interactive and integrated way the system tools are more flexible and more secure system. Collaborative Social learning of Green Sustainable Technology Managements, and Eco design Project construction for Food, Feed and Fuel from wastes is made successfully passive buy building several blogs and internet sites with several system tools outlined.

Keywords: *Development, bioenergy, networking tools integrated, Sustainable Technology Managements.*

"INTEGRATING CLEANER PRODUCTION INTO SUSTAINABILITY STRATEGIES"

São Paulo – Brazil – May 22nd-24th – 2013

Corporate Social Responsibility Integrated Cleaner Production, Industry Case Study of Recife-PE

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Abstract

Organizations are increasingly aligned with consumer demands. These companies are driving the guiding their processes under the basis of sustainability, advances rampant economy has a strong impact on society and because of this, the population has positioned itself against organizations and local governance in order to have responses that contribute positively to social, environmental and economic. A corporate Social Responsibility refers to a business posture in order to attain sustainability throughout its supply chain, from suppliers, customers, employees how they relate to the environment. This can be aligned to the principles of Cleaner Production (CP) if the organization has integrated some action in the company. For the P + L seeks a complex analysis of the production process in order to increase efficiency. The aim of this paper is to describe actions for Environmental Responsibility and check which of these alignment with the principles of Cleaner Production in the productive sector organizations, using as a case study of a chemical branch Cleaning and Hygiene located in the city of Recife-PE, regarded here as Industry X.

Keywords: *Environmental Responsibility, Cleaner Production, Industry, Sustainability.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

The Maintenance Function and its Impact on the Development of Corporate Sustainability: A Theoretical-Analytical Reflexion

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Abstract

The society's concern over global environmental degradation is leading many companies to embrace environmentally conscious policies or undertake corporate sustainability. In this context, the maintenance function is a strategy used during the product's lifecycle in order to extend the production system's reliability. Maintenance function's proactive policies can provide a competitive advantage when the goal is to protect the environment. Therefore, the philosophy of maintenance function and production integration is an important action for companies and academy that are looking for tools to evaluate the aspects of business sustainability of production systems. As main results, this paper presents a reflective and objective approach to assess the importance of production system and maintenance function integration, considering the evolution of maintenance function's policies as well as the interrelationships of this integration with the possibilities of corporate sustainability development (eco-efficiency) in the context of input-processing-output model.

Keywords: *Environmental, Operations, Production, Sustainability*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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22nd May 2013

15h00-16h30

Session 4B

Room 4

Use of Waste Processing Sheet Laminated Bamboo Blended for Platemaking

Utilization of Glass Wool Waste in Gypsum Board

Analysis of the Residual Generation in a Gemstone Processing Industry: A Case Study with Reuse Proposition

Silicon Sludge Co-Processing for Industrial Symbiosis: A Study Case in a Semiconductor Company

Use of Waste Processing Sheet Laminated Bamboo Blended for Platemaking

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Abstract

The clean production technologies are useful tools for environmental management of waste, minimizing the aspects generating negative impacts on the environment. The bamboo has properties relevant to the manufacture of products, enables the replacement of conventional wood in various applications and can all be used. The byproduct resulting from its processing as chips and sawdust, can be used for the production of particleboard. This work provides a research for developing sheets of bamboo blended using waste collected by exhaust coupled to a conventional four-sided planing machine used in woodworking responsible for the standardization of bamboo slats during manufacturing laminated bamboo. To prove the workability of the plate recomposed developed, tests were performed in a practical joinery using conventional operations: radial cutting circular saw, planer trowel, Thicknesser planer, circular sizing, drill, router, sander and still test aquarium, where observed hydrophobicity of the adhesives used. The results demonstrated the ability to be applied in construction, in home furnishings, packaging and furniture industries, as well as reducing the volume of solid waste disposed in the environment.

Keywords: *Remains of bamboo, environmental management, cleaner production, recycling, solid waste.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Utilization of Glass Wool Waste in Gypsum Board

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Abstract

Nowadays, the industrial and world`s consumption of products growth becomes increasingly necessary to develop new alternatives for the reuse of materials. The glass wool, by their physical and chemical properties is one of the most traditional thermal and acoustic insulation used in the world. When generated as waste in an industry of acoustic materials, the final destination most common is the disposal in landfills. The present study aimed to propose alternatives for final allocations of glass wool. In order to characterize the material was held wettability test and measured and the apparent density. The waste is hydrophilic. The incorporation of this waste in gypsum boards can be used to produce a material that improves the sound insulation property, and an option for reuse than reducing waste disposal.

Keywords: *glass wool, gypsum board, waste*

Analysis of the Residual Generation in a Gemstone Processing Industry: A Case Study with Reuse Proposition

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Abstract

The gemstone productive chain and jewelry is an important income source and job generator in Brazil, since the country stands out worldwide for the extraction and processing of these materials. However, this activity generates a high volume of waste. In this way, this work aims at analyzing the generation of waste in a gemstone processing industry and at proposing alternatives for its treatment and reuse in other applications, like, for example, in the composition of ceramic clay. This is a quantitative approach research of descriptive and exploratory character, and there were used bibliographies and case study. As a result, it was observed that at the end of beneficiation process just 65% of the parts come into conformity, while 35% of them have some kind of defect. Furthermore, in terms of volume, it appears that only 15% of the gems become final finished product, and the remainder being transformed into various types of solid and liquid residues, infected by cutting oil that need to be treated properly so that they can have an environmentally correct destination and guarantee the sustainability of the activity.

Keyword: *beneficiation process, gems and jewelry, residues.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Silicon Sludge Co-Processing for Industrial Symbiosis: A Study Case in a Semiconductor Company

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Abstract

For the electronics industry, the silicon powder residue, in the form of an aqueous dispersion, is an environmental and economic issue. Therefore, the objective of this work was to analyze the characteristics of such material, through a study case in a semiconductor company, aiming to close the production cycle. The aqueous silicon dispersion which is generated by the silicon wafer grinding and sawing systems was characterized by physical methods and by optical microscopy. This non-product was used in cement test specimens which were submitted to compressive strength tests to determine a potential improvement due to the addition of micro-silica in comparison with regular cement. The results showed that there was a significant increase in the compressive strength indicating the technical feasibility of using this type of non-product from the semiconductor industry in cement fabrication. Although the study showed evidence about the technical feasibility of the use of this non-product, in order to have a viable industrial symbiosis for both companies, the logistics aspects will also play a determinant role to encourage mutual cooperation between the companies.

Keywords: *industrial symbiosis, electronics industry, non-product, silicon*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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22nd May 2013

15h00-16h30

Session 4B

Room 5

Environmental Regulation Reform: Case Study for the Introduction of the Renewable Operating Permits in Sao Paulo State

Environmental Protection and the Sustainable Use of the Water Resources: The CONAMA ´s and SMA-SP ´s Resolutions in 1984-2010 Period

National Police on Solid Waste as a Cleaner Production and Sustainability Strategies Inductor

Evaluation of Procedures of the Party in SICONV

Environmental Regulation Reform: Case Study for the Introduction of the Renewable Operating Permits in Sao Paulo State

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Abstract

The establishment by the government of a set of requirements for businesses to operate in an environmentally responsible manner, generically named as "environmental regulation" has been one of the most successfully implemented on last century. However the evolution of social dynamics demanded reforms of the most traditional models for environmental regulation, for which various recommendations have been made internationally. Starting with a brief summary of "regulatory quality characteristics" summarized from literature, the present article examines a case study regarding the introduction of the renewable operating permit in Sao Paulo State. After an introduction and the methodological procedures presentation, the case study is described and the most relevant results are presented, mainly from interviews with selected key stakeholders. It is highlighted that even with different quality characteristics and intense planning, the program still faces operational difficulties. It is also emphasized the need for greater definition of rules - including for measurement and performance evaluation and reward. Among the proposed improvements were also noted a broader change of behavior on the part of regulators, as well as the need to improve communication of program results and public disclosure of information.

Keywords: *environmental regulation; environmental permitting; environmental agency; environmental public policy*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Environmental Protection and the Sustainable Use of the Water Resources: The CONAMA´s and SMA-SP´s Resolutions in 1984-2010 Period

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Abstract

The preoccupation, both technical and judicial points of view, with the environmental protection and sustainable use of the water resources in the economic activities developed in the country and, specifically, in Sao Paulo State is something so much evident. About this, one of the main mechanisms used in last years is the edition of resolutions by Conselho Nacional do Meio Ambiente (CONAMA), in the federal scale, and by Secretaria do Meio Ambiente do Estado de São Paulo (SMA-SP, in the state scale. This work intends the study and the analysis of the federal and state resolutions that are connected with the environmental protection and sustainable use of the water resources during 1984-2010. About this, it is used the Compared Law and Literature Research. The conclusions are: (i) the CONAMA´s resolutions follow some instruments and principles of the Política Nacional do Meio Ambiente law and it are linked, in specific way, with the rural sector and with the rural activities; (ii) the SMS-SP´s resolutions have the same behavior of the CONAMA´s resolutions, but with a difference in the time; (iii) finally, it isn´t possible, in accordance with the historic analysis of both CONAMA and SMA-SP´s resolutions, verify some correlation between this kind of specific judicial norm and one stability, constant and long politic of environmental protection and sustainable use of water resources in the period studied.

Keywords: *Resolutions, Water resources, Environmental protection, Sustainable use, Environmental law.*

National Police on Solid Waste as a Cleaner Production and Sustainability Strategies Inductor

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Abstract

The National Police on Solid Waste (NPSW) approved on August 2010 by local federal authorities, introduced a new regulatory mile stone for treatment of urban solid waste and consumable goods after its use, throughout the implementation of urban garbage selective collection and reverse logistics practices, respectively. As a matter of fact, a sustainable agenda is part of the Brazilian citizenship since 1981, with the publication of the National Police on Environment and later on, in 1988, by the insertion within the country Constitution the well known concept of Sustainability, as defined by the Brundtland Report and stated in the 96th United Nations General Assembly. After more than 20 years spent on discussion at the National Congress, the NPSW represent a modern, complex and challenging piece of socio-environmental public police and of administrative ordination, comprehending instruments of command and control a side of market and economic mechanisms for treatment and destination of residues and final rejections proper disposition in landfill. The NPSW covers definitions, principles, objectives and plans for the solid waste correct disposition and corresponding responsibilities for all parts involved, such as: government, industry, commerce, importers, service providers and consumers. Enforces the concept of shared responsibility on products end of life and introduces the reverse logistic (RL) mechanism for several goods, aiming, at the same time, for social inclusion of rubbish picking workers cooperatives, subject to act as partners in the LR processes. A six steps priority scale for product design and its end of use destination was defined on its article 9th covering: *non generation* of residues or its *reduction* during manufacturing processes, product and parts *reuse* extending its respective life cycles, *recycling* and residues *treatment* for material and energy recovery and, finally, the correct *final disposition* of rejects in the landfill, but only after fulfilling all known recycling technical and economical feasible alternatives. The first two steps are preventive measures competing, complementing and promoting similar objectives as stated in the Cleaner Production (CP) compromises and of Sustainability as well. The intermediate measures: reuse, residues treatment and recycling, as mitigation actions, complement and close the processes of materials, substances and energy reclamation, before final rejects environment correct disposition. Therefore, the NPSW contemplates, contributes and induces the accomplishment of several aspects of the CP compromises. However, as a formal and official regulation imposed by authorities, instead of a leadership initiative as placed by the CP, the NPSW could create within the market actors a tendency for observation of its minimum requirements and obligations. The NPSW introduces the CP practices within product design and manufacturing, a side of other relevant attributes such as promotion of awareness, education, training and integration alongside the logistics chains under surveillance of the Brazilian society, considering a pioneering mechanism of protection-receiver for the environment aspects, possible more effective than the well known pollution payer principle. Finally, as a relatively new regulation, several challenging opportunities for research were open by the NPSW in the fields of Cleaner Production and Sustainability.

Keywords: *Sustainability, Cleaner Production, National Police on Solid Waste.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Evaluation of Procedures of the Party in SICONV

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Abstract

This article consolidates the efforts of the Research Group of Information Systems for the construction of a reference model for the management of agreements concluded on the basis of voluntary transfers funds from the Brazilian government. Here is the Consolidated Reference Model for Product Evaluation Process of the contracting party, scheduled for the 3rd stage of the research project. This model will be used as a reference to the 4th. stage of the project will be submitted when the reality of some selected sample with agreements. Experience gained in this next step will allow the consolidation of the Reference Model.

An important contribution of this instrument is to facilitate the understanding of the proposals for the improvement of the processes discussed here, available to all interested parties with information regarding process redesign, since the organization to the detail of the activities of each of these processes.

The results presented here do not have a character finalistic. Unlike this, aim to guide the next stage of the project which is the Survey of the Reference Model along with a set of states and municipalities, with their experiences, can contribute to the idealized model now.

Keywords: *Transparency in government, new technologies and public policies, government, information systems, e-Government;*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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22nd May 2013

15h00-16h30

Session 4B

Room 6

Environmental Management System ISO 14001: Comparative Analysis of Business Sectors between Regions and Countries

Comparative Analysis of Cleaner Production Implementation in South American Countries: Brazil, Chile and Colombia

Combining Sustainability and Quantitative Models - An Analysis for the Countries of The BRICS

Environmental Sustainability Assessment of Southeastern Brazil with Accounting in Emergy

Environmental Management System ISO 14001: Comparative Analysis of Business Sectors between Regions and Countries

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Abstract

The enterprises show growing concerns regarding environmental issues, which can no longer be treated in isolation, because they are part of a system that requires planning, implementation, monitoring and continuous improvement, ie the implementation of Environmental Management Systems. Thus, this article aims to analyze the growth of ISO 14001 certifications in industries, worldwide, between regions and countries. The article was built by literature review and document analysis with the acquisition of the database provided by ISO - International Organization for Standardization (ISO, 2011). It has a quantitative and descriptive focus, having been made the processing and analysis of data with the help of Excel spreadsheets and descriptive statistical techniques using the *Statistica*® software, version 7.0. The analyses occurred in four steps: (i) Grouping of valid certifications in 39 industrial sectors in 2010 for each country into regions, (ii) Separation of valid certifications in industry in 2010 by the countries of Latin America (20 countries), South America (11 countries) and Brazil (iii) The regions were the focuses - 2006 to 2010 - to identify the sectors with the largest number of certifications and annual growth, and (iv) The analysis of data on emissions ISO 14001 from 2006 to 2010 by industry sector and by region. It consisted of some intersections based on techniques such as cluster analysis and descriptive measures of data. The main results are that: Brazil is the country with the largest number of certifications (885) Latin America, while Guyana has no certifications, this may be a consequence of low industrial development, and there is no pressure to deployment of Environmental Management Systems. The sector that had the highest number of certifications in Latin America and Brazil was the Basic metal & fabricated metal products, because Brazil is a major exporter of iron ore, impacting in the leadership of this sector. The country with the highest growth in number of certifications in 2010 was China. The growth largest of certifications was in 2008 with 22%, while in 2010 the increase was 12%. There is an evident concern with the implementation of Environmental Management Systems and ISO 14001 certification, exceeding market issues and becoming a key differentiator for building the company's image. This article is not intended to exhaust all possibilities of research; the data available can be used in different ways, with applying other statistical techniques.

Keywords: *Environmental Management System, EMS, ISO 14001, Cluster Analysis.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Comparative Analysis of Cleaner Production Implementation in South American Countries: Brazil, Chile and Colombia

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Abstract

Cleaner Production (CP), proposed by UNEP, concerns an environmental management strategy that seeks to prevent environmental impacts and risks, and increase the efficiency of processes, products and services. This strategy has been adopted by governments and companies worldwide alongside increased environmental degradation and stricter legal requirements. This paper presents an analysis of the implementation of Cleaner Production policy, in the context of public policies, in three countries in South America with a history of environmental sustainability: Chile, Colombia and Brazil. The goal was to clarify which institutional arrangement contributed the most to encourage companies to adopt Cleaner Production strategies. The methodology consisted of a qualitative exploratory research using bibliography and public documents. The results indicate that the three countries have different institutional-political arrangements concerning Cleaner Production, which explains the different reactions from companies and the different levels of success of CP in each country. Governments most active, with strong policies and environmental management frameworks, such as Chile and, in part, Colombia, show the best results. It is observed that when the environmental management is actually government policy, the production sector is motivated to continue to improve its environmental impact over the years.

Keywords: *Cleaner production, public policy, environmental management framework.*

Combining Sustainability and Quantitative Models - An Analysis for the Countries of the BRICS

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Abstract

The interest in the development of indicators to measure sustainability is growing, but there are few studies about the changes of these indicators over time. In this context, this paper presents a temporal analysis of CO₂ emissions for the BRICS countries (Brazil, Russia, India, China and South Africa) on period of 1980 to 2010, except for Russia (1992 to 2010). The analysis of CO₂ emissions here treated as an indicator of sustainability, presenting in the preliminary current situation and future emissions of these countries on a horizon of 10 years. Although the series analyzed and estimated to be short, it revealed some important information. The estimation by means of ARIMA models and exponential smoothing coefficients showed statistically significant. From a practical point of view, the ARIMA model has better adhesion to the series since it had the lowest Akaike Information Criterion (AIC). The estimated growth of CO₂ emissions confirms the unsustainability of the BRICS future. Finally, the experience of this study suggests the use of predictive models for quantitative analysis of sustainability.

Keywords: *Sustainability, CO₂ emissions, ARIMA, Exponential Smoothing.*

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Environmental Sustainability Assessment of Southeastern Brazil with Accounting in Emergy

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Abstract

The Southeast region has an area of over 920,000 km square and consists of the states of Espírito Santo, Rio de Janeiro, Minas Gerais and São Paulo. In the Southeast, focuses not only the greatest proportion of national GDP, but also the most populous - 77,873,120 inhabitants. In order to highlight and distinguish the differences between the states, a review was conducted in emergy environmental and signatures are presented. Emergy indices in each state (ESI, EYR, and ELR) are presented and compared. The ternary diagram of the triangle was used to display the level of sustainability of the region's states.

Keywords: *emergy, sustainability, southeast, development, economy*

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22nd May 2013

15h00-16h30

Session 4B

Room 7

Life Cycle Assessment of Biobutanol Production Integrated to Sugarcane Biorefineries in Brazil

Proposition of a Model for the Environmental Impact Assessment in the Apparel Industry

Inventory Analysis for the Life Cycle Assessment of Packaging for Soft Drinks

Increasing the Sustainability of Pasta Production Through a Life Cycle Assessment Approach

Life Cycle Assessment of Biobutanol Production Integrated to Sugarcane Biorefineries in Brazil

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Abstract

New sugarcane biorefinery routes considering the integral use of biomass have become more important to the strategic objectives of the bioenergy production expansion in Brazil, especially for diversifying and adding value to the sugarcane production chain. Among these new products, biobutanol has been increasingly investigated, mostly for its use as a fuel, since its energy density is greater than that of ethanol, but also to replace an established use as feedstock in the chemical industry. In view of the new green chemistry technological routes development, it becomes interesting and necessary assessing the viability of the butanol production from sugarcane. In this study, the sugarchemical route characterized by the fermentation of sugarcane juice was evaluated using the Life Cycle Assessment method considering arrangements for the process integration in the existing Brazilian sugarcane biorefineries: first and second generation using ABE fermentation (acetone-butanol-ethanol) with wild and genetically modified strains. The evaluation approach took into account the whole production chain, from the agricultural stage, through the transportation of sugarcane and vinasse, to the industrial process of biobutanol production and its use as liquid fuel for transport. The software package SimaPro and the CML 2 Baseline 2000 v2.05 method were used as tools for the environmental impact assessment. The life cycle inventories were obtained from literature and mass and energy balances taken from process computer simulation. Results showed that butanol produced from the lignocellulosic material (cane bagasse and straw) presents lower environmental impacts compared to first generation scenarios evaluated. As well as previous biofuels production assessment studies have already pointed out, the agricultural stage is the most relevant to the total environmental impacts in the butanol case. Nevertheless, the use of water, enzyme, equipment (carbon steel), and the emissions from the bagasse combustion could be highlighted as the most important in terms of environmental impacts for the industrial stage. Results for the productivity per tonne of sugarcane in first generation scenarios indicate that the efficiency of the ABE fermentation process needs to be improved so biobutanol could turn into an economic viable alternative. The production of second generation biobutanol, on the other hand, could be a viable alternative for the integral use of biomass adding value to the sugarcane production chain. Its analysis accounting for production and use as liquid fuel for transportation has shown that results are at the same level as the impacts related to ethanol from sugarcane, presenting advantages if compared with gasoline in terms of global impacts, such as global warming and ozone depletion potentials. Nevertheless, categories related to local impacts such as eutrophication and acidification potentials presented higher values for butanol in comparison with gasoline.

Keywords: *life cycle assessment, butanol, sugarcane, biorefinery*

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Proposition of a Model for the Environmental Impact Assessment in the Apparel Industry

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Abstract

The garment industry generate impacts to the environment which need to be assessed in order to optimize the overall environmental performance of the production process of fashionable products. This paper proposes a methodology to measure these environmental impacts, based on the analysis of the production processes of a medium-size garment industry. For the definition of the model we take into consideration a series of guidelines based on the postulates of Design for Sustainability (D4S) and the systems and tools commonly used for environmental management. The model proposes a way of mapping the production processes as well as analyzing and measuring the impacts generated by the creation and production of fashion artifacts.

Keywords: *environmental impact assessment, cleaner production, design for sustainability.*

Inventory Analysis for the Life Cycle Assessment of Packaging for Soft Drinks

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Abstract

The knowledge of the life cycle of a product is the first step in the search of the sustainable development. The present work had as objective to make an analysis of material and energy flows of the life cycle of three types of packaging for soft drinks: glass bottles, aluminum cans and bottles of PET. The study considered processes since the extraction of raw materials for production of the packaging until the stages of recycling, after the consumption of the soft drink. They had been identified and quantified the main critical points of generation of negative environmental impact during the life cycle of each packaging. The consumption of natural resources and energy, the generation of atmospheric emissions, solid wastes and wastewaters had been the analyzed categories. The results showed that, in accordance with the scenes and defined variables, the bottle of glass presented a less favorable scene to the environment in comparison with the other packaging.

Keywords: *life cycle assessment, packaging, soft drinks, sustainable development.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Increasing the Sustainability of Pasta Production through a Life Cycle Assessment Approach

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Abstract

Durum wheat cultivation is responsible for most of the environmental impacts of pasta production. Due to this reason, Barilla put forth a specific project aimed to increase widespread use of cereal sustainable cropping systems. Analysis were based on a holistic approach, taking into consideration economic, agronomic, food safety and environmental indicators. The first part of the project was focused on identifying potential improvements in the most diffused cropping systems for the cultivation of Durum wheat in Italy, while maintaining high levels of quality and food safety standards. It has been demonstrated that the well-known low input agronomic practices are environmentally friendly and also often economically advantageous. Implementation of dicotyledons into a cereal-only rotation allows a reduction of environmental impacts (greenhouse gas emissions could be reduced up to 36%), a reduction of DON risk and an increase in net income for farmers (up to 31%). In the second part of the project Barilla gave about 15 farmers a decision support system (DSS) called granoduro.netTM to see if this instrument could help them in reducing production costs and environmental impacts. Results show that the only adoption of the DSS contribute in reducing carbon footprint (-10%), and costs for pesticides and fertilizers (- 10%).

