BOGE COMPRESSED AIR SYSTEMS

Project Report

THE BARBER INSTITUTE OF FINE ARTS

CUSTOMER

The Barber Institute exhibits, curates and protects a priceless collection of art. Visitors enjoy a unique and uplifting experience in this haven of tranquillity on the bustling University of Birmingham campus.

PROJECT

Providing a reliable and cost-efficient supply of compressed air to power the gallery's roof-based ventilation system, safeguard art works and enhance visitor enjoyment.

BOGE PRODUCTS IN USE

- 2 x 3-kw C4L rotary screw compressors
- Control unit

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Compressor failure costs and impacts no longer a worry for Barber Institute

The Barber Institute

Part of the University of Birmingham, the Barber Institute of Fine Arts houses what has been described as one of the finest small art galleries in Europe. It is also home to a concert hall, acknowledged for its perfect acoustics, comfort and visual appeal. Opened in 1939, the grade 1 listed building was designed in Art Deco style by Robert Atkinson, one of Britain's leading architects of the 1920s and 1930s.

To house works of art not currently on display, the Reserve Gallery was built on top of the Music Library in 1974. A metal and glass roof were added between 1986 and 1989, along with a top-lit picture gallery.

The roof structure contains 48 panels which can be opened and closed in sequences and stages to provide varying amounts of ventilation. The opening and closing mechanism is powered using compressed air via a system of pneumatic cylinders. An electro-pneumatic control unit, responding to changes in the outside temperature, automatically adjusts the amount of opening to maintain a suitable room temperature. Compressors are needed to provide the compressed air.

Aroplus (UK) Ltd

Aroplus is a specialist business with expertise in all areas of air and fluid handling, including supply and installation of BOGE compressed air solutions. Based in Redditch, the company had previously worked with other departments at the University. Those clients recommended Aroplus to the Institute to solve its compressor-related problems.

Air challenges

"The two piston-type compressors previously supplying compressed air were overworked and needed to be replaced – at great cost – every 12 to 18 months," says John Nash, who manages the Aroplus air compressor division. "To meet the system's air demand, they were running continuously

PROJECT INFORMATION

> THE CHALLENGE

The system's overworked piston-type compressors needed to be replaced frequently, at considerable expense. Their lack of reliability risked loss of room temperature control, with consequent damage to priceless artworks. In addition, noise and vibration from the compressors negatively affected the visitor experience.

> THE BOGE SOLUTION

Aroplus replaced the old compressor equipment with a system based on two BOGE C4L screw compressors and a BOGE control unit.

> THE RESULT

Reliable new compressors, with a long lifespan, easily meet all air demands and provide full back-up if needed. Around £3,500 is saved annually on compressor replacements, and over £1,000 on energy consumption, along with further savings on maintenance. Noise and vibration have been minimised.

at full load with no changeover between duty and standby modes. This led to very high operating temperatures, rapid deterioration and wear, and inevitable early failure."

He continues: "Breakdowns of compressors meant loss of ventilation control. This threatened the gallery's priceless artworks, which could be seriously damaged by large temperature changes. It also affected the comfort and enjoyment of the Institute's many visitors."

A further problem was the noise and vibration generated by the piston compressors. Located directly above one of the main galleries, their effects could be heard and felt on the floor levels below.

An extra challenge for Aroplus was to replace the old, compressed air system without disrupting visitors – as the Institute remained open during the project – and without damage to the listed building.

