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“CLEANER PRODUCTION INITIATIVES AND CHALLENGES FOR A SUSTAINABLE WORLD”

Cleaner Production at an Environmental Agency: 15 Years of Experience at CETESB, Sao Paulo - Brazil

F. M. Ribeiro ^a, J. W. F. Pacheco ^b

a. CETESB – Companhia Ambiental do Estado de São Paulo, São Paulo, flavior@cetesbnet.sp.gov.br

b. CETESB – Companhia Ambiental do Estado de São Paulo, São Paulo, josepw@cetesbnet.sp.gov.br

Abstract

The State of São Paulo concentrates about 40% of Brazilian industry, which although conferred a large economic force to the state has also brought several environmental challenges in its history. In order to ensure and improve the environmental quality, in 1968 the State government created CETESB, the São Paulo State Environmental Company, which has served on permitting pollution sources, monitoring the environment and transferring technology in its 40 years of existence. In 1996, CETESB made its first contacts with cleaner production (CP) and since then has developed several initiatives to foster CP in the State. This paper presents the main initiatives and the most relevant achievements, with emphasis on the institutional development and the relationship improvement with industrial sectors representatives, concluding with a brief view of the main prospects for the near future.

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

1 Introduction and context

From the second half of the twentieth century, as environmental problems grew, both in number and severity, the evolution of its treatment by society evolved from a passive posture, through a reactive attitude and more recently, reaching a preventive attitude. In the latter situation, Pollution Prevention (P2) and Cleaner Production (CP) concepts emerged, becoming more and more important in environmental discussions in the last 20 years.

This paper presents the evolution of these concepts in a Brazilian context, focusing the Sao Paulo State Environmental Company (CETESB). After a short presentation of the State and the Company itself, the onset of CP practices in the company is described, as well as the most relevant projects and activities since then, concluding with a view of the key prospects for CP development at the Company.

With about 250,000 km² (2.9% of Brazil territory), the State of São Paulo has 42 million inhabitants (22% of the country), and accounts for a \$550 billion gross domestic product (35% of the country), with 43% of all domestic industrial

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production. However, the pioneering spirit of São Paulo industrialization has taken its toll, and many regions have contamination liabilities due to past industrial practices (Sao Paulo, 2010).

Recognized as one of the most important environmental agencies in the world, the São Paulo State Environmental Company (CETESB) emerged in 1968, as the Sanitation Technology Center. Since then, there were many changes in nomenclature, attributions and enforcement strategies – including the publishing of State Law 997 and State Decree 8,468 in 1976, establishing the regulation power to CETESB and some important instruments, as emission and quality standards. More recently, in May 2009, CETESB had its name and assignments renewed through the State Law 13,542 (Sao Paulo, 2009), which promoted the environmental permits unification and brought legal framework for new public policy strategies (Rei and Ribeiro, 2009).

Invested on the corporate mission of “*promote the improvement and ensure environmental quality in the State of São Paulo, aiming to the social and economic development*” (CETESB, 2009), CETESB's core actions comprise five activities: environmental permitting and inspection of pollution sources; meeting public demands for environmental quality; environmental quality assessment; and technical and administrative support to the company activities. For the year 2009 (CETESB 2010), CETESB has 1,988 employees (1,190 with university degree), distributed by three directories and the presidency, occupying the headquarters plus 56 decentralized units through the State.

2 CP history at CETESB – main activities (1992-2010)

The first records of pollution prevention strategies discussions in CETESB came from 1992, when through a partnership with the United States Environmental Protection Agency (USEPA), the concept of “pollution prevention” (P2) was introduced at CETESB in expert training activities. Justo some years after, in 1995 CETESB launched its first publication on the subject, inspired by a USEPA publication, the *Pollution Prevention Implementation Handbook* (Alves and Palombo, 1995), which aimed to guide companies in implementing a management system focused on P2.

To support P2 related activities, in 1996 the *Prevention and Environmental Audit Division* and the *Pollution Prevention Techniques Sector* were created, setting an important milestone of the preventive approach on the company- considered the beginning of CETESB acting on CP. In order to broaden the technical expertise of these new areas, CETESB initiated a series of international training activities of its employees, in Japan, USA and UK, from 1994 until 1998, and also held a series of events and seminars with international support from several institutions.

After that capacity enhancement, in 1998 CETESB organized the *1st America Conference on CP*, a three-day event with 250 delegates from 23 countries that prepared the *São Paulo Letter on Cleaner Production*. In the same year, CETESB participated in events in USA, Chile and Colombia, but the most relevant was conducted in October, when CETESB attended at the *5th International High-Level Seminar on CP*, sponsored by the United Nations Environment Programme (UNEP) in Seoul, Korea. At that occasion, the *International Declaration on CP* was launched, CETESB became the only Brazilian signatory institution, and the term “Cleaner Production” (CP) was officially adopted.

