Research leads to enhanced kit to improve design and processing of plastics

September 26 2011

This is a PVT machine at NPL. Credit: NPL

The National Physical Laboratory (NPL) has developed a world-leading pvT (pressure-volume-temperature) and thermal conductivity test kit.

The kit is based on more than nine years of extensive research at NPL. It can be used to help improve the design and processing of plastics, including the injection moulding process used to make specialised polymers and everyday plastic items such as CDs

NPL's equipment can measure the thermo-physical properties of

polymers. It can help improve the injection moulding process by allowing designers to find the exact pvT and shrinkage properties of a material. Although plastics are the main material tested, other more unusual materials such as soap and even chocolate have also been analysed.

The pvT instrument operates at pressures ranging from 200 bar to 2500 bar, and is the only equipment in the world that can test materials at ultra fast cooling rates of up to 280 °C/min and down to temperatures approaching −100 °C. NPL found that at higher pressures polymers can conduct heat up to 20% more efficiently, leading to faster cooling rates and shorter cycle times.

A thermal conductivity measurement facility is also incorporated into the instrument. Research on the thermal conductivity properties of polymers such as HDPE (high-density polyethylene) and PBT (polybutylene terephthalate) is vital to manufacturers and it was found that they can increase their production rates and gain a higher profit by filling a polymer with glass - as this cools faster, reducing the time that the polymer needs to stay in the mould. The less time the polymer stays in the mould, the faster the output rate of products.

Angela Dawson a Higher Research Scientist for NPL's Materials Division, said:

"pvT testing kits are essential for improving design and processing of ubiquitous, everyday plastics and for more specialised polymers with advanced applications. NPL is the only laboratory where manufacturers can send materials for testing using this advanced equipment and this work has improved the reliability and accuracy of measuring pvT data."

Provided by National Physical Laboratory