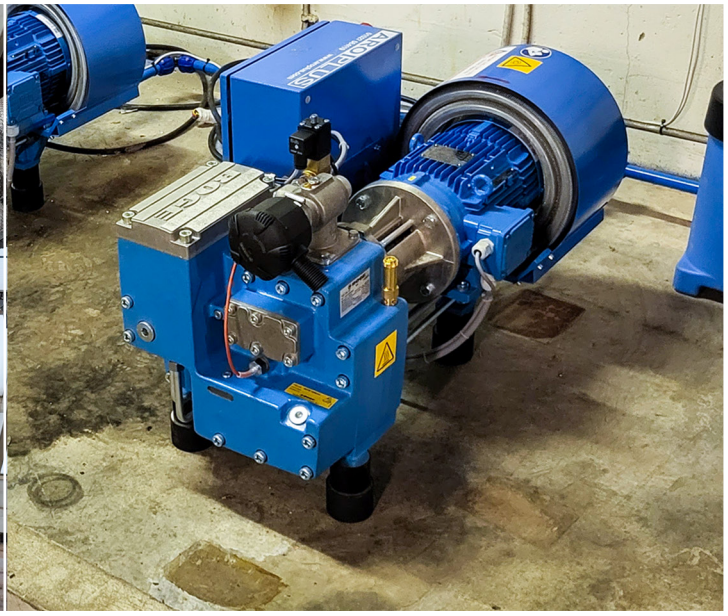
The solution

After a thorough assessment, in consultation with the University's engineering department, Aroplus recommended replacing the existing piston compressors with two BOGE C4L rotary screw compressors. The work would also involve totally stripping down and refurbishing the customised control panel for the roof-opening system's pneumatic cylinders.

"Unlike piston types, screw compressors can be specified for 100% load duty," John Nash explains. "Piston units, which are usually reserved for higher-pressure applications, need to stop and cool down regularly to avoid damage."

The BOGE C4L screw compressors are each capable of meeting the system's air demands, constantly, for as long as they are running. Their activity is governed by a BOGE control unit, which monitors air pressure in the system and starts a compressor whenever more air is needed. The compressor topping up the air receiver as necessary. Once the receiver is full, the compressor stops running if no air has been taken by the system within a certain specified time.

"Depending on the outdoor temperature, the compressor might sometimes remain inactive for days. When a drop in pressure indicates that air is needed again, the compressor restarts. In changeable weather, the ventilation panels may be opening and closing all day."



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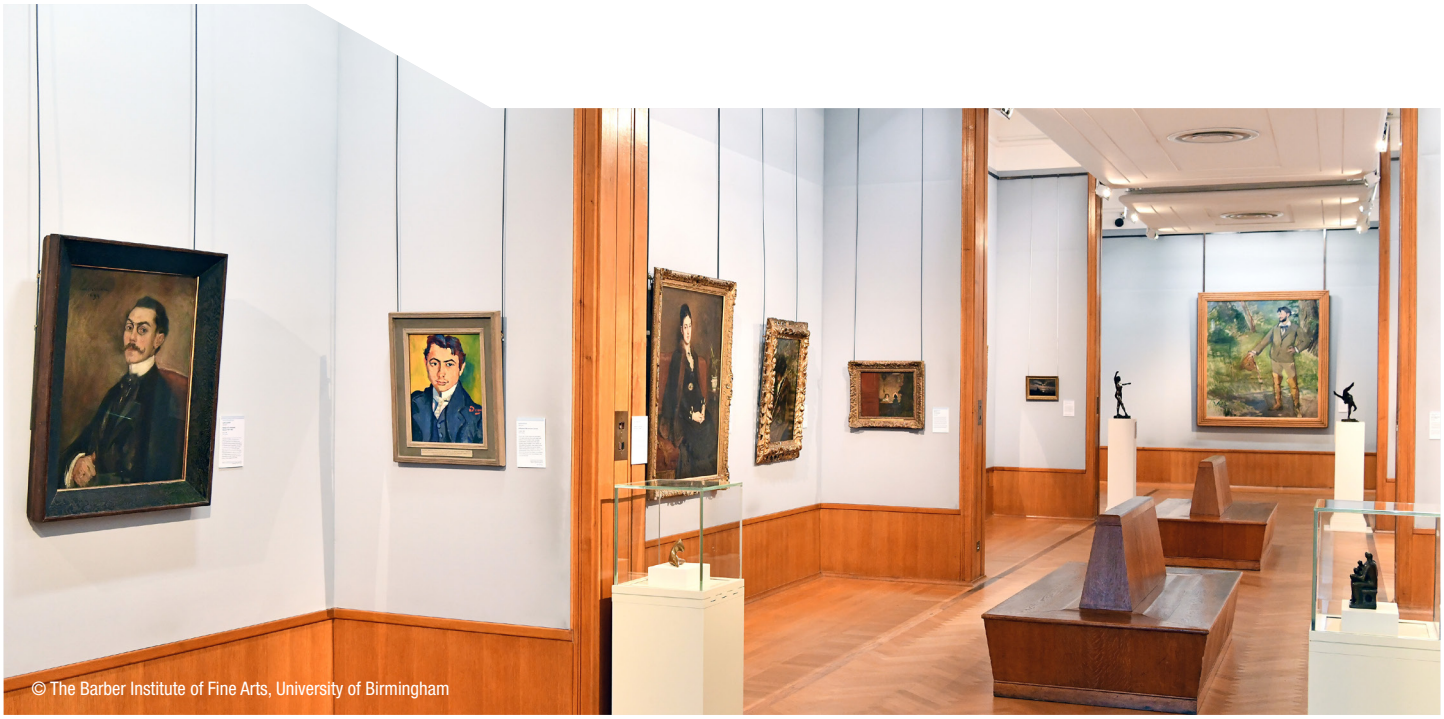
The BOGE control unit also governs the compressors' duty and standby cycle. Every 24 hours, one compressor is switched on to run for a day while the other is turned off. As well as helping to maintain the condition of both compressors, this arrangement provides 100% back-up in the case of a compressor failure. In such an event, the other compressor is automatically brought into action and an alarm is raised.

