Mould Powder Evaluation Services

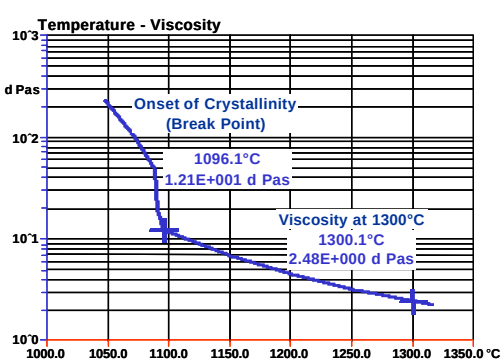
Thermal analysis techniques can be used to obtain qualitative and quantitative information about the effects of heat on materials of all kinds including plastics, ceramics, alloys, construction materials, foods and medicines. At Teesside Technology Centre high temperature viscometry, differential scanning calorimetry and thermogravimetric analysis are used to characterise mould powders and predict their suitability for use on continuous casting machines.

ROTATING VISCOMETER TYPE 403
(10^1 – 10^5 dPas)

This computer controlled high temperature rotating viscometer is a versatile instrument. At TTC it is used routinely to measure accurately the viscosity of molten slags, fluxes and glasses under the following different conditions.

- Static and dynamic measurements
- Dynamic measurements using different cooling rate
- Static and dynamic measurement with open and controlled atmosphere
- In-situ static/dynamic measurements with change in melt composition.

An example of a viscosity measurement of a mould powder is shown below. As the sample is cooled from 1350°C, the torque experienced by the rotating measuring-head increases. The precipitation of crystalline phases leads to a step change in the torque measurements, known as the break point. In the mould this corresponds to a break down in liquid lubrication. This technique provides a valuable method of comparing the lubricating properties of different mould fluxes arising from differences in composition and mineralogy.



POLYMER LABORATORIES STA-1500H THERMAL ANALYSER

Mould powders are heated in a controlled atmosphere through a temperature cycle of up to a maximum of 1500°C. Changes in weight and all heats of reaction are measured simultaneously by combining the techniques of thermogravimetric analysis and differential scanning calorimetry. Plotting the data against temperature enables key chemical reactions and phase changes occurring during the thermal cycle, which are pertinent to the behaviour of casting powders in use, to be identified. Particular attention is paid to whether the solidification involves formation of crystalline or glassy phases, since this has a major effect on the heat transfer between the mould wall and solidifying steel strand. Comparison of STA data for powders being developed for trial with those for powders in use gives a good indication of their suitability for use on plant. This instrument can also be used to determine heat capacities, glass transition temperatures of polymers and purity of compounds and metals.