

Strategy and Plans for Effective Environmental Management

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ABSTRACT:-- *Effective Environmental Management is becoming increasingly important as a tool, not only for preventing negative environmental impact from mills, but also to improve the efficiency and output of the production in the mills. The label used by United Nations Environment Programme (UNEP) on Effective Environmental Management is "Cleaner Production". Cleaner Production can be applied to products, processes and services and combines elements of minimizing the environmental problems and optimizing the financial performance of an operation. The concept of cleaner production is to prevent the environmental problems rather than curing them. This may involve changes in maintenance and housekeeping practices, changes in input material or product specification, technology changes and on-site reuse of waste. Adopting and implementing a cleaner production strategy does not have to be complicated and there are several tools available to help companies adopting cleaner production.*

Environmental considerations are becoming a critical element of national and international competitiveness. The unavoidable changes underway are opening up tremendous business opportunities, and enterprises that adopt effective environmental management plans will be those that prosper in the marketplace of the future. However the decision to adopt the cleaner production approach can only be made by the individual company.

BACKGROUND

The pulp and paper industry in India is undergoing rapid changes in the production growth rate and structure. In 1990 the paper production in India was estimated to 2.4 million tonnes. In 1995 it had increased by 33 percent to 3.2 million tonnes. During the same period the import of paper had more than doubled from 158 000 tonnes to 321 000 tonnes, indicating increasing international competition in the quickly growing Indian market. The

consumption of paper in India is also increasing rapidly and is expected to grow even faster in the future. These changes bring along with them, not only a welcome financial boost to the industry, but

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also an urgency to deal with the environmental impact that is related to paper production. Present levels of production already create severe environmental problems in many areas, raising public awareness of the environmental situation and bringing stricter enforcement of environmental regulations. To solve the industry's existing environmental problems and to prepare for the challenges resulting from future expansion and tighter pollution regulations, improvement in environmental management strategies is required.

APPROACHES TO ENVIRONMENTAL PROBLEMS

Companies and societies as well as individuals may approach environmental problems in one of five ways; Ignore, Dilute, Treat, Prevent or Eliminate.

Ignore- usually the initial approach - means that you do not assume any responsibility for the environmental impact your operation cause. This approach can be based either on sheer ignorance about the problems or on the assumption that the problem will go away if you don't acknowledge it. This, of course, is not a very sensible approach and sooner or later most people realize that the problems will not go away by themselves and that they have a choice to make: Deal with the problems or live with them.

Dilute- "The solution to pollution is dilution!". For a long time this was, and in some countries still is, the prevailing strategy for dealing with pollution. Wastewater can be discharged into large or the ocean where it is diluted making the environmental impact less obvious. Emissions to air are emitted through high stacks in order to disperse the gases as much as possible and waste is mixed with other, less harmful, materials. Unfortunately, in most cases you don't solve the problems this way - you only hide them. It is true that the immediate effects of the emissions may not be so obvious and it may take a long time before anybody notices them. But the day when the accumulated pollutants in the recipient reach the level where you actually notice them, the problems may be so large and the costs to restore the environment so high, that it may be very difficult to improve the situation.

One example of this is the acidification in Europe caused by the emission of sulphur and nitrogen oxides from factories and power plants through high stacks in the belief that the dilution of the emissions would make the pollutants to "go away". Today that mistake has caused a continent wide acidification which has destroyed the vegetation, lakes and groundwater in large areas of Europe. Since the pollutants are already present in the environment, it is also very difficult and expensive to remedy this situation. Another large scale example of the failure of the "dilution solution" is the Mediterranean sea where the combined wastewater load from all the Mediterranean countries has simply wiped out the major parts of the aquatic life.

