COMPOSITE MATERIAL REINFORCED BY A KNITTED FABRIC. PREDICTION OF ITS STRENGTH AND ELASTIC PROPERTIES AND EXPERIMENTAL VALIDATION

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Polymer composites reinforced by knitted fabric (see fig.1) are materials with high potential [1, 2]. In the same time such materials are mechanically non-linear with a high dynamic energy absorption possibility. Two different approaches were executed - numerical (FEM) structural modeling based on reinforcement and matrix mechanical and geometrical properties (were measured experimentally) and inverse method approach for mechanical properties appreciation, based on vibrations modal analysis; with the goal to obtain and predict welf knitted fabric reinforced multilayered composite plate mechanical behavior.

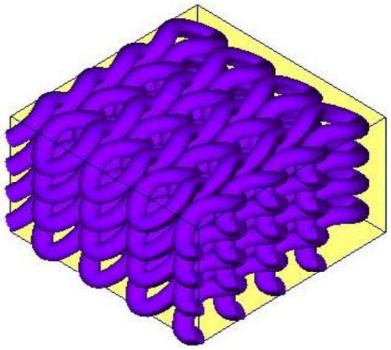

Fig.1. Layered Glass fiber/ Epoxy matrix $[0]_4$ composite laminate (geometrical simulation).

The modal vibration tests in combination with the mathematical optimization procedure are the method which was used for layered material elastic properties evaluation. Is worth to mention, that such approach application for materials with a high damping ability (laminated composites, reinforced by knitted fabric can be positioned as such materials) is still investigated poorly. The inverse technique version was exploited in the work is based on the direct orthotropic plate free vibration measurements and afterward mathematical optimization procedure (the planning of experiments or response surface technique) which is minimizing the error functional. Finally, the elastic constants were obtained by inverse technique were compared with the obtained by direct experimental measurements and FEM modeling data. Structural probabilistic CM fracture model was developed and predictions results were compared with experimentally obtained.

REFERENCES

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