

United Nations Environment Programme Regional Activity Centre for Cleaner Production Mediterranean Action Plan

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CLEAN PRODUCTION, THE ALGERIAN EXPERIENCE

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I. INTRODUCTION

As part of a committed national policy for environmental protection, Algeria is very interested in the use of clean technologies to combat industrial pollution.

This concern is being dealt with through an Institution set up as part of the country's environment structures and within a Sub-department for major risks and clean technologies which has an office for clean technologies forming the NFP (National Focal Point) with the CP/RAC (Regional Activity Centre for Cleaner Production) and which has the aim of :

- undertaking activities which will encourage the use of the least polluting production techniques and the assessment of waste and industrial sub-products as well as the rational use of raw materials, water and energy;
- promoting activities and economic incentives which will encourage investment for the use of clean technologies;
- and ensuring, within the framework of regulations for environmental impact studies, that industrial operators always opt for technological processes which produce as little industrial waste as possible, particularly dangerous waste.

This year the NFP has launched a number of environmental audits in various industrial sectors (mechanical manufacturing of paint and cement). The application of the recommendations of these audits will lead to a substantial reduction in the pollution generated, notably by adopting less polluting procedures (closed circuits, saving resources of water, energy and raw materials).

II. THE ALGERIAN EXPERIENCE OF CLEAN PRODUCTION

In the current state of affairs, the introduction of clean production methods in the industrial sector requires the conversion of certain processes, the substitution of some products, the recovery of raw materials, recycling and setting up anti-pollution systems. These activities have been undertaken by some companies in order to satisfy environment protection regulations. However, some companies have not been able to actually start the required activities due to financial difficulties.

II.1 Chemical products industries:

Within the framework of an industrial pollution control project funded by the World Bank in north-eastern Algeria, two industrial sites, E.N.I.P and ASMIDAL, have been the subjects of environmental audits and technical-economic feasibility studies of the measures to be taken in order to reduce pollution.

The E.N.I.P (the National Company of Petrochemical Industries) petrochemical complex plastics production sited in Skikda currently generates 1,000 tonnes of mercury sludge from the chlorine-soda unit. The manufacture of chlorine and soda is done by means of mercury cathode electrolysis.

It has been recommended, based on economic and environmental studies, that the mercury process should be replaced by a process of ion exchange membranes which is a more modern system which would completely eliminate the discharge of mercury and would save energy. The conversion project, funded by the European Investment Bank, under the form of a loan, is currently being carried out.

The ASMIDAL (the National Company of Fertilizer and Plant Protection Products) phosphate and nitrate fertilizer production sited in Annaba, produces sulphuric and phosphoric acids through the phosphate fertilizer chain, expelling noxious gases (SOx) into the atmosphere, generated by the sulphuric acid and the fluorine from the phosphoric acid unit, which also spews out acid phosphogypsum into the sea.

Steps have also been taken to study the possibility of replacing sulphuric and phosphoric acids manufacturing processes with other methods which pollute less.

On the basis of technical-economic studies these actions have led to the closure of the phosphate fertilizer chain and the importation of sulphuric and phosphoric acids in order to finally end this environmental pollution.

II.2 Surface coatings and treatments

The industrial vehicles complex of the S.N.V.I (the National Company of Industrial Vehicles) sited in Rouiba, near to Algiers, generated a large amount of cyanide waste produced by the surface coatings and treatments unit when producing mechanical parts. In 1990 the site began to replace the cyanide salts with neutral salts.

This initiative was extended to the Tiemcen telephone complex, Sidi Bel-Abbes agricultural materials, Tizi-Ouzou electrical appliances and the El-Euima meters unit.

II.3 Paper and pulp manufacturing

The two CELPAP (National Company of Cellulose and Paper) sites in the Mostaganem and Baba-Ali regions consume a large amount of water and discharge a large amount of liquid waste with a high content of organic matter and particles in suspension.

A project for the recovery of fibres and recycling the water has been accepted and funded within the framework of the METAP programme.

II.4 Leather and other tanning industries

Almost every phase of the leather production process at the E.N.I.P.E.C (the National Company of Leather Industries) in Jijel is aqueous. The pollution caused by the tanning process is characterized by a large volume of wastewater with chrome and sulphide.

A system has been put in place in the water treatment unit to recover the chrome from the wastewater from the tanning process. The chrome which precipitates with the residual sludge, dissolves again into sulphuric acid. Once the chrome has been recovered it will be mixed in different proportions with the raw chrome for use in the manufacturing cycle.

II.5 Energy production and its use in the transport sector

The development of liquefied petrol gasoline (L.P.G) as fuel for motor car engines fits into the framework of national policy for the rational use of available sources of energy. So, a draft law on the use of energy is being developed. This project, apart from saving energy and promoting renewable energies, takes into account environmental aspects linked to this sector.

The introduction of L.P.G fuel responds to many objectives, notably reducing motor car pollution, considering that these fuels are not very polluting (no lead or sulphur).

II.6 Industries using CFC's

Concerning protecting the ozone layer, Algeria has started several projects for converting production lines which use substances which deplete the ozone layer, in various industrial sectors (aerosols, cooling and air conditioning, foams and solvents):

The ENEIM (the National Company for Electrical Appliances) electrical appliances sited in Tiz-Ouzo has this year brought out the first refrigerator without CFC's into the market.

The ASMIDAL state company insecticide unit has eliminated a significant quantity of ozone depleting substances by converting a production line with an investment programme entirely funded with its clean funds.

II.7 Mechanical industries

The initiatives of a small local company concerning the adoption of technologies which are more respectful to the environment have materialized through the development of a high pressure hydraulic pump manufactured by recycling industrial waste (steel and aluminium).

The new design of the pump permits working in a closed circuit; the lubricating oil does not need replacing and there is also a possible reduction in energy consumption. This invention has been patented.

II.8 The agro-food industry

The E.N.C.G (the National Company of Glyceride) refined oil production unit, sited in Annaba is in a very advanced state of dilapidation (countless water, steam and oil leakages from pipes) and furthermore its liquid effluents come out untreated.

With the aim of reducing pollution and improving production, a project for constructing a new refinery using less polluting production technology and an effluent treatment plant is under way.

II.9 Cement factories

The E.R.C.C (the Regional Company for Central Cements) has unblocked a budget of 250 million dinars to start the reform of its units in order to put in anti-pollution equipment.

The Raïs-Hamidou cement manufacturing unit in Algiers which expels enormous quantities of fine grains of cement into the atmosphere (an estimated 10% of production) in 1997 installed two electro-filters with approximately 90% dust retention capacity thus reducing the atmospheric dust emissions from both furnaces.

A study has been made about the possible substitution of asbestos with another less dangerous material based on polyvinyl alcohol for the C.R.C.E (the Regional Company of Eastern Cement) cement-asbestos unit in Bordj-Bou Arrendj.

III. CONCLUSION

In Algeria schemes within the industrial sector to adopt clean production methods often consist of specific measures carried out during the manufacturing process, such as replacing products, recycling, waste treatment and assessment. Clean processes have not been adopted everywhere yet, but these measures do reflect the concern for the environment which is being kept under control by ever stricter regulations.