Treat- also known as the "End-Of-Pipe Solution". This strategy reflects an acknowledgement of the responsibility for taking care of the pollution caused by the production. It includes the use of wastewater treatment plants, pollution control systems for emissions to air and waste handling facilities for solid waste. This is the approach adopted by most companies and also favored by many environmental agencies when trying to solve an environmental problem caused by the production process, at least initially. This approach can indeed be labeled "Environmental Management" but may not always be qualified to get the prefix "Effective". End-of-pipe treatment is often expensive and may in some cases even constitute the financial difference between net loss and net income for the company, i.e. the company may not be able to afford solving their environmental problems with the end-of-pipe approach. Nevertheless, the end-of-pipe approach is frequently considered to be the one and only solution to an environmental problem. However, companies which have taken the step to the fourth approach-Prevent-realize that this is rarely the case.

Prevent- While end-of-pipe treatment focuses on what to do with wastes and emissions once they have already been created, the preventive approach aims at preventing the emissions and wastes from being generated in the first place, i.e. in the production processes. This can be done in a number of ways, which will be discussed in further detail below. The preventive approach is known under several labels; "Waste minimization", "Pollution

prevention", "Eco efficiency", "Cleaner production" etc. Cleaner production is also the label used by UNEP in our worldwide programme for promoting the preventive strategy. Implementing cleaner production may not solve all environmental problems at a facility but it will decrease the need for installing and operating the end-of-pipe treatment equipment and reduce the quantity of hazardous waste that must be treated and disposed of.

Cleaner production may be called effective environmental management because it is not only trying to cure the symptoms of a polluting production process, i.e. the emissions and waste, but it is actually aiming at eliminating the cause of the pollution. Furthermore, by using a systematic approach in identifying remedying the cause for the pollution, cleaner production has proven to be very cost effective, minimizing the costs for solving environmental problems and frequently even resulting in an increased profit for the company.

Eliminate- the strategy of the future. Everything that goes into a plant comes out as valuable assets. All emissions and wastes are eliminated. This is still only a vision of the ultimate goal for most industries. In some industrial sectors this goal may actually be realized in the not too distant future but in general this strategy can still only be applied to some parts of the production processes. One example is the zero-discharge pulp mills in northern Europe and Canada. These are still far from having eliminated all emissions and wastes but at least they have taken the first steps toward the eliminate approach.

CHOOSING A STRATEGY

An individual, a company or a government can choose to adopt any of the above mentioned approaches to deal with environmental issues. In some countries you may not be allowed to ignore or dilute the pollution but you are forced by legislation or other means to actively manage the environmental issues. But then there is still the choice between environmental management, which usually implies end-of-pipe treatment, and effective environmental management, i.e. preventive action or cleaner production. Which approach you finally choose to employ depends to a great extent on your understanding of the relationship between environment and

economy. Unfortunately the traditional view of environment and economy is that they are contradictions and that environmental concerns always conflict with financial profit. This is not necessarily true and, as has been demonstrated several times, an effective environmental management plan may very well lead, not only to a healthy environment, but also to improved profits for the company. The effects of a successful cleaner production scheme may be:

- * Waste quantities and emissions are reduced.
- * Costs for environmental protection are reduced.
- * Process efficiency and product quality are improved.
- * Raw material consumption and associated costs are reduced.
- * Working conditions are improved.
- * Compliance with environmental standards can more easily be achieved.
- * The image of the company is improved.
- * Market opportunities are improved.

ELEMENTS OF CLEANER PRODUCTION

The approach to environmental management generally favored by UNEP is the preventive approach. In UNEP terminology this approach is called "Cleaner Production". UNEP defines cleaner production as follows:

..... the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase eco-efficiency and reduce risks to humans and the environment.

Thus, cleaner production can be applied to production processes as well as to products and to services.

For processes, cleaner production involves conserving raw materials and energy, eliminating as much as possible the use of toxic substances, and reducing the quantity as well as the toxicity of all emissions and wastes before they leave any given process. For products it means reducing their environmental impacts during the entire life cycle, from raw material extraction to ultimate disposal. And for services, it means incorporating environmental concerns when designing and delivering services.

