

Note 87

The new Cosworth Al-alloy casting process



The Cosworth DFX Indycar engine programme began in earnest at the company in early 1977 (351). In service it was found that if there was porosity in the Al-alloy head castings the higher temperature of the TurboCharged engine, running at nearly 2.7 atmospheres absolute intake pressure in 1977, would damage these areas as though they were 'flame-cut'. Keith Duckworth saw this porosity as a failure in consistency of the then-current foundry process and set up a research programme in 1978 under Dr David Campbell to overcome it (869). The patented solution is to use an electro-magnetic (external) pump with no moving parts (developed originally in the French nuclear industry to pump liquid sodium) to force the molten Al-alloy upwards from the middle of an electric-resistance-furnace pool (to eliminate both light and heavy pollutant particles) into a zircon-sand urethane-resin-bonded air-permeable mould (the sand being expensive compared to silicon sand, but capable of great dimensional accuracy, even on small channels, and being recyclable). After this the mould is sealed and inverted to retain pressure until the metal has solidified. The resultant castings are not only much less prone to porosity and, therefore, higher strengths can be relied upon during design but also close-to-size which reduces machining (861).

A new foundry - 'precision casting facility' is a better description of something far removed from original 'dirt floor' foundry images! - was built at Worcester to use the process. Racing engine blocks and heads were available from it in 1979 (867).