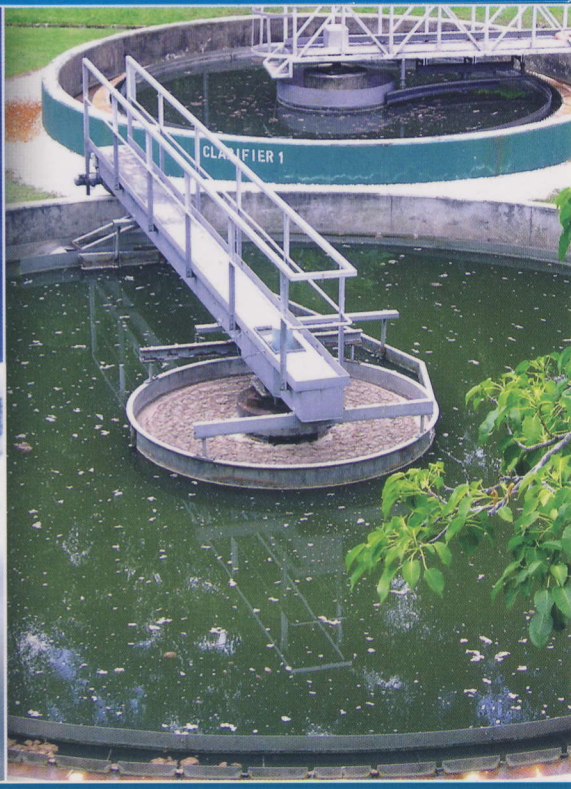
INTRODUCTION TO CLEANER PRODUCTION

(With Special Reference to Electroplating Industry)



DEPARTMENT OF ENVIRONMENT
MINISTRY OF NATURAL RESOURSES AND ENVIRONMENT
MALAYSIA

INTRODUCTION TO CLEANER PRODUCTION

(With Special Reference to Electroplating Industry)

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Cleaner Production Unit
Department of Environment
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Malaysia

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Table Of Contents

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Preface

This booklet contains a compilation of papers and briefing notes prepared for the purpose of giving some background information and general understanding of Cleaner Production (CP) / Cleaner Technology (CT) concept and appiications. An example of a successful CP / CT demonstration project is illustrated in the case of the electroplating industry - Kilang Sadur Letrik QUALITY Sdn. Bhd. in Klang, Selangor. Also highlighted herein are the various issues related to raising the awareness of industry as well as steps and efforts that are needed to further promote CP / CT adoption for various industrial sectors and other activities.

Unlike the conventional or end-of-pipe waste treatment technology, CP / CT approach avoids industrial pollution by carefully considering each process step in order to minimise or eliminate waste before it is generated. It involves identifying, evaluating and implementing various opportunities available to industry for effectively reducing waste streams generated from the production process. CP / CT also aims at cost savings, higher productivity and better quality products and pollution prevention.

In this regard efforts are needed to encourage, assist and further promote industries to change their attitudes towards CP / CT. Through good examples of successfully implemented CP / CT initiatives, it can be clearly shown that the CP / CT options are cost effective and technically better alternative to the end-of-pipe approach.

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INTRODUCTION TO CLEANER PRODUCTION

By

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What is cleaner production?

Methodology for environment management:

- Different between Cleaner Production (CP) and the traditional pollution control and waste management approaches - proactive
- Pollution control and waste management approaches-end-of-pipe technologies add capital and maintenance costs to production. They pay little attention to the root causes of the problem: the products and the precess that make them.
- CP as a concept goes by many names including pollution prevention, source reduction, waste minimization etc.
- To move from pollution control to cleaner production has been likened to a paradigm shift. To shift a paradigm, the evidence has to be overwhelming and many stakeholders have to be convinced.
- To switch to a more comprehensive use of CP inevitably requires a long process of education and training to bring about a fundamental change in people's behaviours.
- The forces that sustain the control paradigm of end-of-pipe (EOP) technologies are:

1. Engineering education curriculum that only teaches EOP methods
2. Development banks that provide capital only for investments in EOP technologies
3. Government environment regulations that require the installation of EOP technologies
4. Environment industry that sells mainly EOP technology
5. Industrial firms that discourage employee creativity in solving environmental problems
6. People need proof before they will even begin to make the shift

*1 - Paper presented at the Seminar - " Introduction to Cleaner Production" organised by DOE at 12TH Floor Wisma Sime Darby Kuala Lumpur on the 7 June 2000

- From the business perspective, the barriers to CP are:

  1. Problems of attitudes
     Many companies remain to be convinced that introducing cleaner production technology really will cut production costs.
  2. Lack of information
     Practical data about new technologies to prevent pollution are not always easily available.
  3. The attitude problem of the management
     Many people in industry are too comfortable with business as usual resist change.

The solutions are:

1. To create a better understanding among goverment leaders of the economic case for CP.
2. To shift governmental spending on the environment from cleaning up pollution after it has occurred to preventing it from happening.
3. To refocus government intervention from end-of-pipe action to pollution prevention using CP methodology.
4. To promote rethinking the economics in government with less emphasis on regulatory control and more on self-regulation and crucially, a greater application of economics instruments.
5. To re-orientate the goals of goverment towards changing both consumer and producer behaviour, to provide continuous incentives and rewards for improvement and to move steadily from pollution control to opollution prevention.
6. To convince the companies through the use of economic instruments that environment is a central and not peripheral issue and that cleaner production, which is talking about products, processes and services, is good business for the companies.
7. To convince the companies the CP leads to sustainable development - that CP means lower cost, competitive advantages, profitability and possibly even survival.

Hopes for changes:

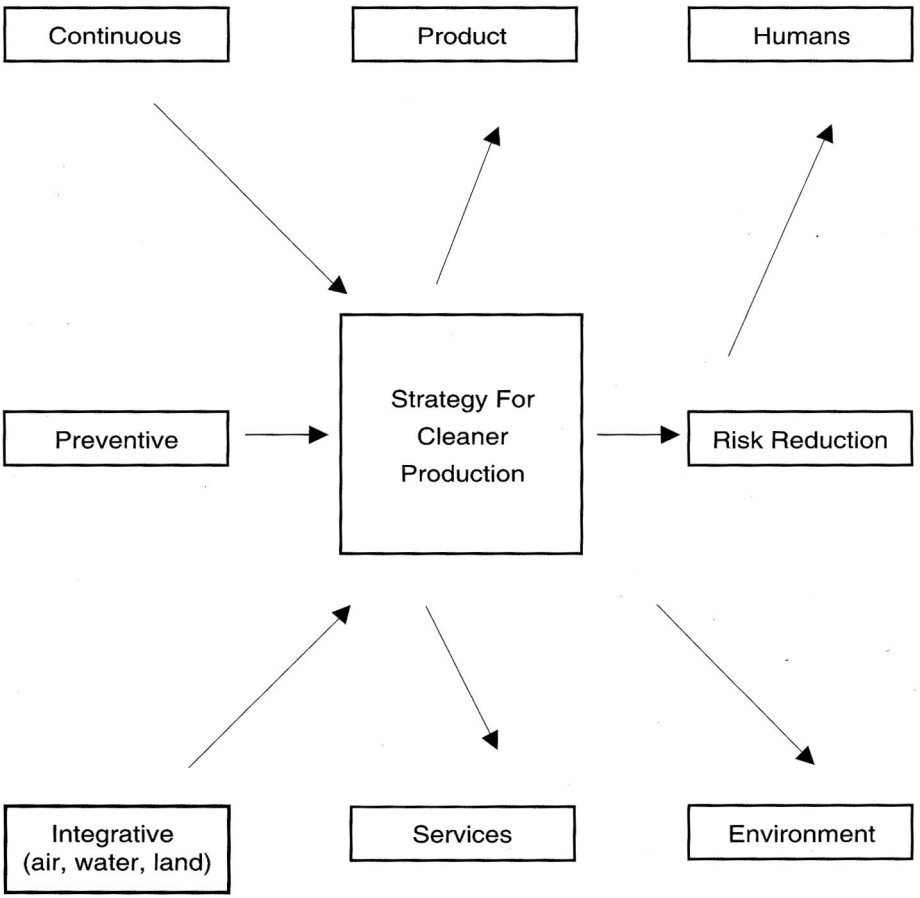
1. Customers demand cleaner products, processes and services.
2. Banks and insurance companies more willing to lend to companies committed to preventing pollution rather than paying for its after math, or more amenable covering "clean" companies.
3. Investors are beginning to flex their financial muscle to press companies to adopt higher environmental practices.
4. The courts starting to exercise a closer interest in pollution issues, especially in the area of management liability for non-compliance with environmental regulations.
5. Employees (especially the brightest and the best) who want to work for environmentally responsible corporations and who may vote with their feet (resign) as a consequence.
6. Together, they represent a powerful confluence of forces for change: a coalition of interests that today's managers would be ill advised to disregard.

