



MED TEST Case Study

FOOD sector — EGYPT

Beverage industry — El-Nile Soft Drinks (Crush)

Company overview

Crush, a private Egyptian shareholding company founded in 1990, produces different types of soft drinks for the local market, Hi-Spot lemon, Crush orange and Sport cola, with a total production of 332,470 hl/year.

The company was motivated to join MED TEST to identify opportunities for increasing resource efficiency and productivity, reduce pollution loads so as to comply with environmental legislation and minimize investment/operational costs of the planned wastewater treatment plant.

At project start, Crush was already certified ISO 9001, OSHAS 18001, ISO 22000 and the Corporate EMS “Coca Cola” standard was already implemented. Within the course of MED TEST, the company initiated an EMS upgrading process according to the ISO 14001/2004 standard.

Benefits

The MED TEST project identified annual total savings of \$US 1,564,086 in water, raw materials, fuel and electricity, with an estimated investment of \$US 1,264,042. Some measures have excellent return on investment and immediate payback period. Most of the identified measures have been implemented in 2011.

Total energy costs will be reduced by 19% through implementation of several measures at the boiler house, RBG (Returnable Glass Bottle) line, lighting and the optimization of cleaning in place (CIP).

Water costs will decrease by more than 85% through the installation of a new CIP technology (ECA), good house-keeping and preventive maintenance measures and process water recycling. The new CIP unit uses Electro Chemical Activation (ECA) technology that dramatically reduces water, energy and chemicals consumptions,



“Through MED TEST, we have learned how to reduce production losses, save resources and increase productivity while complying with environmental regulations.”

Mr. I. Mahmoud MASSEKH, Chairman

besides increasing productivity due to a reduction of time for CIP.

Additional environmental benefits have been reached in terms of reductions of wastewater pollution loads, corresponding to 28% BOD₅ and 16% COD annual loads, mainly resulting from product recovery (19%).

These measures have cut down the investment and operational costs of the WWTP at design stage. MED TEST has assisted the company to fill in the required documentation for accessing EPAP II grants for funding both WWTP and ECA investment projects.

In parallel to the identification of saving opportunities, the site has updated the existing Coca Cola management system according to the ISO 14001 standard, fully integrating resource efficiency into company policy, action plans and internal procedures. This will ensure sustainability of all identified actions at company level as well as the development of new projects. New Environmental Management Accounting (EMA) protocols have also been introduced for tracking and monitoring the most important environmental costs, including those related to non product output costs.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
CIP using ECA technology	392 932	189 810	0.5	26 468 m ³ water	88
Water conservation and product recovery	253 086	51 433	0.2	122 320 m ³ water, 3 324 hl product	
Replacement of half-depth with new full depth plastic crates	193 939	750 000	4	3 324 hl product	
Good housekeeping and preventive maintenance	226 352	-	-	20 135 m ³ water, 10 306 hl product	
Boiler house	23 453	46 834	2		2 303
Optimization of RGB lines	474 324	225 965	0.5		64
TOTAL	1 564 086	1 264 042	0.8		2 455

CIP using ECA technology: Electro-Chemically Activated (ECA) water is a highly effective chemical substitute and a green alternative for cleaning and disinfection applicable to the beverage industries. This technology will enable savings of 88 MWh/year (3%) in electricity, 60% of CIP rinse water and 90% of chemicals used in the CIP. Accordingly, a reduction in TDS by about 634 tons/year (78%) has also been achieved. The new CIP reduces the duration of cleaning time to 1/3, thus increasing the site's productivity.

Water conservation and product recovery: The project identified several measures for optimizing water and product recovery: installation of water flow meters and monitoring plan; reuse of water discharged from washers I and II to save 54% of water consumption (this option has not been implemented because the company will reuse treated wastewater); installation of turbidity/refractive index transmitters to save 3,224 hl/year of product losses and reduce BOD₅ by 3% (2.4 tons/year) and COD by 1% (1.7 tons/year).

Boiler house: Insulating the large boiler, recovering heat from boiler exhaust and installing automatic blow-down system will save 21% of thermal energy consumption.

Good housekeeping and preventive maintenance: The project identified good housekeeping measures and maintenance programmes in order to eliminate excessive floor washing, close/seal running water taps; reroute forklifts pathways to avoid collision and prevent product damage and losses; avoid sending off-specs products to the drain through segregation and offsite recycling as animal feed. These measures resulted in reduction of product losses by 10,306 hl/year (3%), of raw materials losses by 8%, of BOD₅ by 12 tons/year and COD by 16 tons/year in wastewater.

Replacement of half-depth crates: The company manufactured and replaced its half-depth crates with full-depth ones to increase their lifetime and prevent glass bottles breaking due to accidents during transportation. This project resulted in increasing productivity due to reduced bottle-break incidents and pollution load (product to drain), BOD₅ by 5% (4 tons/year) and COD by 3% (5.3 tons/year).

Optimization of RGB lines: Two projects have been implemented for optimization of the RGB (Returnable Glass Bottle) line: replacing the glass walls with curtains to reduce heat stress; replacing the old forklifts with new models working with natural gas. The implementation of these two projects has reduced CO₂ emissions by 26 tons/year.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatec@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

FOOD sector — EGYPT

Vegetable and fruit processing — Edfina Company for Preserved Food

Company overview

Edfina is a large size food enterprise producing approximately 2,282 tons/year of frozen vegetables, juice, fruit nectar, canned food such as jam, tomato paste and legumes for the local market and for export (50%).

The company has joined the MED TEST project in order to improve its environmental performance, identify opportunities for increasing resource efficiency by solving the existing problems that mainly include: high water consumption, materials and energy losses.

At project start-up, the company was already certified ISO 9001, ISO 18001 and HACCP for food safety. The company has plans to design an EMS according to ISO 14001 in the near future.

Benefits

The MED TEST project has identified annual total savings of \$US 888,993 in water, raw materials and fuel against an estimated investment of \$US 257,518. The simple pay-back period is less than 4 months. Some of the planned measures have been implemented in 2011; the rest are scheduled for 2012.

Water costs will be reduced by 32% through good housekeeping measures, water reuse for raw materials washing and blanching, implementation of a monitoring and controlling system concerning water consumption, dry cleaning of floors in different units and improved technique for equipment washing.

Electricity costs will be reduced by 10% by retrofitting the electricity network and improving the power factor thanks to a redistribution of capacitors and measuring harmonics and the installation of soft starters for compressors. In addition, the company will implement heat recovery at the blancher and switch fuel to natural gas in order to reduce thermal energy consumption.



“Through the MED TEST training programme, the company has increased its staff awareness and diffused the cleaner production concept among the workers.”

Eng. Mohamed EMAD EL DEEN, Vice Chairman

The annual wastewater pollution loads will be reduced by 50% in BOD, 25% in COD and 15% in TSS through good housekeeping and mainly by upgrading the packaging unit, which will reduce product losses entering the drain system.

