Honeywell

IMPROVED COMPRESSOR EFFICIENCY

Honeywell International is a Fortune 500 company with a workforce of over 100,000 in 95 countries. Honeywell is a diversified technology and manufacturing company; producing aerospace products, control technologies, automotive products and specialty materials for a wide variety of customers, from private consumers to major corporations.

THE BIG PICTURE

Honeywell Turbo Technologies, a subsidiary of Honeywell, maintains a worldwide network of research centres and manufacturing facilities. One such facility is Honeywell Turbo Technologies, Waterford – one of the world's leading manufacturers of engine boosting systems for passenger cars and commercial vehicles. The facility employs approximately 700 people, producing turbine wheels and aluminium compressor wheels for turbochargers and superchargers.

In 2007 Honeywell Turbo Technologies, Waterford implemented a retrofit project to manage their compressed air system in a more energy efficient manner. This involved introducing a new compressor management system, with associated software and controls. This new management system also enabled Honeywell Turbo Technologies, Waterford to reduce the average air pressure in the system by 0.5 bar.

This project was driven by several factors, including:

- Increasing energy costs;
- Compliance with conditions on Honeywell's IPPC license;
- A Honeywell International corporate energy reduction target of 5%.

The objective was to implement a continuous, compressed air management system to ensure optimal efficiency and utilisation of the existing compressor system. This objective was met in full, with reductions in:

Energy consumption	700 MWh per annum
CO_2 emissions	425 tonnes per annum

This retrofit was part-funded under Sustainable Energy Ireland's Industrial Best Practice Initiative. Based on the energy savings calculated and measured, Honeywell Turbo Technologies, Waterford have a payback timeframe of 0.5 years for this retrofit.

THE PREVIOUS SETUP

Honeywell Turbo Technologies, Waterford uses compressed air to power key industrial processes (milling, CNC, balancing machines, etc.) throughout the facility. The following compressors and ratings are used to drive the compressed air system:

- 3 x 90 kW;
- 2 x 237 kW;
- 1 x 110 kW;
- 1 x 180 kW VSD.

All of the above are oil-free, screw compressors, providing 3,200 cfm of compressed air to machinery throughout the facility, 5 days per week. This system serves 3 business units within the plant. The 2 x 237 kW compressors are standalone, separate units, which were excluded from the scope of this retrofit because of the sensitivity of the applications they serve.

In the previous setup, there was no coordinated, automated management of the compressed air system; each compressor operated in a standalone manner. The compressors were loaded and unloaded by individual pressure settings on a rigid cascade basis and were switched on and off manually for business units.

THE INVESTIGATION

Honeywell's first step was to engage their on-site energy reduction team. This team consisted of the plant manager, financial manager and maintenance and EH&S personnel. The energy management team instigated an energy audit in 2005/2006, which revealed that compressed air was a major source of energy inefficiency.
Other major sources were: air handling units, lighting, air leaks and inefficient heat exchangers.

Due to inefficiencies in control, the use of a number of individual pressure switches forces the system to produce compressed air at a pressure above that required. The team's initial investigation indicated that the 7 compressors currently used on-site were running at an average of 27% unloaded capacity. Based on these findings, the team decided to select and install a new compressor management control system to allow the site to manage both fixed and variable speed drives (VSDs) in the most energy efficient manner.

ACTIONS TAKEN

Based on their investigation, the energy reduction team installed a compressor management system that would modulate pressure to match user requirements. This was done by varying the speed on an existing VSD, while using the fixed drive compressors to handle the base-load. The following actions were taken:

Install a new control system

The team installed a new, state-of-the-art control system. This system is capable of:

- Managing both fixed and variable speed drives in a coherent manner;
- Memorising air demand events to allow tighter control;
- Monitoring the time taken for compressors to match demand;
- Relating compressor capacity to respond to all air demand events;
- Automatically tuning the system for maximum efficiency;
- Monitoring associated air treatment and ancillary equipment.

Install management software

The management software takes the form of a simple data logger, connected through an industrial modem to a standalone PC where the system is monitored on a 24 hour basis. This PC runs software specifically developed for the new control system, which monitors demand and modulates the VSD accordingly.

Monitor the system

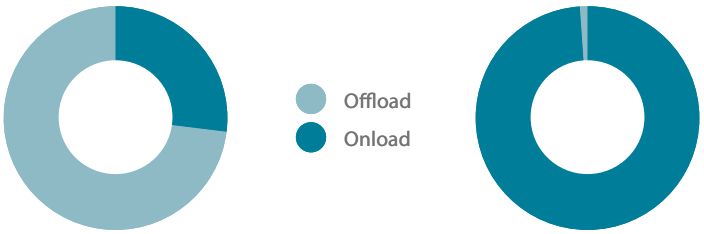
The data logger also provides data for continuous monitoring and reporting of system efficiency. This information is used to assess how production demands and practices affect compressor efficiency on an on-going basis. It is also used to detect leaks in the system and has built in alarms and triggers.

Reduce system pressure

The investigation revealed that the use of advanced control software would allow for a reduction in overall system pressure, due to more accurate control (see line graph below).

SAVINGS AND BENEFITS

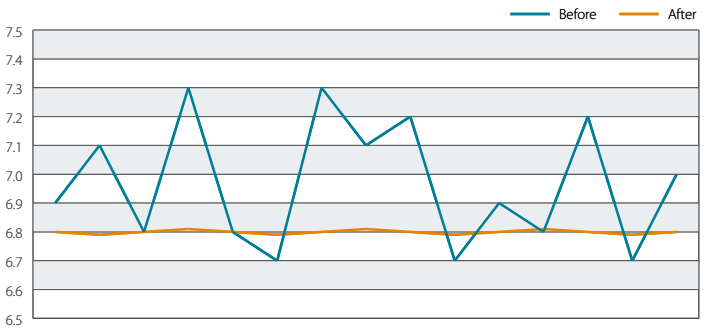
The actions outlined above resulted in a reduction in off-load energy use by up to 90%. This waste accounted for 27% of capacity prior to the retrofit project, as can be seen in the following pie charts.



Before
Offload 73%
Onload 27%

After
Offload 1%
Onload 99%

The reduction in overall air pressure of 0.5 bar resulted in a reduction of 5.25% of energy use. This reduction, and the "smoothing" of the pressure graph, is shown in the following charts.



These two savings combine to give an overall saving of 30% in energy consumed by the compressed air system, which equates to a reduction of 700MWh of electricity consumption per annum.

These energy savings have resulted in a reduction of 425 tonnes in CO_2 emissions annually.

THE UPSHOT

Honeywell's site energy management team has encouraged energy efficient design and technology prior to implementation within their process. Compressed air is inherently inefficient, however the team has shown that good compressor management control systems can minimise energy consumption by generating effectively to match variable demand. This retrofit could be easily replicated in any facility using standalone compressors in a compressed air system.

The monitoring and management system now in place will ensure the continued monitoring of the compressed air management system, allowing for a continuous review of system efficiency.

"SEI afforded us the opportunity to invest in a best practice energy management system, which resulted in significant energy cost savings, a reduction in CO_2 emissions, and a repayment of capital within 6 months. Through the scope of SEI and the grant aid assistance program Honeywell Waterford was recognised at corporate level in early 2008 as being a best practice facility in identifying and adopting energy efficient and environmental initiatives."

Cecil Black,
Health Safety & Environmental Manager,
Honeywell Turbo Technologies

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