Recommendations from the industries (carrot and the stick):

1. Demonstrate to managers that cleaner production and ultimately eco-efficiency are both good business.
2. Use of economic instruments and stakeholders participation to exert market forces on the companies to turn to CP.

Elements of CP:

- Preventative
- Continuous application
- Integrative (air, water, land)
- Processes
- Products
- Services
- Risk Reduction
- Humans
- Environment



• A Strategic Framework for Cleaner Production

CLEANER PRODUCTION STRATEGY

UNEP Definition of Cleaner Production

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

Cleaner Production is aimed at:

- Production processes - conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes before they leave the process.
- Products - reducing the environmental impact along the live cycle of the product, from raw materials extraction to ultimate disposal.
- Services - incorporating environmental concerns into designing and delivering services.
- Cleaner Production requires changing attitude responsible environmental management and evaluating technology options.

Other preventive approaches such as eco-efficiency and pollution prevention, serve similar goals.

UNEP CP Programme

Objective:

- To increase world-wide knowledge on the concept
- To help government and industry develop and adopt cleaner production programmes with a view to change production patterns
- To facilitate that transfer of cleaner production technologies

History of Cleaner Production Programmes:

UNEP Governing Council	May 1989 decision on environmentally sound technologies
Canterbury CP Conference	October 1990 CP Concepts and network launched
Paris CP Conference	October 1992 reorientation of CP as follow-up to UNCED
UNEP Governing Council	May 1993 decision on transfer of environmentally sound technologies decision
Warsaw Conference	October 1994
Oxford CP Conference	1996
Pheonix Park CP Conference	September 1998
International High-level Seminar on CP, Montreal Canada	October 2000

UNEP CP Programme Highlights:

1. Information Exchange (The International Cleaner Production Information Clearing House - ICPIC) Publications:

   - Government strategies and policies for cleaner production
   - Cleaner production world-wide
   - Cleaner production in APEC region
   - Cleaner production newsletter
   - Computerised database, containing 600 case studies, 1200 publication abstracts and
   - Query response services.

2. Capacity Building:

   - Joint UNIDO / UNEP National CP Centre Project to establish centres in 20 developing countries and countries in transition to implement CP
   - Organisation and contribution to international conference, workshops and seminars on CP

3. Demonstration Projects:

   - Cement and pulp and paper industries in Egypt, Senegal and Zimbabwe to determine opportunities for and barriers to cleaner production

PROMOTION OF CLEANER PRODUCTION IN THE MALAYSIAN INDUSTRY

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INTRODUCTION

Environmental legislation enforced by most countries, like in Malaysia, is directed essentially towards pollution abatement through the implementation of waste treatment and disposal schemes with the aim of conforming to stipulated discharge or emission standards. Although such practice, referred to as end-of-pipe treatment, has contributed significantly to environmental protection, it is not an ideal approach in environmental management. In fact, such approach has, in certain cases, proved grossly inadequate and problematical. It has resulted in the transfer of pollutants, particularly those categories as hazardous, from one medium another.

Cleaner Production is a relatively new concept and approach in pollution control. This strategy, which entails reduction, recycling, or even elimination of waste sources through prevention and recycling of wastes generated, is undoubtedly more environmentally sound and acceptable.

The concept has essentially stemmed from legislation intended to curb mismanagement of hazardous wastes in the industrialised countries. In such case, Cleaner Production means reduction of hazardous waste that is generated or subsequently treated, stored or disposed of. It is generelly agreed that Cleaner Production includes volume reduction as well as reduction in the quality of toxic constituents or waste toxicity.

Although the concept of Cleaner Production grows from the need to control hazardous wastes, it has since been applied and extended to all field of waste management, particularly industrial pollution control, because of the worthy goals it aims to achieve. It is logical, at least from the environmental and social points of view, that preventing the generation of waste, when feasible, is preferable to controlling it after it has been generated.

The United Nations Environment Programme (UNEP) has, in this connection, embarked on a Cleaner Production Programme directed towards the industrial sector. UNEP's definition of Cleaner Production is : *the continuous application of an intergrated preventive environmental strategy to processes, products and services so as to increase ecoefficiency and reduce the risks to humans and the environment.* Cleaner Production is a life - cycle approach to industrial production and waste minimisation is one of the tools for achieving cleaner production in industries.

*2 - Paper presented at International Conference Innovative Pollution Management Technologies, 14 - 16 July 1999, Mines Resort City, Kuala Lumpur

WASTE MANAGEMENT PRIORITY HIERARCHY

In consonance with the concept of waste minimisation and waste reduction, a new waste management priority hierarchy has been formulated. Generally, the hierarchy of waste management options is source reduction, followed by recycling, treatment and disposal.

Source reduction. Reduction or elimination of waste at the source, usually within a process.

Treatment. Any method, technique, or process that changes the physical, chemical, or biological character of any waste so as to neutralise the waste, to recover energy or material resources from the waste, or to render such waste non-hazardous, less hazardous, safer to manage, amenable for recovery, amenable for storage, or reduced in volume.

Disposal. Discharge, deposit, injection, dumping, spilling, leaking or placing of waste into or any land or water so that such waste or any constituents may enter the air or be discharged into any waters, including groundwater.

BENEFITS OF CLEANER PRODUCTION

Cleaner Production is expected to bring numerous benefits to the industry. These include:

Reduced waste management costs. This is achieved through one or more of the following:

- Lower onsite handling costs
- Less waste storage area (hence more available production area)
- Lower offsite transportation and disposal costs
- Lower paperwork and record-keeping costs.

Reduced costs of raw materials and energy. This is achieved through the practices of recycling:

- Direct use or reuse of a waste in a process
- Recovery of a secondary material for a separate end use, such as the recovery of energy sources
- Removal of impurities from a waste to obtain a relatively pure reusable material.

Enhancement in productivity and product quality. Cleaner Production leads directly to improved operations through yield improvement and increased production capacity. Savings can be more impressive when calculated on a long-term basis.

Improvement in human health and public image. Cleaner Production reduces health risks and thereby creates a more health environment for workers in particular and the public at large.

Diminution in environmental hazards and liability risks. Reducing the amount of waste being handled on site also reduces potential environmental hazards thereby minimising violations of legislation. It also minimises long-term liability for treatment, storage or disposal facilities. There is also reduction in liability risk of worker exposure to hazardous materials. It has been estimated that liability savings of US$100-300 per ton of hazardous waste could be realised.

CLEANER PRODUCTION APROACHES AND TECHNIQUES

Cleaner technology refers to environmentally sound technology applied in environmental protection. It possesses the following general characteristics:

a) To increase efficiency in the use of raw materials, energy, utilities, land and water resources;

b) To eliminate or reduce the extent of harmful wastes generated during production, to ensure minimum hazard to human health, and to reduce the risk of possible climate change and depletion of ozone layer;

c) To recycle products after their use to produce the same or other marketable products;

d) To increase rates of economics as well as employment growth in developing countries while protecting the environment; and

e) To enchance the overall quality of life.

There are several approaches and techniques for the creative process of identifying new options in Cleaner Production and applying cleaner technology. These include the following:

Inventory management and improved operations

- Inventory and trace all raw materials
- Purchase fewer toxic and more non-toxic production materials
- Improve material receiving, storage and handling practices
- Maintain strict preventive maintenance programme
- Implement employee training and management feedback

Equipment modifications

- Install equipment that produces minimal or no waste
- Redesign equipment or production lines to produce less waste
- Improve operating efficiency of equipment
- Modify equipment to enhance or permit recovery or recycling options
- Eliminate sources of leaks and spills

Production process modifications

- Optimise reactions and raw material use
- Substitude non-toxic for toxic raw materials
- Redesign or reformulate end products to have minimal environmental impact
- Modify process conditions or practices to reduce waste generation

Recycling and reuse

- Install closed-loop systems for direct recycle
- Recycle onsite for reuse
- Recycle offsite for reuse
- Segregate wastes by type to allow for recovery
- Separate toxic from non-toxic wastes
- Participate in waste exchanges (using one company's waste as another's feedstock)

THE SIRIM-DANCED CLEANER TECHNOLOGY PROJECT

A Project on the Promotion of Cleaner Technology in the Malaysia Industry was launched in January 1996 as one of the projects under the Danish Cooperation for Environment and Development (DANCED), a technical cooperation programme between the Government of Malaysia and Government of Denmark.

The Project, which was successfully concluded in October 1998, was implemented by SIRIM, specifically the Environmental and Energy Technology Centre (EETC), as the executing agency under the supervision of the Ministry of Science, Technology and the Environment. The objective of this Project was to enhance the sustainable development of the Malaysian industry, in particular the small and medium enterprises, through the implementation of cleaner technology in their activities. Three specific industrial sectors were targeted, namely food, electroplating and textile. Under the Project, the EETC has established a Cleaner Technology Extension Service (CTES) and a Cleaner Technology Information Service (CTIS). The EETC is offering industrial audit services to the Malaysian industry, in which appropriate and affordable Cleaner Production options are introduced.

