UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

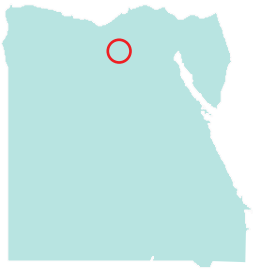
Industrial Energy Efficiency Project
Compressed Air System Optimization

Typically over 75% of the lifetime costs of compressed air system are energy related. This case reviews the optimisation of compressed air system at Evergrow, in order to identify opportunities for saving the energy consumption by that system. The study reveals compressed air system opportunities assessed in this plant, with potential savings 373,525 kWh (or EGP 286,490) per annum at investment cost 89,000 EGP.

EGYPT

A Case Study of Evergrow Company

Evergrow Snapshot



Industry: Chemical Industry
Location: Giza, Egypt
Product: manufacturing & marketing of specialty fertilizers

Implementation cost: 89,000 EGP
System: Air Compressor System
Annual energy savings: ~373,525 kWh
Financial savings: ~286,490 EGP/year
GHG reduction: ~158 tCO_2eq
Overall payback: 1 year

Evergrow was founded in 2006 for manufacturing & marketing of specialty fertilizers in 6th October City, Egypt on 40,000 m2 as the first Egyptian factory specialized in manufacturing all kinds of fully soluble and granular Potassium sulphate, Mono-Ammonium Phosphate, Mono Potassium Phosphate, Urea Phosphate, different formulas of solid, liquid and suspension NPK, Calcium nitrate, Copper sulphate, Calcium chloride and hydrochloric acid.

CASO at Evergrow 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, Evergrow 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)
Fixing Drain Valves	28,965	22,215	---	Immediately
Inappropriate Use (Bearing Cooling)	187,080	143,490	N.A	Low
Decrease Pressure Drop	45,740	35,085	---	Immediately
Fixing Dryer	29,405	22,550	---	Immediately
Installing Variable Speed Drive	82,335	63,150	89,000	1.4
Total:	373,525	286,490	89,000	1.0

Case Description

The compressed air system in Evergrow consists of two separate compressed air rooms that feed the factory in parallel. The two rooms are connected together with a normally closed valve which is opened by the maintenance department in case of extra compressed air need in any side of the factory. 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 represent about 30.8 % of the total compressed air consumed. These two opportunities are obtained from the optimization of Inappropriate use of CA in Bearing cooling and the occurring of pressure drop through network that are consuming about 24.8 % and 6% 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

Compressed air room 1 has two identical fixed speed Ingersoll-Rand MH75 screw air compressors 75 kW each while room 2 has one fixed speed Ingersoll-Rand UP5-30-10 screw air compressor of 30 kW and one dryer.

Two possible opportunities for energy saving in compressed air demand system were identified. One involved reducing compressed air losses through the drain valves (and leaks). And the other involved eliminate improper compressed air use in Bearing cooling.

One possible opportunity for energy saving in compressed air distribution system was identified involved eliminate the pressure drop occurred through the underground pipe by moving the two air compressors to the Storage tank room.

Two possible opportunities for energy saving in compressed air supply system were identified. One involved shutting down the dryers and one involved Installing VSD Air Compressor to eliminate load/unload mode that leads to reduce the overall the system energy consumption.

Outcome and Lessons Learnt

For the air compressor system, it was recommended to implement all the opportunities (except for VSD option) to reduce the energy consumption in the compressed air system with total savings amount of 291,190 kWh (or EGP 223,340) per annum at a low investment cost.

The team doesn't include the VSD option as a priority as the company has to finish the aforementioned opportunities and then start to study the VSD option to generate the new compressed air profile.

- Applying a structured approach to CASO can often realise with no or low cost requirements.
- This case only realises 38.54% of total electricity consumption.

Evergrow Company now realize the potential savings that could be epitomized. Using a continuous improvement approach it intends to realize these savings in future projects.

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