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REDESIGN OF MOTORCYCLE REAR SUSPENSION WITH CAD TECHNOLOGY

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2. ILLUSTRATIONS

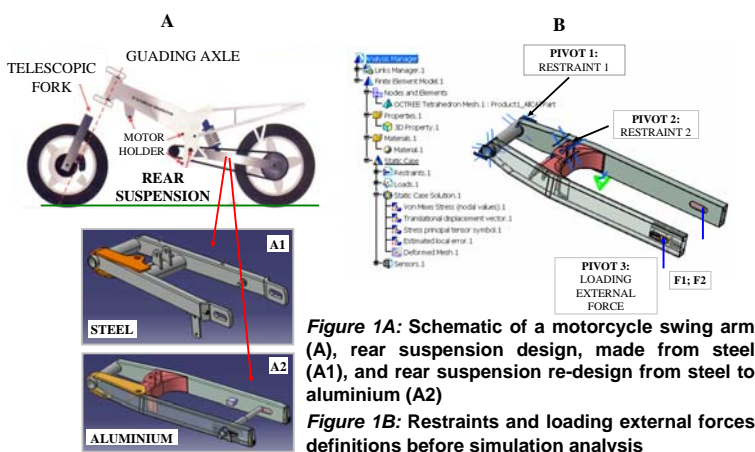


Figure 1A: Schematic of a motorcycle swing arm (A), rear suspension design, made from steel (A1), and rear suspension re-design from steel to aluminium (A2)

Figure 1B: Restraints and loading external forces definitions before simulation analysis

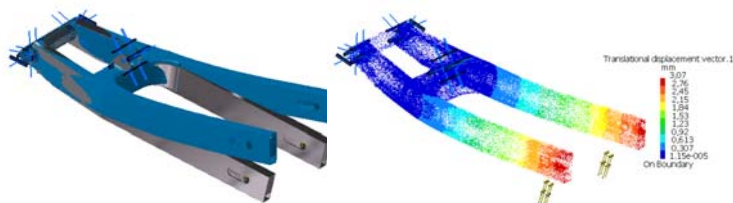


Figure 2: Displacement distribution of the rear suspension motorcycle component in second loading condition

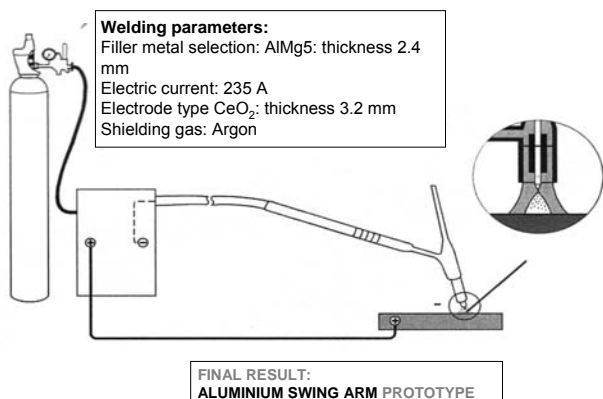


Figure 3: Schematics of TIG welding and final prototype – aluminium swing arm

1. INVESTIGATED PROBLEM

The automotive industry is constantly looking for new ways to reduce fuel consumption. This is not only an individual concern for the car and motorcycle customer but also an environmental question on a more global level. When it comes to meeting these environmental requirements, the contribution from body design and manufacturing engineers lies in the field of weight savings. In the contribution, a design of aluminium rear suspension for motorcycle, made with CATIA V5 R14 computer aided design advanced program, is presented. Investigation of a tension – deformation analysis of this suspension is performed with the finite element method (FEM) simulation.

- The rear suspension re-design from steel to aluminium and the boundary conditions for the FEM model of the rear suspension shown schematically in Figure 1.
- The strain distribution for the component in second loading condition ($F_2 = 1600$ N) is shown in Figure 2. The value of the first maximum strain due to this analysis was 3,07 mm.
- All of the welding parameters, which we are used in our welding process of aluminium swing arm composition, are shown in Figure 3.
- The results of several identification tests are presented and compared with static test results. Rear suspension properties are measured by means of tests on stable table. The aluminium rear suspension component is mounted on special standing (see Figure 4) Laboratory tests can be performed by means of special testing machines. The set-up and control of testing parameters is carrying out with measuring sensors and special program for evaluating the results.

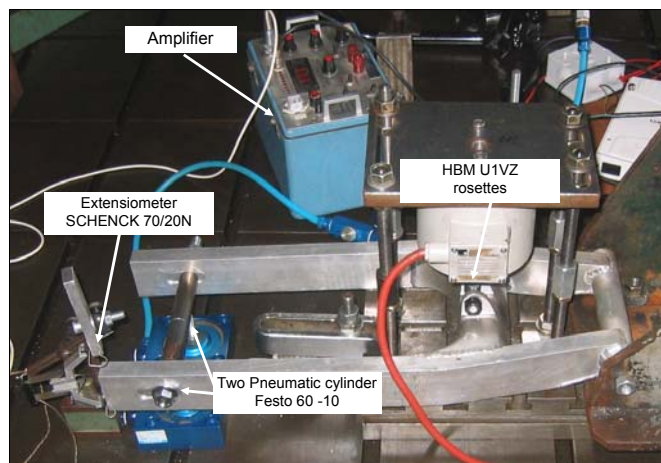


Figure 4: Schematics of TIG welding and final prototype – aluminium swing arm

3. CONCLUSIONS

The work describes a development of rear suspension from idea to the 3D model, making and testing the prototype. It was made a 3D model in a program CATIA V5 R14. This paper presents details of FEM analysis and experimental analysis of motorcycle component behaviour in different loading condition. Careful FEM analyses were carried out in order to understand the effects of different loading condition. Results show that the proposed FEM method of identification in the range of required loading (up to 1600 N) predicts deformation values which are in agreement with those given by static measurements:

The displacement values obtained from the FEM analysis for the first loading condition $F_1 = 500$ N reach 0,939 mm – results from static test reach 0,94 mm;

The displacement values obtained from the FEM analysis for the second loading condition $F_2 = 1600$ N reach 3,07 mm – results from static test reach 3,25 mm.

Due to customer requests for improved properties in areas such as safety, reliability, driving performance, and so on, new materials have successively been introduced into the car and motorcycle body to meet these demands.

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