JP8 Reformation for Combat Vehicles

Funding Source: *U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC)*

Objectives:

- Reduce sulfur content in raw JP8 fuel to less than 1 ppmw
- Demonstrate successful system integration by reforming desulfurized product to generate hydrogen at 10 kWe rate

Key Technology Development:

1. Hydrodesulfurization (HDS) system

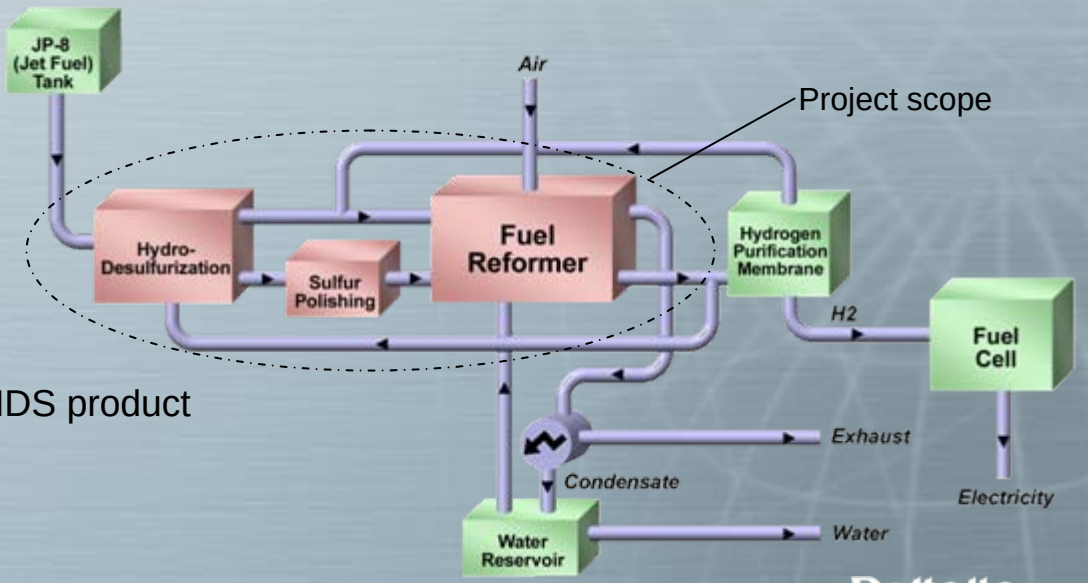
   Reduce sulfur content to < 10ppmw

2. Sulfur Polishing

   Reduce sulfur content to < 1 ppmw

3. Fuel Reformer

   Sustained, stable operation using HDS product



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Conventional Hydrodesulfurization (HDS):

- Large scale, three-phase refinery process employing a catalyst, a liquid phase (fuel), and a gas phase (hydrogen) at elevated pressures.
- Trickle-bed configuration is difficult to model and scale down—not practical for small scale systems.

Key Benefits of Integrated HDS/Reformer System:

- *Compatibility*:

  Direct utilization of reformate from the reformer eliminates the need for a separate H_2 source.
- *Process Intensity*:

  Higher space velocity due to gas-phase fuel and low operating pressures.
- *Efficiency*:

  Light gases output from HDS reactor are used to fuel the reformer.

