Design of an Electronically controlled Recycling Bin Compactor

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Aim of the Project

The Aim of this project is to design a compactor for recycling rubbish in a domestic wheelie bin that can be controlled electronically.

Objectives

The following objectives were set alongside the project supervisor at the beginning of the semester:

- Research potential Electrical and Hydraulic components suitable for the project.
- Carry out calculations to determine a suitable force to be applied to the application.
- Redesign the pre-existing assembly to be electronically controlled.
- Perform an FEA analysis on the new assembly and validate functionality.
- Create Working drawings, wiring or hydraulic schematics.

With these objectives set an effective project plan was set by creating a mind map, Work breakdown structure and Gantt chart to have a clear schedule of tasks to be completed.

Background

Need for this Product

The first research done was to understand why there is a need for this Product?. It was found that there is great benefits to compacting recycling garbage (4.7 times reduction in some cases) and there are isn't any visually appealing electronic compactors for households which leaves an opening for a new product.

Pre-existing assembly

The previously made manually operated compactor was investigated to find suitable parts that could be transferred to a new assembly

Electronics

Aspects of electronics were researched for both a fully electric unit or as control for a hydraulic assembly. Power supply, Linear electric actuators, types of switches, overload protection and Electrical safety were all investigated to see how they could be implemented to a new design.

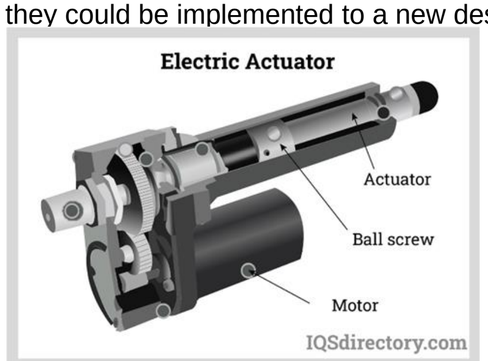

Figure 1: Parts of Linear Actuators

Hydraulics

All hydraulic components were also researched to discover how a cylinder can be used to apply force.

Methodology

The design stage of this project took the longest as it was important to create a functioning product.

Firstly, Calculations were performed to determine how much force a component needs to apply to a compacting plate to give a similar performance to the manual compactor. A force of 1,078 Newtons was calculated by using basic moments theory.

Next, two basic concept designs were created to visualise what the potential compactor would look like. The first one was fully electric by using an electric actuator to apply force. The second uses electric power sully to a hydraulic pump that controls a double acting cylinder to apply force.

These two concepts were then compared under the basis of cost efficiency, functionality, ergonomics and visual aesthetics. From this the first concept was selected and the final design was created on SolidWorks.

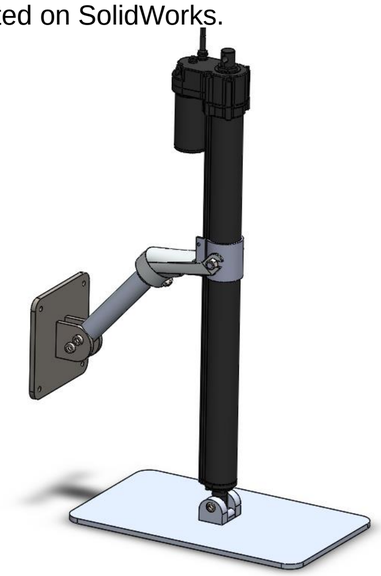

Figure 2: Final design

Once the CAD Model was created, an FEA Analysis was performed using SolidWorks Simulations. This verified the assembly would not fail during operation.

Finaly working drawings of the assembly were created and an electrical Schematic.

Conclusion

- ❑ The final design consists of an assembly capable of compacting household rubbish through electronic control which meets the aim of this project.
- ❑ FEA simulations verified parts would not fail under the operating load of 1,078N.

References

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