The services also cover technical aspects of residual waste management and occupational safety & health, particularly workplace environment. The EETC has, since 1996, completed industrial audits for about 40 companies in Malaysia, more than 90% being the small and medium enterprises, covering, beside the food, electroplating and textile industries, also the pulp & paper and rubber products industries. Six full-scale demonstration projects have been used in showcasing viable and working Cleaner Production options to the industrialists, policy makers, administrators, enforcement officers, professionals, etc. In addition, the EETC has established a database on cleaner technology. Over the past two years or so, the EETC has organised 17 workshops and seminars specifically for promoting cleaner production. 11 radio programmes have also been aired over the national radio networks in the Bahasa Malaysia, English and Chinese languages to create public awareness in cleaner production. Seven issues of a newsletter Cleaner Technology have been published for communicating news on cleaner production to the industrial and other relevant sectors.

CLEANER PRODUCTION CASE STUDIES

Based on the experiences derived from the afore-mentioned demonstration projects, three case studies are described below.

The Electroplating Industry

There are more than 300 electroplating companies currently in operation in Malaysia. The majority of these companies belong to the small and medium category. About one third of them are located in the Klang Valley.

Kilang Sadur Letrik Quality Sdn. Bhd. (QEP) is a typical small and medium industry (SMI) providing commissioned plating for the automotive and electronic industries. In order to comply with the Environmental Quality Regulations, QEP installed a 100 litres per minute treatment system and the management was of the view that it should be able to solve the company's pollution problem. However, due to lack of awareness, excessive process water was used for ensuring the high quality in the final products. It appeared that the wastewater treatment plant was unable to cope with the discharge load, resulting in non-compliance with the environmental regulations.

The company was selected as the site for a demonstartion project under the DANCED programme after an audit was conducted. Three stage counter-flow rinsing was implemented with the desired rinsing flow rate. Two ion exchange units, one each at the zinc and the chromate plating line, were installed to clean the final rinses so that the deionised water could be recycled to the counter-current flow with the products in process. The counter-current flow was balanced to compensate for losses due to evaporation from the plating tanks. The rinse water became increasingly concentrated with plating chemicals dragged out from the plating tanks during the counter-current rinsing process. It was recycled for topping up the plating solution in the process, thus reducing substantially the amount of water used.

The overall benefits of these Cleaner Production options are the achievement of over 80% reduction in water consumption and the substantial savings in plating and treatment chemicals. In fact, the continuous wastewater stream from the plating lines have almost been eliminated.

Wastewater is now generated only during regeneration of the ion exchange units. At the present production capacity, regeneration takes place only once a month. The company no longer faces compliance problem, even though the batch wastewater treatment operation is carried out during weekends instead of everyday as was previously done. With the reduction in wastewater volume and concomitantly sludge quantity, the waste management cost has been reduced significantly. With the ion exchange system, the final rinse tank is crystal clear with a conductivity of 0.2 to 2.0 ms. The plated products are cleaned more effectively resulting in higher plating quality. The investment on the Cleaner Production options was about RM 170,000, but the realised savings have been Cleaner Production options was about RM 170,000.00 but the realised savings have been estimated at RM 160,000.00 annually even at the current production level. When the savings are expected to be much higher.

The Food Industry

As in the case of the electroplating industry, the majority of the food companies in Malaysia are in the SMI category. In' Joy Marketing (M) Sdn.Bhd. is a typical SMI fruit juice company, producing local and traditional fruit juices and cordials.

When a cleaner technology audit was conducted on the company, the first impression was that the production area was warm, noisy, wet and slippery and the working environment unimpressive. The workers complained of drowsiness. It was found that more than 70% of filtered and sterile water meant for production was used in rinsing bottles and floor washing before being discharged into the drains. There were three hot water kettles or low-efficiency boilers without any insulation and with a flue gas temperature of higher than 500°C There were also no safety valves on them. Besides, the sugar dissolving process was slow and product pasteurisation was not controlled.

Working very closely with the company management, the EETC project team introduced a package steam boiler to replace the three hot water kettles. This resulted in higher efficiency and therefore lower energy consumption, and consequently the elimination of heat, and possibly carbon monoxide due to incomplete combustion, emitted to the working environment. From the perspective of occupational safety and healty, the associated healty hazards were removed.

A water recycling system was installed to effect the return of wash water used in rinsing the filled bottles for floor washing, thereby reducing water consumption. Two plate heat exchangers were also installed to supply hot water to the sugar dissolving process and the product pasteurisation process in order to improve the product quality. In addition, pneumatic control, automatic transfer and clean-in-place systems were put in place to achieve overall process improvement.

The aforementioned upgrading works have brought about more efficient and hygienic production conditions. Besides achieving a 23% saving in fuel consumption, the working environment has also drastically improved, thereby resulting in high productivity. With 90% overall thermal efficiency environmental pollution has been significantly reduced. Monitoring data have indicated more than 40% savings in water consumption and wastewater treatment cost through recycling. The quality of the products has also improved due to the well controlled pasteurisation temperature and time. In fact, the productivity has improved by about 60%, with 8 batches instead of the previous 5 per 8-hour shift.

The Textile Dyeing and Finishing Industry

At Xie Li Dyeing Sdn. Bhd., a typical. SMI textile dyeing company, the dyeing temperature for polyester fabrics is about 130°C, and that for cotton fabrics is about 100°C. At the end of the dyeing cycle, the hot and coloured wastewater is discharged directly into the treatment system. Even with some mixing of the rinse water, the temperature of the wastewater is still around 70°C. Resulting from the audit conducted by the EETC project team, the company installed four high efficient dyeing machines to reduce consumptions in water, chemicals and fuel. The boiler was replaced with one with 15% higher overall thermal efficiency.

The Cleaner Production demonstration project at the company focused on waste heat recovery from the hot wastewater discharge as well as recycling of cooling water from the high temperature machines. Wastewater with a temperature higher than 60°C was automatically used to heat up incoming process water through a plate heat exchanger before it was discharged into the treatment plant. This was achieved through a pneumatic valve set and temperature control system. A condensate return system was also installed for heating up the process water in the hot water tank. Monitoring data have revealed that the energy saving is in the region of 30%, with the estimated payback on investment being three years based on the current production. The productivity has improved resulting from the shorter production cycle. As the process water is now pre-heated from 30°C to 60°C in the water tank, the time taken to raise the dyeing temperature to 100°C is reduced by 43%.

At the wastewater treatment plant, the aerobic process which was designed to remove 75% of the pollutant load was almost inactivated as the introduction of the heat recovery step, the wastewater temperature entering the treatment plant is now reduced to less than 40°C, thereby enabling the system to function normally.

The company is now able to comply with the stipulated effluent discharge limits. In terms of air pollution, the company is releasing less NOx and SOx resulting from the 30% reduction in fuel consumption.

After implementing the various Cleaner Production options, and concomitantly achieving compliance with the environmental regulations, which have inevitably uplifted the company's corporate image, it has increased its business volume. This is undoubtedly the greatest benefit that the company would have hoped to derive from the efforts, although the environmental benefits are what have been aimed for.

Conclusion

It has been demonstrated that Cleaner Production is an effective environmental management strategy which brings about sustainable development of our industry. SIRIM will continue to promote the adoption of Cleaner Production practices in the Malaysian industrial sector by offering various related consultancy services, leading to full compliance of environmental regulations and even certification to the ISO 14001 environmental management system, besides assisting the target companies in achieving enchanced productivity and profitability.

Introduction

It is to be noted that Malaysia has already introduced and enforced environmental legislations, basically applying the control at source concept and pollution-pays principle, with the aim of achieving compliance to the stipulated discharge or emission standards. Such practices are being referred to as end-of-pipe approach to treat waste generated from production processes by installing waste treatment facilities to reduce the pollution load before discharge into the environment. It is also pertinent and relevant to note that recent review of the Environmental Quality (Amendment) Act 1996 had included provisions to encourage the practice of self-regulation particularly in the industrial sector and better prospects for clean technology applications.

However, more efforts are required in order to better understand and manage the broad relationship of our industrial economy, societal issues and environmental protection needs so as to be in consistent with the advancing concept of long-term environmental commitment towards sustainable development. We should also be conscious of the trend of increasingly environment conscious export markets which examine not only the environmental impacts of products and processes but also the wider question of resource use. We need to understand and be prepared about the varying kind of possible impacts and opportunities arising from such complex interdependencies and in meeting the customer's requirements. Although protecting the environment has become an integral part of any development plan or process but it also implies that such measure cannot be considered in isolation but necessarily so it will assumed that it will not cause any impediment to the economic growth of the country.

Cleaner Production (CP) is a rapidly growing, internationally recognised discipline. It has been acknowledged as the preferred strategy to achieve efficient use of natural resources and to prevent pollution.

