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*Project*

# Industrial Pollution Prevention

# Case Study: Textile Sector

## Eco-friendly Processing and Obtaining Eco-labels

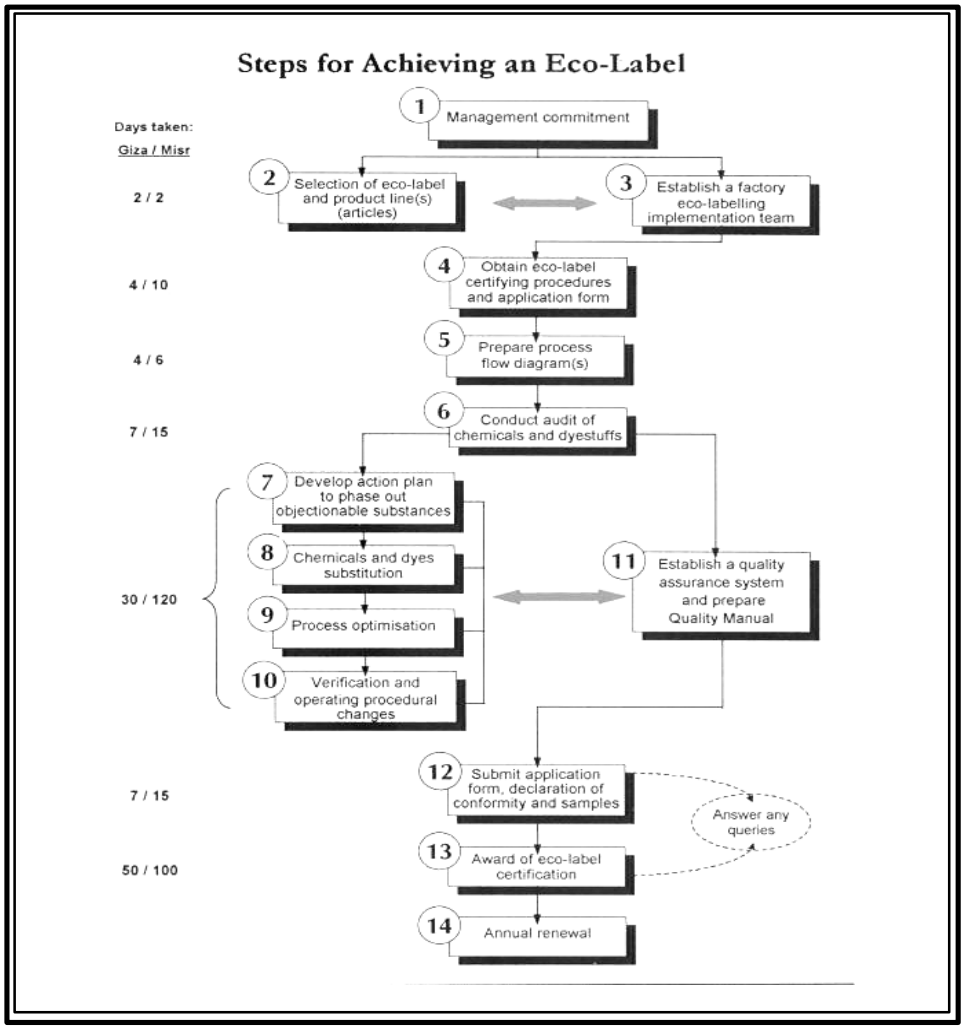
### Misr for Spinning & Weaving Co., Mahalla, Egypt
### Giza Spinning, Weaving, Dyeing & Garments Co., Giza, Egypt

Under the SEAM Project, eco-friendly processing has been introduced at the following factories:

**Misr for Spinning and Weaving Co., Mahalla El-Kobra** is a public company, the largest in the Middle East. It has an average annual production of 48,000 tons, of which approximately 50% is exported. The factory occupies an area of 600 acres (including residential area) and has a workforce of over 30,000. It processes cotton, wool, synthetics and blends to produce a wide range of products, including ready-made garments, yarns, finished fabrics, bandages, blankets.

**Giza Spinning, Weaving, Dyeing and Garments Co.** is privately owned, with an average annual production of 1,440 tons, approximately 95% of which is produced for export. The factory is on a 25 acre site and has a workforce of around 2,400. The main products are cotton, polyester ready-made garments, yarns and finished fabrics.

