



MED TEST Case Study

## FOOD sector — TUNISIA

# Milk and dairy product industry — CLC

### Company overview

Cap-Bon milk company (CLC) is part of the DELICE group, the market leader for dairy products in the Tunisian food industry. The site produces about 1,696,744 hl/year of milk beverages and 3 tons/year of butter.

Among the company's main incentives for joining the MED TEST was the opportunity to find ways of reducing and reusing the generated waste, as well as the rationalization of raw material consumption.

At the beginning of the project, the company was in a preparatory phase for obtaining the ISO 22000 certificate, a goal reached over the course of 2011; the company then took steps to implement an environmental management system in line with ISO 14001.

### Benefits

The MED TEST project has generated annual financial gains of \$US 546,903 in raw materials, products, water and electricity with an overall investment of \$US 484,945. The average payback period is estimated at 10 months. Most of the identified measures have been implemented in 2011.

Energy costs have been reduced by 19% through the implementation of an efficient action plan: optimization of compressed air consumption, boiler upgrade, improved regeneration capacity of pasteurizers and sterilizers, adjustment of the chillers' coefficient of performance (COP). Measures were also identified to reduce water consumption, such as closed-circuit equipment cooling, which led to a 13% reduction in the costs of water purchases.

Further environmental benefits have been achieved at the level of wastewater pollution loads. The company



**“The economic and environmental benefits the project has generated have reinforced the management's commitment to maintain a preventive environmental approach.”**

Mr. Karim BELOUARDA, Energy and Environment Director

has achieved annual reductions of 22% in BOD<sub>5</sub> and 28% in COD through the reduction of product losses, as well as the research for valorization measures regarding waste and by-products. Moreover, this spectacular improvement will allow the company to renegotiate its wastewater processing fees with the communal treatment plant in Sstia, also member of the DELICE group and situated nearby.

During the implementation of the MED TEST project, CLC has been provided with the tools necessary to ensure strong linkages between the Clean Production process and the ISO 14001 environmental management system, so as to allow for the good management of all implemented measures and the sustainability of the method. Indeed the environmental policy has been documented and communicated, so as to initiate the implementation of all necessary procedures, as well as of a suitable environmental management scheme.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Reduction of product losses	237 021	123 304	0.5	414 m <sup>3</sup> milk 7.5 tons butter	-
Water savings	32 993	77 750	2.3	35 500 m <sup>3</sup> water	-
COP of NH <sub>3</sub> chillers	153 606	35 731	0.2	3 142 m <sup>3</sup> water	1 666
Efficacy of pasteurizers and sterilizers	65 442	71 918	1.1	5 846 m <sup>3</sup> water	2 858
Boiler regulation	21 576	86 306	4	-	459
Compressed air production	36 265	89 936	2.5	-	376
<b>TOTAL</b>	<b>546 903</b>	<b>484 945</b>	<b>0.88</b>		<b>5 359</b>

**Reduction of product losses:** The installation of transmitters integrated into the control system of selected workstations, as well as the retrieval of residual milk and butter before the cleaning stage will entail product gains of 414 m<sup>3</sup>/year and 7.5 tons/year respectively. Moreover, the company has launched a collaboration with a research unit so as to develop a procedure facilitating the elimination of fat from centrifuges and of non-compliant milk. As a consequence, COD and BOD<sub>5</sub> levels have been reduced to the minimums of 295 and 144 tons/year respectively.

**Water savings:** The company has implemented several measures aiming to reduce water consumption. These measures include a closed-circuit equipment for cooling as well as the replacement of existing vacuum pumps with closed-circuit pumps. These initiatives will reduce the volume of water used by 35,500 m<sup>3</sup>/year.

**COP of NH<sub>3</sub> chillers:** Ammoniac-based chillers are the site's foremost electricity consumer. The optimisation of the coefficient of performance via condenser and evaporator temperature regulation will improve the current chillers' performance by 27%. As a further direct effect of the measures regarding electricity consumption (gains of 1,660 MWh/year and 883 tons/year of CO<sub>2</sub>), less heat will be transferred to the cooling towers,

which will result in water gains of 3,142 m<sup>3</sup> (cooling tower makeup water).

**Efficiency of pasteurizers and sterilizers:** The regeneration efficiency of heat exchangers between heating and cooling sections should be higher than 90%. This is feasible through the installation of additional plates (heat exchangers). Besides limiting the thermal energy consumption, this initiative will reduce CO<sub>2</sub> emissions by 629 tons/year and water consumption by 5,846 m<sup>3</sup>/year.

**Boiler regulation:** This action consisted of installing an online oxygen analyser on the heater chimney, facilitating the real-time regulation of air/gas debit and therewith the optimization of boiler house efficiency. In addition to energy gains (459 MWh/year), this initiative will cut CO<sub>2</sub> emissions by 153 tons/year.

**Compressed air production:** Several measures have been initiated in order to optimise compressor performance: insulation of hot air sheaths inside the air compressors, acquisition of a lubricated compressor, reduced compressor solicitation achieved through an increase of storage capacity and the installation of an air debit meter on the exit to the factory. These actions have reduced electricity consumption by 376 MWh/year.



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MED TEST Case Study

## TEXTILE sector — TUNISIA

### GARTEX

#### Company overview

GARTEX is a jeans production and bleaching company fully focused on exports. The company has a working capacity of 2,800,000 items per year. It carries out washing and special treatment processes.

At the start of MED TEST, the company was already certified ISO 14001 but was aware of a lack of know-how in resource management and implementation of good environmental practices.

Thus, its participation in the project allowed the company to revise its environmental policy in order to integrate the concept of clean production and to enrich and implement its action plan.

Presently, the company is oriented towards the use of the most eco-friendly chemical products so as to adopt the Oeko-Tex STANDARD 100.

#### Benefits

The MED TEST project has recorded net annual savings amounting to \$US 67,200 from electricity, gas, water, and chemical product consumption with an estimated investment of \$US 76,200. The pay-back period is estimated between 5 and 18 months.

Energy costs have been reduced by 15% installing an economizer at the boiler, leading to the recovery of heat from the boiler emissions through a heat exchange with water, and by the use of machinery monitoring systems.

Water costs have decreased by 19% through implementing a rinse water recovery and reuse system, as well as monitoring systems.

Chemicals costs have been reduced by 11% introducing a machinery monitoring system and a chemicals



**“Our ISO 14001 certification cannot fully respond to our expectations in terms of resource saving and environmental protection. For us, the MED TEST integrated approach is more complete and effective.”**

Nabil BEN HAMMOUDA, Washing Department Manager

management system in terms of storage, maintenance and handling.

Other environmental advantages have been achieved by revising the environmental policy and integrating the clean production concept, by identifying new significant environmental aspects such as preventive maintenance, water and energy recycling, as well as orientation towards the use of eco-friendly chemical products. Thus, new work procedures were installed such as chemicals management and comparative monitoring of water, energy and chemicals consumption.

A measuring and monitoring system for water, electricity, gas and chemicals consumption is being implemented in the washing department, with a benchmarking tool, in order to control consumption and follow up performance indicators.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Recovery of rinsing water of washing unit	12 800	15 700	1.3	Water: 11,250 m <sup>3</sup>	-
Boiler, economizer	18 400	25 000	1.4		930
Management of dyes and chemical products	11 000	5 500	0.5	Chemicals: 5%	
Usage of washing machine monitoring system	25 000	30 000	1.2	Chemicals: 6% Water: 3,500 m <sup>3</sup>	162
<b>TOTAL</b>	<b>67 200</b>	<b>76 200</b>			<b>1 092</b>

**Recovery of rinsing and washing water:** The AVANTEC washing machines are equipped with double water exits. This option facilitates the implementation of a system for reuse of rinse water, which requires the installation of gutters wired to the washing machines, pipes from the gutter to the recovery basin with a 60 m<sup>3</sup> capacity, a return pipe (equipped with branching system) leading back to the machines as well as water pumps in the retrieval and supply blocks. The quantities of reused water amount to 11,250 m<sup>3</sup>/year.

**Boiler, economizer:** The temperature of air emanating from the boiler is very high and can be used to heat water over the installation of water/air heat exchangers or economizer at the exits. The annual gas consumption amounts to 545 TEP/year, and the installation of the economizer will allow for savings of 930 MWh/year.

**Management of dyes, chemicals etc:** The management and reorganization of the storage facilities for chemical products has been achieved thanks to the processing of technical forms and Safety Data Sheets, to a purchasing policy that takes into

account the ecological characteristics of products when choosing among similar products, and to the application of best practices regarding the compatibility of products when stored and of necessary precautions such as retentions to prevent leaks and compliance with height standards in storage.

