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# Automatic Steering Wheel System for Tractors

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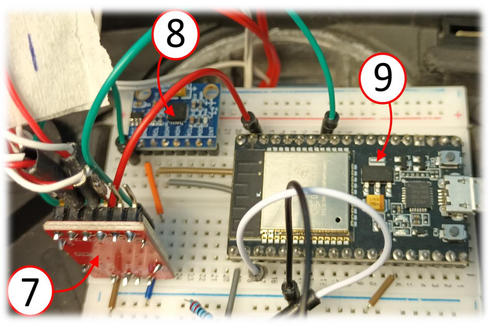
## 1. Introduction

This project is part of a **LeadEng** collaboration between three master programs from the **Department of Materials and Production** and the **Energy Department**. The involved masters were **Electro-mechanical System Design (EMSD)**, **Mechatronic Control Engineering (MCE)** and **Power Electronics And Drives (PDE).**

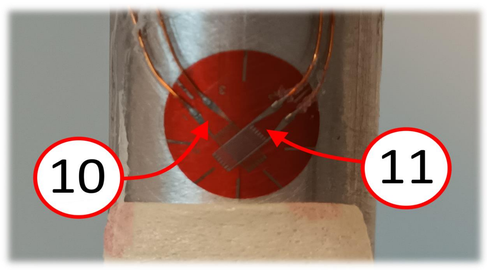
The main **objective** of this project is ***designing and testing of the mechanical part of an automatic steering wheel system***, whereas the design is the dominant and most comprehensive part of the project. The key motivation for doing this is utilizing obtained engineering expertise to create a new product, as well as attaining a greater experience in design and creation of a product.

## 2. Test Setup

For measuring the **torque** in a real tractor without damaging the steering wheel or the column, another steering wheel was clamped onto it, to measure the torque when driving and parked, with the use of **strain gauges**.

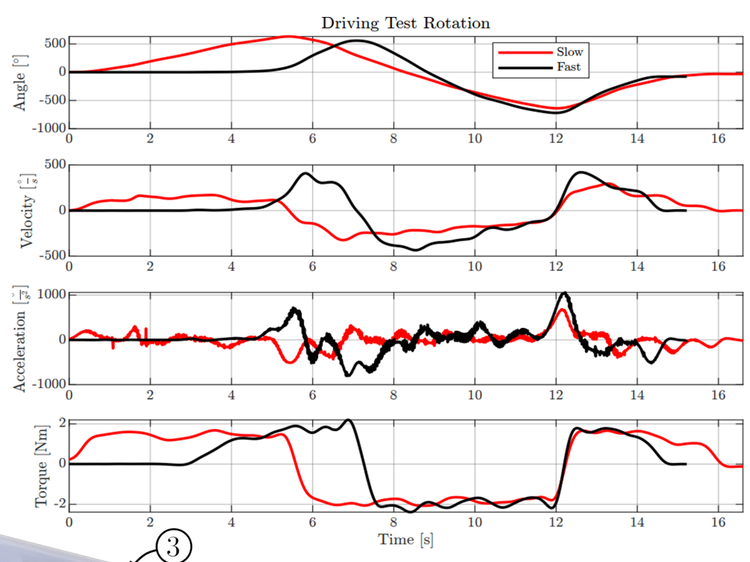


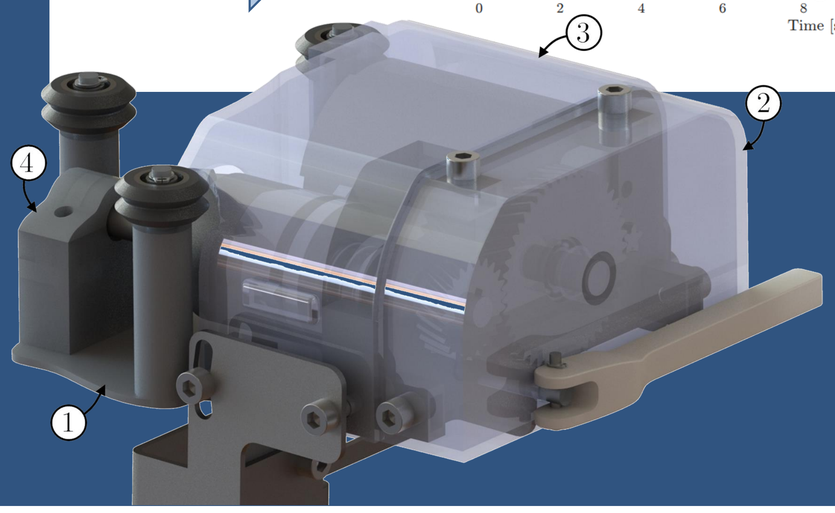





From this setup test, the **nominal torque** value for moving the steering wheel as well as the **rpm** needed for moving the steering wheel were obtained.