This may be exemplified by a company manufacturing candy bar wrappings. When introducing cleaner production into the process it could mean reducing leaks and spillages of raw material and process water, thereby reducing the waste and associated costs for waste handling. Cleaner production adopted to the product may imply changing the composition of the wrappings from multilayered plastic, aluminum foil and paper wrappings to single-layered paper wrappings, thereby reducing the costs for raw material purchase at the same time as the wrappings become recyclable. Cleaner production in services can be done by delivering the wrappings to the candy bar producer in recyclable boxes, in that way eliminating the waste from packaging.

In each and every pulp mill and in each and every paper mill there will be numerous options to achieve the benefits of cleaner production. There are basically five broad categories of cleaner production options: Changes in raw materials; Improved operating and housekeeping measures; Technology changes; Product changes and On-site reuse.

Changes in Raw Materials can be a part of cleaner production if they reduce or eliminate the use of hazardous materials in the production process. Changes in raw materials may also reduce or eliminate generation of wastes as a byproduct. Examples of raw material changes are:

- * Reducing the use of hazardous materials such as chlorinated bleaching chemicals.
- * Using higher quality raw materials, such as sorted as opposed to unsorted waste paper, to avoid introducing contaminants into the process

Improved Operating and Housekeeping Measures usually mean changing existing practices or introducing new habits in operating and maintaining equipment. Good housekeeping investments are normally small and their pay-back period short. Before considering more expensive investments in e.g. new equipment and process controls, managers should exploit improved operating and housekeeping opportunities, such as:

- * Reducing loss of raw materials in the process

by repairing leaks instead of purchasing more material or new machinery.

- * Placing equipment so as to minimize contamination instead of cleaning the material afterwards.
- * Using drip pans and splash guards instead of using more process water.
- * Introducing quality standards for the raw material instead of adjusting the processes to run with substandard material.
- * Improving management of inventory of raw materials and products to avoid degradation of materials instead of expanding waste handling facilities.
- * Scheduling regular cleaning and maintenance of equipment to increase the lifetime of the equipment.
- * Turning off electricity and water at machinery when they are not in use instead of consuming more water and electricity.

Technology Changes refer to process and equipment modifications that reduce wastes and emissions, primarily in production. Technology changes can range from minor retooling to the replacement of entire processes. The following are examples of technology changes.

- * Changing piping layouts to improve material flows.
- * Using better control equipment to avoid making off-specification products.
- * Improving process conditions such as temperatures, pressures and residence times to improve yields and reduce waste quantities.
- * Installing more efficient motors to reduce energy consumption.
- * Improving washing efficiency by installing countercurrent washing equipment.

Product Changes are made by the manufacturer of a product with the intent of reducing

wastes and emissions resulting from a product's use. Product changes include:

- * Increasing product lifetimes
- * Making recycling easier by eliminating unrecyclable parts or components.
- * Eliminating unnecessary packaging, e.g. by using pulp sheets as wrappers for pulp bales.
- * Reformulating the products so that when used by consumers their environmental impact is reduced.

On-site reuse means returning a waste material either to the process where it was created or to another process. Examples are:

- * Recycling cooling and process water within the plant.
- * Recovering heat energy.
- * Creating useful by-products from waste, e.g. by manufacturing fiberboard from rejected fibre.
- * Finding alternative uses for off-specification raw materials.

HOW TO REALIZE CLEANER PRODUCTION

In principle it is easy to adopt and implement an effective environmental management plan. Realizing cleaner production involves four major steps:

Make up your mind about doing cleaner production. It is very important that everybody, from top management to the workshop floor staff, understand the benefits of cleaner production and feel committed to participate in and carry through the cleaner production effort. Cleaner production involves all parts of a company and the decision to adopt an effective environmental management plan must therefore be accepted by the "corporate mind" of the company.

Identifying cleaner production options. This is usually done by doing a waste assessment, as

described below.

Implement selected options. Actions in this step may range from low and no-cost options, such as changing the routines or habits of the staff or altering the retention time of pulp in the cleaners, to more expensive options such as investing in new machinery or upgrading the process control system.

