UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

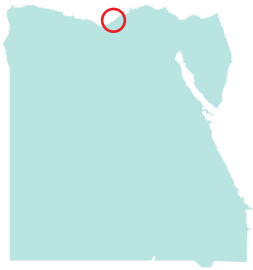
Industrial Energy Efficiency Project
Motor Systems Optimization

Electric motor driven systems globally consume approximately 70% of the industrial sector electrical consumption. This case reviews the optimisation of the utility cooling water system within a large industrial plant in the petrochemical manufacturing sector. The study revealed that for the 2 major motor systems assessed in this plant 1,630,000 kWh (or EGP930,000) per annum could be saved at an investment cost of EGP100,000.

EGYPT

A Case Study of Sidi Kerir Petrochemicals Co.

Sidpec Company Snapshot



Industry: Petrochemicals
Location: Alexandria, Egypt
Products: Ethylene, Polyethylene

Implementation cost: ~100,000 EGP
System: Water cooling fans and pumps
Annual energy savings: ~1.63 GWh
Financial savings: ~850,000 EGP p.a.
GHG reduction: ~9000 tCO_2eq (10 y)
Overall payback: 2 mons

About Sidpec

Sidpec is an Egyptian joint stock company established in 1997 under the Egyptian investment law, located in Alexandria, Egypt.

Sidpec produces 225,000 Ton/Year of Poly-Ethylene. Sidpec production portfolio also includes Ethylene (285,000 Ton/Year), LPG (50,000 Ton/Year) and Butene-1 (10,000 Ton/Year).

MSO at Sidpec and the Industrial Energy Efficiency Project

The Industrial Energy Efficiency Project (IEE) is a programme 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 Optimisation (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.

Sidpec has joined the IEE Project to implement an energy management system for its production facility in Alexandria. It needs to reduce operating costs to remain competitive in the global market. The mandated electricity tariff increases have also contributed to this need to improve energy efficiency.

Since motors consume a large proportion of electrical energy, Sidpec has focussed on motor system improvements.

Summary of Optimization Strategies

System	Saving Opportunity	Annual Energy Savings [kWh p.a.]	Financial Savings [EGP p.a.]	Investment [EGP]	Payback [years]
Cooling Water Fans	1. Installation of 2 VSD	440,000	250,000	100,000	0.4
	2. Installation of additional VSDs	600,000	340,000	200,000	0.6
	3. Switching off "unused" fans	770,000	440,000	0	0
Cooling Water Pumps	1. Replacement of larger pumps by smaller ones (existing)	1,200,000	680,000	0	0
	2. Installation of VSDs	4,950,000	2,810,000	3,600,000	1.3
	3. Installation of additional VSDs	17,740,000	10,070,000	17,500,000	1.7

The Case

Large motor systems within the utility plants were identified as a pilot project. The utility plant was perceived to have a low production and business risk. Successful implementation could realize energy savings but also serve as a stepping stone to realize more energy savings in other areas of production.

Utilities consumption represents 38% of the total electricity consumed by the company. The 2 major motor systems (cooling pumps and cooling fans) were identified as significant energy users consuming 50% and 10% of the utilities plant electrical consumption respectively.

The assessment involved reviewing process requirements, reviewing historical data, taking system measurements and developing optimisation 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 fans cooling system consists of eight 110kW fans. However, the process requirements do not dictate the operation of all eight fans at the same time most of the year. Three possible opportunities for energy saving in cooling fans system were identified. Two of them involved operating parallel fans at reduced speeds to get more reduction in power. The third opportunity was simply through switching off the equipment based on process requirements. A more in depth study of the process requirements was found to be necessary before this option could be implemented.

There are seven 1100kW cooling water pumps, of which 2 are switched off 8 months of the year.

Review of process requirements showed the flow rate could be reduced without any negative effects on production. Three opportunities were identified for the cooling pumps. The first was to replace larger pumps with readily available smaller pumps (750 kW), the second was by installing VSDs on the newly installed smaller pumps and the third was to add VSDs to all larger pumps.

Outcome

For the pumps the company has decided to implement Option 1 (replacement of pumps) and use the savings generated to review implementation of the other options. For the fans Options 1 has also been chosen. Total savings amount to 1,630,000 kWh (or EGP930,000) per annum at an investment cost of EGP100,000.

Lessons Learnt

Applying a structured approach to MSO can often realise with no or low cost requirements. This case only realises 0.8% of total energy consumption.

Sidpec now realize the total potential savings as it has many other large motors systems at the plant that could also be epitomized. Using a continuous improvement approach it intends to realize these savings in future projects

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