A system for monitoring product consumption was implemented in the storage areas and procedures for handling and maintenance were developed and applied. These changes have resulted in 5% savings of chemical products.

**Use of washing machine monitoring system (advanced programming options):** The washing machines have programming systems that are set manually by the machine operator. The advanced programming consists in establishing general washing and drying programmes and adding subprogrammes for facilitating adjustments, thereby eliminating manual interference and reducing error risk. The achieved gains concern time of process, now reduced by 25%, water consumption (3,500m<sup>3</sup>/year), thermal energy (162 MWh/year) and chemical products (6%).



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MED TEST Case Study

## TEXTILE sector — TUNISIA

# Textile finishing – Garment Dyeing Service (GDS)

### Company overview

GDS is an export-reliant dye-works company specialised in jeans and knits. Its production amounts to 10,000 pieces a day (reference year: 2010), divided into jeans (80%) and knits (20%).

At project start-up, the company had no certification and was aware that its financial competitiveness was jeopardized by an excessive consumption of resources. MED TEST enabled the company to launch measures in order to reduce over-consumption as well as process losses.

The company is currently heading for the use of the most eco-friendly chemicals and the adoption of a product ecolabel such as Oeko-Tex standard 100.



**“This project is very timely because we have to cope with an important amount of waste and have to control consumptions. Our goal is to solve our problems linked with resource efficiency and environment.”**

Mr. Dany LALLEMAND, Manager

### Benefits

The MED TEST project has identified an opportunity for annual financial savings of \$US 91,000 in electricity, gas, water and chemical products against an investment estimated at \$US 139,000. The payback period varies between four months and three years.

Energy costs were reduced by 7% through an intervention on process facilitating a better lab-workshop correlation and the reduction of the dye bath ratio for several procedures.

The costs of water and chemicals are reduced by 24% and about 25% through these actions on production process, together with an improved preventive maintenance management system (an efficient good practice tool) and the installation of an automated dosing system for chemical products.

The company has set up an environmental policy that integrates the clean production concept. The ecological aspect has been taken care of by adopting Oeko-Tex standard 100, which implies that the company is orienting itself towards the most eco-friendly and least toxic chemicals.

Moreover, the measures taken by the company to improve and better manage production processes, such as the age and manual use of machines or the diversity of dyeing procedures, have helped to reduce the environmental and financial impact of process losses generated by the company's activity.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Lab-workshop correlation	36 000	22 000	0.6	8,100 m <sup>3</sup> water Chemicals: 8%	770
Liquor ratio reduction for 6 machines	3 800	3 000	0.8	2,500 m <sup>3</sup>	142
Preventive maintenance	6 000	2 000	0.3	1,600 m <sup>3</sup> water Chemicals: 2%	55
Recovery and reuse of water in wool dyeing process	13 500	12 000	0.9	22,500 m <sup>3</sup> water	
Automated chemicals dosing in cotton section (11 machines)	32 000	100 000	3	Chemicals: 15%	
<b>TOTAL</b>	<b>91 300</b>	<b>139 000</b>	<b>1.5</b>		<b>967</b>

**Liquor ratio reduction for 6 machines:** This measure consists of liquor ratio switching from 1:12 to 1:8 for rinsing and softening baths, while pre-serving quality standards in all machines. This measure enables water and electricity savings of 2,500 m<sup>3</sup>/year and 142 MWh/year.

**Preventive maintenance:** This option implies the implementation of a tracking system for failures and machines consumption in consumables and spare parts. Preventive maintenance consists in the establishment of an intervention schedule aiming to eliminate water and steam leaks, as well as malfunctions engendering electricity overconsumptions or quality problems that result in losses of material or process input. This project generates savings in water (1,500 m<sup>3</sup>/year), energy (55 MWh/year) and chemicals (2%).

**Automated chemicals dosing in cotton section (11 machines):** The creation of a centralized station for dye dissolution, preparation of auxiliary products and distribution towards the 11 dyeing machines in the cotton workshop generates substantial

savings through an improved use of products and a reduction of their consumption by 15%.

**Lab-workshop correlation:** This measure consists of controlling the correlation rate between laboratory and workshop, facilitating the optimization of dye recipes in the laboratory in order to improve this ratio and prevent adjusting and redoing, which cause a waste of time, electricity, water, chemical products and therefore of productivity. The option has been implemented in one dyeing process (the “old” label, 80% of the whole cotton production) and has entailed a 30% improvement of the lab-workshop correlation and therewith savings in terms of water and electricity input (15%) and products (8%).

**Recovery and reuse of water in wool dyeing process:** This measure consisting in the retrieval of water used in certain wool dye-baths facilitates the retrieval and reuse of 15% of all process water. The rinsing baths will be reused within the preparatory stage. Water savings amount to 22,500 m<sup>3</sup> while financial gains add up to 19,000 DT.



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MED TEST Case Study

## FOOD sector — TUNISIA

# Oil and fat industry — General Industrial Food Corporation Slama (CSM - GIAS)

### Company overview

GIAS, one of the protagonists of the Tunisian economy, was founded in 1983. With a € 30 million annual turnover and some 500 employees, the company manages innovative and top brands, producing about 50 different products (margarine, ingredients for pastry shops or bakeries). The company has signed a partnership deal with CSM, the world market leader and top supplier for bakery products. This joint venture provides GIAS access to a wide distribution network throughout a large number of countries.

The company's incentive for joining the MED TEST project was to identify new ways of reducing energy consumption, as well as material losses in each production site.

Before the MED TEST project started, the company already had an integrated management system for safety, quality and environment in conformity with ISO 9001, ISO 22000, ISO 14001 and OHSAS 18001 standards.

### Benefits

The MED TEST project has identified opportunities for annual savings of \$US 137,700 in raw materials, semi-finished products, water, electricity and steam, against an overall investment of \$US 191,200. The payback period is estimated at 1.2 years. Most identified projects have been implemented in 2011.

Optimizing the cleaning in place (CIP) process has reduced water costs by 12%, mostly through the replacement of chemicals previously utilized with one single-phase ecological product at the margarine production site GIAS 1. Energy costs have been reduced by 17% through the implementation of an action plan based on a diagnostic review of steam and compressed air leaks, as well as in NH<sub>3</sub> chillers and CIP optimization.

**“The MED TEST method links up with the sustainable development axis of the 2015 Strategy adopted by CSM–GIAS. Intent on being a ‘green company’, CSM–GIAS has initiated a company culture based on cleaner production.”**

Zouhaier SAOUDI, Operational Director

Further environmental benefits have been achieved in terms of reduction of wastewater pollution, corresponding to 93% of annual COD (Chemical Oxygen Demand < 500 mgO<sub>2</sub>/L), through the implementation of three projects which have allowed for a better recovery of product losses in production (215 tons), an improved quality control of water flows entering the wastewater plant and a rigorous follow-up on the wastewater plant performance.

CSM-GIAS's integrated management system has been reinforced during the implementation of the project. Indeed, the quality policy has been updated to adopt a CP strategy. Certain procedures and instructions have also been created and/or updated; an example is the creation of a working instruction for the analysis of oil and grease contents in the wastewater stream. In addition, the OHSAS 18001 system has been updated to include new projects aiming at the improvement of operators' health and working conditions (for instance, local fume hoods for mixing powders, GIAS 35/5 planned for 2012).

The company, which has benefitted from skills training in Environmental Management Accounting, has been able to determine and implement several measures allowing for a 2.5% reduction of raw material losses in production site GIAS 4, formerly identified as the main cost centre. The company has adopted EMA practices and implemented a system for weekly follow-ups in each production site.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Product losses	25 000	-	-	120 tons products	
Optimization of CIP, GIAS1	11 200	7 700	0.7	2,300 m <sup>3</sup> water	50
Optimization of wastewater treatment	14 000	28 000	2		-
Preventive maintenance	10 500	3 500	0.3	1,000 m <sup>3</sup> water	830
Optimization of NH <sub>3</sub> chillers	70 000	138 000	1.9	95 tons product 700 m <sup>3</sup> water	632
Sustainable design of new cold storage at GIAS 2	7 000	14 000	2		100
<b>TOTAL</b>	<b>137 700</b>	<b>191 200</b>	<b>1.4</b>		<b>1 612</b>

**Product losses:** CSM-GIAS has adopted a method for reducing product loss in different production sites, mainly in the topping and icing site GIAS 4. This measure has allowed for the recovery of 33% of products lost during production starts and for their reintegration into the process, which has consequently reduced COD charges by 28%, an achievement in compliance with the national water discharge regulations.