In parallel to the identification of saving opportunities, the site has plans to design an EMS system according to ISO 14001, 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.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Water conservation	19 542	12 267	0.6	93 798 m ³ water	
Electrical system, compressors	25 780	41 834	1.6		619
Process integration at blancher/cooler	1 413	3 417	2.4	4 680 m ³ water	31
Packaging	838 500	200 000	0.2	1 170 tons product	
Good housekeeping	3 758	-	-	18 038 m ³ water	
TOTAL	888 993	257 518	0.3		650

Water conservation: The following measures were identified: dry cleaning of floors, which could save 5% of water consumption; water reuse in raw materials washing; installation of water meters on the source of the feeder and set up of an effective monitoring plan; improvement of floors and equipments washing technique. The implementation of such measures will result in a reduction in water consumption (by 26%) and in BOD, COD and oil and grease pollution loads, by 32 tons/year (19%), 51 tons/year (15%) and 0.75 tons/year (7.5%), respectively.

Electrical system, compressors: A reduction in electricity consumption will be achieved by retrofitting and redistributing the electricity network to monitor and analyze specific energy consumption in different production lines; redistributing the existing capacitors to achieve a standard power factor in the 0.92-0.95 range. A standard power factor will reduce the electricity consumption by 4%, extend the equipment's lifetime, reduce risks for power drops in case of additional load and eventually prevent Edfina from getting a penalty from the Electricity Distribution Company. Installing soft starters and inverters at compressors will save 6% of their electrical consumption.

Process integration at blancher/cooler: the water discharged by the cooler is currently sent to drain, but could be reused to wash and preheat vegetables, saving water and reducing heat

demand at the blancher. Switching from direct to indirect steam injection at the blancher will enable the company to reuse steam condensate in raw materials washing and preheating. The implementation of this measure could save 1.3% of the water consumption and 31 MWh/year.

Packaging: Installing new automatic packaging machines for juice and legumes canning could save 20% of product losses and increase site productivity. The implementation of this investment project will reduce the discharge load of BOD by 42 tons/year (25%), of COD by 17 tons/year (5%) and of TSS by 32 tons/year (15%).

Good housekeeping: The project has identified several housekeeping measures: establishing regular maintenance programmes, eliminating all sources of spillage and leakages, closing/sealing running water taps, avoiding wastewater channels blockage by using screens to prevent solids from entering the drain system. They will result in a reduction of water consumption by 5%, of BOD, COD and oil and grease pollution loads by 10 tons/year (6%), 17 tons/year (5%) and 0.25 tons/year (2.5%), respectively.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

CHEMICAL sector — EGYPT

Detergent manufacturing — Extracted Oils and Derivatives Company

Company overview

Extracted Oils and Derivatives is a large-size publicly owned enterprise that produces approximately 4,460 tons/year of high and low foam detergents and a range of products such as edible oils, sodium silicate, animal feed and glycerine for the local market and for export (14%).

The company has joined the MED TEST project to improve its environmental performance, identify opportunities for increasing resource efficiency by solving the existing problems: high water and electricity consumption, materials and energy losses. The project is focused on the detergent plant.

At project start-up, the company was already certified ISO 9001, ISO 14001 and ISO 18001. MED TEST has enabled it to integrate cleaner production and resource efficiency into the existing ISO 14001 management system.

Benefits

MED TEST has identified annual total savings of \$US 127,803 in water, raw materials and fuel with an estimated investment of \$US 429,627 at the detergent plant. Some options have an excellent return on investment and an immediate payback period. The identified measures have been partially implemented by the company in 2011; the rest is planned for 2012.

Water costs will be reduced by 18% in the detergent plant by applying good housekeeping measures and implementing a monitoring and controlling system for water consumption.

Total electricity costs will be reduced by 23% through the implementation of an effective monitoring plan for electricity consumption, the improvement of the power factor by redistributing the capacitors and measuring harmonics, the installation of soft starters at air



“The implementation of no/low cost options identified by MED TEST helped the company to achieve reductions in water, energy and raw materials consumption.”

Mr. Ezz El Deen Abd Allah BADAWEY, Chairman

compressors and of variable speed drivers at agitators. In addition, the company has launched a new project for fuel switching to natural gas, which will reduce CO₂ emissions by 3,150 tons/year.

Environmental benefits will be achieved by reducing indoor air emissions through the installation of a powder dust collector for final product recovery, which will also improve working environment. Moreover, wastewater pollution loads will be reduced: the company plans to upgrade its common wastewater treatment plant and recycle wastewater for second-grade applications.

In parallel to the identification of saving opportunities, the company has updated the policy, actions plans and internal procedures related to the integration of cleaner production and resource efficiency into the existing ISO 14001 management system. This will ensure the sustainability of all identified actions at company level as well as the development of new cleaner production projects.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Electrical system, compressors and agitators	9 707	10 500	1		203
Powder dust collector, product recovery	76 667	283 794	3.7	230 tons product	
Good housekeeping, preventive maintenance and water conservation	9 429	2 000	0.2	316 tons materials, 5,500 m ³ water	
Wastewater recycling	32 000	133 333	4	80,000 m ³ water	
TOTAL	127 803	429 627	3.4		203

Electrical system, compressors and agitators: The project has identified several measures to reduce electricity consumption: installing an electricity meter for an effective monitoring plan; measuring harmonics to check for distortions in the electric feeder and protect capacitors from damage; installing a power factor correction panel. The power factor will reduce electricity consumption, extend the equipment's lifetime, reduce risks for power drops and eventually prevent the company from getting a penalty from the Electricity Distribution Company. The installation of variable speed drivers for the agitators and of 4 inverters (soft starters) for the dryers' air compressors will reduce their inrush current as well as the total electricity consumption (by 7%).

Powder dust collector and product recovery: This option will enable to recover product losses (powder dust) from the main production lines and convey them to the packaging station. The new collector (capacity: 55,000 m³/hr; efficiency: 99.9%) will be installed after the existing cyclone that currently works with low efficiency and product losses of approximately 4.5%. The implementation of this option will reduce product losses by 230 tons/year and dust emissions to the work and ambient environment by more than 85%.

Good housekeeping, preventive maintenance and water conservation: The project has identified several good housekeeping measures to save materials, improve work environment and reduce pollution loads: they consist of implementing regular maintenance programmes for pipes, equipments and compressors, eliminating excessive floor washing and all sources of leakages, closing/sealing running water taps, avoiding blockages of the wastewater channels thanks to screens that prevent dust impurities and solids from entering the drain. The site has reduced its water consumption by using pressurized water in the utilities department and installing water meters with an effective monitoring plan. The implementation of all these measures will reduce raw materials losses by 2%, water consumption by 18% and the hydraulic load to the WWTP by 8% of COD (2.7 tons/year) and 6% of TSS (1.458 tons/year).

Wastewater recycling: The site wastewater treatment plant will be upgraded by increasing the capacity and performance of the current physical-chemical process. The treated wastewater will be suitable for reuse (production processes, washing, cleaning of equipments). The implementation of this high investment project would save 70% of the overall water consumption.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

CHEMICAL sector — EGYPT

Chemical Industry — Misr Chemical Industries Company (MCI)

Company overview

MCI is a chemical enterprise affiliated to the Chemical Holding Company. It produces sodium hydroxide solution and flakes, chlorine gas, sodium hypochlorite, calcium hypochlorite and hydrochloric acid for the local market and for export (10%).