However, installing clean technologies to ensuring durable development is often difficult to achieve because of the economic crisis that most industrial companies suffer. Apart from these very real constraints there is not an abundance of skilled advice.

The CP/RAC network is an interesting framework for the NFP in the promotion and support of research and development programmes for adopting clean production techniques nationally and in terms of technical assistance and specialized training.

The network will also allow the NFP to inquire, via information exchange facilities, about experiences in other countries on the Mediterranean coastline with processes currently in use.

CLEANER PRODUCTION IN CROATIA

Marijan Host, Senior Advisor, Hazardous Waste Management Agency (APO)

BASIC FACTS

Croatia, as a part of former Yugoslavia, proclaimed its independence in 1991. Now the Republic of Croatia is parliamentary, democratic country. It includes three mayor physical-geographical regions: Pannonian basin, Dinaric Alps and Adriatic coast of about 5800 km length. There are about five million inhabitants with an average population density of 80 inhabitants per square kilometre. During the period of 1991-1994, Croatia had been faced with the war aggression. Currently, it is experiencing significant political and economic changes following the fall of the socialistic political and economic system.

ECONOMY

Croatian economy is recovering from the war and at the same time it is in transition to the market economy. The main agenda of industrial policy is restructuring to overcome the accumulated structural problems of socialistic economy as: overcapacity in industry, protection and support of inefficient state enterprises, as well as lack of encouragement and inadequate incentives for private sector. As a result of such circumstances was dramatically fall in GDP (25%) and industrial production (50%) from 1990 to 1993. From 1993 the economy is slightly recovering. Many economic and social problems still present have pushed environmental issues down on the list of priorities.

The privatization process is a critical component of economic transition; till 1996 about 50% of companies (mainly SME) were privatized. Where the transformation has been successfully completed and market principles has been allowed to operate, labour productivity and overall efficiency have increased and there have been investment in new technologies and new jobs created.

The primary economic activity is industry (44% of GDP), followed by agriculture, forestry and tourism. The most important industries are: metal finishing and machine industry, shipbuilding, chemical/pharmaceutical industry, food, textile and wood industry.

WASTE AND WASTE MANAGEMENT

There are no exact data on quantity of waste, but it is estimated that out of 6.700.000 t/y of total waste, 300-350.000 t/y belongs to category of hazardous waste, according to classification proposed by Basel convention.

Since independent, Croatia has developed institutional and regulatory prerequisites to build up a coherent system for waste management (see Table 1.). On the other hand there is a big lack of expertise and facilities for waste treatment, so hazardous waste management does not work as a system.

The quantity of the waste produced yearly and accumulated untreated waste produced in the past call for emergency. Main problems to be solved are:

- contaminated sites
- 700 waste dumps without license
- stocks of old waste stored in companies
- lack of facilities for waste treatment

CLEANER PRODUCTION

Cleaner production activities started in Croatia recently, in June 1996. Current economic and environmental situation has recognized by APO-Hazardous Waste Management Agency as a right climate and a right time for cleaner production. For Croatia small and poor country CP is an option with no alternative to achieve reduction of environmental risks and for restructuring and developing of the industry on a sustainable way.

After extensive research of cleaner production experience in other countries, Agency initiated the project to pursue CP and with stakeholders have organized national Roundtable on CP in June 1996. The initiative was supported by Ministry of Economy and State Directorate for Environment. There were 47 participants from various sectors: industry, ministries and other governmental organizations, science and education institution, agencies and NGOs.

Participants of the Roundtable adopted the *Declaration of Cleaner Production* in which they stated their pledge to consider cleaner production as basic industrial strategy in the common strife for sustainable development. The Declaration is also calling for launching national CP Programme. Because of lack of experience international assistance is needed to help start this Programme and the Croatian government has applied to UNIDO for assistance.

The Czech Cleaner Production Center has been appointed by UNIDO as a counterpart organization to the project. The Czech CPC is considered to be one of the most advanced centres within the international NCPC network. The CPC capacity building program is widely regarded as very successful and UNIDO is planing to transfer this experience to the whole network.

The project will focus on building basic capacities in CP through "train-the trainer" approach, where graduates from training programme under this assistance project will become domestic trainers and consultants who are expected to conduct on-the-job training and operate demonstration projects.

The important strategy for the project is to involve Croatian professionals from the very beginning, so that they will be able in continue in those activities on their own, after the external assistance is over.

The project will be implemented within the UNIDO/UNEP programme for establishing national CP centres and will be financed within the Multilateral Development Assistance Programme of the Czech Republic.

In March 1997, UNIDO undertook the on-site fact finding tour with scope to evaluate CP potential in Croatia and to identify and contract Croatian counterpart organization.

The general conclusions of the mission are:

- Project is need driver and there is high commitment among Croatian CP stakeholders to cooperate on implementation of the Project.
- It has been recommended by visited partners that a focal point for on site coordination of the Project will be APO.
- CP potential within Croatian industry is high, because end of pipe technologies are not implemented on a broader scale yet.
- Crucial task for Project success will be selection of the right enterprises for the first long-term training and demonstration projects.
- The next step is to organise one-day marketing seminar on the Project for industry and other CP stakeholders in May. Preparation of the seminar will start as soon as the project document is signed.

According to the project time schedule in June it will be organized introductory promotional and marketing seminar following by long-term interactive training in autumn this year.

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Table n 1

INSTITUTIONAL & LEGISLATIVE FRAMEWORK		
	1991	- Parliament Committee for Environmental Protection - Ministry of planning, housing & environmental protection
	1992	- Barcelona Convention - Parliament Declaration on Environmental Protection
	1993	- Montreal Protocol
	1994	- Basel Convention - Law on Environmental Protection - State Directorate for the Environment
	1995	- Law on Water - Law on Waste
	1996	- Codes of Practice: . Inventory of Emission . Types of Waste
	pending	- E.I.A. - Waste Management Strategy

CLEANER PRODUCTION IN CYPRUS

Costas Papastavros, Environment Officer, Environment Service

This report on cleaner production refers to Small and Medium Enterprises (SME's). They are not producers of technology or raw materials. Therefore they cannot impose their purchasing terms relating to "environmentally friendly" materials.

They don't have the commercial leverage.

The need to adapt existing knowledge and technology to SME's has been recognised by the Government and Private engineering consultants who have taken the initiative to set up research laboratories with the aim to scale down and transfer the most appropriate technology under local conditions. It is envisaged that in a few years Cyprus will indeed have environmental technology to export to other regions where SME's face similar problems.

The main industrial sectors of the country that cleaner production can be applied are the following:

- dye houses
- olive mills
- animal farms (waste management)
- foundries
- wineries
- crushing and asphalt plants
- cement factories
- mining activities

There is nowadays an increased interest on cleaner production. What we need urgently is the set up of appropriate demonstration units in order to convince conservative SME's owners. Para-governmental organisations, like the Cyprus Chamber of Commerce and Industry, and the Federation of Employers and Industrialists organise seminars on ISO 14000. Multinationals operating in Cyprus are already taking measures which are being used as references to convince local companies to follow a similar path.

A special programme funded by the European Union is near in completion and it involves complete survey and model studies with suggestions addressed towards specific industrial sectors, like wineries, foundries, etc.

