Design and manufacture of a trailed land roller

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Aim of the Project

The aim of this project was to design and manufacture a land roller which is capable of being towed behind a tractor, while doing this project I also wanted to improve both my welding skills as well as my IT skills and my ability to use CAD programs like Solidworks to improve my design abilities.

Background

The main function of a land roller is to roll over land and to push any foreign objects or stones into the soil, the main reason this is done is to prevent these stones and foreign objects from damaging any harvesting machinery such as combine harvesters, forage harvesters and mowers or balers, by taking the time to roll grass or tillage ground in the spring-time you could be saving both time and money during the harvest season. Another reason land is commonly rolled is that it can help reduce the effects of poaching by cattle has on grassland by compacting the soil down, this is also another advantage of rolling both tillage and grassland, rolling can helped smoothen out the surface of the field, this leaves fields easier and nicer to travel over for tractors or harvesters and can also help reduce wear and tear on both tractor and implement by providing a smoother field surface for the machinery to travel over.

Research and design

The first step of this project was to research some designs that were being produced by different engineering companies. I looked up land rollers online to see which companies were popular in Ireland and what I found was that there was two main companies in Ireland, Fleming Agri and Watson. My next step was to look at some of these rollers in person. I went down to Gary Brogan tractor sales outside Newcastle west who are dealers for Fleming Agri. This was a great step as it allowed me to look at their design and what materials they were using for different parts such as the bearing blocks and it also gave me ideas for my own design.

The main thing that I took away from looking at other rollers was how they are transported from field to field by a three-point linkage attachment on the rear of the tractor. This means that the drawbar which is used to pull the roller in the field would be pointing out at the rear of the tractor, I felt that this was a big safety concern as other road users could drive into it under poor visibility conditions. I decided to change this design so that the drawbar would be able to fold upwards between the three-point linkage and tractor.

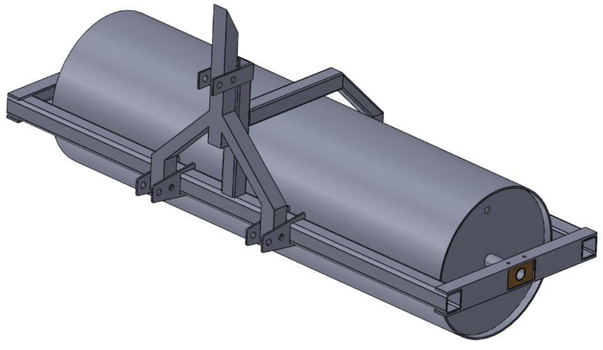
Manufacture

The manufacture of this project can be split into three main areas, the drum of the roller, the frame around the drum and the drawbar and three-point linkage system. For the drum I bought the steel drum from Watson engineering who make their own land rollers as well as the solid 75mm centre shaft, for the two end pieces and reinforcing plates inside the drums I had them cut on a CNC plasma cutter at the company I work for.

For the frame around the drum, I used box section for the two sides that run the length of the drum and channel iron for the two end pieces, I cut these myself at work too, I had to cut pieces out of the channel iron for the bearing to sit into as well as the ends of the box section too.

For the drawbar and three-point linkage system I made the drawbar out of box section and the pieces for the three-point linkage I had cut out on the CNC plasma cutter.

I tacked all the pieces together and made sure that they fitted properly before welding it all together.



Drawings of the finished roller which shows the drawbar and three-point linkage system as well as the entire roller

Conclusion

In conclusion the project is going well, currently the drum is fully welded together, the frame on the roller is fully cut out and tacked together ready to be welded. The drawbar and three-point linkage is all drawn up on Solidworks and is ready to be cut, while the plates for the three-point linkage are cut out and have spacers tacked into them to keep them the right distance apart ready to be tacked and welded onto the frame. I also feel that my welding and computer skills have improved over the duration of this project as well as my understanding of how to produce different projects and how machines like plasma cutters work and their use in engineering companies.

The current progress of the project