

# Fusion project demands electroheat solution

**The versatility and controllability of electric heating has helped to solve a difficult problem in the construction of the Joint European Torus JET project at Culham with a low thermal mass furnace**



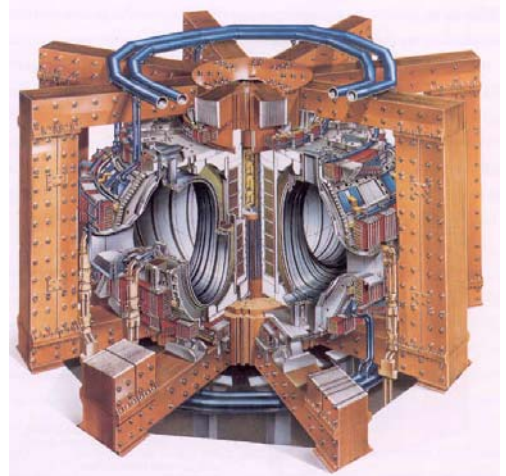
The problem concerned the heating and testing of the eight 13.5 tonne. Double-shell sections (octants) made of inconel, which will form the Torus. The solution has been provided by an 870kW furnace manufactured by **Excel Heat**. The furnace chamber, with internal dimensions 6.5m deep, 9m wide and 4.5m high, is lined with 200mm thickness of low thermal mass insulation. The octant is loaded on to a bogie mounted, brick lined hearth. An insulated door, integral with the hearth, makes an airtight seal when the component is run into the furnace. Heating is by nickel-chrome elements and the temperature of each volumetric quarter of the furnace chamber is individually monitored and controlled. The complete heating and cooling cycle is preset on a programme controller.

The sealed furnace can be filled with helium for global leak testing and has circulation fans to achieve even temperature distribution. Each octant is a complex welded fabrication. Before assembly into the Torus it must be evacuated to a pressure not exceeding  $10^{-4}$  mbar and held at a temperature of  $520^{\circ}\text{C}$  for 24 hours. This ensures that any contaminants present are vaporised and that the vessel is outgassed. The next stage is to allow the temperature to return gradually to ambient while pressure in the component is decreased to  $10^{-8}$  mbar so that rigorous leak testing can be carried out.

During outgassing, it is important to maintain a vacuum within the octant to avoid oxidation of the internal surface. High stresses could also be caused by uneven heating and excessive temperature differentials between inner and outer shells, aggravated by poor heat transfer under vacuum conditions inside the octant.

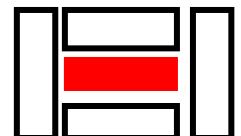
To Avoid this a heating technique with a very fast and sensitive control over temperature rise is necessary. These vital requirements of meticulous cleanliness, a sealed heating chamber and fast accurate temperature control was most conveniently achieved by this **Excel Heat** electric furnace.

*Construction of the Torus, is a central part of Europe's nuclear fusion research programme. Subsequent experiments aim to produce and study a reactor-relevant fusion fuel (in plasma form). If the experiment is successful it will pave the way to a virtually unlimited energy supply*



**For more information on this product or our range of ovens, furnaces and spares contact Mike Kealy**

# EXCEL HEAT



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