Development of Packaging by X-rays

Tetra Pak A/S

Tetra Evero® Aseptic package that has used X-ray technology as a tool for 3D-imaging in the development process

As consumers pour milk or orange juice from their containers, little do they appreciate that they are actually holding a sophisticated, complex material structure with layers of polymers and sometimes also aluminum-foil, laminated to paperboard. Tetra Pak is one of the world's leading suppliers of packaging solutions and the development site in Lund, Sweden, cooperates with the Imaging Industry Portal at DTU.

"The initial project has been limited in size, but it has really opened our eyes to what X-ray technique as such can do for Tetra Pak and what DTU specifically can provide in addition to this," says Eskil Andreasson, Technology Specialist at Tetra Pak within Virtual Engineering.

"The Imaging Industry Portal is a strong partner, because it combines the various types of expertise needed. We have seen that performing the experiments at the instruments is only part of the job. It is maybe even more important to have the capacity to dig into the often quite large sets of data you get, and to extract the information which is really useful to you."

Reduces the number of design loops

X-ray equipment is actually not new to the company.

"We have had X-ray equipment at our manufacturing facility for sealing components quite some time, mainly for quality control purposes," Eskil Andreasson explains.

Recently Tetra Pak also bought equipment to be used in early development phases. The X-ray technique has been used when the Package and Closure Technology group in Lund sets out for a new development of an innovative opening concept with injection molding tools.

"CT-scanning proved to be a useful tool to reduce the amount of design loops. The 3D-imaging is today used for comparison of the simulation results obtained. Simulation models are today part of driving the virtual manufacturing and virtual testing of new opening devices. Next step is to import and use the realistic geometry from CT-scans into the simulation models for a more accurate description of the produced part. The technique can save us a number of traditional experimental test loops, as we can predict how a novel type of opening concept will perform. Further, the method is non-destructive, which means that we will be able to expose the sample to various types of stress and then test it again to see how it has reacted," says Eskil Andreasson.

Post processing of the acquired data is a more challenging task when it comes to other features of the package. The data segmentation can be enhanced with the aid of mathematical algorithms developed at DTU.

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Eskil Andreasson, Technology Specialist, Tetra Pak.

"This has excellently been demonstrated during our initial case study", adds Eskil Andreasson.

Going beyond lab equipment

TTetra Pak already looks at materials and packaging samples in 2D at very high resolution, primarily in scanning electron-microscopy (SEM). However, samples for SEM are usually sliced from a larger sample, meaning that the slicing process could have altered the micro-structure. But 3D-imaging has a potential to also visualize what goes on during the opening process (in-situ testing) while still making it possible to look into the microstructure.

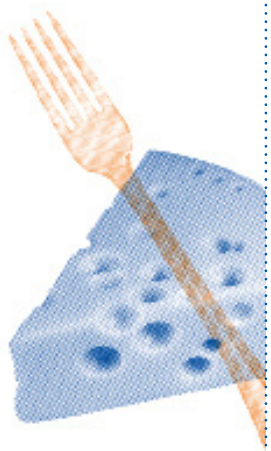
"We will still use SEM and other types of microscopy, but it is useful to supplement with a non-destructive method," comments Eskil Andreasson, while noting that the possibilities will be even greater as the large-scale facilities ESS and MAX-IV are due to open in Lund in the next few years.

"We hope to be able to go beyond, what is possible today with lab equipment which has limitations both regarding resolution and acquisition time. We are keen to exploit the new facilities. Still, I think this would also be in cooperation with the Imaging Industry Portal at DTU. They can help us in selecting the right beam lines at the facilities and setting up the advanced experiments with in-situ testing."

Tetra Pak and DTU are currently planning further joint projects in 3D-imaging, the first due to commence by spring 2015.

New Horizons Are Opening to the Food Industry

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.



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