After that, CETESB soon outlined a strategy which emphasizes the collaborative dialog with industrial sectors, aiming to raise awareness, emphasize economic

benefits and provide best practices guidance. The most important activities under this strategy, many still in force, are described below.

2.1 CP pilot projects in industrial sectors

In 1998 CETESB identified some productive sectors which had potential to work together, on behalf of local environmental problems and improvement potential. Therefore three pilot projects were conducted in the sectors of: plated jewelry, textile and ceramics. With little methodological differences among them, the main steps included: awareness campaign on CP concepts; companies training; environmental assessment and diagnosis; CP opportunities identification and selection; CP measures implementation; and results reporting. During the projects, CETESB helped the participants directly through its CP technical team.

a. Plated jewelry

São Paulo plated jewelry production chain is concentrated in a pole with about 600 companies in Limeira, 150 km far from state capital. Including both manufacturers and service companies, this sector is composed mainly by small industries, with high water pollutant potential (metals and cyanide), high water and electricity consumption and low environmental management structure.

In order to foster CP implementation, CETESB proposed a pilot project in two phases: a first, developed between 1998 and 2000, involving five companies; and a second, carried out from 2002 to 2005, with 19 companies. The project was conducted in a formal partnership with industrial representatives (CETESB, 2006).

Some examples of implemented CP measures are: improvements in layout, ventilation systems and electrical installations; electroplating baths drag-out reduction; replacement of washing showers; raw materials substitution; replacement of polishing chips; and effluent treatment optimization, with water and raw materials recycling.

In general, good results were found, such as: reduction of water and energy uses; cyanide and metals reduction in wastewater; and reduction of chemicals, energy and sludge in wastewater treatment. Reduction rates varied but some good figures higher than 90% were reached (Gasi, 2002). In addition, a water sampling campaign in a local river showed significant benefits to environmental quality, with reductions from 57 to 100% of Cd, Ni, Zn, Cr⁺⁶ and total Cr and of the CN⁻ ion. The economic gains for participants included cost reduction in raw material, wastewater treatment, and also in water, energy and sludge management, with pay-back periods from days to few months (Gasi, 2002). The project also generated five documents, reporting of success cases and giving of technical advices for other companies.

b. Textile industry

The textile industry is an important sector of São Paulo State economy, with a \$13 billion bill in 2007 and directly employing 465,000 people. There are eight textile centers in Sao Paulo State, the main being located in the region of Americana, 130 km from the state capital. The production of this textile pole is directed towards the integrated textile chain, ranging from fiber production to the cloth manufacturing. Up the pole there were 151 textile firms, and local production chain has about 2,000 companies (Sinditextil, 2008), with high electricity and water consumption, high organic load and color in wastewater and significant solid waste generation.

The CP pilot project lasted from January 1998 to April 2001, with support of Textile

Industries Syndicate (Sinditêxtil), and participation of two major companies, planned in two phases: first with ironing and dry cleaning units and afterwards in spinning and weaving units.

Some examples of implemented CP measures were: installation of stop valves and faucets with automatic closure; water reuse in dyeing and fabrics finishing; lamps replacement and "timer" installation; recovery of caustic soda and wastewater; and packaging recycling.

As results, it can be mentioned: reduction of water consumption by 24.7%; reduction of electricity consumption; and 95% reduction in sulfuric acid consumption. Besides these environmental gains, there were significant cost savings by chemicals usage reductions and wastewater treatment optimization, as well as in water and energy acquisition. As in the case of plated jewelry, this project produced three publications, including success stories and CP guides.

c. Ceramic tile industries

The region of Santa Gertrudes is responsible for about 56% of national ceramic tile production, being the largest ceramic tile center of Latin America. Formed by some small cities 170 km from the capital, this sector accounts for about 25,000 direct jobs and 200,000 indirect jobs, and many industries are among the most modern in the world. The ceramic tile industries of Santa Gertrudes are also responsible for 80% of the state natural gas consumption (ASPACER, 2009). Besides, these industries are responsible for high water and mineral raw materials consumption, as well as the emission of particulate materials and fluorides to the air. Salts, metals and inorganic material are the main loads of wastewater, and many solid wastes are generated as sludge, pottery shards and others.

In early 1998, 41 tile companies in the region of Santa Gertrudes signed an agreement to collaborate in a CP pilot project, which lasted until 2003. CP courses were given to representatives of these companies, divided into seven groups, each one with its representative or coordinator.

