Biodiesel Use in Tactical Vehicles

The NDCEE, through the Environmental Security Technology Certification Program (ESTCP), is developing and implementing a demonstration plan to evaluate biodiesel use in non-deployed tactical vehicles. Partners on the effort include the Joint Group on Pollution Prevention (JG-PP), all the Department of Defense (DoD) Services, Naval Air Systems Command (NAVAIR), U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), and Air Force Petroleum Office. (AFPET).

Problem Statement

Energy independence is a key objective of the DoD in response to the Energy Policy Act of 2005 and Executive Order 13123. The military is the largest U.S. consumer of fuel in general and one of the largest consumers of biodiesel. While biodiesel is approved for use in non-tactical military vehicles, it is not approved for use in tactical vehicles including tanks, amphibious vehicles, and HMMWVs because of potential performance concerns. Biodiesel offers environmental benefits, but has technical limitations. It can gel at low temperatures, cannot be stored as long as petroleum diesel, has an affinity for water that can encourage microbial growth, and may be incompatible with certain materials used in engine components. A field demonstration is required before biodiesel can be implemented in non-deployed tactical vehicles.

Technology Description

Biodiesel is a renewable fuel produced by the chemical reaction of alcohol and animal or vegetable oils, fats, or greases. Through a refining process called transesterification, the glycerin, a byproduct that can damage engines, is removed. Biodiesel can be made from a variety of feedstocks including soybean oil, animal fats, algae, and vegetable oils. It ranges in color from gold to brown, has a high boiling point and low vapor pressure, is immiscible with water, and has a tendency to gel at low temperatures. Biodiesel may contain a small but problematic amount of water. Biodiesel can be used in petrodiesel engines in its pure form or in different blends. Pure biodiesel is referred to as B100; B20 contains 20% biodiesel and 80% petrodiesel and can be used in unmodified diesel engines. While biodiesel reduces dependence on petroleum, it has its uncertainties that must be addressed, including fuel stability in storage tanks, potential to increase vehicle maintenance requirements, and compatibility with fuel delivery and storage infrastructures.

The executed ESTCP Demonstration Plan will evaluate three aspects of biodiesel use in non-deployed tactical vehicles: fuel stability, vehicle performance, and maintenance considerations.

Environmental, Safety, and Occupational Health (ESOH) and Cost Benefits

- **ESOH Benefit:** Use of biodiesel can lower harmful vehicle emissions.
- **Cost Benefit:** To identify cost benefits, information on maintenance costs associated with the use of B20 in tactical vehicles will be collected. The data will compare the number and cost of repairs of vehicles operating on B20 to similar vehicles operating on petrodiesel.

Technology Benefits and Advantages

- Is non-toxic and biodegradable; produced from renewable ingredients
- Can be produced in the U.S. reducing dependence on foreign oil and increasing energy independence and security
- Requires little or no engine modification
- Can be used in the current fueling infrastructure
- Meets standards of the 1990 Clean Air Act

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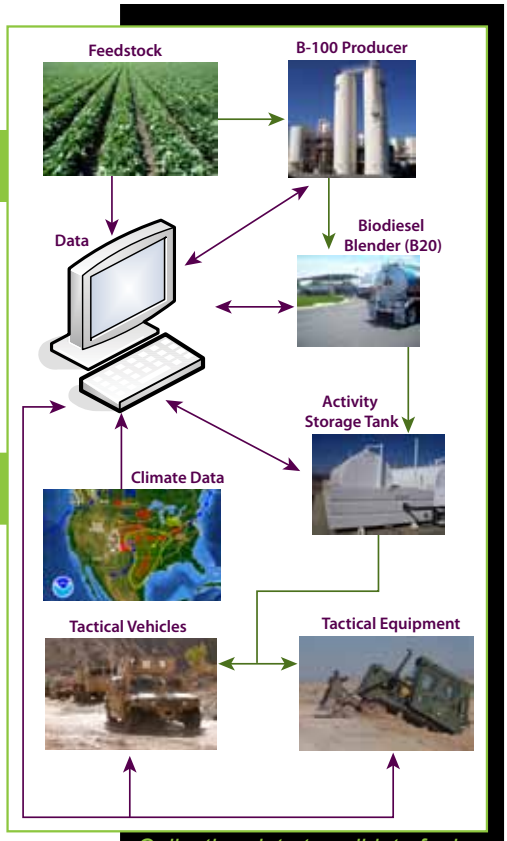
- Can be mixed with petroleum-based diesel to expand its implementation opportunities

Technology Limitations

- Decreased storage life versus petroleum diesel
- Can act like a solvent, particularly on the rubber components in older vehicles
- May not be widely available
- Cost may be an issue, particularly if life cycle costs are not taken into account
- Water affinity can result in accelerated microbial growth

Accomplishments

- Identified multiple sites for the technology demonstration/validation including Naval Base Ventura County, CA; Marine Corps Air and Ground Combat Center 29 Palms, CA; Naval Surface Warfare Center Crane, IN; Moody Air Force Base, GA, and Marine Corps Base Hawaii (MCBH). Geographically diverse locations will allow the NDCEE to collect data on biodiesel performance in different climates.
- Identified sampling requirements; fuel samples will be collected from fuel deliveries, fuel storage and dispensing units, and test vehicles.
- Identified data collection requirements including climate data, vehicle usage data, and vehicle maintenance data.



Collecting data to validate fuel quality

Technology Transition Opportunities

Once biodiesel is approved for use in non-deployed tactical as well as non-tactical vehicles it may be used across the DoD services.

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