Rapid Identification of Crude Oil Properties

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April 16, 2015

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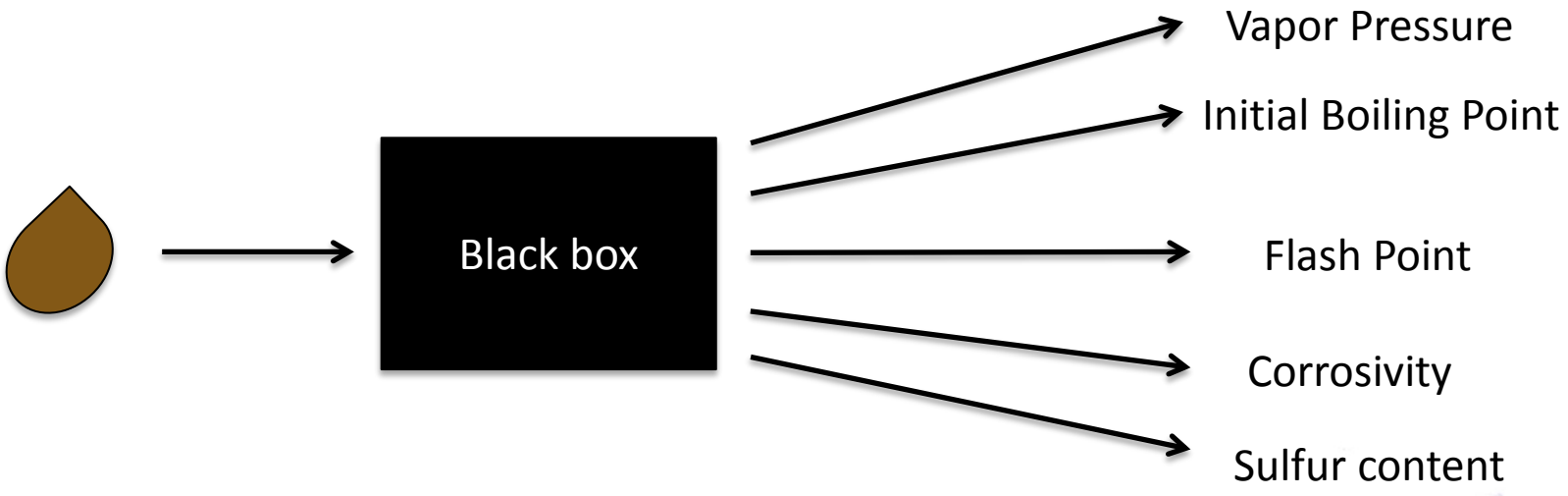
Background (Problem)

- Rapid growth recently in the amount of crude oil shipped by rail
- Composition and important physical and chemical properties of crude oil are highly variable
- No testing is typically done to determine the chemical and physical properties of a crude shipment before it is loaded
- Testing samples before shipping is costly and time-consuming

Objective

- **Create a low cost colorimetric assay that can rapidly extract important properties of hazardous flammable liquids with little expertise or training.**