This case study gives a step-by-step description of what actions were taken to achieve eco-labels for each of these factories.



## WHAT IS AN ECO-LABEL?

An Eco-label can be defined as A guarantee that the fabric purchased does not contain chemicals which might be harmful to the consumer.

The export of textiles to Europe, particularly Germany, requires that stringent standards are met regarding the chemical and physical quality of the fabric. The manufacturer is expected to use environmentally friendly processes and environmentally acceptable chemicals. Possession of an eco-label can show that these conditions are being met.

From the range of eco-labels available, OkoTex-100 was selected, as this is widely accepted throughout Europe.

## WHAT ARE THE BENEFITS OF AN ECO-LABEL?

### Increased Export Market Access

Buyers are increasingly requiring that their imported goods meet a defined set of quality standards. An eco-label will help meet these requirements and can facilitate both entry and expansion into export markets.

Other benefits include:

- Optimising raw materials consumption.
- Phasing out hazardous materials.
- Reducing wastewater volume and toxicity.
- Reducing pollutants in air emissions.
- Improving factory working conditions.
- Increased competitiveness in the domestic market.

## STEPS FOR ACHIEVING AN ECO-LABEL

### Step 1. Management Commitment

Senior management support for achieving an eco-label must be present from the outset. This is essential in:

- allocating appropriate human resources.
- ensuring that work is completed on time.
- releasing financial resources.
- encouraging the implementation of recommended optimisation measures.
- encouraging the development of quality control procedures.

### Step 2. Select the Article to be Eco-labelled

Two general issues need to be considered; which eco-label to use and which product line to start on. Experience gained during implementation showed that the following points needed to be addressed:

- Identify buyer preferences on the type of eco-label.
- Select the eco-label that is able to maximise market penetration in potentially a number of different countries.
- Identify the main export product lines and initiate eco-labelling on that product line where it will yield the greatest return.
- Articles manufactured from the same raw materials and using similar processes can be eco-labelled at the same time.
- Balance market expectations against ease of implementation. Eco-labels based on final product quality are easiest to obtain.

| SEAM Project: Selection of Product Lines | | |
|---|---|---|
| Factory: | *Giza Co.* | *Misr Co., Mahalla* |
| Fabric: | 100% cotton. | 100% cotton. |
| Product: | T-shirts; knitted, bleached and dyed. | Pyjamas, bleached, dyed, printed, colour-woven. |
| Selection rationale: | ❖ Represents 45% of total exports.<br>❖ Buyer request for an ecolabel.<br>❖ Easy to replicate in similar lines. | ❖ Largest export product.<br>❖ Expanded to include shirts and trousers line (similar raw materials and processing). |

### Step 3. Factory Eco-labelling Implementation Team

For each of the factories, a Factory Team was selected to be responsible for achieving the eco-label. The Team consisted of Managers from:

- Sales and Marketing (to provide advice on customer requirements).
- All production and service departments likely to be affected by any changes.
- Quality Control (to ensure quality control procedures are followed and maintained).
- Purchasing (to ensure that raw material purchases - dyes, process chemicals, etc. - comply with eco-label requirements).
- Financing (to quantify savings or profits).

### Step 4. Obtain Eco-Label Certification Procedures

For the selected eco-label, all necessary paperwork and background information should be obtained from the certifying organisation. This includes an application form, Eco-label standards, declaration of conformity, the list of approved certifying institutes and a renewal form from the selected eco-labelling institute.

### Step 5. Prepare Process Flow Diagram(s)

This describes the steps involved in the production of the selected product(s) and includes:

- each relevant step in the manufacturing process.
- all inputs, including water, energy, dyes, process chemicals and accessories in the final product such as buttons, zippers, elastic and cord.
- all outputs, including the final product and any wastes (solid and liquid).

Once completed, the Factory Team should walk through the factory to verify the process diagram.

### Step 6. Conduct Chemical Audit

This step will identify all chemicals which are toxic, hazardous or banned by the ecolabelling organisation.

A detailed survey of the chemicals used in each production stage must be carried out to identify all chemicals used in the production of the fabric, from the processing of the raw fibres (including pesticides) through the manufacturing process to the production of the finished article. Wherever possible, material safety data sheets for each chemical should be obtained from the supplier - this will save time and money later.