Regarding the animal waste (slurries) a special project is underway.

In the very recent years many SME's of the country have put strong efforts to apply cleaner production. Some of these examples are the following:

- A cement factory is in search for alternative fuels.
- In a piggery farm, implementation of total environmental control is underway.
- A tobacco firm applies in integrated environmental policy
- A small rural dairy implements raw milk evaporation and utilises the same system to concentrate whey for use in whey product and animal feed. Other same industry will follow soon.

The National Focal Point for Cleaner Production in Cyprus is the Environment Service.

It consists of 9 people and it works together with local consultancy firms, and other governmental agencies with environmental responsibilities to disseminate information and recommend cleaner production technics and practices.

PERSPECTIVE ON CLEANER PRODUCTION IN EGYPT

Ahmed Hamza, Ph.D.Senior Technical Advisor, Egyptian Environmental Affairs Agency

INTRODUCTION

Recent economic and institutional changes have affected industrial development in Egypt. New industrial policy reform plan has been adopted within the a wider framework of a structural adjustment strategy (SAS) for the country. SAS has three main purposes: (a) to provide financial resources for coping with debt servicing and balance of payment of public sector industries, (b) to produce macroeconomics adjustment, by bringing demand on manufactured products into better balance with supply, in order to provide non-inflationary growth, and (c) to improve production performance through adoption of efficient and low-waste manufacturing technologies.

Within the framework of SAS, incentives are provided for entrepreneurs to invest in cleaner technologies and waste minimization, subsidies on production inputs are gradually removed, and ownership of public industries is being progressively transferred to the private sector. As a result of SAS, most industrial public enterprises were removed from the control of sector ministries, and were reorganized under financially autonomous holding companies.

GOVERNMENT-INDUSTRY INITIATIVES ON CLEANER PRODUCTION

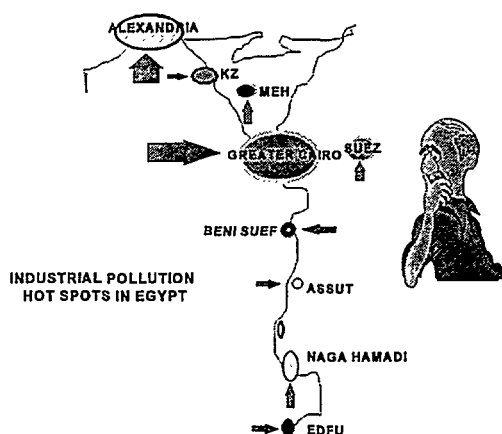
Cleaner production requires fundamental industrial restructuring, strong political commitment, and substantial financing. Within this context, industry is gradually introducing new capital-intensive low-waste technologies, while implementing in-house measures for pollution prevention and improved housekeeping.

The government on its part, has issued new regulations for control of industrial emissions to be enforced in February 1998. A system of economic incentives will be instituted to offer manufacturing facilities tax exemptions on investments in modern production systems and environmentally friendly practices.

Concomitantly, the Egyptian Environmental Affairs Agency EEAA has developed a long-term strategy to ensure environmental-soundness of industrial development in Egypt. The strategy components include: (a) developing master policies to promote the quality of the environment through implementing industry-specific programmes for abatement of pollution, (b) establishing regional and self-monitoring systems for industrial pollution, (c) requesting new industrial and trade activities to perform environmental impact assessment , and (d) providing financial assistance through international donors to enable major polluting industries to shift to cleaner production, and to improve utilization of production inputs.

The national industrial pollution prevention programme NIPPP sponsored by the EEAA is being financed by international donors for a total of \$ 55 million.

The NIPPP projects involves strengthening the institutional and technical capabilities of EEAA, sector ministries and local governments, establishing an pollution monitoring network, supporting NGOs, and conducting environmental audits in major polluting industries.



In addition, about \$ 105 million are allocated for financing pollution prevention and waste minimization projects to demonstrate the economic viability and environmental benefits of pollution control in the Egyptian industry. The financial packages offered to industry include both credit and grant components to encourage polluting enterprises to invest in pollution prevention. So far, the sugar refining, Aluminum smelting and chlorine alkali industries have invested over \$ 150 million dollars in pollution prevention and process modernization projects.

INTERNATIONAL COOPERATION FOR ABATEMENT OF INDUSTRIAL POLLUTION

The Egyptian Pollution Abatement Project (EPAP) of the World Bank aims to assist in reducing industrial pollution and hence minimize the health risks and environmental degradation emanating from major polluting enterprises in Egypt. The project also aims to strengthen the monitoring and enforcement systems of the environmental institutions in the country, and to establish technical and financial mechanisms for supporting pollution abatement investments in both the public and private sector industries. The pollution abatement fund PAF will provide financing for 25 sub-projects in the metal, paper, textiles, fertilizers, and chemical industries for a total of US\$ 39 million. The sub-projects include investments in waste minimization, pollution prevention, resource recovery, adoption of cleaner technology, and end-of-pipe treatment, as a last option. The project will extent over a period of six years starting October 1997.

The German Bank for Development (KfW) has established a facility for financing environmental protection projects in the public sector industries. The facility in its start-up phase will invest DM 56 million to finance wastewater treatment and/or cleaner production in four industrial sectors (chemical, food, pharmaceuticals and engineering). Investment projects will focus on rehabilitation or modernization of existing wastewater treatment facilities, or installation of new facilities where needed. Part of the investments will be allocated for adaptation of modern manufacturing technology which would bring substantial environmental improvements.

USAID has launched an Environmental Pollution Prevention Project EP3 in September 1994. The project aims to improve pollution prevention practices and technologies in the private and public sector industries. About 25 industrial audits have been completed with additional 20 audits to be implemented in the 10th of Ramadan industrial city during the coming two years.

The UK Overseas Development Organization (ODA) has launched an industrial auditing program involving 36 enterprises in the textile and food sectors with the objective of identifying opportunities to reduce wastes, minimize pollution and improve operational efficiency; the project will fund limited demonstration projects with emphasis on low-cost solutions in the public and private sector companies. Japan International Cooperation Agency (JICA) will implement pollution abatement projects in five major polluting industrial facilities, where liquid effluents are discharged in the Nile causing severe water pollution problems. FINNIDA is providing support for the institutional and technical components of EPAP. DANIDA is providing technical and financial support to environmental projects in KIMA fertilizers plant in Aswan. METAP has provided support for Cairo's industrial effluent control program including auditing of the industrial complex in Shoubra El Kheima.

CLEANER PRODUCTION IN EGYPT: SELECTED EXAMPLES

Chlorine alkali Production

Misr Chemical Industries MCI, produces chlorine (49000 t/y) and caustic soda (56000 t/y) using a polluting mercury-cell technology. A recent survey has indicated severe contamination with liquid effluents and sediments containing mercury up to 7500 and 2900 ug/l, respectively. Contamination of the walls, ceilings, and floors of the Cell Houses reached mercury levels of up to 12 g/kg.

In view of the serious health and environmental risks of this old technology, MCI has commissioned a total rehabilitation project in October 1996. The project which costs US\$ 80 million involves replacing the hazardous mercury process by a mercury-free membrane cells. The contaminated derbies, equipment, and top soil is being buried in a restricted landfill in a remote desert location. The landfill contains an impermeable base and cover comprised of two layers of asphalt, concrete and a layer of sulfur to act as a mercury immobilization barrier. The clean-up project costs US\$ 12 million.