Keywords: *Life cycle assessment; LCA; Food; Pasta; Durum wheat.*

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Conferences

and

Oral Presentations

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23rd May 2013

8h00-9h40

Session 5A

Room 1

Cultural Differences in Environmental Behavior and its Antecedents: Comparative Analysis between University Students

Innovation and Sustainability in the Project of Skyscrapers: A Case Study Focusing an Educational Approach

ACS Summer School in Green Chemistry and Sustainable Energy: Fomenting Awareness and Creativity for Innovative Chemistry

Barriers to the Adoption of Green Buildings on Higher Education Institutions

Energy Accounting and CO₂ Emissions: Accessing and Remaining in the Physical and in the Virtual Learning Environment

Cultural Differences in Environmental Behavior and its Antecedents: Comparative Analysis between University Students

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Abstract

The aim of this work is to make a comparison of the ecological behavior of University students from two regions in different contexts: Bahia (Brazil) and the Autonomous Community of the Basque Country (Spain). In this regard, 347 surveys from the Universidade Federal da Bahia (UFBA) and 456 surveys of the University of the Basque Country (UPV/EHU) are analyzed. College students are a study collective especially interesting for their role as future decision-makers. It is intended to emphasize the educational aspect, analyzing the role that environmental knowledge exerts in the development of pro-environmental

Keywords: *Education, sustainability, pro-environmental behaviour, international comparison.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Innovation and Sustainability in the Project of Skyscrapers: A Case Study Focusing an Educational Approach

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Abstract

This paper describes a experiment of proposing the early stages of design of skyscraper, questioning how those mega-structures will interfere over contemporary and future living and respective urban scene. A politic and economical background framed the context but was also flexible enough to not narrow students' imaginations and decisions. It starts describing the main problems skyscrapers in the 20th Century, proposing new approaches with new technologies and programmatic interpretations of those structures. A case study presents three significant projects which were considered satisfactory as to represent the pedagogical bias adopted, which was describe as "Problem based Learning". It ends observing that 70% of the projects collect during 3 years adopted traditional approaches to project, despite the scenario described. It finally suggests that new research should take in consideration not only the module, but the stages where the students are, comprising other modules that can be highly influential.

Keywords: *architectural projects, skyscrapers, technological innovation, sustainable buildings, education towards cleaner production*

ACS Summer School in Green Chemistry and Sustainable Energy: Fomenting Awareness and Creativity for Innovative Chemistry

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Abstract

The concept and applications of Green Chemistry are not a novelty in countries with a well-established chemical industry and universities. Since awareness about sustainability and environment is increasing exponentially, investment in education and in academic areas is viable not only to foment research and development inside the scientific community but also to provide an exchange of ideas potentially applicable to achieve the goals implicit in the Twelve Principles of Green Chemistry. Remarkably, the American Chemical Society has been committed to Sustainable Energy and Green Chemistry since 2003, with an initiative of holding a series of meetings as Summer Schools gathering graduate students and postdocs involved with R&D in the areas of environment, green chemistry and sustainability with sponsorship of various foundations resulting in no cost for the accepted applicants. The Summer School happens every year and offers in one week lectures, applied exercises and interactive activities, enabling networking between representatives of industries, researchers and the students themselves. Even though applications are only accepted from students of the Americas, students from nationalities of all around the world who study in the Americas have attended the ACS Summer School.

Keywords: *green chemistry, sustainability, sustainable energy, education.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Barriers to the Adoption of Green Buildings on Higher Education Institutions

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Abstract

Higher Education Institutions (HEIs) are responsible for significant environmental impacts, both for the massive amount of activities they develop every day, and for their resemblance with "small cities". In this context, HEIs have been suggested to search for a better environmental adequation, and one of the strategies for that to succeed is the adoption of green buildings. However, some researchs, especially the international ones, have been pointing that this kind of initiative usually faces several barriers, on organizational and financial basis, among others. These barriers may be occurring as well in Higher Education Institutions, more specifically in Engineering Colleges which have been receiving a special attention of the Brazilian government and organizations that provide research incentive to raise the quality and amount of graduate engineers in Brazil. In that context, the objective of this article is, therefore, to identify which are the most important barriers to the implementation of more environmentally sustainable buildings in Higher Education Institutions, and, based on research in the available literature, propose suggestions to eliminate these obstacles.

Keywords: *Green Buildings, Engineering College, Environmental Management, Higher Education.*

Emergy Accounting and CO₂ Emissions: Accessing and Remaining in the Physical and in the Virtual Learning Environment

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Abstract

The aim of this work is to compare the environmental cost of accessing and remaining in the physical learning environment, during a typical school night, by the students attending a technicians' level course of Management at the IFSULDEMINAS' (Federal Institute of Education, Science and Technology of the South of Minas Gerais) pole located in the city of Jacutinga-MG to the environmental cost resulting from a session -accessing and remaining for a given amount of time- on the virtual learning environment (VLE) by the students from the Inconfidentes-MG pole enrolled in a Distance Teaching version of a similar course carried by e-Tec (Open Technical School of Brazil) during a typical distance teaching study session. By means of emergy environmental accounting it was possible to verify that a typical virtual instruction session carried by students living in locations where the typical Brazilian matrix hydroelectricity is used to feed their computers will demand more from the environment than their counterparts' use of public transportation to commute to the physical classroom. On the other hand, calculations for CO₂ emissions caused by each system unveils a reverse situation, as far as environmental impact is concerned. This study also presents a simulation by which one is able to verify that a student who uses thermo-electric power from a Diesel-operated generator when accessing the VLE would cause higher CO₂ emission levels than does his counterpart who uses public transportation to go to and from school and use classroom facilities.

Keywords: *Distance Teaching, physical learning environment, emergy, VLE*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

23rd May 2013

8h00-9h40

Session 5A

Room 2

Environmental Accounting of a Building Used as an English School in Ouro Fino – Minas Gerais

Diagnosis of Civil Construction Waste Generation in the Toledo-PR City - Analysis from 2005 to 2010

Proposal of Guidelines for Sustainable Buildings Planning

Characteristics of Environmental Management Systems in the Construction Industry

Ecological Recuperation of Palácio dos Leilões

Environmental Accounting of a Building Used as an English School in Ouro Fino – Minas Gerais

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Abstract

This paper analyses a building used to hold an English school in the city of Ouro Fino – Minas Gerais. This analysis was made only for the construction of the building using a Brazilian norm that states all the material used to build a house in mass unit per km². Using the methodology in emergy accounting developed by Odum (1996) it shows the percentage of the materials used in the building that holds the English school. According to the emergy analysis it is noted that the material that has been used the most in it is the cement (34.78%) of the total emergy, followed by labor (18.16%), copper (17.70%) and the sand (14.16%). When the analyses is performed by mass unit the material that has been used the most is the cement (48.21%), followed by the sand (35.45%) and the ceramic (4.69%).

Keywords: *emergy accounting, transformity, building construction, building maintenance, building use.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Diagnosis of Civil Construction Waste Generation in the Toledo-PR City - Analysis from 2005 to 2010

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Abstract

The current profile of Brazilian economic development, based on various production processes, intense industrial activity and population growth are some of the factors responsible for the rising generation of municipal solid waste. In the present scenario of growth of the Brazilian economy, the construction industry is one of the activities with the greatest growth potential and at the same time constitutes a sector with significant volume of waste generation, with serious implications for the environment. In this context, the study aimed to present the results of diagnostic generation of construction waste (RCC) in the City of Toledo-PR, for the period 2005 to 2010. The methodology included four stages, which are: development of a database with the evolution of films of the buildings in the city of Toledo-PR, during the years 2005 to 2010; estimate the potential of RCC according to the types construction (renovation, expansion and new), diagnosis of the current collection system in the city of Toledo RCC-PR, and finally the processing and systematization of the results by means of thematic maps and charts. As an example for the year 2010, the results showed a generation of 31 178 (t / yr) for RCC from the new buildings, 1815 (t / yr) for reforms and 3217 t / year for expansions. Thus the total RCC generated in the city of Toledo was 36,210 t / year. The topic maps show the total generation of RCC in each district during the years 2005 to 2010 and the central area is the neighborhood with the highest waste generation, followed by buildings located in neighborhoods Workers' Village, Coopagro Garden, Garden and Porto Alegre. Finally, a comparison was made between the total waste generated (36,210 t / in 2010) and total RCC collected (average 76.6% of total). Thus concludes that it is necessary to optimize the management system of RCC, as the research on the characteristics of the throne RCC shows that over 90% of these residues are likely to use, a situation which is not the case in the city of Toledo-PR.

Keywords: *Civil Construction Waste (RCC), RCC Estimate Generation, Collection of RCCs, Toledo-PR*

Proposal of Guidelines for Sustainable Buildings Planning

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Abstract

This article proposes guidelines to be incorporated in the planning phase of sustainable buildings construction. Based on theorist knowledge and empirical research, it presents concepts of sustainability and its application in designing sustainable buildings. Processes and planning requirements are identified under the assumptions of sustainable development. The research method used is qualitative, applied. Performs comparison between sustainability concepts are identified in the scientific literature, and planning practices of building surveyed in the business practices. Experts were interviewed in order to prioritize the guidelines identified in the literature review and in business practices. The search result sets guidelines for planning sustainable buildings.

Keywords: *Life cycle assessment, sustainable building, construction management, sustainability engineering.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Characteristics of Environmental Management Systems in the Construction Industry

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Abstract

The managers seek to implement policies, procedures and techniques for managing the environmental impacts of business activities, which requires a systemic view. Environmental issues can no longer be treated in isolation; they integrate a system that requires planning, implementation and continuous improvement, demonstrating the importance of adopting Environmental Management Systems. The study of the construction sector is crucial as it allows the operation and expansion of other industries, but the environmental impacts that construction generates should be considered. This article aims to present the theoretical basis for preparation of items to be answered by the project participants of International Cooperation: Brazil, Slovenia. This project was signed between Santa Catarina Federal University and Santa Maria Federal University (Brazilian institutions), and by University of Ljubljana (Slovenian institution), which aims to conduct a comparative study of the construction industry in Santa Catarina and Rio Grande do Sul (Brazilian states) and Slovenia, from the standpoint of environmental management and ways to implement Environmental Management Systems. Regarding research methods, we proceeded to review the literature focusing on environmental management in construction. The first group of items aims to identify the profile of the respondent company, the second group of items is relative to the Quality Management System (although the aim of the paper is the Environmental Management System, it appears that there is the tendency of companies having ISO 9001 certification seek ISO 14001), the third group of items deals with issues related to the Environmental Management System. The preparation of the questionnaire came from a survey of literature, identifying the motivators and barriers to implementation of Environmental Management Systems, among the barriers listed for the respondent are: Lack of pressure from the government, lack of customer support, High costs for deployment, outsourcing creates problems in implementation, lack of technology, complex documentation, lack of support from employees, Weak environmental culture among competitors, lack of initiative among firms in the segment. Among the barriers are: Standardization of procedures for environmental management, social recognition (improvement of company image), increase the environmental awareness of contractors and construction sites cleaner. The concern with the implementation of Environmental Management Systems is notorious, surpassing market issues and become an important competitive advantage. Finally, the standards of ISO 14001 do not require of the organization an optimal level of environmental performance, but help it to achieve their own environmental goals.

Keywords: *Construction Industry, Environmental Management System, ISO 14001, Quality Management System, ISO 9001*

Ecological Recuperation of Palácio dos Leilões

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Abstract

This paper analyzes a proposal in the form of an early stage of a architectural, urban and paisagistic project aiming the ecological recuperation for the area of the so-called "Palácio dos Leilões", at the county of Contagem, Minas Gerais state. That area is being considered environmentally poor, unhealthy as it has being used as car crashed deposit. The cars wait for dismantling and their parts to be sold in order to be re-used. In this paper it will be demonstrate new concepts which are related to a cleaner and sustainable reuse since the shred process of pieces and collection of fluids will be more sensible as to open spaces to create new forests surrounding the factory. A small existing wetland in the place will be recovery in order to integrate and adapt itself to the ecological system treated. The paper concludes towards a conceptual framework to support the architectural, urban and paisagistic projects, reflecting on the main steps to achieve cleaner, sustainable and cheaper projects for industrial demands.

Keywords: *clean construction industry, recycling, reforestation, sustainable architectural design*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

23rd May 2013

8h00-9h40

Session 5A

Room 3

Optimization of Packaging Raw Materials in Ceramic Refractory Manufacturing Process

Structuring Management Processes to Get Cleaner Production Results: A Study in the Plastic Industry

Environmental and Economic Benefits of Implementation of Cleaner Production of Polymers in a Company

Application of Cleaner Production in a Process of Sockets Lighting Package, a Case Study

P+WATER: A Model for Selecting Sustainable Opportunities of Industrial Wastewater Reuse from Process Integration Approach

Optimization of Packaging Raw Materials in Ceramic Refractory Manufacturing Process

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Abstract

In the manufacturing of refractory ceramic there are many variables that contribute to the problems in the final product. Some of them can be easily identified. Others, however, require a more comprehensive evaluation and use of specific tools of quality management system to help to identify the real causes of the problem and therefore their elimination in the shortest time. Considering the process itself, the final products presented problems of density variation, fact of material compaction (with expansion deformation of the parts), burn facility in the dryer, weakness, increased water amount and more time-consuming drying parts. These problems caused losses in both, production and financial departments, in addition a considerable energy heat waste, the reprocessing need and eventually waste generation that required final disposal of such materials. Some analysis was performed in the production process so that it was possible to identify the largest possible number of causes that contributed to the emergence of the listed problems. This paper intends, through the application of quality tools (brainstorming and cause and effect diagram or Ishikawa diagram), to identify failures modes of the process so that they will be corrected by implementing actions plan to occur without problems recurrence, making the plant more economic in financial terms as well as more environmentally responsible, generating less waste.

Keywords: *Refractorie Ceramic; Sawdust, Silo, Waste Generation.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Structuring Management Processes to Get Cleaner Production Results: A Study in the Plastic Industry

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Abstract

This paper starts from the concern that, in general, economic growth ignores the environments and deals with how to face this reality in Brazil. The three facts of degradation of the natural ecosystems, population, average consumption per capita and technology, are considered with this aim. The development in the promotion and implementation of cleaner production practices and eco-efficiency procedures in small and medium companies in the country is summarized. It is found that technical proposal and demonstration projects have limited results and a set of strategies is proposed to improve this situation. It is emphasized that good and sustainable results of environmental indicators depend on the presence of cleaner production concepts and principles into structured and standardized management processes. Are included the results and discussion of a research carried on at the plastic industry sector relating management procedures and cleaner production results. The paper ends with the case study associated to the creation of The SINDIPLAST Environmental Management Award, another way to involve executives with cleaner production principles and management practices.

Keywords: *Cleaner Production (CP), Eco-efficiency, Industrial Ecology, Environmental Management, Management Processes*

Environmental and Economic Benefits of Implementation of Cleaner Production of Polymers in a Company

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Abstract

The aim of this study was to evaluate the environmental and economic advantages of implementing the Cleaner Production in a plastic manufacturing company in the closed-loop recycling of polymers. The research methodology was qualitative single case study, developed through semi-structured interviews and participant observation and quantitative through Wuppertall method to evaluate the environmental gains. The results of the research show economic and environmental advantages fairly representative.

Keywords: *Cleaner Production, Polymer Recycling, Environmental Advantage, Advantage economical*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Application of Cleaner Production in a Process of Sockets Lighting Package, a Case Study

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Abstract

Cleaner Production brings a differentiated approach on waste management, since it allows to the company to have a better knowledge of its manufacturing process; constantly monitoring the process, the generated waste becomes an opportunity for improvement. The aim of this study was to reuse and to optimize the use of packaging in a business outsourcer mounting sockets lamps. Since the packaging used in the receipt of parts for assembly and shipment of finished parts were large and contains a few pieces, it could be better used. It was carrying out a study to increase the capacity and reuse of the pack. The results were satisfactory, since it has increased the capacity for packaging receiving socket housing parts from 65% to 78% and the socket cover from 48% to 86.4%. The package mounted socket doubled its storage capacity from 50 to 100 pieces. The environmental benefit was the cutback of consumption of 16,075 units of plastic packaging. The economic benefits were R\$ 4.191,25 per year, without investments. It was proved the efficiency of cleaner production even in small and simple projects.

Keywords: *packing, sockets, cleaner production*

P+WATER: A Model for Selecting Sustainable Opportunities of Industrial Wastewater Reuse from Process Integration Approach

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Abstract

The current trend of rising costs related to consumption, water treatment and wastewater disposal has encouraged the development of methodologies aimed at industrial water reuse. Techniques and procedures from integration of chemical processes applied to the reduction of water consumption and the generation of industrial wastewater have been extensively studied in recent years. One such tool is called Water Sources Diagram (WSD), an algorithmic procedure that uses heuristics rules and searches the best connections between sources and sinks of water within the industrial processes. It allows the synthesis of the mass exchange networks with maximum water reuse, including regeneration and recycling of wastewater in the process. The WSD method may be applied as part of a program for implementation of Cleaner Production. This work presents a procedure aimed at the selection of promising alternatives for reuse obtained by applying the WSD method, in a systematic and efficient way. Furthermore, this procedure is part of a proposed industrial management model called P+WATER, applied to the sustainable management of water resources in production processes, and based on the tripod CP / WSD / Valuation of negative environmental impacts. A case study using data obtained from literature review for a typical oil refinery was carried out. Based on descriptive statistics and criteria of cost and relocation of streams, the water networks were then evaluated by a selection mechanism. In this case, it was possible to identify two scenarios considered promising, starting from an initial set of seven opportunities generated after application of WSD. The results indicated that the procedure can be useful as a preliminary assessment of sustainable opportunities for wastewater reuse. This review is important for the next steps of the model P+WATER and facilitates the search for more practical results in order to study the feasibility of problems that involve many complex scenarios.

Keywords: *Industrial water management; Water/wastewater reuse; Decision making; Process Integration.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

23rd May 2013

8h00-9h40

Session 5A

Room 4

The Influence of Cellulase Enzyme on the Energetic -
Environmental Performance of Second Generation Ethanol
Production – A Preliminary Study

Energy Embodiment on Assembly Phase of Self-Propelled
Sugarcane Harvesters

Development of Industry Sugarcane in Mato Grosso do Sul
State: Impacts and Benefits of the Production Energy from Cane
Sugar Farming

Productive Potential of Green Manures Aiming Rotation with
Sugarcane, in the State of Alagoas

Proposed Indicators for Assessing the Environmental
Performance of Production Processes of Sugar-Energy Plants

The Influence of Cellulase Enzyme on the Energetic-Environmental Performance of Second Generation Ethanol Production – A Preliminary Study

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Abstract

First generation ethanol from sugarcane is produced by Brazilian mills since 1960, currently recognized as a mature technology with high productivity. In a parallel way, the so called second generation ethanol (obtained from lignocellulosic materials) has great potential as an alternative to increase the amount of ethanol currently produced without requiring any surplus of land - avoiding the food versus energy debate. This new technological route demands enzymes for the hydrolysis process, converting the existing cellulose and hemicelulose from vegetal biomass into fermentable sugars. Quantifying the energetic-environmental cost of enzyme production is essential when assessing the total cost of second generation ethanol. In this sense, the aim of this work is to assess the influence of *celulase* enzyme industrial production on the energetic-environmental performance of second generation ethanol. Two main approaches are considered: (i) embodied energy analysis and (ii) emission inventory. Results indicates that enzyme *celulase* production requires about 900 MJ/kg_{enzyme}, which increases from 5,49 to 20,72 MJ the embodied energy used to produce 1 Liter of second generation ethanol. Emission inventory shows that CO₂ is the most released gas to atmosphere (99,9% of total in mass units), reaching 13300 g/kg_{enzima} and Global Warming Potential (GWP) of 13,32 kgCO_{2-eq}/kg_{enzima}. The enzyme's GWP correspond to 0.01% of total second generation ethanol's GWP production, thus its influence could be considered insignificant. While enzyme's industrial production emissions can be considered inapplicable on the total emissions from second generation ethanol, the embodied energy value has a strong influence.

Keywords: *celulase enzyme; CO₂; embodied energy; second generation ethanol.*

"INTEGRATING CLEANER PRODUCTION INTO SUSTAINABILITY STRATEGIES"

São Paulo – Brazil – May 22nd – 24th – 2013

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Energy Embodiment on Assembly Phase of Self-Propelled Sugarcane Harvesters

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Abstract

The energy subject is one the main challenges of 21st century. The geopolitical and environment aspects, they are concern sources to the current economic model. Energy analysis is necessary in order to monitor of scarce natural resources, to supply, a world population in constant growth. Studies of embodied energy in agricultural machinery are rare. The study aimed to determine the embodied energy on assembly phase in the self-propelled sugarcane harvesters. Two models were evaluated, so called: Machine 1 - equipped with wheels and tires; and Machine 2 - equipped with metallic tracks, manufactured by a company located at Piracicaba region, State of São Paulo, Brazil. The consumption of the input used in the assembly phase, was accounted, however, there is no difference in the consumption of those inputs for both machines, because its use from a same infrastructure and assembly time cycle. The consumption data of the inputs were processed, presenting the materials flows used, which they were multiplied by their energy index, resulting in the embodied energy required by the production system. The results show that electricity presented higher embodied energy (16,706.70 MJ). The embodied energy by demanded by labor, as well as, in the infrastructure, was low, could be disregarded.

Keywords: *Agricultural machinery, industry, mechanization, administration, life cycle analysis*

Development of Industry Sugarcane in Mato Grosso do Sul State: Impacts and Benefits of the Production Energy from Cane Sugar Farming

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Abstract

This study analysis the production of the bioenergy from the benefits and environmental and social impacts of the supply chain of sugar and ethanol. Thus, it was analyzed papers and data about scenario of Mato Grosso do Sul State, considered the fifth largest producer of ethanol from Brazil. Data are showed regarding the production and productive process discussed from the viewpoint of production cleaner. The research results showed that the benefits have been measured and presented as a great alternative to fossil fuel, however has not the systems and data that measure the environmental impact of these plants in Mato Grosso do Sul State, mainly regarding the heating region.

Keywords: *Sugarcane industry. Bioenergy. Clean Production. Environmental Impacts.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Productive Potential of Green Manures Aiming Rotation with Sugarcane, in the State of Alagoas

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Abstract

In a neat agricultural production system, it is essential to minimize the disruption to environment as well as to optimize the production factors. In Brazil, the sugarcane is considered as clean energy source. However, one must be aware of the changes caused by sugarcane production system, which can cause physical and chemical deterioration to soil. To maintain the physical and chemical properties of the soil cropped with sugarcane, the rotation with leguminous plants is recommended because they are easy to grow, present high biomass production, vigorous root system, besides their high capacity to fix nitrogen from atmospheric air. In this study, the productive potential of seven leguminous plants grown in Rio Largo, State of Alagoas, on northeastern Brazil were evaluated during two years. Sowings took place on early April and the cutting of the plants for evaluation of the nitrogen and dry matter accumulation was performed at seed formation stage. The *Cajanus cajan*, the *Mucuna aterrima*, the *Canavalia ensiforme* and the *Mucuna nivea* were more effective in accumulating dry matter and nitrogen in aboveground biomass. However, because their very long cycles, they do not allow rotation with cane. On the other hand, the *crotalarias juncea*, *ocroleuca* and *spectabilis* showed lower productive potential, although showing good adaptation to rotation with the sugarcane of one year and half. The results showed the use of the *crotalarias* (*juncea*, *ocroleuca* or *spectabilis*) under rotation with cane rather results higher dry matter production and higher nitrogen supply to soil, in comparison to natural vegetation (spontaneous), when optimizing the production factors and mitigating the effects from the physical and chemical deterioration of the soil.

