Plastic free from tiny Bubbles of Air

Siemens A/S

SIEMENS

Injection molding is a well-proven technique for manufacturing items in plastic. However, the method does have a tendency to allow for the formation of tiny bubbles of air inside the object. This is normally not a problem, but when Siemens produce discs for one of the company's industrial application units it could be.

During operation, the units may be exposed to a mix of high temperatures and harsh chemicals. This puts high demands on the injection molded discs inside the units, and the presence of tiny air bubbles may just be the weakness that causes the system to break down.

Siemens approached the Imaging Industry Portal at DTU. In a series of X-ray CT scans, items produced under different injection molding regimes were investigated. X-ray CT (Computed Tomography) is known from the hospitals as a tool for distinguishing between flesh, fat tissue and bones in human patients.

Similarly the images obtained at the DTU facility revealed both the size and shape of the bubbles inside the injection molded items.

Improved regime has eliminated bubbles

The results clearly pointed to a novel regime developed by the company as being superior to the traditional regime. Items produced under the improved regime had practically no bubbles inside them.

"X-ray CT has proven a powerful tool in the optimization of our injection-molding process. We saw consistent results showing us where air bubbles are most likely to accumulate. Bearing this in mind it is very likely that we will turn to X-ray CT again in the future," says R&D Engineer Kasper Bondo Hansen, Siemens Corporate Technology.

The technique could be taken to even higher levels in the future, explains Research Engineer Jette Oddershede of the Imaging Industry Portal:

"We have to limit ourselves to investigating samples up to a few cubic centimeters in size. This was fine for this project, but should Siemens for instance have wanted to investigate an entire unit this will become possible in the future at the advanced facilities that are about to open in Lund."

> *X-ray CT has proven a powerful tool in the optimization of our injection-molding process. We saw consistent results showing us where air bubbles are most likely to accumulate. Bearing this in mind it is very likely that we will turn to X-ray CT again in the future*
>
> R&D Engineer Kasper Bondo Hansen, Siemens Corporate Technology.

The same item can be tested repeatedly

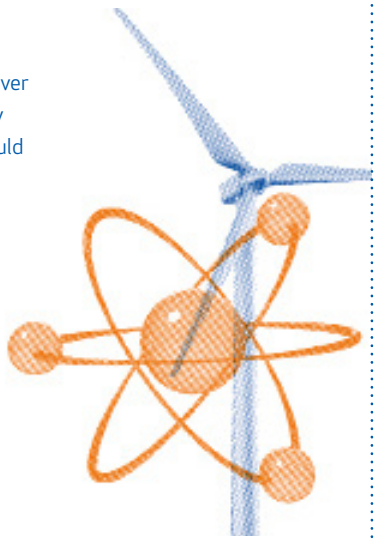
Besides much larger sample size, the ESS and MAX-IV facilities will provide higher resolution, meaning that even tinier air bubbles or other objects of interest can be studied. Further, the possibilities for investigating a produced item several times will be increased.

"In many contexts it would be interesting to known the inner conditions in an item not just after it has been manufactured, but also after, say, 1,000 hours of operation," Jette Oddershede explains.

The Imaging Industry Portal provides guidance for companies on which facilities will be ideal for investigating a specific problem.

New Horizons Are Opening to the Energy Sector

World leading facilities within neutron and X-ray scattering, the ESS and MAX IV, will open in the Oresund region over the next few years. However, there is no need to wait for these facilities to open. Scientists at Technical University of Denmark and University of Copenhagen are already in gear for X-ray and neutron scattering projects. These could either be full research projects in their own right or preliminary projects leading up to projects at existing or the coming large scale facilities. Contact the universities to learn more about what they can offer you.



Technical University of Denmark
Carsten Gundlach
Imaging Industry Portal
Fysikvej, Building 307, Room 021
2800 Lyngby
Phone: +45 2339 6938
E-mail: 3dimaging@dtu.dk
www.imaging.dtu.dk/industriportal

University of Copenhagen
Søren Jønsson Granat
The Niels Bohr Institute
Juliane Mariesvej 30
2100 København Ø
Phone: +45 3532 0605
E-mail: granat@nbi.ku.dk
www.nbi.ku.dk

This brochure is produced by the Confederation of Danish Industry, Technical University of Denmark, and University of Copenhagen as part of the project "ESS and MAX IV as engines of growth for the Capital Region of Denmark", initiated by the Capital Region of Denmark and sponsored by the Capital Region Growth Forum and the European Regional Development Fund.