TESTING SYNTHETIC FUELS FOR USE IN U.S. ARMY GROUND VEHICLES

Presented to

Diesel Engine-Efficiency and Emissions Research (DEER) 2006 Conference

August 21, 2006

PANEL: NEW FEEDSTOCKS AND REPLACEMENT FUELS

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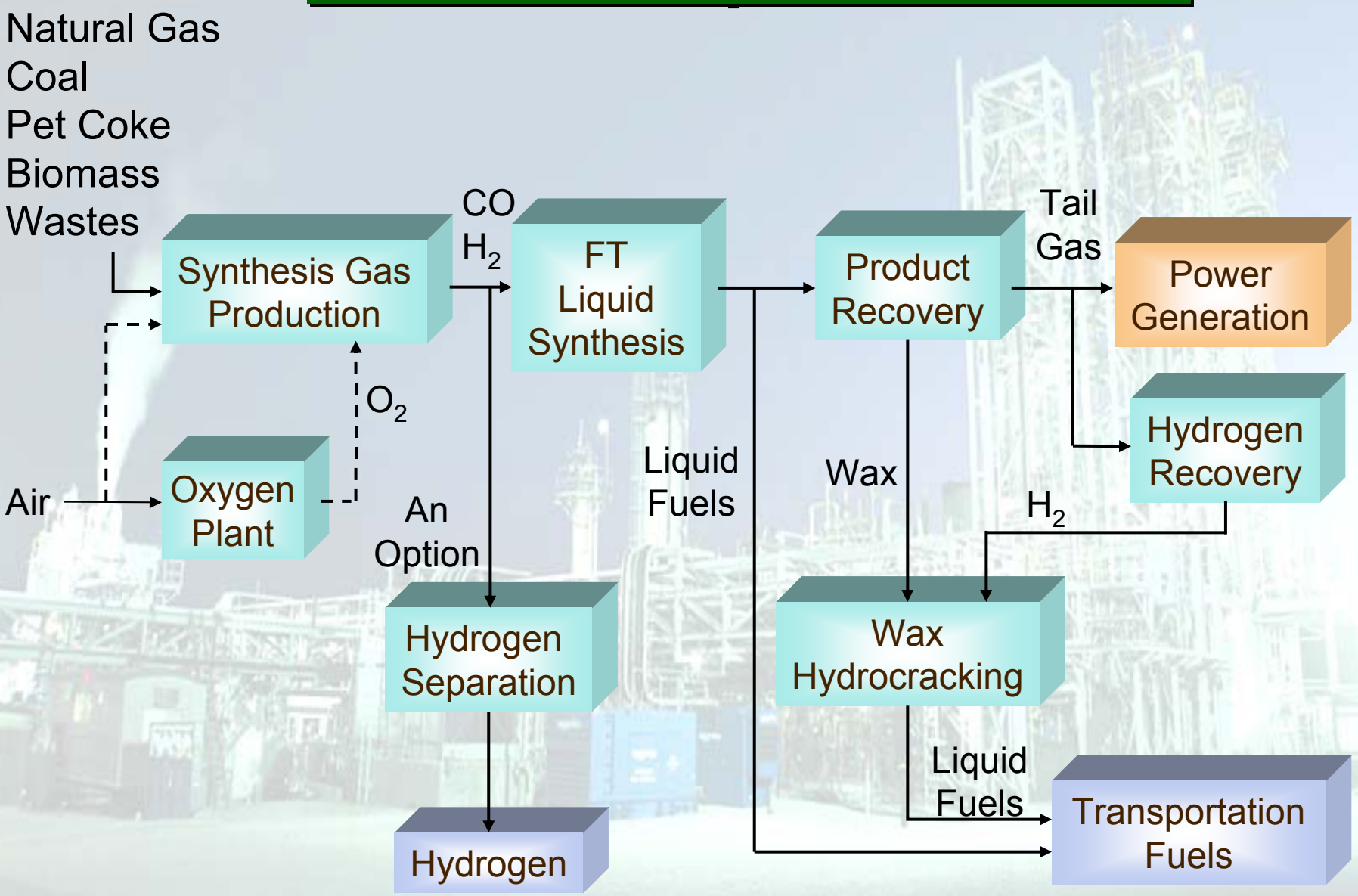
OSD Assured Fuels Initiative