Keywords: *Sustainable development, cleaner production, energy, crop rotation, nutrient cycling.*

Proposed Indicators for Assessing the Environmental Performance of Production Processes of Sugar-Energy Plants

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Abstract

The sugar-energy industry, even governed by a series of laws and ordinances regulating their activities with respect to their environmental impacts, has been subject to seizure by environmentalists because it is a type of industry that employs production processes with intense waste generation. However, there is not in national literature a work that presents a comprehensive set of environmental indicators adapted to the industrial operations of sugar-energy production. Thus, the objective of this work is to develop and present a set of environmental indicators that are applicable to the production processes of sugar-energy plants. From the study of the production process, we identify the steps that generate waste and by-products, the characteristics of each waste or by-product and the relevant legislation. With this, we developed an environmental indicator for each waste/byproduct identified. For the perfect definition of each indicator we define its purpose, its justification, and its standard evaluation procedure. As a result, it is shown a set of 23 architected indicators in order to highlight, from the destination that the plant give to the waste or by-products generated, the level of environmental suitability in the management of each of them.

Keywords: *environmental performance indicators, environmental performance of sugar-energy plants, ethanol production, sugar production*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

23rd May 2013

8h00-9h40

Session 5A

Room 5

Physical Indicators for Conducting Environmental Impact Study in Oceanic Cruises

Environmental Dimension Rating of the ISE Member Companies of BM&FBOVESPA in 2013

Sustainable Development: The Tradeoffs between Corporate Profit and Care for the Environment in Brazilian Automotive Sector

Firm's Sustainable Performance: Proposal of an Evaluation Index for a Chemical Brazilian Company

Sustainable Value and Cleaner Production

Physical Indicators for Conducting Environmental Impact Study in Oceanic Cruises

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Abstract

An Environmental Impact Study is a required procedure for obtaining environmental permits for projects and activities that use natural resources. This study aimed to establish the basic rules for the implementation and development of an Environmental Impact Study in Oceanic Cruises regarding physical indicators. The methodology applied in the preparation of the work was structured in stages. Since this is a theoretical study were used only secondary data. The approach to the subject was made looking up information in books, dissertations, periodicals, specific legislation, etc.. Subsequently dialogues were held with experts in order to obtain specific knowledge to further deepening of the study, as well as interviews with officials from the Port of Recife to obtain information regarding the operational aspects of the port and the cruise. From all the information gathered was defined indicators relating to physical aspects related to environmental quality, as well as the qualitative and quantitative description of those who have supported the development of two specific tables, they were the impact matrix and worksheet weighted Tommasi (1994). Finally, we prepared a matrix multifactorial qualitative for serve as a basis on assessment of the potential impact on a spreadsheet and a weighted quantitative profile, based on the precepts of the spreadsheet and qualitative identification of factors impacting greatest potential and from these measures were outlined mitigating, minimizing and offsetting.

Keywords: *Ocean Cruises, Environmental Impact, Environmental Impact Assessment.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Environmental Dimension Rating of the ISE Member Companies of BM&FBOVESPA in 2013

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Abstract

Stock market is the place where companies can raise capital, stimulating entrepreneurial activity and generating capital accumulation. Investors seek to invest in sustainable companies. Given this demand, in Brazil, it was created in 2005, the Corporate Sustainability Index (ISE) - a pioneering initiative in Latin America and fourth indicator of the kind in the world, comparing the performance of companies listed on the Securities, Commodities and Futures (BM&FBOVESPA) under the aspect of sustainability. It is a stock index benchmark for socially responsible investments, comprised of companies that excel in sustainability in the long term. The ISE is a tool for benchmarking the performance of companies listed on the BM&FBOVESPA. The purpose of this index is to create an investment environment compatible with the demands of sustainable development of society and encourage more sustainable practices in businesses. Investments in sustainable companies create shareholder value in the long term because they are more prepared to face economic, social and environmental risks. Integrating ISE is like having a seal of quality recognized by the market as a company that operates with sustainability. For the 40 companies comprising the ISE in 2013, it is considered as a critical environmental impact that one which in terms of technical, social or legal criteria (severity, reversibility, magnitude, spatial extent), demands specific actions for prevention, control and monitoring. However, the ISE do not include the impact of the economic ladder when they classify the environmental dimension of business activities/enterprises in terms of potential pollution and use of renewable and nonrenewable environmental resources. According to the classification of potential pollution and use of natural resources, 12 companies are not classified by the ISE in 2013. When considering the impact of the economic scale of the companies comprising the ISE, assigning weights (intensity 3 = low, 6 = average and 9 = high) to the respective impacts of environmental ISE, widening the original classification ISE, enabling stakeholders to measure interference of these companies according to classification by the impact of the economic scale.

Keywords: *ISE BM&FBOVESPA, potential pollution, use of environmental resources, economic scale ranking impact.*

Sustainable Development: The Tradeoffs between Corporate Profit and Care for the Environment in Brazilian Automotive Sector

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Abstract

In the capitalist system, in which profit is the main target of the companies, since it is their oxygen and responsible for their survival in the market, companies are planning beyond reach him, care for the environment, mainly by charging society. Thus, the Federal Government must ensure that the actions taken by firms are also converged to the welfare of society and the planet. Conceptualizing tradeoff that is an expression that defines a situation where there is conflict of choice, forcing a choice, how to solve the issue of having financial results without harming the environment and contribute to the economic and social development of the country as well as in improving people's lives and a healthy planet through sustainable development. After the Real Plan, the Brazilian economy has become more stable and the automotive sector has become one of the most important sectors. This article aims to address the tradeoffs between corporate profit and care for the environment, contributing to the economic and social development of the country as well as the improvement of people's lives and a healthy planet through sustainable development in the automotive sector.

Keywords: *Sustainable and Economic Development, Tradeoffs, Corporate Profit, Environment, Automotive Sector.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Firm's Sustainable Performance: Proposal of an Evaluation Index for a Chemical Brazilian Company

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Abstract

This paper aims to propose a model for building a Composite Index of Sustainable Development - I_{CDS} (in Portuguese), from the aggregation of various indicators of economic, environmental and social dimensions, for the purpose of tracking sustainability-related performance of a particular company. Indicators related to the topics considered strategic for one company, after selection, are normalized, weighted and aggregated into three sub-indices to finally be joined and make it possible to generate an overall indicator. The method was applied in Braskem, a the biggest chemical Brazilian company, where the composite index was calculated using the indicators reported by this company in the past four years, according to what is recommended by Global Reporting Initiative (GRI). The weighting of indicators was supported by the macro-objectives from company's vision, and to strategic indicators higher weights were considered. The results of the application of this model were considered satisfactory, because in addition to providing partial numbers for each performance dimension evaluated, it was shown that the tool showed great flexibility in the steps of selection, normalization and weighting of indicators, making it possible the application in different contexts and companies.

Keywords: *sustainability indicators, sustainability evaluation model, chemical industry, Global Reporting Initiative (GRI).*

Sustainable Value and Cleaner Production

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Abstract

As defined by the World Business Council for Sustainable Development in 1992, "eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the Earth's estimated carrying capacity." Eco-Efficiency becomes then a management strategy, which aims at improving the economic and ecological efficiency of companies, attaining a higher Value with fewer inputs, materials and energy and fewer outputs, waste (i.e. pollution in the form of emissions and waste). The result is a higher Value for companies, defined as the relationship between the satisfaction of needs and the resources used in achieving that satisfaction, as well as the increase of their competitiveness. Using the synergies between tools used by Value Management (Value Analysis) and Eco-efficiency (Cleaner Production), the Sustainable Value methodology was developed, and it integrates the three aspects of Sustainability (economic, environment and social) in Value evaluation. The aim of this approach is to increase Sustainable Value of the study subjects (value subject being the application of the methodology to a specific subject) by evaluating their satisfaction levels taking into account environmental and social aspects. The resources used to attain that satisfaction of needs are also characterized in an explicit way in terms of environmental, social and economic aspects. To attain these results an eight phases working plan, to be developed by a team, is presented. To test and validate this methodology some projects have been developed, involving 19 enterprises where the approach was implemented. Those companies, in most cases Small and Medium ones, came from different activity areas and different regions covering almost the whole Portuguese territory. Also the results emerging from the application in the different companies are presented as well as conclusions and suggestions about some conditions that must be fulfilled for the success of the introduction and implementation of these approaches in a company.

Keywords: *Sustainable Value, Cleaner Production, Eco-efficiency, Value Analysis, Competitiveness*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

23rd May 2013

8h00-9h40

Session 5A

Room 6

Potential of Waste from Steam Treatment in Eucalyptus Wood as Natural Dye for Dyeing Cotton

Adsorption of Acid Orange 8 from Aqueous Solution onto Zeolites Synthesized from Coal Fly Ashes Modified by Surfactant

Proposition of Implementation EMS and CP Actions in a Textile Machinery Industry, Curitiba-PR

Alternative Sustainable Dyeing of Textiles with Ionic Liquid

Reactive and Vat Dyestuff in the Dyeing of Cotton: A Review of Energy and Water Consumption, Ecological Analysis and Effluent Treatment

Potential of Waste from Steam Treatment in Eucalyptus Wood as Natural Dye for Dyeing Cotton

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Abstract

Natural dyes are gaining importance due to minor damage to health and the environment. It has been proposed to assess the potential for treating residue produced eucalyptus wood steam coloring natural tissues. We analyzed the chemical and physical characteristics of the residue. We dyed cotton fabrics by using the process of exhaustion with residue concentration at 50% relative to the fiber mass without addition of metal salts. Also we evaluate the addition of metal salts, iron sulfate and potassium aluminum sulfate (alum), called mordant in the dyeing bath to increase the color range in dyed fabrics and their effects on resistance to fading of fabrics. Then we evaluated the Color fastness to washing of dyed fabrics by the ABNT. Fabrics were dyed footnote 5 of color transfer. This showed that the dyed fabric does not transfer color to the white fabrics of any type of fiber which showed that the dyeing with the residue of eucalyptus has characteristics acceptable to the textile industry. Alteration of color after wash was large; therefore, this dye can be a sustainable alternative for products which require neutral or acidic wash. Future studies should include assessments of color fastness to light.

Keywords: *eucalyptus, textile, waste, dyestuff*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Adsorption of Acid Orange 8 from Aqueous Solution onto Zeolites Synthesized from Coal Fly Ashes Modified by Surfactant

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Abstract

The adsorption of Acid Orange 8 (AL8) over zeolites from coal fly ashes modified by surfactant was evaluated. The coal ashes used in the synthesis of zeolite (ZCC) by alkaline hydrothermal treatment were collected in thermal power plants Jorge Lacerda (SC) and Figueira (PR). The modification of zeolites was performed by mixing ZCC with the surfactant hexadecyltrimethylammonium bromide and the materials obtained were modified zeolite Jorge Lacerda (ZMJ) and modified zeolite Figueira (ZMF). The dye adsorption equilibrium was reached after 90 min for ZMF and ZMJ. The experimental data were best fitted to the kinetic model of pseudo-second-order for both adsorbents. The adsorption equilibrium was described in terms of Langmuir and Freundlich isotherms and Freundlich model was the most compatible with the experimental data for ZMJ and ZMF. The maximum adsorption capacities were 5.29 mg g⁻¹ for the AL8/ZMJ and 1.79 mg g⁻¹ for the AL8/ZMF.

Keywords: *zeolite; coal fly ashes; modified zeolites; acid dye; adsorption.*

Proposition of Implementation EMS and CP Actions in a Textile Machinery Industry, Curitiba-PR

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Abstract

The environmental pollution has intensified its rise in the 80's, 90's and 2000s due to the growth of industries allied to capitalism and consumerism. Along with this growth from environmental degradation, there was a concern with the preservation of this environment, in order to maintain the continuity of human life and the earth. This concern quickly spread to businesses through legal and quality improvements in the environmental performance of organizations for environmental preservation. In this context, emerged the ISO 14000 series of standards and techniques of cleaner production (CP), in view of the enterprise application and this performance improvement. Therefore, this study sought to integrate the quality management system of a company of textile machinery to environmental management system (EMS) based on the model of ISO 14001:2004, and raise possible CP actions in this organization. To permit evaluation of the EMS implementation, the survey was first conducted in component processes of manufacturing, as well as the environmental diagnosis of the organization. Then, analyzes were performed of the quality management system (QMS), which was already implemented and certified in the company studied, and we sought, through the quality of the documents, build bases and integration of EMS systems. Subsequently, the items were developed components of the environmental management system as standard: environmental policy, raising environmental aspects and impacts, legal requirements, goals and objectives, programs and procedures. In addition, a survey was conducted of certification costs. Finally, critical points were verified environmental performance in the company and proposing alternatives for improving indicators of control. According to the results, it was perceived that the organization already contained a well-reasoned, mainly due to the presence of the QMS deployed. For the implementation of the EMS, the main barriers were found to standardize procedures and environmental controls as well as employee training. The main actions to improve environmental performance were the recycling of treated effluent for use in cleaning the metal parts and the fate of metal powder grinding for recycling, eliminating the environmental liabilities of the company regarding this waste and enabling a reduced cost of disposal.

Keywords: EMS, CP, Company of textile machinery, Actions

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Alternative Sustainable Dyeing of Textiles with Ionic Liquid

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Abstract

The dyeing processes are extremely important for the differentiation and marketing of textile products. The dyeing takes place by fixing the dye molecule to the fibers, usually aqueous, that is, using water as the primary solvent for the process. It is estimated that spends on average 125 liters of water per kilogram of textile article produced. Whereas there is currently great interest in finding environmentally sustainable substances for this process, one of the alternatives is the use of Ionic Liquid (IL) as solvent substance for dyeing textiles due to its low cost, simple synthesis, biodegradation of high character and ability reuse. The Protic Ionic Liquids (LIP) are produced by acid-base reaction. Until now, there has been few studies directed towards application LI for application to textile dyeing thus justified studies in this area. This study will present multi-fiber textile dyeing fabrics using Ionic Liquids base Diethanolamine (DEA) as a solvent instead of water. The analyzes of the results will be made in equipment spectrophotometer, observing the graph of K/S.

Keywords: *Textile Dyeing, Dye, Fiber, Ionic Liquid, Sustainability*

Reactive and Vat Dye stuff in the Dyeing of Cotton: A Review of Energy and Water Consumption, Ecological Analysis and Effluent Treatment

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Abstract

This study compared reactive dyestuffs and vat dyestuffs in the dyeing of cotton, evaluating the reuse of the effluent generated, the ecological costs, as well as comparative testing for color fastness to water and perspiration acid and alkaline. The experiments with vat dyestuffs showed slight advantage in ecological costs, generating less molecules of carbon dioxide than the experiments conducted with reactive dyestuffs, lower consumption of energy, greater possibility of reuse of treated effluent, which presented decolorization efficiency above 99% in all cases, in addition to higher values in the wet fastness properties

Keywords: *reactive dyestuff, vat dyestuff, dyeing of cotton, ecological costs.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

23rd May 2013

8h00-9h40

Session 5A

Room 7

Municipal Competency and the Environmental Licensing: the Complementary Law n. 140/2011 and the Forestry Resources

Public Politics: The Reality in the Practice of Management Agreements

Fiscal Stimulus to the Green Economy. A case Study about a Tax Incentive for PET Recycling

Environmental Regulation Reform: Case Study for the Cleaner Production Fostering by CETESB

Municipal Competency and the Environmental Licensing: the Complementary Law n. 140/2011 and the Forestry Resources

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Abstract

Environmental licensing is the administrative systematics related to the "natural resources utilization by activities and businesses permission". The regulatory power of this kind of competency (a large quantity of normative instruments like Resolutions for example), considering specially the forestry resources, is delegated to the Union, States and Municipalities. This type of competency is also called "material, administrative or executive competency under the environmental aspects point of view". Therefore and on submission to the command of the single paragraph, article 23, of the Brazilian Constitution is that the Complementary Law n. 140 was created in December, 08, 2011. This law gives the mechanisms of the Union, States and Municipalities cooperation about the exercise of the administrative actions from the usual competency exercise related to the "natural landscape protection, environmental protection, control of all kinds of pollution and forestry, animal and vegetal preservation". The goal of this work is the study of the Complementary Law n. 140/2011 vis-à-vis the specific municipality competency for the forestry resources protection. For this purpose this work intends to use, about the methodological aspects, the Deductive Method (from the general to the specific). So, this work intends a global observation of the Complementary Law n. 140/2011 and the investigation process of the Municipal Public Power competency (mainly of the forestry resources utilization perspective). This work also intends to use the speculative, comparative and logical methods in order to help this investigation. The technical instruments and the material were produced with data researches, professional and historic experiences, literature and other kinds of sources and the conceptual categories use. The main conclusion of this research is that the Complementary Law n. 140/2011 allows to the Municipalities the environmental questions management in their own territories. However, the municipal environmental licensing, in relation to the forestry resource specially, still needs of the Environmental State Council hearing or permission.

Keywords: *Environmental license, Complementary Law n. 140/2011, Environmental Legislation, Municipal competency*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Public Politics: The reality in the Practice of Management Agreements

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Abstract

This paper presents a new version of public policy for government transparency outlining their necessary functions in a context of economic globalization, to enable the fulfillment of social demands and the competitive insertion of Brazil in international markets. In this sense, were adjusted to the role of promoter and regulator of social and economic development and strengthening their capacity for formulating and evaluating public policies; The increase its governance, ie its ability to implement public policies, from the viewpoint of efficiency , efficiency and effectiveness through the introduction of new organizational models and new partnerships with civil society, establishment of management contracts / agreements for management / partnership terms, and finally, the modernization of management. E-government includes three of the seven lines of action of the Information Society: Universal service, available to all Government and Advanced Infrastructure. And finally the System Integration and Intelligence Information Government i3-Gov, developed open platform. Thus, new trends are reflected in shared management and interagency involving the public sector, the productive sector and growing voluntary sector or third sector (Frey, 2002). Our waxed paper with the result presented by SICONV systems - Covenant of the Federal government, which adequately meet the assumptions of service and transparency, but needs improvement in regard to the participation of Government and assumption without state interference.

Keywords: *Transparency in government, new technologies and public service, government, information systems, e-Government.*

Fiscal Stimulus to the Green Economy. A case Study about a Tax Incentive for PET Recycling

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Abstract

This paper discusses the importance of Brazil for the implementation of the Green Economy, the role of laws inducing sustainable development and the role of taxation to promote socially and environmentally responsible development. Consider the specific case of positive results obtained mainly in São Paulo, Brazil, with the tax waiver of 60% of the tax '*imposto sobre a circulação de mercadorias e serviços*' - ICMS, done by the National Tax Policy Committee. The agreement 08/03, which was consolidated by tax waives encouraged the collection of PET packaging, created jobs, protected the environment and stimulated recycling.

Keywords: *Development, Environment, Taxation, PET Packaging*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Environmental Regulation Reform: Case Study for the Cleaner Production Fostering by CETESB

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Abstract

The establishment by the government of a set of requirements for businesses to operate in an environmentally responsible manner, generically named as "environmental regulation" has been one of the most successfully implemented on last century. However the evolution of social dynamics demanded reforms of the most traditional models for environmental regulation, for which various recommendations have been made internationally. Starting with a brief summary of "regulatory quality characteristics" summarized from literature, the present article examines a case study regarding the cleaner production fostering by CETESB, Sao Paulo State environmental agency. After an introduction and the methodological procedures presentation, the case study is described and the most relevant results are presented, mainly from interviews with selected key stakeholders. It is highlighted that although there has been no specific planning, many of those "characteristics" are already presented at the program, especially with regard to participation, flexibility, preventive focus and innovation. It also stressed that this presence influences the behavior of regulators and regulated, although most at those who participated directly in the activities, since there was little diffusion effect. Finally, suggestions for improvement are collected, among which the need for cleaner production consideration in the agency's strategic planning and its incorporation in the main regulatory routines, especially the environmental permitting.

Keywords: *environmental regulation; cleaner production; environmental agency; environmental public policy*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop*, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

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23rd May 2013

13h30 -15h00 Conference

Mark T. Brown

University of Florida - USA

Emergy and the Economy:
Reflections on Sustainability

Emergy and the Economy: Reflections on Sustainability

Mark T. Brown
University of Florida – USA

Following Schumacher's (1973) concept of the primary economy (nature) feeding the secondary economy (agricultural and industrial production), we suggest that there now exists a tertiary economy (the financial system of trade, banking, insurance, and stocks). This tertiary economy is the tail that wags the dog of modern nation states. Driven by expectations for continued growth, investments have been increasingly directed toward the tertiary economy rather than toward the primary and secondary economies. As most economic theory for stable economies is based on growth, the planning and policy for economic health of nations is based on increases in all aspects of the economy. Yet growth cannot continue forever, and, in fact, the insistence on continued growth is at the root of the current economic crises.

We hypothesize that the increasing distance (spread) between the actual increase in wealth (measured by emergy throughput) and the illusion of wealth (measured by GDP) is a sign of serious future shocks or stochastic surprises similar to the boom and bust cycle that occurred up to and including 2008. The increasing concentration of money in the tertiary economy represents "wastepaper" wealth since there are few, if any, flows of emergy connecting the tertiary with the rest of the economy. Paper wealth in the tertiary economy represents a significant threat to the larger economy resulting in hyper-inflation if it were spent in the economy. In addition, continued concentration of paper wealth in the tertiary economy

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threatens national security, indeed global security since it precipitates boom and bust trends and fosters resource imperialism.

Consistent with this biophysical perspective, we raise some important caveats of sustainability necessary to understand the present and adjust to the future, we do some sustainability myth busting, and finally provide guidelines for a prosperous way down (Odum and Odum, 2001).

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Schumacher, E. F. 1973. *Small Is Beautiful: Economics As If People Mattered*. Blond & Briggs, London. 288p.

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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23rd May 2013

15h00-16h30

Session 5B

Room 1

Environmental Regulation Reform: Case Study for Extended-Responsibility Adoption in São Paulo State Waste Policy

Assessment of Demand and Potential Associated with Solid Waste Management in Emerging Cities: The Case of the City of Rio das Ostras, RJ

Recycable Waste Grinding Container

Analysis of the Emergy Indicators for the Installation of a Landfill in the Southern Region of Minas Gerais

Environmental Regulation Reform: Case Study for Extended-Responsibility Adoption in São Paulo State Waste Policy

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Abstract

The establishment by the government of a set of requirements for businesses to operate in an environmentally responsible manner, generically named as "environmental regulation" has been one of the most successfully implemented on last century. However the evolution of social dynamics demanded reforms of the most traditional models for environmental regulation, for which various recommendations have been made internationally. Starting with a brief summary of "regulatory quality characteristics" summarized from literature, the present article examines a case study regarding the adoption of the extended responsibility strategy at Sao Paulo State Waste Policy. After an introduction and the methodological procedures presentation, the case study is described and the most relevant results are presented, mainly from interviews with selected key stakeholders. It is highlighted that the case illustrated an important example of the regulatory process inversion, which brought a significant change in the regulated behavior. It is also verified that, although the program does not intentionally included those characteristics, many of them are present, mainly participation, decentralization, flexibility, and the use of multiple instruments, among others. At the end suggestions for improvement are collected, recommending that those must be accompanied to ensuring its effective adoption in the future.

