UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

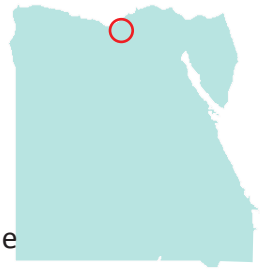
Industrial Energy Efficiency Project
Motor Systems Optimization

Electric motor driven systems globally consume approximately 70% of the electrical consumption in industrial sector. This case reviews the optimization of motor systems in compressed Air System within a large industrial plant in the petrochemical manufacturing sector. The study revealed that for the system assessed in this plant 172,000 kWh per annum could be saved (or EGP 133,000) without any investment cost.

EGYPT

A Case Study of Egyptian Linear Alkyl Benzene Co. (ELAB)

ELAB Snapshot



Industry: Petrochemicals
Location: Alexandria, Egypt
Product: Linear Alkyl Benzene (LAB)

Implementation cost: almost none
System: Compressed Air System
Annual energy savings: ~0.17 GWh
Financial savings: ~133,000 EGP p.a.
GHG reduction: ~935 tCO2eq (10 y)
Overall payback: immediately

About ELAB

The Egyptian Linear Alkyl Benzene Co. (ELAB) is an Egyptian Shareholding company established in November 2003 to produce Linear Alkyl Benzene licensed by UOP Technology. ELAB Complex is located in Alexandria, Egypt. ELAB Complex is designed to produce 100,000 MT per year of Linear Alkyl Benzene, 80,000 MT per year of Normal Paraffin, and 36,000 MT per year of Benzene.
LAB is the most common raw material in detergent manufacturing.

MSO at ELAB 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.

ELAB has firstly joined the IEE project during peer-to-peer network moderated by Sidpec, ECHEM, and UNIDO in 2015 where the company implemented its energy management system (EnMS) and was ready for ISO 50001 certification. ELAB was selected to join MSO program as a part of the cooperation with Egyptian Ministry of Petroleum represented by Oil and Gas Sector Modernization Project (Group 4B).
The company consumes about 72,000,000 kWh of electrical energy annually where the tariff was EGP0.77 in 2017. Since motors consume the largest proportion of electrical energy, ELAB has focused 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]
Compressed Air System	Leakage Reduction in Instrument Air Network	96,000	74,000	0	0
	Air Compressor Pressure Adjustment	76,000	59,000	0	0

The Case

Compressed Air System in ELAB is identified as one of the significant energy users. Each of the three air compressors is driven by 260 kW motor where their electrical energy consumption is around 1,440,000 kWh per annum.

Due to the expected potential energy savings opportunities in compressed air system, ELAB decided to select it as a pilot project for MSO work and started the system assessment.

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

ELAB team recognized the most common optimization strategies for compressed air systems which include reduction of leakage and inappropriate usage in addition to improvement of compressor control.

Check the sources of leak in instrument air network was accomplished and all the required maintenance was performed. All operators were also advised to eliminate inappropriate usage of compressed air during daily activities like cleaning or using higher pressure than necessary.

An investigation for the optimum load/unload pressure set points was conducted to find the optimum values for energy savings achievement where it was found that decreasing the cut-in pressure to be 6.5 bar instead of 6.8 bar and letting the compressor working in the new band 7.8/6.5 bar can result in reasonable energy savings.

Further check for instrument air network leakage is still required and may be done using ultra sound detector or by third party investigation. Decreasing instrument air network pressure is still under investigation and may lead to extra savings.

Outcome

The company has decided to implement the maintenance for the identified leakage points in instrument air network, increase the awareness of the operators to avoid the inappropriate usage of compressed air, and adjust the air compressor pressure set points. ELAB achieved total savings amount of 172,000 kWh (or EGP133,000) per annum without any investment cost.

Lessons Learned

Applying a structured approach to MSO can often result in savings with no or low cost requirements.

Applying MSO is easier and more efficient when there is an energy management system (EnMS) in place.

ELAB admitted that top management support is mandatory for deployment of an energy efficiency improvement culture.

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