SUCCESS STORY

CHASE
Chemical Systems Engineering

Programme: COMET – Competence Centers for Excellent Technologies

Program line: COMET-Centre (K1)

Type of project: DATA KNOWLEDGE AND PRODUCT PERFORMANCE INTERACTION IN A RECYCLING PROCESS, 10/19 – 09/23, multi-firm MFP 3.1

Recycling machine INTAREMA 1108 TVEplus (© CHASE/Chung)

MODELING OF THE DEVOLATILIZATION PROCESS IN AN EXTRUDER

MODELS FOR THE PREDICTION OF THE DEVOLATILIZATION PERFORMANCE IN EXTRUSION PROCESSES

With a few exceptions, the material flow in the plastics industry is generally still linear. Unfortunately, this is leading to a dramatic increase in plastic waste worldwide. Therefore, society and politics are putting pressure on the plastics industry in the form of mandatory recycling quotas. Thus, the recycling or even upcycling of the raw material plastic is becoming increasingly important.

The devolatilization of the polymer melt during polymer extrusion plays a crucial role in ensuring a constant quality of the recyclates. To remove the undesired volatile constituents (so-called VOCs) from the polymer melt, vented screw extruders are often used. Single- or multi-shaft screw machines are used, with devolatilization taking place under atmosphere or vacuum. To increase the devolatilization efficiency and to prevent the melt from flowing out of the degassing openings, devolatilization zones are operated partially filled (see figure below).

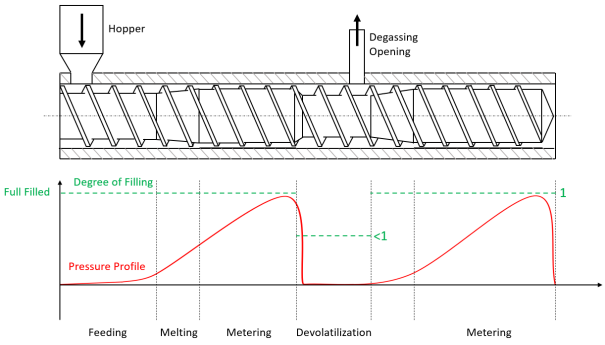

Figure 1: Schematic representation of a vented screw

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When designing extruder screws for polymer extrusion, the prediction of the devolatilization performance is extremely important. The literature provides only few theoretical modeling approaches to estimating mass transport processes in the degassing zone of extruders. Most of these models describe this process via bubble-free diffusion on the free surfaces. A comparative study of three models from the literature is provided, based on different theories. The models are validated with experimental extrusion data to allow an assessment of the prediction accuracies of the models. The aim is to be able to make a statement as to which model reflects the experimental extrusion data qualitatively well.

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