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CLEANER PRODUCTION TECHNOLOGIES: CASE STUDY

Ashok K. Rathoure*, Hani Patel, Tinkal Patel, Devyani Bagrecha, Unnati Patel and Jahanvi Modi

Biohm Consultare Pvt. Ltd., Surat, Gujarat (India)

Corresponding Author's Email: biohmconsultare@gmail.com

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Abstract: Cleaner production (CP) is about less and more efficient energy and materials use and therefore substitution of more harmful product for the environmental and health by less dangerous ones. CP is preventive, not so much end-of pipe technology is aimed at, rather the reduction of waste and emission at the source. The continuity of the CP effort is emphasized: one can always do better, there's always space for improvement. Technologies can always be cleaner, the ultimate ideal goal being a technology that produces no pollution at all. Cleaner production is about processes, production and services as fields of application. Cleaner production is systematically organized approach to production activities, which has positive effects on the environment. These activities encompass resources use minimization, improved eco-efficiency and sources reduction, in order to improve the environmental protection and to reduce risk to living organisms. It is applied to processes used in any industrial sector and to products themselves. Better working environment apart from improving the economic and environmental performance, cleaner production can also improve the occupational health and safety conditions for the workers. Favourable working conditions can increase the morale of staff and at the same time foster a concern for controlling waste. Such actions will help your company gain a competitive edge.

Keywords: Cleaner production; End-of pipe technology; Identify; Implementation; Waste reduction; Zero liquid discharge.

Postal Address: 705, Luxuria Business Hub, Biohm Consultare Pvt. Ltd., Surat, Gujarat (India), Tele: +91261 2976611

INTRODUCTION

Cleaner production (CP) was developed in 1992 during the preparation of the Rio Summit as a program of UNEP (United Nations Environment Program) and UNIDO (United Nations Industrial Development Organization) to reduce environmental impact of industry. United Nations Environment Program (UNEP), 1994 defines cleaner production as the continuous, application of an integrated preventive environmental strategy applied to processes, products and services in order to increase efficiency and reduce risks to humans and the environment. For production processes cleaner production includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes; For products cleaner production includes the reduction of negative

impacts along the life cycle of a product, from raw material extraction to its ultimate disposal; and for services cleaner production is to incorporate environmental concerns into designing and delivering services. Cleaner production requires changing attitudes, responsible environmental management and evaluating technology options. CP is a method and tool to identify where and why a company is losing their resources in the form of waste and pollution, and how these losses can be minimized (GCPC, 2016).

METHODOLOGY

Steps of Cleaner Production Methodology proposed by UNEP

As per Penha Da Costa *et. al.*, (2017), the steps for cleaner production methodology are as follows:

