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# NEW RESULTS CONCERNING THE SOLID CONVEYING IN SINGLE SCREW EXTRUDERS WITH SPIRAL GROOVED BUSHES

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Because of their high throughput and their stiff-feed behaviour, grooved barrel extruders are widely used within the polymer-engineering industry. But the advantage of guiding the material in grooves and increasing the barrel friction coefficient is at the same time a problem as it causes thermal stress and increases the danger of melting material within the grooves. This can be avoided by using spiral instead of axial grooves. But high investment costs, a difficult fabrication and not-sufficient possibilities of calculation and configuration complicated their use so far.
Concerning modern designs of extruders with the pressure built-up continuing after the grooved bush, the concept of spiral grooves appears more and more attractive. Following that, analytical models for the configuration of these grooves are developed here. They concern conveying mechanisms driven by friction as well as those driven by form-fitting: For the friction-driven conveying, a maximum throughput can be reached if the groove-angle equates to the conveying angle while for the form-fitting conveying the throughput increases with an increasing groove-angle up to the angle of 90° of an axial grooved bush. The following experimental investigations with different types of materials and grooved bushes show for most cases a mixture of friction driven and form-fitting conveying. Very interesting is the investigation of spiral grooves which follow the same direction as the screw channel which has been widely disregarded so far. But for some combinations of material and machine-geometry the throughput exceeds that of an axial grooved bush. Altogether, the models which are developed here offer the opportunity to estimate the performance of a spiral grooved bush for cases of friction driven conveying and those driven by form-fitting. The models can help to optimize the design of the grooved bush regarding the material and the screw and can so lead in some cases to even better performances as an axial grooved bush.