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A New Method for the Calculation of the Barrier Section of Single Screw Plasticising Units

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The throughput is one of the most important process parameters for designing single screw plasticising units for extrusion and injection moulding processes. Usually the screw design is optimised by trial and error experiments, which are both time and cost intensive. However, mathematical models for calculating the pressure-throughput behaviour exist as well. These models are able to describe the pressurethroughput behaviour of commonly used screw designs with, for example, a metering section, compression section, feed section and barrier section. These models can only be solved for the barrier section, however, if a constant pressure difference is assumed to prevail between the melt channel and the feed channel. This assumption does not correspond to the true situation, however. The problem can be resolved by using a new mathematical algorithm which does not require this simplification.
For purposes of the calculation, the screw is divided into subsections with constant process parameters. The algorithm presented in this paper makes it possible to couple the subsections. Hence, the result is a system of linear equations that is quite similar to the system of equations for finite element analysis . For this reason, the new method for calculating barrier sections permits a wide range of calculations to be performed. It is thus now possible to calculate all the different combinations of open or closed inflow, and open or closed outflow. Variations of the geometry of the barrier flight can additionally be included in the calculation.