

## Car Bottom Furnace Headed for Heat Treater

In a move that builds further on an encouraging first half of 2025, NUTEC Bickley recently gained the order for a gas-fired car bottom furnace for one of the most well-established heat treat operations in the US Midwest. This furnace will be capable of handling both steel and aluminum ingots and has been designed to operate across a wide temperature range. The high levels of temperature uniformity to be delivered by the combustion system mean that this furnace will be qualified to undertake AMS 2750 compliant surveys.

The working dimensions of the furnace are 12ft (3.66m) wide by 35ft (10.67m) long by 14ft 6in (4.42m) high and it is able to accommodate substantial loads – up to 150,000lb (68,000kg) per cycle. Normal operational temperatures range between 300°F (150°C) and 1650°F (900°C), with a maximum of 2000°F (1095°C). With burners firing above and below the load, there are 11 automatic control zones (five top, six bottom).

To effectively heat treat these complex, heavy loads, the optimum approach is pulse firing with variable excess air; with the option of fuel-only pulse for low temperature heat treatment. NUTEC Bickley achieves all this by employing its proprietary IMPS® combustion concept (Integrated Multizone Pulsing System).

In this case, the furnace uses top brand high-velocity nozzle-mix burners, each individually controlled with its own automatic ignition and safety systems. The burners are positioned in staggered configuration to fire above and below the load, maximizing heat transfer and providing optimum temperature uniformity. The IMPS system generates a predetermined pulse sequence to fire individual burners, or groups of burners, depending on the heat requirement of each of the 11 control zones.

One of the most beneficial IMPS modes is Excess Air Firing. Among other things, it is possible to control very low temperature while high turbulence is maintained to achieve a great temperature distribution.

Alongside this are the advantages to be gained from the Ratio Firing mode. Here, the air and gas valves pulse in a synchronized pattern, from low to high fire in stoichiometric ratio, to ensure optimal fuel efficiency. This is made possible by using the kinetic energy generated by the flame speed and the rapid transition from low to high fire which increases entrainment and turbulence, thus promoting a better temperature distribution without the need for a high level of excess air.

Overall process stability is ensured through the innovative elements of NUTEC Bickley's chamber pressure control system. A digital transmitter senses the pressure inside the furnace and provides feedback to the control system, which in turn modulates the linear flow-controlled exhaust damper to provide precise control of the exhaust gases and chamber pressure. The exhaust control damper comprises a multi-louver blade manufactured from cordierite with an internal shaft manufactured from reaction-bonded silicon carbide (SiSiC).

This system offers a number of important advantages, including:

- Greatly improved linear response to pressure changes
- Low torque, high efficiency
- Substantially reduced maintenance requirements
- Smaller exhaust stack diameter

Arturo Arechavaleta, NUTEC Bickley's VP, Metal Furnaces, said: "Our customer for this important project has been serving industry with a dedicated heat treat facility for many decades, and is a widely recognized and trusted name in steel and aluminum circles. We have a similar pedigree when it comes to designing car bottom furnaces and so this project is a great fit. We're pleased and proud to be delivering once again to a successful customer that is expanding capacity and looking to benefit from the very latest combustion technologies."

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