OP-4-60

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INFLUENCE OF SURFACE ROUGHNESS ON THE EXTERNAL COEFFICIENT OF FRICTION OF POLYMER PELLETS IN SINGLE SCREW PLASTICIZING UNITS

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The external coefficient of friction of polymeric bulk materials should be rather low at the screw surface and high at the barrel surface in order to achieve a high mass flow rate and a sufficient pressure build up related to the feeding zone of single screw plasticizing units. That can be figured out by analyzing different models for solids conveying in single screw extrusion technology as well as injection moulding. Machine producers usually try to manufacture highly polished screw surfaces to achieve low surface friction. The influence of surface roughness on the external coefficient of friction of high density polyethylene, polypropylene, polycarbonate and polymethyl methacrylate pellets is pointed out in this paper. The measurements are carried out in dependence on pressure and velocity using a previously developed test apparatus. The bulk solids are fed into the sample chamber and pressed pneumatically at a defined normal force with a piston onto a heated, rotating shaft. The induced frictional force is measured by means of a load cell. Shafts with different surface roughness are used for these investigations. Adhesion and deformation are two contributions on the coefficient of friction of solid polymers on metal surfaces. It is shown in this paper that not always a low external coefficient of friction of polymer pellets can be achieved with smooth metal surfaces. There is also a strong influence of the polarity of the processed polymeric material. New aspects for surface preparation of extruder screws depending on the processed material regarding to the feeding zone are the outcome.