The company joined the MED TEST project to identify opportunities for increasing resource efficiency through solving the existing problems which mainly include: high water consumption, materials and energy losses in compliance with law limits for the discharged effluents.

At project start-up, the company was already certified ISO 9001 and ISO 14001 and had plans to establish a management system for safety and health according to the OSHAS 18001 standard.

Benefits

The MED TEST project has identified annual total savings of \$US 416,057 in water, raw materials, fuel and electricity with an estimated investment of \$US 49,033. Some options have excellent return on investment and immediate payback period. The identified measures have partially been implemented in 2011; the rest are scheduled for 2012.

Water costs will be reduced by 26% thanks to good housekeeping measures, segregation and recycling of compressors cooling water, implementation of a monitoring and controlling system for water consumption, control of washing water and overhaul of the cooling towers.

Thermal energy costs savings of 10% will be achieved by insulating the steam conveying system of the boiler inlet to reduce heat losses. Electrical energy costs will decrease by 6% through the redistribution of the capacitors in the capacitors bank to improve the power factor.



“The Med Test project is a very good opportunity to apply the concept of cleaner production and to rationalize resource consumption and environmental conservation.”

Eng. Ragab EL SAID ALI, Chairman

Environmental benefits will be reached by reducing the capacity of the WWTP and wastewater pollution loads (3% TSS and 1% TDS). The identified measures would reduce the investment and operational costs of the WWTP at design stage. MED TEST has assisted the company to fill in the required documentation for accessing EPAP II grants and funding scheme for the implementation of the WWTP, which will have a capacity of 1,500 m³/day, achieving 99% reduction in TSS pollution load as well as environmental compliance.

In parallel to the identification of saving opportunities, the company has updated the policy, actions plans and internal procedures related to integration of cleaner production and resource efficiency into the existing ISO 14001 management system. This will ensure the sustainability of all identified actions at company level as well as the development of new cleaner production projects.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Good housekeeping	46 128	-	-	112 500 m ³	
Power factor	288 750	1 000	< 0.1		6 930
Water conservation	39 111	3 700	< 0.1	117 332 m ³	
Insulation of the boiler	18 000	3 500	0.2		2 469
Cooling tower	24 068	40 833	1.7	72 204 m ³	
TOTAL	416 057	49 033	0.1	302 036	9 399

Good housekeeping: The project has identified several good housekeeping measures to improve work environment and reduce pollution loads, which include: implementing regular maintenance programmes, applying a brine recirculation process, eliminating excessive floor washing and all sources of spillage and water leakages, closing/sealing running water taps, avoiding blockages of the wastewater channels by using screens to prevent brine impurities and solids from entering them. These measures will save 9% of the water consumption and reduce the WWTP capacity, resulting in a decrease of TSS (4.3 tons/year, 3%) and TDS (5.7 tons/year, 1%).

Power factor: The power factor sometimes reaches 0.84 (which is below the standard) due to the inefficient distribution of the capacitor banks. The redistribution of the existing capacitors requires a small capital investment to achieve standard power factor in the range 0.92-0.95. This option would reduce the electricity consumption by 6%, extend the equipment's lifetime, limit risks for power drops in case of additional load in the future and eventually prevent the company from getting penalty from the Electricity Distribution Company.

Water conservation: Several measures have been identified to reduce water consumption: segregation and recycling of compressors cooling water; installation of water meters,

combined with an effective monitoring plan; control of washing water by using high pressure water. The implementation of these options will decrease water consumption by 11% as well as the hydraulic load to the WWTP.

Insulation of the boiler: The process requires high thermal energy inputs, which could be reduced by properly insulating the steam distribution system (mainly steam pipes) to prevent heat losses. This measure would save 10% of thermal energy consumption.

Cooling tower: The project has identified several actions for overhauling and tuning the cooling tower (which has not been maintained since its installation 16 years ago), resulting in increased performance and cooling capacity: fixing the fans (by adjusting blades' angle, changing belts, maintaining or replacing motors) and overhauling the hot water distribution system. The increased efficiency of the tower will allow recycling the compressors' cooling water back to the tower, which concerns 6% of the total water consumption. This option will also reduce the capacity of the WWTP under design.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

PULP and PAPER sector — EGYPT

Paper industry — National Paper Company (NPC)

Company overview

NPC is a large-size privatized paper enterprise owned by EMAK Paper Company (El-Kharafi Group) and producing approximately 72,000 tons/year of cardboard, Kraft linear, printing and fluting paper for the local market and for export (5%).

NPC joined the MED TEST project to identify opportunities for increasing resource efficiency through solving the existing problems, which mainly include: high water consumption, cellulosic fibre and energy losses, in compliance with law limits for the discharged effluents.

The company received MED TEST's technical assistance to design and implement an integrated management system for quality, environment and safety according to ISO 9001, ISO 14001, OSHAS 18001 standards.

Benefits

The MED TEST project has identified annual total savings of \$US 1,731,170 in water, raw materials, fuel and electricity with an estimated investment of \$US 1,228,167. Some options have excellent return on investment and immediate payback period. The identified measures have partially been implemented by the company in 2011; the rest are scheduled for 2012.

Water costs would decrease by 52% by adopting good housekeeping measures, implementing a monitoring and control system for water consumption, installing an empty cement sacks shredder, recycling of process water, and closing compressor and refiner cooling water circuits. Recirculation of some water streams limits fibre losses and eventually increases productivity.

The upgrade of the steam distribution system would reduce thermal energy costs by more than 11%. Electricity costs will decrease by 20%, mainly by improving the power factor of the turbines.



“MED TEST provided a good framework for the company to apply cleaner production, save resources and increase productivity while achieving compliance with the environmental legislation.”

Eng. Ibrahim SALEH, Chairman

Environmental benefits would be reached by reducing the annual wastewater pollution loads (corresponding to 6% BOD, 2% COD and 28% TSS), through good housekeeping measures, the upgrade of the automatic dosing system for the water treatment unit, and the installation of an empty cement sacks shredder with a dust removal filter. The identified measures would reduce the investment and operational costs of the WWTP at the design stage, which has a design capacity of 20,000 m³/day.

In parallel to the identification of saving opportunities, the company has received technical assistance through MED TEST to design and establish ISO 9001, an EMS according to ISO 14001 and safety system in line with OSHAS 18001 standards, and fully integrating resource efficiency into company policy, action plans and internal procedures. This will ensure sustainability of all identified actions at company level as well as the development of new cleaner production projects. The company plans to achieve the ISO 14001 certification in 2012.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Water conservation	183 427	42 833	0.2	3 057 120 m ³ water	
Steam system	705 504	475 000	0.7	90 288 m ³ water	41 367
Preventive maintenance and good housekeeping	318 863	no cost	immediate	902 880 m ³ water 982 tons fibre 213 tons materials	
Empty Cement Sacks Shredder	157 810	700 000	4.4	660 000 m ³ water 293 tons chemicals 1 100 tons product	
Chemical dosing system at process water treatment unit	13 333	8 334	0.6	355 tons chemicals	
Power factor of the turbines	352 233	2 000	< 0.1		8 453
TOTAL	1 731 170	1 228 167	0.7		49 820

Water conservation: Several identified measures have reduced the overall water consumption by 29%: installation of water meters with an effective monitoring plan; recycling of process water, and closing compressor and refiner cooling water circuits in paper making plant.