*3 - Paper presented at the workshop on Cleaner Production and Zero Waste Technology 1999, 6-7 December 1999, Holiday Inn, Johor Baharu.

Its goal is to avoid generating waste in production systems while minimising the use of energy and materials. It strives to achieve reductions in production costs, energy consumption, pollution and health risks. Previously, the use of conventional (end-of-pipe) waste treatment technology was not that attractive because of the extra expenditure required to purchase, operate and maintain the equipment as well as reduced competitiveness for local industries. Over these years, many other terms were introduced such as pollution prevention, waste minimisation, green productivity, source reduction, eco-efficiency and clean technologies (CT) are used to refer to Cleaner Production concept or aspects connected with it.

New Legal Provisions

In view of "long-term sustainability approach" and to address emerging issues like sustainable development and life cycle analysis, a number of related terms, analytical tools and key concepts such as "environmental audit", "environmental management system", "environmental risk" and "environmentally hazardous substances" were incorporated in the amendments of the Environmental Quality Act 1974.

These amendments could provide further impetus for a more systematic and integrated approach to the prevention of pollution and better resource utilization in view of expected more significant impact on the environment through the unavoidable generation and discharge of wastes alongside with the increase in the number of potentially polluting sources or activities.

Also, in view of the recent changes made to the Environmental Quality Act 1974, there could be consequently, the possibility of the need to further identifying, formulating and imposing additional environmental regulations, policy and administrative measures and/ or new enforcement requirements on the part of the Department of Environment (DOE) and / or other relevant parties such as introducing some features of economic instruments to be applied to supplement the present legal obligations or regulatory measures imposed - the so called command-and-control system.

Concurrently, as its consequence the possibility would be that of further adoption of the polluter-pays-principle which requires any activity incurring environmental costs has to make compensation by way of internalising the costs within its operation.

This kind of initiative could possibly be made in conjunction with some other policy measures, administrative set-up and control strategies on what constitute as the best preferred environmental management options.

Cleaner Production Initiative

Through Cleaner Production (CP) or Cleaner Technology (CT) approach, it has been identified as one of the important policy option and programmes to address the issues of pollution reduction and resource scarcity, to foster environmental friendly production and reduce materials wastage. It is understood as a preventive means and practical tools to control and manage our environmental quality and reduce risk and hazard to the people and the environment. It is also a strategy that entails reduction-at-source, reuse or even elimination of waste resources through prevention and recycling of the wastes generated, including recovery of useful by-products as resources and ultimately to make the initial capital venture turned into profits. Hence, all industrial and business sectors are very much encouraged to introduce and practice clean technologies to improve the production processes, management and operating practices and achieving better environmental performance and higher profitability

By incorporating CP practices, environmental protection and reduction of pollutants will be then shifted from purely treating waste (merely an add-on feature) to reviewing the whole production process so that waste generation can be identified for subsequent reduction and minimisation by means of innovative cleaner technology options or that can be incorporated at various stages (built into it from the beginning) of the production process.

Cleaner Production - An Integrated Approach

Issues in Cleaner Production / Cleaner Technology Adoption

a) Economic Incentives

Environmental management or more specifically pollution control has been generally being viewed as non-productive and non-revenue generating activity by some quarters, to a certain extent that it may be initially difficult to create a ready market demand for the associated CP / CT services. Also, funding sources for CP / CT implementation could also easily available. Hence, as an alternative, it is more likely that CP / CT products and services shall be marketed in combination with pollution control technology and / or Environmental Management Services (EMS) services. In addition, through certain right market mechanisms, economic incentives or financing scheme could be considered for manufacturers, business or industry that implement and achieve technological improvements and cost-effective measures in pollution control without causing noncompetitiveness among industries or inefficiency in production.

In order to create greater awareness, availability of information and initiatives about CP / CT especially among SMIs, a database on the proven cleaner technology, sources of funding and information on available option and facilities for transfer of technology should also be made available.

b) Institutional Mechanisms

The existing inter-agency arrangement among the different departments / agencies / private sectors involved in promoting and encouraging cleaner technology needs further strengthening. To a large extent, the success in promoting CP / CT options depends on coordinated efforts and concerted support given by all concerned parties through a common intention to achieve business profitability and environmental benefits when applying the cleaner production technology that is beneficial to all.

Noting that environment actions do require institutional support which the government can meaningfully provide by way of programmes, policies, plans and projects. Nonetheless, response strategies should not be limited to the government but instead the private sector initiatives could also initiate action plans in promoting cleaner technological applications on a voluntary basis rather than entirely letting the government to enforce by ways of legislative means. At industry level, there is a need to internalize environmental costs in its annual operating cost and revenue structure. The right prices should include the environmental costs within production costs. At country and regional

levels, cleaner technology agendas need to be identified, programmes developed and course of actions planned and implemented, and the progress carefully monitored and any environmental quality improvement reported.

(c) Cleaner Technology Option

Cleaner technologies could be incorporated in our continuous efforts to advocate and demonstrate the idea about benefits of a "Pollution Prevention Pays" Programme. Energy inputs and pollution loads generated could be reduced through product reformulation, process modification, equipment redesign, recycling and resale of recovered waste in its operation.

As such modern plant designs and cleaner technologies should be less wasteful and less polluting. Besides providing better environmental benefits, the shift to process driven alternatives makes facilities more efficient as the use of raw materials is reduced and less waste is produced or needs to be treated. It therefore lowers the production costs.

Technical Cooperation Programme

Under the project theme of "Promotion of Cleaner Technology in the Malaysian Industry", a technical cooperation programme between the Government of Malaysia and the Government of the Kingdom of Denmark was implemented under the Danish Cooperation for Environment and Development (DANCED) with the overall theme of "Environmental Management for Sustainable Development". The Ministry of Science, Technology and the Environment and SIRIM Berhad were appointed as the supervisory and the executing agencies respectively. The objective of the project is to promote cleaner technology by identifying and implementing feasible cleaner technology (CT) options in the targeted industries. Numerous activities which include environmental and energy audits, demonstration plants and information dissemination were carried out.

Conclusion

The choice of cleaner production concept by the business and industrial community as the preferred alternative means of industrial processing and manufacturing will open the door for promoting and applying innovative ways of production of goods that is more environmentally friendly or efficient and more acceptable to both the regulators and the general public. It is also a challenge to the industrial sector in view of competition among countries in the international exports market and the trend towards increase incorporation of environmental factors in the production, manufacturing processes and emerging trade rules.

However, as generally understood, certain partnership and development of public-private response is needed in any dealing with environmental issues and problems. Also, promoting an environmental programme or resolving environmental problems is largely a collective effort.

In this respect, to be more successful in implementing cleaner production programme, it could be suggested that it must be given due recognition in the same manner as protection of the environment is an important issue for which there is already widespread government and public support. There will be need for additional infrastructure and capacities, including knowledge base and dissemination of information to increase the awareness of cleaner technology applications. The business sectors should be encouraged look at environmental protection not a cost but as an investment in the future.

INTERNATIONAL DECLARATION ON CLEANER PRODUCTION *

We recognize that achieving sustainable development is a collective responsibility. Action to protect the global environment must include the adoption of improved sustainable and consumption practices.

We believe that Cleaner Production and other preventive strategies such as Eco-efficiency, Green Productivity and Pollution Prevention are preferred options. They require the development, support and implementation of appropriate measures.

We understand Cleaner Production to be the continuous application of an integrated, preventive strategy applied to processes, products and services in pursuit of economic, social, health, safety and environmental benefits.

To this end we are committed to:

Leadership
using our influence
to encourage the adoption of sustainable production and consumption practices through our relationships with stakeholders.

Awareness, education and training
building capacity
by developing and conduction awareness, education and training programmes within our organization; by encouraging the inclusion of the concepts and principles into educational curricula at all levels.

