

Med *Clean* *Propre* *Limpio* **Mediterranean**


No. 20
Pollution prevention case studies

Pollution prevention in the textile industry

Company background

El Nasr Spinning and Weaving Co., Dakahleya Spinning and Weaving Co., and Amir Tex Co., (Egypt) are three textile companies where an industrial audit was carried out to identify pollution prevention opportunities in the sulphur black dyeing process.

Industrial sector

Textile industry sector.

Environmental considerations

Sulphur black dyes are a method of producing a jet-black colour in cotton fibres, and must be converted to a water soluble form by adding a reducing agent, traditionally sodium sulphide, so that the dyes can be absorbed by the fibre. After dyeing the fabric, the dye is converted back to insoluble form with the addition of an oxidising agent, often acidified dichromates.

Both sodium sulphide and acidified dichromate are hazardous to handle, and their usage may leave harmful residues in the finished fabric and generate effluents that are difficult to treat.

Background

The audit carried out in the selected facilities approached cleaner production by proposing chemical substitution in order to reduce the identified environmental considerations at source. Therefore, an evaluation was undertaken to assess the feasibility, costs and quality of using various potential substitutes for sodium sulphide and acidified dichromates, and pilot trials were carried out to assess its reproducibility at production scale. In addition, process optimisation opportunities were also identified to achieve greater productivity and financial savings.

Summary of actions:

The following measures were put into practice:

1. Replacement of sodium sulphide and acidified dichromates.
It made the final effluent easier to treat and savings in wastewater treatment were achieved.
- Replacement of sodium sulphide in all three factories with glucose, which gives good depth of shade when used with sodium hydroxide and has a lower cost compared to other possible substitutes. In addition, elimination of free sulphur also avoids the past problem of tendering upon storage.
- Replacement of dichromate: in *El Nasr Spinning and Weaving Co.* dichromate was replaced with sodium perborate since it is an acceptable substitute and has a lower cost compared to others. In *Dakahleya Spinning and Weaving Co.*, and *Amir Tex Co.* hydrogen peroxide was preferred as it is particularly suitable for processed knitted fabrics (one of the main products of both companies).

2. Process optimisation:

- In *El Nasr Spinning and Weaving Co.* the desizing and scouring processes were combined and temperature in the soaping bath was reduced. Achievements were savings in steam (16%) and electricity (22%) and reduction of the processing time by 2 hours.
- In *Dakahleya Spinning and Weaving Co.* cold washes were used between the dyeing and oxidation steps, and two baths were eliminated: one cold wash after oxidation, and one hot wash after the soaping bath. As a result, steam, water and electricity costs were reduced by 38-39% and processing time was reduced from 13 hours to 8 hours thereby increasing production capacity.
- In *Amir Tex Co.* two cold washing steps (after the overflow washing) were eliminated, thereby reducing water consumption by 15%, and temperature and duration of the oxidation bath were reduced. Other savings were electricity (18%), steam (21%), water (15%), time and labour.

Balances

Options	Environmental benefits	Additional costs <i>Due to an increase in chemicals used cost (glucose)</i> €/tonne of processed fabric	Savings €/tonne of processed fabric	Payback period
Replacement of sodium sulphide and dichromates	<ul style="list-style-type: none"> • Reduction of toxic and hazardous wastes in wastewaters • Elimination of toxic and hazardous materials from the workplace 	<ul style="list-style-type: none"> • Nasr Spinning and Weaving Co: 23.82 • Dakahleya Spinning and Weaving Co: 3.57 	<ul style="list-style-type: none"> • Nasr Spinning. and Weaving Co: 91.23 • Dakahleya Spinning and Weaving Co: 118 • Amir Tex Co: 61.26 	Immediate
Process optimisation	<ul style="list-style-type: none"> • Reduction of water consumption and steam • Electricity savings 			

Conclusions

By means of the carrying out of an environmental audit and implementing the proposed pollution prevention opportunities, the three companies achieved economic savings and environmental benefits. In addition, due to process optimisation and replacement of sodium sulphide and dichromates other positive outcomes such as improvement in the fabric quality, improved production efficiency (by decreasing processing time), and increased productivity were also achieved. Buyer reaction to the quality of the fabric produced was also favourable.

NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.

Case study presented by:

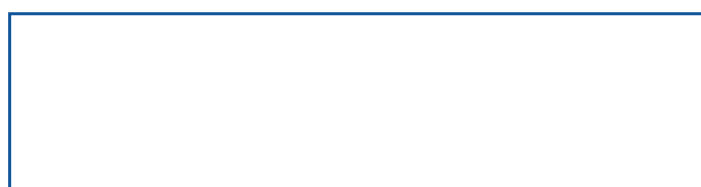
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