Steam system: The measures introduced to reduce steam consumption include: installation of a centralized tank to collect condensate from the paper machines; replacement of the existing old control valve on paper machines with a steam trap; pipes and turbines insulation; replacement of nine differential pressure control valves in paper machine by an equivalent system to recycle steam for other sections' heating; installation of steam flow meters with an effective monitoring of energy consumption. These measures would reduce energy and steam consumption by 11% and 8% respectively, as well as the hydraulic load to the WWTP.

Preventive maintenance and good housekeeping: Implementing regular maintenance programmes, eliminating excessive floor washing and all sources of spillage and water leakages, closing/sealing running water taps, using screens to prevent solids from entering the wastewater channels and blocking them: such options would save 10% of water

consumption, reduce fiber losses by 10%, raw and auxiliary materials by 8%, BOD by 160 tons/year and COD by 82 tons/year.

Empty cement sacks shredder: The installation of an empty cement sacks shredder with a dry system and an aerodynamic separator and dust removal filter will enable collection of cement dust. The latter currently causes severe problems during washing process as it turns into paste with water and rapidly solidifies, resulting in clogged pipes and productivity losses. This option will reduce water consumption by 7% and chemicals used to break the solidified cement by 293 tons/year; thus increasing site productivity. The TSS pollution load will decrease by 28% (2,524 tons/year).

Chemical dosing system at process water treatment unit: Replacing the manual dosing system of chemicals with an automatic one at the process water treatment unit would save 5% of chemicals used and lead to reductions in BOD by 3% (160 tons/year) and in COD by 1% (82 tons/year).

Power factor of the turbines: 20% reduction in electricity consumption could be achieved by increasing the load capacity of the electricity generated at the site, thus decreasing the amount of purchased electricity from the grid.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatec@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

PETROLEUM sector — EGYPT

Lube oil blending plant — Misr Petroleum Company

Company overview

Misr Petroleum is a major lubricant manufacturing and distributor company in Egypt, owned by the Egyptian General Authority for Petroleum and producing approximately 63,728 tons/year of a wide range of lubricants such as automotive and industrial greases for the local market and for international companies like BP and Castrol (20%).

The company joined the MED TEST project in order to improve its environmental performance and identify opportunities to increase resource efficiency by solving existing problems, mainly high water consumption and materials and energy losses.

At project start-up, the company was already certified ISO 9001 and the EMS Petroleum standard was in place. Within the course of the project, it initiated a process for upgrading its EMS according to the ISO 14001/2004 standard.

Benefits

The MED TEST project has identified annual total savings of \$US 457,371 in electricity, fuel, water, raw materials and products with an estimated investment of \$US 100,934. Some options have excellent return on investment and immediate payback period. The identified measures have partially been implemented in 2011; the rest are scheduled for 2012.

Water costs will be reduced by 20% through implementing good housekeeping measures, a regular maintenance programme and a monitoring and controlling system for water consumption.

Electricity costs will decrease by 50% mainly by installing soft starters and variable speed drivers at the pumps, agitators and compressors. Thermal energy costs will be



“It was a pleasure to cooperate with the distinguished MED TEST team. We have established together a system on how to convert environmental losses into a real gain at our plant.”

Chemist Magdy Ahmed YAKOUT, General Manager

reduced by 4% through the insulation of steam lines, improvement of the boiler's efficiency and maintenance of the steam system.

Environmental benefits will be achieved mainly by reducing leakages of raw materials and products and consequently of wastewater pollution loads. The company plans to upgrade the existing WWTP and recycle 27% of treated wastewater for second-grade applications.

In parallel to the identification of saving opportunities, the site has updated its existing management system according to the 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.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Good housekeeping, preventive maintenance	46 663	100	< 0.1	8,323 m ³ water, 186 tons product	
Variable speed drivers, electrical system	66 042	46 000	0.7		1 585
Raw materials unloading system	333 333	41 667	0.1	458 tons materials	
Steam system and boiler	11 333	13 167	1.2		1 397
TOTAL	457 371	100 934	0.2		2 982

Good housekeeping, preventive maintenance: The project has identified the following measures: regular maintenance programmes for pipes, equipments and compressors; operational control practices in the receiving, blending and filling sections to reduce materials and product losses; elimination of excessive floor washing and of all sources of spillage and leakages; and closing/sealing of running water taps. The site has reduced 11% of its total product losses, corresponding to 186 tons/year (77.5%) of losses in the filling section, by applying operation control best practices. The implementation of these measures will reduce water consumption by 15% and decrease the hydraulic load to the WWTP.

Variable speed drivers, electrical system: A reduction in electricity consumption will be achieved by installing soft starters and variable speed drivers for agitators at the oil blending unit, pumps and compressors, which will reduce their inrush current and achieve 50% savings (1,585 MWh/year) in total electricity consumption; measuring harmonics to check for distortions in the electrical feeder will protect the capacitors from damage.

Raw materials unloading system: The existing raw materials unloading system generates oil leakages upstream in the manufacturing process. These material losses are re-processed into low-grade final products that are sold at a lower price. Consequently, they represent an important economic loss for the company, due to energy and labor costs for reprocessing and due to reduced revenues from sales of mediocre products as opposed to first-grade ones. The implementation of a new automatic control system for raw materials unloading will detect leakages and, if any, will block the process. The implementation of this option would save 0.7% (458 tons/year) of raw materials losses that undergo downgrading to low quality products.

Steam system and boiler: Thermal energy inputs could be reduced through the proper insulation of the boiler's steam lines to prevent heat losses; the improvement of the boiler's efficiency by adjusting the air to fuel ratio and implementing an effective maintenance programme; and the installation of water meters on the source of the boiler's feeder with an effective monitoring plan. The implementation of these measures would save 4% of the site's thermal energy consumption (1,397 MWh/year).



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

PULP and PAPER sector — EGYPT

Paper industry — Moharrem Press Company

Company overview

Moharrem Press is a medium-size paper enterprise with core business in production of corrugated board. It produces about 10,887 tons/year of corrugated carton, 18,338,136 sheets/year of printed white paper and carton and 450,000 packages/year of playing cards for the local market.

The company has joined the MED TEST project to identify opportunities to increase resource efficiency by solving the existing problems, which mainly include high water consumption and materials and energy losses.

At project start-up, the company was already certified ISO 9001, ISO 14001 and ISO 18001. Through MED TEST, the company has integrated cleaner production and resource efficiency into the existing ISO 14001 management system.

Benefits

The MED TEST project has identified annual total savings of \$US 304,786 in water, raw materials, fuel and electricity against an estimated investment of \$US 279,217. Some options have excellent return on investment and immediate payback period. The identified measures have partially been implemented in 2011; the rest are scheduled for 2012.

