



# Demonstration of Biodiesel in Ground Tactical Vehicles and Equipment

## *Project Background*

In 2007, the Naval Facilities Engineering Service Center (NAVFAC ESC) was funded by the Environmental Security Technology Certification Program (ESTCP) and the Navy Environmental Sustainability Development to Integration (NESDI) Program (ESTCP Project WP-200728, NESDI Project No. 412) to conduct testing to determine if existing fuel management technologies and procedures can satisfy the minimum engineering requirements for using 20 percent biodiesel blends (B20) in Department of Defense (DoD) ground tactical vehicles and equipment normally fueled with military JP-8 fuel. The project was also funded to determine whether available technologies sufficiently manage biodiesel stability, high/low temperature properties, and water affinity concerns. Currently, insufficient information is available about the stability of various biodiesel feedstocks and the improvement provided by commercially available additives. To ensure that the proposed demonstration plan addressed all these concerns, the plan was developed with the assistance of the DoD's Petroleum, Oil and Lubricants working group.

## *Demonstration Results*

For the demonstration, 15 DoD tactical vehicles and a corresponding number of control vehicles at 5 demonstration sites were tested with B20 for up to a one year test period.

The test sites were chosen to provide varied climatic conditions including cold temperatures as well as both hot and dry, and hot and humid conditions. Data generated from this project was chosen to enable DoD to identify military-unique risks associated with using biodiesel and determine if commercially available technologies can be utilized to address these risks.

During the demonstration, all newly supplied B20 fuels were tested in accordance with the ASTM fuel specification. Samples were taken from the fuel distribution tanks after new fuel was added. In addition, periodic testing of the fuel in the test vehicle was completed. The most important tests completed included the fuel's acid number, oxidation stability (i.e. Rancimat test), particulate contamination, viscosity, and water & sediment. Oil samples from the test vehicles were also periodically tested using the methodology contained in the JOAP (Joint Oil Analysis Program) Manual and compared to control vehicles running on JP-8 or Ultra-Low Sulfur Diesel. Important oil tests included acid number, viscosity, wear metals and water content.

The results from this demonstration showed that the new fuel supplied to DoD activities was of high quality, the fuel did not significantly degrade in the vehicle fuel tanks even for low use vehicles and the oil testing showed no differences between the test and control vehicles. The only problem identified was a fuel system material incompatibility issue with a 1997 truck.

## ***Technology Benefits***

The ability to use B20 biodiesel in selected tactical vehicles and equipment will:

- Improve fuel supply security and operational flexibility
- Reduce greenhouse gas emissions.
- Reduce carbon monoxide, hydrocarbon and particulate matter air pollution
- Improve the environmental sustainability of tactical training operations
- Provides equivalent fuel economy to JP-8

## ***Financial Information***

Both B20 and JP-8 are provided to DoD customers by the Defense Logistics Agency – Energy. Currently, B20 is sold at a cost of \$0.11 per gallon less than JP-8. This cost differential does, however, change every year.

## ***Availability***

B20 meeting the quality requirements of ASTM D7467 can be supplied by the Defense Logistics Agency – Energy as well as numerous private dealers. As a result of this demonstration, the NAVFAC ESC will be developing a fleet users guidance to assist fleet operators in implementing a B20 program. The NAVFAC ESC is also available to provide individual assistance to DoD activities in making the switch to B20.

### *Sponsored By:*

Environmental Security Technology Certification Program  
(ESTCP) Project # - WP-0728  
and  
Navy Environmental Sustainability Development to  
Integration (NESDI) Program - Project # - 412

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***LAV Test Vehicle at NSWC Crane, IN***



***MTVR Test Vehicle at NBVC, CA***



***Hummer Test Vehicle at 29 Palms, CA***