BOGE COMPRESSED AIR SYSTEMS

Improving the efficiency of your compressed air systems

How can you cut the costs associated with a power hungry compressed air system while, at the same time, boosting productivity? This white paper explores ways to save money through sensible control measures and make money by increasing output. It covers the means to achieve these twin goals, and examines ways to maintain the output of a compressed air system.

Too many managers mistakenly believe that compressed air is free. It is a site commodity they tend to ignore because they're only involved in production and air is always on tap. In fact, the untapped potential to improve compressed air efficiency is truly astonishing.

As well as saving energy (a subject tackled in other BOGE white papers), reducing compressed air wastage by tightening up on control measures also cuts costs, improves reliability and boosts productivity.

Air flow (the rate that compressed air moves through an application) directly impacts on the speed of the air; air pressure (the force over a given area exerted by compressed air in a given application) affects force. Both of these factors can be controlled. Indeed, the efficiency of compressed air systems is largely determined by the effectiveness of their controls.

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Effective compressed air system controls match the compressed air supply with system demand. Compressor manufacturers have developed a number of control measures, including:

- Start/stop – the simplest form of control. The motor driving the compressor is turned on or off in response to the discharge pressure of the machine. Typically, a simple pressure switch provides the motor start/stop signal.
- Load/unload – also known as constant speed control, this allows the motor to run continuously, but unloads the compressor when the discharge pressure is adequate.
- Modulating controls – throttling the inlet control varies the compressor output to meet flow requirements.
- Variable speed drives – a special drive is used to control the speed (or revolutions per minute) of the unit, reducing power cost, reducing power surges (from starting AC motors), and delivering a more constant pressure.

But the control of compressed air systems is not the only issue affecting costs. Downtime can also have a catastrophic impact on production schedules.

Last year, business magazine Works Management – which is read mainly by factory managers and directors – ran a survey into management attitudes towards compressors. It revealed that, of the 84 sites polled, just over two-fifths had suffered a compressor breakdown in the previous 12 months. Compressors were out of action for a week or more in 41 per cent of reported breakdown incidents, and a further 6 per cent were never replaced.

The attrition rate is easily explained when you examine the prevailing attitude among manufacturing managers towards investment. Just one in 10 was running a compressor less than three years old. Around 55 per cent relied on equipment six years old or older and 3 per cent counted on compressors that had been pressurising air since the 1980s.

Depending on frequency of use and type of machine, a typical compressor life cycle is 10 to 15 years before it is no longer economically viable to repair and would need replacing.

Some oil-free models can last longer – 20 years-plus – but all compressors degrade in performance over time. For example, a major overhaul might involve rewinding the motor and will require remanufacture of the compressor element. Every time you do that you lose efficiency and there comes a time when it is no longer worthwhile to continue, and replacement becomes necessary.

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A newer compressor will be more efficient, less likely to break down, the components are of better standard and variable speed drives (VSDs) allow further opportunity for businesses to reduce energy consumption. VSDs on a compressor can provide energy savings of up to 50 per cent. Modern units are also more reliable and can run for extended hours between maintenance interventions. And the air delivered is cleaner thanks to advances in air filtration that will extend the lifespan of your air tools.

All this should add up to a compelling case for regular conversations over compressor replacement. Bucking the 'make do and mend' mentality is a must if UK firms are to stay competitive in the face of soaring energy costs.

The question is: how? There is a management maxim that states: "You cannot learn what you don't know because you don't know that you don't know it." In other words, you can't manage that which you do not measure.

Measuring a compressed air system's performance can take several forms. You might, for example, consider a data monitoring device that tracks compressor and pipework

performance, including upcoming servicing requirements based on actual usage, and provides early warning of potential compressor or piping problems as well as 24/7 analysis of a unit's energy efficiency.

There are many systems available to monitor compressor performance. We, for example, offer a system called airstatus. This includes a fault and maintenance indicator, remote data polling and server-based data retention for up to 24 months, as well as web visualisation. Measurements it can take include hours run, faults, air consumption and electrical consumption.

We also supply an app for IOS and Android operating systems, so you can keep an eye on the status of the system even if you are on the move. Other features of airstatus include user and client management and alarm management by email and/or SMS.

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Most manufacturers and consultants can also offer a one-week audit service where they visit a site, connect monitoring equipment to the compressors and system to measure flow and pressure and air quality if necessary. Then they would put together a report. For example, we can provide either fixed remote monitoring, which is permanent, as part of an installation, or temporary auditing.

Anyone conducting a compressed air energy assessment should follow the procedures outlined in ISO 11011:2013. This international standard sets requirements for conducting and reporting the results of a compressed air system assessment that considers the entire system, from energy inputs to the work performed as a result of these inputs.

The standard sees compressed air systems as three functional subsystems:

- Supply, which includes the conversion of primary energy resource to compressed air energy;
- Transmission, which includes movement of compressed air energy from where it is generated to where it is used;
- Demand, which includes the total of all compressed air consumers, including productive end-use applications and various forms of compressed air waste.

It outlines requirements for analysing the data from the assessment, reporting and documentation of assessment findings, and identification of an estimate of energy saving resulting from the assessment process. It also identifies the roles and responsibilities of those involved in the assessment activity.

Of course, without effective maintenance, the compressed air system will degrade far more quickly, as well as becoming increasingly hungry for energy and expensive to

operate. Periodic maintenance ensures the system operates at peak efficiency and minimises unscheduled downtime.

However, beware – poor maintenance can increase energy consumption because it will result in lower compression efficiency, air leakage, or pressure variability. Other effects can include high operating temperatures, excessive contamination and poor moisture control.

The running hours of the plant and the loads on the machines both have a profound impact on the level and cost of maintenance. On a typical industrial site, production gets its energy from high pressure air stored in a factory's piping distribution system; air compressors simply replenish the air consumed.

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In other words, energy input to compress the air is supplied to the connecting pipes for delivery to the various demands around the factory. Energy output from the system to perform tasks involving compressed air – such as powering air tools – comes from air already stored in the pipes.

This means the inefficiencies of a compressed air system are affected as much by how the air escapes the system as by how it is generated in the compressor. So, matching supply with demand requires that both generation and storage are maintained.

That means, for example, fixing leaks in pipework as well as servicing the compressor itself. You can take on the maintenance in-house, but we would recommend consulting the experts. Progressive manufacturers offer a range of service and maintenance contracts. For example, BOGE has the expertise to maintain and service all makes of compressors, dryers and ancillary equipment and provide 24/7 backup.

The Chartered Institution of Building Services Engineers (CIBSE) has it right: “It is a false economy to ignore maintenance on any type of compressor. It is recommended that manufacturers, or their accredited agents, are used for service work and that genuine spare parts are used.”

Where to get more information

After measuring and monitoring the compressed air system and making an initial plan to improve its efficiency, there are several other information sources that you can refer to for more detail. You can consult:

- BOGE
- The BCAS Installation Guide
- Health and Safety Executive (HSE) - Compressed air safety
- Health and Safety Executive (HSE) - Pressure systems and the law
- Carbon Trust – Energy performance

To find out more about BOGE Compressors and specialist gas generators, please contact us or visit our website:

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