- I. Planning and Organization

- Obtain the commitment of the high administration.
 - Get the participation and motivation of staff, through the awareness of employees. Constitute CP teams, with people from different departments who know the company well.
 - Define the program's objective, goals, scope, and activities.
- II. Pre-Evaluation and Diagnosis
- Prepare a flowchart of the productive process (raw material, input, and products).
 - Analyze all environmental aspects and impacts to point out the company situation regarding environmental questions.
 - Collect data and information that help in the process description.
 - Evaluate the entrance and exit of inputs and materials to track critical points of waste production and its causes.
 - Select evaluation foci, gathering environmental aspects with the company's interests.
- III. Evaluation
- Analyze the causes of waste production.
 - Identify and eliminate barriers which make the program development difficult.
 - Identify CP opportunities that aim to avoid waste production and to improve the environmental performance of the activity.
- IV. Technical, Economic and Environmental Viability
- Study the technical viability of CP opportunities.
 - Evaluate the environmental viability to determine positives and negatives impacts of particular CP opportunities.
 - Analyze the economic viability of CP opportunities.
 - Select CP foci after analyzing the viability of identified opportunities.
- V. Implementation and Continuity
- Create a plan of implantation for CP opportunities.
 - Implement the chosen CP opportunities.
 - Evaluate and monitor the efficiency of implemented CP opportunities.
- Give the CP program a sequence and seek its continuous improvement.
- Application of Cleaner Production (CP)**
- As per Gavrilescu (2004), for the implementation of cleaner production in industries some cleaner production Tools are used that are:
- I. **Good Housekeeping:** Preventing leaks and spills, instituting preventive maintenance schedules, regularly checking equipment, making sure employees are following the official work procedures.
 - II. **Input Substitution:** Substituting one or more less expensive, less dangerous, or more efficient input material for an existing input material.
 - III. **Better Process Control:** Changing working procedures, machine instructions, and process record keeping increasing throughput, reduce waste and/or improve product quality.
 - IV. **Equipment Modification:** Changing the existing process equipment to increase throughput, reduce waste and/or improve product quality.
 - V. **Technology Change:** Replacing the existing technology, changing the order of process steps to in to increase throughput, reduce waste and/or improve product quality.
 - VI. **Product Modification:** Changing the characteristics of a product to increase throughput, reduce waste, and/or improve product quality.
 - VII. **Energy Efficiency:** Making changes in any aspect of business operations to reduce energy consumption or cost.
 - VIII. **On-site Recovery and Reuse:** Capturing and reusing on-site, materials that were previously wasted.
 - IX. **Waste to Product:** Identifying an end market and marketing a material formally considered waste. May involve changes in processing of original product or new processing steps to transform waste.
 - X. **Energy Efficiency:** Making changes in any aspect of business operations to reduce energy consumption or cost.
 - XI. **On-site Recovery and Reuse:** Capturing and reusing on-site, materials that were previously wasted.

XII. Waste to Product: Identifying an end market and marketing a material formally considered waste. May involve changes in processing of original product or new processing steps to transform waste.

Application

As per Mosconi *et al.*, (2008) Cleaner production evaluation methodology is used to identify and evaluate the opportunities and to facilitate their application into industries. It is based on five essential phases:

- i. Design and Organization
- ii. Pre-evaluation
- iii. Evaluation Procedure
- iv. Feasibility Analysis
- v. Realization
- vi. Continuous Application

CP applied in different fields. Waste generation in large amounts, high energy utilization, emission of pollutants to the natural environment, low production, and unsafe working environment are general aspects of the normal manufacturing and treatment processes. On the other hand, reduction of produced wastes, low energy and raw materials utilization, decrease in pollutant emission, increase in production quantity, enhancement of production quality, and provision of safe working environment are the features of CP application in various fields (Aziz and Aziz, 2011).

The greatest application possibilities of cleaner production are in following areas:

- Energy saving
- Conversion and utilization
- Transports
- Industrial sources utilization
- Reuse management

The use of opportune technologies in these sectors can make a higher use of sources, through a process improvement of products substituting the raw materials or reducing their material content or increasing information content (Mosconi *et al.*, 2008).

Advantages of Cleaner Production Technologies

Cleaner production is relevant to all industries, whether they are small or big, or whether they have a low or high consumption of raw materials, energy and water. The advantages are as follows:

- Improved production efficiency

- More economical utilization of raw materials, water and energy
- Recovery of valuable by-products
- Less pollution
- Lower prices of waste disposal and waste water treatment
- Improved image of organization
- Improved occupational health and safety
- Less use of raw materials and energy
- Better access to finances
- Cleaner production can make it much easier to implement an environmental management system such as ISO 14000 and energy management system ISO 50001, as a result of most of the initial work already has been carried out through the cleaner production techniques.
- Meeting the regulatory standards for discharge of wastes (liquid, solid and gaseous) needs typically installation of pollution control systems like wastewater treatment plants. With cleaner production the treatment of residual waste normally becomes easier and cheaper. This is often as a result of cleaner production leads to reduction in wastes: volume-wise; load-wise; and even toxicity-wise (GCPC, 2016).
- Cleaner production reduces the load to waste treatment plant and transferring of hazardous or toxic waste from one medium to another (Gavrilescu, 2004).