Some examples of the CP measures which were implemented are: general energy efficiency measures (mainly in furnaces); replacement of toxic materials; conversion of furnaces and dryers to burn natural gas instead of LPG; water reuse from wastewater treatment plant; and improvements in storage conditions of clay and raw materials.

As results it can be cited: reduction and 55% reuse of solid waste; toxicity reduction of waste; LPG use decreasing; wastewater reduction; and energy consumption reduction. As economic gains for companies, it can be pointed lower costs resulting from the optimization of raw material, water and energy uses and waste management, particularly of chips.

In general, these three CP pilot projects brought positive results, such as: relationship improvement between productive sectors and CETESB, by emphasizing the strategy of negotiation for joint solutions; introduction of preventive approaches in the participating companies; institutional learning for CETESB about benefits and barriers to CP adoption, and preparation and delivery of CP documents to sectors, with high potential for technology and management practices dissemination.

2.2 CP technical guides

Motivated by the CP pilot projects, the elaboration of sector guidance manuals was proposed through a contact between CETESB and São Paulo Industry Federation (FIESP), which signed a technical cooperation protocol in 2001. Since then, a series of documents, called *CP Technical Guides*, are available to download for free at CETESB Internet page (www.cetesb.sp.gov.br).

Aiming to present CP opportunities for individual industrial sectors in a simple manner, these documents bring information on industry characteristics, process description, environmental aspects and impacts identification, and the most relevant CP opportunities. Currently, 16 guides are available, with different partnership arrangements, as summarized in Table 1.

Table 1. CP guides published by CETESB until 2010

Productive Sector	Publication Year	Institutional partners involved
Printing Industry	2003	FIESP, ABTG, SINDIGRAF, ABIGRAF
	2009	
Jewelry	2005	ALJ, CIESP, SINDIJOIAS
Beer and Soft Drinks	2005	-
Tanneries	2005	-
Citrus Juices	2005	-
Personal hygiene, perfumery and cosmetics	2005	ABIHPEC
Slaughter-Houses (beef / pork)	2006/2008	FIESP, ITAL
White and Coating Ceramic	2006/2008	FIESP
Meat Industry (beef / pork)	2006/2008	FIESP, ITAL
Rendering Plants (beef / pork)	2006/2008	FIESP, ITAL
Dairy Products	2006/2008	FIESP, SINDILEITE, ITAL
Paints and Coatings	2006/2008	FIESP, SITIVESP, ABITIM, ABRAFATI
Pulp and Paper	2008	FIESP, ABTCP, ABRACELPA

New guides are in final preparation for sectors such as Foundry and Plastic production, and others are being negotiated with industry representatives.

2.3 Prospecting and publication of CP success cases

Another CETESB initiative for disseminating preventive measures is the compilation and publication of *CP Success Cases* - short description of CP implementation cases highlighting the company's data, the opportunity description, the actions taken and the benefits – both environmental and economic.

These cases are published on CETESB web page (www.cetesb.sp.gov.br), and by the end of 2010 a total of 71 CP Success Cases were published, covering several types of CP actions in various sectors, mainly metal-mechanic (38% of the total), chemical/pharmacy (24%), electroplating (18%) and textiles (11%).

2.4 Partnerships and support to other institutions in CP activities

Among its duties, CETESB develops and supports various initiatives with partners, national and international. In the area of CP, the following can be highlighted:

- United Nations Environment Programme (UNEP): CETESB elaborated and

published two documents under UNEP coordination: the *Status Report on Cleaner Production in Latin America and the Caribbean* (1998), and the *Cleaner Production and Sustainable Consumption in Latin America and the Caribbean* (2004). CETESB also participated in several events, as the *2nd Conference of the Americas on Cleaner Production* (1999 in Colombia); the *8th International High-level Seminar on Sustainable Consumption and Production* (2003, in Mexico); the 3rd and the 5th *Meeting of Government Experts on Sustainable Production and Consumption in Latin America and the Caribbean* (2005, in Nicaragua and 2009, in Colombia). CETESB also organized other events with UNEP in Sao Paulo, as the *Workshop on Sustainable Consumption in Latin America and the Caribbean* (2001), the *Global Dialogue for Business and Industry* and the *4th Regional Expert Meeting on Marrakech Process on Sustainable Consumption and Production*, both in 2007.

More recently, CETESB negotiated to help UNEP to build and put into practice a virtual initiative: the *Information Network of Sustainable Consumption and Production for Latin America and the Caribbean* (Red PyCS). This project is being implemented and gradually coming into operation through the web site <http://www.redpycs.net/>. Currently, CETESB is part of Red PyCS Advisory Group, and is discussing with UNEP the coordination of a thematic node on CP.