Dyes and Organic Chemicals

The Dyes and Chemicals Company ISMADYES produces a wide range of dyes, auxiliaries and textile intermediates. Dyes produced constitute mainly Azo dyes, Naphthol dyes, Acid dyes, Sulfur dyes, and Aniline-black. ISMADYES is a major polluter which discharge about 5 million m³/y of toxic effluents in the Mediterranean. A project will be implemented in 1997 for recovery and recycling of 800 t/y spent acids, and for replacing production of toxic and harmful dyes and chemicals with safer substitutes. In addition, an environmental improvement program has been initiated to strengthen workers awareness, upgrade material handling and inventory practices, employ practical waste minimization measures, and improve existing end-of-pipe waste treatment system.

Leather Tanning

Chrome tanning is common in most Egyptian tanneries. The tanning process contributes substantially to the waste load and represents the major source of heavy metals in the discharged effluent. As much as 2 kg of chromium may be discharged in one cubic meter of wastewater from a single hide processor. El-Nasr Tanning Company NTC liquid discharges to the Mediterranean amounts to 250000 m³ which contain up to 16 tons chromium salts.

An industrial-scale unit for chromium recovery is presently in operation at NTC. The unit consists of thickening the spent liquor, vacuum filtration and drying. The recovered salt is mixed with freshly prepared chromium salt solution to enhance the absorption capacity of the tanned hides. The recovered water is partially used for make-up water in the tanning process. The recovered chromium salt is estimated at 13-15 t/y which accounts for about LE 40000 savings in chromium costs.

Pulp and Paper

The pulp and paper industry in Egypt relies on agricultural residues as the source of raw material; rice straw and bagasse represent over 90% of the fibers used in pulping. The General Company for Paper Industry RAKTA is probably the world's largest rice straw pulp mill. Using rice straw relies on a primitive technology for pulping the residues compared to the new and sophisticated developments in pulping wood. The black liquor, containing about one half by weight of the straw quantity and all of the cooking chemicals is presently dumped in the Mediterranean.

Despite RAKTA concerted efforts, previous attempts for caustic recovery were failed due to increased scaling in the primary evaporation of black liquor, high viscosity of the concentrated black liquor; increased amount of sludge at the recausticizing stage; and inferior quality of burned lime. A new desilication technology has been developed. The process consists of flash evaporation, carbon dioxide generation, reaction, and sludge separation. Desilication of over 90 percent and caustic loss of about 1 percent were achieved in bench-scale trials. A pilot investigation has confirmed the techno-economic feasibility of caustic recovery from the straw-based black liquor using the new desilication technology.

The white water from paper making is recycled in RAKTA for processes such as pulping and dilution of stocks. To achieve full recycling, shower applications of the clarified water is being examined. The average recovery of fibers and water are 30 t/d and 18500 m³/d respectively. However, closing the water cycle may result in increased temperature and gradual build-up of suspended solids that can lead to plugging and reduction in life of felt wires and shower nozzles. The dissolved solids accumulate odours, colours, slimes and foams and could lead to corrosion and scaling of the process equipment. An investigation is underway to optimize the operating conditions of the saveall system at RAKTA. Introducing new cleaner production in RAKTA requires an investment of US\$ 70 million.

Aluminum Smelting

Misr Aluminum Company MAC in upper Egypt, is presently using wet scrubbing system for recovery of $\text{Na}_3 \text{Al F}_6$ which has a limited use in the smelting process. To avoid use of expensive chemicals (Soda ash and Caustic soda) and to improve fluoride recovery, MAC is investing LE 100 million in a new dry scrubbing system due for commissioning in 1997. The system will enable recovery of Al F_3 for use in MAC and other industries in Egypt. The high recovery efficiency (> 99 percent) will alleviate existing air pollution problems.

Cement Industry

The production capacity of the 8 cement plants in Egypt amounts to 17 Mt/y. A major part of the production relies on the polluting and expensive wet process instead of the dry one.

The energy input and NO_x emissions of the wet process are roughly twice that of the dry process. Based on a conservative figure of 3 percent particulate emission, the amount of the fugitive dust may reach 600000 t/y. The pollution problem is attributed to absence of emission control systems in the old plants and inadequate operation of electrostatic precipitators in the new ones. In 1995, an annual surcharge of \$ 1.5 /ton of cement sold was imposed. The fund has generated on the sale price \$ 23 million so far, which is being used to finance emission control projects in the cement plants.

Food Processing

Dairy processing generates heavy loads of polluted effluents which contain dilutions of whole milk, separated milk, whey and sanitisers used in the Clean-In-Place (CIP) system.. White cheese processing consists of mixing skimmed and dry milk, heating, addition of salts and rennet; the mixture is left for separation. The separated whey is commonly discharged to the sewerage without pretreatment, thereby increasing production losses and aggravating pollution problems. The dried whey can be blended with basic food materials to produce less expensive foods such as fruit sherbets, custards and bakery goods. Reverse osmosis has been applied on a limited scale in Some dairy plants in Egypt to produce a protein supplement and recyclable water; the technical and economic aspects of full-scale application of this advanced treatment remain to be evaluated.

Wastewater in starch processing originates mainly from the stepping process in which clean, broken, rice seeds are macerated in caustic soda for dissolution of proteinaceous matter; protein recovery from starch wastes is being practised by multi-stage evaporation and the recovered protein is utilized as a basic ingredient in animal feed production. A novel system is currently under investigation for successive acidification and neutralization of starch wastes to remove suspended solids and soluble organics prior to activated sludge treatment. The recovered sludge is dried for subsequent use as animal feed.

Processing of fruits and vegetables in Egypt generates large amounts of wastes in the range of 25-50 percent of the raw materials; they include spoiled raw materials, peels, pith and trimmed parts. Solid waste generated from the canning industry is occasionally sold as animal feed. However, the lack of an organized collection and proper storage systems, result in residue putrefaction. This often renders the accumulated residues unsuitable for feeding formulae.

A continuous-flow unit has been designed for the treatment of oil wastes using a system comprising diffused air flotation in a field demonstration project. Removal of oil and suspended residues was effectively accomplished by air flotation in conjunction with chemical coagulation. The recovered oil is successfully used for the production of low -quality soaps. Diatomaceous earth is widely used as a filter aid in food processing and as a bleaching agent in oil refining. Considerable amounts of spent clay are presently discarded, which pose serious environmental problem. Residual oil in the spent clay may reach 40 percent. A field demonstration project for reactivation of spent clay demonstrated that caustic treatment can recover over 70 percent of the entrained oil, while solvent extraction is capable of recovering about 90 percent of the lost oil. The remaining clay can then be burned under controlled condition to produce reactivated clay with more or less similar bleaching power to that of the imported clays. Application of this technique in a centralized unit would be cost-effective because of the high demand for the recovered oil and the regenerated clays. Regeneration will also alleviate the disposal problems of the spent clay.

