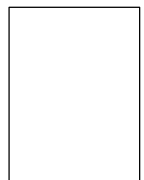


SEAM Project

**Oil and Soap Sector, Egypt
Cleaner Production Opportunities**

**Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency
Technical Cooperation Office for the Environment**

***Entec* UK Ltd
UK Department for International Development**



Oil and Soap Sector, Egypt

Cleaner Production Opportunities

SEAM Project

Implemented by:

Egyptian Environmental Affairs Agency
Technical Cooperation Office for the Environment
and

Entec UK Limited

A SECTOR REPORT PRODUCED BY THE SEAM PROJECT

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Preface

A. The SEAM Project - An Introduction

Support for Environmental Assessment and Management (SEAM) is a multi-disciplinary environmental project being funded by Britain Department for International Development (DFID). This Project is being implemented by the Egyptian Environmental Affairs Agency (EEAA) through the Technical Cooperation Office for the Environment (TCOE) and *Entec* a UK based engineering and environmental consultancy.

The SEAM Project is made up of 5 components focusing on environmental management issues. These include Industrial Pollution Prevention/Cleaner Production Environmental Impact Assessment Solid Waste Management Environmental Action Plans and development of an Environmental Database.

B. The Industrial Pollution Prevention/Cleaner Production Component

The main goal of the Industrial Pollution Prevention/Cleaner Production component is to show that significant financial savings and environmental improvements can be made by relatively low-cost and straightforward interventions. These consist of pollution prevention through good housekeeping waste minimisation process modification and technology changes. This approach has two benefits - valuable materials are recovered rather than wasted and factories are moved towards legislative compliance. This work is being undertaken in support of the National Industrial Pollution Prevention Programme (NIPPP) and has focused on three sectors: textiles food and oil & soap.

Industrial auditing of 32 factories identified in excess of 200 low cost/no cost pollution prevention measures. Commonly occurring issues were then developed as demonstration projects for each sector whose aims were to show the financial and environmental benefits of the pollution prevention approach.

Thirteen demonstration projects have been implemented in 21 sites as follows:

Textile Sector

- Eco-friendly Processing for an International Eco-label.
- Water and Energy Conservation.
- Combined Processing: Scour and Bleach.
- Bleach Clean-Up using Enzymes.
- Sulphide Reduction in Sulphur Dyeing.

Food Sector

- Installation of Milk Tank Level Controls and Valves.
- Water Conservation in Food Factories.
- Energy Conservation in Food Factories.
- Reducing Waste by Improved Quality Control.
- Recovery and Use of Whey as Animal Feed.

Oil and Soap Sector

- Waste Minimisation in an Edible Oil Factory.
- Oil and Fat Recovery.
- Improving Raw Water Quality to Reduce In-Plant Losses.

Outputs from these projects include industry workshops and seminars demonstration projects with supporting Guidance Notes and Manuals (to enable other factories to implement similar projects themselves) case studies incorporating cost-benefit analyses to demonstrate project feasibility detailed Sector Reports and Guidelines describing how to carry out industrial audits.

C. Industrial Pollution Prevention/Cleaner Production Documents**(i) General Documents**

Guidelines for Industrial Audits- A description of the methodology followed in the auditing of 32 factories 10 of which were in the textile sector.

(ii) Sector Reports

A description of 3 industrial sectors in Egypt including information on pollution prevention/cleaner production opportunities the findings of the industrial audits and demonstration projects.

Textile Sector Report Egypt. Cleaner Production Opportunities.

Food Sector Report Egypt. Cleaner Production Opportunities.

Oil and Soap Sector Report Egypt. Cleaner Production Opportunities.

(iii) Case Studies

Case Study: Textile Sector. Ecofriendly Processing and Achieving Ecolabels. Misr Spinning and Weaving Co. Mahalla and Giza Spinning Weaving Dyeing and Garments Company.

Case Study: Textile Sector. Sulphur Black Dyeing: A Cleaner Production Approach. El Nasr Co. for Spinning and Weaving Mahalla El-Kobra Dakahleya Spinning and Weaving Co. Mansoura and Amirtex Co. Sadat City.

