OP-17-1158

Wednsday, May 11, 2011, 05:00-05:20 pm
Room: Karam 3

INFLUENCE OF A NEW CONTROL VARIABLE IN REACTION INJECTION MOLDING'S MIXING QUALITY

N. Gomes[2,3], R.J. Santos[1] , M.M. Dias[1] , A.J. Mateus[3] , P.J. Bártolo[3] , J.C.B. Lopes[1,2*]

[1]Laboratory of Separation and Reaction Engineering, Faculdade de Engenharia da Universidade do Porto Rua do Dr. Roberto Frias s/n, 4200-465 Porto, Portugal, [2]Fluidinova, Engenharia de Fluidos, S.A. TECMAIA, Rua Engº Frederico Ulrich, 2650, 4470-605 Moreira da Maia – Portugal and [3] Centro para o Desenvolvimento Rápido e Sustentado do Produto, Instituto Politécnico de Leiria Centro Empresarial da Marinha Grande, Rua de Portugal, Zona Industrial, 2430-028 Marinha Grande

nuno.o.gomes@ipleiria.pt, rsantos@fe.up.pt, dias@fe.up.pt, antonio.gouveia@fluidinova.pt, csousa@estg.ipleiria.pt, amateus@estg.ipleiria.pt, pbartolo@estg.ipleiria.pt, lopes@fe.up.pt

Reaction Injection Molding (RIM) is a reactive process for polymer processing. Two monomers (polyol and isocyanate), having low viscosity, 80 to 1000mPa.s, are mixed in a cylindrical mixing chamber with passage times of about 10ms. The monomers enter the mixing chamber as high-speed jets through two opposed injectors having a diameter of approximately 1.5mm. The performance of the RIM process is highly dependent on the contact of the opposed jets / monomer streams, i.e. of the mixing of the tow monomers. However, state of the art RIM processes do not have the means for the assessment of mixing. New concepts for control of mixing in RIM were introduced at LSRE/FEUP and registered under the commercial name RIMcop® - RIM with Control of Oscillation and Pulsation. These concepts incorporate the control of the monomer jets equilibrium from the dynamic monitoring of the differences of the static pressure between the two feeding lines of the injectors, Δp . Using an industrial prototype of a RIMcop® machine, this work studies the influence of the new control variable, Δp , on mixing and on the final mechanical properties of a polyurethane, PU, part. The Δp values in a range of -1 to 1bar, are correlated with mixing scales, mechanical and chemical properties of the PU part. The quantity of unreacted groups is measured with ATR-FTIR. Mechanical tests of PU are made following the ASTM standards. Mixing efficiency will be assessed from the local scale of an inert tracer seeded into one of the monomer streams.