Service Industry

Service industries represent a fast growing business in Egypt. They usually provide specialized services or lease products rather than selling them. They are therefore, responsible for taking products after use for reconditioning before being offered for reuse. As such they contribute to the extension of products' life cycle. Service industries such as auto repair and maintenance of house hold appliances, can extend the serviceable life of capital goods far beyond their designed useful-life. Product-life extension is a strategy widely adopted by the service-oriented economy of Egypt; the focus in this case is directed to developing skills for provision of services rather than promoting manufacture and sale of new products. In essence, service industries is serving the same purpose of the cleaner production which aim to conserve resources and increase products' useful life .

THE MOVE TO CLEANER PRODUCTION IN ISRAEL

Romy Even-Danan, Ministry of the Environment, State of Israel

Israel is one of the world's most densely populated countries. About 630 people per square kilometer are crowded in the area north of Beersheba and the forecast is for over 800 people per square kilometer by the year 2020.

As the availability of new landfill sites diminishes (because of few land resources, hydrological sensitivity and citizen opposition) and existing landfills reach full capacity, Israel is undertaking new steps to minimize waste generation at source, increase recycling and encourage waste to energy options.

To facilitate these developments, Israel is increasing its efforts to promote recycling by every possible means - research, legislation, pilot projects.

The Israeli government has decided that the solution for the country's solid waste problem is integrated waste management. This includes the adoption of several technologies according to the following descending order: priority minimization at source, reuse, recycling, waste to energy and landfilling.

Following are some examples of Israel's move toward clean production. These examples relate to adoption of a "Green Label" and ISO 14000, water technologies and solar energy.

"GREEN LABEL" - THE ISRAELI ECO-LABELLING

With the advent of Eco-Labeling in Israel, individuals will have the chance to opt for cleaner and safer environmentally-friendly products.

In 1993, criteria for Eco-Labeling were defined and a symbol designed, setting the way for manufacturers and importers to apply to the joint committee of the Ministry of the Environment and the Standards Institute of Israel for permission to mark the Eco-Label to their product.

Israel's "Green Label" takes into consideration the product's environmental impact at each stage of its life cycle (pre-production, production, packaging and distribution, use and disposal).

Criteria for granting the "Green Label" include the evaluation of a product's impact on waste, soil pollution, noise, energy consumption, natural resources and other factors.

The new standard will provide uniform, recognized criteria for environmental labelling which will replace the multitude of environmental claims currently being made by manufacturers regarding their products. The provision of accurate and reliable information on the environment effects of certain products will increase consumer awareness, change consumer behaviour, lead manufacturers to develop environmentally friendly products and improve the environment. The environmental label is conceived as a market-oriented instrument of environmental policy which will provide a competitive edge to environmentally friendly products relative to other products in the same category.

Standards for environmentally friendly products have been published by the Standards Institute of Israel:

- IS 1738 - General guidelines for the assessment of products with reduced environmental impact (Green Label).
- IS 1611 - Hygienic paper with reduced environmental impact (toilet paper, paper napkins and towels, tissues, etc.)
- IS1899 - Paper products for writing and printing with reduced environmental impact (notebooks, printing paper, envelopes, computer paper, etc.).
- IS 1576 - Paper and cardboard products for packaging with reduced environmental impact.
- IS 1937 - Water based paints with reduced environmental impact.
- IS 1621 - Mineral based lubricants with reduced environmental impact.
- IS 990 - *Primary batteries: general requirement with reduced environmental impact*
- IS 1999 - Polyethylene bags with reduced environmental impacts.(Green Product).
- IS 4163 - Product made from recycling plastic with reduced environmental impact.
- IS 268 - Autoclave aerated concrete block.
- Standards test methods for solid waste with reduced environmental impact.
- Standards test methods for air quality with reduced environmental impact.
- Standards test methods for water quality with reduced environmental impact.

Other standards, in advance stages of preparation, include:

- IS 2300 - Rules for recycling of plastic used in the production of non pressure pipes: Polyethylene.
- IS 1983 - Triple layer irrigation pipes of virgin polyethylene and recycled polyethylene.
- Standards for compost with reduced environmental impact.
- Standards determination of smoke emission from solid fuels for domestic use.

The "Green Label" management approve granting the label to 56 products:

- 4 Recycling hygienic paper products.
- 8 Remanufactured toner cartridges.
- 18 Water based paints with reduced environmental impacts.
- 6 Green batteries.
- Renewed air filter.
- Autoclaved aerated concrete block.
- 3 Products of closed cycle vapour turbogenerator and industrial air cooled heat exchangers.
- Green combustion delaying product.
- Green lipids removed product.
- Green bulb adapter (reduce energy).
- 3 Ecological detergents.
- Organic cotton socks.

The "Green Label" is in the process of being issued to 4 products in the following fields:

- Renewed oil filter
- Green block
- Acoustical wall
- Paint remover

ISO 14000

ISO 14000 Environmental Management System is a series of voluntary guidelines, rules and regulations on environmental management without any legal restrictions.

Israel is currently preparing to adopt ISO 14000.

One company, Israel Bromide Compounds Ltd, has already been granted certification.

Another 10 companies have registered for authorization and another 30-40 companies have expressed interest in adoption of the standard.

The Israeli Ministry of the Environment is currently reviewing various possibilities for providing incentives to those companies which will adopt the standard, that include:

- Easing the process for license renewal.
- Easing the process of reporting to various government agencies.
- Protection of information.

ENVIRONMENTAL TECHNOLOGIES

Increasing international concern over the state of the environment has influenced the demand for environmental technologies. Israel's scarcity of natural resources has led to the development of a number of technologies, particularly in the fields of water use and solar energy.

Some examples follows:

1. Water technologies

- Drip Irrigation

Israeli companies manufacture a number of sophisticated irrigation systems that deliver the minimum possible amount of water directly to the plant's roots.

These system have become a commercial success in many countries because of their efficiency in saving water.

- Desalination

Israeli manufactures are recognized as world leaders in a number of desalination methods. Sea water desalination plants constructed by Israeli companies represent over 20% of the world market outside the Middle East.

In addition, reverse osmosis desalination systems are used for a wide range of applications, including drinking water production, industrial feed and water process treatment.

- Waster treatment and reuse

Israel has developed technologies for the treatment of industrial and urban waste water and its reuse in agriculture. Utilization of these technologies in Israel is widespread.

Scientists at the Hebrew University's school of Agriculture have developed a method in which a common water fern is used to treat industrial wastewater: the dried fern absorbs over 90% of trace metals, including nickel, cadmium and chromium from industrial effluents.

The metal can be recovered from the biomass after drying and burning.

2. Solar Energy

Israel is perhaps best known for its solar energy technologies. It is the world's largest consumer of solar energy (relative to total energy consumption).

Roof top solar water heaters supply 3,2% of the country's energy and have also been exported in large quantity throughout the world.

Israel is the only major producer of solar - powered electricity generating stations. This technology involves large areas covered by dense rows of curved mirrors.

A number of stations have been sold abroad, and the technology has proven to be effective.

An Israel company has built an experimental five megawatt capacity solar pond generating station at the Dead Sea, taking advantage of the high density brine and the stable stratigraphy of the water column of the pool to accumulate heat for its low temperature turbine technology.

The Hebrew University's school of Agriculture has developed a method of soil sterilization by solar energy through use of plastic sheeting.