Keywords: *environmental regulation; waste policy; environmental agency; environmental public policy*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Assessment of Demand and Potential Associated with Solid Waste Management in Emerging Cities: The Case of the City of Rio das Ostras, RJ

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Abstract

The rapid urban and population growth observed in some Brazilian cities in recent years, associated with the troubling framework of management of municipal solid waste (MSW) in the country has as a consequence environmental problems that tend to gain scale in the future. Note that there is a technology and management lag relative to some efficient models adopted in developed countries that use waste as a feedstock in power generation and maintains high standards of environmental control. Therefore this paper addresses, holistically, the problems of urban waste management, as well as the main routes that can be taken to advance the department in accordance with the guidelines of the National Solid Waste. For a closer view of reality, a case study was conducted in the city of Rio das Ostras, RJ, where was diagnosed a scenario that, despite being above the national average, is still far of desirable standards characterized by difficulties in meet the growing demand, large wastage of materials and lack of adequate treatment for most waste. Based on collected data in the field and in the literature, were made projections of future scenarios considering population growth. It was estimated that if nothing is done, the city will need to triple its garbage disposal capacity in less than 10 years. On the other hand, from some actions and investments, is possible to reverse this framework using the economic and energy potentials associated with the management of MSW generating countless benefits to the city. Actions such as separating waste for recycling, installing biodecomposition centrals and framing the landfill as CDM were considered most advantageous to be implemented in the short term considering the factors of technical, economic and environmental involved. Yet, not rule out the use of heat treatment for some types of materials, and eventually even to the RSU. However, it was concluded that a new approach of municipal administrations, especially those growing cities, it is possible to manage the waste more efficiently resulting economic advantages and also protecting the environment.

Keywords: *waste management, MSW, urban growth, environment, waste to energy*

Recyclable Waste Grinding Container

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Abstract

The growing concern of global organizations on environmental issues has generated discussions about methodologies and strategies that will ensure the sustainable development of enterprises and businesses. The strategy logistics business is a key factor in its success where seek continuous improvements related to environmental issues. In this context there is the opportunity to work in structuring reverse flows of products as a way to address these concerns. Reverse logistics is a key strategy for the organization that seeks to improve its image with consumers, sustainable development and economic advantages and is being developed by various global organizations. The objective is to bring consumers a product that not only meet their needs and aspirations, encourage the separation of recyclable waste and crushing them. It is also objective of this work, the awareness of the need to rethink attitudes and individual and collective actions that can provide sustainability of the planet.

Keywords: *reverse logistics, grinding, separation of recyclable waste, environment, economic advantages.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Analysis of the Emergy Indicators for the Installation of a Landfill in the Southern Region of Minas Gerais

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Abstract

More than 50% of Brazilian cities place their urban solid wastes (USW) in places with no previous treatment and adequate control, according to data from Instituto Brasileiro de Geografia e Estatística (IBGE, 2002), although Law 12.305 (PNRS, 2010) forbids the existence of dumps and encourages more environment-friendly treatment techniques. In this sense, a study was made simulating a landfill implantation that contemplates some cities in south Minas Gerais, where residuals are placed in open dumps, based on studies of the emergy synthesis from São João Landfill in São Paulo. The calculations were made regarding the population average of each city in a period of 12 years. For the annual solid waste generation rate per inhabitant it was used data from Panorama de Resíduos Sólidos do Brasil (ABRELPE, 2011), that corresponds to 341,275 kgRSD.year/hab of waste. This paper concludes that approximately 5.45×10^6 m³ of biogas and $2,72 \times 10^6$ m³ of CH₄ (Methane gas) would be produced. The indicators in emergy point that the landfill system simulated for south Minas Gerais area is not sustainable because it would use 73,98% of the resources coming from the economy. Although it is worth highlighting that without the implantation of a landfill in this area and the use of inputs from the economy the impacts to the environment would be much more overwhelming.

Keywords: *Emergy; landfill; sustainability; environment; Landfill waste*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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23rd May 2013

15h00-16h30

Session 5B

Room 2

Electrodialysis as an Alternative for Treatment of Nickel
Electroplating Effluent: Water and Salts Recovery

Application of the Principles of Cleaner Production in a
Galvanizing Company

Method for Data Collection and Analysis of Environmental
Performance Assessment Inmetal Mechanic Industries

Searching Cleaner Production through Lean Production: Case
Studies in Foundry Industries

Electrodialysis as an Alternative for Treatment of Nickel Electroplating Effluent: Water and Salts Recovery

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Abstract

Galvanic processes are one of the main activities contributors of metal discharges into the environment. The wastewater generated contains high load of salts and metals that must be treated for recovery chemicals and water, saving resources. In this work the treatment of effluents from bright nickel electroplating process by electrodialysis (ED) was studied in order to concentrate and extract nickel (Ni) and its salts and recover water for reuse, saving industrial and environmental resources. This study was started as a case requested by an European company, manufacturer of ED plants, due the operation of equipment used in the treatment of nickel plating wastewater at an Brazilian enterprise.. After many tests using real and synthetic nickel plating effluent and determination of limiting current value in previous works, one bench scale electrodialysis system was evaluated, containing five compartments cells separated by four 16cm² membranes. It was used a synthetic effluent based on industrial baths composition, including salts and organic additives. Nickel extraction, pH and conductivity were evaluated for all compartments. After ED, the treated effluent was evaluated by chemical analysis for verify its quality. It was found that ED treatment generates, as product, a very low conductivity solution, allowing the reuse as rinsewater, and a concentrated solution able to fortify the bath and recover volumes lost by evaporation and drag during the nickel electroplating process.

Keywords: *Nickel electroplating, effluent treatment, electrodialysis, reuse.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Application of the Principles of Cleaner Production in a Galvanizing Company

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Abstract

Sustainability is a recurring theme and source of discussions in various fields, whether government, business and academic institutions. The need to reduce emissions of pollutants has become a constant concern, and in the racing companies, the focal point lies in manufactured goods and the generation of emissions to the environment resulting from their production processes. One of the concepts that is in evidence is called Cleaner Production (CP), which refers to a new way to see the productive operations, whose aim is to generate less environmental impacts during the production process, ie before the "end-of-pipe". In this context, this article aims to analyze the results obtained through interventions in the production process in an electroplating company. The research fits as an exploratory case study and the results show substantial gains occurred surveyed using the new method, both environmental and economic order, which represents an important opportunity for application in other companies.

Keywords: *Sustainability, Environmental Management, Cleaner Production, Plating*

Method for Data Collection and Analysis of Environmental Performance Assessment Inmetal Mechanic Industries

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Abstract

The Metal Mechanic industry stands out for relevance in the economy and the broad scope, including metallurgy, manufacture of metal products and machinery manufacturing. In view of the inputs used and waste generated during industrial processes, there is an important cause of environmental impacts. A methodology to reduce environmental impacts in the production process is the Cleaner Production (CP). Therefore, it is necessary to identify what the root causes of these impacts. In this context, both the CP as well as the environmental standard ISO 14001, in item 4.3.1 titled Environmental Aspects, states that the organization should establish procedures to identify the environmental aspects of activities, products and services within the defined scope of the environmental management system. Moreover, both not recommend or determine a specific method geared to this purpose. Moreover, the Life Cycle Assessment (LCA), a technique used to evaluate the environmental impact of products, depends on data of each process from extraction to product disposal and Frischknecht et al (2007) present a consistent collection data along this chain processes. Thus, in order to optimize data collection by organizations for environmental assessments, it is suggested that both the implementation of the CP as the ISO 14001, use the form of data collection in ACV. In this paper we present a case study in manufacturing products of the metalworking industry, demonstrating the viability of this proposal.

Keywords: *Cleaner Production, Life Cycle Assessment, Environment, Sustainability.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Searching Cleaner Production through Lean Production: Case Studies in Foundry Industries

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Abstract

The advancements towards the sustainable development have been too slow in all industrial sectors. The contribution in this direction on part of manufacturing industries frequently stumbles in constraints related to increase in costs and loss of competitiveness. The Cleaner Production (CP) approach that nurtures more sustainable practices focused in manufacturing processes provides an important alternative to overcome this situation. This paper contemplates the relation between the principles of CP and practices of lean production, with the purpose to indicate tools for manufacturing industries that can facilitate the search for sustainable development, without requiring the establishment of a specific and costly structure for supporting this. As in the struggle to accomplish productivity gains, manufacturing firms rationalize their production with lean production practices, they can benefit from the tools and structure of this production approach to also incorporate the goals of CP.

Keywords: *cleaner production, lean production, foundry, case studies, environmental control management*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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23rd May 2013

15h00-16h30

Session 5B

Room 3

Minimization of Mass Flow in District Heating Network Equipped with One Stage Domestic Hot Water Production Substations

Sustainability in the Hotel Industry, Efficient Use of Water and Electricity Resources. Case: Hotel San Angel

Preliminary Assessment of Potential water Savings through Actions of CP in Cementos Cienfuegos SA

Toward a Beneficial Sanitation

Minimization of Mass Flow in District Heating Network Equipped with One Stage Domestic Hot Water Production Substations

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Abstract

The paper presents the possibilities of decreasing the mass flow in district heating system supplying district heating substations for residential buildings. In majority of district heating system in Western, Eastern and Central Europe the type of district heating substation with two stages of domestic hot water preparing is deeply rooted. The main aim of the paper is to show lack of arguments for grounds to use this technical solution in contemporary district heating networks. On the basis of computer simulation, the possibilities of decrease the mass flow and electrical energy consumption in heating (power) plant have been presented.

Keywords: *district heating system, domestic hot water, DHW priority, energy saving*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Sustainability in the Hotel Industry, Efficient Use of Water and Electricity Resources. Case: Hotel San Angel

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Abstract

The tourism industry provides significant economic benefits to be a powerful generator of income, employment and development, but the provision of these services generates negative impacts so comes the concern of the companies to be sustainable. It should be noted that a continued growth of this sector is expected and, within this, the hotel industry, so it is necessary to implement actions that benefit the environment, from which the objective of this study is potentially prevent, eliminate and/or reduce environmental impacts by optimizing the use of electricity and water; this through the implementation of Sustainable Services Program that serves as a tool for environmental decision making and proposes technological and cultural measures to reduce consumption of resources in question. This program includes among its stages the processes characterization carried out by the provision of services involving the use of electricity and water in section III of the Hotel San Angel, and is required for the formation of a team of integrated sustainability by hotel staff and the graduate faculty of sustainability where there was an exchange of information and through its analysis priority areas are identified for the implementation of sustainable actions. Sustainable Services Program leads to cost reductions resulting from the optimization of the use of electricity and water, which also benefits by reducing environmental impacts such as CO₂ reduction and better use of water resources that help reduce one of the main problems in the region, that is to say, water availability, also the sum of the economic and environmental benefits they provide as well as social benefits by providing a better corporate image and competitive advantage to meet customer expectations.

Keywords: *Sustainable development, Tourism, Hotel, Optimization*

Preliminary Assessment of Potential water Savings through Actions of CP in Cementos Cienfuegos SA

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Abstract

In paper a quantitative analysis of the main processes consumers of water in the company Cements Cienfuegos SA and actions focused to saving water through the introduction of the water recycled and use of the rain waters. Also a preliminary evaluation of the proposed actions is carried out and concludes that this company has potentialities of to reduce drastically its billing of water and to improve its indicators of specific consumption of water.

Keywords: *water savings, cleaner production, Cementos Cienfuegos*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Toward a Beneficial Sanitation

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Abstract

Good sanitation for all is a major social and political challenge. Infrastructure for sanitation expanded in the last two centuries entailing a highly performing but costly production system. Possibilities of cost-saving along with social benefits through constructed wetland technologies are discussed with particular attention to the vertical flow technology, which is a cost-effective option based on experiences in the Netherlands. Cost-saving and income generating actions are presented based on examples across the world and brainstorming technique.

Keywords: *sanitation, constructed wetland, costs, income*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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23rd May 2013

15h00-16h30

Session 5B

Room 4

Life Cycle Assessment of Metallic Structures

Energy Analysis of the Productive Life Cycle of the MDP Wood-Based panel In Brazil

Integrating Life Cycle Assessment and Input-Output Analysis for the Assessment of Ethanol Greenhouse Gases Emission in Brazil

Energy Production from Microalgae Biomass: The Carbon Footprint and Energy Balance

Life Cycle Assessment of Metallic Structures

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Abstract

A life cycle assessment is a method that helps to identify the magnitude of the environmental impact of a product within their chain of production and consumption. The results of this evaluation may be useful in designing strategies for more sustainable use of natural resources. This work studied the life cycle of steel structures of a company from São Paulo, Reccom Industrial Equipment during the ministry of matter Engineering Product Lifecycle, taught by Professor Aldo Roberto Ometto the University of São Paulo - Sao Carlos . It was found that the production of the same could be revisited is the realization of a project to minimize waste production, or through a system of reverse logistics or implementing actions CP (Cleaner Production), thus making more sustainable products.

Keywords: *life cycle assessment, environmental impact, case study, metallic structures.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Energy Analysis of the Productive Life Cycle of the MDP Wood-Based panel In Brazil

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Abstract

This paper presents a life cycle study of the MDP (medium density particleboard) produced in Brazil. This study considers an energy analysis of the cradle to gate life cycle of the product, divided into two subsystems: forest production and industrial production. For this, it was assumed the Life Cycle Assessment (LCA) technique, normalized by ISO 14040 and 14044 documents, and applying the Cumulative Energy Demand (CED) method, that computes the total primary energy used throughout the life cycle. According to results, it was checked that the industrial production subsystem was responsible for the major consumption and losses of energy, with 87.0% of the total life cycle energy consumption, and 96.4% of all energy losses. Furthermore, in terms of energy efficiency use, the industrial production subsystem showed inferior results, with 79.8%, while the forest production subsystem showed 95.0% of efficiency. In this sense, we proposed some improvement opportunities focused on the industrial production subsystem, considering some possibilities of optimization of energy use. We suggested the utilization of wooden residues generated during industrial manufacturing of MDP as an energy resource. This residue could be applied on cogeneration systems, to reduce electricity demand, and also reducing demand for fossil fuels used at energy matrix from industrial production subsystem.

Keywords: *forest biomass, MDP wood-based panel, life cycle assessment, energy balance.*

Integrating Life Cycle Assessment and Input-Output Analysis for the Assessment of Ethanol Greenhouse Gases Emission in Brazil

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Abstract

The increasing ethanol production in Brazil is deeply related to the global demand for alternative energy sources which can both decrease the reliance of economic sectors on non-renewable energy and drive global energy production towards a more sustainable situation. Simultaneously, it is important to improve techniques that allow the assessment of environmental impacts from different scenarios of biofuel production, aiming to improve its sustainability. The Life Cycle Assessment (LCA) is recognized as a powerful methodology that provides detailed information about the environmental impacts related to agricultural production, industrial stage and consumption phase of sugarcane-based products and co-products. However, LCA has some limitations regarding the definition of system boundaries and also requires huge effort during the data collection for Life Cycle Inventory. In this sense, a different technique such as the LCA integration with Input-Output Analysis (IOA) emerges as an alternative approach which allows expanding the boundaries of LCA studies to the country's economy without losing important information provided in the life cycle inventory. This approach is based on the country's input-output matrix, which allows calculating the direct and indirect impacts related to all production sectors of a country. In this paper, such integrated approach will be used to simulate the greenhouse gases emission related to different technological scenarios of bioethanol production in the Virtual Sugarcane Biorefinery (VSB), under development by the Brazilian Bioethanol Science and Technology Laboratory (CTBE). Data for the assessment were obtained from literature and computing simulation. Preliminary results show that integrated first and second generation ethanol production (1G2G) has the lowest global warming potential (measured in CO₂-eq) when compared with first generation ethanol production technologies in Brazil.

Keywords: *life cycle assessment, input-output analysis, ethanol production, greenhouse gases emission*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Energy Production from Microalgae Biomass: The Carbon Footprint and Energy Balance

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Abstract

Bioenergy sources are promising alternatives for energy production in a sustainable world. Nevertheless many research and detailed analysis are necessary to measure in which circumstances they can contribute to it. This paper focuses on microalgae biomass combustion to produce heat and compares the use of different electricity sources with respect to Greenhouse Gas (GHG) emissions and Net Energy Ratio (NER). Some fossil sources were used as reference. The methodology was based on ISO 14040/44 standards and most of the data were obtained from scientific publications. The results showed that NER from microalgae combustion is still disadvantageous compared to fossil options. Microalgae GHG emissions were higher than fossil using the United States electricity grid but lower using the Brazilian one. Regardless of the fossil options show slightly better yields related to microalgae in the two categories analyzed, the fossil energy technology is mature and has less space for improvements while microalgae is in its infancy and have many technological solutions being developed.

Keywords: *Microalgae, Life Cycle Analysis, Greenhouse Gas, Net Energy Ratio.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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23rd May 2013

15h00-16h30

Session 5B

Room 5

Treating Input Data Uncertainty in LCA: Monte Carlo and Fuzzy Approaches

Evaluation of Essential Drivers of Green Manufacturing Using Fuzzy Approach

Web-Based Application for Calculation and Analysis of Environmental Sustainability in Emergy

Business Certifications for ISO 14001: Descriptive and Comparative Study of the Evolution Over the Period 2000 to 2010

Treating Input Data Uncertainty in LCA: Monte Carlo and Fuzzy Approaches

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Abstract

This work aims at discussing the differences between Monte Carlo method and Fuzzy data sets approaches when dealing with input data uncertainty in LCA models. Input data variation is treated in most LCA studies considering uncertainties because practitioners do not have the necessary specific data for the case study or even because the available data has a characteristic variation. In this work the probabilistic and the possibilistic approaches are detailed discussed and the probability density function and the membership function curves of the respective results are compared, through the application of both methods in a simple case study. It consists of two materials mainly composed of recycled cotton fibers used as acoustic barriers in automotive vehicles: DL (Dual Layer) and ABA (Absorption, Barrier, Absorption). The Monte Carlo Method was applied through SimaPro[®]. The lognormal probability density function adapted to the result data showed that DL material is more impacting than the ABA one in the Acidification category, however in the Photochemical Oxidation category, there is an intersection between the curves and in this interval there is a chance of both materials to be the most harmful for the environment. The same results were observed through the membership functions of these impact categories when applying the Fuzzy data sets approach; therefore, probabilistic and possibilistic approaches were validated for the treatment of input data uncertainty in LCA models and they can be useful tools for LCA practitioners.

Keywords: *Life Cycle Assessment, Input data uncertainty, Monte Carlo Method, Fuzzy data sets*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Evaluation of Essential Drivers of Green Manufacturing Using Fuzzy Approach

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Abstract

Green Manufacturing (GM) issues became the wide biased debate over the last decade because of its environmental concerns and economical importance. This paper attempts to analyze the drivers of GM with a fuzzy approach. The common drivers are identified through the existing literature and with the combined assistance of industry experts. The Common drivers are provided as stakeholders (D1), company image (D2), competitors (D3), financial benefit (D4), environmental conservation (D5), customers (D6) and compliance with regulations (D7). These seven drivers are getting compared over one another based on the data provided by the firm which is situated in the southern part of India. This paper concludes with the priority among common drivers to find out the essential driver of GM. This study helps to identify the essential driver of GM and in the future it also assists to stimulate that essential driver for implementing GM.

Keywords: *Green Manufacturing, Drivers, Fuzzy AHP*

Web-Based Application for Calculation and Analysis of Environmental Sustainability in Emergy

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Abstract

This paper presents a software on the web, client/server model of four layers, for calculation and analysis of environmental sustainability indexes using emergy as a tool. The first layer is formed by a MySQL database stored on a web server Apache. In the layer of business rules are developed routines calculation and analysis of the indices in emerging resource considered, using the programming language PHP. Through a form on the presentation layer, the user provides the primary data input about renewable resources, non-renewable, transformed, exported and imported from any regional system and receives as output, environmental analysis emergy in the form of graphs, thematic maps and tables with calculated values of indicators. Internet browsers represent the client layer. The tests indicated that the PHP and MySQL open source technologies associated with an environmental assessment methodology showed how computational tools can contribute to the sustainable development of a region.

Keywords: *emergy, resource, web application, sustainable development*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Business Certifications for ISO 14001: Descriptive and Comparative Study of the Evolution Over the Period 2000 to 2010

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Abstract

The evolution of certifications in the last decade highlights the concern about aspects related to environmental management in enterprises, based on a overview from every continent on the standards of the ISO 14000 series. In this sense, the aim of this article is to demonstrate the growth of certificated companies based on information consolidated from the descriptive and comparative analysis, identifying continents and countries that grew the most from 2000 to 2010. The research is: bibliographic, documentary; descriptive and exploratory research. Regarding on the approach is: qualitative and quantitative. The results demonstrated the evolution of the certifications over the period studied, and gave visibility to the current stage of certifications by continent and countries. It was found that companies use certifications as a requirement for improving the indicators of competitiveness, innovation and for eliminate barriers imposed by importing and exporting countries. The requirements to certify the environmental management system are related to the compliance of internal and external procedures, where companies seek to meet of the stakeholders.

Keywords: *ISO 14001 certifications, environmental management system, continents, countries, companies.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop*, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

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23rd May 2013

15h00-16h30

Session 5B

Room 6

Towards a Cleaner Vehicle Fleet: the Dynamics of the Swedish Biofuel System

Study of Vehicular Emission of Greenhouse Gases (GEE) in Gasoline-Powered Vehicles

Cleaner Production and Innovative Processes for an Industry of Re-Manufacturing Automotive Plastic Parts in Hermosillo, Sonora

Biogas Production from Manure of the Fish Farming

Towards a Cleaner Vehicle Fleet: the Dynamics of the Swedish Biofuel System

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Abstract

The study's overall objective is to present how the development of the Swedish biofuels system impacts the achievement of the European Union's target of 10% of renewable fuels in transport by 2020 and the establishment of a vehicle fleet independent of fossil fuels by 2030. The methodological approach is based on a combination of forecasting and backcasting scenarios. This cross-analysis is used to relate one set of data with others in order to identify gaps between the potential energy use in the Swedish domestic transport sector with the country's desired targets. Our analysis shows three gaps related to i) infrastructure and management capabilities for local biofuel production, ii) policy instruments to trigger systemic changes to reduce dependence of imports, and iii) investment decisions. In order to bridge those gaps, policymakers have to decide on how to steer the system's development not only by combining different pathways between different growth patterns of the Swedish biofuel system but also deciding either to apply supply or demand pressures onto the system as driving forces. These choices have to be taken in a very short-run in order to shape the development of the Swedish biofuel system away of failing the target of establishing a vehicle fleet independent of fossil fuels by 2030.

Keywords: *Biofuels, bioenergy systems, transport sector, Sweden.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Study of Vehicular Emission of Greenhouse Gases (GEE) in Gasoline-Powered Vehicles

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Abstract

Knowing the behavior of the emission of greenhouse gases (GHG) in the atmosphere is important due to global climate change and its consequences for ecosystems. Studies involving vehicular emissions are of great importance due to its role in GEE emissions. The aim of the research was to determine the emission of major greenhouse gases (CO₂, CH₄ and N₂O) in fleet vehicles powered by gasoline. For this, we studied two gasoline-powered vehicles of different years of manufacture. The tests were performed on the dynamometer CETESB and IPEN.

Keywords: GEE, gasolina, aquecimento global, vehicular emission.

