MEDIGLOVES LIMITED

Compressed Air Leak Repair and Reduction of Intake Air Temperature

SUMMARY OF THE OPTION

Medigloves Limited is a Thai producer of more than 70 million pairs of quality surgical and cleanroom latex gloves per year for the domestic and international market. The company uses compressed air for leakage tests of manufactured gloves and for pneumatic equipment. An assessment of the compressed air system found that 23.9 million ft^3/year of compressed air was lost through leaks in the system itself and through the misuse of compressed air by staff to clean their clothes and equipment. Leaks were repaired and maintenance and cleaning instructions changed to minimize future compressed air losses. Secondly, the compressors used air from inside the compressor room as intake-air. Ducting was changed to take ambient air as intake-air, which was 3 degrees cooler.

The implementation of these two options cost US$ 1,500, resulting in US$ 7,450 annual savings and with a payback period of 25 months. Annual electricity savings were 129,573 kWh, resulting in greenhouse gas emission reductions of 70 tons CO_2 per year.

KEY WORDS

Chemicals, Thailand, Compressors and Compressed Air System, Intake Air, Leaks

OBSERVATIONS

The company pays more than US$ 32,000 per year for compressed air, which is mostly used for leakage tests of manufactured gloves and for pneumatic equipment.

The following compressors are installed:

- 70 Hp compressor, operating at 7.5 bars, 7.4 m^3/min (262 cfm), 24 hours/day
- 50 Hp air compressor, operating at 8 bars, 5.75 m^3/min (203 cfm), 24 hours/day
- Two 50 Hp air compressors reserved for rotating with other compressors
- 40 Hp compressor for emergency backup

The company's Team conducted a survey of losses and leakages from the compressed air system. Results obtained from the survey showed losses of 76 ft^3/min or 23.9 million ft^3/year of compressed air. Causes of leakages and losses included:

- Operational losses: worn gaskets and rubber seals, and broken pipes and joins
- Non-operational losses: the misuse of compressed air from pneumatic equipment by staff to remove dust from their clothes and for cleaning machines

A second observation was that the compressed air system is equipped with an air-cooling system. Heat generated by the operation of air compressors is collected and discharged into the atmosphere via an exhaust stag. The company planned to replace this system with a more efficient water cooling system that would make use of chilled water from the company's chiller system.

However, the Team found that the intake-air for the compressors was unnecessarily high because air inside the compressor room was used as intake-air. The indoor air temperature (i.e. average 33 °C) was 3°C or 9% higher than the outdoor air temperature (i.e. average 30°C). Theoretically, every 1% reduction of the intake-air temperature would reduce the electricity consumption for compressors about the same percentage. Therefore approximately 9% of electricity for compressors is wasted, which equals to more than 52,000 kWh (the total electricity consumption for air compressors is 576,000 kWh per year).

OPTIONS

Two options were proposed and implemented:

- The mitigation of operational and non-operational losses/leakages through routine maintenance and good housekeeping practices, such as replacing worn out gasket/rubber seals and broken pipes/joints. In addition, maintenance instructions were changed to improve compressed air leak management in the future. Thirdly, work instructions were revised to eliminate the use of compressed air for staff cleaning their clothes
- Modification of ducting to take the cooler ambient air as intake-air for the compressors instead of air inside the compressor room.
- The company has now also installed a water cooling system, although savings could not be included in this case study at time of writing.

RESULTS

Financial benefits

- Investment: US$ 1,500, including
  - US$ 5,00 for leak repair
  - US$ 1,000 for reduction of intake air temperature
- Annual operating costs: none
- Annual energy cost savings: US$ 7,451, including
  - US$ 4,440 (77,209X0.0575) for leak repair [3]
  - US$ 3,011 (52,364X.0575) [5]
- Payback period: 2.5 months, including
  - 2 months for leak repair {(500+1000)/(4,440-3,011)} X 12
  - 4 months for reduction of intake air temperature

Environmental benefits

- Annual electricity savings total: 129,573 kWh/yr
- Annual electricity savings from leak repair: 77,209 kWh, calculated as follows:
  - Compressed air leak reduction: 66 cfm or ft^3/min (76 cfm leaked compressed air before leak repair – 10 cfm after leak repair)
  - Annual compressed air savings: 23,950,080 ft^3 (66 ft^3/min X 60 min/hr X 18 hours/day X 336 days)
  - 23,950,080 ft^3 compressed air / 310.2 ft^3/kWh = 77,209 kWh
- Annual electricity savings from reduction of intake air temperature: 52,364 kWh, calculated as follows:
  - Temperature difference is 3 degrees or 9.09% {(33 ^oC inside compressor room – 30 ^oC ambient) X 33/100}
  - Annual electricity consumption: 576,000 kWh
  - Annual electricity savings: 576,000 X 9.09% = 52,364 kWh
- GHG emission reduction: 80.08 tons CO_2 {= (77,209 kWh +52,364 kWh) X 0.00061 ton CO2/kWh}

FOR MORE INFORMATION

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