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COUPLED COMPUTATION FOR INTERNALLY TEMPERED SINGLE EXTRUSION-SCREWS

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It is of utmost importance to obtain and maintain certain temperature ranges during the extrusion process.In addition to the conventional barrel tempering, screw tempering is also used in some processes to guarantee these temperature ranges. This is carried out particularly during the processing of thermally sensitive materials. In this way, temperature peaks are avoided and a temperature profile as homogenous as possible is achieved along the screw length and across the channel height. To maintain these temperature ranges, it is necessary to possess precise knowledge of the running processes and be able to predict their course. For this purpose, one has to be able to mathematically model the phenomena occurring in the cooling medium as well as in the melt. This is achieved with particular solutions to the energy equation which has been set up subject to the boundary condition of a heat input at the screw's root surface. Furthermore, ranges of equal geometries inside the cooling medium are described with the help of equilibrium conditions. To minimize the number of the necessary default values needed for the calculation and to reduce possible sources of error, the calculations inside the polymer melt and the cooling medium are directly coupled with each other. For this purpose the equations of both subsystems are set up as functions of the temperature and transferred into one single system of equations. This system is then solved with the help of a suitable method. Since only the inlet temperature of the cooling medium and the temperatures at the location of the first melt whirl formation have to be entered, this procedure has an advantage over a decoupled analysis. Since, in most cases, these values are known anyway, no assumed values (e.g. the outlet temperature of the cooling medium) have to be defined. Thus, possible errors in the computed results.