**Hazardous materials identified at Giza and Misr Mahalla:**

- Sodium hypochlorite (Giza and Misr Mahalla)
- Kerosene in pigment printing (Misr Mahalla)
- Pigment colours based on banned amines (Misr Mahalla)
- Binder containing high levels of formaldehyde (Misr Mahalla)
- Resin containing high levels of formaldehyde (Misr Mahalla)
- Copper sulphate used in after-treatment of direct dyes (Giza)

### Step 7. Action Plan to Phase-out Objectionable Substances

An Action Plan should be developed to address the results of the chemical audit. This is essential when there are a number of substances to be phased out and/or when there is a range of options for doing so.

In SEAM, some substitutions were relatively straightforward (e.g. substitution of hazardous dyes with eco-friendly alternatives), whereas others required a series of trials to be carried out:

- **Laboratory Bench Testing**. A low-cost way of assessing a wide range of possible substitutes and/or process modifications.
- **Pilot Scale Testing**. This assesses the most promising options (identified during the laboratory trials) under production scale conditions.
- **Production Scale Testing**. Fine-tuning of the pilot scale tests, whilst maintaining optimum conditions.

### Step 8. Chemicals and Dyes Substitution

A summary of the substitutions made are as follows:

| Substitutions made at Misr Mahalla and Giza factories | |
|---|---|
| **Hazardous Chemical** | **Substitute** |
| Sodium hypochlorite | Hydrogen peroxide |
| Pigments based on banned amines | Safe pigment colours |
| Kerosene | Synthetic thickener |
| High formaldehyde binder | Low formaldehyde binder |
| High formaldehyde resin | Low formaldehyde resin |
| copper sulphate | polymeric agent |
| *Note: Whenever a substitution is made, tests to confirm their suitability should always be carried out.* | |

After substitution, fabric quality tests were carried out to determine:

- pH of the final product.
- colour fastness properties.
- free formaldehyde content of the final fabric.

### Step 9. Process Optimisation

By modifying the process, opportunities to improve efficiency, both in the modified process itself and in downstream processes may develop. In both factories, all recipes and procedures were reviewed to identify where raw material could be minimised and where process steps could be eliminated or reduced.

| Process Optimisation Benefits: Elimination of Sodium Hypochlorite (Giza Spinning and Weaving) |
|---|
| 60% savings in water usage and wastewater treatment. |
| 14% savings in steam consumption. |
| 73% savings in processing time. |
| Elimination of sodium hypochlorite (hazardous chemical). |
| Improved working conditions - no chlorine gas generated. |

### Step 10. Verification and Operating Procedural Changes

Once all substitutions have been made, ongoing testing is required to ensure that the fabric complies with eco-label requirements.

### Step 11. Establish Quality Assurance System

This is usually presented in the form of a Quality Assurance Manual, produced and maintained by the Quality Manager.

**Suggested outline of Quality Assurance Manual contents:**

- Dyes and pigments in use along with their C.I. number
- Chemicals in use.
- Material Safety Data Sheet (MSDS) for all items.
- Processing sequence used.
- Process control check points.
- Quality parameters of final product.
- Test methods for each of the items.
- Frequency at which each test needs to be conducted.
- Eco-Label requirements.
- Mode of verification, in case of correction, if any.

### Step 12. Submit Application

The following items need to be submitted to the eco-labelling institute:

1. ***Application Form***. A detailed description of the goods to be tested must be given, such as the composition of the textiles, dyes, auxiliary agents etc. If possible, material safety data sheets of the process chemicals used should be submitted.
2. ***Declaration of Conformity***. This confirms that the factory has a Quality Assurance System in place which guarantees that the fabric is always in compliance with eco-label requirements.
3. ***Samples - send to Eco-labelling Institution***. The goods (including the fabrics and any accessories, such as buttons and zippers) are sent to the eco-labelling institute for analysis.

### Step 13. Award of Eco-label Certification

Copies of the certificates awarded to Misr Spinning and Weaving and to Giza Spinning and Weaving follow:

**Step 14. Annual Renewal**

Eco-label certificates are valid for a period of 1 year and must be renewed annually.

