



INTERNATIONAL WORKSHOP
ADVANCES IN CLEANER PRODUCTION

"KEY ELEMENTS FOR A SUSTAINABLE WORLD: ENERGY, WATER AND CLIMATE CHANGE"

Development of an Environmental Methodology for Solid Wastes Management in Higher Education Institutions

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INTRODUCTION

- Environmental question has been theme of discussion in recent years, with the concerning about natural resources conservation and the environment degradation that mankind has done (DRUZZIAN et SANTOS, 2006).
- Due to the population growing, waste accumulation and environmental degradation increased in a very fast way (ALENCAR, 2005; DRUZZIAN and SANTOS, 2006).

INTRODUCTION

- Furiam and Gunther (2006) say that solid waste generated at universities range, besides the ones classified as urban solid wastes, some wastes classified as industrial and health services wastes;
- There are also, according to the same authors, Environmental Education activities that are important to define the segregation, the collect, the treatment and final destination of solid wastes generated in these spaces, as they demand a special treatment.

OBJECTIVE

- So, this article aimed to present a critical analysis on the development of a new methodology for waste management in Higher Education Institutions (HEI), using tools ISO 14001 and Cleaner Production, in order to contribute at environmental impacts control and at fitting to the actual laws.

THEORETICAL REFERENCE

- Higher Education Institution;
- Environmental Methodologies:
 - Industrial Ecology;
 - ISO 14001 (global tool; managerial aspects);
 - Ecological Economy;
 - Clean Production;
 - Cleaner Production (analyzing the management; indicators for decision taking);
 - Life Cycle Analysis;
 - Ecodesign;
 - Eco-efficiency.

METHODOLOGY

- By the revision of literature was undertaken a comparison between ISO 14001 and Cleaner Production methodologies;
- The study undertaken by Vaz (2008) about the management of solid waste in the Technological University of Paraná (UTFPR), Campus Ponta Grossa, showed subsidies that helped this research results and data interpretation.

- This way, in this study were analyzed environmental aspects and impacts, presenting an environmental policy for the Institution and an environmental management program with purposes and targets, and its fitting at Cleaner Production, according to the survey realized by Vaz (2008).

RESULTS E DISCUSSION

Analysis of ISO 14001 and Cleaner Production at HEI's

- In order to make easier the understanding about the main elements for an EMS implementation, they are described as follow according to NBR ISO 14001 (1997):
 - Environmental Policy.
 - Planning: Environmental Aspects and Impacts; Legal Requirements; Purposes and Targets; Environmental Management Programs.
 - Implementation and operation: Structure and Responsibility; Training; Communication; EMS Documents; Operational Controls; Preparation and emergency attend.
 - Checking and corrective action: Monitoring and measurement; Non-conformity and corrective action; Registers.
 - Critical analysis: Management Critical Analysis.

- According to the National Center for Clean Technology - CNTL (2003), implantation steps of Cleaner Production do not follow a sequence.

Stage	Activities
Planning and organization	- To get the commitment of high administration; To set the project team; To set the CP range; To identify barriers and solutions.
Pré-assessment and diagnosis	- To develop the process flow; To assess the inputs and outputs; To select the assess focus of CP.
CP assessment	- To make a material and energy balance; To generate CP options; To select CP options.
Study of Technical, Economic, and Environmental viability	- Technical assessment; Economic assessment; Environmental assessment; Select options to be implanted .
Implementation of the option plan and continuity plan	- To prepare the CP implementation plan; Implementation of the CP options; To monitor and assess; To keep the CP activities

Analysis of similar points between ISO 14001 and CP

ASPECTOS	ISO 14001	PML
High direction commitment	X	X
Initial Environmental Diagnostic	X	X
Environmental Policy	X	
Planning	X	X
Implementation and Operation	X	X
Checking and Corrective Action	X	X
Critical Analysis	X	
Organization		X
CP Assessment		X
Technical Feasibility Study		X
Environmental Feasibility Study		X
Economic Feasibility Study		X

CASE STUDY AT UTFPR-PG

ISO 14001 analysis

- ISO 14001 is not implanted at UTFPR;
- According to ISO 14001 stages implantation and based on the Institutional mission, relevant environmental aspects and impacts were assessed, it was made the environmental diagnosis and targets and objectives were outlined based on the management of solid waste at UTFPR-PG.

Aspects and improvement suggestions

ENVIRONMENTAL ASPECT	IMPROVEMENT SUGGESTION
Use of chemical substances	Reuse of the substances
Use of Metals	Metals Recycling
Consume of water, energy and paper	Consume Reduction and reuse of paper
Work Conditions	Use of PPE, equipments adaptation to the activities considering ergonomic aspects
Chemical substances storage	Training for proper storage of the substances
Laboratories equipments maintenance	Training for equipments maintenance

Source: Authors

Environmental aspects and impacts

IDENTIFICATION	
Aspects	Impacts
Use of chemical substances	Soil contamination
Use of metals	Soil contamination and decreasing of natural resources
Consume of water, energy and paper	Consume of natural resources
Work conditions	Risk of accidents
Maintenance of laboratory equipments	Gas emission, soil and effluents contamination, consume of fuel (energy)
Chemical substances storage	Soil and effluents contamination

Source: Authors

ENVIROMENTAL MANAGEMENT PROGRAM	
GOALS	PURPOSES
To reduce the waste generation at laboratories	To reduce the mensal amount in 10%
To reduce the amount of energy in the institution	To reduce the mensal KWH consume in 5%
To reduce the water consume in the institution	To reduce 10% of treated water To implant a rain water capture system, to be use in the bathrooms
To improve the danger products conformity	Training for teachers, students and workers to correctly destine the waste

Source: Authors

CP analysis

- UTFPR-PG is on level 2 of internal recycling.
- The institution has a selective collect program on several departments, it is done the reuse of wastes like papers generated in academic and administrative sectors.
- However, some wastes like computers and furniture cannot be sold, because it is a public institution.
- Recently, in chemical laboratories there is a control of generated solutions, which is not disposed as waste, but kept properly to be correctly destined.
- There is, in the institution, a separation system of recyclable waste.

- By CP in its levels like the following can be taken:
 - a) Level 1: reduction and continuous improvement of chemic waste;
 - b) Level 2: try to recycle chemic solutions and solvents. For decision taking must be elaborated technical and economic feasibility plan, at same time generating indexes of environmental performance. Goals and purposes surveyed previously in ISO 14001 are factors to be reached.

CONCLUSION

- From this bibliographic research can be concluded that, besides economic aspects, the bases of CP like prevention, continuous improvement, good practices, search for innovation in products and processes, application/assessment of internal and external recycling, make this tool totally integrated to other management systems;
- ISO 14001 is a tool used by organizations to be according the rules and/or environmental legislation, required for an environmental quality standard.

CONCLUSION

- ISO 14001 applied altogether with CP can contribute effectively for competitiveness improvement of HEI, because both have benefits, for example, productivity growing, quality improvement, environmental resources optimization, input and energy, important factors to the search for entrepreneurial and educational excellence in the world nowadays.

CONCLUSION

- It is necessary, when implanting an EMS in a HEI, that there is a compromised and motivated direction.
- At the UTFPR case, it is not possible to conclude the benefits that EMS brought to the institution, because the analysis was undertaken just at the initial stages of EMS and on what level it was in the management of solid waste at CP, to show that is possible to implant an environmental methodology as in industries as in Teaching and Research Institutions.

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Thanks!

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