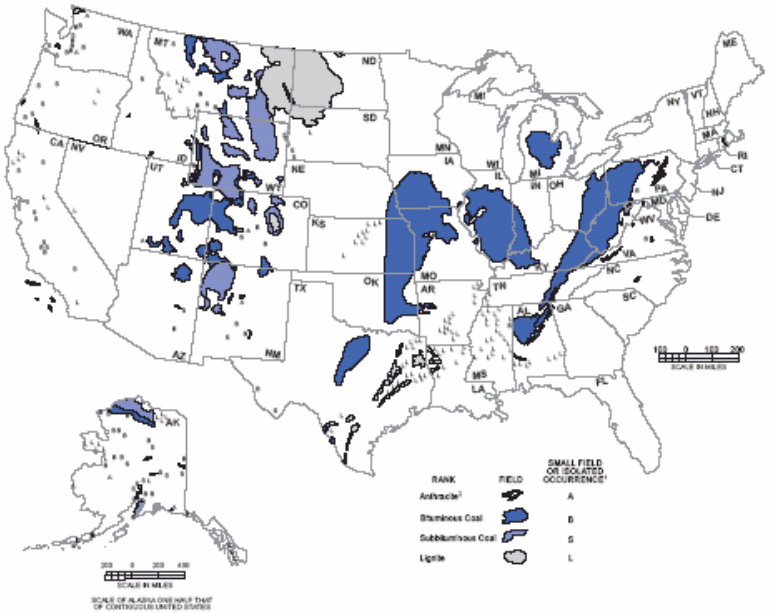
Vision: To catalyze commercial industry to produce clean fuels for the military from secure domestic resources using environmentally sensitive processes as a bridge to the future.

