UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Industrial Energy Efficiency Project
Compressed Air System Optimization

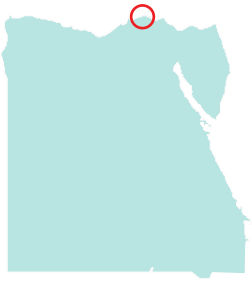
Typically over 75% of the lifetime costs of compressed air system are energy related. This case reviews the optimisation of compressed air system at MOPCO Company in order to addressing the potential energy consumption savings. This study reveals compressed air system opportunities assessed in this plant, 2,934,355 kWh (or EGP 1,687,245) per annum could be saved at an investment cost of EGP 469,000.

EGYPT

A Case Study of MOPCO Company

MOPCO Snapshot

Industry: Chemical
Location:Damietta, Egypt
Product: Liquid ammonia and Urea



Implementation cost: 469,000 EGP
System: Compressed Air System
Annual energy savings: ~2,934.4 MWh
Financial savings: ~1.7 million EGP/year
GHG reduction: ~9,600 tCO_2eq (10 y)
Overall payback: 4 months

MOPCO is one of the petroleum sector companies established over 400.000 meters square. MOPCO produces Urea as a main product and liquid ammonia. MOPCO is producing approximately 1200 metric tons per day (mtd) of Ammonia (UHDE technology), 1925 mtd urea Granulation (Stamicarbon technology).

CASO at MOPCO 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.

MOPCO has joined the IEE Project to implement an energy management system for its production facility in Damietta city. 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.

Summary of Optimization Strategies

Saving Opportunity	Energy Savings (kWh/year)	Financial Savings (EGP)	Capital Cost (EGP)	Payback (Year)
Install automatic drains	789,475	464,365	100,000	0.2
Heat recovery	1,705,680	1,003,280	Low	Immediately
Replace currently installed Screw with centrifugal	439,200	219,600	369,000	1.7
Total:	2,934,355	1,687,245	469,000	0.3

Case Description

Screw compressor was installed and starts operation in 2008 with a kWh meter was installed to monitor the station consumption. And also the system records the compressed air flow. Calculating the total consumption of compressed air is done by using the kWh meter that have the accumulated consumption of the station with the total generated compressed air.

It appears that the specific energy consumption (SEC) for m3 equals as follow: SEC = 0.1349 kWh/m3 & 0.0793 EGP/m3 so that the main driver which affects the compressor is the air consumption through the whole plant.

Optimization Strategies

Identifying the opportunities of improvement of the compressed air system in separation unit is the main issue in the assessment as it leads to power consumption reduction and therefore its costs.

Four possible opportunities for energy saving in compressed air system are developed to meet the objective of this project. First opportunity is to Identify existing leaking points by using the leak detector and fix them. Second opportunity is to install an automatic drain as it was found out that permanently open drain valves on the after-cooler take air at 7.5 bar from 25 mm pipe line. These valves always open at 25 % of their diameters which represent continuous source of air losses. Third opportunity can be done based on using demineralized water instead of cooling water for the existing Heat exchanger. The energy heat recovery is calculated based on the below operating condition and by using simulation program (Aspen plus V.09). Fourth opportunity and the last, replacement of existing screw compressors with a centrifugal compressor is the fourth saving opportunity.

Outcome

Applying these solutions will help the air compressor system to become optimized which will lead to an increase in savings and keep the current savings within limits. All opportunities have been recommended to be implemented together.

The annual energy savings amount for the compressor replacement opportunity is estimated to be 439,200 kWh and Financial Savings to be around 219,600 EGP at total investment of EGP 369,000.

Lessons Learnt

- Small component could introduce huge saving in the compressed air system
- Heat recovery is promising solution that could supply hot water up to 65 ^{o}C

MOPCO Company now realizes the potential savings as it has other compressed air system 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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