Solar Heating in Industrial Processes (SHIP) Project

The project "**Utilizing Solar Energy for Industrial Process Heat in Egyptian Industry**" is financed by the GEF and implemented by UNIDO in partnership with the Egypt National Cleaner Production Centre ENCPC. The objective of the project is to develop the market environment for the diffusion and local manufacturing of solar energy systems for industrial process heat. The project results will increase the knowledge and strengthen the awareness among the major stakeholders on the penetration potential of solar technologies in the food, chemical and textiles sectors in the region. The project focuses on improving the energy efficiency of the industrial process heating systems and the introduction of solar thermal technologies mainly in industrial companies that have low and medium temperature heat demand in three industrial sectors, namely the food, chemical and textiles sectors.

Timex Tannery Case Study

El-Robiky City, 10th of Ramadan City, Egypt

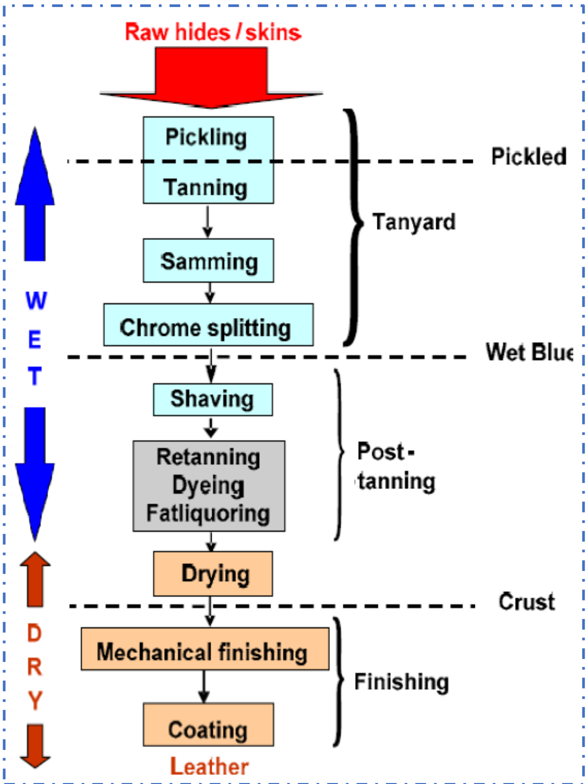
Leather Sector

Tanned and Finished Leather

4,000,000 ft²/year

653,330 kWh/year of thermal energy consumed

Production Processes Flow Diagram



Timex Tannery is an Egyptian-Italian leather tanning company in Egypt. Its official name is TIMX "Engineering Co. for International Trading". It was established on 1997 with about 20 employees. The company specialized in tanning crust leather and finished leather products.

Timex production processes flow diagram exhibits the main processes performed on the raw material to produce the finished leather. General analysis on the thermal energy consumption shows that the factory uses about **8 LPG cylinders daily** to supply the existing **2 hot water boilers** which heat water up to **85 °C**, one boiler supplies hot water for the tanning process in an open loop and the other boiler supplies hot water for the vacuum & finishing processes in a closed loop.

The waste heat streams are only the flue gases from the boiler, waste water from the drums' drainage, in addition to the pipe losses. System optimization measures were identified to decrease the energy consumed by the plant and it is waste heat utilization from flue gases and waste water were found not effective. Applying the suggested optimization measures will eliminated unnecessary losses and the system can operate at much lower cost.

- Optimization Opportunities -

Thermal Insulation

Solar Water Heating

Thermal Insulation

This measure aims to eliminate the heat losses while transporting the hot water due to convection and radiation from the uninsulated pipes. **The proposed solution** is to **insulate all steam parts** in the boilers' room and the production area. This solution will help to **reduce energy consumption**, **CO_2 emissions** and **operation costs**. This measure could save about 3.8 MWh/y which is equivalent to about 20 LPG cylinders annually (about 1% of vacuum's boiler fuel consumption).

Capex: 188 USD/meter
Energy Savings: 3,830 kWh/year
Payback: 1 years
CO_2 Reduction: 1.1 tCO_2/year

Integration of Solar Thermal Heating System

Solar heating technologies collect thermal energy from the sun and this heat can be used for heating purposes. Solar collectors are selected based on the range of the operating temperature range and the type of the industrial sector. Heat in the lower temperature range (<100 °C) can easily be provided with systems commercially available, such as flat plate collectors (FPC) and evacuated tube collectors (ETC).

Three integration **scenarios** on the supply level were envisioned for the factory is to **provide hot water** which will decrease the energy consumed by the boiler. The **1st scenario** is integrating with the hot water supply of the drums, the **2nd scenario** is integrating with the hot water supply of the vacuum system and **3rd scenario** is integrating with both processes combining the first two scenarios.

The combined scenario gives the best payback period and the maximum savings which will be **installed on the roof** occupying **650 m^2** of area. The system is designed to heat about **60 m^3/day to 87 °C**. The **system cost** is around **USD 68,880** and the **annual savings** will be **USD 11,680**. With lifetime of **20 years**, the **total savings** is about **USD 151,800**. Other parameters are shown below.

System Design Area: 650 m^2 using FPC
Energy Savings: 240,000 kWh/year
Capex: 68,880 USD
Annual Savings: USD 11,677
Payback: 6 years
CO_2 Reduction: 66 tCO_2/year
Water Flow Rate: 60 m^3/day
Design Temperature: 87 °C
Lifetime: 20 Years

Lessons Learnt

- **Thermal insulation is a quick win. It saves energy with very low upfront costs and have high impact a low payback but needs to be checked periodically.**
- **Despite the existence of a waste heat streams, utilization heat from it may not be technically of financially effective.**
- **Solar thermal integration combines renewable energy resources utilization and energy savings measures.**

The **total proposed solutions** summary:

- **Thermal Energy Savings:** up to **243,830 kWh/year**, representing about **37.3%** savings of the total **thermal energy** consumption,
- **Financial Savings: 11,860 USD/year,**
- **Capital Cost**: **~69,060 USD**,
- **Overall Payback Period: 5.8 years**,
- **CO_2 Emissions Reduction: 67 tCO_2eq/year**.

For more information:
UNIDO Project Management Unit in Egypt,
Email: info@shipprojectegypt.org
Phone: +20 102 895 1112
www.SHIPprojectEgypt.org

UNIDO Headquarters:
Mark Draek,
Email: m.draeck@unido.org
Phone: +43 (1) 26026 4356

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SOLAR Heating for Industrial Process
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