- Brazilian Environmental Ministry (MMA): after signing the UNEP *International Declaration on Cleaner Production* in 2003, MMA decided to establish a CP Steering Committee in order to foster the creation of CP State Boards and elaborate a CP National Policy and Action Plan. So, MMA conducted a cycle of five regional discussion forums in 2004, with CETESB as a collaborator. Between 2005 and 2006, CETESB collaborated in structuring the *Brazilian Network of Eco-efficiency*, presenting the State roundtable model to encourage the establishment of the CP Forums in eight other states. Additionally, in April 2007, CETESB supported the organization of the *National Round Table on Sustainable Consumption and Production*, part of the global plan of the Marrakech Protocol implementing plan, sponsored by MMA, UNEP and the European Commission. By the end of 2010, MMA prepared a *National Sustainable Consumption and Production Plan*, submitted to public discussion. CETESB sent its comments, mainly on CP related activities, the steering committee re-structuring.
- The Sao Paulo CP Round Table (MRPP+L): inspired in multilateral international organizations aimed at promoting and stimulating CP, it was proposed the establishment of the Sao Paulo CP Round Table in 2011, with an installation committee composed by CETESB and entities of industry, academy, services and society. The Sao Paulo CP Round Table (MRPP+L) is a permanent, non-profit organization, with open participation, voluntary and unpaid. With over 1,200 members, it aims *“to contribute to increased satisfaction of all stakeholders in society, through the use of strategies and resources provided by the CP, improving relations between economic development, environmental and public health”* (MRPP+L, 2010). CETESB has exercised the MRPP+L executive secretariat since its creation and the achievements to date are: organization of five state CP conferences; conducting of 17 training sessions; establishment of cooperation with the Canadian CP Round Table; performing over 50 presentations; organization of a UNEP International Declaration on Cleaner Production signing ceremony; information dissemination; and conducting of several regional and sector meetings. Nevertheless, after the 5th Conference and the organization of a joint seminar with USA Pollution Prevention Roundtable in 2009, it was proposed a whole review of MRPP+L objectives and structure, so since then the roundtable activities are intentionally interrupted.
- Other Support Activities: besides the long-term actions mentioned above,

CETESB performs several specific actions of institutional support, such as: support the organization of the *International Workshop: Advances in Cleaner Production*, held at the Paulista University (UNIP) each two years, with its third edition in 2011; support the Sao Paulo City Council in organizing the Municipal CP Conference, held annually since 2002, with 3,000 participants in 2009; collaboration in the FIESP program to CP fostering at universities; and collaboration in several forums like CETESB Environmental Chambers and others.

2.5 Other CETESB CP activities

Besides the activities mentioned above, CETESB has developed various CP activities and related projects, such as:

- Prevenir Project: result of cooperation between the CETESB and USEPA, Prevenir Project aimed to promote CP measures on enterprises using large industries supply chain as an inductor factor. Started in 1998, this project had the participation from 3M and AMP, multinationals that identified a number of vendors for collaboration. Visits to companies were conducted in 1999 and the project concluded that there was a lack of involvement of multinational companies. As a recommendation, it was suggested that CETESB assess the creation of additional benefits for the companies, such as extension of permits validity, which results in a law described latter on this text;
- Public Green Purchases Project: adopting the concept of using the purchasing power of the state government to induce sustainable behavior of companies, in 1996, CETESB partnered with Sao Paulo University (USP) a pilot project on toxic reduction. This led to the creation of a working group and the launching of a *State Policy for the Use of Purchasing Power*, in 1999. Currently, it is possible to see major advances in the state, as many product-oriented legislation (on efficient lamps; use of wood products; engineering services; etc) and the establishment of the *State Program for Sustainable Procurement* in 2008, which defines criteria to public green purchases;
- Support for CETESB agencies: the CETESB CP team has met a growing demand in the last two years, on the direct assistance to the decentralized agencies, seeking in applying CP solutions to local environmental problems. Besides two specific agencies which called for help on the sectors of slaughter-houses (cattle and pig) and tanneries, CETESB has worked in developing CP-related activities in supporting some of the recent institutional change, such as the best practices adoption on permitting renewal, the climate and energy efficiency regulatory policy, the use of environmental education and planning, the development of a voluntary toxic release reduction program, among others.
- Technical manifestations and answers: among its assignments, CETESB gives technical support, including CP, in two situations: to legislative body propositions and to request for funding at State Environmental Funds. In addition to these formal demands, CETESB also caters to various stakeholders, which direct their questions through the website and other consultation channels; and
- Capacity building (courses and lectures): since its inception, one of the vocations of CETESB CP area is the dissemination of environmental management concepts, either for general public, whether for company employees. On this aspect, it can be cited the following: an annual course, created in 1997 and offered to date; tailored courses on demand to industry or others; awareness campaigns within CETESB agencies, explaining CP importance and guiding how to insert CP into the permitting and inspection routine; and lectures and events, activity started already in 1998 and currently serving dozens of applications per year.