**CIP optimization at GIAS1:** After obtaining satisfying results during one month testing of a single-phase product for CIP of the pasteurizer, chemical cleaning products used at GIAS1 have been replaced; which has allowed for water savings worth 12% of the total volume of water consumption in the company. COD charge and electricity consumption were reduced respectively by 7% and 1%.

**Wastewater treatment optimization:** Equipment purchases have allowed for very satisfying results (DCO < 500 mg O<sub>2</sub>/L), bringing sewage treatment into compliance with national wastewater regulations and reducing COD by 57%.

**Preventive maintenance:** The implementation of the action plan has contributed to a 3% reduction in the overall water consumption, a 10% reduction in thermal energy and 4.2% in electricity. The achieved financial gains have an immediate payback period (<1 month). Currently, a leak inspection programme is included in the weekly maintenance schedules.

**NH<sub>3</sub> chillers optimization:** The acquisition of a new compressor with variable speed drivers and an evaporative condenser has facilitated the optimization of the NH<sub>3</sub>-based cooling circuit for margarine crystallization, which has reduced inactivity periods due to low temperatures, thereby facilitating the recovery of 95 tons of product losses, the decrease of electricity consumption by 632 MW/year, corresponding to 12% of total electricity consumption, as well as 2% savings in water.

**Sustainable design of new cold storage (GIAS 2):** This project is a reference case for the application of CP principles when investments are at planning stage. The revision of the initial project design for a new cold storage room has highlighted the opportunity of moving the evaporators originally situated at the two ends of site GIAS 2 to the site's corridor, so as to facilitate the homogeneous circulation of cold air. As a consequence, the energy demand of the new cold group should decrease by 5%.



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MED TEST Case Study

## TEXTILE sector — TUNISIA

### MEGASTONE

#### Company overview

MEGASTONE is specialized in jeans bleaching, dye-works and special effects treatments. It has a washing capacity of 12,000 pieces a day and exports 100% of its production.

At project start-up, the company, no longer meeting the environmental standards for wastewater, had lost its ISO 14001 certification. It was aware of a know-how deficit in terms of resources management and implementation of good practices; energy costs, for instance, had risen by 40% between 2007 and 2009.

Thanks to MED TEST, the company was able to revise its environmental policy and aspect register, so as to integrate cleaner production principles and good practices. The company is currently striving to make use of more environmentally friendly chemicals, in order to become certified Oeko-Tex Standard 100.

#### Benefits

MED TEST has identified annual savings opportunities of \$US 55,600 in electricity, gas, water and chemicals against an investment estimated at \$US 76,500. The pay-back period is expected between 4 and 26 months.

Energy costs have been reduced by 30% by installing an economizer at the boiler, operating the machines in automatic mode and insulating steam pipes.

The costs of water and chemicals have fallen off respectively by 10% and 12%. The preliminary improvement of the lab-workshop correlation will generate savings in water, chemicals and energy, by optimizing the laboratory recipes in order to directly reproduce them in production, by bettering automation level and batching precision, and by raising awareness among operators.



**“As we are facing tough price competition, we are forced to keep our costs under control to remain on the market. MED TEST has given us insights on our hidden costs and helped us move towards significant saving opportunities, in order to maintain competitiveness.”**

Abdelkader SOUALEH, General Director

Further environmental benefits have been achieved through revising the environmental policy to include cleaner production and identify new significant environmental aspects such as preventive maintenance, maintenance management for machines and enhancement of the implementation plan for efficient energy management.

Currently, a benchmarking system for tracking and measuring the consumption of water, electricity, gas and chemicals of the washing department is being installed in order to monitor consumption and follow up on performance indicators.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Preventive Maintenance	1 000	3 000	0.3	Water: 900 m <sup>3</sup> Chemicals: 2%	30
Boiler economizer	20 600	4 000	2.2	-	1 042
Insulation of steam pipe network	9 500	11 400	1.6		482
Upgrades of the automation system of washing and drying machines	24 500	17 100	0.7	Chemicals: 10% Water: 3 000 m <sup>3</sup>	304
<b>TOTAL</b>	<b>55 600</b>	<b>35 500</b>	<b>1.4</b>		<b>1 858</b>

**Preventive maintenance:** This measure consists of implementing a monitoring system for machine breakdowns and related consumption of spare parts and consumables. Preventive maintenance includes intervention planning for maintenance operations, aiming at the elimination of water or steam leaks and of operational problems that cause energy overconsumption or quality lapses inducing losses of materials and process inputs. This project allows for savings in water (900 m<sup>3</sup>/year), energy (30 MWh/year) and chemicals (2%).

**Boiler economizer:** The significant boiler flue gas temperature can be exploited to heat up water through the installation of heat exchangers (or economizers). The latter allow for energy savings of 1,042 MWh/year. This measure has been studied but not implemented yet.

**Insulation of steam pipes:** The steam network causes losses due to a lack of thermal insulation of the pipes, that add up to

5,71 therms/hour. In order to eliminate them, the plan is to insulate the steam pipes with rock wool subsequently covered by an aluminium duct. Energy savings will add up to 482 MWh/year, corresponding to about 7% of thermal energy consumption.

**Upgrades of the automation system of washing and drying machines:** The company plans to replace the washing and drying machines programmer, to change or repair the water levels of the washing machines and to install individual water meters as well as humidity control phials in the tumble dryers. Furthermore, centrifuges are to be equipped with time-out mechanisms, broken time-out hardware shall be repaired and the degree of residual humidity controlled, all to adjust centrifuging and drying times. The economic savings relate to a reduction per year of process duration (15%), consumption of water (3,000 m<sup>3</sup>), thermal energy (304 MWh) and chemical products (10%).



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MED TEST Case Study

## FOOD sector — TUNISIA

# Beverage industry — Cap-Bon Beverage Company (SBC)

### Company overview

The Cap-Bon Beverage Company (SBC) is part of DELICE, the leading group in the Tunisian dairy industry. The site produces approximately 286,382 hl/year of beverages, divided among local brands and Coca-Cola.

To rationalize water and energy consumption, and to position itself as an environmentally responsible company towards competitors, were among the company's primary motivations for taking part in the MED TEST project.

At project start, the company did not have an environmental and safety management system, however a health and security committee was operational. The site is currently implementing the Total Coca-Cola Quality System standard, which includes an environmental facet.

### Benefits

The MED TEST project has generated annual financial gains worth \$US 75,454 in raw materials, semi-finished products, water and electricity, against an overall investment of \$US 56,331. The payback period is estimated at 9 months. Most of the identified measures have been implemented in 2011.

The cost of electricity has been cut by 21%. Among the measures for electricity savings, the optimization of compressed air production yielded the highest gains. As a matter of fact, the company installed a management system and variable speed drivers that considerably reduced the electricity demand of the 40 bar compressors. The company has achieved gains of 22% on water costs through the implementation of several projects: the most relevant one was the recovery of rejects from reverse osmosis (RO) to supply a secondary RO unit.



**“In subscribing to the MED TEST project, SBC has committed to maintaining its image as an environment-friendly company.”**

Karim BELOUARDA, Chief of the Energy and Environment Section

In terms of wastewater treatment, the company achieved annual reductions of 25% in BOD<sub>5</sub> and 32% in COD. The improvement was a logical consequence of the reduction of product losses, especially for sugar and concentrate. This improvement will enable the company to renegotiate the wastewater treatment cost, currently charged by another company STIAL belonging to the group DELICE.

During the implementation of the MED TEST project, SBC has been provided with the necessary tools to ensure a good linkage between its Cleaner Production programme and an environmental management system (EMS) based on ISO 14001, that will contribute to the good management of all implemented measures and their sustainability. Within its EMS framework, the company has come to define its environmental policy and has implemented operational procedures, as well as an adequate environmental management scheme.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Water conservation	17 602	29 738	1.7	18 310m <sup>3</sup> water	-
Heating ventilation and air conditioning (HVAC)	15 887	6 562	0.4	-	191
Reduction of product losses	20 170	1 381	< 0.1	16 tons sugar 300 m <sup>3</sup> water	-
Air compressed circuit, compressors	21 795	18 650	0.8	199 m <sup>3</sup> water	709
<b>TOTAL</b>	<b>75 454</b>	<b>56 331</b>	<b>0.8</b>		<b>900</b>

**Water conservation:** Several measures facilitating a reduction of water consumption have been implemented. Among them is the installation of a system that allows adjusting the rinsing water volume according to the size of contents and end products. This water can therefore be reused after filtration. Recycling reject water from reverse osmosis (RO) unit into a secondary RO unit will increase the efficiency of the water treatment process. Although this raised electricity consumption by 0.9%, the overall implemented measures have led to significant gains of 18,310 m<sup>3</sup> water.

