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APPLICATION OF MODELING AND SIMULATION TOOLS FOR DESIGN OF PLASTIC PRODUCTS

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ABSTRACT

This paper is related to the application of finite element analysis to designing a plastic product particular a rim for unitary wheel used with Ground Service Support Equipment such as trolleys, container dollies, luggage trailers. The workwas carried out paying special attention to the optimization of the wheel structural architecture for load bearing capability.

Modeling and simulation work was carried out by considering thermoplastic material namely polyamide 6 filled with 30% short glass fibers. The selection of plastic material was based on several factors, including mechanical strength under static and dynamic load, resistance to prolonged action of elevated temperatures, cost and ability to be molded with conventional techniques.

A plastic model of the steel rim was developed based on general plastic product design standards. The model was simulated in order to identify areas of possible potential failure. After that model was optimized by changing and re-arranging its structural elements for further reduction of stresses in the identified potential failure areas. Final modification of the proposed model was carried out for product mold ability to ensure its manufacture with conventional molding technique. The finite element analysis showed that the stresses generated in the optimized model components were well below the actual yield stress of the plastic. The destructive load ofthe plastic wheel model estimated under static radial load condition with finite element analysis agreed well with the results obtained by physical testing the molded prototype samples under the same loading conditions. This fact affirmed suitability of the Solidwork design and Simulation packages for plastic part design. The application of this techniques lead to the reduction of prolonged product implementation period and significant cost saving due to reduced reproduction number of prototypes to bemade for evaluation of the product suitability, thereby making design successful and efficient.

KEYWORDS: *Rim for Unitary Wheel, Design, Simulation, Modeling, Validation*

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