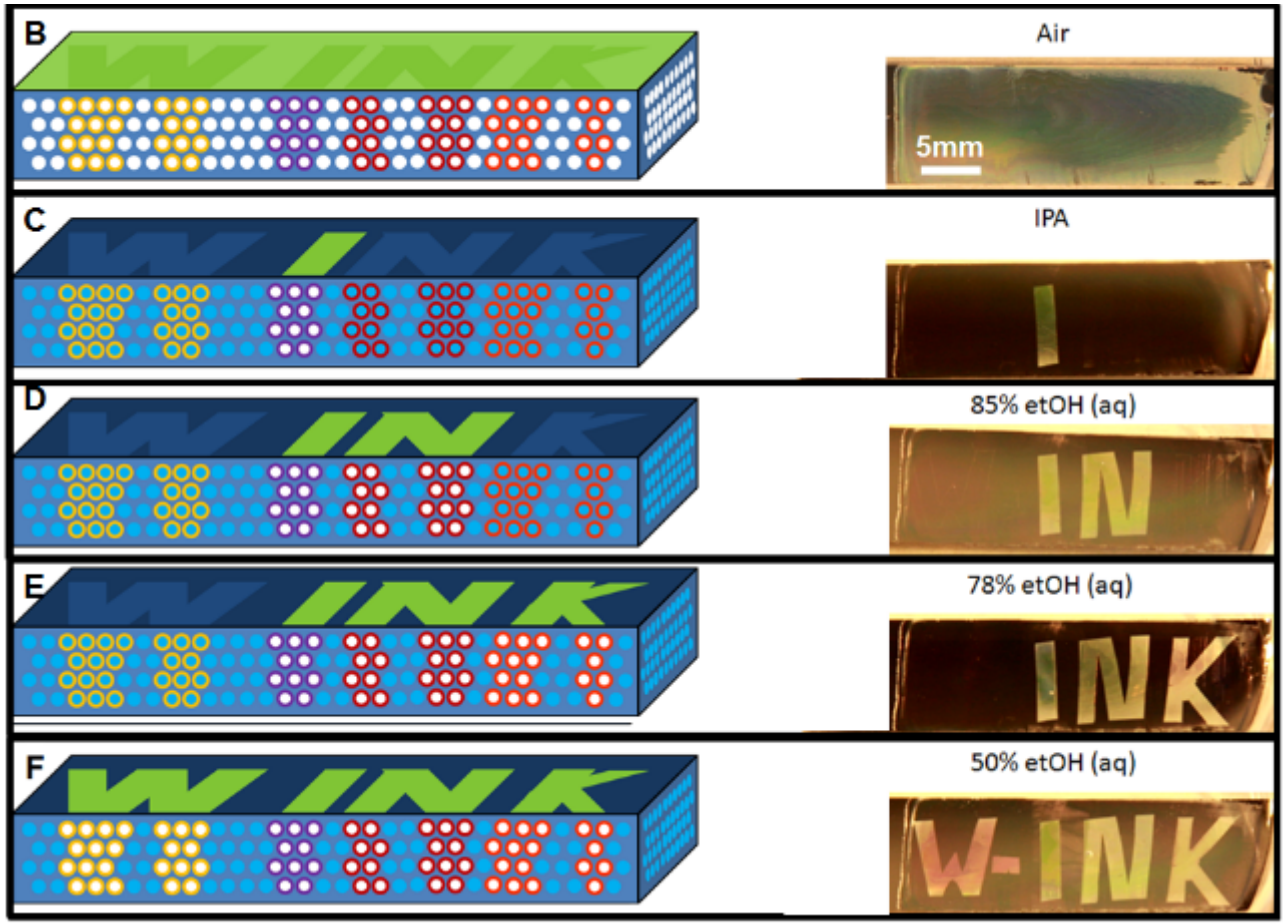
Who Benefits?

