CLEANER PRODUCTION IN EGYPT
SUCCESS STORY
IN
AL HELLAL TRICOT FACTORY

The Factory: Al Hellal Tricot Factory an Egyptian company established in 1983, it is a leading company in manufacturing knitted fabrics and ready made garments adding to the preparation, dyeing and finishing in the company's dyehouse. Industrial operations take place in two connected buildings, the first floor are for handling the preparation, dyeing and finishing process, second & third floors for knitting process and the rest for the sewing process.

Residential buildings border the factory specially the dyehouse which increases the danger of environmental impacts on the surrounding environment

The results achieved from the CP are summarized. The information serves to demonstrate how CP and Energy Efficiency can be successfully implemented in industries in Egypt.

GENERAL INFORMATION		
	COMPANY	Al Hellal Tricot Factory
	SECTOR	Textile – dyeing and knitted fabric
	PRODUCTS	Knitted fabrics and different types of garments dyed and finished in its dye house. It is also working as a commissionable dye house with a 50 % for other manufacturer.
	MARKET	Local Market and exporting.
	EMPLOYEES	320 (300 permanent; 20 seasonal)
	WORKING SYSTEMS	two shifts 6 days/week 12 months/year

PRODUCTION	PROCESSES	The productive process can be summarized in 3 main stages: • Producing the knitted fabrics. • Prepare and dyeing the fabric • Swing and making up.
PRODUCTION (CONT.)	RAW MATERIALS	-100% cotton yarn. -Cotton /pes. Blended yarn. -100 % polyester yarn. - Chemicals and dyestuffs.
	ENERGY SOURCES	- There is one steam boiler house in the factory- 4tons/hr capacity. The steam produces is of the adsorbent type at pressure 9 bar, which reaches the dye house at pressure 7 bar. Fuel oil is the main source fuel of the steam boiler houses. The average monthly fuel oil use is approximately 50 tons with a cost of 9000 EP.
	WASTES AND EMISSIONS	1- Gaseous emissions The company still uses fuel oil for the steam boiler houses; it has already contracted with the gas company in the governorate to be supplied with a gas pipe line in order to get rid of emissions of burning fuel oil and to protect the outside environment. 2-Solid Wastes: These are wastes produced from the chemical containers as well as some depreciated fabrics during production, which are sold regularly and do not cause any environmental issues inside the company. 3- Liquid Wastes: The factory has taken some actions aiming at reducing of water borne pollutants before discharging it into the public sewerage network; it established a chemical treatment unit for industrial sanitation composed of: • 2 ground- level waste tanks, which help precipitating, with capacity of

60m^3 each
- One high-level waste tank with capacity of 70 m^3 in which chemicals are added and precipitation takes place

After which, water is discharged through one spot after being gathered with human wastes into the public network. The amount of wastes discharged from the factory is approximately 480m^3/day

Occupational safety and health (OSH)

Current status:
Types of hazards to which factory employees are exposed to are for example health hazard like machinery uproar, and physical or chemical hazard as a result of handling chemical substances such as acids and alkali, as well as accidents and mechanical injuries when employees do not use personal protective equipment and the mishandling of chemicals.

It has been noticed that the factory employees- despite the fact that they handle chemicals a lot of which has negative side effects on safety and occupational health- do not conform to health and safety regulations while handling these chemicals; for instance, they do not wear gloves to prevent direct hand contact with chemicals, dyes and their solutions.

There is no clinic for the employees in the site with a full time nurse and a contracting physician to visit the location once or twice a month.

Proposed System
Establishing an Occupational Health and Safety System
The Occupational Health and Safety System can be defined as a means of securing employees against occupational hazard, and that it achieves an economic objective by securing materials, production and machinery.

CP OPTION

Specifying cleaner production Opportunities

1- Substitutions of Na_2S by Glucose
To prevent the hazard environmental impact that

result from using sodium sulfide due to the dyeing stage, in addition to the financial return results from using glucose instead of Na_2S.
This method results in cost reduction of about = 14.94 pound / 100 kg of cloth

2 Using enzyme for O_2 killing
To remove hydrogen peroxide and use the same bath, where the O2 is killed, in dyeing.

This method results in a reduction of the active dye cost = 7.06 pound / 100 kg of cloth

3-Improving the quality control laboratory
Current situation:
Now, there is a simple laboratory in the factory to control the dyed stuff quality and to prepare the prescriptions, yet, there is no accurate methods to adjust the color degree and the product's quality, that lead most of the times to dye preparation (correction) which result in an increment to the dyes and the chemicals consumption, in addition to the extra load from the pollutants of the liquid wastes.

Recommendations:
Provide the laboratory with color match system unit to determine the required degree of the dye and adjusting the product's quality.
Benefits:

- Reducing the consumption of the chemicals and the dyes.
- Reducing the pollutants load discharged with the liquid wastes.

