

Carboflex[®]: Advanced Atmosphere Solutions for Heat Treatment

Business benefits

- Improved wire quality
- Reduced decarburisation of the coil surface
- Energy savings
- Improved security of production
- Safer and more reliable nitrogen/propane atmosphere

When Cirteq, one of the world's leading manufacturer of Circlips, replaced its Exogas generator with a BOC Carboflex[®] solution it gained a more reliable and superior system that produced better quality product.

The issue

Circlips manufacturer Cirteq Ltd traces its company roots to 1939 – it has a history of trailblazing development that continues today.

Cirteq supplies a wide range of sectors worldwide, including the automotive and aerospace industries, with precision-engineered Circlips produced at its site in Glusburn, UK.

A vital part of the Circlip manufacturing process is annealing wire under an Exogas generator atmosphere. This is used on all eight of its bell furnaces in the annealing treatment section of Cirteq's Glusburn factory.

Wire coils for Circlips production are annealed (heated then controlled cooled) using an Exogas generator atmosphere consisting of carbon monoxide gas (CO), hydrogen (H₂) and carbon dioxide (CO₂), before drawing and stamping out the Circlips' shapes.

Until 2010 the Exogas generator had produced acceptable results but as it aged it had become unreliable and malfunctioned several times. It needed constant maintenance while at the same time, parts and expertise for its upkeep were increasingly hard to come by.

This uncertain situation left Cirteq exposed to the unthinkable in manufacturing – a possible shutdown. To prevent that from happening, Plant and Facilities Manager Bob Holinski decided to revisit a proposal that BOC had devised some years previously.

"I was convinced that a similar nitrogen/hydrocarbon based atmosphere to the one BOC proposed would be successful in our annealing process," said Bob.

"We have worked with BOC for many years and have a very good working relationship. We were not dealing with people who thought it might work but experts who knew it would, because they'd had similar situations."

The BOC solution

BOC proposed to trial its Carboflex® atmosphere solution at Cirteq. This advanced technology and BOC's familiarity with Cirteq's annealing process not only led to a superior solution but also a more reliable and cost-effective one with improved quality.

While already supplying nitrogen for Cirteq's shaker hearth furnaces, BOC had analysed Cirteq's Exo generator usage on the bell furnaces and proposed that a nitrogen/propane mixture based Carboflex® solution could replace the Exo generator atmosphere.

It was this solution that Bob decided to put to the test as long as BOC could trial it cost-effectively.

BOC's answer was to refurbish and modify one of its Admix heat treatment gas supply panels, which accurately supplied a mix of natural gas and nitrogen for Heat Treatment processes.

"During the three-week trial in 2013, the panel was manned around the clock," said Mark Cole, Technical Support Specialist. "Small percentages of propane were used as a hydrocarbon additive to nitrogen as it was very good at reducing decarburisation."

"A number of propane / nitrogen mixtures with differing flow rates were trialled to prove their effect on the 42-hour annealing process. We completely replaced the Exogas atmosphere and prevented decarburisation of the coil surface during the high temperature annealing cycle within the bell furnace."

Issues such as over sooting and high pressures blowing of the sand seals on the furnace were also resolved by modifying trial conditions, ultimately proving the solution's acceptability.

The business benefits

The trials meant that the effectiveness of the new mixture was confidently understood before a commercial proposal for an updated system was submitted.

In May 2013, a Carboflex® control system and associated gas supply were installed. Commissioning began on each bell furnace base and by August they were all complete and fully operational.

Initial commissioning issues were quickly identified and resolved by modifying operating flow rates. By September 2013, all bases were running successfully on the Carboflex® nitrogen/propane atmosphere and all the issues were fixed.

The continued close relationship between BOC and Cirteq, resulted in a review of other furnaces by BOC (currently operated with Endo gas atmosphere), with a potential like-for-like atmosphere replacement.



Example of a Carboflex installed heat treatment furnace

Bob Holinski, Cirteq Plant and Facilities Manager

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