The Measurement of Temperature of Soaking Pit Waste Gases

ADVANTAGES OF PALLADOR II THERMOCOUPLES

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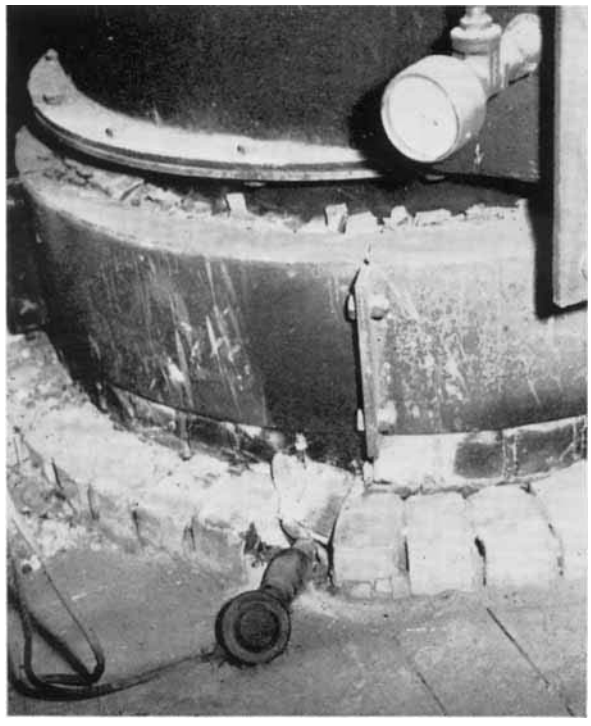
Ingot heating at Llanelli Steel Co is carried out in Salem circular-type soaking pits fired with heavy fuel oil. The ingots are heated to 1280°C, and to make effective use of the residual heat in the waste gases leaving the furnaces, the combustion air is preheated in Escher shell-type recuperators. The waste gases from the furnace pass upwards through the recuperator which is of a heat-resisting high chromium steel capable of prolonged use up to 1200°C.

It is essential to monitor the waste gas and preheat temperatures in order that the upper temperature may be controlled by the admission of cold dilution air to the waste gas stream. The temperatures of waste gas and air entering and leaving the recuperator system used to be recorded on a 4-channel strip-chart recorder operating with Chromel-Alumel thermocouples. The waste gas inlet temperature thermocouple was made up using 10 gauge wire in porcelain beads and porcelain inner sheath contained in a silicon carbide outer sheath. The life of these couples seldom exceeded four weeks, and often they did not last for one week. The wires embrittled and broke, and the couple was not reliable enough to operate the high temperature alarm to warn of the need for dilution air.

The Pallador II couple, 12.5 per cent platinum-palladium: 46 per cent palladium-gold, seemed to offer a suitable alternative to Chromel-Alumel at the point of measurement of the waste gas inlet temperature, without



A Pallador II thermocouple installed at the base of a recuperator at Llanelli Steel Co.

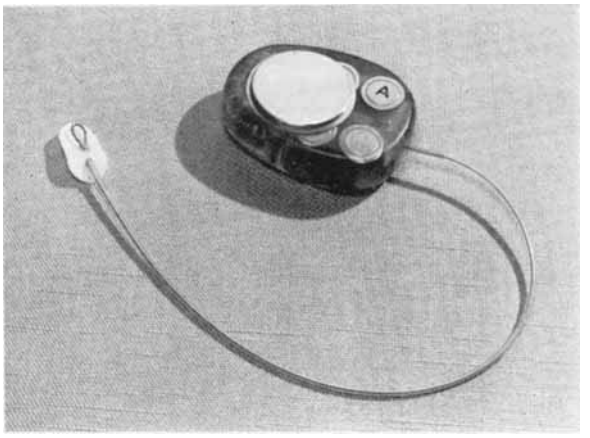
any modification to the existing 4-point recorder. The calibration for Pallador II in the range of greatest interest for this temperature measurement has been a little higher than for Chromel-Alumel couples, which is an obvious advantage in the operation of a high temperature alarm signal. The couples were of 25 gauge wire and insulated originally with porcelain beads and inner sheath as were the Chromel-Alumel couples.

Two couples were tried originally and both failed after a few days, during which there was a gradual reduction in the e.m.f. until a final failure. The break occurred in the region of the couple where the assembly emerged from the brick wall of the flue into the hot gas stream. The wire of both limbs was discoloured, and the discolouration was found to be due to contamination by iron, and it was possibly due to iron oxide carried by the waste gases.

It was then decided that the beads and inner sheath should be made of recrystallised alumina, and this modification was incorporated in the next pair of couples tried. These couples were put into use on April 24th, 1967, and continued until July 22nd, when they were taken out of service during the annual shut-down. There had been no deterioration in the calibration, and the wire showed no physical change. One couple was damaged during examination, but the second was returned to use, and continued in operation from August 10th to November 3rd, when the couple assembly was broken during a furnace repair. Other couples were put into use at the same date, August 10th, and one continued in operation until the end of January 1968. When examined after its failure, it was found that the silicon carbide outer sheath had eroded and the inner sheath had cracked. We now use Pallador II couples on the recuperator inlet position on all the soaking pit installations.

It has been found that the life of Pallador II couples where exposed to long periods around 1100°C is 10 to 15 times that of Chromel-Alumel couples, with a great saving in labour, and a more reliable operation of the high temperature alarms.

Iridium-Platinum in Heart Pacemaker



Prosthetic implants in the human body must be constructed from materials which resist the corrosive action of body fluids. Devices Implants Limited has developed a fixed-rate heart pacemaker suitable for either transvenous or transthoracic pacing. It rests in a subcutaneous pocket.

A logical solution to the corrosion problem has been to seal the electronic circuitry inside a welded metal can, which in turn is encapsulated in epoxy resin except for the passive metal plate forming the return electrode on the side of the pacemaker.

This plate, which obviously must remain inert during the useful life of the unit, is made of 10 per cent iridium-platinum alloy in the form of a 1⅜ in. diameter disc and is entirely unaffected by the corrosive environment of the body.

The tip of the catheter is also 10 per cent iridium-platinum and the active electrode at the tip is stainless steel.