**Heating ventilation and air conditioning (HVAC):** The company has brought about a loads reduction on the air-conditioning system through the removal of a cooling unit of the blower outside the workshop, as well as the installation of heat exhaust hoods on some machines. As a consequence, the electricity consumption has been reduced by 191 MWh, which has brought about a reduction of 95 tons in CO<sub>2</sub> emissions.

**Reduction of product losses:** 4.8% of sugar, corresponding to 16 tons/year, has been recovered from the rinsing of the syrup residues between batches, as well as its reuse as supplement for subsequent fabrications. Moreover, the company has opted for using CO<sub>2</sub> instead of water for pushing product between pipes and equipment, thereby recovering 6.8 tons of concentrate. These measures have also reduced wastewater loads BOD<sub>5</sub> and COD by 32 tons/year and 60 tons/year respectively.

**Air compressed circuit, compressors:** The 40 bar compressors use 35% of the annual electricity consumption. These machines were running in on/off mode with a 500 litre buffer balloon, which led to a reduced performance due to frequent starts and stops. This problem has been solved by installing variable speed drivers on the compressors motors. This has cut down electricity consumption by 15% and chilled water demand to cool compressors. Moreover, flow meters and KWh meters have been installed at compressors allowing for real-time detection of malfunctions and helps to prevent their return. This good practices measure has had a positive environmental impact, also engendering electricity savings of 48 MWh.



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MED TEST Case Study

## FOOD sector — TUNISIA

# Canned food production — Company Cap-Bon (SCAPCB)

### Company overview

Founded more than half a century ago, SCAPCB has a production capacity to process 1,200 tons of fresh tomatoes daily. It is the first exporter of harissa on the international market, including France, Italy, Germany, Belgium, Qatar, Algeria, Libya, etc.

The company was motivated to join the TEST MED programme in order to identify possibilities to increase efficiency in resource management and productivity, reduce the pollution costs and minimize investments and operational costs of the used waters processing plant.

At the beginning of the project, the company already had ISO 9001 and ISO 22000 certificates; in 2009, out of concern for environment, it voluntarily set about to implement a system of environmental management, security, and health on the workplace in accordance with ISO 14001 and B.S OSHAS 18001 standards.

### Benefits

The MED TEST project has identified an annual financial gain of \$US 73,639 in terms of raw materials, semi-finished products, water and steam with a total investment of \$US 98,139. The return on the investment is expected within one year. Most of the identified saving opportunities deal with water conservation, as this aspect is one of the company's main priorities. Part of the identified projects have been implemented throughout 2011; others are planned for the first half of 2012

The costs of water were cut by 44% through the recovery of water and its subsequent reuse in the pre-washing of tomatoes, the optimization of the tomato washing transporter belts, and the installation of a buffer water tank to improve the water distribution system.

The energy costs in terms of steam were reduced by 9% after the implementation of actions designed to reduce steam consumption within tomato pre-heating process.

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**“The TEST approach supports the hunt for squandering and the efficient use of resources, thereby facilitating financial and environmental gains which reinforce company performance.”**

Sofiane GASTLI, Manager

The implementation of certain projects (especially the recovery of tomato waste) will allow the company to achieve other environmental advances that will in turn facilitate a reduction of pollution costs (BOD<sub>5</sub> and COD) by 80% in comparison with the previous year.

The integrated management system SCAPCB was enforced throughout the implementation of the project. In fact, the company reviewed its quality and environment policy, integrating the aspect of cleaner production (CP). Furthermore, certain procedures and instruction manuals were created, such as the procedure for water reuse. As a part of the implementation of an environmental management system, SCAPCB conducted its own environmental analysis. An environmental programme was undertaken, including all CP measures identified during the implementation of the TEST project. The company plans to achieve the ISO 14001 standard within the second half of 2012.

## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Reuse of tomato washing water for pre-washing	2 071	2 142	1	50,000 m <sup>3</sup> water	
Optimization of water sprinkling on conveyor belts used for tomato washing	9 800	715	<0.1	16,737 m <sup>3</sup> water	
Pre-heating process	23 000	2 140	<0.1		761
Conception of a buffer water tank	24 000	93 000	4	60,000 m <sup>3</sup> water	
Process water treatment unit	1 768	142	<0.1	3,000 m <sup>3</sup> water	
Valorization of tomato marc	13 000	-	-	900 tons tomatoes	-
<b>TOTAL</b>	<b>73 639</b>	<b>98 139</b>	<b>1.3</b>	<b>-</b>	<b>761</b>

**Reuse of tomato washing water for pre-washing:** This refers to the retrieval of 50,000 m<sup>3</sup> of well water previously discharged, and its reuse for the pre-washing of fresh tomatoes. This has facilitated a 12% reduction in the overall water consumption on the site, which consequently contributes to the reduction of the hydraulic load of the wastewater treatment plant.

**Optimization of water sprinkling on conveyor belts used for tomato washing:** After a modification of the nozzle (company design) used for pre-rinsing and final rinsing of fresh tomatoes, the company could reduce its overall water consumption by 40%. This has also permitted the overall improvement of the quality of finished products in comparison to the previous year.

**Valorization of tomato marc:** This project consists in the sale of 900 tons of waste from tomato refinement to the farmers who use it to enrich animal fodder. Thus a timely waste disposal is facilitated and the cleanliness of the company site is ensured. Moreover, in the future the company will seek to valorize tomato marc for the extraction of lycopene or essential oils for cosmetic usage.

**Pre-heating process:** The company has implemented several measures seeking to reduce thermal energy. These measures include the installation of a continuous control system for steam debit and pressure upstream the block valve, a pressure meter after the hub and the insulation of all non-insulated parts on steam piping (switch latches, valves, etc.). These measures have allowed for a 40% reduction in thermal energy consumed at the pre-heating stage, corresponding to 761 MWh/year.

**Conception of a buffer water tank:** The conception of a water tank with a 300 m<sup>3</sup> capacity has allowed for a more efficient distribution and a more economical use of drilling water, as well as the protection of submerged pumps against water currents. A total 15% reduction of the overall water consumption has been achieved, corresponding to 60,000 m<sup>3</sup>.

**Process water treatment unit:** The company has carried out physicochemical and bacteriological analyses of the wastewater from the regeneration of the resin (reject) at the process water treatment unit. The achieved preliminary results were satisfying. A quantity of 3,000 m<sup>3</sup>/year could be reused for second grade applications and generate gains of 7% relative to the total water consumption.



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MED TEST Case Study

## LEATHER sector — TUNISIA

# Tannery industry — Société Moderne des Cuirs et Peaux (SMCP)

### Company overview

SMCP is a leather company founded in Sfax in 1965. The tannery's production is distributed in ovine skins (57%, 525 tons/year), goat skins (10%, 90 tons/year) and bovine skins (33%, 300 tons/year). It produces for both local and international market.

The company joined the MED TEST project in order to identify opportunities for improvement regarding the pollution linked to its activity and to improve its environmental performance, which will in turn help it to conform to regulations and facilitate access of its goods to the international market.

While the company is already in the process of implementing an ISO 9001 standard, its adhesion to MED TEST represents an opportunity to integrate in the near future an Environmental Management System (EMS) in line with ISO 14001 standards.

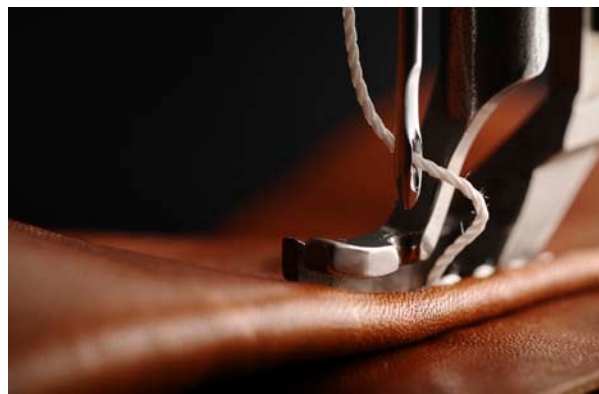
### Benefits

The MED TEST project has identified an opportunity for \$US 97,200 of annual savings in electricity, water and chemicals, against a \$US 287,000 investment with a three-year payback period. The identified cleaner production measures are under implementation.

The gains resulting from the minimization of chemicals use are mainly as a result of substantial reductions in the volume of chrome (up to 77%) as well as of auxiliary products (e.g. salt), which are estimated at 15%.

Water consumption has been reduced by 22% through the installation of new systems for dosing and control water in the drums, hide splitting and recycling of pickle liquors.