Costs and Returns:
Device cost: 230.000 pound
Return
The amount of the dyed cloth per year: 1500 ton
The amount of cloth dyed by using direct dyes: 480 ton
The amount of cloth dyed by using active dyes: 480 ton
The amount of cloth redyed to correct the color: 10 % from the direct and active dyes.
= 48 ton with direct dye
= 48 ton with active dye
The cost of ton of cloth (direct dye): 1500 pound
The cost of ton of cloth (active dye): 4000 pound

Total cost of redyeing (correcting)
48 = 264000 pound / year× 48 + 4000×1500
Pay-off period = 230000 / 264000 = 10 months.

4- Improving the quality of the dyeing house:
Current situation:
The company using old type of dyeing machine, open and highly consumption of water L/R 1:10 and chemicals which affect the environment.

Recommendations:
Installation of new modern dyeing machines (Multi flow type) to decrease the water/fiber ratio from 10/1 to 5/1 and in accordance decrease water, chemical and energy consumption.

Benefits:
- reduction of the total load of the waste water with 5%
- reduced the COD with 10%.
- Reduction in the water consumption with about 2600 M3/ year.
- reduction in the emission of CO2 with about 9.2tons/y.
- reduction of the timing process.

Costs and Returns:
cost: 2.700.000 LE

Return:
Savings[L.E./y] = 986.360 LE
Pay-off period = 986.360 / 2.700.000 = 3 YEARS.

5- Installation of raw water treatment plant (softener)

Current situation:
The water of the municipal network is used directly in the dyeing operations without any treatment; this water contains an amount of hardness represented in calcium, magnesium, and other salts. These salts lead to the increment of the consumption of the chemicals used in the different production stages, furthermore its intervention in the dyeing operations which leads to negative results and so the dye operation will be repeated, in addition to the extra

load which results from the pollutants discharged with the liquid wastes.

Recommendations:
Installing softener unit for water treatment which is used in the dyeing and getting red of the hardness percentage with capacity of 30 m^3 /hour.

Benefits:

- Reduction in using the chemicals and the dyes.
- Reduction the pollution loads discharged with the liquid wastes.
- Increment of the product's quality.

Cost and return:
The unit's cost: 80.000 pound

Return:
25% as an increment from the dyes amounts, used in getting the dye with positive results.

Amount of dye used per year:
Active dyes: 900 k of cost 45 pound / kilo.
Direct dyes: 1150 k of cost 30 pound / kilo.

The amount of direct and active dyes that will be saved is 25% from the annual consumption.
= 280 k of active dye
= 359 k of direct dye

Annual Savings:
30 = 23370 pound / year× 359× 45 ×280
Pay-off period = 80000 / 23370 = 3 years.

5- Substitution of Mazot by Natural Gas for Boiler House

Current Situation:
Now, the Mazot is used in the factory as the boiler house fuel source, which is considered as a resource of the pollutants that discharges from the burning operation, specially, because it contains a percentage of sulfur, beside the Mazot spillage with the liquid wastes that results from the factory, furthermore, the terrestrial pollution in the

surrounding area of the boiler house and the tank of storing Mazot.
Recommendations:
Replacing the Mazot lighter of the boiler house with another that works with the natural gas

Benefits:
Reduction in the cost of using the fuel
Reduction in the discharged pollutants that result from the burning operation

Cost and return:
The lighter's cost = 80000 pound

Return
Calorific value of the natural gas = 9415 k calorie/ m^3
Calorific value of the Mazot= 10530 k calorie/ kg
Monthly consumption rate of the Mazot= 50 ton

(Amount of natural gas equivalent to the Mazot of every month) =

(50 x 1000 x 10530)/9415 = 55921 m^3/month

Natural gas cost	=	55921 x 0.15 = 8388 LE/month
Mazot cost	=	250 x 50 = 12500 LE/month
Saving	=	12500 – 8388 = 4112 LE per month
	=	4112 x 12 = 49344 LE per year
Pay-off period	=	80000 / 49344 = 1.6 year (19 months)

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RESULTS

During the CP assessment that was conducted by a team of ECO experts, 4 CP options were identified for the company.

The three most feasible and rewarding options are described below:

Option	Environmental Benefits	Economic Aspects		
		Savings [L.E./y]	Investment [L.E]	Payback [year]
Option 1: Rearrangement	Reduce raw materials & dyeing losses as a solid	14700	No cost	immediate

for chemicals & raw materials containers.	waste.			
Option 2: Substitution of sodium sulfide by glucose in sulfur black dyeing	Avoiding hazardous effects of sodium sulfide on the environment & workers health. Improving product quality	1494	No cost	immediate
Option 3: Quality control lab Using color match system	Achieving right first time in the dyeing step. Reduction in pollution load. High profit.	230000	264000	10/12
Option 4: Replace of 3 old dyeing machine with 2 MULTIFLOW dyeing machines.	- reduction of the total load of the waste water with 5% - reduced the COD with 10%. - Reduction in the water consumption with about 2600 M3/ year. - reduction in the emission of CO2 with about 9.2tons/y. - reduction of the timing process.	986.360	2.700.000	3 years

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