How to reduce your energy use

Compressed air is used throughout industry; indeed, it is often referred to as the fourth utility, after electricity, water and gas. Although considerable steps have been taken in recent years to improve the energy efficiency of air compressors there is still more work to be done. This white paper looks at the most swift and cost-effective ways to reduce your energy use while maintaining both the efficiency and performance of your compressed air solution.

The proportion of energy used to produce compressed air varies between business sectors; in some cases it can be as much as 30% of the total site electricity usage, and since energy costs account for up to 86% of operating costs there is clearly strong potential to increase efficiency. Annually, UK industry uses over 10TWh of electricity to compress air – equivalent to the output of almost 1.5 power stations and over 5 million tonnes of CO2 emitted to the atmosphere, which has driven legislation to control its use.

Standards you should know

Compressed air users will benefit significantly from the introduction of the ISO 11011 standard as it sets in place guidelines for companies to conduct industry-wide, like-for-like energy efficiency audits. Energy audits establish the volume of compressed air that a company uses and how much it costs to generate. The audit results then enable businesses to look at the procedures that are available for reducing carbon emissions and waste in their manufacturing process, while reducing environmental impact.

Another measure is the mandatory CRC (Carbon Reduction Commitment) Energy Efficiency Scheme, an initiative aimed at improving energy efficiency and cutting emissions in large public and private sector organisations that offers tax benefits and financial rebates available for those showing a commitment to carbon reduction. The ECA (Enhanced Capital Allowance) Scheme also provides businesses with enhanced tax relief for investments in equipment that meets published energy-saving criteria.

Energy Survey

Undergoing an energy survey is often the first step to cutting carbon emissions and improving the

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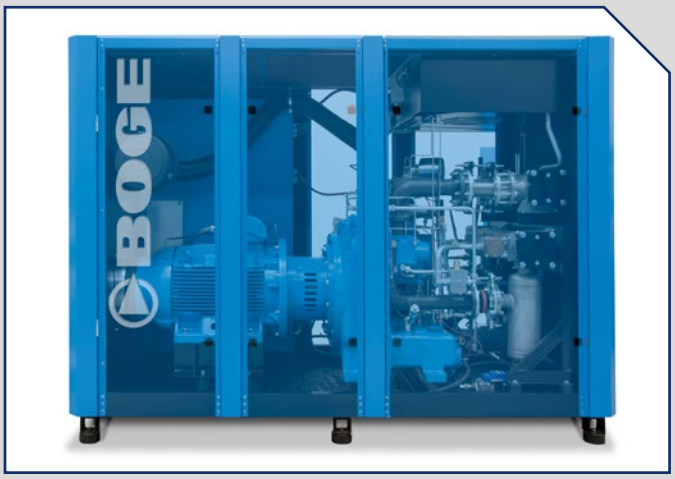
energy efficiency of a compressed air system. Today's advanced energy surveying equipment can audit all areas including generation, treatment, distribution and process usage. During the audit, engineers will install state-of-the-art logging equipment, which will allow a detailed report on the compressed air systems condition with particular reference to energy and the operating efficiency of the system to be provided. Following a full analysis of the systems energy and air usage, your solutions provider will take into account all the specific conditions and factors relating to your site and forward a detailed report highlighting potential ways to generate energy savings.

Leak detection

Typically the first thing to do will be to count the cost of leaks. All compressed air systems have leaks – even new ones. Even a well-maintained system may leak by as much as 10%, but the leak rate of an unmanaged compressed air system can be as much as 50% of the generated output and in certain applications even higher figures have been measured. In fact, one 3mm hole could cost over £1,000/year in wasted energy.

An audit can detect each and every leak – even from a long distance (up to 15 m) – which is useful in places that are not easily accessible or visible, optimising your resources and significantly reducing energy losses. The result is not only a reduction in wasted energy but also reduced demand on installed compressor performance, which reduces compressor wear and tear.

Detection can be accurately achieved via ultrasound detection. When compressed air escapes, friction develops between the gas molecules and the pipe wall. This friction produces a high-frequency ultrasound inaudible to the human ear. A compressed



air leak detector can register the ultrasound, transform it into an audible sound and indicate it optically. Compressed air losses at microcracks, worn-out flange joints, defective sealing rings or loosened connections can then be addressed.

A survey can reveal not only leaks but also unnecessarily high pressure. Energy and service costs have been dramatically reduced by businesses that have undergone an audit, saving money during overhaul and achieving ROI on compressor upgrades even quicker than initially envisaged.

In some cases, the identification of unnecessarily high pressure has meant a compressor upgrade using less units. Maintenance is much cheaper with a fewer number of compressors, which brings further savings, and maintenance requirement and energy costs can be cut yet further by reducing the running hours.

