wheel's on project

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SUMMARY

Following a previous idea for a wheelchair with wheels which can be split into three segments, this project intends to optimize the manufacturing process through advanced assisted injection processes technology, with the use of biopolymers and natural reinforcements. This will bring advantages over the current production method as the piece will be lighter, cheaper and recyclable.

INTRODUCTION

The wheelchair is one of the most valued technology devices in the field of rehabilitation as it provides the only means of mobility for many people with severe motor impairments. However, one of the major problems for wheelchair users is the lack of a lateral exit to access a bed, bathroom, car or eating table. *Chap Rad is* a wheel that can be divided into three segments with a hard rubber traction tyre that can be adapted to any conventional wheelchair. Removing one of the segments, the wheelchair remains stable and the user can change his position without problems.

The current project will study advanced plastic injection technologies such as Water Injection Technology (WIT) or Gas Injection Technology (GIT), and alternative raw materials, to make the product affordable and eco-friendly.

DEVELOPMENT

Wheel's on project is divided in three main stages.

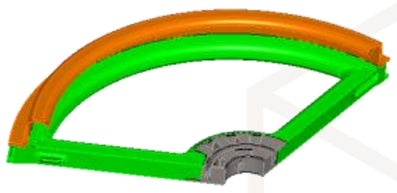
In the first step, the part design was optimized to be produced using common petrochemical based polymers. In order to make a robust and feasible plastic part, the new design was validated by structural analysis by Finite Elements Method (FEM) and rheological simulations. Finally, with the help of 3D printing, it was possible to validate the final design.

Briefly, the wheel segment can be reduced to three parts.
Two of them in regular polypropylene and the third one with polypropylene plus glass fiber, with WIT or GIT. Due to water properties (higher thermal condutivity and lower compressibility, compared with gas) it is expected that WIT will deliver cheaper and with better aesthetics parts. With PP raw material and WIT/GIT it is possible to produce the wheel for a fraction of the cost of a traditional wheel.

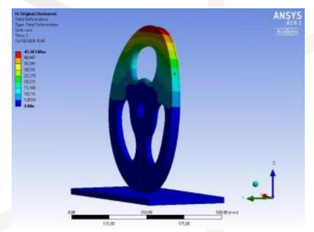
The next stage will include the study of biopolymers and natural reinforcements, in order to make the product more eco-friendly.

With this aim, injection molds were produced in order to test several biopolymers and natural reinforcements with WIT/GIT.

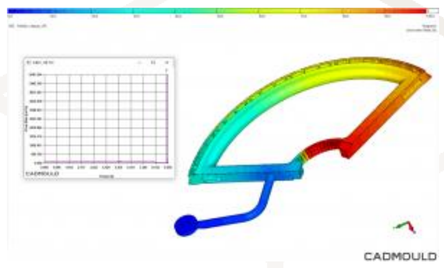
APPLICATIONS



1. Design otimization



2. Structural analysis



3. Rheological Simulation

4. 3D printing

OTHER APPLICATIONS

CONCLUSIONS

The expectations are that the investigation will be completed by the end of 2021.

The results will allow us to understand biopolymers and natural reinforcements for:

1. their application in durable products;

2. their processability in advanced injection technologies.

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