Case Study: Textile Sector. Water and Energy Conservation. El Nasr Company for Spinning and Weaving Mahalla El-Kobra and Misr Beida Dyes Alexandria.

Case Study: Textile Sector. Bleach Clean-Up in Cotton Textile Processing using Enzymes. Dakahleya Spinning and Weaving Co. Mansoura and Amirtex Co. Sadat City.

Case Study: Textile Sector. Combining Preparatory Processes - A Low Cost High Productivity Solution. Giza Spinning Weaving Dyeing and Garments Company and Misr Beida Dyes Alexandria.

Case Study: Food Sector. Reduction of Milk Losses. Misr Company for Dairy and Food Mansoura.

Case Study: Food Sector. Water and Energy Conservation. Edfina Preserved Foods Alexandria and Kaha for Preserved Foods Kaha.

Case Study: Food Sector. Recovery of Cheese Whey for Use as Animal Feed.

Case Study: Food Sector. Integrated Quality Assurance and HACCP Approach to Waste Reduction in Food Processing.

Case Study: Oil and Soap Sector. Waste Minimisation at Sila Edible Oil Company Fayoum.

Case Study: Oil and Soap Sector. Pollution Prevention in Tanta Oil and Soap Company Tanta.

(iv) Guidance Manuals

These manuals give a step-by-step description of how the demonstration projects were implemented to allow other interested factories to implement similar projects by themselves. These are illustrated with examples from the demonstration projects and also include detailed

cost-benefit analyses.

Cleaner Production for Textiles: Sulphur Black Dyeing. The elimination of 2 hazardous chemicals from the sulphur black dyeing process resulting in a better quality product reduced pollution and improved working conditions.

Cleaner Production for Textiles: Combining Preparatory Processes. This describes how the desize and scour or the scour and bleach steps could be combined to save money reduce processing time and reduce environmental pollution.

Cleaner Production for Textiles: Ecofriendly Wet Processing of Textiles. How to improve textile processing so that it could be awarded an ecolabel certificate which guarantees that the fabric meets specific quality criteria.

Cleaner Production for Textiles: Water and Energy Conservation. How to identify and prioritise water and energy losses.

Integrated Quality Assurance and HACCP Approach to Waste Reduction. How to improve food quality and reduce wastage by improving quality assurance procedures and establishing a quality management plan which incorporates HACCP principles.

Cleaner Production for Food Processing: Water and Energy Conservation. How to identify and prioritise water and energy losses.

(v) Workshops and Training

Industrial Auditing - A Workshop for Auditors. A 5 day workshop describing the auditing process and review potential barriers and how to overcome them.

Industrial Auditing for Companies - A Workshop for the Textile Sector. This consisted of 2 parts one to brief senior management on the benefits of auditing and one to describe the audit process to selected technical staff and a nominated Environmental Champion.

Industrial Auditing for Companies - A Workshop for the Food and Oil & Soap Sector. This consisted of 2 parts one to brief senior management on the benefits of auditing and one to describe the audit process to selected technical staff and a nominated Environmental Champion.

Cleaner Production and Pollution Prevention. A Workshop for the Pulp and Paper Sector. This 5 day workshop illustrated how significant financial and environmental savings could be made through the identification and implementation of low-cost Cleaner Production interventions.

Cleaner Production and Pollution Prevention. A Workshop for the Metal Finishing Sector. This 5 day workshop illustrated how significant financial and environmental savings could be made through the identification and implementation of low-cost Cleaner Production interventions.

List of Abbreviations used

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CP	Cleaner Production
DAF	Dissolved Air Flotation
DFID	Department for International Development
EEAA	Egyptian Environmental Affairs Agency
GOE	Government of Egypt
GOS	Gravity Oil Separation
PE	Poly-ethylene (polythene)
RBD oil	Refined bleached and deodorised oil
SMEs	Small and Medium sized Enterprises
TSS	Total Suspended Solids
VFA	Volatile Fatty Acids
WWTP	Wastewater Treatment Plant

1.0 Introduction

1.1 Cleaner Production - Concept and Definition

Traditionally, pollution coming from a factory has been controlled by using end-of-pipe controls, such as wastewater treatment plants. This continues to be the most common method of dealing with water pollution in developing countries even today.

