



ASSOCIATED MOTORWAYS LIMITED

Replacement of Inefficient Compressor with two Screw Type Compressors

SUMMARY OF THE OPTION

Associated Motorways Limited is one of the leading rubber products factories in Sri Lanka, producing tyres and tubes and retreading tyres. To meet its compressed air requirements at the tyre rebuilding and blending departments, the company was using two old reciprocating compressors, which had several problems such as low efficiency, high no load current, high temperatures of the delivery air, and leakages. In addition, the two old capacitors combined capacity was 263 kW, which was much more than needed and therefore large quantities of compressed air were wasted.

The company replaced the two old reciprocating compressors (263 kW) with one 75 kW screw type compressor for the tyre rebuilding section and one 30 kW compressor for the blending department. The screw compressors cost US\$ 29,500, annual electricity savings were 500 MW or US\$ 43,137, and therefore the payback period was 8 months. GHG emissions were reduced with 102 tons CO₂ per year. Finally, noise levels and ambient temperatures in the compressor room were reduced, thus improving the work environment. A continuous improvement programme was also introduced to improve the compressed air distribution system, especially aimed at reducing leaks.

KEY WORDS

Chemicals, Sri Lanka, Compressors and Compressed Air System, Rubber, Screw type compressor

OBSERVATIONS

The production processes make use of compressed air supplied by energy-intensive compressors. Because the company's departments and factories are spread out the compressors are often located far from the production machines. Company management and the GERIAP Team were very keen to study the system and especially focus on the old reciprocating compressors. These two centralized reciprocating compressors supply compressed air to the tyre rebuilding department and the rubber compounding/blending department. The rubber compounding/blending department operates continuously to meet increase in demand from customers, while the tyre rebuilding operation only operates for a limited number of hours each day.

Both compressors had the following ratings:

- Loading current: 600 Amp
- Unloading current: 400 Amp
- Free air delivery: 635 cuft/min
- Motor rating: 150 kW
- Operating pressure: 10 bar
- Total average power consumed by the old compressors 263 kW
- Annual operating hours: 6512

The GERIAP Team found that there was improvement potential because:

- A capacity test found that the compressors operate at low efficiency: 60% and 70%
- The compressor with a 60% efficiency was found to take very high no load current
- The temperature of the delivery air was very high
- The temperature and noise level inside the compressor house were very high
- Leakages were also detected in between the compressor and the receiver
- Although no measurements were taken, losses of compressed air supply were believed to occur between the compressor rooms and the blending department

Upon investigation it was found that the major causes found for these losses were:

- Mechanical problems in the compressor that existed for a long time
- Faulty electric motor of one of the compressors
- Absence of an after-cooler for both compressors
- Line loss
- Leakages in the distribution system
- Old compressors and therefore frequent downtimes, high cost of repairs, resulting in production losses

In addition, the two old capacitors combined capacity was 263 kW, which was much more than needed and therefore large quantities of compressed air were wasted.

OPTIONS

Management preferred the high cost option to replace the two old reciprocating compressors with a more efficient compressor. However, the blending department operated more hours than the tyre rebuilding department. For this reason, two compressors were purchased to meet these different load patterns (photographs are shown below):

- 75 kW screw type compressor for the tyre rebuilding department
- 30 kW screw type compressor for the blending department

In addition, the company started a leak management program.



Figure 1: the New Compressors

RESULTS

Financial benefits:

- Investment costs: US\$ 29,500, calculated as follows:
 - Screw compressor 75 kW = US \$ 21,000
 - Screw compressor 30 kW = US\$ 8,500
- Annual operating costs: not quantified, but less than in old situation
- Annual cost savings: US\$ 43,137 (500,000 kWh X Rs. 8.75/kWh X 0.00986 Rs/US\$)
- Payback period: 8 months

Environmental benefits:

- Annual electricity savings: 500 MW, calculated as follows:
 - Capacity of two old compressors: 263 kW
 - Capacity of two new screw compressor: 105 kW
 - Operating hours (average): 12 hours per day, 22 days per month, 12 months
 - $(263 - 105) \times 12 \times 22 \times 12 = 500,000 \text{ kW} = 500 \text{ MW}$
- Annual GHG emission reductions: 102 ton CO₂ (500 MW X 0.205 CO₂/MW)

Other benefits:

- The working environment has improved because of reduced noise levels and reduced ambient temperatures in the compressor room

FOR MORE INFORMATION

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