Water costs will be reduced by 33% by applying good housekeeping measures, implementing a monitor and control system for water consumption, reusing washing water in the starch section and using high pressure water in the washing processes.

Insulating the steam system, recovering steam condensate, installing a semi-automatic blow-down system at the boiler as well as soft starters and inverters, improving



“The MED TEST project is a symbol of technical cooperation and a model for realizing environmental sustainability.”

Eng. Mohamed Nagieb SALAH, Chairman

the lighting system and the power factor will reduce total energy costs by approximately 15% and CO₂ emissions by 370 tons/year.

Additional environmental benefits will be achieved through good housekeeping and water conservation measures as well as the replacement of the existing glue machine, resulting in a reduction of annual wastewater pollution loads by about 20% BOD₅ and 12% COD.

In parallel to the identification of saving opportunities, the company has updated their policy, actions plans and internal procedures by integrating cleaner production and resource efficiency into the existing ISO 14001 management system; this will ensure the sustainability of all identified actions at company level as well as the development of new cleaner production projects.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Good housekeeping	64 704	-	-	1 932 m ³ water, 787 tons materials	
Water conservation	7 343	5 134	0.7	7 270 m ³ water, 9.5 tons fibres	
Steam system	168 293	17 083	0.1	6 733 m ³ water	1 294
Electrical system	14 446	7 000	0.5		346
New glue machine	50 000	250 000	5	966 m ³ water, 2.4 tons glue 1 678 tons product	
TOTAL	304 786	279 217	0.9		1 640

Good housekeeping: Regular maintenance programmes, safe disposal/recycling of hazardous waste like lubricating oils, elimination of excessive floor washing and all sources of spillage and water leakages, closing/sealing running water taps, installation of screens to prevent solids from entering the wastewater channels and blocking them, water recycling in paper section: such measures will save 4% water consumption and 5% raw and auxiliary materials, and reduce BOD₅ by 5% and COD by 3%.

Water conservation: Several measures will reduce the overall water consumption by 15%, including: installing water meters with an effective monitoring plan, closing the cooling water circuit in the corrugated board section, using high pressure water in washing, reusing the starch tank washing water. The latter will save 9.5 tons/year of starch, reducing BOD and COD respectively by 338 and 308 kg/year.

Steam system: Thermal energy inputs could be reduced by properly insulating the boiler's steam lines to prevent heat losses; installing new steam condensate and blow-down tanks to replace the deteriorated ones; applying semi-automatic blow-down system. These options would save 16% of thermal energy consumption.

Electrical system: A reduction of 11% in electricity consumption could be achieved by: installing soft starters and inverters at pumps, compressors and printing machines; converting the existing manually controlled lightening system into an electronic system; measuring harmonics to check for distortions in the electrical feeder and protecting the capacitors from damage; redistributing the existing capacitors to achieve a standard power factor in the range 0.92-0.95. The power factor will extend the equipment's lifetime, reduce risks for power drops in case of additional load and prevent the company from getting penalty from the Electricity Distribution Company.

New glue machine: Replacing the existing old glue machine with a new one will improve the quality of the product, save 2% water and 30% glue consumption, reduce out-of-specification products by 13%, ultimately decreasing production costs and increasing productivity. The implementation of this high investment project will reduce pollution loads by more than 5% for BOD and 3% for COD.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpcpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

PULP and PAPER sector — EGYPT

Paper industry — General Company for Paper Industry (RAKTA)

Company overview

RAKTA is a publicly owned large size company. The company produces approx. 27,000 tons/year of writing and printing paper, cardboard, fluting and test liner mainly for the local market and for export (5%).

The company was motivated to join the MED TEST project to identify opportunities for increasing resource efficiency and solving the existing problems such as: high water consumption, cellulosic fibre and energy losses and in compliance with law limits for the discharged effluents.

At project's start the company was already certified ISO 9001 and has received technical assistance through the MED TEST project to design and establish EMS according to ISO14001.

Benefits

The MED TEST project identified annual total savings of \$US 1,518,466 in water, raw and auxiliary materials and fuel with an estimated investment \$US of 2,443,446. Some measures have excellent return on investment and immediate payback period. Some of the identified measures were implemented by the company in 2011 and the remaining measures are planned to be implemented in 2012.

Water costs would be reduced by 15% through applying good housekeeping measures and implementation of monitoring and controlling system for water consumption.

Thermal energy costs will be reduced by more than 10% by implementing a monitoring system for steam consumption and boiler efficiency, recycling of steam condensate and isolating the steam lines in boilers and paper section. These measures have been integrated into a larger investment project "Rehabilitation of steam, condensate and ventilation system".



“Med TEST Project supported the company to implement cleaner production technology including conservation of raw materials, energy and water.”

Eng. Mahmoud EL BATOUTY, Chairman

Additional environmental benefits would be reached in terms of reducing wastewater pollution loads corresponding respectively to 6% BOD₅ and 2% COD annual loads. The identified measures will reduce the investment and operational costs of the WWTP at design stage, which will have a capacity of 26,000 m³/ day.

In parallel to the identification of saving opportunities, the site has received technical assistance to design and establish EMS according to ISO14001, fully integrating resource efficiency into company policy, action plans and internal procedures. This will ensure sustainability of all the identified actions at company level as well as the development of new projects. New environmental management accounting (EMA) protocols have also been introduced into the existing internal accounting system for tracking and monitoring the most important environmental costs including those related to non product output costs.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Good housekeeping	203 628	-	Immediately	1 075 200 m ³ water 585 tons fibres, 450 tons materials	
Process monitoring	124 257	37 333	0.3	537 600 m ³ water	6 809
Rehabilitation of steam system	250 000	400 280	1.6	150 000 m ³ water	15 200
Installation of a system for fibre recovery	815 581	2 000 000	2.5	5 847 tons fibres	
Activating the monitoring system for controlling boiler efficiency	125 000	5 833	< 0.1		180
TOTAL	1 518 466	2 443 446	1.6		22 189

Good housekeeping: The project identified several good housekeeping measures: regular maintenance programmes, eliminating excessive floor washing and all sources of spillage and water leakage holes, closing/ sealing running water taps, taking measures to avoid blockages of the wastewater channels by using screens to prevent solids from entering wastewater channels. The implementation of good housekeeping measures would save 10% of water consumption, reduce fibre losses by 10%, and raw and auxiliary materials by 8%. These measures resulted in reduction of 39.6 tons/ year (3%) BOD and 72.2 tons/ year (1%) COD.

Process monitoring: The installation of metering devices for water and steam flows will allow good monitoring and control of process consumptions. The implementation of these options could save 5% of water consumption, 3% energy consumption and accordingly reduce the capacity of the WWTP by 10%.

Rehabilitation of steam system: Important energy savings can be achieved by increasing the percentage of recycled steam condensate which is currently 20% only. The company applied a steam survey system to detect the steam leakage sources and start the insulation of steam lines in boilers and paper machines.

The implementation of this initiative will save total thermal energy consumption by 7%, increase the percentage of recycled steam condensate up to 90%, corresponding to 150,000 m³/ year of water. This project has been integrated into a large size investment plan of the company for improving and optimizing the steam, condensate and ventilation system in the paper making section.