An alternative approach to this is to eliminate the problem at the source, using the Cleaner Production approach. Unlike end-of-pipe solutions alone, Cleaner Production can generate significant financial savings, improve product quality and improve working conditions.

Cleaner Production (CP) can be defined the continuous improvement of industrial process, products and services to reduce the use of natural resources, to prevent - at the source - the pollution of air, water and land and to reduce waste generation - at the source - in order to minimise risks to the human population and to the environment (UNEP, 1990).

The operational expansion of this definition states that:

- For production processes, CP includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes before they leave a process.
- For products, the strategy focuses on reducing impacts along the entire life cycle of the product from raw material extraction to the ultimate disposal of the product.
- For services, the strategy incorporates environmental concerns into designing and delivering services.

1.2 The Benefits of Cleaner Production

The CP concept radically differs from the traditional end-of-pipe approach, in that CP makes no division between production and the wastes generated by production. It is an integrated approach which attempts to conserve resources by increasing production efficiency whilst meeting environmental requirements. In addition, by minimising wastage, the required capacity of any wastewater treatment plant will be greatly reduced, thus reducing capital, operating and maintenance costs.

By adopting the CP approach, waste reduction automatically starts to occur. As a result, the overall resource utilisation factor improves, leading to increased profitability and competitiveness. Against the rising costs and procurement difficulties of resources, these benefits may even be greater than the savings made on waste treatment costs.

Adoption of the CP approach can result in the following specific benefits being realised:

Improved efficiency: Cleaner Production leads to better efficiency of production, which means more output of product per unit input of raw materials. This helps the financial performance of the factory.

Lower costs: The ultimate goal of Cleaner Production is to minimise the generation of emissions and waste. Thereby the amount of waste and emissions that need to be treated are reduced, as are the associated costs.

Conservation of raw material and energy: Given the increasing cost of raw materials and the growing scarcity of good quality water, industry cannot afford to use these resources inefficiently. Cleaner Production measures help in overcoming constraints posed by scarce or increasingly costly raw material, water and energy.

Market Requirements: Increasing consumer awareness of environmental issues has brought about a need for the companies to demonstrate the environmental friendliness of their products

and manufacturing processes, particularly in international markets. The emerging ISO 14000 series further accentuates this need. By adopting the Cleaner Production approach, many of the market requirements are met and a company ability to compete and get access to the green market increases.

Improved Environment: Cleaner Production minimises the volume and toxicity of waste and emissions and renders products more agreeable from an environmental standpoint. The direct effect is that the pollution load on the environment is decreased and environmental quality improved.

Increased compliance with environmental regulations: Minimising or eliminating the causes of wastes and emissions makes it easier to meet existing environmental regulations and standards, and reduces the environmental impact of the factory.

Working environment (Occupational Health and Safety Issues): Cleaner Production not only improves the environment outside the factory but improves working conditions as well. Keeping the factory clean and free of waste, spilled water, oil and chemicals not only reduces the likelihood of accidents but motivates the workforce to control new leaks and material losses.

Public image: As public awareness of the need for environmental protection is growing each day, it becomes more and more important for the industry to respond and react to the questions and demands posed by the public. The environmental profile of a company is an increasingly important part of its overall reputation. Adopting Cleaner Production is a proactive, positive measure and can help the concerned company build confidence with the public regarding its environmental responsibility.

The overall potential of Cleaner Production and subsequent enhancing profit margin in edible oil units is about LE30-100 per ton of final product. The potential of Cleaner Production in monetary terms is given in Table 1.1

Table 1.1: Potential of Cleaner Production

Area	Potential	of	Cleaner
	Quantity		Value (LE)
Oil recovery from broken seeds	25-30 %		15-20
Final Product	15.30%		0-25*
By-product (lecithin)	4-20 Kg/T		5-25
Steam	200-400 Kg/T		8-15
Electrical Energy	30-60 KW/T		3-6
Neutralising chemicals	10-16 Kg/T		10-16** 20-35
	TOTAL		61-126

* Difference in the price of acid oil and hydrogenated oil.