Insulating steam and hot water pipes has reduced energy costs. The tannery plans to cut down its thermal energy



**“Opting for finished leather export, SMCP has adopted the TEST approach in order to improve its environmental performance and raise its international market share.”**

Amine BEN ARABE, Director

consumption by 10% in the coming years, when the tannery's industrial area will be connected to the public natural gas network.

As for environmental improvements, the company has focused on a reduction of its wastewater loads and an improvement of the existing water treatment plant, to achieve 80% reduction in COD, corresponding to annual financial gains of \$US 14,000. Taking into account all the measures adopted by the company, substantial environmental gains have been achieved, corresponding to approximately 40% reduction of chlorides discharges.

Parallel to the identification of minimization opportunities, the company has outlined its own environmental policy and begun to look for further areas of potential improvements.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Hide splitting	26 000	72 000	2.5	1,850 m <sup>3</sup> water	-
Water savings, dosing and control in the drums	17 000	35 000	2	5,500 m <sup>3</sup> water	68
Hot water/steam pipes insulation	1 700	5 000	3	-	31
Drumming and salt reduction	17 000	43 000	2.5	72 tons of Cl	-
Reuse of recovered chromium	24 000	107 000	5	24 tons of Cr	-
Recycling of pickle liquors	11 500	25 000	3	2,250 m <sup>3</sup> water	-
<b>TOTAL</b>	<b>97 200</b>	<b>287 000</b>	<b>3</b>		<b>99</b>

**Hide splitting:** This option limits the consumption of chemicals (15 tons/year of chrome) and water (1,850 m<sup>3</sup>/year, i.e. 4% of the global process water), thus minimizing the environmental impact of the site.

**Water savings – dosing and water control in the drums:** In addition to using drums with low water consumption, already installed some years ago, the tannery has proceeded to install an on line metering system for water flow and bath temperature in the drums, which has led to savings in water (10%) and thermal energy (7%).

**Insulation of hot water and steam pipes:** Heat dispersion through the hot water and steam pipes causes a significant loss in thermal energy. Their insulation allows for a reduction of thermal energy consumption (3%), as well as of CO<sub>2</sub> (10 tons).

**Reduced use of salt in skin and leather drumming before soaking:** The tannery's equipment, with a perforated shaking

drum, facilitates the elimination of salt from the salted hides before the soaking stage, which results in the elimination of 120 tons/year of salt, in a 40% reduction of chlorides in wastewater, and in lowering COD and BOD<sub>5</sub> loads.

**Reuse of recovered chromium:** The chromium sulphate recovered after precipitation and filtering can replace 46% of the new chromium with no impact on the quality of finished leather. This technique allows for the reuse 24 tons/year of recovered chromium otherwise discharged as sludge, and for \$US 24,000/year savings, taking into account the additional electricity costs.

**Recycling of pickle liquors:** Pickle liquors can be recycled in the pickling process or reused in the tanning process, allowing for a reduction of the quantities of salt and effluents discharged into the sewer. As a result, the lower demand for chemicals entails a reduction of 45 tons/year of salt; of 5% of the annual water consumption within the production process; and of wastewater pollution loads, especially in sulphur acids, formic acids and COD.



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MED TEST Case Study

## FOOD sector — TUNISIA

# Beverage industry — Société Nouvelle de Boissons (SNB)

### Company overview

SNB, a leading carbonated soft drinks producer, is part of the Tunisian holding “Société Frigorifique et Brasserie de Tunis (SFBT)”. The company produces approx. 635,000 hl/year of its own brands and Coca-Cola licensed beverages for the local market and for export (50%).

The company was motivated to join the MED TEST project to identify opportunities for increasing resource efficiency and productivity, reduce pollution loads in order to minimize investment/operational costs of the planned wastewater treatment plant.

At project start-up the company was already certified ISO 9001, ISO 22000 and had completed the design of its EMS according to the ISO 14001 and of its occupational health and safety system in line with OSHAS 18001 standards.

### Benefits

The MED TEST project identified annual total savings of \$US 194,600 in electricity, natural gas, water, raw materials and product savings with an investment of \$US 29,200. The simple pay-back period is less than 2 months. All the measures have been implemented by the company in 2011.

Energy costs have been reduced by 14% by implementing heat recovery at syrup preparation unit, installing a frequency variator on compressors and a compressed air recovery system at PET bottle blowing machine. CO<sub>2</sub> emissions were reduced by 464 tons/year.

Water costs decreased by 12% through optimizing Cleaning in Place (CIP) and applying several conservation measures to reuse high-grade rinsing water into second-grade applications (e.g. washing of sand and carbon filters at the water treatment unit).



**“MED TEST has enabled SNB to implement a culture of rationalization of the use of natural resources for the good of the company and of the environment.”**

Lasaad MZEH, Director General

Additional environmental benefits have been achieved in terms of wastewater pollution loads reductions, corresponding respectively to 17% BOD<sub>5</sub> and 10% COD annual loads, mainly resulting from improved management of return goods from clients and online product recovery. These have reduced the investment and operational costs of the wastewater treatment plant at design stage.

In parallel to the identification of saving opportunities, the site has designed an EMS system according to ISO 14001 standard, fully integrating resource efficiency into company policy, action plans and internal procedures. This will ensure the sustainability of all identified actions at company level, as well as the development of new projects. Top management already started to capitalize on the experience gained by engaging its own internal team in replicating TEST at manufacturing sites within the holding group.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Expired, damaged and out of specs products	66 000	-	-		
CO <sub>2</sub> supply and distribution system	35 000	2 700	< 0.1	80 tons CO <sub>2</sub>	99
CIP and water savings	53 400	10 000	0.2	9 300 m <sup>3</sup> water	
Heat recovery in syrup preparation	6 600	3 300	0.5		338
PET bottle blowing	1 100	-	-		8
Distribution pumps, compressed air	32 500	13 200	0.4		359
<b>TOTAL</b>	<b>194 600</b>	<b>29 200</b>	<b>0.1</b>		<b>804</b>

**Expired, damaged and out of specs products:** The implementation of a management system for on-time sorting of returned goods from clients has recovered 0.4% of product and has reduced by 95% the volumes of non conforming products sent to drain. As a result COD and BOD<sub>5</sub> loads were reduced respectively by 27 tons/year and by 21 tons/year. An on-site segregation procedure and a storage system have been put in place to valorize expired/damaged products as animal feed.

**CIP and water savings:** The site implemented several measures for optimizing the levels of water and chemical consumptions and recover product (0.15%). These included: recovery of final CIP rinse of the filling machine and of rinsing PET bottles/cans into the water treatment system for washing of sand and carbon filters and for production of softened water; installation of on-line conductivity/pH transmitters for product recovery during in-line transfer between tanks and equipment; soda recovery after cleaning of the PET and can lines. These measures resulted in reduction of 9.7 tons/year COD and 7.6 tons/year BOD.

**CO<sub>2</sub> supply system:** 10% of the CO<sub>2</sub> consumption corresponding to 80 tons/year has been recovered and reused at the cans filling lines. In addition, the evaporation of liquid CO<sub>2</sub> has been performed using heat recovery from the water inlet (40°C) to the cooling tower, by installing a company designed heat exchanger.

**Heat recovery in syrup preparation:** Water with sugar mixture is pasteurized at 85°C before filtering and cooling down to 22°C. Chilled water used for cooling has been replaced by process water installing a heat exchanger to recover calories into the next batch and reduce cooling demand. This option will increase production capacity and reduce 10% of total gas consumption.

**PET bottle blowing:** Manufacturing of PET bottles is a key electricity consumer with multi stadium compressors at 40 bars. Part of the compressed air had already been recovered by the company at the PET blowing line in the pre-blowing stage. The project identified a significant saving opportunity for recovering excess compressed air back to the compressors that would reduce electricity consumption of the line by 40%. This option requires some investments for modifying the compressors. In the meantime the company started to recover the excess compressed air into the utility circuit at 7 bars, without any investment.

**Distribution pumps, compressed air:** Implementing variable speed drivers at two 7 bars compressors and in the cooling tower will reduce electricity consumption by 338 MWh/year. Reducing the pressure level at distribution systems of compressed air from 36 to 32 bars and from 7 to 6.7 bars, has resulted in saving additional 21 MWh/year.



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MED TEST Case Study

## TEXTILE sector — TUNISIA

### Textile finishing – STARWASH

#### Company overview

STARWASH is a fully export-oriented company for jeans fabrics dyeing and bleaching. Its production amounts to 2,000 pieces a day (reference year: 2010), divided into washing (80%) and dyeing (20%).

At project start-up, the company had no certification and was aware that its financial competitiveness was jeopardized by a poor environmental performance in terms of resources consumption and cost structure.

