UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Industrial Energy Efficiency Project
Compressed Air System Optimization

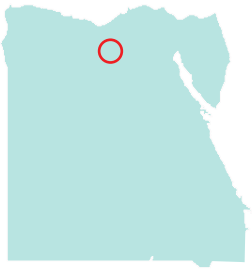
Typically over 75% of the lifetime costs of compressed air system are energy related. This case reviews Compressed Air System Optimisation assessment at Egyptian dairy products and Juices Company., in order to identify opportunities for saving the energy consumption by that system. The study reveals compressed air system opportunities assessed in this plant, 696,930 kWh (or EGP 299,705) per annum could be saved at an investment cost of about EGP 146,000.

EGYPT

A Case Study of El-Masria Company

El-Masria Juhayna Snapshot

Industry: Food
Location: 6th October, Egypt
Product: dairy products and juices



Implementation cost: 146,000 EGP
System: Air Compressor System
Annual energy savings: ~696.9 MWh
Financial savings: ~299,705 EGP /year
GHG reduction: ~377 tCO_2eq
Overall payback: < 1 year

Juhayna Food Industries is one of the pioneer companies in Egypt working on the production of dairy, juice, and cooking products established in 1983 and has expanded its presence in the Middle East. As part of Juhayna endeavour to increase production capacity in line with growing demand for, the company acquired Egyptian dairy products and juices factory (EL-Masria) in 2005 with a total of 300 workers. it utilizes the most advanced technologies to produce milk and white cheese.

CASO at El-Masria 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 developing saving opportunities for the company. 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 since it utilizes 13% of the plant's annual electric energy, Juhayna has focussed on compressed air system improvements.

Summary of Optimization Strategies

Saving Opportunity	Energy Savings (kWh/year)	Financial Savings (EGP)	Capital Cost (EGP)	Payback (Year)
Adjust regulators to minimum required pressure	40,130	30,780	---	Immediately
Fixing drain valves	9,675	7,420	36,000	4.85
Install Pressure-Flow control and use cascade control	154,765	118,705	110,000	0.92
Compressor waste heat recovery to preheat boilers' air	492,360	142,800	N.A	N.A
Total:	696,930	299,705	146,000	< 1 year

Case Description

The compressed air system at Egyptian dairy products and Juices Company consists of four of the brand Atlas Copco compressors. One is 250 kW two stages oil free compressor (VSD control) and Two of them are 55 kW single-stage air-cooled, lubricant injected screw compressors (not working), these three compressors are located in a single compressor room, while the fourth one is 145 kW two stages oil free compressor (load/unload control) is located outdoor beside the compressors room.

The major compressed air system utilizes about 13 % of the total electric energy consumed by of Egyptian dairy products and juices plant.

This is represented by the two running compressors (including the dryer) that were identified as significant energy users. Successful implementation could realize energy savings but also serve as a stepping stone to realize more energy savings in other areas of production. The study focused on the analysis of network 1 only.

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

Five possible opportunities for energy saving in compressed air system were identified. The first one is to adjust the pressure higher than the demand, which will add to the so-called artificial demand. The second one is to replace the drain valves with no-loss drains.

The third one is to install flow controller to use the controlled release of air already in storage to stabilize the air pressure delivered into the main piping header leaving the compressor room and run compressors in cascade control.

The fourth one is to use the cooling air of 250 kW compressor for pre-heating boiler combustion air, but the company should check with the manufacture that the present fans can tolerate the raised air temperature).

The last one is to change the output of the second tank to be from the higher port not from the lower port and change the interconnection pipe to connect the higher port of the first tank to the lower port of the second tank.

Outcome and Lessons Learnt

For the air compressor system, the compressed air savings opportunities implementation will lead to save about 45.1% of the total electric energy of Egyptian dairy products and Juices Company where the saving values for each EMO are calculated from a new baseline after the prior EMO savings is achieved. The total savings amount of 696,930 kWh (or EGP 299,705) per annum could be saved at an investment cost of about EGP 150,000.

Applying a structured approach to CASO can often realise with low cost requirements. This case only realises 5.86% of the total electrical energy consumed by Juhayna plant.

Juhayna company now realize the potential savings as it has other motor 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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