

interchange of tools from one vehicle to another, which is not possible with vehicles dedicated to one function. This advantage reduces the number of vehicles circulating in the casting centre.

Productivity

In a casting centre, there are a multitude of operations to accomplish during the normal batch preparation cycle. When these operations are carried out quickly, the operating costs decrease and the production volume increases. As production efficiency is based on reduced operating times while maintaining the quality of the cast metal, the availability of optimised tools in the casting centre is essential.

The various tools can be connected to the vehicle

in a few seconds. The hydraulic power on some tools allows grasping, rotating the forks, charging alloy materials and positioning the forks, while increasing the safety of the operator, who is comfortably seated in an ergonomic, air-conditioned cabin.

Smelters using the QuickConnect technology system have enjoyed a return on investment that has been rapid while improving the safety of the workers. Significant savings are achieved with furnace refractories, the number of vehicles required and mechanical maintenance. Increased productivity is ensured by the careful selection of the appropriate tools, reducing the operating time during the batch preparation cycle. As the furnace cleaning operation is simplified, the cleaning

schedules are more frequently respected.

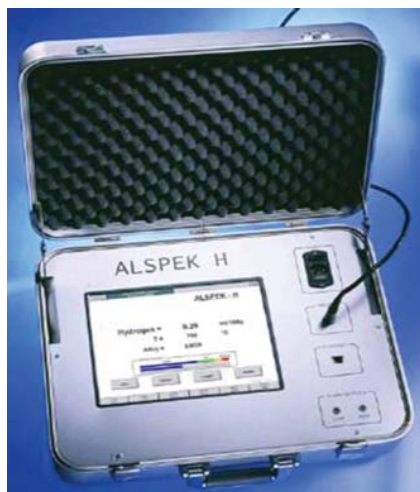
Safety, productivity and ergonomics were the major factors considered in the design of the multi-functional vehicle with its semi-automatic connecting system. With the hydraulic power on the modular tool, a range of possibilities opened up for the development of tools better adapted to the activities of a casting centre. A variety of tools are available: charging clamps, fork rotators, fork positioners, tilting buckets, furnace scrapers, stirring rakes and skimming tools. This technology allows casters to reduce the number of vehicles and increases the general safety in the casting centre.

Reader Reply No.115

Fast and accurate hydrogen measurement for aluminium casthouses

MQP have recently initiated a programme to introduce the Alspek H hydrogen measuring equipment into wrought aluminium casthouses.

The Alspek H hydrogen analyser was developed by EMC Ltd in the UK and introduced by Foseco into the aluminium foundry industry where many units are now operating successfully worldwide. MQP is acting in partnership with EMC to introduce the Alspek H into the wrought aluminium casthouse sector.



The Alspek H hydrogen analyser

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Alspek H is a portable analyser for the direct and continuous measurement of dissolved hydrogen in molten aluminium. It has three main components:

- electrochemical sensor
- measurement probe
- analyser unit

The innovative electrochemical sensor contains indium doped calcium zirconate, a high temperature perovskite proton conductor (1), that is capable of the rapid and real time measurement of hydrogen. It compares the known partial pressure of the reference with an unknown. Each sensor is individually calibrated and supplied with calibration coefficients and resistance values. It is capable of measuring and recording changes of hydrogen concentration during a degassing treatment with an inert gas. The sensor is contained in a replaceable unit assembly easily

fitted to the end of the probe. Average sensor life is 100 batch measurements or 12 hours continuous immersion.

The measurement probe is of stainless steel and ceramic sheath construction. The ceramic probe is hard tough and durable, chemically inert and does not corrode or oxidise in aggressive environments. It is fitted with a K type thermocouple for continuous temperature measurement.

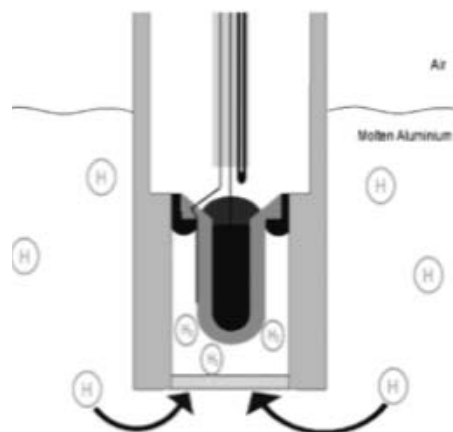
The analyser unit is set in a robust and portable aluminium carrying case with a 12.1 inch touch sensitive colour screen. This gives access to the display and diagnostic options. The main screen displays continuous hydrogen and temperature readings and has a sensor indicator and sensor failure alarm. A second screen display gives a real time and continuous graphic display plotting changes in both hydrogen level and temperature. Up to 100 days of data can be stored with a high capacity graphical data logger. Data history can be accessed directly via a USB memory stick or via the unit's Ethernet connection. Customised software is supplied to display data in chart form or export data to Microsoft Excel. A third screen display gives full diagnostic information on calibration and sensor outputs. Pre-sets for wrought alloys can be installed according to customer requirements.

Performance

Stable measurements are achieved in static melts in less than 5 minutes. In melts agitated by rotary degassing treatment, stable measurements are achieved in less than two minutes.

Once immersed and at equilibrium, Alspek H will continuously measure hydrogen and respond to changes in hydrogen concentration in under 5 seconds.

- Temperature measurement resolution: ± 1 °C as standard.
- Hydrogen measurement resolution: 0.1 ml/100 g as standard.
- Accuracy of measurement is ± 0.02 ml/100 g, or $\pm 10\%$ of hydrogen concentration, whichever is greater.
- Reproducibility of measurement is ± 0.015



Principle of Alspek H probe operation

Hydrogen comes out of solution and enters the cavity as H₂ gas. The sensor compares the known partial pressure of the reference with the unknown. The unknown partial pressure is then calculated using the Nernst equation, taking into account aluminium alloy chemistry.

ml/100 g or 10% of hydrogen concentration, whichever is greater.

The Alspek H hydrogen analyser is robust, portable and easy to use, giving fast accurate measurement in real time.

- Spot or continuous measurement
- Continuous display of hydrogen level
- Graphic display of hydrogen level and temperature
- Automatic data logging for subsequent download

Reader Reply No.116

References

- M.P. Hills, C. Thompson and M.A. Henson (1); A. Moores (2); C. Schwandt and R.V. Kumar (3). *Accurate Measurement of hydrogen in molten aluminium using current reversal mode.* TMS Light Metals 2009, pp707-712.
(1. EMC Ltd, Stafford; 2. Foseco, Tamworth ; 3. Metallurgy Department, University of Cambridge.)

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