Start over again. Effective environmental management is not a one-time event. Like economic management or technical management it is an ongoing process that needs to be attended to regularly. Each change in technology, economy, consumers' demand, raw material supply etc. will open up new cleaner production opportunities and therefore needs to be considered from a cleaner production viewpoint. Even though no change happens in the mill, the development of new technologies, tools and understandings of paper production in the outside world will have implications for the possibilities of improving the performance of the production inside the mill and will ultimately also affect the chances of the company to compete on the market. Starting over again may involve reevaluation of options not yet implemented, reassessments to identify new options, training and introduction of new employees to the environmental management plan, implementation of new options etc. The key issue in maintaining the cleaner production effort or the environmental management plan is to consider it as an integrated part of production operations.

CLEANER PRODUCTION TOOLS

Each mill is unique in its potential in identifying and implementing cleaner production options. However, most pulp and paper mills experience a need for some outside support when carrying through plans for effective environmental management for the first time. To help companies adopt cleaner production a number of tools and strategies have been developed.

Waste Assessments are the main tool for identifying areas in the production where cleaner production opportunities exist. In the cleaner production terminology, a waste is any process output that is not a product. The term includes solid,

liquid and gaseous emissions of all types, as well as energy losses. The waste assessment gives managers a better understanding of material flows and identifies areas where waste reductions and cost savings are possible. Undertaking a waste assessment involves observing, measuring, recording data, and collecting and analyzing samples of waste (i.e. solid and liquid waste, spent process water, energy losses etc.) To be effective, it must be done methodically and thoroughly, with full management and operator support. A typical waste assessment includes six steps:

1. Put together a team responsible for the waste assessment, make a list of the process steps and identify obviously important/wasteful process steps, where the focus of the assessment should be placed.
2. Analyze the process steps in further detail with the aid of flow charts and material balances. Assign costs to the waste streams and identify the causes of the waste generation.
3. Suggest solutions to minimize or eliminate waste streams and wasteful process steps.
4. Analyze the proposed solutions from technical, economic and environmental perspectives in order to decide which solutions are feasible and most desirable to implement.
5. Implement the selected solutions and monitor and evaluate the results.
6. Start over again. Like cleaner production the assessment needs to be repeated periodically to keep the production optimized.

Life Cycle Analyses is a fairly new tool, used for measuring the total environmental impacts of a product during its "life", all the way from the extraction of raw materials, through the manufacturing and use of the product to its final disposal. It allows products to be compared to each other and is instrumental in the process of eco-labeling products in many countries. In the context of cleaner production life cycle assessments may be utilized for identifying "weak areas" in the product or the production process compared to other competing products on the market. This allows the producer to improve

their product from an environmental as well as a competitive perspective. Life cycle assessments are almost certain to be increasingly important in the next few years, especially for companies competing in international markets.

Environmental accounting is the art of assigning costs to pollution. Traditionally the environment has been regarded as a no-cost resource. The environmental accounting recognizes that this is not the case and that emissions and waste that deteriorate the environment actually reduces the value of that "free" resource and that this should be accounted for when doing economic and environmental plans. The idea is that by putting a price tag on the environment, e.g. a clean lake or unpolluted air in an area, it will also be possible to show the true environmental costs of producing a certain product as the negative economic impact on the environment of the emissions and waste associated with the production will show. Basically this is nothing more than acknowledging that emissions and waste represent costs whether you pay for them by investing in waste and emission reduction equipment or not.

This is a tool to be used by companies as well as by regulators. Companies can use environmental accounting as an instrument for identifying the expensive parts of their production when doing waste assessments and life cycle analyses. Regulators can use it to provide more accurate information in decision - making on policies, permissions and national environmental plans.

Training materials. One of the key issues of implementing an environmental management plan successfully is to be able to inform and involve all concerned persons in a company. Sometimes this proves to be difficult since traditional pollution control approaches remain dominant in many professional and managerial circles where the understanding of the benefits of cleaner production is poorly developed. Also cleaner production, as opposed to traditional end-of-pipe solutions, intrudes upon the production processes and requires a more profound understanding of the process, which may appear to be a more tedious task to achieve than simply to install pollution control equipment. The adaptation of an environmental management plan in a company

will depend on the success of the initial information and training effort.