Fischer-Tropsch Process



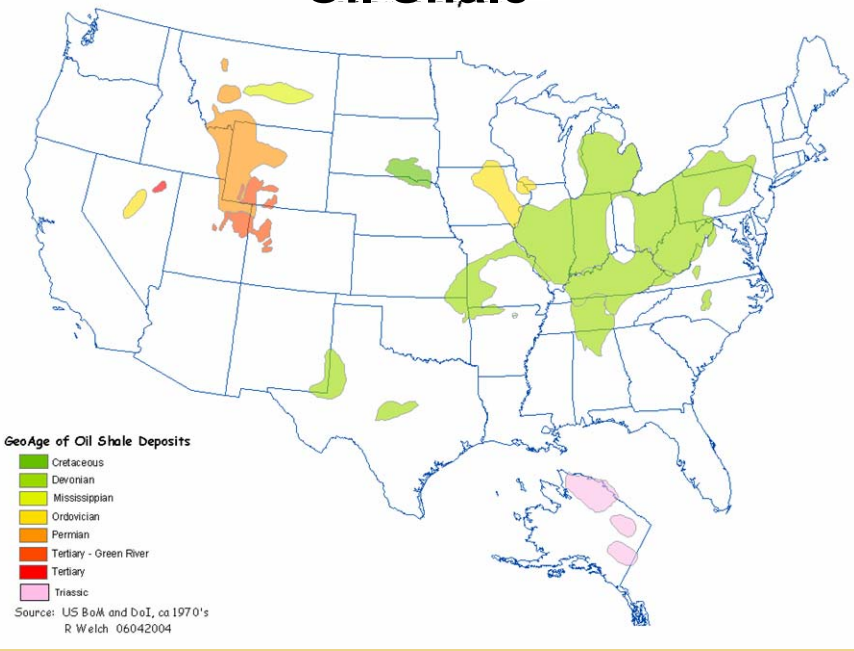
Evaluating All US Energy Resources

Coal

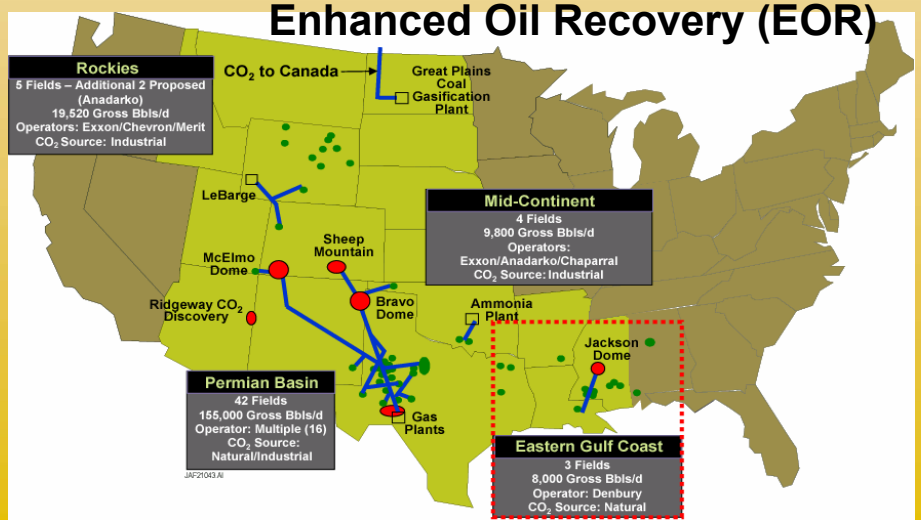


Sources: United States Geological Survey, *Coalfields of the United States, 1960-1961*; Texas Bureau of Economic Geology, *Lignite Resources in Texas, 1980*; Louisiana Geological Survey, *Near Surface Lignite in Louisiana, 1981*; Colorado Geological Survey, *Coal Resources and Development Map, 1981*; and Mississippi Bureau of Geology, 1983.

Oil Shale



Enhanced Oil Recovery (EOR)



Domestic Resources

- 1.4 trillion barrels (shale)
- 900 billion barrels of FT (coal)
- 0.15 billion barrels (pet coke)
- 22.7 billion barrels oil reserves
- 32+ billion barrels of oil (EOR)
- 100 million pounds of pulp waste/year

Total 2.3+ trillion barrels equivalent

OSD Assured Fuels Initiative Goals

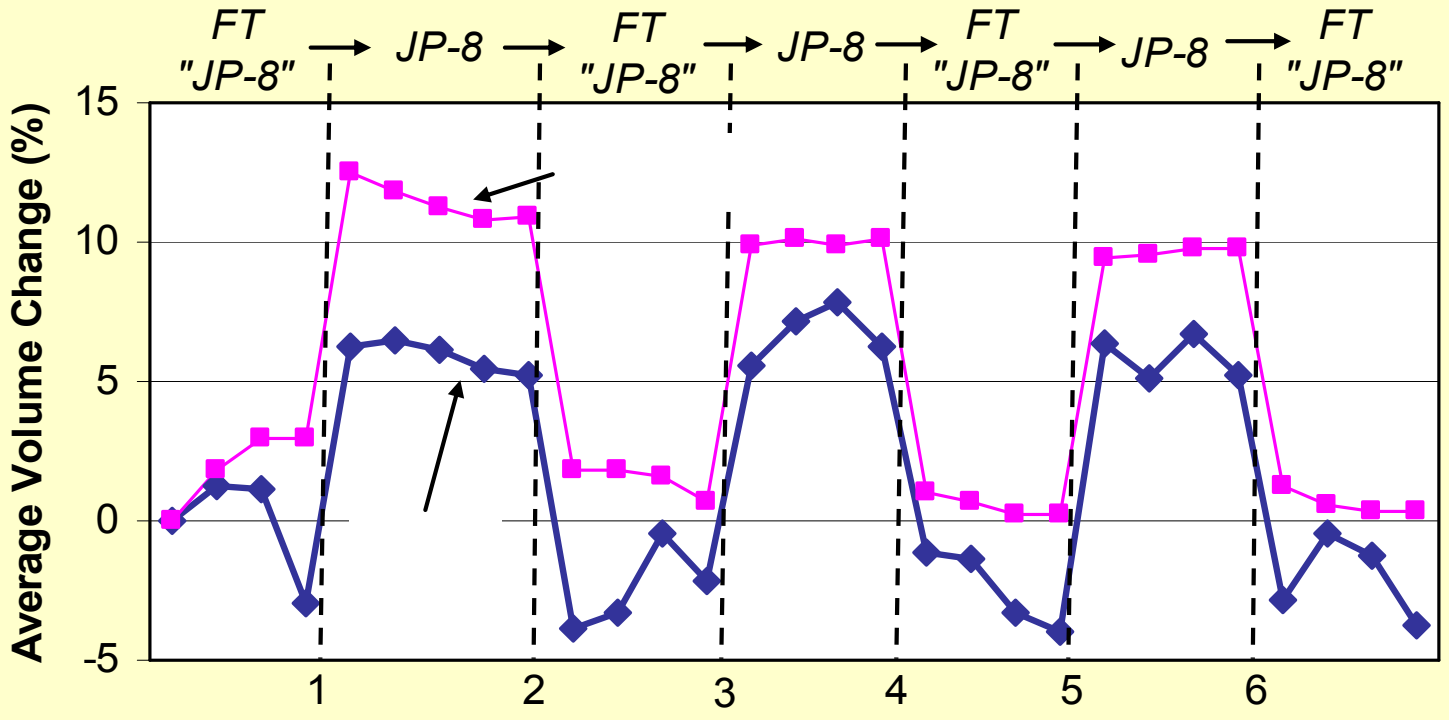
- **Total Energy Development (TED)**
  - Catalyze the industry to produce fuels for the military from domestic energy resources
  - Develop a roadmap to provide fuel for the Joint Battlespace Use Fuel of the Future program and implementation