The promotion of cleaner production is a high priority for Israel's environmental field. We hope to enter the next century with greater public awareness and cooperation with industrialists.

With our expertise in technology and science, the Ministry of the Environment sees these goals as realistic.

CLEANER PRODUCTION ON LEBANON

Olfat Handam, Ministry of the Environment, Lebanese Republic

In Lebanon, the main source for the environmental chemical pollution is the industry.

23,517 industrial units are found in Lebanon, where 68% of them employ fewer than 5 workers, and fewer than 20% employ more than 20. In general, 91 units employ more than 100 persons, and only 41 employ more than 250.

The size distribution varies by sector, with nearly half of the largest enterprises concentrated in food processing and beverages, clothing and cement and associated building products.

The table below shows the number of units by employment.

The industrial units produce daily, tens of tons of industrial wastes; and over 500 of these units use toxic and hazardous raw materials.

The industrial sector is characterized by the following:

- More than one half of the industrial units, especially the largest ones, are unlicensed.
- Obsolete production infrastructure.
- Limited capacity of the government institutions to control the environmental quality standards and consequently control environmental pollution. Also, there is no capacity within the industries themselves for measurement and control for emissions; and the fact that the majority of enterprises are extremely small makes both implementation and enforcement extremely difficult.
- The Lebanese industry has developed some of its equipment's and technologies, without taking security procedures, control of and cease of pollution.
- The lack of environmentally accepted processes, needed to treat wastes.
- The disposal of industrial water used by enterprises in the environment, without any treatment.
- Disposal of liquid and solid wastes in the sea, rivers, non septic tanks without any treatment.

From all of the above, we can say that the industrial sector is in a poor shape, and has a negative impact on the environmental conditions.

In order to solve the pollution problems, the MoE, with the aid of other institutions, is trying to monitor existing known pollution problems and help industry adopt pollution control technologies.

THE INDUSTRIAL SECTOR

The existing industrial sector in Lebanon is marked with a large number of transforming industries mainly concerned with food processing and beverages, textiles, wood and metal products.

These industrial establishments are scattered all over the country with the largest share being located in Mount Lebanon.

Large scale industries which are known for their large work force or extensive production, comprise the Sidem plant in Mount Lebanon for aluminum casting and fabrication, the cement plants in Chekka and Sibline, the fertilizers factory in Selaata(North Lebanon) and the sugar refinery in Bekaa.

In general, most of the manufactured goods produced by the small and large establishments are destined for the local market.

The key characteristics of each of the industrial sectors are listed as follows:

- Food products and Beverages: This activity concerns the production of foodstuff including the canning industry of vegetables and fruit preserves, confection of fruits, marmalade and syrups, dairy products, wine making, oil extraction, spirits distilleries, and production of some packaged snacks.

Almost all of the products of this category are destined for the domestic markets as exportation is limited to canned food only.

- Metal products and equipment: This type of industry covers a wide range of products such as construction materials including steel scaffolding, aluminum sheets and sections, plumbing accessories, and cast iron appurtenances for infrastructure and ornamental works, and also the transformation of previously manufactured materials such as steel sheets and sections for chassis, copper and brass sheets for decoration objects and the fabrication of tools and equipment destined mainly for construction.

- Furniture and other Related goods: This type of existing industry concerns only the fabrication of households and office goods from wood and metal. The finishing of such equipment requires the use of chemical products.

Most of these goods are intended for the local market.

- Clothing and Garments: This industry is quite active in Lebanon and includes the making of cloth from imported fabric materials and the production of ready- made clothes and garments.

This activity plays an important role in the trade business as a considerable percentage of its products is destined for foreign markets.

- **Non-Metal Products:** This type of industry includes the construction of materials and household consumable goods. The former covers the production of asbestos cement and concrete pipes and sheets, concrete blocks, ceramic tiles, marble products, white and Portland cement, aggregates and sand extraction.

All of these activities play an important role in the national economic cycle as they are directly related to the present reconstruction programs. The second component of this industry concerns the manufacturing of household goods, such as glass products. These products are mainly destined for the local market.

- **Wood products:** This activity concerns the processing of imported wood materials to be used for the local market and for manufacturing furniture and other household items. It also covers the production of construction materials as formwork, frames, doors and boxes as well as the braiding and plaiting of wood derivatives.

- **Tanneries:** Leather tanneries and leather treatment facilities are mainly located in Greater Beirut, Saida, Zahleh and Machgara. Finished products are used to manufacture bags and cases, leather tools and shoes which are mainly destined for the local market.

- **Paper and printing:** This industry presents an important component in the national economy as it comprises a wide range of goods covering processed paper and cardboard products and printed materials destined for the local and foreign market as well. The industrial establishments are mainly located at Nahr Ibrahim and Zahleh.

- **Textiles:** This industry mainly concerns the dying and bleaching of yarn materials to be used in making clothes. Raw materials are mainly imported and manufactured products are marketed locally.

- **Plastics and Chemical Products:** This industry is of the transforming type that re- formulate or re-pack imported materials for domestic use. Manufactured products consist of detergents, soaps, eau de toilette, perfumes, paints, varnishes, synthetic coating materials, pharmaceuticals, and plastics.

The distribution of industry by type and Mohafaza is shown in the table below:

Mohafasa

Sector	Beirut	Mount Lebanon	North Lebanon	Bekaa	South Lebanon	Nabatiyeh
Food processing	655	1,877	929	535	548	294
Textiles, Garments	786	1,716	598	428	220	86
Wood Products	115	535	332	150	288	106
Paper and Printing	189	381	40	23	24	16
Chemicals and Plastic	64	463	85	39	21	16
Non Metal Minerals	45	686	545	381	181	210
Primary metals	37	156	42	12	13	4
Metal products/ equipment	298	2,047	785	413	475	315
Leather/Leather Products	99	613	77	23	32	49
Other manufactured goods	394	1,842	1,124	226	178	87
Construction work/others	167	216	28	30	74	54
Total	2,849	10,532	4,585	2,260	2,054	1,237

-----Source: Ministry of Industry and Petroleum, 1994

CLEANER PRODUCTION IN MALTA

Anton Pizzuto, Director Cleaner Technology Centre, Malta

INTRODUCTION

Cleaner production is still a very new concept for the local industrial sector. The emphasis up till now has been on achieving rapid economic growth sometimes at the expense of the environment. It is only in the last few years and not in every sector that environmental considerations have been taken into account when planning for industrial development.

In fact, in the manufacturing sector only those companies with trans-national connections practice any form of cleaner production techniques. In most cases this is imposed by Corporate Headquarters.

Local micro-industries make up about 78% of the total number of industries. Here, traditional, somewhat polluting activities are still carried out. The metal finishing industry is one of the main culprits, as regards to hazardous effluents. With regard to bulky (although mostly inert) waste production, the quarrying and construction industry is the main offender.

Experiences have almost exclusively been connected with fuel and water consumption savings. There have been the odd cases where adjustments to production processes have resulted in lower raw material consumption being achieved, but it is not the rule.

At least one company has also replaced solvent based inks with other more environmentally friendly bases.

Redesigning in some industries have also resulted in reduction of packaging material.

The elimination of the use of CFCs in the majority of industrial applications has also been achieved.

