

ABSTRACT

The dissertation attempts to increase the efficiency of production process with a modified polymer processing method using high-pressure injection moulding.

The thesis includes an introduction to the topic, a literature review and an analysis of current polymer processing processes. The aim and scope of the work are defined and the thesis is set. The work describes the use of an innovative modification of a standard polymer injection moulding process, which makes it possible to increase production efficiency to a greater extent than the investment required for this purpose.

In preparation for the study, a decision algorithm for the use of the proprietary process was developed, which suggests whether it is valid and cost-effective to use this method. Subsequently, different variations of injection moulding processes were also analysed with regard to the feasibility of implementing a modern injection moulding method.

In order to carry out the research, the test values were defined and the measurement system was described, the criteria for evaluating the experiment were defined and the experimental plan was made. A test piece in the form of reusable cutlery was selected, a prototype injection mould was constructed and built, and then, following the selection of the polymer used for the target tests, a target research injection mould was designed and built. To operate it, it was also necessary to devise and build a controller for the valve gate hot runner nozzles.

As a result of the research, the thesis was confirmed by achieving a stable and correct injection moulding process using the described TwinShot method. It was proven that it is possible to carry out two consecutive injection processes within one cycle of opening and closing the injection mould, what leads to several advantages: production, process, technical, technological, economic and organisational.

The TwinShot technology developed in the dissertation contains important features of structural and technological innovation and has great potential for commercialisation and application in industrial practice.