

Abstract

From this project, the possibilities of reducing the weight of a roll cage within a FIA/MSA approved car, whilst keeping within the regulations. The design and materials used for the roll cage will be discussed. The motivation for this report is to reduce the overall weight of an MSA/FIA approved vehicle, the weight can be reduced by reducing the weight of the roll cage within the vehicle, if the vehicle is lighter then theoretically it would be faster or more competitive. The design of the roll cage will be changed using CAD and FEA, from this it would be possible to change the material of the roll cage to ensure that it the roll cage is as stiff as required and that it is within regulation. Hopefully from this, the roll cage will be lighter but just as strong, if not stronger. Alongside using FEA to test the materials for the roll cage, stress testing will also be conducted on a standard roll cage tube. From this data it will be possible to make a comparison between the results from the FEA and the live results produced by the testing. The reasoning behind this project is to effectively reduce the overall weight of the roll cage within a vehicle, roll cages can be very heavy depending on the amount of materials used. Once the data is collected and a design has been made with various materials that comply with the regulations, theoretical calculations could be made to make an evaluation on what

the overall weight of the roll cage could be.

Introduction

Within this report, aims and objectives will be set to ensure that the final outcome will be achievable, one of the main aims would be to reduce the weight of roll cage, thus reducing the weight of the vehicle. In order to achieve this aim, objectives will be set, these objectives include, conducting stress testing on the standard roll cage and then making a comparison against other material using CAD and FEA. Another objective for this aim would be to ensure that the materials and design of the roll cage comply with FIA/MSA regulations, the information on the regulations will be acquired from Motorsport UK (www.motorsportuk.org) and the FIA (www.fia.com) websites along with the MSA handbooks. Another aim for this project is to produce a theoretical calculation to estimate what the overall weight of the roll cage would be prior to and after changing the material and design, one of the main objectives for this to be achieved would be to ensure that the materials and design used are within the FIA and MSA regulations. Once each aim is completed an analysis of the results will be made, from here it will be possible to make an evaluation, where the feasibility of following through with changing the design and materials used for the roll cage will be discussed. A conclusion of the findings will then be made, within the

conclusion the overall findings will be outlined and discussed, a reflection on the methods used for producing the results will be made and any changes that could be made in the future will be discussed.

Conclusion

To conclude, within this report the design and materials used for producing a roll cage for a MSA/FIA approved vehicle will be investigated and an evaluation of the possibilities of making the roll cage lighter will be made, the roll cage must also be just as strong, if not stiffer than the standard roll cage, the design and materials used must also comply with the MSA and FIA regulations. Prior to the evaluation an in depth analysis of the results produces by the stress testing and CAD and FEA will be done to ensure that the FEA results are similar to the results produced by the live testing, once this is done CAD and FEA will be used to make a comparison between various materials and roll cage designs, this will be done in order to produce theoretical results that can ensure that the roll cage is lighter and just as strong after the materials and design has been changed.

References

Motorsport UK. 2019. Home - Motorsport UK - The beating heart of motorsport in the UK. <https://www.motorsportuk.org>

Federation Internationale de l'Automobile. 2019. Federation Internationale de l'Automobile. <https://www.fia.com>