Cleaner Production and Innovative Processes for an Industry of Re-Manufacturing Automotive Plastic Parts in Hermosillo, Sonora

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Abstract

Currently, industries are required to include best practices in order to reduce the impact of their activities with their environment. The nature of the production process of industry will be the determining factor in efforts to prevent pollution. So making a precise characterization of the process is an essential part for cleaner production. This work, with this recognition, aims to propose a program of cleaner production and pollution prevention in a re manufacturing industry of automotive plastic parts in the city of Hermosillo, Sonora, this program is based on the eight steps of a Industrial Pollution Prevention Handbook, taking place within the period of May to December 2012. During the development of this research was detected the existence of environmental and occupational risks. Quantitative and qualitative analysis was made for the assessment of these, in order to broaden the scope of understanding. Increase the scope of the project is recommended in order to take advantage of the corporate interest in improving their practices due to the importance of achieving a greater competitiveness on terms of sustainability.

Keywords: *cleaner production, pollution prevention, industry*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Biogas Production from Manure of the Fish Farming

MACHADO, S. T. ^{a*}, JORDAN, R. A.^a, SANTOS, R. C. ^a, PAOLETTO, A. M. ^a, REIS, J. G. M. ^a, AVÁLO, H. ^a

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Abstract

This paper evaluated the potential of biogas production from anaerobic digestion of manure of the fish farming, species Tilapia Gift (*Oreochromis niloticus*). This study is part of a pilot project conducted in order to evaluate feasibility to biogas production from manure of the fish farming in zone of Grande Dourados-MS, conducted by Federal University of Grande Dourados (UFGD). For construction of the biodigester and gasometer model used in this work was two plastic gallon with capacity of 50 liters and white PVC pipe. The results of this study indicate a potential of 917 cm³ / day per 50 gallons of the gross material with retention time 10 days. Thus, it is possible to use manure from fish farming to produce biogas.

Keywords: *Biogas. Pisciculture. Tilapia Gift (Oreochromis niloticus).*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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23rd May 2013

15h00-16h30

Session 5B

Room 7

Safe Thermal Decomposition of Organochloride Pesticides by Submerged Oxidation in Molten Salts

Green Analysis of Steroids for Clinical Purposes: The Use Of Ethanol as an Environmentally Friendly Alternative for Solid-Phase Extraction

Characterization of Resultant Effluent of the Washing Process of Plastic Film Evaluating Treatment Application for Electrolytic Process

Suggestions for Implementation of Cleaner Production in Cassava Starch Industry

Safe Thermal Decomposition of Organochloride Pesticides by Submerged Oxidation in Molten Salts

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Abstract

This study was motivated by the current interest in the world in the development of advanced processes for waste decomposition, category in which the process described herein is inserted. This interest stems from the need for safer processes for the decomposition of some wastes, particularly those deemed hazardous or present significant impact on the environment. The technology developed fits into this principle and it is applicable for intrinsically safe disposal of hazardous organic wastes, particularly the organochloride, whose degradation has presented problems when using the most common methods, such as incineration. Pesticides banned, obsolete or discarded constitute a serious environmental risk around the world, especially in developing countries. The HCHS, or Hexachlorocyclohexanes also called BHC or Lindane, are organochloride insecticides that have been banned in most countries in the 70s and 80s. It is one of the compounds that constitute the group of so-called POPs, or persistent organic pollutants that are regulated internationally by the Basel Convention. Among the major POPs could be cited pesticides, dioxins and PCBs that represent, according to the United Nations Industrial Development Organization - UNIDO, one of the most serious and urgent problems to be faced, because on the one hand, its wide dissemination in environment and, secondly, because of its properties and characteristics, which determine its persistence in soil and water. The United Nations Environmental Protection - UNEP, for example, launched a global action for the establishment of an international treaty to reduce and / or eliminate emissions and discharges of 12 specific POPs, also known as "dirty dozen" (Aldrin, Chlordane, Mirex, Dieldrin, DDT, Dioxins, Furans, PCBs, Endrin, Heptachlor, Toxaphene and BHC), besides the adoption of scientific criteria for the possible inclusion of others. The molten salt oxidation is a process which promotes a more complete and safer decomposition of wastes considered critical, such as POPs, obsolete chemicals, extremely energetic compounds (propellants and explosives), etc.. In this process, the waste and oxidant (air or oxygen enriched air) are mixed below the surface of a turbulent bed of molten salts. The oxidation process occurs at temperatures lower than those of conventional incineration, but associated with the liquid phase reactions that occur, they are sufficient to promote complete and safe decomposition of hazardous wastes, particularly the organochlorides. In this case, the chlorine reacts with the sodium to form sodium chloride, which is retained in the salt bath. In this paper, we describe the activities of construction and development of a molten salt reactor for decomposition of hazardous wastes, as well as present some results from the decomposition of pesticides.

Keywords: *thermal, decomposition, pesticides, molten, salts.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Green Analysis of Steroids for Clinical Purposes: The Use Of Ethanol as an Environmentally Friendly Alternative for Solid-Phase Extraction

CARDOZO, K. H. M^o. NAKAMURA, O.^a, ERNESTO, V. A. R. T.^a,
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Abstract

The paper describes the use of a “green” automated on-line solid phase extraction (SPE) coupled to liquid chromatography and tandem mass spectrometry (LC–MS/MS) for the analysis of androstenedione and testosterone in human serum. The on-line SPE was performed using aqueous ethanol for cleanup and analyte extraction instead of aqueous acetonitrile. To evaluate the accuracy of the proposed method, a range of samples were extracted using aqueous ethanol and the results were compared with the traditional method with acetonitrile. Results showed good agreement between extraction, however, on-line SPE with ethanol provides more environmentally friendly alternative by reducing hazardous waste and potential environmental pollution. Ethanol has better EHS (environmental, health and safety) properties than acetonitrile, such biodegradability and it is considered to be a “bio-solvent”, i.e. produced with renewable resources (by fermentation processes). Therefore, its manipulation is less harmful for analysts. The strategy showed to be possible allied efficiency, safety and high quality with cleaner production practices.

Keywords: *cleaner production, ethanol, steroids, green solid-phase extraction, LC-MS/MS.*

Characterization of Resultant Effluent of the Washing Process of Plastic Film Evaluating Treatment Application for Electrolytic Process

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Abstract

The water is a fundamental component for the process of raw material preparing for recycling plastic post-consumer, for participate as element of removing debris and dross that contaminate the raw material matrix used. The present work aims characterize the water washing of one recycler of plastic type film (bags) to estimate increments and pollutants as a general form to gross water, through the parameters indicators of characteristics physic-chemical, relating the influence of plastic volume prepared for recycling with solid volume. These results will serve as a basis for preparatory estimate of removal these solids through the application for electrolytic process, considering the effluent characteristics before the process and after the electrolytic process.

Keywords: *treatment, water resources, recycling, film.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Suggestions for Implementation of Cleaner Production in Cassava Starch Industry

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Abstract

The market is becoming increasingly demanding, requiring companies not only offering quality products, but also the implementation of responsible administration of the environment and the community in which they operate. In this scenario, the Cleaner Production may favor the emergence of competitive advantage in business, and a big step towards the economic and sustainable development, enabling enterprises to function with socially and environmentally responsible, reflecting also on economic and technological improvements. The objective of this work is the suggestion of applying actions of Cleaner Production in cassava starch factories, as these industries are found in large number in the state of Parana and have a potential pollutant due to the toxicity of manipueira (liquid from the pressing of cassava), amount of waste generated and water consumed in the processing of cassava for the production of starch. To this end, the production process was mapped, in accordance with the literature, and was identified in each step opportunities of improvement and implementation of Cleaner Production. Were identified two types of solid residue in process, the cassava's peels and the residual mass, and two types of liquid residue, the manipueira and the residual water. According to the CNTL / SENAI methodology of cleaner production program implementation, was proposed to the cassava's peels the commercialization to cattle farmers, for animal feed. To the residual mass, was recommended the double-milling to the recovery of starch, and its use in feed for beef cattle. Regarding to manipueira, was suggested the implementation of a anaerobic horizontal reactor, with the possibility of using the gas generated in the production process, for burning in boilers. For the residual water were proposed several suggestions, like using systems with pressurized water and hoses with reducer nozzles to control water flow, best practice training to the employees, water reuse in the process (when possible), and use of the cleaning system (CIP cleaning in place). The adoption of an environmentally correct posture by companies is becoming increasingly common, because of the prerequisites of national and global trade and compliance with laws. The cleaner production is a viable alternative to combat environmental problems of the companies, whatever its segment of industry. The cleaner production programs requires constant revision and commitment of all employees of the companies, so that it becomes part of your organizational culture. That way, they can obtain competitive advantages generated by clean production strategy.

Keywords: *Cleaner production, cassava starch industry, waste.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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Conferences

and

Oral Presentations

24th May 2013

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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24th May 2013

8h00-9h40

Session 6A

Room 1

Environmental Accounting of Strawberry Conventional Production

Environmental Impact of Agriculture: Ecological Aspects and Need for Changes

REVIEW ARTICLE. Reconsidering some of the Earth`s Biophysical Limits to the Long Term Sustainable Development of Humanity

Is Healthy Eating, Healthy For The Environment? Barilla Center for Food and Nutrition Double Food Pyramid

Environmental Accounting of Strawberry Conventional Production

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Abstract

This paper aims to evaluate and present the results obtained by the emergy account of the strawberry conventional production process. The strawberry production was evaluated by the environmental indicators and compared with the orange juice conventional production system from Pereira (2008). The strawberry production system has its Emergy Yield Ratio (EYR) of 1,53; Emergy Investment Ratio (EIR) of 1,88; Environmental Load Ratio (ELR) of 1,88; Environmental Sustainability Index (ESI) of 0.81; Emergy per unit value (EUV) of 1,15E+13; renewable resources percentage (%R) of 34,68%. These numbers show that the strawberry production system has a better performance than the orange juice when analyzed with the emergy account technique, if we consider both as food products.

Keywords: Emergy; strawberry; Environmental indicators.

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Environmental Impact of Agriculture: Ecological Aspects and Need for Changes

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Abstract

In recent decades, changes that have occurred in agricultural production systems have caused a major environmental impact, which includes the planet and mankind. Agriculture has expanded the use of pesticides, abused water resources and soil unduly. However, researchers have sought better and more sustainable alternatives to assist in the development of agriculture. As the use of natural substances to prevent pests instead of pesticides, the use of soil and water, such as drip irrigation, which provides development for the plant and water savings. Therefore this study is aimed to show the ecologic impacts of agriculture and to propose investment solutions for a sustainable and long lasting development.

Keywords: *sustainable agriculture, environmental impact, organic farming, ecology.*

REVIEW ARTICLE

Reconsidering some of the Earth`s Biophysical Limits to the Long Term Sustainable Development of Humanity

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Abstract

Humans` existence as living organisms depends on some essential natural resources and ecosystem services. On the other side, nature has a certain speed of regenerating its resources required by humans. That`s why the nature`s speed of resource recovery should be taken in consideration by economic activities that use these resorces directly or indirectly, as it might be fundamental for the long term sustainable development of humanity. This requires the quantitative definition of the Earth`s biophysical limits that are crucial for the existence of life and monitoring of these limits by identifying the proper indicators of the Earth` performance.

Keywords: *Long term sustainability, Earth`s biophysical limits, Earth`s performance indicators*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Is Healthy Eating, Healthy For The Environment? Barilla Center for Food and Nutrition Double Food Pyramid

RUINI, L.^a, CIATI, R.^a, PRATESI, C.A.^b, PRINCIPATO, L.^{b*}, MARINO,
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Abstract

It has been demonstrated that agriculture and animal farming are among the sources that yield the greatest amounts of greenhouse gasses (beating out transportation) and it is generally known that proper nutrition is an essential condition to health. In 2010 Barilla Center for Food & Nutrition (BCFN) decided to re-propose the food pyramid (the first time proposed by the US Department of Agriculture in the 1990s) elaborated and updated to carefully integrate the latest findings by research, involving global warming and the impact of food on the environment. The results were obtained with the use of Life Cycle Assessment methodology. But, a need for both communicational conciseness and clarity imposes a simpler method that accounts for all outcomes. This is why the ecological footprint served as base indicator in the construction of the double pyramid. Thus, it has been made a reclassification of food that goes beyond their positive impact on health, encompassing their impact on the environment as well. These values are overlapped in descending order to obtain an upside-down pyramid that re-proposes the same succession of foods. This new Environmental Pyramid brought alongside the Food Pyramid, created a Food-Environmental Pyramid called "Double Pyramid". It shows that those foods with higher recommended consumption levels are also those with lower environmental impact. Contrarily, those foods with lower recommended consumption levels are also those with higher environmental impact. Applying the model to everyday life and in order to estimate the extent to which the food choices of individuals affect the environmental impact, two different daily menus were analysed: both are balanced from a nutritional point of view, but in the first one, the protein is of plant origin ("vegetarian menu"), while in the second, it is mainly of animal origin ("animal protein-based menu"). The vegetarian menu has an environmental impact that is two and a half times lower than the beef one. It may be affirmed that the Mediterranean diet is the cheapest if the foods are selected judiciously, preferring those, which have a low cost and high nutritional value, such as pasta, legumes, certain types of vegetables, oil, and dried fruit. The creation of a single-course meal based on vegetables enriched with a modest addition of meat may be the best method to provide the proper caloric and nutritional intake at a limited cost. Sustainable eating definitely does not necessarily mean spending more money; accordingly it is also possible saying that eating well and healthy does not cost much more.

Keywords: *Nutrition, ecological footprint, carbon footprint, water footprint, costs of diets.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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24th May 2013

8h00-9h40

Session 6A

Room 2

Innovation and Life Cycle Assessment in the Sustainable Context

Comparing the Environmental Performance of two Cosmetics Soaps using the LCA´s Technique

The Methodology of Life Cycle Analysis with the Aid of Software Umberto

LCA as Support for P+L in the Lighting Industry

Life Cycle Assessment of Wardrobe Made of Medium Density Particleboard (MDP)

Innovation and Life Cycle Assessment in the Sustainable Context

SALVADOR, R.^{a*}, HORCHULHACK, B. W.^a, FRANCISCO, A. C.^a,
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Abstract

The intense competition encourages organizations to innovate to remain active and competitive in the current market. Furthermore, due to the importance that the environmental issue has gained in the current set, the sustainable development encourages the use of environmental management tools in order to reduce the impacts caused by products. One of available tools that can help in this aspect is the Life Cycle Assessment (LCA) which encompasses all stages of the product life cycle. In this sense, this article presents the role that technological innovation together with LCA plays in Sustainable Development. For this proposal has been made a theoretical research about Sustainability, Innovation and LCA. Was observed that the LCA and Innovation when integrated tread a path towards a production more attentive to environmental issues and collaborate on sustainable development, because while that technological evolution achieves economics benefits, the LCA indicates the route that causes the least impacts.

Keywords: *Sustainable Development, LCA, Technological Innovation, Social Responsibility.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Comparing the Environmental Performance of two Cosmetics Soaps using the LCA's Technique

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Abstract

The society's environmental awareness growth resulted in a need to produce consumer goods and services in a more rational and harmonious way with the environment and, within this scenario, new environmental techniques have emerged, and the methodology of Life Cycle Assessment (LCA) achieved prominence, since it can be used by companies as a tool for decision support environment, from environmental relevant indicators and characterized as a competitive opportunity for diverse sectors of economy. In search of an opportunity for differentiation, there are the cosmetic industries that have the need to present news and may, with the application of LCA methodology, develop more sustainable products. The cosmetic products more consumed are the soap, bar and liquid, which may in its manufacturing processes, favoring the use of plant ingredients and use the appeal of being environmentally friendly products, but a more detailed study of all its processes, may include the use of some non-renewable source materials and the use of soap in the bath, may disqualify it from the eco-friendly appeal. Therefore, in this study, sought the application of LCA tool chain management of two cosmetic soaps, bar and liquid, allowing the identification of critical steps and their assessment of their environmental effects, performing an environmental comparison between the results for the choice of which soap is less harmful to the environment. It was conducted a case study in a cosmetic company manufacturer of bar soaps and liquid and were evaluated the production processes in the suppliers of raw materials soaps, its use in the bath step process and the packaging dispose of these soaps. Through this model, it was possible to identify the most critical stages of manufacturing processes, to observe the impact that the stage of use of cosmetic soap in the shower and compare the differentiation of impact that the type of packaging promotes in a life cycle assessment study. The RECIPE2008 was used as the LCIA methodology and at the environmental comparison of the two soaps, it was possible to conclude that the liquid soap had less overall impact than the bar soap. The impact categories like Climate change and Fossil depletion were the most significant for both soaps and the Transformation of land was significant only for the bar soap.

Keywords: *Life Cycle Assessment, Environmental Impact Assessment, Soap, Cosmetic Industry.*

The Methodology of Life Cycle Analysis with the Aid of Software Umberto

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Abstract

The concern with sustainability and the environment is becoming increasingly apparent. Companies are having to put these issues in its strategic planning, considering the entire lifecycle of their products. It represents not only the concern with the raw material and waste, but also with the destiny of their products after the use generated by them into the environment. This study aimed to describe concepts of the methodology used for the application of Life Cycle Analysis (LCA), its benefits, its limitations and used software, with emphasis on software Umberto, it being a very important tool to aid the study. For that, it was conducted a bibliographic, documentary, qualitative and exploratory search. One can see that Life Cycle Analysis presents some complexity of appliance, but can contribute to the reduction of environmental impacts caused by industrial activities and result in benefits and improvements for the company.

Keywords: *Life Cycle Analysis; literature; environmental impacts.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

LCA as Support for P+L in the Lighting Industry

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Abstract

The emergence of concerns about the environmental sustainability of economic activities eventually leveraging the use of the approach of Cleaner Production - P + L for production processes and techniques of Life Cycle Assessment - LCA to evaluate the environmental performance of products and services. The present study sought to identify key indicators of the LCA that could support the implementation of the P + L for the lighting industry. In the first stage there was a structured survey of published papers dealing with LCA studies in lighting. In the second step, we carried out a search in journals to identify studies published among those that address the application of LCA to the development of products for lighting and found what the major parameters that potencializariam the approach of P + L. In the third phase proposes a comprehensive model for the application of criteria for P + L with technical support from the LCA. The authors conducted an analysis of published papers that use LCA for design and product development that provided the possible indicators for use in decision-making approach of P + L. From the survey was conducted a mapping of interrelations between the processes of the LCA and the sequence P + L and identified himself as the flow of information could occur in a complementary way. It is concluded by the complementarity between process P + L and ACV technique, with the advantage of leveraging the desempenho environmental analysis on the production process.

Keywords: *LCA of lighting products, comparative LCA..*

Life Cycle Assessment of Wardrobe Made of Medium Density Particleboard (MDP)

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Abstract

This study aims to assess the environmental performance of a wardrobe made of medium density particleboard and propose environmental improvements focused on life cycle perspective. The Life Cycle Assessment technique was used based on ISO 14040 and 14044 standards, which has the following phases: Goal and Scope Definition, Life Cycle Inventory (LCI), Life Cycle Impact Assessment (LCIA) and Interpretation. The life cycle considered in this study was cradle-to-gate type which comprises obtaining raw materials, manufacturing and distribution of the wardrobe. The functional unit was 40 kg of stored goods for 5 years and the reference flow defined was one unit of wardrobe. The life cycle modeling was conducted in GaBi software, version Education 4.4, based on attributional modeling and EDIP-97 method was used for LCIA phase, including normalization step. The results shows that the most significant environmental impacts occur in obtaining raw materials and distribution of the wardrobe steps, and the categories of environmental impacts most relevant were Human Toxicity, Global Warming and Acidification, totaling 68,0% of total environmental impact of life cycle. The proposed actions for environmental improvement aim to optimize product distribution through the use of cleaner fuels and reducing distances of transport routes. Furthermore, a additional study was recommended to analyze and optimize the MDP panel consumption, for example, combining its use with alternative materials.

Keywords: *Life Cycle Assessment (LCA), Environmental performance, Sustainability, Medium Density Particleboard (MDP), Environmental Impact.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

24th May 2013

8h00-9h40

Session 6A

Room 3

Potential Environmental and Economic Savings by Using Rainwater in Subprefeitura Capela Do Socorro – São Paulo

Rainwater Use in Modular Green Roof System for Application in Drainage Systems

Quality Control in Water Treatment Plant

Benefits of Optimization Process in Water Treatment Plants - Case Study SANASA Campinas

Systematization of Actions and its Respective Sustainability Indicators as Part of the Development of a Support Tool for Water Resources Management in Watersheds

Potential Environmental and Economic Savings by Using Rainwater in Subprefeitura Capela Do Socorro – São Paulo

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Abstract

The availability of drinking water has become a critical global problem due to: demand growth, especially in large metropolitan areas, insufficient or mismanaged government investment; increased deforestation and irrational water use due to lack of environmental education. Substitution of drinking water by other types of water, such as rainwater and reuse for purposes that do not require drinking water, is one of the ways to partially face the problem in favor of environmental conservation. The present work compares the use of rainwater instead of drinking water in Subprefeitura Capela do Socorro (a public buildings) – São Paulo, using the H. T. Odum 1996 emergy analysis, where a common metric, the emergy written with "m" quantifies renewable, non-renewable and purchased resources in the analyzed system. The calculated environmental payback is 7 months with environmental benefits of 2.3×10^{16} sej / year. The estimated economic payback is 16 months with a savings of R\$ 42,239.00 / year. The possible uses of this rainwater are: washing streets of fairs, washing internals courtyards, toilets and urinals, internals garden and vegetable garden water.

Keywords: *drinking water, rainwater, emergy analysis, payback*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Rainwater Use in Modular Green Roof System for Application in Drainage Systems

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Abstract

Nowadays, most of the cities are increasing their population combined with disorganized and unplanned urbanization. This fact leads to a change of soil use with serious consequences for urban drainage systems. Therefore, the flooding risk rises as well as the peaks flows in runoffs. Thereby the use of sustainable drainage techniques includes green roof systems to mitigate peak flows and capitalize on a portion of the rainwater. A modular green roof system was installed at Federal Technological University of Paraná in Londrina city. The system was examined over 47 days and were measured evapotranspiration and precipitation data, which the average of evapotranspiration was approximately $1.9 \pm 0.93 \text{ mm.d}^{-1}$. In the end it showed 94.57 mm of evapotranspiration, 191,3 mm of drainage with an accumulation of 6.83 mm and 292.7 mm of precipitation and irrigation. The reduction of the average volume of the drainage system was 46.4%. The modular green roof allows a significant reduction on the effective precipitation in the drainage system.

Keywords: *rainwater, green roof, sustainable drainage techniques*

Quality Control in Water Treatment Plant

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Abstract

The increased demand for water in urban centers has caused greater concerns about the reliability of drinking water supply systems, specifically for quality and quantity of water distribution. The aspect of quality can be determined through appropriated operation in Water Treatment Plants (WTP), especially when using rivers like a source of water. The variables monitored in this study at a conventional WTP were pH and turbidity. These variables can be considered as main parameters to check the performance and process control by statistical methods of quality, such as control charts and process capability indices. The calculation of process capability indices allows evaluating the performance of the process for the production of drinking water within limits specified by rules or laws. In this way, the performance of a WTP can be controlled by statistical process control to minimize the consumption of chemicals and the generation of excess sludge. This work applies statistical control techniques in a WTP in the city of Londrina.