The project implementation enabled to single out several measures that allow saving substantial percentages of production inputs. Moreover, good practices were implemented to optimize chemicals consumption and reduce wastes.

#### Benefits

The MED TEST project has identified opportunities for annual financial savings of \$US 28,000 in electricity, gas, water and chemical products against an investment estimated at \$US 37,000. The payback period varies between 14 and 17 months.

Energy costs were reduced by 14% through a process intervention setting up a better lab-workshop correlation and the reduction of the dye bath ratio for some procedures.



**“Our company needs assistance to gain control over its consumptions and therewith its production costs. The project fully matches our expectations.”**

Habib JEBRI, Manager

The costs of water and chemicals are reduced respectively by 30% and about 17% through these actions on production process and the establishment of an improved preventive maintenance management system and of an automatic dosing system for chemicals.

The company has set up an environmental policy that integrates the cleaner production concept.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Machines advanced programme control	8 800	10 000	1.2	2 600 m <sup>3</sup> water chemicals: 5%	110
Preventive maintenance	2 000	1 500	1.5	500 m <sup>3</sup> water chemicals: 2%	20
Partial reuse of rinsing waters	8 000	12 000	1.3	3 700 m <sup>3</sup> water	-
Lab-workshop correlation	10 000	14 000	1.4	1 000 m <sup>3</sup> water chemicals: 10%	220
<b>TOTAL</b>	<b>28 800</b>	<b>37 500</b>	<b>1.3</b>		<b>350</b>

**Machines advanced programme control:** Within the production cycle, the washing machines are equipped with programming control devices used in a manual mode through the operator's direct intervention. Advanced programming consists in setting up principal washing or drying programmes combined with sub-programmes for additions or adjustments, thus eliminating manual intervention and reducing error risk. This measure requires control valves, meters, probes, etc., to check the machines parameters. The gains concern a reduction of process time (by 25%), water consumption (by 2,600 m<sup>3</sup>/year), thermal energy (by 110 MWh/year) and chemicals (by 5%).

**Preventive maintenance:** The company has installed a tracking system for failures and machines consumption in consumables and spare parts. It also has set up an intervention schedule aiming to eliminate water and steam leaks as well as malfunctions engendering electric overconsumption or quality problems that result in losses of material or process input. This project thus facilitates savings in water (500 m<sup>3</sup>/year), energy (20 MWh/year) and chemicals (2%).

**Partial reuse of rinsing waters:** The washing machines are equipped with a double water exit. This option requires the installation of a rinsing water recycling system consisting in a gutter connected to the washing machines, a pipe connecting the gutter to a 40 m<sup>3</sup> capacity water recovery basin, a return pipe leading to the washing machines with a feed-in and feed-out branching system and water pumps. The water recovery amounts to 4,700 m<sup>3</sup>/year.

**Lab-workshop correlation:** This measure consists in controlling the correlation rate between laboratory and process and the optimization of dye recipes in the laboratory in order to prevent adjusting and redoing, which cause a loss of time, electricity, water, chemical products and therefore competitiveness. This action has achieved a 25% improvement of the lab-workshop correlation and therefore annual savings in terms of chemicals (10%), electricity (220 MWh) and water (14,800 m<sup>3</sup>).



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MED TEST Case Study

## TEXTILE sector — TUNISIA

# Teinturerie Finissage Méditerranéenne (TFM)

### Company overview

TFM is a company specialized in textile dyeing and finishing. Its business field covers bleaching, dyeing and finishing. The company exports 70% of its production. Over the year 2010, it achieved an annual production of 6 million linear metres of fabric.

TFM has been among the first companies to implement the MED TEST project in order to improve productivity, resource efficiency and waste minimization, and ultimately to reduce waste treatment costs.

At project start-up, the company had no certified management system but it is now certified Oeko-Tex standard 100 and is setting up an ISO 14001-based environmental management system.

### Benefits

The MED TEST project has identified improvement options worth \$US 491,860 of annual savings in electricity, gas, water and chemical products, against an investment estimated at \$US 1,264,645. The pay-back period varies between 6 months and 5 years.

Energy costs have been reduced by 10% thanks to the implementation of heat exchangers in the mercerizing and washing units, to the thermal isolation of steam conducts, to the installation of special regulators on the PTZ gas hubs (because it depends on gas pressure, on the temperature and nature of the gas used) and by the installation of economic bulbs for lighting.

The cost of water will decrease by 56% thanks to the installation of a treatment and recycling system for wastewater, which subsequently will be reused in the process at a rate of 80%. This project is in the study phase.



**“Our company needs assistance to gain control over its consumptions and therewith its production costs. The project fully matches our expectations.”**

M. MOTTA, Director General of TFM

The cost of chemical products will decrease by 25% through the installation of a system for recovering caustic soda at the mercerization stage.

Other environmental advantages have been achieved through improvement in the management of chemical products storage and handling, and optimization of use in lab works, leading to a substantial reduction in the pollution load of waste water. In addition, the implementation of Oeko-Tex standard 100 improved the choice of products based on their ecological merit.

Environmental management accounting has been taken up by the company; currently, department-specific means for the measurement of different process input will be installed, which in the near future will allow for real-time monitoring of consumptions and costs by centre of costs, as well as for data integration into the environmental management accounting system.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Heat recovery at mercerizing unit	8 000	7 500	1		551
Caustic soda recovery in mercerizing unit	285 000	430 000	1.5	600 tons NaOH	
Insulation of steam pipe network	17 500	19 285	1.1		976
Treatment and reuse of wastewater	175 000	800 000	5	135 000 m <sup>3</sup> water	
Installation of regulators on the PTZ gas hub	3 930	5 000	1.3		197
Lightening, installation of energy-saving bulbs	2 430	2 860	1.2		88
<b>TOTAL</b>	<b>491 860</b>	<b>1 264 645</b>			<b>1 812</b>

**Heat recovery at mercerizing unit:** The energy recovery project consists in the installation of a heat exchanger at the machine exit in order to recover calories for fresh water feeding the machine. The annual water consumption is about 130,300 m<sup>3</sup>, the heat exchange occurs between 90°C discharged water and fresh water with an average temperature of 20°C. Therefore thermal gains amount to about 45 th/m<sup>3</sup>, implying a total annual gain of 551 MWh/year.

**Insulation of the steam pipe network:** The steam network generates losses over the exchange with fresh air and over the lack of thermal isolation of the pipes. The losses incurred due to the complete absence of isolation on the network in question amount to 5,71 Th/h. To eliminate these losses, the project is to install isolation so as to insulate the steam pipes against heat. The isolation material opted for is rockwool, to be covered with an aluminium casing produced on the premises. The energy gains will be of 976 MWh/year (about 7% of the thermal energy consumption).

**Lighting, installation of energy-saving bulbs:** The project is to widely introduce economical lighting over 36W neon tubes, providing an annual gain of 88 MWh/year.

**Caustic soda recovery in mercerizing unit:** In the mercerization block, TFM annually consumes about 800 tons of caustic soda. The system in question is based on an advanced technology for thermal separation of soda and water. This allows for the retrieval of soda with a lower concentration, to be reused in the mercerization cycle. The caustic soda retrieval system allows to save up to 600 tons/year.

**Treatment and reuse of wastewater:** TFM consumes water of an average of 650 m<sup>3</sup>/d. The objective is to reprocess used water until its quality enables its reuse in the process. The treatment process therefore includes three stages: physicochemical reprocessing, biological reprocessing and tertiary cleaning: a filter system. This project, which will allow for the reuse of 500 m<sup>3</sup>/d, is still at the design stage.

**Installation of regulators on the PTZ gas hub:** Fuelled with natural gas under a pressure of 20 bar over the national STEG network, TFM is equipped with a 4 bar counting hub. The installation of a PTZ-type debit regulator (pressure, temperature, nature of gas) allows for the regulation of the remedial factor related to the varying temperature, which represents gains worth 197 MWh/year.



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MED TEST Case Study

## LEATHER sector — TUNISIA

# Tannery industry — Tanneries Mégisseries du Maghreb (TMM)

### Company overview

TMM, founded in 1976, is part of a Tunisian holding company. Heavily export-reliant, it operates in the leather sector and annually produces about 20 million square feet of ovine and bovine leather.

The company joined MED TEST in order to identify opportunities for improvement, reduce pollution and integrate Best Technologies Available (BTA) and Good Environmental Practices (GEP) into the production process.

The company was already certified ISO 9001 at project's start. Taking advantage of its participation in MED TEST, it has initiated an Environmental Management System (EMS) in conformity with ISO 14001 and plans to implement Corporate Social Responsibility (CSR) in the near future, following ISO 26000 standards.