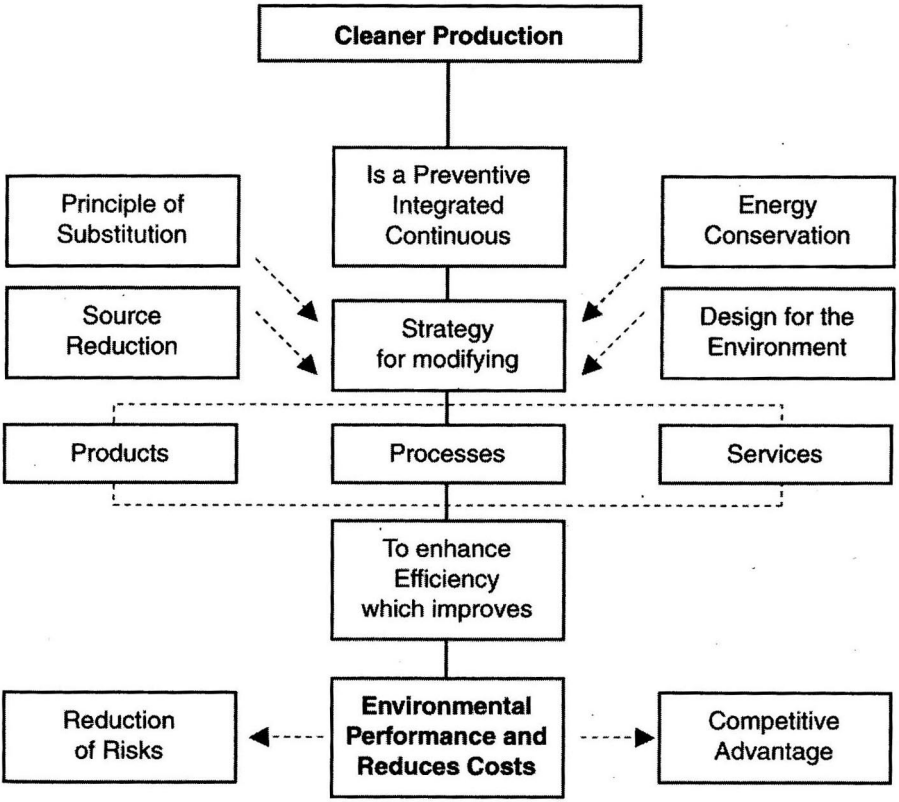
Integration
encouraging the integration of preventive strategies
into all levels of our organization;
within environmental management systems;
by using tools such as environmental performance evaluation, environmental accounting, and environmental impact, life cycle and cleaner production assessments.

Research and development
creating innovative solutions
by promoting a shift of priority from end-of-pipe to preventive strategies in our research and development policies and activities;
by supporting the development of products and services which are environmentally efficient and meet consumer needs.

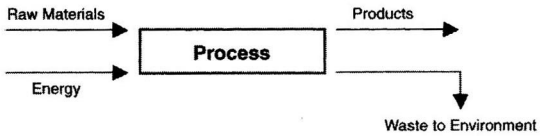
Communication
sharing our experience
by fostering dialogue on the implementation of preventive and informing external stakeholders about their benefits.

Implementation
taking action to adopt Cleaner Production
by setting challenging goals and regularly reporting progress through established management systems;
by encouraging new and additional finance and investment in preventive technology options, and promoting environmentally-sound technology cooperation and transfer between countries;
through cooperation with UNEP and other partners and stakeholders in supporting this declaration and reviewing the success of its implementation.

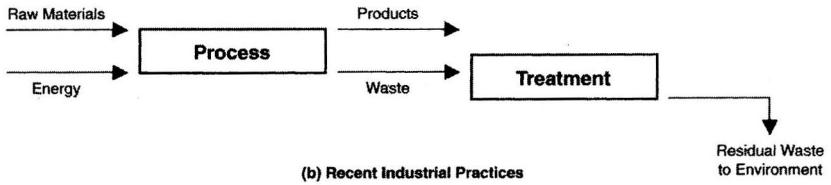
* Presentation made at the seminar - 'Introduction to Cleaner Production' organized by DOE on 7th June 2000


Cleaner Production
Is a Preventive Integrated Continuous
Principle of Substitution
Source Reduction
Energy Conservation
Design for the Environment
Strategy for modifying
Products
Processes
Services
To enhance Efficiency which improves
Reduction of Risks
Environmental Performance and Reduces Costs
Competitive Advantage

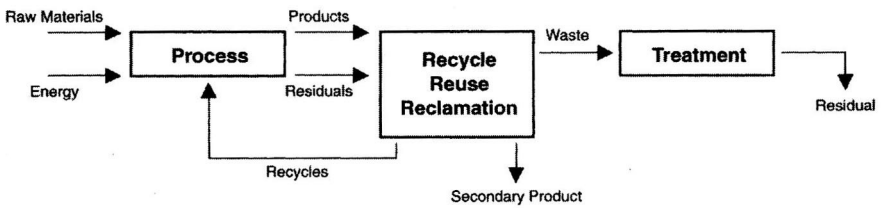
RECENT AND PROPOSED INDUSTRIAL PRACTICES



(a) Past Industrial Practices



(b) Recent Industrial Practices



(c) Proposed Industrial Practices

CP-related Activities Undertaken by DOE

1. Publication of a series of industry-specific Handbooks (Industrial Processes & the Environment Series)

(The contents of the handbooks include the production processes, potential environmental impact and pollution control practices, recommendations for cleaner technologies)

The Five (5) Industry Sectors are:

a) Metal Finishing - Electroplating (completed)
b) Crude Palm Oil Industry (completed)
c) Raw Natural Rubber Industry (completed)
d) The Food Processing Industry - rice noodle processing (completed)
e) Textile & Apparel Industry (completed)

2. Workshop on Cleaner Production, 12-13 May 1999, Shah Alam, Selangor

The main objectives of the workshop are to identify and deliberate issues related to CP promotion and to propose recommendations towards planning and implementation of National CP Programme encompassing:-

- Economic instruments, incentives and funding mechanism to facilitate CP adoption & waste minimisation
- Institutional roles and support to encourage CP practices and interagency cooperation
- Regulatory measures to achieve better environmental performance and to support CP using auditing schemes, CP / EMS and use of environmentally sound technologies
- Education, awareness and training aspects
- CP database and information system; communication and networking
- Technical assistance, case studies and demonstration projects to illustrate cost-benefits of CP approach
- Research initiatives for CP application for different industry sectors

3. Malaysia Agenda for Waste Reduction (MAWAR)

Launched and initiated by the DOE in April 1996. A programme of waste minimisation on voluntary basis by the industry sectors, namely electronic and semiconductor, metal finishing, paint, industrial gas, asbestos and chemical plants with the support from the DOE.

A 5-year pilot programme involving, survey, identification, assessment and reporting of on-site and off-site waste reduction initiatives that can be employed in cost-effective manner using the various available waste minimisation techniques viz., inventory management and control, production process modification, volume reduction recovery / recycling and reuse.

4. Campaign on Promotion of Cleaner Production Practices for Electroplating Industry

To create awareness and educate especially the small electroplaters on the benefits of applying cleaner production options in the production processes. The first phase covers the states of Selangor, Federal Territory of Kuala Lumpur and Negeri Sembilan. (A total of 84 premises are expected to be involved).

Target Groups:

- Electroplating Industry (Types, Sizes & Categories)
- Raw materials suppliers
- Customers for the products
- Other stakeholders

Coverage (Phase I):

- Federal Territory Kuala Lumpur, Selangor and Negeri Sembilan
- Number of facilities & Number of DOE personal involved breakdown according to States:

DOE	No. of Sources
Kuala Lumpur	29
Selangor	135
Negeri Sembilan	14

Duration: Three months (June-August 2000)

Activity Performance Measures:

a. Immediate

- Number of participants
- Number of factories visited
- Number of posters and booklets distributed
- Number of handbooks sold
- Number of dialogue and meetings

b. Long term

- Decrease % waste produced @ reduction in waste
- Increase % of reuse of waste and chemicals
- Increase number of industries implementing CP options
- Outreach - suppliers & customers needs & demands

CLEANER PRODUCTION OPPORTUNITIES

PROCESS MODIFICATION
- Control chemical addition
- Control contamination level in rinsing baths
- Improve process water quality with ion exchange or reverse osmosis
- Minimise oil on incoming materials
- Reduce excess plating deposits

DRAG-OUT REDUCTION
- Use spray rinsing
- Install drip guards to recover chemical drips
- Lengthen drag-out time to allow more chemical to drip back into tank
- Rotate plating barrel at top position

MATERIAL SUBSTITUTION
- Alternative to chlorinated solvent claning
- Alternative to cadmium plating
- Alternative to cyanide plating
- Alternative to usage of hexavalent chromium

RINSEWATER REDUCTION
- Use multiple stage rinsing
- Use conductivity sensor to trigger the opening / closing of clean rinse water inflow

ENERGY CONSERVATION
- Use plastic balls in hot process tanks
- Use insulation for hot process tanks