Emergency Responders

Industry

Inspectors

W-Ink



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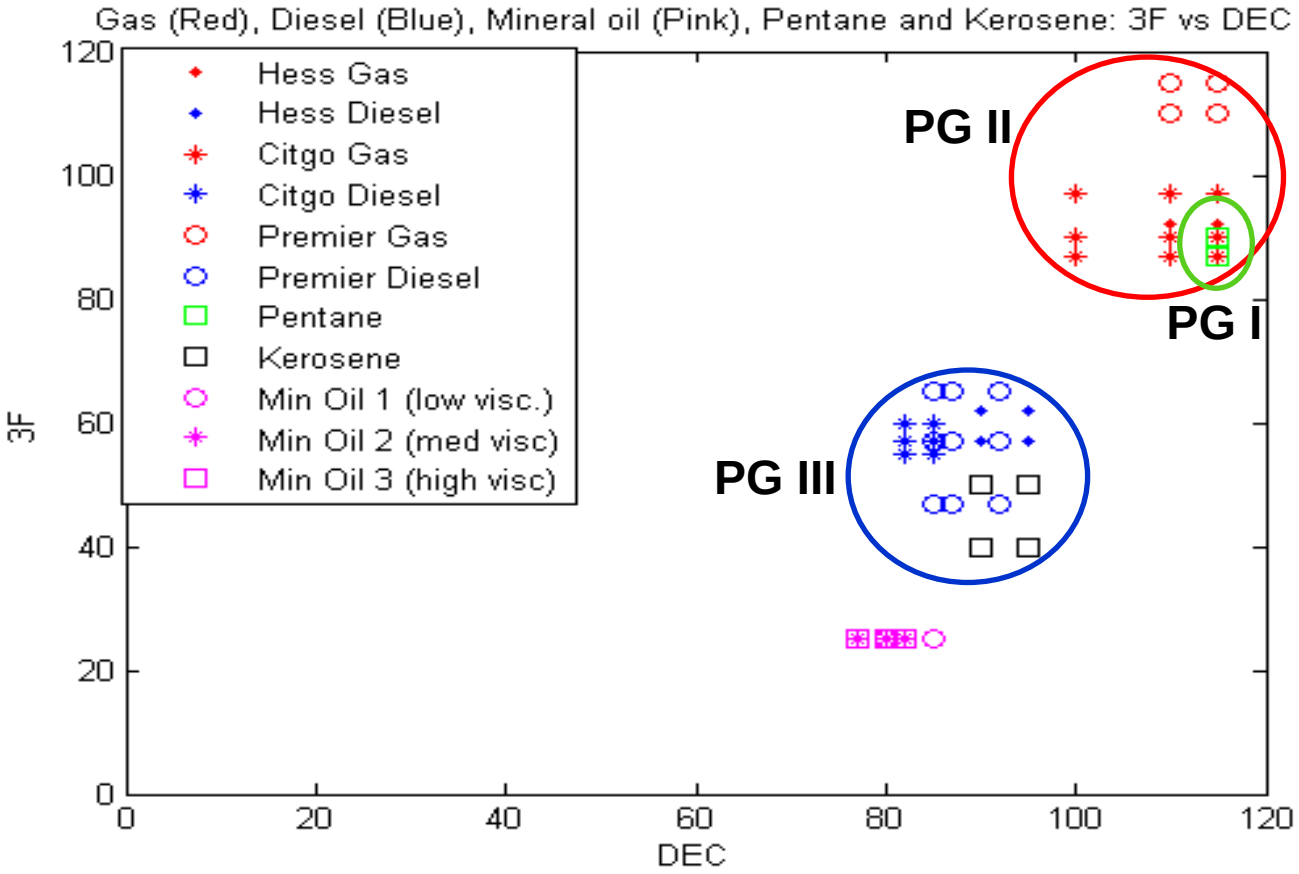

Response 1

Outputs (Expected)

- **Milestone 1: Development of a scoring system that covers the full range of indicator responses observed in petroleum products.**
- **Milestone 2: Demonstration of image analysis software that enables complete automation of numerical scoring from images taken with a smartphone camera.**
- **Milestone 3: Identification of indicator functionalities that enable hazardous flammable liquids to be distinguished according to volatility (vapor pressure and initial boiling point), flammability (flash point), corrosiveness (e.g. acidity, reactivity), and sulfur content.**
- **Milestone 4: Completion of a physical model relating the volatility profile of a flammable mixture to the time-dependent optical properties of an indicator strip as the mixture evaporates from it.**
- **Milestone 5: Demonstration of a strategy to control or measure and account for temperature, humidity and airflow in indicator measurements based on both wetting and drying.**
- **Milestone 6: Completion of a response library for the complete list of hazardous liquids provided by the FRA and PHMSA.**

Project Schedule

Task	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Task 1: Development of indicator technology that rapidly distinguishes crude oil samples based on their volatility profile and dissolved gas content								
Subtask 1.1 – Development of indicator arrays based on wetting	■	■	■					
Subtask 1.2 - Development of indicators based on drying	■	■	■	■	■			
Task 2: Development of software and user interface to extract and simplify volatility profile and dissolved gas content from indicator technology								
Subtask 2.1 – Image analysis and composition-response-correlations	■	■	■	■	■	■		
Subtask 2.2 – Adapting to diverse testing conditions						■	■	■
Task 3: Optimization of indicators and user interface for rapid identification of chemical spills			■	■	■	■		
Submission of Quarterly Financial Reports	■	■	■	■	■	■	■	■
Submission of Quarterly Technical Reports	■	■	■	■	■	■	■	■

Requested funds: $600k over 2 years