1948 Oliver Row Crop 60 Electric Tractor Conversion

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Introduction

With the growing costs of farming and maintenance of farm equipment, the need to revive and continue using old farm equipment is fast and growing. Although the farm and heavy equipment industry has long been dominated by diesel and gasoline power, with current advances in electric motor technology this mainstream energy trend can be slowly altered by the electric alternative. The benefits of electric conversion vary from mechanical to environmental. With improved electric technology and a focused design approach, the power and torque requirements can be met in entry level applications. Another added benefit of this conversion is reduced moving components that lead to lower maintenance and parts costs. On a larger scale the carbon footprint of an electric conversion will be significantly lower than that of a diesel or gasoline engine with the added benefit of a conversion being cheaper than the cost of purchasing new farm equipment

The main goal of this project was to explore the capabilities of an electric conversion on a 1948 Oliver tractor, which began by removing the old gasoline engine and installing a custom electric power setup. This goal was accompanied by several other smaller but important goals. In order for the tractor to be considered a success it needs to maintain its original functionality, maintain the original aesthetics, be a competent pulling tractor, have at least a 10 mile range, include an onboard charger, be reliable and be at least as safe as the original tractor.

Gas Engine Model

Electric Conversion Model

Methods

We began the project by carefully analyzing the original tractors performance and frame design. We utilized the information we gathered from the machine and the University of Nebraska Tractor Testing data sheets to establish the original engine and transmission performance. We also utilized SolidWorks to design a CAD model of the front portion of the tractor where the majority of work was performed.The project components were divided into the following categories.

Motor

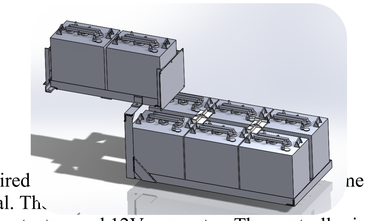
The motor that was chosen was a D&D motors model ES-31B. This motor was chosen based on several factors. These factors included motor size, power consumption, power output, and overall reliability. This motor provided good power density in a robust housing that would allow for continuous operation at high loads while maintaining a high level of reliability. This model offers a peak 60ft-lb of torque with a maximum level of 3600 RPM. This will allow for a greater pulling and working capacity than the original gasoline engine.

D&D ES-31B

Batteries

In order to provide power to the electric motor, a battery bank was developed. This 48-volt bank consists of eight deep cycle batteries rated at 6-volts each and 208 amp hours. These batteries were chosen for their high cycle capacity and robust nature.

Interstate Battery GC2-RD-UTL



Other Electronics

The tractor required ne completely functional. Th controller, charger, contactor, and 12V converter. The controller is the interface between the motor and the throttle. The charger is mounted on the tractor and will allow the tractor to be charged at any 120V source. The 12V converter will allow the addition of common automotive accessories such as lights, a horn, or a 12V automotive outlet.

Driveline

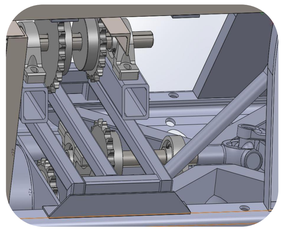
The driveline of the tractor was one of the major issues which needed to be addressed. The input shaft of the transmission was angled at 5 degrees while the motor needed to be mounted parallel to the frame. This allowed us to insert a gear reduction and thereby either increase the range or trade range for torque. This can be done by simply swapping out the sprockets.

Ratio	speed 5th	speed 1st	Torque	Amps	RPM
1:1.2	10.96	2.43	35.98	142.25	1473
1:1.2	11.73	2.61	30.01	123.75	1577
1:1.3	9.56	2.12	45.49	147.69	1392
1:1.3	10.11	2.25	38.97	131.31	1473
1:1.3	10.83	2.41	32.51	114.23	1577
1:1.4	9.39	2.09	41.97	121.93	1473
1:1.4	10.05	2.23	35.01	106.07	1577
1:1.6	9.53	2.12	32.02	78.69	1709

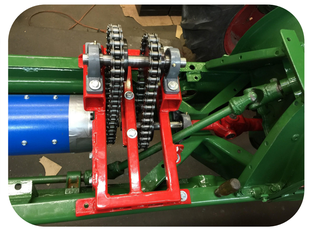
Optimal Gear Ratio

Mounting and Brackets

The largest fabrication portion of this project was creating all of the mounting brackets and tabs. Brackets needed to be created to hold the batteries, driveline components, motor, electronics and gauges.



Driveline as designed



Driveline as its been fabricated

Conclusions and Results

As of the printing of this poster, the tractor is running and driving and has achieved almost all of the initial goals. The tractor was entered into a pulling competition where it competed against a stock tractor of the same make and model. The electric conversion was able to beat the original tractor in a distance pulling competition by approximately one foot. The tractor has also met the goal of including an onboard charger, maintaining all of the original functionality, and remaining aesthetically original.

This tractor will be entered into antique tractor pulls and shows and will be placed on display at local fairs and parades. The owner will also be looking into making simple modifications that will make the tractor a more competitive puller and eligible for multiple weight classes. With proper maintenance and care, the tractor will survive for another 67 years.

View all of the Build Pictures and Videos on Reddit

See it work on Youtube

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Acknowledgements

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