However, identifying leaks through a survey is pointless unless a maintenance schedule is planned to plug them, and the benefits will be short-lived unless ongoing monitoring of leakage via a planned maintenance and management scheme of the

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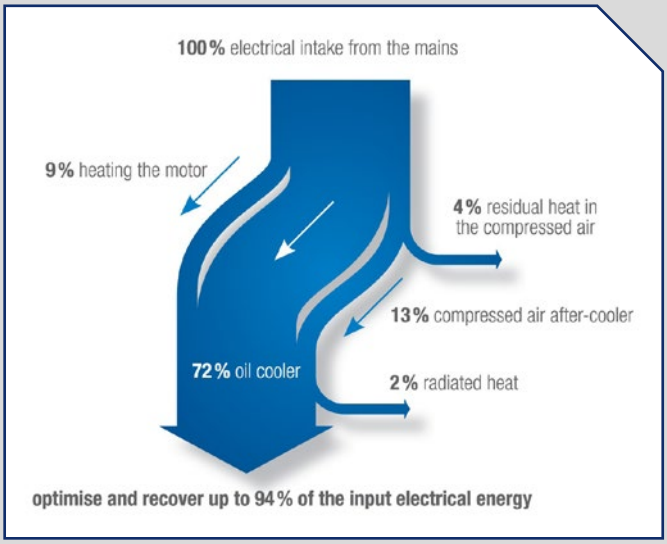
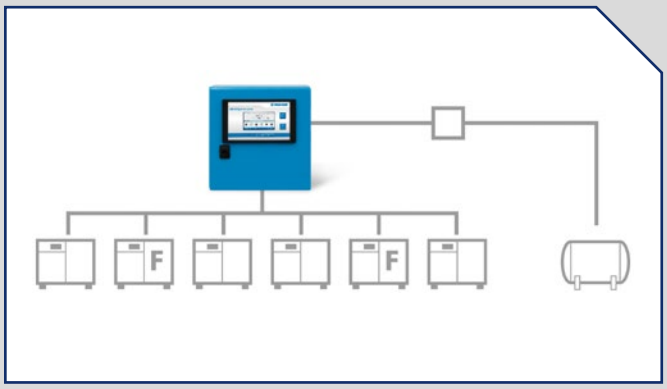


entire system is implemented. Some compressed air service providers offer continued leak management and monitoring as part of their equipment service contracts – something to consider when evaluating one such provider's offering against another that does not offer the same service. A new trend in maintenance management is that some manufacturers now offer compressors with built-in leakage monitoring devices. These devices automatically calculate losses through system leaks and give an estimate of their actual cost in a visual display. Monitoring losses on an ongoing basis in this way makes it very easy for the compressed air user to manage the system, and if costs start to escalate the data provided will prompt the user to conduct a thorough survey to determine the source of the leaks.

Heat Recovery

Reducing energy use also means looking at heat recovery. Nearly all of the energy that is used to power an air compressor gets converted to heat. With 94% of this heat available for heat recovery you can harness this heat source to the financial benefit of your business. Recovery of this waste heat generated by an air compressor is effectively free after the initial investment with swift payback periods often seen.

According to figures from The Carbon Trust, over 90% of the electrical energy used by a typical air compressor is lost as heat. Being able to capture and reuse this energy for space heating, water heating or for other production duties potentially offers real benefits for businesses and is in step with the view being taken across industry that a broader, more holistic view must be taken when it comes to energy efficiency. Typical sites and applications include, water heating, space heating, process heating and drying, boiler houses for feed water or combustion air, and compressed air plant using heat to regenerate desiccant dryers.



Multi-processor control

Further savings can be achieved when two or more compressors are operated via a central controller. Modern electronic controllers provide much greater energy saving in two ways:

The first method is to maintain the pressure to a much narrower range. This is achieved by constantly monitoring the pressure using an accurate pressure

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transducer to predict when a compressor should be switched on or off. This is based on the rate of change of the system pressure. Using this method, the pressure band can be maintained to within 0.2 bar.

The second technique is to predict and select the best combination of compressors to meet demand. This method is especially effective if using a combination of fixed speed and variable speed machines since it minimises off-load and part-load running of the compressors.

Multi pressure systems can make significant savings; every 1 bar saved on pressure can save you 7% on electrical running costs, while booster compressors can be integrated where limited flow of higher pressure is needed.

Electronic sequential controllers, which control multiple compressors around a single set pressure, can also make compressors available to match demand as closely as possible. For example, instead of using a 100kW compressor at 60% utilisation, the system will select two 30kW compressors at 100% utilisation. These systems can operate up to 16 separate air compressors in a pressure window of only 0.2bar and can also be set to vary the pressure according to production requirements, for example, lowering pressure at weekends or for varying shifts.

Summary

With pressure on the profit margin and mandatory measures being taken to cut emissions, running energy efficient systems will only become a greater priority in the future. BOGE is committed to all aspects of waste reduction and energy efficiency and aims to support end users by providing comprehensive and regular energy audits in line with ISO 11011. BOGE evaluates all areas in the compressed air generation and treatment process to detect any present defects and recommends carrying out a number of important tests – including a consumption test, vibration control test, leakage test, sound test and an oil check – to ensure you get the best possible efficiency from your compressed air solution.

To find out more about BOGE Compressors and the services we provide, please visit our website:
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