Keywords: *water treatment plant, quality control*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Benefits of Optimization Process in Water Treatment Plants - Case Study SANASA Campinas

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Abstract

In many water drinking treatment plants, the chemical applications are made with manualequipment. These dosing controls are very difficult and depend of the experience of the operators. The water drinkingtreatment depends on several factors such as pH, turbidity, color and origin of the sample to be treated. These and other factors can determine the best chemical to be used and the best pH of coagulation and flocculation. Generally the treatment in higher values of pH may lead to an increased consumption of coagulants with a consequent increase in the sludge production. The use of aluminum salts and iron is common in water treatment plants. These products have capacities of treatment in different ranges of pH and the correct choice will influence the kinetics of the reactions involved with consequent production of a higher or lower amount of sludge. Another important factor is the high cost that a wrong choice will lead to the process, because, in addition to direct consumption of coagulant and increased sludge generation, there may be a higher consumption of other products indirectly. This work show the results of accurate control and the choice of the best product for water drinking treatment with environmental and financial benefits which provided a reduction of over 40% in the consumption of chemicals including the coagulant and lime, in addition to the almost total reduction of the use of powdered activated carbon. As a indirect consequence of optimization process, there was a large reduction in the generation of sludge that has a high cost for your treatment and disposal.

Keywords: *dewatering, clean production, reduction of waste, water treatment, sludge treatment*

Systematization of Actions and its Respective Sustainability Indicators as Part of the Development of a Support Tool for Water Resources Management in Watersheds

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Abstract

The present article aims to present the methodology proposed to development of a Water Resources Management Support Tool (denominated FAGRH) to River Basins, supplying decision process with subsidies correlated to sustainability concept, integrating different dimensions (ecological, economical, social, cultural and politics). The sustainability main concept that oriented the research was, "the development that foresees satisfies the needs of the present generation without compromising the chance for future generations to satisfy their" (Brundtland Report, 1987). The FAGRH will be composed by Sustainability Indicators (SI), related to conditions or situations correlated to water resources management. The SI are tools that can be used as support to systematize existing information and to evaluate water resources situation at specific moments, allowing to foresee tendencies to future, to analyze sceneries, compare them in time and space, and, finally, to collaborate in decision processes. The FAGRH should be structured based in Decision Support Systems (DSSs) concepts, considering the consent that DSSs were adapted for water resources planning and management. The multi criteria analysis method was capable to aid choice process, alternatives ordination or classification and also to incorporate multiple aspects. This method will make possible join diversified problematic conditions, several sustainability dimensions, as well as integrate different stakeholders' opinions. The FAGRH will correlate some conditions previously measured by SI and potentials actions to mitigate, to correct or to prevent them. The alternative selection should attend previously defined goal for Basin Committee, and will be proceed through stakeholders' analysis about aspects as social, economic and environmental benefits, legal and institutional constraints, among others. Finally, the FAGRH should guarantee wide participation of Basin Committee actors' at decision process. In this way, the tool should still be accessible, comprehensible for technicians, as for users and all society members; and it will be structured in an electronic spreadsheet, simplifying its application and modification along the process. he FAGRH intend to collaborate in basin water resources situation diagnosis, and to elaborate prognostics and programs, projects and actions, composing or providing information for Basin's Plans composition.

Keywords: *water resources management, sustainability indicators, basin and support tool.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

24th May 2013

8h00-9h40

Session 6A

Room 4

Environmental Accounting of Data Centers: Traditional Versus Cloud Computing

Optimization of Electricity and Natural Gas Consumption in Automobilitic Industry

Integrated Energy Management of Buildings Using Computer Network Protocol SNMP for the Integration of Clean Production and Sustainability

Energy Efficiency Based on Cleaner Production Approach on an A/C System within a Wire Harness Industry in the State Of Sonora

Analysis of Energy Consumption in the Computer Section of the Group Libra

Environmental Accounting of Data Centers: Traditional Versus Cloud Computing

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Abstract

The growing demand for information technology services occurs in parallel to the ongoing technological advances both in the computation and the means of communication areas, in which data processing centers (DPC's) are either constantly updated or implemented. In order to optimize the DPC's, several concepts and technologies have arisen in the last few years, among which the so-called cloud computing is the most recent one and plays an important role. Such technique allows for improvements in the equipment use rates and, consequently, a reduction in the expenses with electricity and infra-structure. Several studies display the technological and economical benefits from the DPC's in the clouds. However, there is a call for complementary studies in order to assess the environmental costs for this new technology. In that sense, applying eMerqy synthesis features great potential. The aim of this work is to assess the environmental cost for the implantation and operation of DPC's for academic use by comparing a virtualized environment to a non-virtualized one. Results show that the non-virtualized DPC demands $3,39 \times 10^{17}$ seJ/yr, 67% of which refers to operation and maintenance routines, including expenses with electrical energy, labor and communication links. The virtualized DPC demands 86% more eMerqy than the non-virtualized one, and its main cost comes from the acquisition of equipment, which reaches 60% of the total eMerqy. While the virtualized DPC demands a higher eMerqy amount, it is nevertheless advantageous as compared to the non-virtualized one when the benefits provided are accounted, i.e. the number of users and the total processing power (seJ/user and seJ/Benchmark). In a general way, the technique of virtualization tends to offer a better cost-benefit relation when compared to the non-virtualized environment.

Keywords: *Data Center, Energy, cloud computing, virtualization*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Optimization of Electricity and Natural Gas Consumption in Automobilistic Industry

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Abstract

Industrial processes are considered as major consumers of inputs (either in the form of electricity and natural gas). From this perspective, and taking into consideration the preconization of ABNT NBR ISO 14001 (2004), which determines the development of study and development of action for improving the industrial process in order to minimize the consumption of inputs, this paper aims to developing action which allows to improve the operation of heating equipment (primer oven curing) in the manufacturing process of automobilistic painting. The work is also based in concepts established by applying the technique of CP (Cleaner Production) which according to FIESP (2008), consists of a comprehensive and integrated assessment in relation to environmental problems, promoting direct action on the manufacture process. This article will focus attention on systematically applied to improve the process of heating the greenhouse and the actions set out to develop a process with better performance. Besides developing action that features the company's concern with environmental issues and attitudes of cleaner production is intended to achieve a 10% reduction in consumption of equipment in fluid analysis, starting from the average consumption in the period 2009 which was 0.16 MWh / vehicle and 12.13 m3 gas / vehicle during the period from July to November of the same year. The importance of this work also concerns the performance of a conventional fabrication process that allows the application of concepts and practices in everyday life. Thus, it is possible to develop activities with environmental protection in the determinations and make environmentally friendly processes, generating less waste of materials and reducing consumption of electricity and natural gas equipment for analysis.

Keywords: *Electricity, Natural Gas, Process Painting, Energy Efficiency*

Integrated Energy Management of Buildings Using Computer Network Protocol SNMP for the Integration of Clean Production and Sustainability

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Abstract

Energy consumption is a constant concern for the generation and consumer, and to reconcile with cost productivity is always a task that requires long periods of study to learn how to use it rationally. It's pretty a consensus that the survival of the planet requires profound changes in industrial society, changing patterns of technological production, consumption habits and even cultural roots. It is also consensus that the transformation of the construction supply chain is crucial in this process. Sustainability is now the main driver of technological innovation in all sectors, including construction. Companies and professionals that position themselves at the forefront will get major benefits. Sustainability is now a key point in the development concept. Sustainable development ensures that present needs are found without, however, compromising the ability of future generations to satisfy their needs. This term is closely linked to two concepts: energy and the environment. So the better management of energy resources with consumer demand, the better their productivity. In order to collaborate with the process of energy management, the technology employed in this context can use the SNMP protocol, developed for equipment management of computer networks, switches, routers, servers and workstations. To this end, they will use the same infrastructure of a network of computers: in place of traditional equipment, enter the motors, generators, lamps.

Keywords: *Home automation, Energy, Sustainability, Management, SNMP protocol.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Energy Efficiency Based on Cleaner Production Approach on an A/C System within a Wire Harness Industry in the State Of Sonora

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Abstract

This paper shows relevant results on a study conducted into a wire harness industry in the city of Hermosillo, Sonora, about Energy Efficiency into air conditioning (A/C) system. The adaptation of the manual from the UN Programme Environment (UNEP) for a cleaner production program with a focus on efficient use of electricity was used as a guide for the study. Several options were generated in order to reduce consumption with different solution plans. A compilation of technical data of the equipment used was necessary, thus making crucial the characterization of the electrical energy consumption in the production area in KWH and how the amount of carbon dioxide equivalent would be reduced by the implementation for each of these by taking into consideration the investment and savings plans, leaving top management the decisions for their potential implementation.

Keywords: *Sustainability, Cleaner Production, Energy Efficiency, Air Conditioning*

Analysis of Energy Consumption in the Computer Section of the Group Libra

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Abstract

With technological advances under way, the issue of pollutant emissions and reduced operating costs are important topics to be highlighted in any organization, highlighting the need to accept a different attitude that we use the resources we have available today. From a holistic view, This fact occurs due to financial, business, government, strategic reasons or simply for environmental awareness. With the increase in mass of this problem, computers are part of a select group of pollutants, rated one of the major consumers of electricity, both in its production, and in your life, use and disposal on their behalf directly or indirectly, the increased emission of greenhouse gases that impact the environmental condition. This article is part of an abstraction on energy applied to Green IT, which is the sum of the energy management of the economy, with regard to resources. The main objective of this project is to present a proposal to implement a policy of standardization of equipment (laptop / desktop) added to a conscious use, in order to reduce energy consumption, which sees a reduction in electricity cost (TEPHEN, 2009).

Keywords: *Green IT, Efficiency Environmental, Assessment IT, Energy Consumption Estimation.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

24th May 2013

8h00-9h40

Session 6A

Room 5

Analyzing Important Corporate Social Responsibility Activities with help of Analytical Hierarchy Process

Evaluation of Mercury-Free Alternatives in Hospitals of Sonora, Mexico

Waste Minimization in an Aircraft Maintenance Process: Six Sigma, Lean Manufacturing and Cleaner Production Approaches

KAIZEN Management Model and its Application in the Fertilizer Industry

Using the Method Adapted TRIZ as a Tool to Support the Implementation of Cleaner Production

Analyzing Important Corporate Social Responsibility Activities with help of Analytical Hierarchy Process

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Abstract

Corporate social responsibility (CSR) is a concept which industries use to improve their societal well-being through discretionary business practices and corporate resource contributions. It is a high profile notion perceived as deliberate by the production world in addition to being a well-known concept in academia and with its practionners. CSR now gets increasing attention in global sourcing and supply chains. Indian SMEs have started adopting CSR activities recently to ensure their social responsibilities. But, Indian SMEs struggle to identify major CSR acts to improve their social standing. Because of this, this study's objective was fixed as identification of important CSR activities and categories for improving its performance aided by the analytical hierarchy process (AHP). This study was undertaken in 47 SMEs in Tamilnadu, South India. The results reveal employee satisfaction to be the most important CSR category followed by social activity rewards, society view and combined social activities to improve CSR performance.

Keywords: *Corporate social responsibility; analytical hierarchy process*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Evaluation of Mercury-Free Alternatives in Hospitals of Sonora, Mexico

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Abstract

Mercury pollution is a global problem because its toxicity and because when it is released remains circulating in the environment and is spread through the air. This paper shows the evaluation of mercury-free measuring instruments such as digital thermometers and sphygmomanometers as safer alternatives in two pilot hospitals of Sonora Mexico. The data collections were obtained from hospital nurses through questionnaires. The Hg-free devices were in general well accepted by nurses as adequate and safer alternatives to reduce and/or eliminate mercury. The actions recommended in this paper include following a guide with accurate requirements and specifications when hospitals acquire digital thermometers and mercury-free sphygmomanometers, a calibration system for thermometers and mercury-free sphygmomanometers, provide batteries disposal services to the digital thermometers and replacement of batteries when needed in order that the nurses accept better this instrument, promote the use of solar digital thermometers that avoid the problem caused by the use of batteries in digital thermometers, work closely with the manufacturers so that they take over the composture of the sphygmomanometers, and continue Hg training in hospitals staff in order to be aware of Hg hazards and take into account the costs of the harm of the health and environment of Hg pollution

Keywords: *mercury, hospital, pollution prevention, safer alternatives*

Waste Minimization in an Aircraft Maintenance Process: Six Sigma, Lean Manufacturing and Cleaner Production Approaches

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Abstract

The aircraft maintenance involves actions designed to assess and minimize wear of parts through the preventive action (lubrication and replacement of filters, for example) and also the corrective action (replacement parts), respecting all the requirements of safety, occupational health and environment. During the maintenance procedures a variety of waste are generated, such as parts and different types of used inputs. It is noteworthy that many of these are hazardous waste, for which the possibility of minimization generation is also an opportunity to reduce costs of disposal. This article presents a case study of a Brazilian airline company focus to identify opportunities for waste minimization in aircraft maintenance step, applying approaches lean manufacturing, six sigma and cleaner production. Among the activities include the maintenance process mapping and environmental aspects identification. In addition, there is the integration of three types of approaches cited that supported the project ensuring the correct prioritization of the identified opportunities. It was observed that the use of the three approaches together provides a greater opportunity to generate gains to the company, since all potential possibilities within a process were addressed. The waste used as inputs in the process of maintenance such as filters, chemicals, paint, rags, PPE etc., represent a large reduction potential with low effort and in accordance with sector regulation. The results demonstrated that by integrating these approaches is possible to obtain gains of 10% to 15% reduction in solid waste generation and reducing the danger of same in case of no generation avoided. For market in question, numerous other opportunities reduction of waste generation can be addressed through these three methods of approach, it is suggested including benchmarking in companies in other sectors with more mature processes in terms of quality and loss control.

Keywords: *maintenance; waste; aircraft; continuous improvement; cleaner production.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

KAIZEN Management Model and its Application in the Fertilizer Industry

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Abstract

This article aims to demonstrate how the *KAIZEN* Management Model, through its three key elements –waste elimination, five senses practice ("5S") and standardization of repetitive tasks – it is possible to identify a way to improve performance in the process of loading road-rail of sulphur in a fertilizer company in Cubatão. It is concluded that, through the application of the Management Model of continuous improvement, *KAIZEN*, the sector of loading road-rail of sulphur achieved a significant change in its working method, resulting in the elimination of rework and in the reduction of time and costs, contributing as well to the increase of operation's productivity.

Keywords: *KAIZEN, Productivity, Performance, Sulfur.*

Using the Method Adapted TRIZ as a Tool to Support the Implementation of Cleaner Production

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Abstract

This work reports the experience of applying the TRIZ (Theory of Inventive Problem Solving) adapted method as a support tool to Cleaner Production Program (CP) implementation. The focused CP implementation case study was carried out in a company that manufactures toys and industrial components. As the CP methodology does not utilize any specific tool for the formulation of solutions to the prioritized cases, it was proposed to apply the TRIZ adapted method. This tool showed efficacious inasmuch as it allows an approach on the organization's improvement opportunities in an unconventional format, bringing greater freedom for the development of creative ideas and solutions, as a result of a broader evaluation of the problematic situation. The waste generation reduction results and the consequent decrease in costs after CP implementation aided by the TRIZ adapted method showed satisfactory, leading to a positive evaluation of this experience.

Keywords: *Cleaner production, TRIZ, problem solving, rotational molding*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

24th May 2013

8h00-9h40

Session 6A

Room 6

Reflection on the Concept of Sustainability and its Completeness Proposition

An Introduction to the Nature of Wicked Problems - Ecological Challenges as Super Wicked

Sustainable Bioeconomy Using Ecological Industrial Biorefinery Design for Food, Feed and Fuel from Wastes: System Innovation and Techno Economic Analysis Using Process Simulation Tools

Developing a Conceptual Framework for Assessing Printing Companies Operations Sustainability Practices

Reflection on the Concept of Sustainability and its Completeness Proposition

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Abstract

From the ECO-92 the term sustainability has been used in all international meetings and entered definitely on the agenda of commitment of various organizations and companies. However, apparently, the concept of sustainability remains elusive in terms of limits and scope. The objective of this research paper is to introduce a discussion of the concept of sustainability. Thus, from a rescue of its meaning and verification of the fluidity of its contents, the paper pointed to the absence of a clear conceptual systematization. This scenario allows the expansion of its content. Although, it also can cover up problems that society and its agents do not want to deal with. From an initial connection with the biological sciences and the physical limitations of the Earth, the definition of sustainability penetrated the economic model of production for contesting the legacy of the current generations for the future generations. Therefore, the argumentative method proposes the expansion of the dimensions of sustainability for completeness. It is proposed that the sustainability meaning encompasses in its content the ethical commitment of the present generation. The argument built aims to put the sustainability in front of the oneness and wholeness of the human species. It is in this sense an individual responsibility and social commitment. The human being is regarded as the focus of analysis and within an integral perspective, or better, completeness, incorporating four dimensions: social, environmental, economic, and worldview. The conclusion shows the integral sustainability is the awakening of human beings to their potential and the expansion of their "inner self". It is the assumption of individual responsibility, from the perception of acting locally to the globally. The integral sustainability considers the personal attitude that expands towards each other, the environment and the planet Earth.

Keywords: *sustainability integral, individual responsibility, social commitment.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Introduction to the Nature of Wicked Problems - Ecological Challenges as Super Wicked

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Abstract

In this paper the concept of “wickedness” is presented and discussed, considering the importance of this notion, to correctly deal with problems emerging in ecological systems. The term “wicked problem” was coined by Horst Rittel, who with colleagues perceived the failure of linear approaches to treat design and planning. Failing to recognize a problem as “wicked”, results in the utilization of inappropriate tools to solve challenges in climate change, leading to the use of inadequate methodology and management procedures, fit only to treat “tame problems”. Ecology is considered as a “super-wicked” problem, due to its innumerable uncertainties, interdependencies, and social fragmentation of the stakeholders involved. Ecological systems consist of an integrated and coherent association of dissipative structures, where the whole is not given by the sum of its parts, as known from complexity theory. Ecology consists of a network of open, nonlinear systems, hierarchically structured, highly integrated, adaptive whole of the living and non-living, entangled with social, cultural, and economic phenomena. How we perceive and manage this complex network will strongly influence the future of our planet, and hopefully, correctly orient the study of ecological issues as well as contribute to the effort to implement cleaner production practices. We strongly emphasize that this class of problems –wicked- should be made more familiar to students.

Keywords: *wicked, super-wicked, ecology, cleaner production*

Sustainable Bioeconomy Using Ecological Industrial Biorefinery Design for Food, Feed and Fuel from Wastes: System Innovation and Techno Economic Analysis Using Process Simulation Tools

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Abstract

Brazil is the leader of ethanol biofuel development and also for biomass charcoal, yet lacks in clean rural biofuel and bioenergy production from waste are common. Agro industrial wastes pose a major concern today due to the increase of production with time and thus needs ecological solution. For this problem, an integrated system, industrial and ecological, using the clean Small Integrated Bio-Systems (SIBS) based on the Zero Waste, industrial ecology, cleaner industrial design and green chemistry concept was studied using the three basic principles. The first principle is to use all components of the biological organic materials of the wastes. The second principle is to obtain more co-products from the wastes. The third principle is to close the loop via reuse, recycle and renewal of the material and nutrient flows. This paper deals with tools and methods used to make the system design based on industrial ecology using innovative process equipments design and the process optimization for waste minimization. The main objective is not only small scale energy production, but as well as with the co-production of hot and cold thermal energies from agro wastes along with small electric power. The SIBS approach has many benefits and potentials. The system design use hybrid bio-fuels and internal combustion (IC) engine. The project was developed using simulation system tools for the process analysis (synthesis, modeling, and design) of two stage anaerobic bio process and its integration. SuperPro Designer Process simulation software was used to make synthesis and evaluate these options and performs material balance, environment impact analysis. Case study was made with the anaerobic process, aerobic micro algae production, production of biodiesel from micro algae in several stages and recycle of reactor output are found to be very useful to produce biofertilizer, bio-methane charcoal, bio electrical energy with recycle of water, CO₂ and microbial biomass, which are integrated to internal Combustion and fuel cell for combined cold, heat and Existing biogas and biodiesel from micro algae technologies has potential for practical application combined with hydro pyrolysis, as well as green hydrorobiodiesel to make fuel electrical energy towards sustainable local development. The systems tools and methods used for several preliminary project developments of clean SBS are reported to build up the integrated system developments of industrial ecological complex as base case that need to adopted for the present and future need of clean production of fuel, feed and food with the economical and ecological sustainability.

Keywords: *Waste, Energy, Biomass, zero waste Biogas, Pyrolysis, Biodiesel, System tools*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Developing a Conceptual Framework for Assessing Printing Companies Operations Sustainability Practices

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Abstract

There is a worldwide concern with sustainable development and this has compelled organizations to modify their management systems and operations design in order to fit to this new environment. To have a sustainable business and operations means to be economically viable, to reduce or even not generate waste, to conserve energy and natural resources, to be safe to workers, communities and consumers, to improve quality of life, and to share value. It is noticed that Brazilian printing companies understand these demands and they are promoting changes in their strategy, business models and operations systems. The main goal of this research is to propose a conceptual framework for organizing sustainability practices in printing industry companies' operations. It is intended to answer the following research question, based on manufacturing operations analysis: Does the printing industry runs its operations in a sustainable way? Observing standards practices for economic, environmental and social sustainable aspects. It was conducted a literature review and also it was recovered secondary data from governmental institutes and agencies as well from printing companies associations. These elements helped in characterizing the context, structures and processes for designing, implementing and managing printing enterprise sustainable operations. The proposed framework intends to contain best practices for developing a sustainable operation and to be used for auditing and normative purposes. This will allow companies to adapt their operations models and systems in order to create a real sustainable enterprise.

Keywords: *printing industry; operations management; sustainability; sustainable development; sustainable manufacturing*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
Paulo, SP, Brazil. May 22nd-24th, 2013.

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In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

24th May 2013

8h00-9h40

Session 6A

Room 7

The Role of Health in Impact Assessment and Related Initiatives:
A Literature Review

Systematic Literature Review on Cleaner Production and Quality
Tools and Techniques

Ecodesign Integration Models: Systematic Literature Review with
a Systemic Focus

Contributions of Knowledge Management Tools Applied To
Sustainability Based on a Systematic Review of Literature

International Workshop Advances in Cleaner Production:
Bibliometric Analysis of the Years 2007, 2009 and 2011

The Role of Health in Impact Assessment and Related Initiatives: A Literature Review

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Abstract

Health Impact Assessment (HIA) is widely unstructured in their scope and procedures. Besides, it lacks regulation in several countries. However, health impacts of projects and plans are assuming increasing relevance and are claimed as critical in traditional Environmental Impact Assessment (EIA) and similar types of assessment. This paper investigates the role of health in EIA and in other variety of assessment in which human health is directly or indirectly related. A literature review in *Web of Knowledge* data basis enabled to recover 46 studies related to HIA, EIA and respective correlations. These studies were classified in 10 categories accordingly the main subject presented. For each category, a content analysis were performed aimed at identify the role assumed by health. It was found that: (i) when EIA is central, health assumes secondary function, usually associated to harm from exposure (category 1); (ii) when the main subject regards to EIA framework, health is a variable in EIA structure (2) or health assessment is embedded in EIA (8); health plays central and community characteristics when EIA is assumed as integrated to social aspects (3); health tends to be quantified and analytically deployed when Risk Assessment is central (4); health is considered an asset when practical assessment is addressed to integration purposes (5); in HIA, health assumes a pluralistic role due the wide scope it undergoes (6), but it can be uplifted from the traditional toxicological/epidemiological approaches to social ones (7); in infrastructure projects, HIA embraces governance issues (9) and in combined HIA and RA frameworks, health is regarded as management subject (10).