The main industrial sectors in Malta can be divided into two

A) SERVICES ACTIVITIES

- i) **TOURISM** - This sector employs approximately 6% of the total labour supply. With arrivals approximating 1.1 million the loading on the Island's infrastructure is considerable (the area of Malta is 316 m²).
- ii) **SHIP REPAIRING** - An important foreign exchange earner and representing approximately 3.8% of total labour supply. The variety of activities taking place in this sector have a high pollution potential.
- iii) **FREEPORT AND TRANSHIPMENT OF GOODS**

B) PRODUCTIVE ACTIVITIES

- i) **MANUFACTURING** - Out of approximately a total of 3,000 industries, 57% is manufacturing.
- ii) **AGRICULTURE & FISHERIES** - Agriculture plays a modest role as only 12,000 hectares are cultivated but the use of pesticides and fertilizers is not inconsiderate. The fisheries activities are expanding rapidly in the aqua-culture sector with the connected environmental loading potential.
- iii) **QUARRYING AND CONSTRUCTION** - The rapid land development taking place necessitates a closer look at this sector as it produces approximately 2.1×10^6 tonnes per year of waste creating a serious landfilling problem.

INTEREST IN CLEAN PRODUCTION

Although from various surveys carried out among small sections of industry, interest in cleaner production is high, implementation is rather slow for a variety of reasons.

Among the reasons for lack of implementation are:-

- i) Lack of expertise.
- ii) The belief that CP programmes require significant capital investment.
- iii) Perception that pollution prevention expenditure does not bring economic benefits.
- iv) Lack of government clear environmental programme targets.
- v) Lack of institutional support.
- vi) Too much emphasis on production.
- vii) Technological limitations.
- viii) Lack of financial support.

CLEANER TECHNOLOGY CENTRE - MALTA

Anton Pizzuto, Director Cleaner Technology Centre, Malta

1. INTRODUCTION

The following is a description of the Cleaner Technology Centre recently established by the Government of Malta. This brief report highlights the particular format which was chosen for this Centre, with the specific objective of making the best use of the limited intellectual and financial resources typically available within a small country. The aim is clearly to facilitate the emergence of joint initiatives between the Government, Industry and the University. It is felt that the 'formula' developed in Malta is likely to be of relevance to other small countries.

2. ORIGIN

In February 1993, the Environment Secretariat (Office of the Parliamentary Secretary for the Environment in the Ministry for the Environment) published a National (Solid) Waste Management Strategy at the conclusion of a 2 year study under the auspices of METAP.

This broad policy document emphasised the central importance of waste minimisation as an indispensable component of the overall strategy and it specifically advised the Government of Malta to set-up a Cleaner Technology Centre to help local industry to introduce cleaner production processes which favour waste minimisation.

3. TRI-PARTITE INITIATIVE

The Environment Protection Department immediately acted upon the recommendation described above and on the 4 November 1993 it entered into an agreement with the Department of Industry and Malta University Services Ltd to set up a Cleaner Technology Centre, to be based at the University of Malta.

The Cleaner Technology Centre is therefore a joint venture between:

- (a) The Environment Protection Department (Ministry for the Environment) who are the originators of the concept and the instigators of the initiative. To emphasise the environmental objectives of the Centre.
- (b) The Department of Industry. To highlight the relevance of clean technology to considerations relating to improved efficiency, industrial re-structuring and economic development.

- (c) Malta University Services Ltd which is a limited liability company set-up within the University of Malta to facilitate the interaction between the University, Government and the Private Sector through the successful exploitation of the considerable knowledge and expertise which exists within the University.

4. OBJECTIVES OF THE CENTRE

The objectives of the Cleaner Technology Centre were identified as follows:

- a. to encourage industry to apply the least polluting technologies;
- b. to transfer know-how to industry about the implementation of cleaner technology;
- c. to offer assistance with the analyses of existing systems to find feasible solutions with regard to pollution prevention;
- d. to become involved in any initiative likely to lead to cleaner technology being taken up by local industry;
- e. to pursue any other objectives which both parties may consent to include.

Some of the above points have been subsequently clarified and in part amplified further as follows:

Technology refers to the widest possible definition of this term, which is not concerned only with techniques of production but also with the appropriate management practices.

Industry does not relate only to manufacturing companies but to all sectors of economic activity. In fact, the search for cleaner technology must adopt an even wider horizon since one of the most relevant aspects is consumer preferences and behaviour. Public information, awareness building and education assumes central relevance in this respect.

Consideration needs to be given to all factors likely to bring about the introduction/ diffusion of cleaner technology. In this respect, the assessment of economic instruments for the achievement of environmental policy objectives is assuming an ever increasing relevance.

The prime role of the Cleaner Technology Centre should be one of instigator and coordinator. It should instigate new initiatives and facilitate and facilitate the co-ordination of the relevant joint effort towards their implementation, without however infringing upon the responsibilities of individual agencies (e.g. the Environment Protection Department or the Department of Industry).

5. MANAGEMENT BOARD

The Cleaner Technology Centre is physically based at the University of Malta. It is run by a full time co-ordinator under the direction of a Management Board chaired by the representative of the Environment Protection Department and made up of one representative from each of the other partners (i.e. the Dept of Industry and Malta University Services Ltd).

6. ADVISORY BOARD

To secure, as much as possible, a positive and proactive dialogue with the private sector and to ensure that the Centre effectively responds to the real problem facing the country - an Advisory Board has been set-up to define priorities and to provide the longer-term direction to the Management Board and hence to the Centre.

The advisory board is chaired by the representative of the Malta Federation of Industry and includes members from such institutions as the Malta Chamber of Commerce, Council for Science and Technology, Department of Manufacturing Engineering at the University and the Chamber of Professional Engineers.

7. ACTIVITIES IN MALTA

1994:

- | | |
|---------------|--|
| 19th May | - Official Launching of The CTC during the 2nd Malta Industry & Environment Conference under the specific heading "Cleaner Technology - A Good Business Proposition. |
| 15th July | - One day seminar on the subject "CFC's What Future". |
| 9th September | - Presentation "Cleaner Technology" at the EVAC Building Systems Seminar. |
| 25th November | - One day seminar on the subject "Metal Finishing - Environmental Focus". |

1995:

- | | |
|--------------------|--|
| 30th Jan - 3rd Feb | - Seminars with the general theme "Energy Management" held in conjunction with the Institute For Energy Technology of The University of Malta. |
| 31st January | - Inaugural meeting for 'Focal Points' in Industry on Environmental matters. |
| 23rd March | - One day seminar - "The Construction Industry and the Environment" (in conjunction with the Planning Authority). |

- 25th May - One day seminar - "Workshop on the Country Programme for the Reduction of Ozone Depleting Substances.
- 26th October - One day Industry & Environment Conference - "Recycle, Reuse and Recover our Resources".
- 15th December - Seminar on Waste Disposal - New Regulations.

