# EXPERIMENTAL TESTING OF MATERIAL MOSTEN GB 005 ON VARIOUS CONCERTATION OF RECYCLED MATERIAL


**Jozef Dobransky[1], Jozef Zajac [1], Michal Hatala[1] ,Dusan Mital[1]*, Zuzana Hutyrova[1] , Frantisek Botko[1], and Lubos Behalek [2,]**

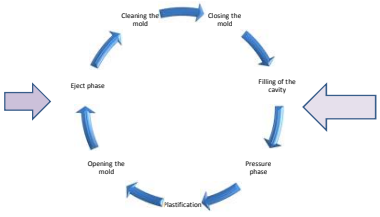
[1]Faculty of Manufacturing Technologies Technical University of Kosice with a seat in Presov, Bayerova 1, 080 01 Presov, Slovakia; jozef.dobransky@tuke.sk, jozef.zajac@tuke.sk, michal.hatala@tuke.sk, dusan.mital@tuke.sk, zuzana.hutyrova@tuke.sk, frantisek.botko@tuke.sk

[2]Technical University of Liberec, Faculty of Mechanical Engineering, Studentská 2, Liberec, Czech Republic ; lubos.behalek@tul.cz


2nd International Electronic Conference on Materials

## INTRODUCTION

*Thermoplastic injection technology is currently among the most commonly used plastics processing technologies and production of plastic products. Thanks to the wide range of uses thermoplastics, especially in the automotive, electronics and other areas of industry, the technology is perspective ahead. There are many factors affecting the final quality of plastic. Presented paper is focused on monitoring the impact of changes in the basic technological parameters and mechanical properties. Among the biggest disadvantage of plastics is their long life, which has a negative impact on the environment. Efforts of manufacturers is to implement back in the production of plastics in the form of recycled or of regranulate. Evaluating the quality of products made of materials containing regranulate is possible only by experimental research.*


### Engel Victory 80/25 + molding cycle

**Properties of base material**

| Property | Unit | Mosten GB 005 | Testing method STN EN |
|---|---|---|---|
| Melt mass flow rate MFR | g/10 min | (230 0C, 2,16 kg) 5,0 | ISO 1133 |
| Yield strength | MPa | 34 | ISO 527-2 |
| Density | g.cm-3 | 0,908 | ISO 1183 |
| Flexural modulus | MPa | 1550 | ISO 178 |
| Notch toughness CHARPY (23 oC) | kJ.m-2 | 4 | ISO 179 |
| Softening temperature according to Vicat | oC | 157 | ISO 306 |

*Experimental samples were produced on Department of engineering technologies Technical University in Liberec. As experimental material was selected Mosten GB 005 (polypropylene, homopolymer) and experimental samples were produced on injection press ENGEL Victory 80/25 Technological parameters preset was according to material data sheets of selected material. Mechanical properties are shown in table.*

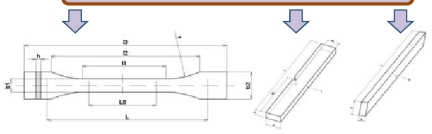
*Realized tests:*

- *Test of rheological properties EN ISO 1133:2006*
- *Hardness test EN ISO 868:2003*
- *Impact strength (Notch toughness) EN ISO 179-1/1eU (EN ISO 179-1/1eA)*
- *Test of flexural properties EN ISO 178:203*
- *Differential scanning calorimetry EN ISO 11357-1:2010*

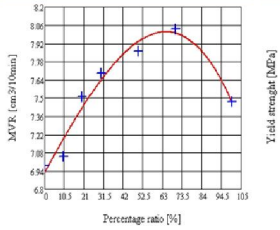
*Testing samples were divided to 7 classes :*

- *1 - 0% - base material*
- *2 - 10% - content of recyclate*
- *3 - 20% - content of recyclate*
- *4 - 30% - content of recyclate*
- *5 - 50% - content of recyclate*
- *6 - 70% - content of recyclate*
- *7 - 100% - recyclate*