Keywords: *Health Impact Assessment, Environmental Impact Assessment, Health, Risk Assessment.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Systematic Literature Review on Cleaner Production and Quality Tools and Techniques

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Abstract

The business environment is presented as one of the major causes of environmental impacts, particularly with regard to the production sector. The Cleaner Production (CP) in turn is considered a major strategy to increase eco-efficiency in production. The use of quality tools and techniques can enable and maximize the use of this strategy in organizations. Thus, this paper aims to investigate the main use of quality tools and techniques to aid deployment and management procedures for CP companies. There will be a Systematic Literature Review (SLR) in two of the principal international databases of journals to identify the simultaneous use of tools and techniques of quality practices with CP.

Keywords: *Cleaner Production, CP, Quality tools, Quality techniques*

Ecodesign Integration Models: Systematic Literature Review with a Systemic Focus

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Abstract

The concept of integration plays a key role in Ecodesign, defined as incorporating environmental aspects with a life cycle perspective into projects and the Product Development Process (PDP) of businesses. Assuming that a broad framework for a comprehensive integration adhering to the principles of innovation management is still missing, this article seeks to make a scientific state of the art of the theme, focusing on published Models. The methodology associates bibliometric techniques and content analysis, based on searches conducted on two databases (Web of Science and Scopus) and several complementary sources giving priority to the primary publications of the Models. The research identified 52 models that were analyzed in depth, coming from various types of publications and worldwide geographical origins, predominantly from northern Europe. It was possible to trace a systemic pattern of the Models, using scientific concepts associated with the success factors of innovation management together with principles of environmental sustainability in business. The adopted three levels segmentation (micro, meso and macro) covers the main issues and challenges of the Ecodesign integration in the PDP of business, contributing to the analysis and comparison of the Models. Throughout the scientific literature reported in this paper, a convergence and consolidation of Ecodesign knowledge was initiated, gathering scientific constructs and best practices from various areas. The proposed systemic approach is a promising way to synthesize the main constructs involved in Ecodesign integration and Life Cycle Management, and is a useful step towards the construction of a complete integration Model.

Keywords: *Ecodesign, integration, models, systemic, development.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Contributions of Knowledge Management Tools Applied To Sustainability Based on a Systematic Review of Literature

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Abstract

This research aims to raise the contributions of knowledge management tools for advancing sustainability, from technology studies. We used the systematic review method to collect and analyze technology studies available in the databases ISI Web of Knowledge and Scopus, in all the years available until May 2010. The results present descriptive analyzes of technological studies regarding the application area, the main aspects of the problem situation and the proposed solutions. Also highlighted they are the main features found in the proposed solutions, such as scope, approach, ability to integrate knowledge, among others. The article discusses the contributions and limitations of the systematic review, the connection between knowledge management and knowledge engineering, and managerial implications.

Keywords: *knowledge management, sustainable development, sustainability, knowledge management tools.*

International Workshop Advances in Cleaner Production: Bibliometric Analysis of the Years 2007, 2009 and 2011

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Abstract

This study aims to evaluate the universe of articles published in the International Workshop Advances in Cleaner Production in the years 2007, 2009 and 2011. The methodology included bibliometric analysis, using the software UCINET-Draw that quantified and evaluated the scientific production of the years in question in qualitative and quantitative terms. We investigated the number of publications in the years of achievement, allowing to know the issues, methods, and the authors who published their networks of relationships, universities / companies affiliated authors and their networks of relationships, and quantify the contribution domestic and foreign. The results of the bibliometric analysis showed the overview of the elements that have been discussed in IWACP in Brazil, focusing on the implementation of Cleaner Production in the production system.

Keywords: *Bibliometric Analysis, UCINET-Draw, International Workshop Advances in Cleaner Production*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

24th May 2013

13h30 -15h00 Conference

Simone Bastianoni

University of Siena, Italy

Unsustainability: A Syndrome of
Human Systems

Unsustainability: A Syndrome of Human Systems

Simone Bastianoni
University of Siena - Italy

Sustainability is an ideal state, and therefore it is difficult to measure per se. What is quantifiable is the distance from the ideal point of sustainability, i.e. UNSustainability. The 3-dimensional representation of sustainability is misleading since environment, society and economy have very different features and time characteristics, with the environmental part that is *condicio sine qua non* for sustainability, while things can change rapidly in society and even more in the economy. A key to the quantification of the environmental part is offered by H. Daly's principles of sustainability:

- 1) Resources should be used at a rate that allows their re-formation (sustainable yield);
- 2) Wastes should be produced at a rate which allows the environment to absorb them.

In Thermodynamics there are two categories of functions: intensive and extensive. As suggested by the observations of Jevons in the mid XIX century, improvement of intensive parameters (e.g., energy efficiency, CO₂/person or CO₂/\$) is not enough to reduce unsustainability. Therefore, it is not possible to assess sustainability/unsustainability by means of intensive parameters, because the problem is strongly correlated with the size of the system.

If we want to try to give a measure to unsustainability the indicators should be based on systems characteristics (not reductionist) and extensive.

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production*, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

24th May 2013

15h00-16h30

Session 6B

Room 1

Proposal for more Sustainable Re-Moisturizing Tobacco Leaves

Diagnostic of the Domestic Effluents Management from Paraná State Rural Area

Alternatives Reuse for Waste of Treatment Plants Water and Sewage: The Brazilian Situation

Cleaner Production with Emphasis on Environmental Sustainability and Organizational Performance: An Empirical Study in Southern Brazil

Proposal for more Sustainable Re-Moisturizing Tobacco Leaves

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Abstract

The re-moisturizing is an important step in the processing of tobacco leaves. It is crucial to obtaining the final moisture content of processed tobacco, essential for their physical preservation, handling and ensuring conservation of their intrinsic qualities. Current techniques of tobacco leaf reumidificação uses water vapor and, therefore, have high energy consumption for steam production, high water consumption for the steam generation, a constant vapor generation promotes corrosion and requires intensive and constant equipment maintenance, finally, treat a large amount of boiler blowdown water consumes chemicals and energy. The aim of this work was to test a tobacco leaves re-moisturizing by steam created from cold water mist generated by use of ultrasound. For experimental testing bench was developed a Test Box, which was attached to a commercial humidifier equipment, simulating an industrial vapor re-moisturizing camera. This Tests Box was built to assess the ability of re-moisturizing tobacco leaves with cold water, testing the differentes positions for water mist entrance, different positions for ventilation or suction of steam mist, always comparing in the same time required in the industrial plant. The measurement of the initial and final tobacco moisture was made by mass loss in a appropriated laboratory equipment, applying the tobacco industry methodology. From these assays could be proved the more sustainable re-moisturizing process is possible having the leaves with the necessary final humidity in the industrial required time and also was find a more efficient position for the water mist get into the Test Box.

Keywords: *Tobacco, Re-moisturizing, Ultrasound moisturizing, sustainable re-moisturizing.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Diagnostic of the Domestic Effluents Management from Paraná State Rural Area

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Abstract

Environmental awareness in rural areas advances in relation to the preservation of water quality and their reservoirs, but the management of domestic effluents considers treatment and the appropriate final disposal moves at a slow rate across the country. In this way, the study aims to diagnose the conditions of the rural sanitation in Paraná State and the rural areas of Brazil. The data contained in IBGE, IPARDES, Water Institute of Paraná and OMS database was collected. The results showed that: a) in the Paraná State 1.531.834 inhabitants live in rural areas (in approximately 204.000 residences); b) the average of daily water consumption (for domestic use) is 326.000 m³; c) the domestic effluents generation potential is 261 mil m³ day⁻¹; and d) the Rio Iguazu watershed stands out among the others in all analyzed aspects, because it has the highest population density in rural areas, with approximately 690.000 inhabitants and the consequence of this is the higher water consumption (103 thousand m³ day⁻¹) and the higher generator of domestic effluent (82.710 m³ day⁻¹). Nationally it was found that 16% of the Brazilian population live in rural areas and that 75% of the rural residences use inadequate domestic effluents treatment and disposal methods. In Paraná State, only 19.35% of rural residences have a sewage collection system or septic tanks. On the other hand, the study indicated as one of the critical factors the lack of methods, processes and conventional technologies specific for domestic effluents treatment in rural areas.

Keywords: *domestic effluents; rural sanitation; Paraná State rural areas.*

Alternatives Reuse for Waste of Treatment Plants Water and Sewage: The Brazilian Situation

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Abstract

The existence of an environmental sanitation system that meets the population for public water supply and sewage is so relevant for basic needs. This infrastructure prevents water borne diseases and improves life's quality. However, the treatment process of water and out puts produces solid waste. Therefore, this activity has brought concerns about the proper disposal of these wastes produced by Treatment Stations Water-ETA, and Sewage-EET. The waste accumulated during the treatment process has as destination the aquatic system and soils of land near the stations. This is deposited in nature form, without any pretreatment, which causes large environmental damage by insertion of chemical and biological contaminants in these environments, contained in the waste disposed. So-called sludge ETA and EET possess highly toxic organic load to the environment. The adoption of alternative measures for proper disposal is an urgent issue. This approach brings work on reuse of material from the procedures operating of stations in some segments identified as units of utilization of these wastes.

Keywords: *Sanitation, Solid waste, Reuse.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Cleaner Production with Emphasis on Environmental Sustainability and Organizational Performance: An Empirical Study in Southern Brazil

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Abstract

As a result of globalization and breakneck industrial development, concerns about pollution and the environment encompass a global level. However, environmental degradation can undermine an entire local ecosystem, and some negative impacts may also be felt in different biomass. Accordingly, organizations can minimize the environmental impact by making use of environmental practices, such as methodologies on Cleaner Production (CP). Cleaner Production refers to actions that allow a company to qualify itself as an efficient user of raw materials and energy during the production process, aiming to increase productivity and consequently, to increase competitiveness and improve organizational performance. The Automotive Metal-Mechanic Cluster (AMMC) of Serra Gaúcha, Brazil, is seen as an important industrial Pole in Brazil, due to its high concentration of spare parts, agricultural machinery and transport vehicles production companies. The AMMC is currently the second largest cluster of its kind in Brazil. Therefore, this study aims to analyze the relationship between CP, environmental sustainability and organizational performance, in 298 companies of the Serra Gaúcha Cluster. In this regard, a survey was realized and Structural Equation Modeling (SEM) was implemented for data analysis. The results show that companies the AMMC in the Serra Gaúcha seek alternative processes to reduce costs and contribute to the company's image for their customers. Moreover, practices related to environmental sustainability, such as CP are often used among Metal-Mechanic Companies. It was also observed that CP practices influences environmental sustainability, as well as organizational performance, showing that the CP methodologies contribute to increase production capacity and flexibility, and improving aspects of health and safety. It is evident the contribution of CP for the performance and competitiveness of organizations. It is worth noting that companies in the Serra Gaúcha tend to work committed to environmental sustainability welfare workers, society and the environment, while still moving up by coercive and normative pressures.

Keywords: *cleaner production, environmental sustainability, organizational performance, Brazilian metal-mechanic industry.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

24th May 2013

15h00-16h30

Session 6B

Room 2

The Adoption of Green Supply Chain Management Practices in the Brazilian Automotive Industry

Green Supply Chain Management: A Study on Criteria Selection and Collaboration with Suppliers

Implementing Sustainability Strategies in Emerging Economies: Challenges and Opportunities for Supply Chain Management

Energetic -Environmental Assessment of Milk Production Systems in South of Minas Gerais State: Traditional Small Family-Managed Versus "Minas Leite" Program

The Adoption of Green Supply Chain Management Practices in the Brazilian Automotive Industry

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Abstract

Green Supply Chain Management (GSCM) considers all the environment effects in all processes of the supply chain, from the extraction of the raw materials to the final destination of the products (EMMETT e SOOD, 2010). GSCM has been studied and researched intensively on the last decades, especially at the international level, for example, studies conducted by Srivastava (2007), studies conducted in China, by Zhu, Sarkis and Lai (2007) and Zhu, Sarkis, Cordeiro and Lai (2008b), as well as study conducted in Thailand by Seksan, Tossapol and Pilada (2009). Although the theme is explored internationally over the past decade, few studies have been found in Brazil. For Beamon (1999), the trend of environmental degradation indicates the need for change in manufacturing philosophy. The new environment era represents a new challenge for companies worldwide. The challenge is to develop different ways in industrial growth and environmental protections are integrated. Based on these aspects, this work has as main objective to check the level of application of the concepts and practices of GSCM in the Brazilian automotive sector. In order to reach this objective was developed an exploratory, descriptive, analytical and qualitative research, done through a survey. Data's collection was carried out collected through a standardized questionnaire, with relevant and structured questions about the GSCM. This questionnaire had been sent by the internet (web survey) to the automotive companies affiliated to Anfavea and automotive parts, affiliated to Sindipeças. In total, 77 completed questionnaires were received, constituting a sample of 15.88% of the population. For data analysis, statistical techniques were used, such as descriptive statistics and factor analysis. The research results showed that the practice of waste management is the most widely adopted by companies in the Brazilian automotive sector. On the other hand, the practical of green design and green buildings are the least adopted. With the pressure from stakeholders to follow the environment requirements, this study gains importance, nationally and internationally, once it explores the practices that reflect the environmental commitment of the automobile organizations.

Keywords: *green supply chain management; sustainable supply chain management; environmental performance and reverse logistics.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Green Supply Chain Management: A Study on Criteria Selection and Collaboration with Suppliers

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Abstract

The aim of the work presented is to understand the green supply management practices in terms of criteria selection of suppliers and partnership to improve environmental stance of suppliers adopted by a textile industry responsible for yarn manufacturing, located in Rio Grande do Norte (Brazil). Therefore, it was analyzed the company's behavior with the suppliers regarding the adoption of sustainable supply chain management practices. A questionnaire whose analysis criteria were selected from literature was applied with key individuals of the company. Regarding the practice of environmental management in the supply chain, it was found that the company worked with its suppliers through collaborative approach. Direct involvement activities justified this positioning of the company, since it promotes training activities to improve the environmental performance of its partners, and collaborates in the development of the initial suppliers' weaknesses and works with them to develop products. Again, the company uses the environmental variable in a competitive way, including its suppliers in its strategic environmental approach.

Keywords: *Green supply chain management, selection criteria, collaboration, suppliers.*

Implementing Sustainability Strategies in Emerging Economies: Challenges and Opportunities for Supply Chain Management

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Abstract

Although research on sustainable supply chain has made many valuable contributions, there is a dearth of empirical evidence and theoretical reflection on sustainability strategies adopted by supply chains operating in emerging economies. Consequently, the literature still lacks a framework that incorporates the context and dynamics encountered in such settings. The aim of this paper is to help to fill this gap by exploring a successful case of a focal company that was able to deal with the challenges and exploit the opportunities associated with such contexts towards the incorporation of cleaner production innovations and sustainability strategies into supply chains. Drawing from capability accumulation, innovation and sustainability literatures, this paper develops a theoretical framework that provides a more fine-grained understanding of the dynamics, challenges and opportunities associated with the incorporation and management of sustainability within supply chains in emerging economies. This research employs case study method in the oil and gas supply chain in Brazil based on 52 interviews with key informants between 2004 and 2012. Our findings suggest that incorporating cleaner production innovations and sustainability strategies into supply chains in emerging economies presents additional barriers and higher levels of uncertainty when compared to supply chains operating elsewhere. This research contributes to the literature by identifying and discussing those salient barriers and arguing that in emerging economies, due to unique institutional idiosyncrasies, focal companies play an even more important role to endorse cleaner production innovations and promote sustainability strategies than in other countries. Also, it contributes to the research by asserting that sustainable supply chains can only be successfully pursued and implemented through innovation, which is a critical driver for supply chain enhanced sustainability performance.

Keywords: *Sustainable supply chains, barriers to sustainability strategies, emerging economies, innovation, oil and gas, Brazil.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Energetic-Environmental Assessment of Milk Production Systems in South of Minas Gerais State: Traditional Small Family-Managed Versus “Minas Leite” Program

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Abstract

In the state of Minas Gerais, which is considered Brazil's top milk producing state, a program named "Minas Leite" (Minas Milk) aims at increasing the productivity of small family-managed agricultural properties by introducing efficient farming management techniques. The program's goal is to reach every small family-managed producer statewide, which would probably result in a social-economical shift within the producing regions. On the other hand, such program focuses on economic and social issues, raising doubts about the actual energetic-environmental cost of its implementation. Thus, the aim of this work is to carry out a comparative analysis regarding the energetic-environmental performance between the traditional model of small family-managed milk production and the system intensified by the Minas Leite program, both of which are representatives of the southern region of Minas Gerais state. The embodied energy analysis and the emissions inventory are taken as scientific methodologies. Results show that for the hectare/year functional unit the traditional model performs better as compared to the "Minas Leite", because it demands 295% less energy for its activities (11,454 versus 33,768 MJ/ha/yr) and releases the same percentage ratio of gas emissions to atmosphere, indicating that production intensification requires higher energetic cost and causes higher environmental loading. On the other hand, when considering the amount of milk produced as functional unit, the traditional model performed worse, because it demands 177% more embodied energy than Minas Leite system (17.40 versus 9.83 MJ/L_{milk}) and has higher global warming potential (2,675 gCO_{2-eq}/L_{milk}) compared to Minas Leite (1,508 gCO_{2-eq}/L_{milk}). Considering that milk production is the main role of the two analyzed systems, the system intensified by the Minas Leite program has better energetic-environmental performance when compared to the traditional model.

Keywords: *Milk production, sustainability, embodied energy analysis, gas emissions inventory*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
Paulo, SP, Brazil. May 22nd-24th, 2013.

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24th May 2013

15h00-16h30

Session 6B

Room 3

Growth of Basil from Inoculated Organic Household Solid Refuse

Performance of a Bioreactor Using Organic Compound and Pall Ring Media for the Treatment of BTEX Vapors

Role of Culture Medium in Bacterial Cellulose Biosynthesis: Details

Application of Electrochemical Oxidation in the Treatment of Landfill Leachate and Evaluation of Toxicity in *Allium cepa*

Growth of Basil from Inoculated Organic Household Solid Refuse

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Abstract

One of the main environmental issues in Córdoba (Argentina) is the large volume of urban solid refuse produced that pollutes soil, surface and groundwater streams, and affects flora and fauna. From this problem, a need of a sustainable strategy arises, such as biodegradation of organic household solid refuse using microorganisms, and its reuse as amendment in aromatic plants production. The aim of this study was to evaluate the effect of organic household solid refuse biodegraded by aerobic microorganisms inoculation in the growth of basil *Ocimum basilicum* L. var. Genovese. 1.7 kg of waste of vegetables and fruits were inoculated and after twelve days of microcomposting process microcompost was obtained which dried at room temperature weighed 0.249 kg. Different quantities of the amendment thus produced were applied to an entic haplustoll soil, and the effect on basil plants was studied. Significant differences were found in plant height both the time elapsed since the emergency as using the substrate T5 with highest amendment application respect to the other treatments. This substrate has higher content of organic matter, N, P, K⁺ and Ca²⁺ + Mg²⁺. An advancement of reproductive stages was observed in treatments T3, T4 and T5 with higher amendment dose. These substrates have higher content of organic matter, N, P and K⁺. Thus, a sustainable strategy was achieved, consisting in the reduction of organic household solid refuse and its reuse as amendment in growing basil var. Genovese.

Keywords: *organic household solid refuse, basil organic production, microcompost, inoculation*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Performance of a Bioreactor Using Organic Compound and Pall Ring Media for the Treatment of BTEX Vapors

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Abstract

In this study a laboratory-scale biotrickling filter was operated to investigate the performance on treating BTEX (benzene, toluene, ethylbenzene and o-m-p xylenes) vapours in a waste gas stream. In the experiment, a column containing a mixture of compost and Pall rings, and the consortium of microorganisms presents in the compost were tested to biodegrade the vapours of BTEX. Results showed that removal efficiencies were between 86.6 and 93.4% in the phase log (exponential growing) of the consortium microorganisms in the compost after a period of 2-3 weeks for acclimatization for an inlet concentration in the range of 70 to 250 ppm. The maximum elimination capacity (EC) achieved was 29 g/m³-h for a critical loading concentration (CL) of 46 g/m³-h for an empty bed retention time (EBRT) of 2.4 min. The conclusion was that it is valid technology for the treatment of BTEX with the potential of meeting environmental requirements, and its application in Brazil is important as an alternative to more impactful and costly technologies

Keywords: *Biological air treatment, air toxic pollutants control, air emissions control in bioreactors, atmospheric emissions, air pollution.*

Role of Culture Medium in Bacterial Cellulose Biosynthesis: Details

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Abstract

Bacterial Cellulose biosynthesis is one of the most important applied biochemical processes in biology. In order to explain the detailed molecular events of bacterial cellulose biosynthesis, we discuss in this work, the different steps required for bacterial cellulose formation and crystallization from sugar cane and honey. The potential of organisms to produce biocellulose fibers was analysed. After fermentation bioprocess change new morphological and thermal properties were obtained.

Keywords: *applied biotechnology; bacterial cellulose production; fermentation process; nanobiocomposites.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Application of Electrochemical Oxidation in the Treatment of Landfill Leachate and Evaluation of Toxicity in *Allium cepa*

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Abstract

The disposal of waste in landfills is a practice increasingly common in big cities, and it generates large volumes of leachate as a product of waste decomposition and rainwater percolation. This liquid is highly toxic and must be treated before its release in the environment. Due the problems presented by conventional systems, there is a growing need for procedures that offer higher treatment efficiency or can be integrated by conventional processes. In this regard, clean technologies, such as advanced oxidation processes (AOPs), are considered an excellent alternative for the removal of color and organic matter, as well as to increase the biodegradability of leachate. The aim of this study was both to evaluate the effectiveness of advanced oxidation process of electrochemical oxidation in leachate treatment and to assess the toxicity of the sample before and after treatment. The experiments were performed with 150L sample of leachate and used an electrochemical reactor consisting of electrodes DSA® (Ti/70Ti/30 RuO₂ De Nora ®), which were arranged parallel in batch regime. A current density of 10,04 mA.cm⁻² was applied for a period of 40h and 60h. The results indicate excellent removals of COD, BOD₅, ammonia and phosphorus within the first 40 hours of treatment. However, the evaluation showed the toxicity remained unaltered, which points to the importance of this type of study as a complement to traditional analyzes. The advanced oxidation processes are considered a clean technology, mainly for neither requiring the addition of chemicals nor generating sludge treatment. Still, assessment of toxicity of the treated effluent is necessary, considering the possible generation of toxic byproducts.

Key words: Leachate, Electrochemical Oxidation, Toxicity, *Allium cepa*.

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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24th May 2013

15h00-16h30

Session 6B

Room 4

Environmental Study of Disorder and Social Vulnerability of Santos City after the Arrival of the Production Chain of Oil and Gas

Initiatives of Cleaner Production in the Oil and Gas Exploration and Production Industry

The Impact of the Cleaner Production Technologies in the Mining Productive Chain: The Case of Padua-RJ

Environmental Accounting in Emergy of Limestone Rock Processing for Agricultural Use

Environmental Study of Disorder and Social Vulnerability of Santos City after the Arrival of the Production Chain of Oil and Gas

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Abstract

The extraction of petroleum, a nonrenewable natural resource, generates disturbance to the environment and requires measures to minimize these impacts. This study identified and analyzed the impacts generated in the city of Macae after the arrival of Petrobras and projected impacts for the city of Santos. To conduct this research were heard representatives of civil society and local governments, and analyzed data from government agencies, research institutes and census. To expedite the discovery of the most relevant, hierarchical criteria were identified and used the AHP (Analytic Hierarchy Process) for structuring and solving the problem. The impacts were studied: Population density, Labor Market, Economic Development, Environmental, Mobility and Quality of Life (Education, Public Safety and Health). The research aims to generate an analytical model that manages grants for public policies, creating agendas for government stepped priorities.