1996

- 5th March - One day seminar "Introduction of Alien Species - Flora & Fauna".
- 21st March - One day seminar "Packaging Waste - A Threat to the Environment?".
- 11th July - 4th Industry & Environment Conference - "Waste Management - Options?" .
- 27th September - One day seminar "Tourism and the Environment" (in conjunction with the Ministry of Tourism).
- 13th November - "Industrial Activity and Environmental Health" (in conjunction with the Department of Public Health) .
- 28th November - "National Workshop - Dolphins & Other Cetaceans" (in collaboration with Marine Life Care Group, Department of Biology and the Environment Protection Department).

1997:

- 20th February - Supported the launching of the Malta Institute of Waste Management.
- 22nd April - One day seminar - "Waste Management in Small Island States" (in conjunction with the Malta Institute of Waste Management).

8. CONTACT PERSON

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CLEANER PRODUCTION IN TURKEY

Akin Geveci, Chemical Engineer, Marmara Research Centre

1.0 INTRODUCTION

Although Cleaner production as an expression is started to be pronounced in Turkey at early 1995 with negotiations with UNIDO to activate the RCPC programme, the application of the principals of CP like waste minimisation, recycling, E.M.S (BS 7750), good housekeeping, maintenance for leaks, etc. were already effected for many years especially in multinational large manufacturing companies. Turkey decided to implement the CP starting with Textile Industry, which produces products from consisting big portion of Country's export. And more than 50% of manufacturers are SMEs. The aim is to widen the application to all sectors of industry through KOSGEB (State owned organization to give training and development services to SMEs).

2.0 ORGANISATION

Textile, Finishing, Apparel Clean Technology Institute (TFACTI) was established in 1995 with a specific objective to start CP activities within textile industry. TFACTI was established within the Marmara Research Centre (MRC) of the Scientific and Technical Council of Turkey (TUBITAK) together with Consortium of textile manufacturers, namely Turkish Textile Foundation, Textile Dying and Finishing Industrialists Association, Turkish Clothing Manufacturers Association, Istanbul Chamber of Industry, Turkish Textile Dye-stuff Importers Association.

To realize these objectives, Technology Development Foundation in Turkey (TDF) and TFACTI will jointly establish an instrumental laboratory inside TUBITAK-MRC. The total amount to cover this project expenses is 2,567 MUSD. 1,371 MUSD of this amount will be covered by TFACTI.

3.0 PROJECT FOR THE PROMOTION OF CLEANER PRODUCTION IN TEXTILE INDUSTRY

3.1 Promotion of Cleaner Technology in the Turkey's Textile Industry

The way in which the project contributes to promoting cleaner production in Turkey are first and fore most through the institutional capacity building at Marmara Research Centre. The means are training, joint audit projects in the textile industry and management support to Marmara Research Centre in setting up relevant cleaner production services towards the textile industry.

The training will be integrated with conducting the cleaner production audit at the enterprise level. Through this we will ensure that the future Turkish experts on cleaner production will get both formal and practical hands-on experiences with introduction and implementation of cleaner production technologies.

The training methodology is based upon train the trainers concept. This means that the necessary training concepts and materials will be handed over to Marmara Research Centre in order to enable them to be engaged in the training of future Turkish specialists.

Some of the participants of the training should be specialised in cleaner production training for managers, engineers and technicians.

The training activities will be divided into two periods:

Period one focus on the cleaner production concept and its place and function in general environmental management, the cleaner production audit methodology, textile product development and the systematic working procedure and reporting system.

Period two will focus on perfecting the cleaner production audit methodology and the adaption to a Turkish methodology. In addition this period of the training will also focus on the textile industry specific needs and techniques.

A number of cleaner production audit reports will be carried out as an integrated part of the training activities. During period one a specific number of audits will be carried out and the remaining audits will be carried out through period two. The division into two periods is seen as an advantage, i.e. because it enables a better selection of enterprises, and the direct involvement of Marmara Research Centre staff as well as Danish experts. The Danish audit experts will participate in selected enterprise audits, evaluate and provide necessary assistance to the others. The Danish textile experts will provide assistance to all audits. In period one their involvement would be to evaluate and provide specific technical assistance to the findings, plan the sector specific audits of period two of the training programme and the selection of the enterprises. The textile experts involvement in period two will be more extensive.

In addition local textile experts would support the cleaner production audits activities as required.

3.1.1 Cleaner Production Audit Concept

The methodology for the cleaner production audit is understood as the proactive element of environmental assessment. Further, the cleaner production in relation to enterprises should be seen in context of environmental management.

The cleaner production audit concept can be presented as consisting of five main steps. This concept should be adapted and modified through the process of training to become the specific Turkish cleaner production audit concept. In this project the cleaner production audit should also focus on options which could be used in the demonstration projects later in the project.

The five steps are:

- 1 Planning and Organisation
 - Enterprise management involvement
 - Establish audit team
 - Set goals and identify internal organisation barriers and prepare solutions

- 2 Pre-assessment
 - Overall process flow sheet
 - Evaluate input and output in general
 - Select cleaner production audit focus
- 3 Assessment
 - Derive material balance of selected process operation units
 - Conduct a waste cause assessment
 - Identify and generate cleaner production opportunities
 - Screening of these options
- 4 Feasibility Analysis
 - Preliminary evaluation and selection
 - Technical evaluation
 - Economic evaluation
 - Environmental evaluation
 - Selection of options for implementation
- 5 Implementation and Continuation
 - Prepare cleaner production audit plan for the enterprises
 - Prepare implementation plan for feasible options
 - Monitor and evaluate implemented options
 - Sustain cleaner production activities

3.1.2 Establishment of Cleaner Production Information Center

This part is focusing on the establishment of Cleaner Production Information Center at Marmara Research Center. In addition a cleaner production extension service will be established at Marmara Research Center as a part of the CP audit activities. In general the CP audit activities will provide specific cleaner production information from Turkish textile industry and other technical information of Turkish origin. This information flow would become an important element of the information collection and dissemination activities of Cleaner Production Information Center.

The specific approach to the establishment of an information system on cleaner production at the Cleaner Production Information Center is to focus on the development of a simple information collection and dissemination system which in future can be developed into a real database system. Development of a "system" should happen gradually and be based on the actual need at the Cleaner Production Information Center for serving their purpose.

DTI has been actively involved in the development of the Danish formation system of cleaner production, RENTEK. In addition DTI has a broad experience in servicing industry with information collection and dissemination. Based on good experiences of using a local consultant for the development of a business strategy of an information center in a similar project in Thailand, project management should consider identifying and using a local consultant.

A Danish information specialist should participate in the planning and design of the preparatory need assessment and future business strategy development. In addition a link to assess international databases and online communication e.g. via Internet will be established.

Based on the preliminary planning and design of the surveys the specific training needs of the Marmara Research Center staff will be determined.

To establish a library function at Cleaner Production Information Center, general information on cleaner production technologies from Denmark and a list of contacts on sources for future key information collection from sources as the World Bank, UNEP, UNIDO, the Netherlands, Norway and the United Kingdom will be provided. The information specialist mentioned above will also provide support in the library establishment.

4.0 OTHER ACTIVITIES ON CLEANER PRODUCTION

TUBITAK-MRC together with an Environment Biotechnology Center (formed jointly with TUBITAK and Istanbul Technical University) joined EUROENVIRON Working Group on Integrated Cleaner Biotechnology. The aim of the W.G. is to generate research projects that develop integrated biotechnological processes/process steps for cleaner technology application.