Thesis Title	Experimental Design and Development for Measuring Melt Temperature Profiles of Flowing Polymer Melts in Twin Screw Extruder
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Abstract

This research work aimed to design and manufacture an experimental apparatus coupled with a novel design of temperature sensor for determining temperature profiles of polypropylene melts in a twin screw extruder. The effects of screw rotating speed, die geometry and glass fibers were of interest. The temperature sensor was based on a construction of thermocouple network, using unsheathed thermocouple type K. The sensor was designed such that the melt temperature profiles across the barrel diameter could be measured, the measurements being carried out using a high speed data logger coupled with a personal computer. In addition, flow patterns of the melt were followed, this being for explaining the changes in melt temperatures.

It was found that increasing screw rotating speed resulted in an increase in maximum temperature rise (ΔT_{max}) except for a 10mm die with one hole, at which the ΔT_{max} increased up to the screw speed of 60 rpm and decreased for the higher screw speeds. The increase in the screw rotating speed also led to greater temperature fluctuation and uniformity, these being explained using the flow patterns observed. The changes in melt temperature were associated with flow patterns, flow length, pressure drop, and shear heating and heat conduction effects. Additionally, it was noticeable that the number of die hole did not affect the changes in melt temperatures. For given processing condition, adding 20-40 %w/w glass fibers caused an increase in melt temperature, the melt temperature reducing for 40-80% w/w glass fibers.

Finally, the experimental melt temperature rises were significantly different from the theoretical melt temperature rise.

Keywords: Twin Screw Extruder/ Measurement / Novel Temperature Sensor / Flow Pattern / Thermocouple / Shear Heating / Pressure Drop