ANALYSIS AND OPTIMIZATION OF POLYMER COMPOUNDING OPERATIONS FOR AUTOMOTIVE PLASTICS

Prof. Costas Tzoganakis
Department of Chemical Engineering
University of Waterloo
Waterloo, Ontario

This presentation will highlight a methodology developed for modeling, monitoring and optimization of industrial polymer compounding operations for automotive plastics production. In plastics compounding operations, a diverse portfolio of specialty automotive products is often produced on one line in relatively small batches. This necessitates frequent product changes on compounding extrusion lines resulting in low yields and lost capacity due to not being able to meet certain product specifications without multiple process adjustments.

In such operations, product melt flow rate (MFR) is frequently one of the quality control variables and it is usually measured off-line in a quality control lab using an extrusion plastometer. The ability to monitor product MFR on-line from output process variables such as motor load and die pressure enables quick quality control to maintain products within specification limits and minimize waste production.

In this work, inferential sensing of MFR is based on a simple flow model for a co-rotating twin screw extruder (TSE). This model is employed for on-line MFR sensing using on-line parameter estimation techniques. The usefulness of the model for inferential MFR sensing and fault diagnosis is demonstrated for compounding experiments performed at SABIC Innovative Plastics for an industrial production operation involving polycarbonate (PC) and polybutylene terephthalate (PBT) blends.