### Benefits

The MED TEST project has identified an opportunity for \$US 446,800 of annual savings in electricity, gas, water and chemical products against an investment estimated at \$US 523,000. The return on investment is expected within a little more than one year. The identified cleaner production measures are under implementation.

Energy costs have been reduced by 15% through fuel switch to natural gas, insulation of steam and hot water distribution systems, installation of an economizer at the boiler, recovery of compressors heat losses into the dryer section, as well as the adjustment of the power factor.

The financial gains resulting from the reduced use of chemical products (e.g. chrome) and auxiliary products such as salt in the production process are estimated at 10%.

Water costs have been reduced by 14% thanks to the optimization of water consumption in the drums and



**“Aiming at the principle of ‘Ecological Tanning’, TMM has adopted TEST for a profitable environmental management approach.”**

Mr Sofiène BEN AMMAR, Deputy CEO

according to the hourly tariffs, the reuse of vacuum dryer condensates as well as the retrieval of process bathwaters (soaking baths) and their reuse.

Other environmental improvements have been achieved in terms of reduction of wastewater pollution loads, corresponding to approximately: 50% of chlorides through the use of punched drums and the installation of a refrigerated chamber for fresh hides storage, 39% of BOD<sub>5</sub> and 25% of COD in comparison to the annual loads, resulting mainly from the separation and retrieval of hairs before the process, the processing of sulphide and chrome baths, and the softening of process water (dyeing). These measures have cut operating costs of the wastewater treatment plant and improved its efficiency through annual reductions of 100 tons COD and 35 tons of nitrogen.

Parallel to the identification of minimization opportunities, the company has charted its own environmental policy and is implementing an EMS in conformity with ISO 14001 standards, thanks to the identification of further areas of improvement.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Reduced use of salt through drumming and cold conservation of skins	75 000	92 000	1.2	965 tons salt	-
Water savings	47 000	150 000	3.2	Water 46 000 m <sup>3</sup>	-
Steam system and compressors	222 800	46 000	0.2	-	1 705
Valorization of splits	55 000	110 000	2	1 500 tons waste	-
Reuse of retrieved chrome	30 000	100 000	3.3	150 tons chrome	-
Hair retrieval	17 000	25 000	1.5	-	9
<b>TOTAL</b>	<b>446 800</b>	<b>523 000</b>	<b>1.2</b>		<b>1 714</b>

### Reduced use of salt, drumming and cold conservation of skins:

The installation of a cold chamber for fresh hides storage helps minimize or even completely eliminate salt as a conservation agent. This option provides for net savings of \$US 50,000/year, taking into account additional electricity costs. Moreover, the company acquired a punched drum facilitating the elimination of all conservation salt stuck on the skins before the soaking process. It allows for a 50% reduction of salt in all liquid effluents, and therefore of chloride, COD and BOD<sub>5</sub> loads.

**Water savings:** The tannery has implemented several measures to cut down water consumption, which include the optimization of water consumption in the drums, the recycling of soaking and rinsing baths from tanning and post-tanning processes and their reuse in similar processes. The installation of submeters at each process enables an increased consumption control as well as the easy detection of possible overconsumption.

**Steam system and compressors:** The tannery has focussed its efforts to cut down energy consumption through: the installation of a boiler economizer, the insulation of steam and hot water pipes, the recovery of heat losses from the compressor into the dryer, and the fuel switch to natural gas.

**Valorization of splits waste:** The tannery has put in place an equipment to process splits resulting from the fleshing processes valorizing 1,500 tons/year of this kind of waste. The splits are ground then heated up to 75°C. The obtained liquid is separated in 2 phases: one proteinaceous phase valorized as fertiliser and retanning agent, and one fat phase valorized in the soap industry and as leather nourishment product.

**Reuse of retrieved chrome:** This technique allows replacing 30% of the new chrome with no effect on quality, thus saving 150 tons/year of chrome otherwise disposed of with the sludge.

**Hair retrieval:** The retrieval of intact hair from the drum through the installation of a filtering and recirculation system of the liming baths permits to reduce wastewater pollution loads by approximately 40% of TSS, 30% of BOD<sub>5</sub>, 25% of COD and 50% of sulphides. This allows for electricity savings within the sewage treatment plant of about \$US 8,000/year, corresponding to 48 tons of CO<sub>2</sub> per year and a 300 tons/year reduction of TSS.



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MED TEST Case Study

## LEATHER sector — TUNISIA

# Tannery industry — Tannerie du Nord Utique (TNU)

### Company overview

Based in the Utique industrial zone, TNU is a Tunisian company operating in the leather sector and producing for both local and international markets. Its total production amounts to 1,385 tons/year, segmented into different kinds of skins: bovine (58%), ovine (27%) and goat (15%).

The company joined the MED TEST project in order to identify opportunities for improvement regarding pollution linked to its activity and introduce Best Available Technologies (BATs) and Best Environmental Practices (BEPs).

Taking advantage of its adhesion to MED TEST, TNU has become familiar with EMS in line with the ISO 14001 standard and plans to implement it in the company.

### Benefits

MED TEST has identified an opportunity for \$US 126,585 of annual savings in electricity, water and chemicals against an investment of \$US 186,150 with a payback period of less than two years. The identified cleaner production measures are under implementation.

Energy costs are expected to be reduced by 70% by switching boiler fuel to gas once the industrial area is connected to the public natural gas network, installing a boiler economizer, a insulating steam and hot water pipes, and demineralizing well water used for boiler feed.

The financial gains resulting from the reduction of chemicals are estimated at 5% for finishing products, 30% for chrome and 10% for auxiliary products such as salt.

Water costs have been cut down by 8% through the installation of a high volume/low pressure pistol in the



**“Prioritising the pollution control principle, TNU has adopted the TEST approach to improve its environmental performance and comply with regulations.”**

Imed MALEK, Manager

finishing process; the use of a trial drum for testing purposes to improve quality and splitting of bovine hides.

Further environmental benefits, especially through drumming before soaking, have been achieved in terms of reduction of wastewater pollution loads, corresponding to about 10% of chlorides and 5% of annual COD flux. These measures have minimized the operating costs of the water treatment plant and allowed for annual reductions of 130,000 kg of COD and 65,000 kg of BOD<sub>5</sub>.

In parallel with the identification of cost minimization opportunities, the company is in the process of elaborating its own environmental policy so as to undertake the implementation of EMS in conformity with the ISO 14001 standard.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Using a test drum to improve quality	10 715	21 150	2	1,500 m <sup>3</sup> water	-
Drumming before soaking and salt reduction	8 570	25 000	3	170 tons salt	-
Hot water/steam generation and distribution system	63 000	64 000	1	-	1,197
Installation of high volume/low pressure pistol for finishing	2 150	2 500	1	5% finishing chemicals 300 m <sup>3</sup> water	-
Hide splitting	42 150	73 500	1.7	28 tons Cr 2,100 m <sup>3</sup> water	-
<b>TOTAL</b>	<b>126 585</b>	<b>186 150</b>	<b>1.5</b>		<b>1,197</b>

**Using a test drum to improve quality:** The use of the tannery's equipment with a test drum will make it possible to diversify production without squandering raw materials and auxiliary products and renew it by following fashion trends. It will also reduce COD (3%), as well as total water consumption, and most of all facilitate substantial gains in hides.

**Hot water/steam generation and distribution system:** Insulating hot water and steam pipes allows for a reduction of thermal energy consumption by 4%. Installing a boiler economiser, a softener for boiler water and switching fuel to natural gas will bring forth very substantial financial and environmental benefits, adding up to 70% of total annual thermal energy consumption.

**Drumming before soaking and salt reduction:** The installation of a punched drum enables the elimination of salt from the salted hides before the soaking stage, which results in the elimination of 170 tons/year of salt, a 10% reduction of wastewater chlorides and lower COD and BOD<sub>5</sub> loads.

**Hide splitting:** This option limits consumption of chemicals (28 tons/year of chrome) and water (1,800 m<sup>3</sup>/year, i.e. 4% of the global process water), thus minimizing the end-of-pipe environmental impact.

**Installation of a high volume/low pressure pistol for finishing:** About 50-70% of COV emissions are released by pistol finishing machines. Installing this equipment in the finishing stage will bring about reductions in consumption of finishing products (5%), water (300 m<sup>3</sup>) and COD (2 tons) and moreover cut down VOC emissions by about 40%.



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MED TEST Case Study

## TEXTILE sector — TUNISIA

### TRAITEX

#### Company overview

TRAITEX is a textile finishing company that provides services for tubular stitches exclusively, both in cotton and polyester cotton, and also processes denim-washing articles with special effects.

Concerning stitches finishing products, the company works exclusively for the local market, whereas washed jeans products are exported. Its annual production in 2010 was estimated at 400 tons.