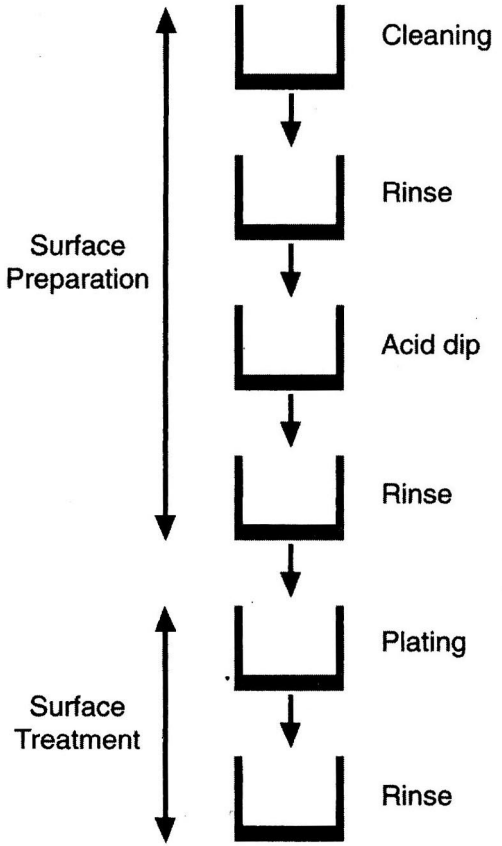
DRAG-OUT CHEMICAL RECOVERY AND WATER RECYCLING
- Use atmospheric evaporators to concentrate rinse water for reuse
- Use high purity water for make-up water by treating tap water with help of ion exchanger or reverse osmosis
- Use counter-flow rinsing
- Reuse spent acid to neutralise an alkaline waste stream

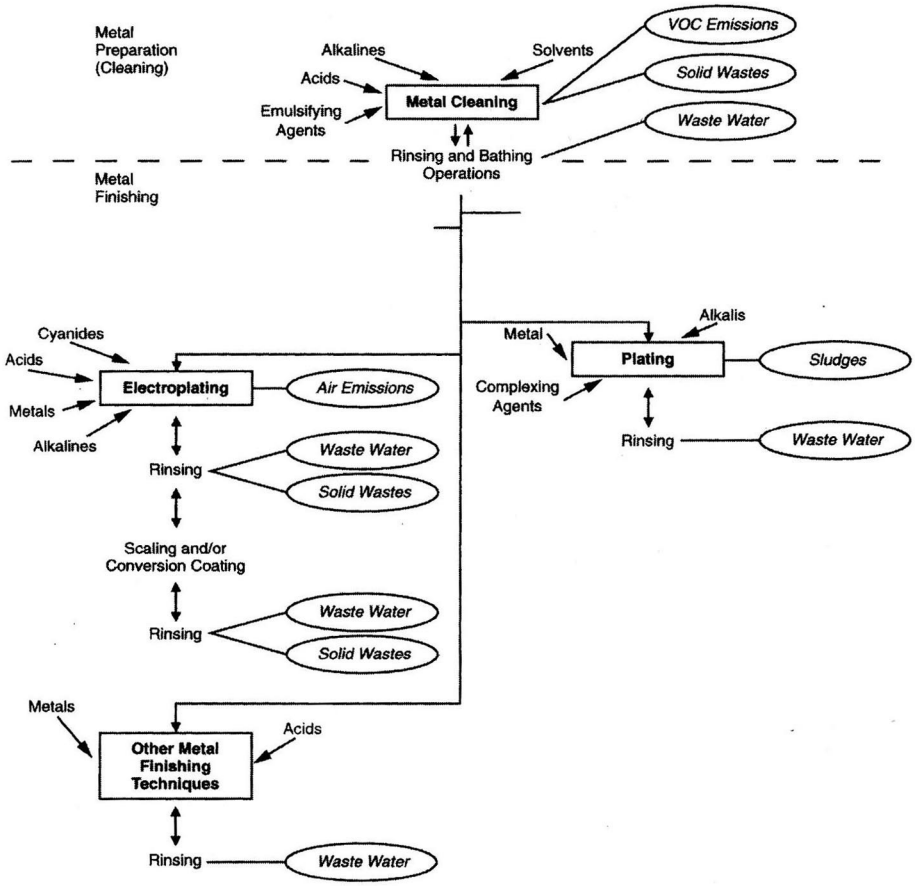
GOOD OPERATION PRACTICES
- Have a company pollution prevention policy and programme
- Train employees
- Carry out preventive maintance, housekeeping and spill control
- Optimise bath concentrations to legthen bath life
- Track waste and costs
- Segregate wastes (especially chromium-bearing waste from cyanide wastes)

POLLUTION CONTROL TECHNOLOGIES (end-of-pipe)
- Conventional wastewater treatment
- Ultra-filtration of wastewater
- Wet chemical scrubbers for air emisions

Source : Industrial Processes & The Environment (Handbook No. 1) Metal Finishing - Electroplating

SIMPLIFIED PROCESS FLOW DIAGRAM FOR PLATING PROCESS





NOTE: Metal finishing facilities generate various of air emissions, process wastewater, solid and hazardous chemical waste. The above simplified diagram describes the pollution emissions that can occur during metal surface preparation and finishing operations at plating shops.

THE CHOICE BETWEEN NEW REGULATION FOR METAL FINISHING FACTORIES – ELECTROPLATING + GALVANIZING (METAL COATING) OR CP INITIATIVE?

a. Environment - related Issues
- Electroplating Industries / SMIs - a major source of waste discharge + cause of heavy metal contamination + not in compliance + effluents not meeting discharge standards (Sewage and Industrial Effluent Regulations 1979) + sludge / scheduled wastes handing & disposal regulations (Scheduled Waste Regulations 1989), air pollution control requirements (Clean Air Regulations 1978) + overall poor house keeping;
- No or inadequate or malfunctioning or not in operation treatment systems;
- Relocation with central treatment facilities or electroplating zones.

b. New Regulatory Control (?) - regulatory focus on the industry sector

Listed as prescribed premises + owner / occupier / operator require license to operate + acceptable conditions of approvals imposed (licensing requirements);
- Introduction of the source-specific discharge standards & enforcement of the specified parameter limits of effluent discharged;
- License fees + effluent related fees (pollution charges) + quarterly reporting to DOE on effluent treatment and disposal + auditing?;
- Enforcement + penalties - fines + imprisonment;
- Contravention license in the interim;
- Need to upgrade + install waste treatment plants + assurance of complying with the all aspects of the regulatory provisions;
- Require operational and technology changes & investment in new machinery & pollution control equipment.

c. Cleaner Production Options (++)

- Proven enironmental improvement and larger than cost economic benefits of pollution prevention and CP practices;
- Initial investment but + return + definite payback period;
- Availability of financing facilities + economic incentives;
- Introduction of incentive-based approvals;
- Towards self-regulatory approach.

INDUSTRIAL POLLUTION PREVENTION AND CLEANER TECHNOLOGY

By

Lu Sim Hoay *4
SIRIM BHD Shah Alam, Selangor

WHAT IS CLEANER TECHNOLOGY

- Cleaner technology means applying an integrated, preventative environmental strategy to orocesses, products and services to increase efficiency and reduce risks to human and the environment.
- Cleaner technology saves money for companies while reducing wastes and harm to the environment.

HOW IS CLEANER TECHNOLOGY DIFFERENT

- Most environmental legislation emphasize on end-of-pipe treatment and disposal.
- Such practice is not an ideal approach in environmental management; often resulting in transfer of pollutant from one medium to other.

CLEANER TECHNOLOGY emphasize on REDUCTION, RECYCLING, REUSE or ELIMINATION of waste sources through prevention, and RECOVERY of useful by-products if practicable.

- The goal of cleaner technology is to avoid generating pollution in the first place– which frequently cuts costs, reduces risks and identifies new opportunities.
- Cleaner technology can be the most efficient way to operate processes, produce products and to provide services.
- Costs of wastes , emissions and environmental and health impacts, can be reduced and benefit from these reductions and new markets can be realized.

EXAMPLES OF CLEANER TECHNOLOGY

- Use of non-toxic raw materials
- Eliminate sources of leaks and spills
- Modify equipment for recovery or recycle
- Improve operating efficiency of equipment
- Optimize materials utilization
- Modify process to reduce waste generation

*4 - Paper presented at the Seminar / Dialog with Negeri Sembilan Electroplaters Organised by DOE at Allson Kiana Resort, Seremban, 13 July 2000

CLEANER TECHNOLOGY APPROACHES TO POLLUTION PREVENTION APPROACHES AND TECHNIQUES

Inventory Management and Improved operations

- Inventory and trace all raw materials
- Purchase fewer toxic and more non-toxic production materials
- Improve material receiving, storage and handling practices
- Maintain strict preventive maintenance programs
- Implement employee training and management feedback

Equipment Modifications

- Install equipment that produces minimal or no waste
- Redesign equipment or production lines to produce less waste
- Improve operating efficiency of equipment
- Modify equipment to enhance or permit recovery or recycling options
- Eliminate sources of leaks and spills

Production Process Modifications

- Optimize reactions and raw material use
- Substitute non-toxic for toxic raw materials
- Redesign or reformulate end products to have minimal environmental impact
- Modify process conditions or practices to reduce waste generation

Recycling and Reuse

- Install closed-loop systems for direct recycle
- Recycle onsite for reuse
- Segregate wastes by type to allow for recovery
- Separate toxic from non-toxic wastes
- Participate in waste exchanges (using one company's waste as another's feedstock)

BENEFITS

Reduce Waste Management Costs

Achieved through one or more of the following:

- Lower onsite handling costs
- Less wastes storage area (hence more available production area)
- Lower offsite transportation and disposal costs
- Lower paperwork and record-keeping costs

Reduced Costs of Raw Materials and Energy

Achieved through the practices of RECYCLING:

- Direct use or reuse of a waste in a process
- Recovery of a secondary material for a separate end use, such as the recovery of energy sources
- Removal of impurities from a waste to obtain a relatively pure reusable material

Enhancement in Productivity and Product Quality

Waste minimization leads directly to improved operations through yield improvement and increased production capacity. Savings can be more impressive when calculated on a long-term basis.

