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U.S. Department of
Transportation



Project Title: A Multifunctional Frequency-Response Permittivity Sensor for Biofuel Concentration Measurement and Impurity Detection

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Project Objectives

1. Develop a portable sensor for quick measurement of blend ratio and impurity concentrations for biodiesel.
2. Develop an embedded blend-ratio sensor to assist fuel-injection adjustment.
3. Prove the accuracy, reliability, and durability of the sensors through a well-designed experiment.

Project Outcomes

- A real-time control system for a frequency-response (FR)-based permittivity sensor was developed during the study. The system was improved from a previous design mainly on extended frequency range (0-400 MHz) and enhanced measurement resolution.
- Sensor probes of three sizes (2cm, 2.5cm, and 7.5cm) were fabricated and tested in biodiesel with different impurities, including water, glycerin, and glyceride.
- A study on the "signature frequencies" indicated that both the higher and lower frequency ranges were equally significant. The frequency that was selected most often was around 70 MHz.

Other Sources of Funding

Via cost sharing by Kansas State University, a Graduate Research Assistant was hired for hardware/software design and laboratory experiment.



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