Aware since 2007 that its production costs were increasing because of utilities costs (water and energy), TRAITEX looked for a means to reduce them. The MED TEST project represented an opportunity to achieve this goal.

At the beginning of the project, TRAITEX had no cost accounting in place and no management system. Today, the company has engaged an Oeko-Tex certification programme and developed indicators for water, energy and material consumption.

#### Benefits

The MED TEST project has identified opportunities for annual savings worth \$US 111,836 in electricity, gas, water and chemicals, through an investment of about \$US 181,800. The average return on investment ranges between 6 months and 2 years. The identified measures are within the financing capacities of the company.

Energy costs have been reduced by 39% through the automation of the production process, the optimization of the correlation between laboratory and workshop, the installation of economisers on the boilers and of PTZ for regulating the gas pressure feeding the company. These actions had a direct positive effect upon water consumption (reduced by 19%) and chemical product consumption (reduced by 15%).



**“We would like to have more control over our production costs, mainly for water, energy and production materials; the TEST methodology helped us to achieve this goal.”**

M. SABBAGH, Director General of TRAITEX

Other environmental advantages have been achieved in terms of reduction of the wastewater pollution load by diminishing the consumption of chemical products. The optimization of product and dyestuff storage and the efficient management of preventive maintenance have allowed for an improvement in the production performance, in turn leading to a reduction of process losses and the realization of economic gains. These options are now under implementation in the company.

The implementation of the Oeko-Tex ecolabel standard 100, aimed at improving the choice of products based on their ecological merit, is underway.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Optimization of laboratory activity	14 800	6 800	0.5	1,500 m <sup>3</sup> 5% chemicals	244
Installation of a boiler economizer	18 216	32 000	1.7		658
Automation of production machines	61 500	120 000	2	8,040 m <sup>3</sup> 10% chemicals	941
Installation of PTZ regulator on gas hub	2 320	5 000	2.2		114
Productivity optimization	15 000	18 000	1.2	4,500 m <sup>3</sup>	436
<b>TOTAL</b>	<b>111 836</b>	<b>181 800</b>	<b>1.6</b>		<b>2 393</b>

**Optimization of laboratory activity:** The project is to reactivate the spectrophotometer used for determining the colour nuances to be developed on the basis of the receipts, and for verifying the conformity of nuances. Optimization also concerns the small dyeing machines, by changing the alkali introduction system in order to allow the progressive introduction of alkali, thus passing from an all-in method that does not support the reproducibility in production to a system similar to that of the workshop. These changes allowed an annual gain of 1,500 m<sup>3</sup> in water, 244 MWh in energy and 5% in chemical products.

**Productivity optimization:** The project consists in working continuously in three shifts on a reduced number of machines (those considered the best). This will improve productivity for each machine, as well as the boiler efficiency, and will result in a productivity improvement (by 30%), and a reduction of energy and water consumption (respectively by 5% and 6%). The company has decided not to implement this action for the time being, due to resistance of its employees, who are not very favourable to change their actual working conditions.

**Automation of production machines:** Currently, dyeing machines are operated in a manual mode, and the functioning

parameters such as temperature, pressure, water volume and time are not well under control, which leads to problems in the dyeing process in terms of quality, costs and reproducibility. The automation of the process consists in installing monitoring mechanisms such as valves and temperature control instruments, and in automating them through the installation of microprocessors for better control. These works allow annual savings in water by 8,040 m<sup>3</sup>, in energy (941 MWh) and in chemicals (around 10%).

**Installation of regulators on the PTZ gas hub:** Fuelled with natural gas under a pressure of 20 bar over the national STEG network, the company is equipped with a 4 bar counting hub. The installation of a PTZ-type throughput regulator (pressure, temperature, nature of the gas) allows for the regulation of the corrective factor due to the varying temperature, which represents gains of 114 MWh/year.

**Boiler economizer:** The high temperature of boiler exhaust can be used to heat water over the installation of water/air heat exchangers (economizer) at the exits. The installation of the economizer will allow for savings of 658 MWh/year. The company will subsequently consider the implementation of this action.



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MED TEST Case Study

## FOOD sector — TUNISIA

# Milk and dairy industry — Tunisie Lait

### Company overview

Tunisie Lait is a dairy producer established in 1974. Its activities include the production and marketing of a wide range of beverages and other fresh products based on milk.

It annually produces about 73,316 hl for the local market and about 10% of its production is for export.

Among the key objectives that pushed the company to join the MED TEST project were the opportunities to learn how to reduce product losses, increase resource efficiency (water and energy) and improve the performance of the existing wastewater treatment plant.

At project start-up, the company was already certified ISO 9001, ISO 22000 and ISO 14001, but it currently plans to improve these systems in order to enhance environmental and economic performance.

### Benefits

The implementation of measures identified within the MED TEST project has led to substantial financial gains of about \$US 746,638, with an investment amounting to \$US 827,410, resulting in reduced total water and energy consumption of 16% and 13% respectively.

Moreover, the company's efforts to minimize production losses have enabled to cut them down by 1.3% (from 4.5% to 3.2%), which corresponds to annual financial gains of about \$US 369,310.

Further environmental benefits have been achieved in terms of decrease of pollution loads in wastewater, corresponding to 33% of annual loads of BOD<sub>5</sub> and 90% COD respectively.



**“MED TEST has contributed to the implementation of an efficient strategy to simultaneously reduce production losses and the environmental impact of our activities.”**

Imed GHARBI, General Manager

The company's integrated management system has been strengthened as well throughout the implementation of the project. Indeed, the quality policy has been modified to include commitment to preventive measures; the environment management programme has integrated an action plan for cleaner production, which involves projects to reduce energy and water as well as the minimization of material losses in the production process.

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## Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Flushing time of cream and germ separators	8 700	5 140	0.6	10,000 m <sup>3</sup> water	
Reception and pasteurization rehabilitation	434 000	490 000	1.1	19,000 m <sup>3</sup> water, 8,500 Hl milk	910
CIP optimization, product push and crate washing	94 900	77 570	0.8	86,580 m <sup>3</sup> water	220
Chilled water production	10 5000	160 000	1.5	-	1 130
Elimination of direct cooling at the sterilizer	52 900	51 700	1	59,904 m <sup>3</sup> water	1 292
Electrical system, preventive maintenance	51 138	43 000	0.8	10,000 m <sup>3</sup> water	613
<b>TOTAL</b>	<b>746 638</b>	<b>827 410</b>	<b>1.1</b>		<b>4 165</b>

**Flushing time of cream and germ separators:** This project essentially consists in a five-minute extension of the flushing time (time interval between the cleaning of cream separator and germ separator). This measure has entailed the reduction of water consumption by 2% and therewith of annual loads of BOD<sub>5</sub> by 3% and of COD by 12%.

**Reception and pasteurization rehabilitation:** The new project's approach consists of an on-line standardization of the semi-skimmed milk production, based on a system of densimetric scales. It will enable a total retrieval of the cream and its precise dosage into the skimmed milk. The implementation of this project will facilitate reductions of:

- milk losses resulting from product transfers by 1,3%, corresponding to 8,500 hl/year.
- water consumption by 4%, BOD<sub>5</sub> by 10% , COD by 29% and total energy consumption by 3%.

**CIP optimization, product push and crate washers:** Optimizing the time for pushing product between pipes and equipment at the milk and fresh dairy products lines, as well as a 50% reduction in the cleaning time of the cream and germ separators, have permitted reductions in water consumption (17%) as well as in BOD<sub>5</sub> (20%) and COD (59%). In addition, a closed system for water recovery has been installed at the crate washer to avoid

the previous open circuit. These measures have allowed for reductions in water and thermal energy (2% and 1% respectively).

**Chilled water production:** The installation of a control unit that regulates the chilled water flows according to the temperature of return waters has allowed for an 11% electricity reduction, equivalent to 1,130 MWh.

**Elimination of direct cooling at the sterilizer:** The installation of a closed loop in the bottle sterilizer line has made it possible to eliminate direct cooling with a shower system and to achieve the most substantial water and energy gain: the company has achieved reductions in water and thermal energy (13% and 5% respectively), equivalent to 600 MWh.

**Electrical system/preventive maintenance:** The installation of batteries of capacitors on the electrical panels of the main energy consumers (chillers, air compressor, sterilizer) has enabled to raise the power factor from 0.8 to 0.94 and to reduce the electricity consumption by 4%, corresponding to 500 MWh. A periodical inspection programme checking for leaks has also been devised by the technical maintenance office so as to come up with a maintenance schedule. As a result the company has achieved reductions in water (2%) and in total energy (about 1%).



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