Limitations of Cleaner Production Technologies

The widening scope of cleaner production technology is promising but also has its limitations. Additional initiatives e.g. to advance CSR (Corporate Social Responsibility) are often situated in the realm of the social targets and instruments. The concept of shared value might be provided. In the long term the financial performance of an organization depends on the quality of the environment in which it operates. According to this vision, acting in a sustainable way goes beyond responsibility; it offers opportunities serving the core objectives of the organization, promoting innovation and establishing a competitive advantage. Another weakness of the new developments concerns the hesitating and controversial implementation of CSR in developing countries. In view of the varying

first research results on this emerging topic, more research is strongly indicated (Hens, 2017).

CASE STUDY

Intervening Technology/ Technique

Zero liquid discharge effluent treatment plant.

About the Industry

Industry located in Surat (Gujarat) is proposing weaving of textiles grey cloth in Om Textile Park.

Implemented Techniques/ Technology

Industry install water jet effluent treatment plant (ETP) with RO and Evaporator which convert the ETP in zero liquid discharge plant.

Environmental Benefits

Main water required for industry which will about 240 KL per day (RO permeate 192 KL per day). RO reject will be evaporated by evaporator. Industrial wastewater of 152 KL per day will be generated and treated in ETP (170 KL per day) followed by RO. RO permeate will be reuse in manufacturing process (~151 KL per day) and Sludge generated from ETP send to TSDF site.

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CONCLUSION

In the past, cleaner production significantly contributed to the implementation of sustainable development in business and industry. It proved to be likely one of the most effective solution and instruments awakening this sector for the changes in a society moving towards a cleaner environment. Therefore, the widening scope, targets and methods will, without a doubt, contribute to a society moving towards long-term, respectful and responsible transitions. This is most likely one of the major strengths of the widening of cleaner production. CP aims to reduce the environmental, health and safety impacts of products over their entire life cycles, from raw materials extraction, through manufacturing and use, to the ultimate disposal of the product. For

services, cleaner production implies incorporating environmental concerns into designing and delivering services.

REFERENCES

- Aziz, Hamidi Abdul and Aziz, Shuokr Qarani, (2011). Cleaner Production Approaches for Sustainable Development, International Engineering for sustainability Conference, pp:26-37. Available online at https://www.researchgate.net/publication/234840093_Cleaner_Production_Approaches_for_Sustainable_Development
- Penha Da Costa, Nelma, Francisco do Prado Filho, José and Fonseca, Alberto, (2017). Cleaner Production Implementation in the Textile Sector: The Case of a Medium-sized Industry in Minas Gerais. *Revista Eletrônica em Gestão, Educação e Tecnologia Ambiental - REGET*. 21:222-231. 10.5902/2236117029373.
- Gavrilescu, Maria, (2004). Cleaner Production as a Tool for Sustainable Development, *Environmental Engineering and Management Journal*,3(1):45-70
- Gujarat Cleaner Production Centre (GCPC), (2016). Mini Guide to Cleaner Production – a preventive approach towards pollution Published in the year, pp:1-14
- Hens, L., Block, C., Cabello-Eras, J.J., Sagastume-Gutierrez, A., Garcia-Lorenzo, D., Chamorro, C., Herrera Mendoza, K., Haeseldonckx, D. and Vandecasteele, C., (2017). On the evolution of Cleaner Production as a concept and a practice, *Journal of Cleaner Production*, 127:3323-3333. doi: 10.1016/j.jclepro.2017.11.082
- Mosconi, Enrico Maria, D'Ascenzo, Fabrizio and Arcese, Marika, (2008). Cleaner Production and Competitive Advantage for the Enterprise in the age of Environmental Sustainability, *J. Commodity Sci. Technol. Quality*,47:153-169
- United Nation Environmental Program (UNEP), (1994). Government Strategies and Policies for Cleaner Production (United Nations Environmental Program: Paris), pp:57-68

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