

Industrial Energy Efficiency Project Motor Systems Optimization

Electric motor driven systems globally consume approximately 70% of the electrical consumption in industrial sector. This case reviews the optimization of motor systems in sea water station within a large old industrial plant in the petroleum sector. The study revealed that for the system assessed in this plant 3,480,000 kWh per annum could be saved (or EGP 2,430,000) without any investment cost.

EGYPT

A Case Study of Suez Oil Processing Company (SOPC)

SOPC Snapshot

Industry:

Oil Refinery

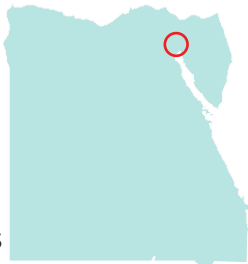
Location:

Suez, Egypt

Product:

Petroleum Products

(Gasoline, Kerosene, Gasoil, Naphta, LPG, Coke, Sulphur and Wax Distillates)



Implementation cost: almost none

System: Sea Water Pumps

Annual energy savings: ~3.48 GWh

Financial savings: ~2,430,000 EGP p.a.

GHG reduction: ~18920 tCO₂eq (10 y)

Overall payback: immediately

About SOPC

Suez Oil Processing Company (SOPC) is the first national oil refining company in Egypt; it has been founded in 1921. It is located on the coast of Gulf of Suez just downstream the international water way of Suez Canal, It is a wholly owned subsidiary of the Egyptian General Petroleum Corporation (EGPC), SOPC refining capacity is 3 MM ton/year of crude oils to produce the main petroleum products required for the local market for petroleum products.



MSO at SOPC and the IEE Project

The Industrial Energy Efficiency Project (IEE) is a program developed and initiated by UNIDO to promote energy efficiency in industry as part of its primary objective of “promoting and accelerating inclusive and sustainable industrial development in developing countries and economies in transition.”

The Motor Systems Optimization (MSO) Project forms part of the IEE Project and has the specific objectives of developing local personnel to become competent in the application of energy efficiency in industry in order to unlock the potential for energy savings within their respective local industries.

SOPC has joined the IEE project as a part of the cooperation with Egyptian Ministry of Petroleum represented by Oil and Gas Sector Modernization Project (Group 4B). SOPC energy team appreciated their attendance of MSO training courses delivered by IEE project which provide knowledge for motor system assessment, identifying potential improvement opportunities, achieving financial savings through MSO measures and projects.

The company consumes about 41,300,000 kWh of electrical energy annually where the tariff was EGP0.709 (in 2017/2018) . Therefore, ASORC has focused on improvements related to

Summary of Optimization Strategies

System	Saving Opportunity	Annual Energy Savings [kWh p.a.]	Financial Savings [EGP p.a.]	Investment [EGP]	Payback [years]
Sea Water Pumps	1. Discharge Valves Opening Adjustment	750,000	530,000	0	0
	2. Run only one Pump during Units Outages	2,730,000	1,900,000	0	0
	3. Using New Efficient Smaller Pumps	1,480,000	1,000,000	8,000,000	8
	4. Replacing Manual Valves by Motorized	518,000	366,000	3,000,000	9

The Case

Sea water station provides production units in SOPC by cooling water. It contains 6 vertical pumps driven by large motors (6.6 KV, 825 ~ 925 KW) which consumes around 13% of total electricity consumption. During normal operation, only two pumps are running. SOPC is considerably old plant and those pumps were installed in different times; two pumps in 1963, two pumps in 1982, and the newest two pumps were installed in 2009. Each pump is operating annually for around two months. The discharge line diameter for each pump is 28 inch and controlled by manual valves three of them are gate valves and the other three are butterfly valves where any valve is operating at 60% opening. The sea water large motor system has been selected to be the pilot project for MSO.

The assessment involved reviewing process requirements, reviewing historical data, taking system measurements and developing optimization solutions. This approach requires the engineers to develop a strong understanding of the system efficiency, operation and control conditions, as well as maintenance practices impact.

Optimization Strategies

The result of the sea water pumps motor system assessment concluded the identifications of four optimization opportunities. First, adjusting the discharge valves for sea water pumps to an accurate opening percentage that can fulfill the required flow rate and pressure while affording energy savings. Second, due to the old plant status, many unplanned shutdowns happen regularly during the year so that stopping one of the two running pumps and keeping only one pump operating at max capacity can be a good opportunity for energy savings. Replacing the existing pumps with smaller pumps driven by higher efficiency motors is considered as third opportunity. The fourth identified energy saving opportunity is replacing the existing pumps discharge manual valves with new motorized control valves of butterfly

types. Another opportunity was identified to use VSD with the existing pumps, however the assessment indicated that it is not applicable in the system under study.

The first two opportunities can be implemented at no cost while the latter two opportunities showed somehow long payback period.

Outcome

The company decided to implement the first two opportunities and now both are successfully tested and energy savings have already been gained. Total savings amount to 3,480,000 kWh (or EGP2,430,000) per annum without any investment cost. The other two opportunities are approved to be implemented not only from energy efficiency perspective but also from asset integrity perspective to revamp the very old equipment.

Lessons Learned

Joining a program like MSO that concerns with improvement can provide a very good support to deploy a culture of improvement especially in old companies with high resistance to change.

The assessment of the motor systems identified the need for many measuring instruments that could be considered while preparing a measurement plan within the company.

Energy efficiency initiatives can always encourage many other initiatives that improve the operations in general.

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