3 Current challenge: bringing CP to CETESB routine

Previous section briefly presented the most relevant CETESB actions on CP, demonstrating that since the onset of the theme to date, various activities were carried out to first disclose the concept and encourage companies to action. Notwithstanding the success of these activities, it has been observed that industry participation is still low respecting to São Paulo State universe. Moreover, the environmental effects of these strategies, so far, are only marginal, with no significant changes in the CETESB routines, including its main preventive instrument: the environmental permitting.

The environmental permitting insertion in Sao Paulo (on 1976) did not forecast the renewal of the permits themselves, and therefore exempt entrepreneurs on updating the information about the pollution sources in a regular basis (Rei, 2006). This limitation was overcome in 2002, when the enactment of State Decree 47,397 (Sao Paulo, 2002a) and State Decree 47,400 (Sao Paulo, 2002b), established the Renewable Operating Permit (LOR).

The State Decree 47,397 establishes that LOR should be issued with validity periods related to the complexity of the enterprise, ranging from 1 to 5 years (Rei, 2006). This change brought the opportunity to both periodic update the information and offer a stimulus to continuous improvement in company's environmental performance. In turn, the State Decree 47,400 establishes the possibility of CETESB extend this expiry date by up to 30%, depending on the company environmental performance evaluation. Important to cite that these Decrees are the first explicitly performance-based environmental regulation in Brazilian legal system, and it is expected to induce CP adoption on a broader scale that gradually lead to environmental quality improvement (Ribeiro and Kruglianskas, 2009).

In late 2002, during the entire year of 2003 and early 2004, several proposals were discussed to implement the cited Decrees. One of the most innovative of them was the establishment of an official administrative framework created to send improvement proposals from industry to CETESB, the Environmental Improvement Plan (PMA). According to CETESB (2005), the PMA consists of a plan being prepared by the companies and submitted to CETESB as part of renewal of operating permit requirements, containing proposals for environmental improvement for the period. The application of this plan may be undertaken in discussion with each entrepreneur, and the document should be composed of: problem identification, presenting of alternative(s), alternative(s) selection and implementation schedule.

It should be noted that there is no restriction on the use of specific techniques and technologies, being the entrepreneur free to propose the most efficient solution to the problems, but there is an expectation of adopting preventive strategies such as CP, to proclaim that this approach is a way to improve environmental performance effectively (Rei and Ribeiro, 2009).

The put into practice of PMA is currently one of the main efforts of CETESB CP team, and it is intended that, by using strategic planning guidelines, it would be directly geared to mitigate the most relevant environmental quality problems in each region of the state. The implementation of these innovations area a huge challenge, since it requires *"the application of procedures strongly linked to environmental quality, as well as the establishment of environmental targets and adoption of monitoring tools such as environmental management plans that incorporate business participation"* (Rei, 2006: 33). This distinction means a significant change in the way the permitting process is conducted, particularly because it is not intend to create a "single rule", but rather a mechanism to allow the individualization of a "general rule" by each industrial typology and/or location.

In addition CETESB is intended to use, whenever necessary and appropriate, the structure of its Environmental Chambers (forums created with representatives of each industrial typology to discuss and propose new strategies and regulations) to define criteria, indicators, benchmarks and other milestones for full implementation of this instrument by the most relevant industrial activities in Sao Paulo State.

4 Conclusion

The evolution of CP in CETESB followed the trend of its own evolution in businesses: from the first concept, under influence of the term 'P2', through the merger of CP plus the later consumption side – actually called Sustainable Consumption and Production (SCP), influenced by UNEP, which points to a new transition where CETESB is expected to find its particular vision and way of action.

In this way, some important results have been achieved, especially in dissemination of concepts, convincing relevant stakeholders and institutions to care of the issue. But there is still a significant way to go towards the establishment of CP routines in CETESB, and more broadly, in Sao Paulo State environmental policy.

To meet these challenges CETESB has pledged to strengthen dialogue on this need, both internally (with the permitting staff) and externally (with industry representatives), in order to create more favorable conditions to follow this path towards expanding its contribution to sustainable development.

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