** If using caustic lye.

1.3 Cleaner Production in the Egyptian Oil and Soap Industry

Cleaner Production and pollution prevention concepts started to play considerable role in industrial pollution control activities undertaken by the Egyptian industry. There have been a number of Cleaner Production initiatives, which have made considerable progress in convincing the oil and soap industry management for converting to Cleaner Production. These initiatives comprised awareness programmes developed by the Egyptian government and international

development agencies from one side, and research work developed by research centres from the other side. In the following sections these initiatives are presented, along with some implemented measures by the industry as a positive reaction to these initiatives.

Environmental protection initiatives could be traced back in Egypt to the early eighties. In 1982, Law 48 for the protection of fresh water bodies was initiated, to control polluting wastewater discharges. In the same year the Egyptian Environmental Affairs Agency was established.

In the eighties and early nineties, most of environmental protection initiatives for the industry concentrated upon end of pipe approach. Cleaner Production and pollution prevention concepts began to be promoted on a national level in 1994, when the Egyptian Environmental Affairs Agency initiated the National Industrial Pollution Prevention Programme (NIPPP). The programme is being implemented with a sectoral approach to identify different Cleaner Production opportunities that are common in each industrial sector.

In parallel with the NIPPP, several programmes implemented by international donor agencies promoted Cleaner Production. This promotion varied from being the direct objective of some programmes, to an important tool used by some others. The Environmental Pollution Prevention Programme (EP3) is an example of the first type, EP3 has been implemented by the United States Agency for International Development (USAID), adopting the same concepts and methodologies considered by the NIPPP.

Some other programmes, which aimed to help the industry comply with environmental legislation, used Cleaner Production as an important approach in reducing pollution loads of final effluents. Examples of such programmes are the Environmental Pollution Abatement Programme (EPAP) implemented by the World Bank, Environmental Facility for the Public Sector Industry implemented by the German Construction Bank (KfW).

It is worth noting that the Egyptian government has regarded Cleaner Production as a strategic tool in its approach of implementing the environmental Law 4. The previously mentioned programmes are working or have worked under this framework set by the government.

It should also be emphasised that Cleaner Production would also facilitate treatment of wastewater both qualitative and in monetary term.

1.4 SEAM Project in the Oil and Soap Industry

The SEAM Project carried out audits of 11 oil and soap factories. These audits focused on identifying low-cost interventions with fast payback periods - a total of 120 such interventions were identified, with implementation costs ranging from LE0 to LE550,000. Savings from implementing these actions ranged from LE2,400 to LE1,000,000, with average payback periods of less than 2 months. A summary of the different types of interventions identified follows:

Type of Intervention	Capital Costs (LE)	Annual Savings (LE)	Average Payback Period (months)
Improved Housekeeping	0 - 200,000	12,960 - 1,000,000	<1
Energy Conservation	0 - 30,000	222,000 - 550,000	<1
Water Conservation, Recycling & Reuse	0 - 40,000	13,000 - 425,000	5
Process Modifications	0 - 127,600	2,400 - 250,000	3
Optimising Use of Process Chemicals and Materials Substitution	0	81,000 - 460,000	<1
Recovery of By-Products	0 - 200,000	1,000 - 630,000	<1

This auditing work was supported by training given to the audit teams and to factory personnel. These took the form of 3 workshops:

Senior management of the factory - this workshop outlined the financial and economic benefits of implementing CP and broadly described the audit process. The management were also requested to nominate a member of staff to act as the Environmental Champion and point of contact for the audit team.

Middle management and technical factory staff - this workshop was aimed at personnel who would be directly involved in the audit. The aim of the workshop was to demonstrate the benefits of auditing and explain the auditing process. It was also used to brief the factories on the needs of the audit teams.

Audit teams - this workshop presented the audit methodology to the auditors and explained how findings were to be described and quantified. It also outlined the needs and concerns of the factories in relation to the audit process and emphasised the importance of confidentiality.

1.5 Factories Participating in the SEAM Project

Alexandria Oil and Soap Company, Kafr El-Sheikh is a public sector factory, one of seven owned by the Alexandria Oil and Soap Company. It was built in 1965 and has around 760 employees. Its main products include vegetable oil/ghee (700 ton/month), animal fodder (1,500 ton/month), laundry and toilet soap (1,500 ton/month), crude and medical glycerine (175 ton/month).