Installation of a system for fibre recovery: This project will replace the old existing DAF (Dissolved Air Floatation) units with a new one for separating and recycling fibre, which in turn leads to increasing productivity of the site. The implementation of this option would save 16.5% (5,847 tons/year) of fibre losses, 16% of auxiliary chemicals and reduce the pollution load of the discharged effluent.

Activating the monitoring system for controlling boiler efficiency: The site implemented an effective monitoring system for adjusting the burning process of the boiler by: regulating air to fuel ratio; and controlling excess air emissions of the combustion process and exhaust temperature. The implementation of this option resulted in reduction of 180 MWh/year.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatec@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

FOOD sector — EGYPT

Egyptian Company for Starch, Yeast and Detergents

Company overview

Starch, Yeast and Detergents is a medium-size food enterprise owned by the Egyptian Holding Company for Food Industries and producing 10,079 tons/year of fresh and dry yeast for the local market.

The company joined the MED TEST project in order to identify opportunities to increase resource efficiency by solving the existing problems which mainly include: high water consumption, materials and energy losses and in compliance with law limits for discharged effluents.

At project start-up, the company was already certified ISO 9001. It has a short term plan to design an EMS according to the ISO 14001 standard.

Benefits

The MED TEST project has identified annual total savings of \$US 1,726,986 in water, raw materials, fuel and electricity with an estimated investment of \$US 136,474. The simple payback period is less than 2 months. Some of the identified measures have been implemented in 2011; the rest are scheduled for 2012.

Water costs will be reduced by 40% through good house-keeping and water conservation measures, implementation of a monitoring and controlling system for water consumption and improvement of the cooling towers efficiency.

Thermal energy costs will be reduced by 72% by installing a steam trap in the dry yeast plant, reducing steam consumption in CIP and optimizing boiler blowdown. Electricity costs will decrease by 22%, mainly by improving the power factor and installing inverters and soft starters at motors.



“The MED TEST project has supported us in reducing raw materials, water and energy losses through training and technical assistance and in complying with the environmental legislation.”

Chem. Mahmoud EL MIRASY, Chairman

Environmental benefits will be reached thanks to several measures aiming at recovering product and limiting product losses entering the drain system, thus reducing the annual wastewater pollution loads in the existing WWTP, respectively by 12% COD and 16% BOD₅. The company marketing strategy aims at improving product packaging through the installation of a new packaging machine, which in the future will further reduce product losses.

In parallel to the identification of saving opportunities, the site has plans to design an EMS according to the 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.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Water conservation and CIP of fermentation tanks	483 001	38 974	< 0.1	271 618 m ³ water, 201 tons materials	6 117
Electrical system and efficient motors	154 003	37 500	0.2		3 502
Product recovery	990 289	46 000	< 0.1	930 tons product, 198 tons materials	
Steam system	53 713	13 500	0.3	5 840 m ³ water	3 080
Preventive maintenance	45 980	500	< 0.1	130 790 m ³ water, 40 tons materials	
TOTAL	1 726 986	136 474	< 0.1		12 699

Water conservation and CIP of fermentation tanks: The existing manually operated CIP of the six large fermenters consumes a large amount of water and energy. An effective solution consists of installing rotating spray balls inside the fermentation tanks as well as turbidity/refractive index transmitters to detect product concentration in pipes before starting CIP cycle. Other water conservation measures include the use of high pressure water in washing and the installation of water meters with an effective monitoring plan. The total water consumption will decrease by 27%, energy for CIP by 48%, product losses by 2%, pollution loads by 3% for BOD₅ (20.3 tons/year) and 1% for COD (35.4 tons/year).

Electrical system and efficient motors: Adjusting the power factor will decrease the electricity consumption by 20%, extend the equipment's lifetime and reduce risks for power drops in case of additional load in the future. Installing soft starters at the blowers and inverters at the motors in the fresh and dry yeast formulation units will allow for 2% saving of total electricity consumption. Measuring harmonics will enable to check for distortions in the electrical feeder and to protect the capacitors from damage.

Product recovery: About 9% of yeast losses can be recovered by installing a rubber belt conveyor underneath the filter press,

replacing the existing manual collection and handling of yeast paste, which leads to appreciable product losses; the installation of mechanical seal pumps in molasses and yeast plants will also save 1% of molasses losses. BOD₅ and COD pollution loads will decrease by 10% respectively by 68 tons/year and 354 tons/year.

Steam system: Several measures were introduced to reduce thermal energy and steam consumption: recovery and reuse of steam condensate; optimization of the boiler blowdown system; and installation of a steam trap in the dry yeast plant. These measures would achieve a reduction of thermal energy consumption by 24%.

Preventive maintenance: Establishing regular maintenance programmes, eliminating excessive floor washing and all sources of spillage/water leakages, and avoiding blockage of the wastewater channels are effective measures to increase site performance. The cooling towers efficiency could be increased by periodically adjusting the fan blades angle and the cooling loads, in order to cope with the high cooling demand from the fermentation process and compressors. The implementation of these measures will reduce consumption of water by 13% and of raw and auxiliary materials by 1%, BOD₅ by 3% (20.3 tons/year) and COD by 1% (35.4 tons/year).



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

LEATHER sector — EGYPT

Tannery industry — Atef El-Sayed Tannery

Company overview

Atef El-Sayed Tannery is a medium size private tannery recently established in Alexandria. The tannery produces approx. 231 tons/year of wet blue and crust leather for the local market (10%) and for export.

The tannery joined the MED TEST project to identify opportunities for increasing resource efficiency and productivity and reduce pollution loads to minimize investment/operational costs of the planned wastewater treatment plant.

At project's start there was no formalized management system in place. During the implementation of MED TEST project, the company established a management system for quality according to ISO 9001.

Benefits

The MED TEST project identified annual total savings of \$US 97,377 in water, raw materials, fuel and electricity with an estimated investment of \$US 416,850.

Water costs would be reduced by 30% through applying good housekeeping measures, implementation of monitoring and controlling system for water consumption and recycling of pickling bath.

Total electricity costs will be reduced by 62% through improving the power factor, installing soft starters and inverters at machines and improving the lighting system.



“The MED TEST project helped the tannery to understand the Cleaner Production concept and how to apply its tools in the production processes.”

Mr. Atef El Sayed, Chairman

The identified measures will entail environmental benefits in terms of reducing wastewater pollution loads by about 5% BOD₅ and 7% COD annual loads.

In parallel to the identification of saving opportunities, the site designed and established a management system for quality according to ISO 9001. The company was trained in EMS according to ISO 14001 during the MED TEST in order to be able to integrate CP into the internal quality procedures. This will ensure sustainability of all the identified actions at company level as well as the development of new projects.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Good housekeeping	1 119	767	0.7	149 m ³ water, 25 tons materials	
Electrical system, motors and lighting	3 583	5 083	1.4		30
New production machines	88 750	402 667	4.5	5.8 ton product	
Recycling of pickle bath	3 925	8 333	2.1	220 m ³ water, 23 tons chemicals	
TOTAL	97 377	416 850	4.3		30

Good housekeeping: The project identified good housekeeping measures, including: regular maintenance programmes, regular cleaning and washing of equipments to control odor generation, better collection of splits from fleshing to reduce waste accumulation and unnecessary washing; using screens to prevent solids from entering wastewater channels; and activating the grounding system to all machines in the tannery to maintain health and safety for employees. The implementation of good housekeeping measures would save 10% of water consumption and reduce the amount of wastewater discharged to sewage. These measures resulted in reduction of 646 kg/year (5%) BOD and 1,306 kg/year (7%) COD.