- **Joint Battlespace Use Fuel of the Future (J-BUFF)**
  - Develop fuel specifications that include non-petroleum components, for use in military equipment, aircraft, ships and ground vehicles
  - Validate use of the fuels in all tactical vehicles, aircraft and ships
  - Provide a transition plan for DoD wide deployment

Research Participants

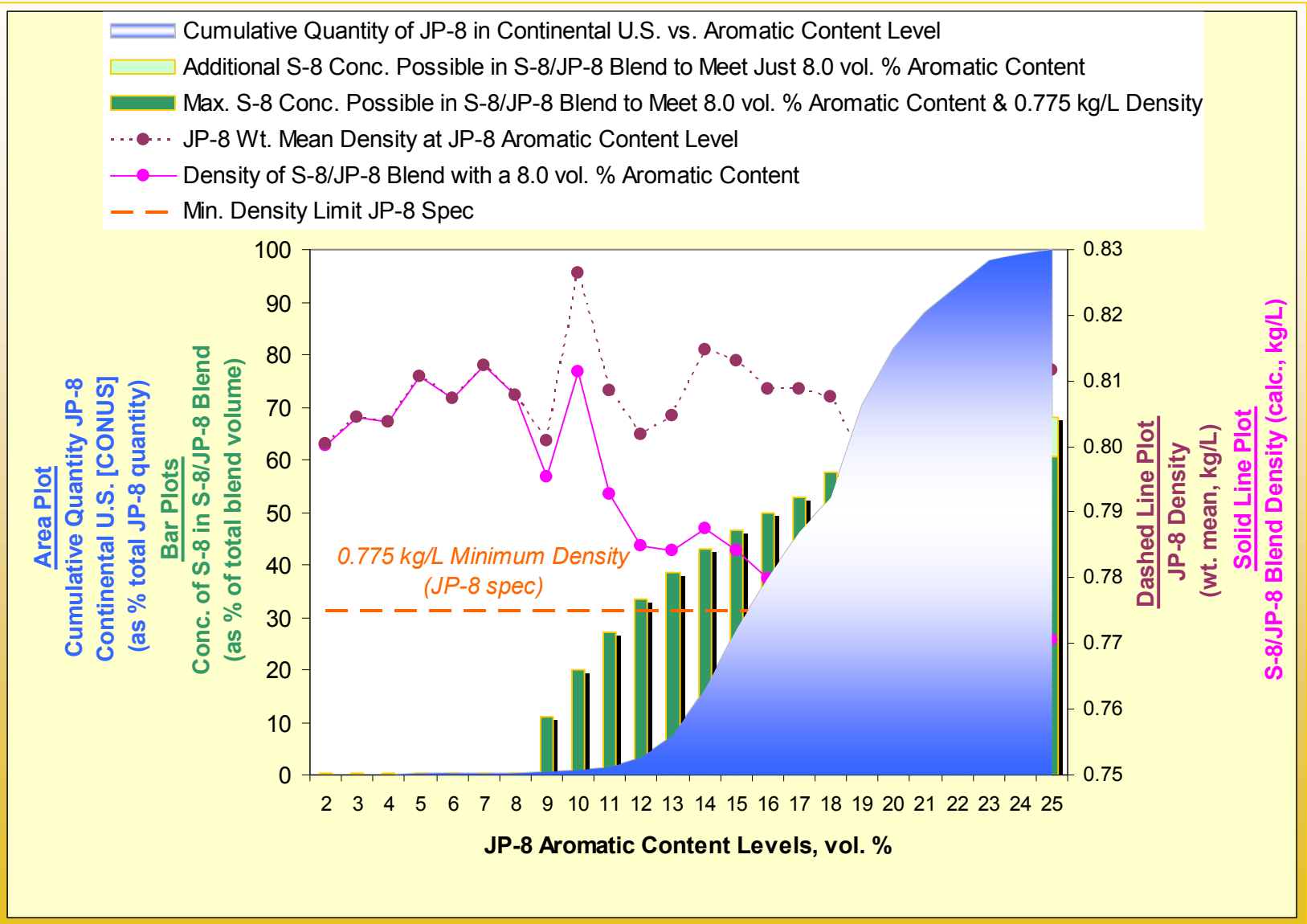
- Air Force
  - Air Force Fuels Research Laboratory/NAFRC
  - University of Dayton Research Institute
- Army
  - TARDEC Fuels & Lubricants Laboratory
  - Southwest Research Institute
- Navy
  - NAVAIR Fuels and Lubricants Laboratory
  - Naval Fuels and Lubricants Integrated Product Team
- DOE
  - National Energy Technology Laboratory
- Syntroleum Corp.

