Fluid Level Sensing

Overview
The current course of action to determine the level of fluid in a tank on a tractor requires the operator to get out of their cabin and check a physical gauge. This method is outdated and provides a delay to farmers on strict timelines. John Deere desires a way to remove the physical gauge and transition to an integrated sensor that displays a real time value to a user in the cabin.

Objectives
The objective of this project was to produce a system capable of measuring the volume of fluid in a non-uniform reservoir and displaying the value to an operator.

Approach
- Customer needs were gathered through weekly teleconferences with the sponsor.
- Went on an on-site visit to answer questions and see the location of the tank on the tractor.
- Performed a thorough external search to determine what was currently on the market.
- Concept generation involved ranking sensors based upon customer needs.
- Created SolidWorks models to display the system and check for interferences.
- Produced a prototype consisting of a spiral float gauge, potentiometer, LCD display, and Arduino microcontroller.
- Testing apparatus mimicked real world setting.
- Testing was performed to calculate the response time and accuracy of the sensor.
- Displayed height was compared to real time height by noticing the differences in the LCD display and level of fluid in the clear tubing.

Outcomes
Over a 15 week time span the team built a superior final prototype that has the following characteristics:

- Succeeds in satisfying all customer needs.
- Contains components to combat inaccuracies from fluid sloshing and clogging of floating debris.
- Successfully monitors the fluid with an accuracy of ±160mL
- Cost approximately $106.85 per fluid level sensor.