UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Industrial Energy Efficiency Project
Motor Systems Optimization

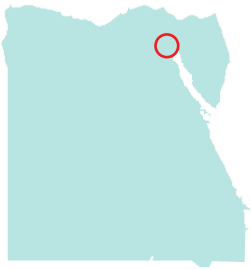
Electric motor driven systems globally consume approximately 70% of the industrial sector electrical consumption. This case reviews the optimisation of a single motor system within a large industrial plant in the steel manufacturing sector. The study revealed that for the fume extraction system 10,250,000 kWh (equivalent to EGP 4,100,000) which represent 1.8% of the plant's total electricity consumption could be saved per annum at zero investment cost. This project is implemented by the UNIDO in partnership with the Egyptian Environmental Affairs Agency, Ministry of Industry, Trade and SMEs and the Federation of Egyptian Industries.

EGYPT

A Case Study of Ezz Flat Steel (EFS) Company

Ezz Flat Steel Company Snapshot

Industry: Iron & steel
Location: Suez, Egypt
Products: long steel and flat steel



Implementation cost: None
System: Fume extraction fan motor
Annual energy savings: ~10.25 GWh
Financial savings: ~4 million EGP /year
GHG reduction: ~55 ktCO_2eq (10 y)
Overall payback: Immediate

About Ezz Flat Steel

Ezz Flat Steel (EFS) is part of EZZ industries. EZZ Industries is the leading group of companies for steel making, continuous casting and rolling in Egypt that produces more than 5 million tons of steel of long and flat products annually. EFS plant has facilities for steel making, treatment, thin slab casting, BCC casting, hot rolling mills (rebar and flat), skin pass treatment. The plant has a production design capacity of 1.2 million tons per year.

MSO at EFS 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 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.

The global market for steel has changed with Chinese imports now adding pressure to pricing of steel products. EFS have looked for opportunities to improve production efficiency. One of these was to implement an energy management system. The mandated local electricity tariff increases have also driven the need for energy efficiency. Electric motor driven systems consume approximately 70% of electrical energy supply in the industrial sector. Consequently EFS have identified motor systems as a potential are for savings.

Summary of Optimization Strategies

System	Saving Opportunity	Annual Energy Savings [kWh p.a.]	Financial Savings [EGP p.a.]	Investment [EGP]	Payback [years]
Fume Extraction System	1. Stopping one Induced Draft (ID) fan motor	10,250,000	4,100,000	0	0
	2. Installation of soft starters	10,250,000	4,100,000	4,000,000	1
	3. Installation of VSDs	10,720,000	4,240,000	6,300,000	1.5
	4. Stopping one ID fan and Installing VSDs	16,160,000	6,430,000	6,300,000	1

The Case

EFS attended the MSO courses administered by UNIDO. This case represents the pilot project at motor optimisation using the methodology proposed in the course.

The induced draft (ID) fan in the Fume Extraction System of the Melt Shop was selected. The Melt Shop represents 41% of the total plant electricity consumption, whilst the Fume Treatment Plant consumes 5% of the Melt Shop consumption.

The fume extraction system consists of four 1200kW fans that operate continuously. The actual fume extraction is controlled by regulating dampers and changed during the various phases of production.

Analysis of the case involved reviewing process requirements, reviewing historical data, taking system measurements as required, and developing optimisation solutions for the identified system.

This approach requires local personnel to develop a strong understanding of the system efficiency, operation and control conditions, as well as maintenance practices impact of the identified motor system.

Careful analysis of the production process showed that all ID fans were not required to operate at full power all the time. During certain production phases less power was required. This formed the basis for the optimization strategies.

Optimization Strategies

Understanding the process requirements, four potential optimization strategies were developed.

These involved either stopping or slowing down the fans as the process required.

Outcome

Option 1 was chosen as the optimal implementation strategy at this stage when considering investment, operational impact, maintenance and technical difficulties when commissioning new equipment.

This represents a saving potential of 10,250 MWh or 1.8% of total plant consumption of 540,000MWh per annum. In financial terms it represents a potential saving of 4,100,000 EGP per annum.

Lessons Learnt

MSO have proven to have a strong potential for achieving significant energy and financial savings.

Sometimes no and low cost solutions could deliver the same energy and financial savings as other measures that require higher investments. Technically simple interventions are often missed.

Applying a structured methodology to analyze systems often reveal options for significant energy saving without the need for additional resources allocation

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