Nitrile Elastomer Coupon & O-Ring Volume Changes With Switches Between Synthetic FT "JP-8" & JP-8



Fuel Aromatic Content
FT "JP-8" = 0% vol.
JP-8 = 18% vol.

Predicted Fuel Blend Properties

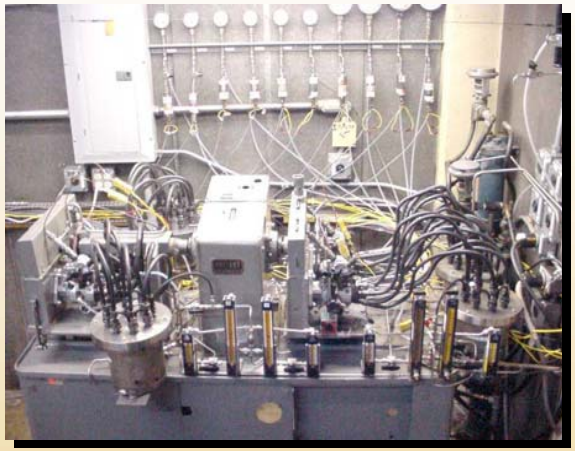


Lubricity of treated synthetic fuel

Test	Pump	Duration (hours)	Change[1] (mm)	FT Fuel CI/LI (mg/L)
1	1	95.6	0.096	Untreated
	2	150.7	0.068	
2	3	500	0.007	12 (Min.[2])
	4	500	-0.006	
3	5	500	0.005	22.5 (Max.[2])
	6	500	0.002	

[1] Change in roller-to-roller dimension pre-& post- test.

[2] Min. and Max. treat rates per QPL-25107.



Data courtesy
SwRI – TARDEC
Fuels & Lubricants
Research Facility

Testing in rotary injection pump test rig established improvement in neat FT fuel treated with lubricity improver additive, CI/LI, indicative of acceptable field performance.

[SAE 2004-01-2961]

Next Army Steps

Next Army steps: Progressive engine, fuel system, equipment, vehicle and fleet tests thru 2009, leading to qualification for use in Army ground vehicles, aircraft and equipment. Air Force and Navy timetables are comparable.

- ***Document engine performance of blend fuels versus petroleum JP-8***
- ***Continue research in the effects on elastomer seals of switch-loading petroleum and synthetic fuels, and additives to promote seal swell in non-aromatic fuels.***
- ***Continue research in lubricity of blended fuels and potential lubricity additives.***
- ***Develop a knowledge-based qualification approach to minimize expense and time.***