

DETERMINATION OF MECHANICAL PROPERTIES FOR IMPACT AND BENDING A BUMPER SHOCK ABSORBER MADE OF STEEL COMPARED TO BUMPER SHOCK ABSORBER MADE FROM A NEW COMPOSITE MATERIAL FOR AUTOMOTIVE INDUSTRY - PART 1

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Abstract: A current issue is related to increasing levels of environmental pollution and global warming caused by industrialization especially excessive burning of fossil fuels or liquid. This is due in part to motor vehicle fuel in the combustion process they eliminate environmentally harmful emissions. By reducing the weight of vehicles will be allowed to reduce the amount of energy needed to produce mechanical work. The purpose of this study is to design and create a new lightweight composite material used in the structure of automotive bumper shock absorber. This item is made of composite material and bumper shock absorber type was compared with the current bumper shock absorber made from steel. New laminated composite type must meet the standards of today, have minimized weight and impact absorption capacity at low speed.

Keywords: absorption, weight, stratified, bumper car design.

1. INTRODUCTION

In the present context, excessive industrialization hardly degradable materials is that researchers create new materials that meet the requirements of present but that is biodegradable and recyclable. Thus by reducing the weight of vehicles using composites in automotive safety bumper structure, reduce resource consumption and wear occurred due to vehicle weight. But bumper shock absorber has an important role in reducing injuries to pedestrians in collision bumpers with them. Most accidents are low speed frontal, such as the first element in contact with: other vehicles, pedestrians, items on or off road, is car bumper. Car bumper consists of several elements that make up its structure as we can see in figure.1.:

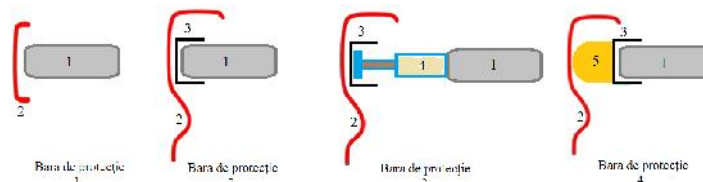


Figure 1: Car bumper structure section [1,2]

Mechanical test methods for case study namely layered polymeric composite materials consist of car bumper shock absorber made of steel bending test in comparison with car bumper shock absorber made of composites.

2. WORKING METHOD

In this study, to get a bumper for a car was used as bumper mold present existence on cars made of steel. Thus the overlap of 6 layers of textile fabric warp yarns to reinforce polyester resin PolyLite 440-M880 and adding foam cork tiles in Figure 3, was obtained by manual or molding in Figure 2., bumper shock absorber in Figure 5.

From an economic perspective was used manual method of molding the polymer immersed in resin with hardener overlapping cork and foam.

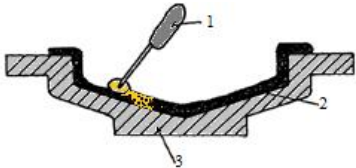


Figure 2: Lay-up method [4]
 1.roll;2.layer (resin-impregnated reinforcement material);3.mold open



Figure 3: Lay-up method for obtaining composite structure for bumper shock absorber [1]

Temperature is the most important factor in this process because the polymer is plastify and pressure die cast him in a certain period of time. After the time-out, the finished product can be removed from the mold as can be seen in Figure 4:



Figure 4: Bumper shock absorber made of composite materials removed from the mold [1]



Figure 5: Bumper shock absorber made of composite materials [1]

3. EQUIPMENT USED FOR BENDINDING TEST FOR BUMPER SHOCK ABSORBERS

In Figure 6. is presented the bending testing machine and in Figure 7. analyzer designed to transmit data to the computer, the data obtained from the bending test:



Figure 6: Bending testing machine [1]



Figure 7: Actuator signal reception and transmission of registered [1]

Here are some details as follows:
 Manufacturer: JIANIN-CHINA;
 Type: WE-60 with measuring range: 5...550kN; res=0,001kN

4. BENDING TESTS OF BUMPER SHOCK ABSORBER FOR AUTOMOTIVE

For three-point bending test using test machine described above were used as car bumper shock absorber made of steel black painted and composite car bumper shock absorber yellow coloured as can be seen in Figure 8.:



Figure 8: Steel and Composite car bumpers shock absorbers [1]

Were weighed bumpers car shock absorber made of steel in Figure 9. and in Figure 10 were weighed both of them and the mass difference obtaining will be the weight of composite bumper car shock absorber.
- for steel car bumper shock absorber 4kg mass is fitting and sheet thickness is 0.2 mm;
- for composite car bumper shock absorber, mass is 1.3 kg;



Figure 9: Weight of steel car bumper shock absorber [1]



Figure 10: Weight of both of them [1]

After knowing about the drive test data and the items to be tested, the testing was determined as follows:

- the car bumper shock absorber made of steel like in Figure 11. and composite car bumper like in Figure 12.,were mounted on the bending test machine:



Figure 11: Bending test for steel car bumper shock absorber [1]



Figure 12: Bending test for composite car bumper shock absorber [1]



Figure 13: Bending detail for steel car bumper shock absorber [1]



Figure 14: Bending detail for composite car bumper shock absorber [1]

5. RESULTS

The bending tests where you can see details of test and behavior of car bumper shock absorber respectively in Figures 13. and in Figure 14. We can see actuator by receiving and transmitting data to the system were obtained for fitting the force-displacement graphs in Figure 15. and for composite car bumper shock absorber in Figure 16.:



Figure 15: Force-displacement graphic steel car bumper shock absorber [1]



Figure 16: Force-displacement graphic composite car bumper shock absorber [1]

In Table 1. were displayed peaks resulting from force-displacement graphs for steel shock absorber bumper car and separate composite shock absorber bumper car made from a new composite material:

Table 1: Values obtained from flexural reinforcement and self bumper bar [1]

Values	Car bumper shock absorber made of steel	Car bumper shock absorber made of composite materials
Fmax [kN]	4.258	2.957
Rm [N/mm ²]	1.314	0.091

6. CONCLUSIONS

By reducing the weight of the bumper using biodegradable and recyclable materials such as cork can make the claim that depreciation costs of producing this type of bar can be achieved by reducing the vehicle weight, reducing mechanical work and thus lower consumption.

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REFERENCES

- [1] Calienchiug A., Cercetări privind bara parașoc pentru autovehicule, confecționată din materiale compozite noi, Teza de doctorat, Universitatea Transilvania din Brașov, Brașov, 2012.
- [2] Davoodi M.M., S.M. Sapuan, A. Aidy, N.A. Abu Osman, A.A. Oshkour, W.A.B. Wan Abas, Development process of new bumper beam for passenger car: A review, Elsevier, Materials and Design 40, pp. 304-313, www.elsevier.com, 2012.
- [3] Dogaru F., Mecanica compozitelor laminate, Editura universității Transilvania, ISBN 978-973-598-251-5, 2008.
- [4] Preda M., G., Șontea S., Procedee de elaborare a pieselor pentru automobile din materiale compozite stratificate, in The 8th International Conference University Constantin Brâncuși, Târgu Jiu, 2002.