Power Take Off Load Simulator

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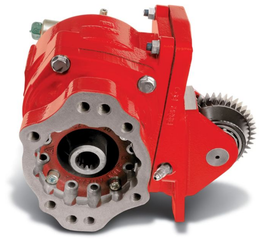
What is a PTO?

Mechanism that allows power taken from the engine and transfers to other equipment such as a cement mixer or a crane lift.



Problem Statement

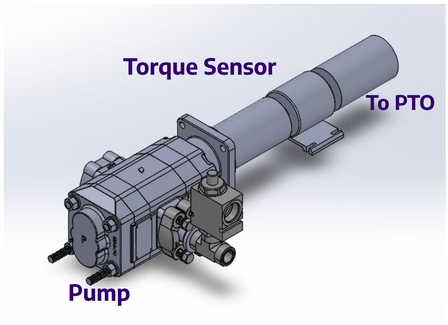
Design a system to simulate a load of up to 100 HP on a bottom or side mounted PTO so that shift performance, engine characteristics, and other vocational aspects could be evaluated.

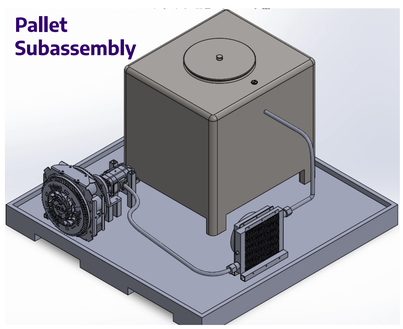
Figure 1: Current setup of the PTO load simulator

Core Functions

- Apply up to a 100 HP load on the PTO at a wide range of RPMs
- Eliminate excess heat produced by inefficiencies
- Control system to maintain constant load applied at PTO
- Pressure relief and thermal shut-off for safety
- Faster setup time

Design and Development





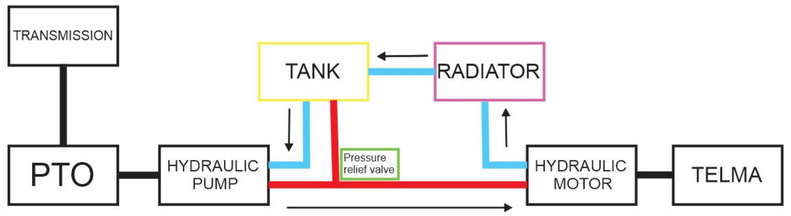


Figure 2: CAD Assembly (Top) and System Architecture (Bottom)

Key Components

Telma Eddy Brake Retarder

- Dissipate power through a Telma with its variable resistive torque

Figure 3: Telma

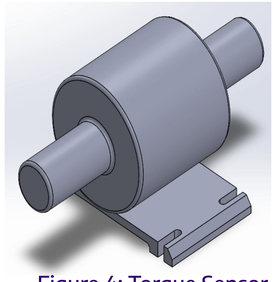


Figure 4: Torque Sensor

Torque Sensor

- Records torque at PTO/Pump interface and sends it to controller

Pressure Relief Valve

- Prevents over pressure of the hydraulic system to ensure safety

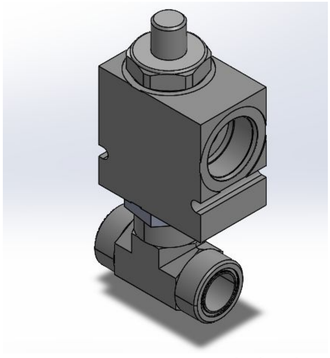
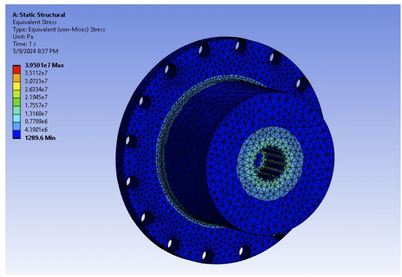


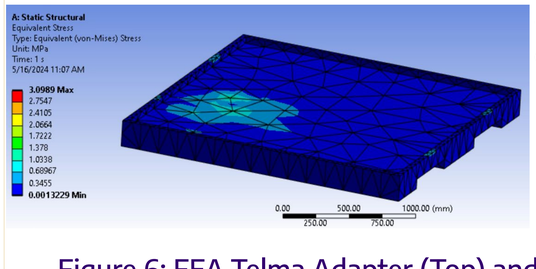
Figure 5: Pressure Relief Valve

FEA Study

Telma-Motor Adapter

- Able to withstand max torque of 720 Nm that is applied by the Telma to remain at 100 HP





Pallet

- Able to withstand the substantial weight of the hydraulic fluid and components.

Figure 6: FEA Telma Adapter (Top) and FEA Pallet (Bottom)

Control System

TELMA torque control scheme is modeled by the following block diagram:

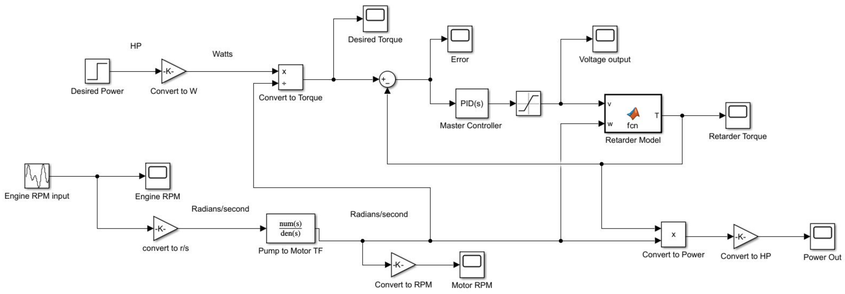


Figure 7: Block Diagram

Future Work Considerations

- Purchase components and assemble system
- Machine custom components
- Finalize integration of control system
- Run tests under different loading conditions
- Develop compatibility with different trucks and PTOs

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