MODELLING OF NEW LIGHTER DISCRETE FILLED COMPOSITE MATERIAL IN BASIS OF RECOVERED GFRP POWDER

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Summary. The new composite is modelled on the basis of the properties of new material. The target characteristics of the material considered are the tensile strength and surface hardness. The combination of fractions of the PMMA powder, the mixing ratio of fractions and the mixing ratio of resign and powder are considered as design variables. The relation between the objectives and design variables is modelled on the basis of the experimental data.

1 INTRODUCTION

Composites are by their very nature mixtures of different materials: polymer, fibrous reinforcement (glass or carbon fibre) and in many cases fillers (these may be cheap mineral powders to extend the resin or have some other function, such as fire retardants) [1].

There are several potential recycling and end-of-life methods for polymeric composites including pyrolysis, hydrolysis, chemical recycling, regrinding, and incineration [2]. For pyrolysis reaction 1 kg composites needs 2.8 MJ energy, but can provide useful energies in the different forms of fuel oil and composite fillers [3].

Mechanical reprocessing is continually the most commonly used technology for recycling thermosetting composite plastics. The reprocessing of the composite PMMA+GFP plastic scrap by using disintegrator milling will enable to produce the acrylic plastic powder with a determined granularity and technological properties (particle size, the apparent density) [4].

The main goal of the current study is to develop new composite material with optimal physical and mechanical properties.

2 EXPERIMENTAL MANUFACTURING OF NEW COMPOSITE MATERIAL
In [4] two key factors, density of the filler material and the specific surface area, are considered in modelling of new composite. The first factor - density of the filler material should be maximized and the second factor - specific surface area should be minimized in order to reduce the amount of the resin used i.e. the price of the new composite.

In the current study the new composite is modelled on basis of testing of new material. The mixtures of composite material were made in different compositions of fine (0-0.16 mm) and coarse filler (1.25-2.5 mm) materials and polyester matrix resin. To assure homogeneous mixtures and to avoid air entrapment the vacuum mixing technology was used. The vacuum mixed composite was casted into one-sided silicone moulds and de-moulded after 12 hours curing. The experimentally manufactured samples of new discrete filled composite material were tested in tensile conditions and surface hardness test.

3 MODELLING OF DISCRETE FILLED COMPOSITE MATERIAL

The new composite can be modelled on the basis of the mechanical test results of properties of the experimentally manufactured new discrete filled composite materials. The most important target characteristics of the material considered are the tensile strength and surface hardness. Another important factor is cost of the new material. The combination of fractions of the PMMA powder, the mixing ratio of fractions and the mixing ratio of resin and powder are considered as design variables. The relation between the objectives and design variables can be modelled on the basis of the experimental data.

REFERENCES