## HOW LONG WILL IT TAKE?

The length of time that this will take will vary depending on:

- How many chemicals are used and how many are hazardous.
- How quickly suitable alternatives can be identified and obtained.
- How much work is required for successful substitution.
- How well developed the existing quality system is.
- How much factory staff time is available to complete the work.

The time required to achieve an eco-label will also decrease as staff become familiar with what is required.

In **Giza factory**, a relatively uncomplicated line was selected (dyed T-shirts) where only 2 hazardous chemicals were identified. Consequently, the application was submitted to OkoTex in 8 weeks. Giza factory are now considering eco-labels for other products, including knitted and woven shirts, trousers, shorts and pyjamas.

In **Misr Mahalla**, a much more complex line was selected, producing pyjama suits, shirts and trousers, where 12 hazardous chemicals were identified. Consequently, more work had to be carried out and the application was submitted after 24 weeks.

## ADDITIONAL INFORMATION:

More information on this project and the SEAM Project are available from:

- **Misr for Spinning and Weaving Company**
  Mahalla El-Kobra, Egypt
  Tel. (Office): (02) 225 592
  Fax. (Factory): (040) 227 833 (Office): (02) 355 7079
- **Giza for Spinning, Weaving, Dyeing & Garments Company**
  Head Office: 162 Gohar El-Kaid Street, Darassa, Cairo, Egypt
  Tel. (Factory): (20) 18 401 354/5/6
  Fax. (Factory): (20) 18 401 353 (Office): (20) 2 284 0733
- **Egyptian Environmental Affairs Agency (EEAA), Technical Co-operation Office for the Environment (TCOE)**
  30 Misr Helwan Agricultural Road
  5th floor, Maadi, Cairo, Egypt
  Tel.: (20) 2 525 6452 Fax: (20) 2 525 6457
  email: EEAA2@idsc.gov.eg
- **SEAM/Entec UK Ltd.**
  30 Misr Helwan Agricultural Road
  4th floor, Maadi, Cairo, Egypt
  Tel.: (20) 2 525 6452 Fax: (20) 2 524 6162
  email: entecegy@eis.com.eg

Eco-Labelling Organisation:

- **Zertifizierungsstelle OkoTex**
  Frankfurter Str. 10-14
  Postfach 5340,
  D-65760 Eschborn, Germany.
  Tel.: +49 61 96 966 230. Fax.: +49 61 96 966 226.

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## The SEAM Project

Support for Environmental Assessment and Management (SEAM), is a multi-disciplinary environmental project being funded by Britains Department for International Development (DFID). This project is being implemented by the Egyptian Environmental Affairs Agency (EEAA) through the Technical Co-operation Office for the Environment (TCOE) and *En*tec, a UK engineering and environmental consultancy.

## SEAM: Pollution Prevention

This is being implemented under the National Industrial Pollution Prevention Programme (NIPPP). NIPPP focuses on the introduction and promotion of low-cost improvement measures, which can be easily and quickly implemented by factories. It also emphasises the importance of economic benefits of any such intervention, particularly those with short pay-back periods.

## Methodology - A Description

Pollution prevention opportunities can be identified through an industrial audit[1]. This systematically reviews the factorys operations and processes, focusing on reducing waste, improving efficiency and alleviating pollution. This aims to identify and prevent losses from occurring in the first place, rather than resorting immediately to a treatment facility.

The SEAM Project has carried out audits in 32 factories in the food, textile and oil and soap sectors, which identified a wide range of low-cost pollution prevention opportunities, including water and energy conservation, the importance of good housekeeping, in-process modification and hazardous materials substitution. The SEAM Project is presently implementing 23 of these opportunities as demonstration projects.

## Benefits of Pollution Prevention

It can ***REDUCE :***

- production costs;
- losses of valuable raw materials;
- on site treatment costs;
- energy and water costs;
- the volume of solid and liquid wastes generated;
- the risk of spills and accidents.

. . . and ***IMPROVE :***

- overall operating efficiency;
- generation of income through reuse and recycling of wastes;
- this approach can be easily replicated in sister factories to achieve similar savings;
- safety of employees;
- legislative compliance;
- company image.

1 Guidelines for Industrial Audits have been prepared by the SEAM Project.