New production machines: The company has put in place an investment plan to replace the existing old deteriorated machines with new ones to increase productivity and quality of products as well as environmental performance. New machines are foreseen for toggling, measuring, ironing, spraying, sammying and overhead conveyor for drying the skins that will minimize out of specification products by 5.8 tons/year, reduce time of different tanning processes and ultimately improve labour safety.

Electrical system, motors and lighting: Actions identified to reduce electricity use include: installing power factor correction panel to achieve a standard value in the range of 0.92-0.95; measuring harmonics for checking distortion in the electrical feeder and protecting the capacitors from damage; installing soft starters and inverters on motors (drums) to reduce their electricity consumption; improving the lighting system by replacing the current incandescent lamps with energy saving lamps. The implementation of these options will save 62% of total electricity consumption corresponding to 30 MWh/year.

Recycling of pickle bath: Recycling of pickling bath would require installation of a vessel and a filter: this measure will reduce salinity of the discharged wastewater, which is a major problem of the company, achieve 15% water savings and lead to 23 tons/year of chemicals reduction.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.encpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

PETROCHEMICAL sector — EGYPT

Egyptian petrochemicals company (EPC) – Chlorine plant

Company overview

EPC is a large size petrochemical enterprise, affiliated to the Egyptian General Petroleum Corporation (EGPC). The company produces liquid and flakes caustic soda, liquid chlorine, Poly Vinyl Chloride (PVC) resins and compounds and sodium hypochlorite for the local market and for export (30%).

The company joined the MED TEST project to identify opportunities for increasing resource efficiency and productivity and reduce pollution loads to minimize investment/operational costs of the planned wastewater treatment plant. The project focused on the chlorine plant.

At project's start the company was already certified ISO 9001, ISO 14001 and ISO 18001. Through MED TEST, the company integrated cleaner production and resource efficiency into the existing ISO 14001 management system.

Benefits

The MED TEST project identified annual total savings of \$US 530,638 in water, raw materials and fuel with an estimated investment of \$US 1,536,667. Some measures have excellent return on investment and immediate pay-back period. There are some identified measures being implemented by the company in 2011 and the remaining measures are planned to be implemented in 2012.

Total energy cost will be reduced by 37% through the use of excess hydrogen generated as a by-product from the chlorine plant as fuel. CO₂ emissions will be reduced by 9,500 tons/year. In addition the company is planning to apply a steam system survey to identify reductions in thermal energy consumptions.

Water costs will be reduced by 4% by applying good housekeeping measures and implementation of control system for water consumption.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.



“The MED TEST project supported EPC to comply with environmental regulations, increase productivity and improve quality.”

Eng. Ahmed EL BORDINY, Chairman

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, Chemicals	Energy [MWh]
Good housekeeping	107 635	-	-	287 027 m ³ water	
Hydrogen recovery from chlorine plant	305 183	225 000	0.7		58 802
Filter press	69 150	500 000	> 5		
Water treatment unit	16 000	16 667	1		
TDS loads reduction	32 670	795 000	> 5	87 120 m ³ water	
TOTAL	530 638	1 536 667	2.9	374 147	58 802

Good housekeeping: The project identified several good housekeeping measure, such as: regular maintenance programmes, applying brine recirculation process, eliminating excessive floor washing and all sources of spillage and water leakages, and taking measures to avoid blockages of the wastewater channels by using screens to prevent brine impurities and solids from entering wastewater channels. The implementation of good housekeeping measures would save 3% of water consumption and achieve reduction of 9.2 tons/year (3%) TSS and 128.9 tons/year (1%) TDS.

Hydrogen recovery from chlorine plant: Hydrogen is produced as a by-product of the electrolysis process in the chlorine plant. Currently the excess hydrogen is flared in air after mixing with steam to prevent explosions. The reuse of excess hydrogen as fuel requires capital cost, but will allow significant reduction by 37% in energy consumption as well as in CO₂ emissions.

Filter press: The underflow of the clarifier is sent for dewatering and sludge separation to the filter press, which is in deteriorated conditions, causing leakage of filtrates in the work environment. The replacement of the current deteriorated filter press by a new fully automated one will prevent leakages of the brine solution to the work environment and reduce the weight of sludge and cost of its transportation to disposal by 30%.

Water treatment unit: Replacing the existing system with an automatic dosing system at the process water treatment unit will reduce chemical losses and consumption by 5% and subsequently reduce the hydraulic load of the unit.

TDS loads reduction: The site is experiencing a fluctuation in the levels of TDS pollution load generated by the chlorine plant. The company has started a project with the support of EPAP II funding scheme to address high TDS streams, which consists of several actions: recycling of the over analyzers flows (4m³/hr) back to the dissolution tank; design of a collection basin for segregation of the process streams with high TDS loads and installation of evaporators; installation of an on-line control system for in process recycling or discharge to the WWTP of the process streams based on their TDS concentration; and replacement of 10 pumps for effluent recirculation by new ones with closed cooling system. The implementation of these measures will prevent penalties associated to the fluctuation of TDS load, achieve water savings, maintain the effluent wastewater at 2000 mg/l TDS, reducing by 70% and 9,000 tons/year the TDS load discharged.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.encpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatecteam@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

FOOD sector — EGYPT

Frozen vegetables and fruits — The Egyptian British Company for General Development (Galina-Agrofreeze)

Company overview

Galina is a medium size joint stock food enterprise. The company produces approx. 10,000 tons/year of frozen vegetables and fruits for export.

The company joined the MED TEST project to improve its environmental performance, identify opportunities for increasing resource efficiency through solving the existing problems which mainly include: high water consumption, materials and energy losses.

At project's start the company was already certified ISO 9001, food safety according to HACCP of CODEX, while OHSAS 18001 was under development. The company just started designing EMS according to the ISO14001, BRC global standard for food safety.

Benefits

The MED TEST project identified annual total potential savings of \$US 113,499 in water, raw materials and fuel with an estimated investment of \$US 32,500. The average simple payback period is less than 3 months. Most identified measures are planned to be implemented in the near future.

Water costs would be reduced by 50% through applying good housekeeping measures, preventive maintenance programme, implementation of monitoring and controlling system for water consumption, dry cleaning of floors in different units and improved technique for equipments washing.

Electricity costs could be reduced by 10% through preventive maintenance programme for compressors and cooling towers, improving the lighting system and measuring harmonics. In addition the company can implement heat recovery at the blancher in order to reduce thermal energy consumption.



