Compressing

As compressors and associated plant continue to see engineering updates, Steed Webzell examines the cost/benefits for plant engineers seeking to improve operations

Above: Mattei's Andy Jones
Right centre, Boge's David Burton

Around 30 years ago, sales engineers offering compressed air equipment had very few tools at their disposal to assist with specification. As a result, many systems were over-specified and over-sized, with educated guesswork the best available practice. Additionally, there were air quality issues that would cause most plant engineers to raise an eyebrow today.

Then, several factors impacted industry – notably rising costs of fossil fuels and increasing awareness of ozone depletion by refrigerant gases and other contaminants. These led to compressor equipment innovations, such as variable speed drive options, zero loss drains, zero purge and heat of compression dryers, and intelligent controllers.

And, because the thirst for better technology hardly ever abates, the search is still on for the next big thing. So, what will it be? Well, on the basis that if 'it can't be measured, it can't be controlled', one of Beko Technologies' most notable recent developments could be in the running.

Oil vapour issues

MetPoint OCV is a device that measures oil vapour content in compressed air, down to 0.003mg/m^3. According to Beko, this is the first 'affordable' device that gives results in real time and has the equipment connectivity required in today's information-hungry world.

Until now, options were either very expensive or involved passing air across absorbent material, which then had to be sent away for spectroscopic analysis – a protracted process that could cost thousands in contaminated production waiting for the results. That said, successful innovations are often those that engender best practice and, while technology has a huge part to play, a sound supporting infrastructure must also be in place.

Unfortunately, that is often not the case. As rotary vane compressor manufacturer Mattei's general manager Andy Jones says, the vast majority of plants don't know how much compressed air is being consumed, how much it costs – or even if the compressor is appropriate for the production processes concerned.

"We recently found that one plant running a 75kW compressor could actually fulfil its compressed air requirements with a 45kW machine, with savings in the region of £12,000 a year," states Jones. He agrees that's a lot of money: "Typically, the electricity consumed during operation over a five-year period accounts for around 75% of the total cost of ownership, including initial capital outlay for the compressor."

One answer is to get smart by going for data logging exercises and leak detection surveys – and, with this in mind, the evolution of energy audit products and services is worth exploring. Mattei's Intelligent Energy Management system, for example, claims significant cost savings through supporting the implementation of energy efficiency measures.

Adopting this approach is very much in line with the goals of the forthcoming ISO 110011 standard, 'Compressed air – Energy efficiency – Assessment' (due to be implemented in 2013). The objective is to encourage end users to assess their compressed air systems and then take action to reduce energy usage. Incidentally, this document includes a framework for assessment and auditing, so should standardise energy audits across compressor companies.

What improvements might you reasonably expect? A recent data logging exercise by Mattei, at the Harwich-based refinery of Petrochem Carless, led to a pair of 12-year-old 90kW compressors being replaced with Maxima 75kW models. Despite delivering the same volume (32m^3/min) of air, the investment is saving the company in excess of 430,000kWh of electricity per annum – a result

Lighten the load

CompAir's new SmartAir Lite, capable of controlling up to four compressors, manages the most efficient combination to meet demand – so avoiding the risks and costs of off-load running, while also helping to reduce energy consumption by up to 30%.

Where compressors of the same capacity are installed, the system can equalise running hours, so that no machine is over- or under-utilised, resulting in longer maintenance intervals and lower overall maintenance costs.

The unit's real-time clock and timer control also enables users to start and stop compressors at preset times. This allows the system to reach its target pressure prior to production, meaning users have instant availability of compressed air at the start of a shift.

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estimated to provide payback on the capital outlay within just two years.

So much for size; according to Richard Moore, marketing services manager at award-winning Parker Hannifin's Domnick Hunter Industrial Division, the other big compressed air problem is directly or indirectly associated with water vapour. High efficiency adsorption dryers provide a solution, not only to optimise air quality, but also to prevent corrosion and inhibit microbiological growth.

Among latest Parker Domnick Hunter technologies is its PneuDri MX range of heatless desiccant dryers, which adds extra drying banks to allow for expansion as plant demands increase, as well as providing 100% standby capacity. Flow rates of individual dryer banks extend from 408 to 2,815m³/h, although smaller PneuDri 'point-of-use' dryers are also available, from 5.1m³/h.

This company has also developed dewpoint dependent switching (DDS) energy management, which measures operating parameters of the dryer and adjusts its performance according to detected moisture content. Moore suggests that, on a 160kW compressor equipped with a PneuDri MX heatless desiccant dryer (typically, averaging 70% of rated flow), DDS could save 153,000kW of energy every year, simply by extending the cycle time to match decreased demand. This equates to an annual environmental saving of 66,000kg of CO_2.

Data logging

Perhaps the best way to illustrate the gains on offer from going green is, again, to embark on some data monitoring. However, rather than conventional procedures, using technology such as iiTrak data loggers from Atlas Copco can help establish a true indication of air usage, cost and environmental impact, without any interruption to the air supply or production processes.

These battery-powered loggers record compressor load status via current sensing. They're designed as stand-alone units, with one logger being allocated to each machine or compressor parameter, as required. True energy drawn by each compressor (on and off load) is recorded, and mains voltage and power factor correction captured, leading to precise data on energy consumption.

And there is another way: David Burton, general manager at Boge, suggests using his company's Airtelligence Provis, an energy management system designed to adapt continuously to a plant's momentary demands. Continuous consumption calculation, he says, ensures that the most efficient combination of compressors is running at all times. All parameters are displayed, providing a log of each compressor's behaviour and its ongoing efficiency.

Bringing it all together, however, consultancy Air Technology of Loughborough says that plant managers should take a holistic, common sense, plant-wide view of air usage. The firm, which has conducted more than 1,900 energy-saving investigations in many industries around the world, reckons it has notched up average savings of 28%.

What should you do? On the demand side, process optimisation can lead to good returns. Air Technology cites a paper recycling plant making annual savings of £12,000, simply as a result of isolating production machines when not in use. Equally, in air-intensive operations, such as wastewater treatment aeration plants, savings greater than 60% have been achieved.

Then, supply side savings are down to increasing compressor efficiency, improving individual and group compressor controls, using variable speed motors and reducing air generation pressure. On Air Technology's recommendation, one packaging manufacturer recently replaced a centrifugal compressor with oil-free screw machines and saved over £73,000.

And don't forget waste heat. For a compressor to be efficient, it has to reject 90% of the input energy. Recovery of the waste heat and its use, for example, in space heating can result in very worthwhile savings. One recent example was an aircraft manufacturing plant that saved £6,800 just by ducting that recovered heat into the factory. Now there's a warm thought. PE

Below: Parker PneuDri energy saving compressed air treatment products