Improvement in Human and Public Image

Waste minimization reduces health risks and thereby creates a more healthy environment for workers in particular and the public at large

Diminution in Environment Hazards and Liability Risks Reducing the amount of waste leads to:

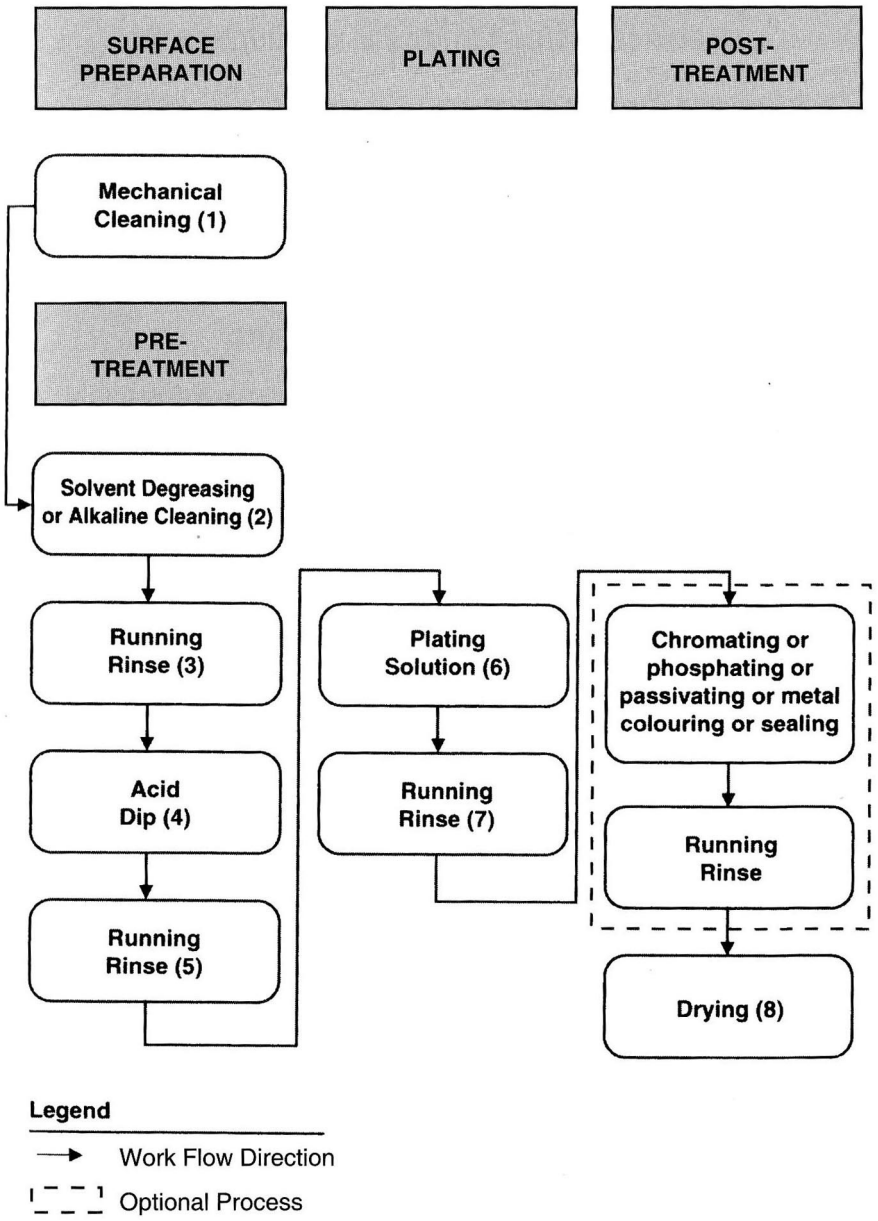
- Reduction in potential environmental hazards
- Minimizing violations of legislation
- Minimizing long-term liability for treatment, storage or disposal facilities
- Reduction in liability risk of worker exposure to hazardous materials

END-OF-PIPE TREATMENT COST

- Waste water treatment plant
- Operation and maintenance
- Trained manpower
- Treatment chemicals and waste water analysis
- On-site handling and storage
- Off-site transportation
- Disposal
- Documentation
- Compliance with legislation
- Others

CLEANER TECHNOLOGY OPTIONS FOR WATER UTILISATION

Method	
Good house keeping	
Optimization	
Counter Current	
Spray rinse	
Ion exchange	
Membrane filtration	Increase complexity
Reverse osmosis	



Typcal Work Flow In Electroplating Processes

Source: Industrial Process & The Environment (Handbook No. 1) Metal Finishing - Electroplating (DOE, 1999)

CLEANER TECHNOLOGY OPTIONS FOR WATER REDUCTION

- Using multi-step countercurrent rinsing
- Installation of flow meters to reduce unnecessary of water
- Installation of recovery tank
- Spray rinsing over process baths
- Ultra filtration or centrifuging of degreasing bath to reduce drag out of oil and dirt
- Ion exchange of rinsing water and chemicals
- Reverse osmosis on rinsing water

CLEANER TECHNOLOGY OPTIONS–BATHS

- Intensive supervision of the process, control / adjustment and cleaning up
- Pick-up of object in baths
- Covering of bath not in operation
- Separation of oil by ultra filtration
- Purification of bath by ion-exchange, electrolysis or filtration

DRAG–OUT FROM BATHS

- From and size of the objects
- Way the objects are mounted
- Viscosity of the bath liquid
- Surface tension
- Concentration of bath liquid
- Draining time over the bath
- Presence of spray rinsing over the bath

Relevant Issues In Cleaner Production: DOE Perspective

By

Mohamad Sanusi Sulaiman *5
Department of Environment, Malaysia

Introduction

One of the possible serious environmental problems encountered in many developing countries is pollution caused by rapid and uncontrolled industrialization. Such progress in industrial development is beneficial in that it provides the driviing force for economic growth, creation of job opportunities for increasing urban populations and hopefully an improvement in living standards. Neverheless, traditionally, their production processes are often inefficient, wasting raw materials and energy. Also, they often cause pollution to the surrounding environment.

In Malaysia, environmental concerns were initially addressed through the need to control pollution. This resulted in the introduction of the Environmental Quality Act in 1974. The Act has been the main legislative instrument to prevent, abate and control pollution and to enhance the quality of the environment.

Legislation are designated to promote environmental protection, often has unintended impacts on the behavior of the private sectors. To understand the effects of the governmental action on the choices of polluters, it is important to appreciate the alternative courses of action open to the polluters. Industries that are in non-compliance with the environmental regulations will usually take one or more of the following actions:

*5 - Paper presented at the Seminar / Dialog with Negeri Sembilan Electroplaters Organised by DOE at Allson Klana Resort, Seremban, 13 July 2000

- They can adopt good housekeeping measures and implement changes that require little or no investment. These measures usually involve some operating costs and they may or may not pay for themselves;

- They can adopt process changes that often require major investments. These investments may or may not pay for themselves, often depending on the economic lifetime of equipment to be replace;

- They can adopt end-of-pipe treatment technologies that usually have a negative financial return since they don't have any financial benefits;

- They can decide to do nothing if risk of enforcement or the level of penalties imposed does not justify the cost of the least-cost pollution reduction measures; and

- Finally, they can close their business if none of the available alternative options allows continued profitable operations of the industries.

Development and Environmental Issues.

The challenge we face is to reconcile the demands of rising economic trends and population growth, the desire for continued industrial development and the need to preserve our environment. As we already know, uncontrolled industrial activity especially from such energy and pollution-intensive industries has been identified as a major contributor to environmental deterioration. Therefore a new approach to industrial development is needed that will allow us to preserve and sustain our environment. The only possible way seems to be the reduction of pollution intensity of industrial activities without affecting the growth in industrial output or not constraining the possibility of maximizing the outputs that can be generated from such industrial development. Therefore an important role of the governmental problem associated with industrial development is to plan and implement accordingly the required preventive and control measures to deal with any adverse effects resulting from the industrialization programmes.

The traditional governmental policy response on pollution control is by implementing the so called command-and-control legislation that set standards for emission, set-up regulatory compliance scheme in the permitting system and carrying out enforcement and monitoring programmes. There will be regulatory provisions and imposition of fines in casee of violation against the prescribed approval conditions, emission limits and other pollution control requirement. However, the general trends in practice are that environmental related standards are becoming more stringent and increasingly expensive to meet by the industrial sector.