The results can be seen in the **plot**



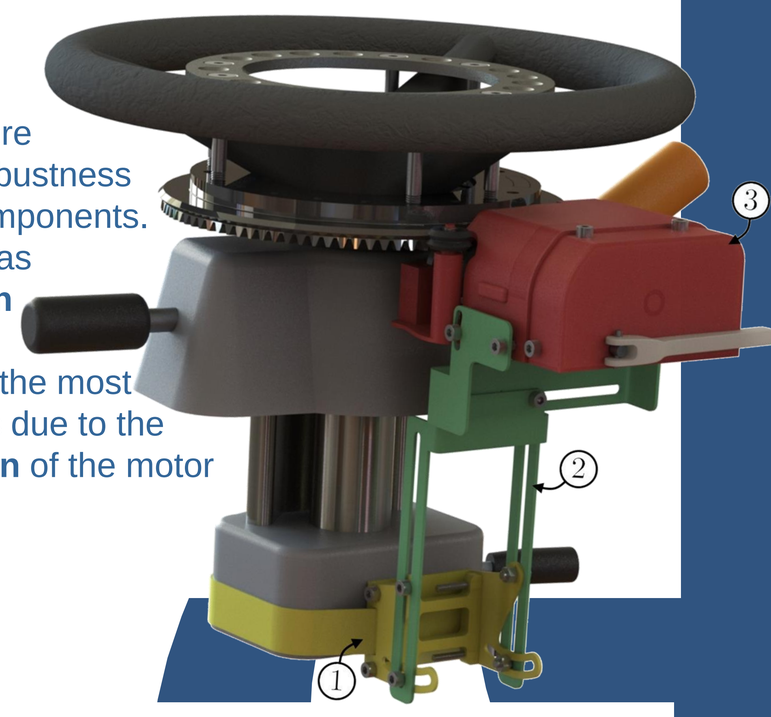




## 3. Design

Before the design phase, multiple **concepts** have been developed, for which evaluation lead to generation of solutions, whose assessment produced the final **solution**. The final solution then proceeded to the design phase.

The design is split into design of the **gearing**, **clutch mechanism**, **shaft** and **fixture**. The fixture couples all the parts together, and consists of; a **casing**, which allows for transmission of the **mechanical torque** from the motor through the gears, clutch and bevel gear to the steering wheel; a **stationary mounting**, which anchors the system to the steering column; and a **connecting part**, which connects the stationary mounting and the casing together. Each design was conducted with necessary **calculations** and **considerations** in mind.

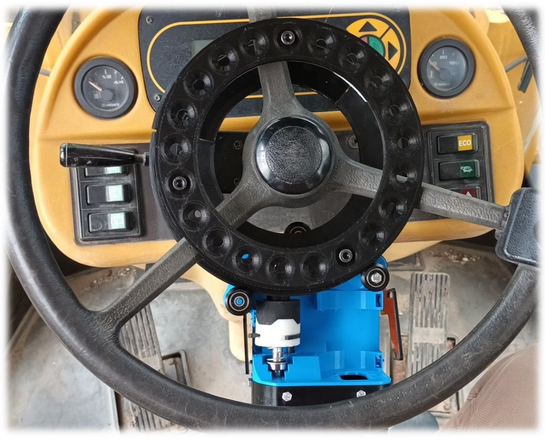
Finally, for validating the design, several **ANSYS simulations** were ran, in order to guarantee the robustness of some of the most relevant components. What is more, the final design was **analyzed** in terms of **production** and **economics**, from where it was deduced that the gears are the most expensive components, which is due to the specific **addendum modification** of the motor gear.




## 4. Conclusions

A **prototype** has been **manufactured** and **tested**, which served as a way to examine the functionality and feasibility of the design. There, it has been demonstrated that most of the system **functionality** seemed **valid**, although some validity was limited.

Whereas the major **flaws** of the system appear to be the **shifter mechanism** and the **provided motor**. In the end, it can be concluded that the **objective has been mostly achieved**, as the design has been proven to be **feasible** to a large extent, except for the aforementioned flaws and other minor shortcomings.



## Acknowledgement

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