To facilitate the introduction of a company into the cleaner production concept, the United Nations Environment Programme (UNEP), the International Chamber of Commerce (ICC) and the International Federation of Consulting Engineers (FIDIC) have produced a training kit named the UNEP/ICC/FIDIC Environmental Management Systems Training Resource Kit. This kit provides trainers and managers with the tools necessary to conduct training courses in environmental management systems for companies in their own region. It offers guidance on adopting the kit to local regulations, conditions and culture. Elements are included that are common to the International Organization for Standardization (ISO) environmental Management system standard, ISO 14,001.

The Network for Industrial Environmental Management (NIEM), administrated by UNEP's Regional office for Asia and Pacific in Bangkok, is also in the process of producing a training resource package which addresses more specifically the conditions for cleaner production in pulp and paper mills. The aim of the package is to provide advice and assistance to persons, who wish to conduct workshops or training seminars about cleaner production in the pulp and paper industry. It consists of three parts: an audit manual, guiding the user through the process of waste assessments in pulp and paper mills; a technical report reviewing environmental management in pulp and paper industry from a broader perspective and a training part with case studies, group exercises and advice on how to successfully arrange and conduct a training workshop. The resource package in planned to be available at the end of this year.

Information resources. Apart from the training materials several sources of information on cleaner production and environmental management plans are available. One of these sources is UNEP's programme for the promotion of cleaner production worldwide. The objective of this programme is two-fold; to increase worldwide awareness of the preventive environmental protection strategy embedded in cleaner production and to help industry and governments to develop cleaner production programmes.

The cleaner production programme disseminates information on cleaner production by developing publications, maintaining a case study database and by responding to technical queries. To arise awareness the programme develops technical manuals and general publications such as the popular *Cleaner Production Worldwide* series. More information on this programme may be acquired from UNEP's Industry Office in Paris, France. A particular focus of UNEP's cleaner production programme is on promoting self-sustaining cleaner production programmes in developing countries. UNEP has joined UNIDO (United Nations Industry Development Organization) to establish and support National Cleaner Production centers (NCPCs) in developing countries and in countries in transition. These centers play a coordinating and catalytic role by conducting demonstration and training programmes, assessing national policies and making recommendations for policy changes and by acting as focal points for cleaner production information. The NCPC in India is located with the National Productivity Council in New Delhi.

Green funds are quite a new concept which is spreading rapidly in many countries. As the public awareness of environmental issues increase, investors and financial institutions are growing more reluctant to give loans and other kinds of financial support to polluting companies and to corporations lacking a positive environmental profile. To give investors the opportunity to more easily channel their investments into enterprises with an environment friendly profile green funds are created. These funds extend financial support on favorable conditions to companies with a "green profile", thereby promoting an environment friendly development of the industry. Companies which have adopted ambitious environmental plans and which are working along the lines of cleaner production will be among the companies favored by green funds.

Networking. Although there is plenty of information on effective environmental management accessible, it is generally easier to use and exchange this information in a network of people involved with implementing cleaner production. Networking can be anything from a list of names whom you can contact, to a virtual organization with frequent meetings, newsletter publications and ongoing

discussions on the Internet, via telefax or mail. A network is as ambitious as its participants but it is generally a good way of keeping each other updated on relevant news and events.

CONCLUSIONS

Effective Environmental Management is an emerging concern for companies with the ambition of staying in business for more than a few more years. Environmental management is not necessarily only a way of dealing with environmental issues but may also be a way of optimizing the production and minimizing costs associated with the production. The future challenges of an increasingly international market and of consumer demand for environment

friendly products accentuate the need for implementing environmental management plans further.

Each mill is unique in its potential for adopting and implementing an effective strategy for environmental management. There are many tools and materials available for the manager who wishes to bring his company into line with the cleaner production concept. Of course, one should never forget that without the commitment of the management, along with the rest of the staff of the mill, the implementation of the strategy will be a very difficult task to carry through. However, the incentive to make that commitment is obvious and can be expressed in one single sentence: Cleaner production is what the leading companies of tomorrow are doing today!