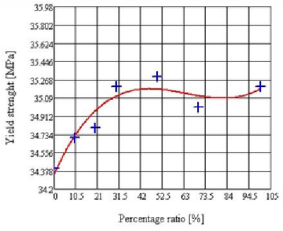
*EXPERIMENTAL SAMPLES*



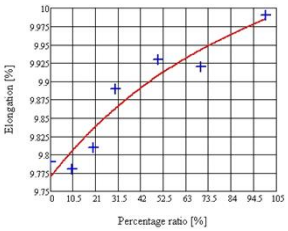
## RESULTS OF EXPERIMENT+GRAPHICAL DEPENDENCES+ EQUATIONS



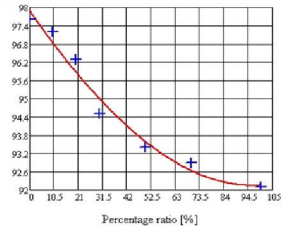

$$MVR = -1{,}7.10^{-6}.x^3 - 3{,}29.10^{-5}.x^2 + 0{,}026.x + 6{,}93$$



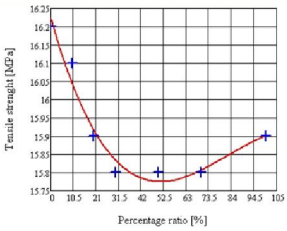

$$YP = -32{,}17.10^{-4}.x^2 + 0{,}04426.x + 34{,}34$$



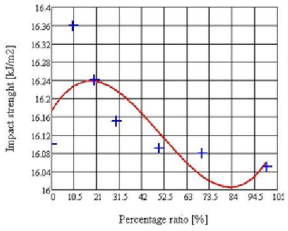

$$E = -2{,}7.10^{-5}.x^2 + 0{,}00237x + 9{,}77$$



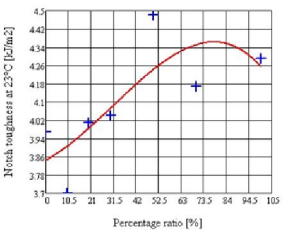

$$EF = 1{,}17.10^{-6}.x^3 + 3{,}96.10^{-4}.x^2 - 0{,}1.x + 97{,}88$$



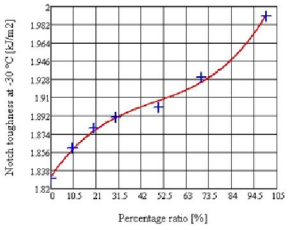

$$T = -1{,}2.10^{-6}.x^3 + 2{,}96.10^{-4}.x^2 - 0{,}021.x + 16{,}22$$



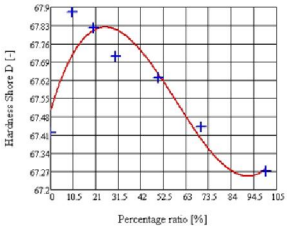

$$IS = 1{,}704.10^{-6}.x^3 - 2{,}598.10^{-4}.x^2 + 16{,}172$$



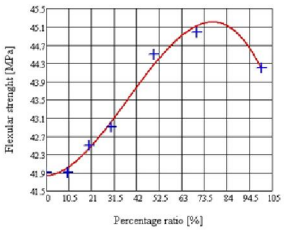

$$NT = -1{,}36.10^{-6}.x^3 + 1{,}28.10^{-4}.x^2 + 3{,}85$$



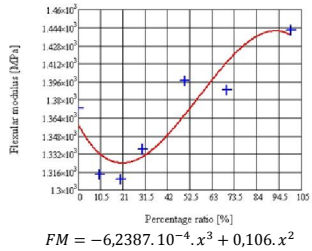

$$NTC = 0{,}0031.x + 1{,}83293$$




$$HS = 3{,}93.10^{-6}.x^3 - 6{,}897.10^{-4}.x^2 + 0{,}0276.x + 67{,}5$$



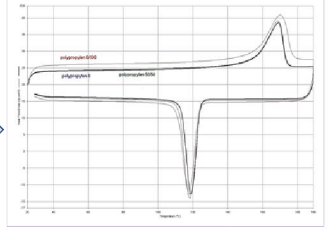

$$FS = -1{,}3999.10^{-4}.x^3 + 0{,}0016.x^2 + 0{,}00426.x + 41{,}82$$




$$FM = -6{,}2387.10^{-4}.x^3 + 0{,}106.x^2 - 3{,}566.x + 1357{,}61$$

*Microstructures*

*Ratio of recyclate 0% and 50% represent almost ideal and identical curves of calorimetry, but at 100% ratio of recyclate is seen increase of heat flow, although initial and final temperatures for exothermic and endothermic reaction are in range from 2 ° C. Percentage of the recyclate ratio causes increase of initial melting temperature from 134,676°C at 0% to 139,715°C at 100% ratio of the recyclate. Melting enthalpy was measured at 0°C with value of enthalpy -122,941J/g, at 50% was measured value -114,78 J/g and at 100% was value -135,778 J/g.*



*Calorimetric curve*


Ministry of Education, Science, Research and Sport of the Slovak Republic

VEGA 1/0594/12

This paper has been elaborated in the framework of the project VEGA 1/0594/12.

We support research activities in Slovakia/ Project is cofinanced from funds of EU. ITMS project code: 26220220125

Európska únia