In this application there are two compressors, but systems containing multiple Boge screw compressors can be easily installed and governed by one control unit. They provide a much more flexible and responsive solution compared to the old compressors and are far quieter, with little or no vibration.

The inherent efficiency of direct drive screw compressors, combined with accurate monitoring and control of compressor activity, pressures and temperatures, has reduced the roof system's energy consumption by about 20%.

Importantly, the new units are much more reliable and longer lasting than the old piston compressors, which typically needed to be replaced every 18 months. At a cost of £1,800 per machine, £3,600 for the pair.

By contrast, a BOGE screw compressor's lifetime is expected to exceed 20 years, if properly maintained. Some BOGE units supplied and installed by Aroplus are still providing compressed air, 24/7, after 25 years of service.



A further expense now avoided is frequent replacement of damaged pneumatic valves and cylinders. This damage was caused by contamination of compressed air by lubricating oil carry over, which in turn resulted from the piston compressors' high operating temperatures.

Annual routine maintenance costs will also be reduced, as servicing intervals have now been extended from 500 operating hours (or 3 months) to 3,000 (or 12 months). Meanwhile, a five-year warranty package minimises the risk of unexpected costs.

Results in brief

- Higher reliability and full back-up of compressed air supply
- Greater flexibility of operation and response to demand
- Much lower noise – down from 82 to 62 dB(A) at 1 metre
- Vibration minimised
- Over £1,000 annual energy saving
- Around £3,600 saved annually on compressor replacements
- Around £500 annual saving on valve and cylinder damage
- Around 40% annual saving anticipated on routine maintenance costs

Customer satisfaction

From the initial enquiry to commissioning the system and passing off, the project took 14 weeks. Removal of the existing system and replacement with a BOGE set-up was achieved over a two-week period, during which the Institute remained open to the public.

With no lifts, the old equipment had to be dismantled into smaller parts and carried manually, via a stairway, from the fourth floor to ground level. Similarly, the BOGE equipment had to be dismantled and carried up the stairs, then reassembled at the top.

To maintain the availability of ventilation throughout the work, Aroplus carried out the work in three stages, first removing the old compressor system, whilst simultaneously installing the new Boge air compressors and control, before 24 of the 48 pneumatic cylinders were removed and refurbished together with the control panel prior to their refitted. Finally, the remaining 24 pneumatic cylinders were removed and refurbished, reinstalled and the completed system commissioned.

"On completion, both the Barber Institute's management and the University of Birmingham's supervising staff congratulated our engineers on their performance and on the high standard of their work," John Nash notes.

Dave Lowe, the Institute's Visitor Services & Operations Manager, comments: "We were especially happy to see the work completed within the time frame specified in the quotation, and with no disruption to the gallery's operation."

He adds: "We are pleased that there has been a reduced amount of noise and vibration with this new install, and with the intelligence of the new compressors to share workload which will greatly reduce the risk failure overloading a singular compressor presented previously."