While there are basis for tightening environmental control on industries especially those belonging to the category of small and medium industries (SMIs) which include electroplating industries, it has been recognized that there are some difficulties currently faced by the SMIs such as those lacking in space for the purpose of installing on-site pollution control and treatment systems. The use of cleaner production techniques will be more acceptable if it can obviate the use of expensive pollution control equipment or end-of-pipe treatment system or at least it can reduce the size and cost of the treatment systems.

In general, in spite of the attractiveness of cleaner production options, there still other difficulties in introducing the cleaner production concept to industries at large. Firstly, the industrial establishments may not be aware of the potential of adopting preventive measures for reducing losses such as in reducing process inputs and/or reutilization of non-product outputs for other beneficial uses.

Secondly, they may not have information about the availability of techniques or technologies appropriate for their specific cases.

Thirdly, they tend to overlook the environmental and financial benefits of cleaner production or else they do not have the interest or do not think those cleaner technologies or techniques are appropriate for their situation.

Experiences with implementing cleaner production initiatives showed many improvements can be made in industrial processes at lower costs and simultaneously increase the profitability of the production process.

Several companies who have adopted cleaner production technologies managed to reduce waste management cost, cost of raw materials including energy, enhanced productivity and product quality, not to mention the benefits in terms of improvement in the working environment and public image, as well as in reducing their potential violation of the environmental legislation.

It has been demonstrated that companies such as electroplating plants using cleaner production techniques are able to save up to 80% of their water consumption thus effectively reduced the amount of hazardous chemicals used. The recoveries for such investments were not more than two years.

To stay competitive, industries must continue to strive for better and better production processes that is most cost effective and meet the consumers' demand. There is an upward trend among the consumers to change for more products labelled as either green products or environment friendly. It is therefore inevitable that industrial society should keep pace with such development.

It remains however a challenge for cleaner production proponents as to finding means to pursue further improvements in the efficiency of industrial processes that will lead to waste reduction and/or redesigning of products, making them less polluting or easier to recycle or implementing steps that will constitute as some forms of in-plant control measures. The need to encourage cleaner production activities is particularly so amongst small and medium sized industries.

Conclusion

To deal with environmental problems associated with industrial development is to be less dependent on end-of-pipe treatment or abatement that is treating pollutants at the end of a process instead of preventing their occurrence. Cleaner production approaches encompass the concept of industrial production that minimizes all environmental impacts through careful management of resource use. It is a better approach to avoiding and minimizing environmental problems.

Cleaner production should be viewed as a welcome addition to the menu of options for pollution reduction from which the least-cost approach for a specific industry and a specific situation.

However, environmental regulation cannot be effective without enforcement. Polluters will not adopt costly cleaner production measures without facing a credible enforcement system that is linked to the threat of sufficiently high fines or closure. The effectiveness is linked to spot-checks and deterrent enforcement procedure.

Balancing the demands for economic growth and environmental protection needs has not always been easy for any responsible government. While it is the government crucial role to provide favourable environment that will encourage industrial production, it is also the responsibility of the industrial sectors to adopt technological innovations for environmental protection purposes. The industrial sector must continue to explore all possible options when determining the most feasible options or best practical means of improving their environmental performance.

PROMOTION OF CLEANER TECHNOLOGY IN THE MALAYSIAN INDUSTRY

(CLEANER TECHNOLOGY DEMONSTRATION PROJECT: ELECTROPLATING INDUSTRY)

By

Choong Kok Seng *6
Sadur Letrik Quality Sdn. Bhd., Klang, Selangor

COMPANY PROFILE:

Name : Kilang Sadur Letrik QUALITY Sdn. Bhd.

Location : Klang, Selangor

EQUIPMENT: by DANCED

- Ion exchanger comprising cation exchanger, anion exchanger, pumps, filters and PLC-control
- Ion exchanger comprising mixed bed exchanger, anion exchanger, pumps, filters and PLC-control
- Tanks for collecting waste fractions for internal reuse
- Pumps, instruments and piping used for establishing counter-current flow in the rinse cascades

By Kilang Sadur Letrik QUALITY Sdn. Bhd.

- Waste water treatment plant
- New barrel and rack line

PROJECT BRIEF DESCRIPTION

The new installation at Kilang Sadur Letrik QUALITY Sdn. Bhd. comprises two ion exchanger units. One system is installed at the cyanide zinc plating line, while the other is installed at the chromate line. The purpose of these units is to clean the final rinses, that is to keep them completely de-ionized.

Part of the de-ionized water is sent in counter-current flow with the product in process. The counter-current flow is balanced with the compensation for the evaporation from the various plating tanks.

The rinse water becomes more and more contaminated with chemicals extracted from a plating tank during the counter-current rinsing process. The concentrated rinse water can be regarded as diluted plating solution and is subsequently used for topping up the plating solution

*6 - Paper presented at the workshop on Cleaner Technology Cost saving and Pollution Prevention Strategies for the Electroplaters organised by SIRIM at Bluewave Hotel, Shah Alam on 25 July 2000

SADUR LETRIK QUALITY SDN. BHD.'s EXPERIENCE ON CLEANER PRODUCTION

Before having the cleaner technology, the operators were very busy in the waste water treatment. The company deal mainly with cyanide zinc plating. It treats 3 kinds of waste to the waste water treatment. The water flows at the rate of 3,000 liter/4hrs. The operators will have to remove the sludge every 2 hours. The amount of sludge for 8 hours is about to 200 kg.

After having the cleaner technology project, the chromic and cyanide discharge water had minimize to about 70%, not only that, the chemical usage also decrease to about an estimate of 60-70%. The sludge had been reduced to an estimate of 60% compared to previous. The output of sludge per day reduces as much as about 60kg. The output of water level is 250 liters for 10 hours. Operator need to remove the sludge from the filter-press only 2 times/day.

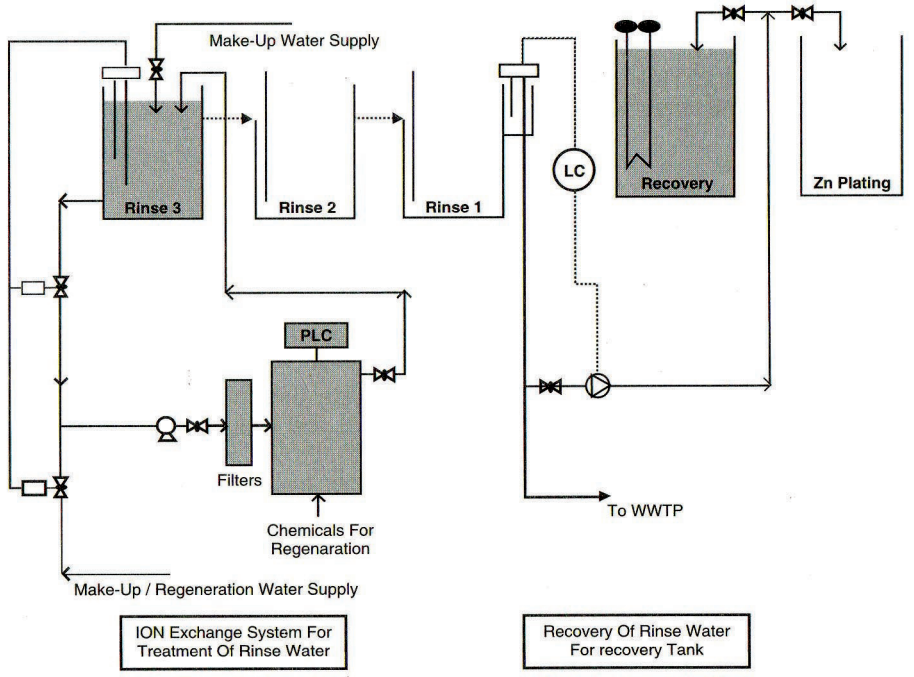
THE BENEFITS

The overall benefits of the Cleaner Technology option are to reduce the water consumption by 50-90% and to save chemicals especially for the system installed in the zinc plating line. The continuous wastewater stream from the zinc plating line will be eliminated. Wastewater is only produced during regeneration of the ion exchanger units. Regeneration is expected to take place once a week.

The investment involved in the Cleaner Technology project was RM 170,000. The estimated savings on water (RM 12,000), chemical and treatment (RM 120,000) and disposal and man power (RM 30,000) amounts to RM 162,000 per year. The simple pay-back period is slightly more than a year. The overall chemical savings and sludge disposal cost alone amounts to RM 8,000 per month.

The quality of the parts plated (screw, nuts, etc.) had perfectly improved due to the distilled water from the cleaner technology system.

Zinc Plating Counter-Current Rinsing With ION System At Kilang Sadur Letrik Quality Sdn. Bhd.



Cleaner Production Options