Keywords: *Oil & Gas, Social Impacts, Public Policy, AHP*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

Initiatives of Cleaner Production in the Oil and Gas Exploration and Production Industry

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Abstract

Taking into consideration the global scenario involving questions related to environmental management and protection, in addition to the initiatives generated as consequence from environmental legal advances in gas and oil exploration & production area, Petrobras has been working, since 2011, in the development of projects based in the Cleaner Production methodology, within a corporative program. Petrobras exploration & production segment is composed by more than a dozen operational units, which act in scattered spots in the Brazilian territory, performing a great amount of off and onshore activities, involving the complete chain of the exploring and producing area. In a certain way, this characterizes an intense challenge in the implementation of Cleaner Production projects, since its methodology predicts the selection and execution of actions in productive or administrative processes, both of which composed, several times, by a sequence of stages. The beginning of the slow implementation (considering the existing universe) of projects based in the Cleaner Production methodology was predated by the availability of a HSE personnel training in Petrobras Units, provided by an institution with proven expertise in the theme. This training, designed in a scholastic shape, contributed in building and solidifying the methodology stages knowledge. In sequence, it was suggested to the Units to develop the creation and execution of a pilot project, that exemplified the methodology, but of easy and quick implementation. Thus, several ideas of projects emerged, some regarding the minimization of wastes generation and some the minimization of effluents, allowing their use in a wide range of situations. In the course of the implementation of each pilot project associated with the generation of wastes/effluents in the different productive/administrative processes, despite the construction of interesting ideas that could be shared among the Units, there were also found several operational and organizational obstacles that, sometimes, contributed to the discussions about shared solutions, favoring experience gathering. This paper discusses the experience accumulated during the realization of the training and the execution of the pilot projects as a contribution to the Cleaner Production theme towards the oil and gas industry, considering its size and the particularities of its processes, which not always match the classical linearity of a regular industry structure.

Keywords: *Oil and Gas Industry, Cleaner Production, E&P*

"INTEGRATING CLEANER PRODUCTION INTO SUSTAINABILITY STRATEGIES"

São Paulo – Brazil – May 22nd-24th – 2013

The Impact of the Cleaner Production Technologies in the Mining Productive Chain: The Case of Padua-RJ

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Abstract

The industry of ornamental stones of Santo Antônio de Pádua, located in the northeast region of the state of Rio de Janeiro/Brazil, is currently the most important productive activity in the region. Despite this, companies make use of simple and rudimentary techniques, which causes serious environmental and competitiveness problems. In order to seek a reasonable sustainability standard for firms operating in the sector, many research, government and civil society organizations have tried to develop and diffuse technologies in order to enhance the industry's competitiveness. However, some difficulties to diffuse technologies, especially to small companies, have arisen. The objective of this research paper is to describe and assess the use and implementation of these technologies as an important contribution for cleaner production and more sustainable approaches and attest that these technologies can represent partial solution for the practice of cleaner production systems in its broader and modern conceptualization. The research study used a qualitative approach and sought to work with multiple sources of evidence such as an extensive bibliographical review, multiple case studies with semi-structured interviews with entrepreneurs and industry professionals, in addition to technical visits to local companies. This paper considers that even with all the effort, the model used to address the lack of sustainability of the firms located in Padua was incomplete and the results were modest. The model was too focused on the technology development itself, but missing other aspects such as training of entrepreneurs and workers as well as the implementation of environmental management systems and adequate set of policies to back up these initiatives.

Keywords: *cleaner production technologies, innovation, technological diffusion, mining, productive chain.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Environmental Accounting in Emergy of Limestone Rock Processing for Agricultural Use

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Abstract

This study performs the environmental accounting processing of limestone rock for agricultural use by the emergy synthesis of an enterprise operating in that sector, located in the municipality of Arcos - MG. In agricultural limestone is used in order to correct the soil pH and provide calcium supplement for plants. The environmental accounting literature of agriculture have only used the transformity of limestone. In this sense, the study calculates the transformity of the agricultural lime including its processing. The methodology presents results that are synthetic and easy to understand and that help the pursuit of environmentally correct and sustainable development. The analysis indicates that the total system is emerging of 8.70 E +21 sej / year, resulting in a transformity of 2.81 E +6 sej / J as a co-product of 4.30 and E +6 sej / J as 'Split'. Regarding the limestone transformity calculated by Odum (1996, 2000) the Agricultural Limestone represents a 2% increase in co-product and 55% in 'Split'.

Keywords: Environmental Accounting, Emergy; Agricultural Limestone.

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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24th May 2013

15h00-16h30

Session 6B

Room 5

Eco-Innovation and Knowledge Management: How Are These Practices Related?

Application of the Theory of Inventive Problem Solving as a Cleaner Production Method for Solar Heating Optimization Proposals

Decision Criteria for the Implementation of Cleaner Production

Innovation Management as a Factor in Small Business Competitiveness

Eco-Innovation and Knowledge Management: How Are These Practices Related?

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Abstract

The article aims to analyze, using three different tools, the relationship between the practices of eco-innovation and knowledge management (KM). It is known that the commitment of top management through education, training, and deep intervention in the organizational culture, organizational change is essential for the implementation of environmental management systems. Due to the importance of these aspects, management should promote the creation of knowledge. As a way to demonstrate the relationship that is the subject of research, the S Curve of innovation, the Standard Design Process Form (SDPS) and the PIT Diagram (Product Ideas Tree) are studied. These methodologies were selected in order to characterize and enlighten the process of generating ideas in the eco-innovation. In addition to the relationships found between the KM and eco-innovation, a set of five assumptions is listed in order to emphasize the results found in the discussion.

Keywords: *Eco-innovation; Knowledge Management; Knowledge Creation; Environmental Management.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Application of the Theory of Inventive Problem Solving as a Cleaner Production Method for Solar Heating Optimization Proposals

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Abstract

The global growing concern regarding minimizing negative environmental impacts of industrial and commercial products, processes and services has generated an increasing need for detailed studies related to clean technologies and renewable energy sources. In this context, this study applied the Theory of Inventive Problem Solving (TRIZ) as method to identify and support to develop cleaner production opportunities, towards a contribution to the development of solar heating systems more efficient and innovative. Then, we conducted a case study on a solar heating systems manufacturing company, using TRIZ fundamental concepts and contradiction matrix as data collection and analysis technique. Results show the subsequent formulation of inventive solution proposals, based on the obtained information, to minimize harmful functions found in the technical system investigated. We concluded that TRIZ has potential contribution in the creative process for new solar heating systems.

Keywords: *Theory of Inventive Problem Solving, Fundamental concepts, Contradiction matrix, cleaner production, solar heaters.*

Decision Criteria for the Implementation of Cleaner Production

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Abstract

In the last three decades, but specifically after the conference ECO-92 (Rio-92) emerged a lively discussion around the business world, on alternatives to improve organizational performance with a focus on sustainability, with an explicit objective to minimize the environmental impacts caused by production systems. The use of environmental practices has become a key strategy to achieve these great goals. Among the alternatives are the methodologies of Cleaner Production (CP), which integrates a technology strategy, economic and environmental processes / products in order to increase efficiency in the use of inputs and raw materials, by reducing waste, not generation, minimization or recycling of waste generated, providing economic and environmental benefits for society and organizations. This study aims to analyze the critical success factors of CP, found in five medium and large southern Brazil, as well as identifies organizational performance as a result of CP. The methodology used in this research is qualitative, scoped multiple case study conducted through semi-structured interviews and content analysis. The key contribution of this study is to develop a qualitative analysis of companies of varying sizes, using a model of critical factors, presenting an option to the academic and business analytics implementation of CP. Among the results of this research identified that companies that have deployed CP have different characteristics, with different levels of maturity, however there is an improvement in the performance of the five companies due to CP.

Keywords: *cleaner production, environmental sustainability, decision criteria, organizational performance.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Innovation Management as a Factor in Small Business Competitiveness

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Abstract

Considering the characteristics of small businesses and has representation on the economy of the State of Ceara, the purpose of this article is to present the situation of innovation management in three small industries, as well as relevant aspects in the management, able to drive growth through dynamic improvements in processes and products. Survey data, combined with literature exploratory and descriptive, it was established that the management of innovation as a continuous process is a factor of great importance for a company to grow and strengthen its competitive position; being necessary, however, a model strategic, integrated and manageable to deal effectively with business innovation. The article presents the six dimensions of innovation management used by SENAI-CE as the basis of actions developed with the small scale industries, preparing them to take advantage of opportunities for financial incentives both government projects developed by the Federation System Industries.

Keywords: *Innovation Management. Competitiveness. Strategies. Small Business. Products.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São
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24th May 2013

15h00-16h30

Session 6B

Room 6

Pollution Prevention Opportunities in the Brazilian Auto Refinishing Industry

Relationship Time Sintering on Densification and Electrical Conductivity in a Fuel Cell

Critical Analysis of Large-Scale Integration of Electric Vehicles in Brazil

Vehicle Emissions of Greenhouse Gases(GEE) in Automotive Diesel Powered

Pollution Prevention Opportunities in the Brazilian Auto Refinishing Industry

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Abstract

This industry has been studied in developed countries. However, the results of a study in Mexico showed that the industry can move towards more sustainable operating styles, also in developing countries. This paper shows the information obtained in 14 autobody shops in the city of Sao Paulo, which allows to evaluating the opportunity to implement cleaner production techniques and Pollution Prevention through a program that runs on the cleaner production approach and pollution prevention to prevent, reduce and / or eliminate occupational and environmental risks generated by the activities of these workshops.

Keywords: *enviromental risk, occupational risk, cleaner production, auto body shops*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Relationship Time Sintering on Densification and Electrical Conductivity in a Fuel Cell

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Abstract

The cerium-gadolinium solid solution has been extensively investigated for application to cells in solid oxide fuel operating at intermediate temperatures. In this work, we used nano crystalline cerium containing 10mol% of gadolinium. The main objective was to investigate the effect of sintering time on the microstructure and electrical characteristics of solid electrolytes. Cylindrical samples were prepared by compaction followed by sintering at 1200°C for different holding times. The linear shrinkage was obtained by dilatometry measures and key aspects of the microstructure by scanning electron microscopy. Measurements of electrical conductivity were performed on selected samples. The average grain size for all samples remained in the sub-micrometer range. The conductivity of grain boundaries depends on the sintering time, but the rate of heating, while the conductivity of the grains showed no significant differences.

Keywords: Fuel cells, cerium-gadolinium, sintering.

Critical Analysis of Large-Scale Integration of Electric Vehicles in Brazil

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Abstract

The transport sector is a drag on worldwide search for sustainability. More than 850 million vehicles annually burn trillions of liters of fuel, across the planet, emitting almost three billion tons of carbon dioxide. One alternative that has established itself around the world is about electric vehicles. 4.5 million of them, 95% hybrids, are already in circulation. Brazil, with its fleet of 35 million vehicles, was licensed by 2012, less than 100 electric vehicles (not 100 000, are 100). Why? This study aims to provide a critical analysis for large-scale integration of electric vehicles in Brazil. Specifically are presented and discussed aspects related to charging, autonomous, acquisitive investment, operating cost, impacts on the Brazilian electrical system, on the chain of ethanol and gasoline, reflexes in the country's energy matrix, and other related factors. Data are presented by classical methodology of research, analysis and synthesis, occurring under their treatments multidisciplinary perspective. It developed a quantitative and qualitative scientific vision of the present facts and future projections, presenting them with answers about the ideality. The study concludes (1-6): 1) Electric vehicles represent a clean option from urban centers, consuming less fuel and advantageous for countries with renewable resources for processing in electricity, the case of Brazil, 2) The government has refrained meaning barrier integration, due to the concentration of efforts on ethanol and flex-fuel engines, 3) The main determinant of growth will be represented by public policies that may be adopted; 4) In the current parameters, the integration should occur slowly without introducing large array of problems in the country's electricity generation, 5) In the long term, large-scale integration could provide reduction of final consumption for the energy matrix; 6) The big risk would not integrate: the country would lag behind of the forefront of technology and by consequence lose the participation opportunity of the Brazilian economy in an international market that already grows and tends to loom.

Keywords: *energy, electric vehicles, energy planning, renewable resources, sustainability.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.

Vehicle Emissions of Greenhouse Gases(GEE) in Automotive Diesel Powered

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Abstract

The study of the emission of greenhouse gases(GEE) in the atmosphere is of fundamental importance due to global climate change and its consequences for ecosystems. Studies involving vehicular emissions are of great importance due to its role in GEE emissions. The aim of the research was to determine the emission of major greenhouse gases (CO₂, CH₄andN₂O) in the diesel fleet. For this, we studied three Diesel-powered vehicles for emission test on the dynamometer LACTEC in Curitiba. Were tested vehicles manufactured in 2003, 2007 and 2008.

Keywords: *Greenhouse gases, vehicular pollution, methane, atmospheric pollution.*

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors):
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24th May 2013

15h00-16h30

Session 6B

Room 7

Analysis of the Efficiency between Different Adhesives for the Manufacture of Laminated Bamboo Panels

Verification of Applicability of the Adhesive of Castor Oil in the Manufacture of Glued Laminated Bamboo

Best Management Practices and Environmental Management in Aquaculture – Indicators for Monitoring in Multiple Scales

Determination of Moisture in Tobacco Leaves through The Microwave Technique

Analysis of the Efficiency between Different Adhesives for the Manufacture of Laminated Bamboo Panels

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Abstract

In each product production process, the incorporation of techniques and methods to reduce waste and environmental issues are generally facilitating the maintenance of a natural more balanced. The clean production is a good alternative for this to occur. Considering the whole production cycle and incorporating environmentally sustainable techniques, the life cycle of industrialized something is optimized, which prevents techniques pipe end. The bamboo plant easy to grow and good workability, has been applied in various purposes such as the production of flooring, furniture, fixtures and even decorative structures in civil construction and cement. This plant to be inserted in the manufacture of laminated bamboo plates avoids, for example, species of wood endangered may be used. When used, this plant is from crops specifically grown for various purposes which may have bamboo and features. Something has researched in countries like Brazil, specifically in Goiás. This work has as main goal to evaluate the efficiency of different adhesives used for making laminated bamboo panels. In forming laminated boards, the process can be summarized in the defoliation of the plant and general cleaning for the removal of unwanted parts, cutting planer four sides for finishing cutting, gluing of parts and finally finishing determine where this material may be applied. This technical-scientific research laboratory tests were performed, where properties of twelve laminated bamboo beams can be compared. The plant was chosen type *Dendrocalamus giganteus*. This genus is one of the best to perform carpentry work. For each type of adhesive applied to the plates of laminated bamboo, bending tests (reduced size), hardness, density, screw withdrawal, shear stress and shear stress at the glue line, a tool constituted conclusive on the workability of the different Products promoters junction between the parts that form the plywood. In some types of adherent reviews have not responded well to tests, bringing the disruption of certain body-of-evidence, but one can prove the efficiency of adhesives used in the manufacture of laminated bamboo. The technology of bamboo utilization for the formation of products useful in our daily lives is something shown by research centers of renowned educational institutions, and this work is the result of a detailed study on the plates made with bamboo. In environments with significant levels of humidity and temperatures can shorten the use of furniture, laminate made with *Dendrocalamus giganteus* has higher efficiency over other matters falling in the furniture industry.

Keywords: *Bamboo laminate, sustainable technologies, clean production, furniture industry, environmentally sustainable materials.*

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Verification of Applicability of the Adhesive of Castor Oil in the Manufacture of Glued Laminated Bamboo

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Abstract

The current concern with the environment promotes the development of new technologies for production with use of alternative materials, from renewable resources, and changes in production processes, having as main objective the reduction of environmental impact. One of the alternatives for Cleaner Production is the use of castor oil derivatives instead of non-renewable sources, such as adhesives based on polyvinyl acetate (PVA), applied in the manufacturing process of Glued Laminated Bamboo. Based on the versatility of the bamboo laminate and the castor oil, and from the perspective of sustainability, this study aims to contribute to the application of new materials and processes, used in the manufacturing industry, by proposing the use of the oil castor adhesive for Glued Laminated Bamboo manufacturing, which can later be used in the manufacture of several products. To verify the applicability of the castor oil adhesive in the Glued Laminated Bamboo manufacture, mechanical tests of traction and shearing of the glue sheet were performed in specimens of the said material, and the results compared with the Cascorez 2590 and Waterbond adhesives. The results showed that the castor oil adhesive, in the traction test, has superior performance than the Waterbond adhesive and slightly below than the Cascorez 2590 adhesive, but in the shear test, the castor oil adhesive presented a slightly inferior performance than the other two adhesives used in the comparison.

Keywords: *design, castor oil, glued laminated bamboo, sustainable development, PVA adhesives.*

Best Management Practices and Environmental Management in Aquaculture – Indicators for Monitoring in Multiple Scales

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Abstract

The promotion of sustainable aquaculture depends on the documented adoption of Best Management Practices (BMPs), associated with the monitoring of environmental health, of the availability of natural resources (especially uncontaminated waters and sediments), and of the efficient use of inputs. In order to ensure a traceable and organized procedure to help fish farmers to comply with these requisites, a set of environmental performance indicators has been integrated into an Environmental Impact Assessment (EIA) system, under the coordination of the Brazilian Ministry of Fisheries and Aquaculture (MPA), through a research project carried out in the Furnas reservoir (Minas Gerais State, Brazil). This choice of location aims at supporting a national policy, dedicated to implement 'Aquaculture Parks' in the large reservoirs associated with hydroelectric facilities in the country. These 'Parks' have been delimited in selected areas, following careful diagnostics of hydrodynamics, carrying capacity evaluations, multiple water uses and conflicting interests, to receive permits to install cages for fish production. One provision of said policy charges MPA to offer producers with monitoring programs related with environmental impact and social benefit assessments of these aquaculture ventures. A challenge for such monitoring programs is to encompass the multiple scales represented by (i) the individual aquaculture ventures (be these small or large numbers of fish cages for each fish farmer), (ii) the collective association of producers in an 'aquaculture park', and (iii) the community at large eventually affected by these businesses. Furthermore, the monitoring procedure should emphasize the ability to promote and recommend adoption of BMPs, while facilitating the record keeping of environmental quality and resource carrying capacity information. The primary component of this record keeping, environmental management and resource monitoring procedure has been formulated as a 'Weighted Impact Assessment System for Best Management Practices in Aquaculture' (APOIA-Aquaculture), comprised of 68 indicators integrated in a multi-attribute platform to assess the 'Spatial organization' of the enterprises (in a set of 22 indicators), the analytical conditions of 'Water quality' (14 indicators), and 'Quality of the sediments' (09 indicators), and the conditions regarding 'Management, nutrition and safety' (23 indicators). A series of case studies has been carried out at the Furnas reservoir, in order to check the flexibility of the impact assessment system towards the different enterprise typologies, and its applicability as an environmental management tool for producers. Interestingly, a subset of 'sediment quality indicators' is frequently showing sensitivity as a record of mismanagement, especially those linked with inadequate feeding management. For instance, organic matter and phosphate contents increased markedly from sediments sampled ~10m upstream (considering the local current flows) as compared to just under the cages. The main reasons for these changes seemed to be the inadequate identification of cages, with consequent poor control on feeding practices and impossible bookkeeping. Such indicator interactions, and related management tradeoffs and improved practice recommendations, are stressed in 'Environmental Management Reports' offered to producers' decision making. Further development of the methodology is now focusing the formulation of a set of 'Natural resources and environmental assets sharing' indicators, to address the joint organization of the upcoming 'aquaculture parks', in compliance with the multiple uses intended to these territories around major water bodies.

Keywords: aquaculture, impact assessment, environmental management, water quality, Best Production Practices

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Determination of Moisture in Tobacco Leaves through the Microwave Technique

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Abstract

The determination of moisture in various industrial processes is very important to monitoring the quality of raw materials and products. As a result, a technique fast, cheap and reliable for determining moisture is an object of interest to all companies. In the tobacco industry, traditionally, determines humidity by the mass loss, a destructive technique, slow and random sampling. This study aims to validate the technique for determination of moisture in processed tobacco leaves through the use of microwaves. The microwave moisture determination technique is fast, easy, low-cost analysis, earnings stability and able to analyze 100% of the population, so this study is justified by the importance in seeking improvements in the process. Through the variance analysis as statistical tools for analysis of results these two techniques, weight loss and microwave, was compared and verified that there is a low dispersion of the measured values and similarity in the measures. So, in addition to a gain in time and preservation of samples, there is no waste generation with the microwave technique, when compared to the technique of mass loss, demonstrating environmental gains beyond the technical gains, also showing up as reliable as conventional methodology for moisture content determination.

Keywords: *microwave, tobacco moisture, techniques for moisture determination*

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24th May 2013

16h50 -18h50

Closing Conference

Jeffrey Burke

**National Pollution Prevention
Roundtable – USA**

Environmental Management
Systems: Providing the Best
Opportunity to Integrate Cleaner
Production into Sustainability
Strategies

Environmental Management Systems: Providing the Best Opportunity to Integrate Cleaner Production into Sustainability Strategies

Jeffrey Burke

National Pollution Prevention Roundtable – USA

Sustainability, as defined at the 2005 World Summit on Social Development, includes three pillars: environment, social equity and economic demands, which are also referred to as the “triple bottom line.” There is some disagreement as to how these pillars interrelate, but it is clear that attention must be paid to all three in order for an organization to be “sustainable.” Failure to address one of the pillars will inevitably result in a breakdown of the organization, similar to removing one of the legs on a tripod.

This presentation will focus on the environment pillar and how an Environmental Management Systems (EMS) provides the structure, accountability and continual improvement approach necessary to achieve sustainability. In some of the examples, social equity and economic benefits will also be mentioned and discussed.

An effective EMS utilizes the basic principles and approaches of Cleaner Production as a cornerstone, without which the foundation of the environmental pillar is insufficient to support sustainability strategies. Using the “Plan-Do-Check-Act” method of management, an EMS relies on the proven success of numerous organizations over the past seventy-five years. The EMS provides the mechanism to integrate Cleaner Production programs and initiatives into Sustainability Strategies by incorporating innovative problem solving and source reduction into an organization’s strategic planning. Numerous examples will be used to show how organizations

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throughout the world have developed, implemented and maintained robust EMSs as part of their Sustainability goals, while utilizing cleaner production tools and techniques. These companies have benefitted by achieving a competitive advantage through more efficient resource utilization, improved worker morale, safer working conditions, and increased profitability.

Developing an EMS is not an easy undertaking and requires strong leadership and commitment at all levels of an organization. Many of the barriers to developing an EMS, as well as the approaches to overcome these challenges, will also be discussed. In addition, several of the tools used to develop an EMS will be highlighted.

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"INTEGRATING CLEANER PRODUCTION INTO SUSTAINABILITY STRATEGIES"

São Paulo– Brazil – May 22nd-24th - 2013

In Giannetti, B. F.; Almeida, C. M. V. B.; Agostinho, F. D. R.; Bonilla, S. H. (editors): *Advances in Cleaner Production, Proceedings of the 4th International Workshop, UNIP, São Paulo, SP, Brazil. May 22nd-24th, 2013.*

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