“MED TEST supported the company in identifying saving opportunities and we are satisfied with its methodology”

Dr. Abd EL WAHED SOLIMAN, Chairman

Environmental benefits could be reached in terms of reducing the wastewater pollution loads corresponding to 55% BOD₅, 40% COD and 15% TSS annual loads, mainly resulting from good housekeeping measures, water conservation measures and upgrading the packaging units which will reduce product losses entering the drain system.

In December 2011, as a follow up to the identification of saving opportunities, the company has requested the assistance of the MED TEST team to design EMS according to ISO14001, BRC global standard for food safety as well as updating the existing ISO 18001, fully integrating resource efficiency into company policy, action plans and internal procedures. This will ensure sustainability of all the identified actions at company level as well as the development of new cleaner production projects.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, materials	Energy [MWh]
Preventive maintenance	16 471	18 002	1.1	4 727 m ³ water	350
Water conservation	16 040	6 165	0.4	40 100 m ³ water	
Upgrading packaging unit	80 988	8 333	0.1	124 tons product	
TOTAL	113 499	32 500	0.3		350

Preventive maintenance: The site could implement an effective preventive maintenance programme for reducing water, materials and energy losses. These include: insulation of pipes and replacement of the evaporator with new one in the refrigeration system; reuse of defrost water; periodical maintenance of the compressors and cooling towers; improving the hygienic conditions and lighting system in the packaging unit; measuring harmonics for checking distortion in the electrical feeder and protecting the capacitors from damage. The implementation of these measures could save 10% of electricity consumption, 5 % in water consumption and wastewater generation. The BOD and COD would be reduced respectively by 3% (142) kg/year and 3% (213) kg/year.

Water conservation: There are several measures identified by the project for reducing water consumption. These included: dry cleaning of floors; installation of water meters at the source of

the feeder with effective monitoring plan; improving technique of floors and equipments washing. The total water consumption could reach 42% reduction with a significant impact on the capacity of the WWTP that the company plans to install in the future. BOD and COD pollution load would decrease respectively by 1.2 tons/year (27%) and 1.8 tons/year (22%).

Upgrading packaging unit: Installing new automatic packaging machines could reduce 15% of product losses generated during the manual packaging and increase productivity of the site. The implementation of this high investment project could reduce solid waste generation and increase product recovery by 124 tons/year. This option would also reduce the discharge load of BOD by 1.1 tons/year (25%), COD by 0.4 tons/year (5%) and TSS by 0.5 tons/year (15%).



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatec@gmail.com,
www.ewatec-eg.com





MED TEST Case Study

CHEMICAL sector — EGYPT

Chemical industry — Solvay Alexandria Sodium Carbonate (SASC)

Company overview

SASC is a large size, chemical company owned by the multinational Solvay Belgium. The company produces light and dense sodium carbonate, pure sodium bicarbonate and calcium oxide.

The company joined the MED TEST project to identify opportunities for increasing resource efficiency through solving the existing problems which mainly include: high water consumption, and materials & energy losses.

At project's start the company was already certified ISO 9001 and had plans to establish a management system for environment and safety according to ISO14001/ OSHAS 18001 standards.

Benefits

The MED TEST project identified annual total savings of \$US 491,793 in water, raw materials, fuel and electricity with an estimated investment of \$US 55,383. The average simple payback period is less than 2 months. There are some identified measures being implemented by the company in 2011 and the remaining measures are planned to be implemented in 2012.

The implementation of cleaner production measures identified by MED TEST assisted the company to improve its performance reducing consumptions by almost: 10% electricity, 15% steam and 10% raw materials.

Water costs decrease by almost 20% through segregation and recycling of compressors cooling water and CO₂ gas washer effluent, and implementation of water consumption monitoring and controlling system. The company has also launched a steam survey and insulation project aiming at reducing 10% of its thermal energy consumption.

All the identified actions contribute to improve the environmental performance of the site.

MED TEST is a UNIDO green industry initiative to promote sustainability and competitiveness in the private sector in Egypt, Morocco and Tunisia. TEST integrated approach includes tools like resource efficiency and cleaner production, environmental management system and accounting, cleaner technology transfer and CSR.

Learn more about TEST approach at www.unido.org

MED TEST is sponsored by the Global Environment Facility, the Italian Government and the MedPartnership.



“Participating in the MED TEST project has allowed several departments of our company to look in a different way to the environmental aspects linked to our activity, generating important optimizations of several processes and impressive savings, finally decreasing the Non Product Output costs.”

Eng. Laila El GHAZALY, Managing Director

In parallel to the identification of saving opportunities, the site has plans to design an EMS system according to ISO 14001 standard, fully integrating resource efficiency into company policy, action plans and internal procedures. This will ensure sustainability of all the identified actions at company level as well as the development of new projects. New environmental management accounting (EMA) protocols have also been introduced into the existing internal accounting system for tracking and monitoring the most important environmental costs including those related to non product output costs.

Saving opportunities

Measure	Economic key figures			Resource savings per year	
	Savings [USD/yr]	Investment [USD]	PBP [yr]	Water, [m ³]	Materials [t]
Recycling of CO ₂ gas washer effluent	36 500	20 833	0.6	99 000	
Water conservation	82 120	34 550	0.4	231 990	
Good housekeeping	348 173	-	-	463 978	9 643
Limestone recycling	25 000	-			
TOTAL	491 793	55 383	0.1	794 968	9 643

Recycling CO₂ gas washer effluent: Segregation and recycling of CO₂ gas washing effluent from two lime kilns has been implemented during the project. Part of the gas washing water is now reused within the gas washing process, while the other part is used in the lime slaking unit and in the sludge mixing tanks replacing fresh water intake. The implementation of this option leads to 2% reduction in water consumption.

Good housekeeping: The project identified good housekeeping measures for improving work environment and reducing pollution load. These included: regular maintenance programs, applying brine recirculation process, eliminating excessive floor washing and all sources of spillage and water leakages, closing/sealing running water taps, and taking measures to avoid blockages of the wastewater channels by using screens to prevent brine impurities and solids from entering the drains. The implementation of good housekeeping measures would save 10% of water consumption.

Water conservation: There are several measures identified by the project that overall reduce water consumption by more than 5%: closing the compressors' cooling water circuits, installation of water meters with effective monitoring plan; and the use of pressurized water for washing processes.

Limestone recycling: Two main projects were identified for reducing solid waste generation. The first project consists in the collection and reuse of limestone fines at the lime preparation unit for use in civil engineering works as filler material for roads, highways and cement manufacturing. The second project under evaluation consists in the reuse of grits from lime milk preparation unit as soil conditioner for pH correction. These projects aim at valorizing solid waste as by-products avoiding their accumulation on the company ground and eliminating their disposal cost.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Environmental Management Branch
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org



EGYPT NATIONAL CLEANER PRODUCTION CENTER
26 A Sherif St., Downtown, Cairo, Egypt
Telephone: 02 23916154
02 23925984
Email: h_elhadary@link.net,
www.enpc.org



EWATEC CONSULTANTS
55 Adham St., # 5 Rassafa Tower,
Moharam Bay, Alexandria, Egypt
Telephone: (+203) 3930700
Fax: (+203) 3906191
E-mail: ewatec@gmail.com,
www.ewatec-eg.com

