UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Industrial Energy Efficiency Project
Compressed Air System Optimization

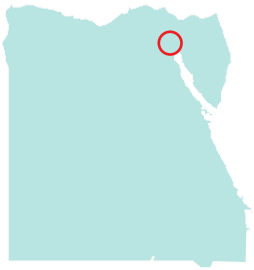
Typically over 75% of the lifetime costs of compressed air system are energy related. This case reviews the optimisation of compressed air system at Ezz Flat Steel in flat production line and the screw compressor station, in order to identify opportunities for saving the energy consumption by the system. The study revealed that for compressed air system opportunities assessed in this plant 16,181.9 MWh (or 11,025 Million EGP) per annum could be saved at an investment cost of EGP 523,000.

EGYPT

A Case Study of EFS Company

Ezz Flat Steel Snapshot

Industry: Steel
Location: Suez, Egypt
Product: Steel HRC, Billet and Rebar



Implementation cost: 523,000 EGP
System: Air Compressor System
Annual energy savings: ~16,182 MWh
Financial savings: ~11,025 million EGP/year
GHG reduction: ~9,225 tCO_2eq (10 y)
Overall payback: < 1 year

The Ezz flat steel (EFS) is located in Ain Al Sokhna, 4th industrial zone, Suez, Egypt with a short distance from the port and local market and at the canter of international consumer market. Ezz flat steel is considered the largest producer of steel in the Middle East and is the market leader in Egypt holding more than 10,000 employees. The company production capacity riches 1,345,123 ton of molten steel, 1.175.000 ton of HRC, 1,316,902 ton of Billet and 1,020,824 ton of rebar.

CASO at EFS and the IEE 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 "promoting and accelerating inclusive and sustainable industrial development in developing countries and economies in transition."

The Compressed Air Systems Optimisation (CASO) 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.

The CASO serves pretty well in addressing the potential energy measures in its compressed air system by providing the technical consultancy from UNIDO`s national and international consultants and afford the measurement devices. 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 compressors consume a large proportion of electrical energy, Ezz Flat Steel company has focussed on compressed air consumption improvements

Summary of Optimization Strategies

Saving Opportunity	Energy Savings (kWh/year)	Financial Savings (EGP)	Capital Cost (EGP)	Payback (Year)
Shutdown centrifugal compressor (1050 kW power)	6,272,000	4,263,390	---	Immediately
Eliminate inappropriate uses of compressed air	1,442,295	1,081,445	15,000	< month
Shutdown another compressor (1050 kW power)	2,877,675	2,158,255	---	Immediately
Reduce the leakage for screw compressors	593,385	373,830	50,000	0.17
Reduce in appropriate use for screw compressors	1,233,805	777,295	28,000	< month
Install automatic drain	1,321,920	832,810	400,000	0.48
Increase the air receiver's capacity	64,800	40,820	30,000	0.74
Connect centrifugal & screw compressors networks	2,376,000	1,496,880	0.0	Immediately
Total:	16,181,880	11,024,725	523,000	< 1 year

Case Description

Ezz Flat Steel compressed air demand is supplied through three compressed air stations, One stations consists of three dynamic (centrifugal) compressors feeding three different air demands. Each compressors controlled by means of throttling control (inlet valve). The other two identical stations are the screw compressors stations each one consists of three compressors. Successful implementation could realize energy savings but also serve as a stepping stone to realize more energy savings in other areas of production. The two major compressed air consumption opportunities represents about 21.8 % of the total compressed air consumed. These opportunities are obtained from shutting down one centrifugal compressor with 1050 kW power rated and from Opening connection between the screw and centrifugal compressed air networks. These opportunities are consuming about 15.8 % and 6% respectively. The assessment involved reviewing process requirements, reviewing historical data, taking system measurements and developing optimisation solutions.

Optimization Strategies

Ezz Flat Steel first compressed air station consists of three 1050 kW Ingersoll Rand three stages centrifugal compressors where three possible opportunities for energy saving were identified. First, is to shut down one centrifugal compressor with 1050 kW power. Second, is eliminating inappropriate uses of compressed air that comes mainly from cooling applications for any equipment suffers overheating. Third, is to shut down another centrifugal compressor with 1050 kW power.

The other two identical compressed air stations consists of three 160 kW Atlas Copco screw compressors where six possible opportunities for energy saving were identified including Reduce the leakage, Reduce in appropriate use for about 28 air cooling points, Install automatic drain for 20 draining valves point; Increase the air receiver's capacity and Opening the connection with the centrifugal compressed air network.

Outcome and Lessons Learnt

For the whole air compressor system, it is recommended to implement all the opportunities to reduce the energy consumption in the compressed air system with total savings amount of 16,181.9 MWh (or 11,025 Million EGP) per annum at an investment cost of EGP 523,000.

Applying a structured approach to CASO can often realise large amount of energy savings with low cost requirements. This case realises about 40.6% of total electricity consumption.

Ezz Flat Steel company now realize the potential savings that could be epitomized. Using a continuous improvement approach it intends to realize these savings in future projects.

For more information:

UNIDO Project Management Unit in Egypt:
Email: iee-egypt@unido.org
Phone: +20 (2) 2380 0357

UNIDO Headquarters:

Rana Ghoneim: r.ghoneim@unido.org
Phone: +43 (1) 26026 4356
or visit: ieeegypt.org