Alexandria Oil and Soap Company, Kafr El-Zayatt is a public sector factory, one of seven owned by the Alexandria Oil and Soap Company. It was established in 1892 on a 58 feddan site and employs around 2,400 staff. The main products are cotton and sunflower seed oil (1,900 ton/month), laundry soap and soapstock (630 ton/month), glycerine (70 ton/month), sodium and potassium silicates (800 ton/month) and animal fodder.

Cairo Oil and Soap Company, Badrasheen, Cairo was established as a private enterprise in 1950 and nationalised in 1960. It occupies an area of about 28 feddans and employs around 500 staff. The factory produces around 700 ton/month of edible oil (grade 1), 6,500 ton/month of animal fodder, 90 ton/month of soapstock and 20 ton/month of gums.

Misr Company for Oil and Detergents, Zagazig is a public sector company, constructed in 1976 and employing 1,100 staff. The main products are edible oil (2,500 ton/month), shortening (960 ton/month), animal fodder (10,000 ton/month) and soap powder (280 ton/month).

Misr El-Khalig for Oil Manufacture (MIGOP), Suez is a privately owned company, constructed in 1988 and employing around 580 staff. The factory produces a range of edible oils from corn, sunflower seeds and oil palm (1,600 ton/month), shortening (580 ton/month), vegetable ghee (4,080 ton/month), palm stearin (32 ton/month), fatty acids and waxes (14 ton/month).

Misr Oil and Soap Company, Mansoura is a public company, built in 1968 on an area of 30 feddans. Its main products are edible oil (2,300 ton/month), toilet and laundry soaps (113,000 ton/month for domestic use) and glycerine (200 ton/month).

Nile Company for Oil and Detergents, Asyut was established in 1928 as a private company and then nationalised in 1960. It is now a public sector company employing around 900 staff. The factory produces around 100 ton/month of edible oil, 90 ton/month of soap stock, 400 ton/month of toilet and laundry soap, 70 ton/month of glycerine and 5,000 ton/month of animal fodder.

Salt and Soda Company, Moharrem Bay, Alexandria was constructed in 1899 and is currently one of 4 factories belonging to the Egyptian Salt and Soda Company. It occupies 12 feddans and employs around 1,300 staff. It produces an average of 5,300 ton/month of edible oil, 115 ton/month of shortening and 19 ton/month of waxes (mainly for forming as candles).

Savola Company, 10 Ramadan is a privately owned company, constructed on a 10 feddan site in 1994 and employing 400 staff. The company produces around 1,030 ton/month of edible oils (mainly palm oil), 300 ton/month of cocoa butter substitute (CBS) and 6,000 ton/month of vegetable ghee.

Sila for Oil Company, Fayoum is a private company which was constructed in 1993, with a workforce of 200 employees. The factory covers an area of 34 feddans. It processes an average of 5,700 tons of seeds per month, mainly sunflower, corn, soybean and cotton, producing up to 2,000 tons of first grade edible oil. The main by-products around 3,300 ton/month of animal feed and approximately 150 ton/month of soapstock and gums.

Tanta Oil and Soap Company, Tanta was established in 1934 as a private sector enterprise and was nationalised in 1962. It is now publicly owned and is one of three that are owned by Tanta Oil and Soap Company. Tanta factory produces an average of 22,000 ton/year of edible oil, 10,850 ton/year of ghee, 2,400 ton/year of soap, 480 ton/year of glycerine, and 54,000 ton/year of animal fodder, using cotton, kettan, and sunflower seeds.

1.6 SEAM Demonstration Projects

The audit findings were assessed to identify common problems facing the Egyptian oil and soap sector. A total of 3 projects were implemented:

Demonstration Project	Factory Name	Location
Waste Minimisation	Sila Edible Oil Company	Fayoum
Oil and Fats Recovery	Tanta Oil and Soap Company	Tanta
Reduced Wastage through Improving Raw Water Quality	Alexandria Oil and Soap Company	Kafr El-Sheikh