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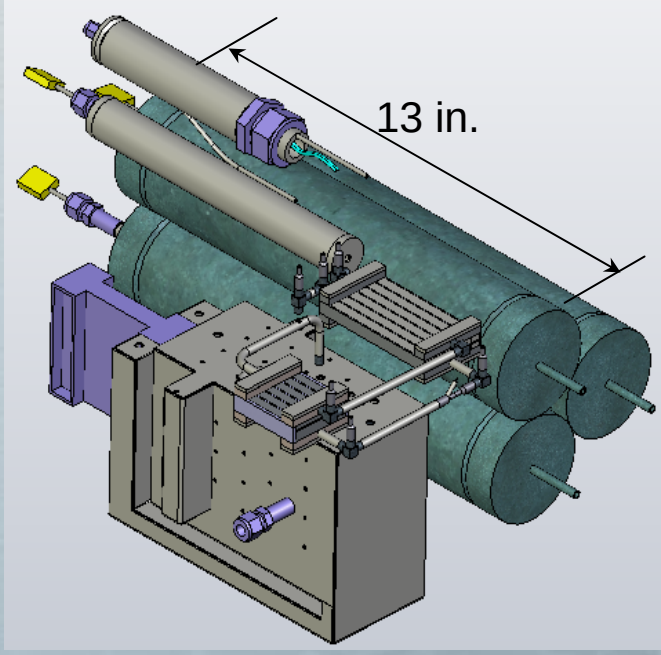
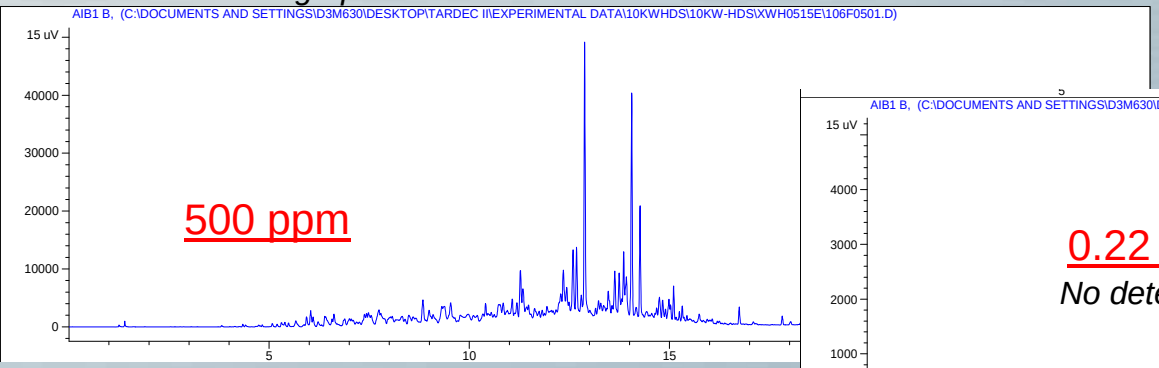
Current Technology Status:

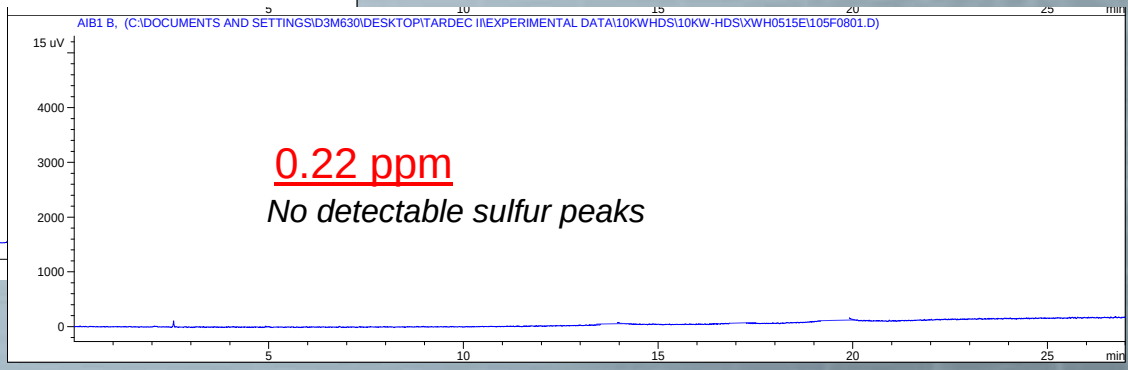
- Integrated desulfurization/reforming system successfully demonstrated
  - 10 kWe-scale JP-8 desulfurization subsystem
  - 1 kWe-scale JP-8 reformer
  - 500 ppmw raw sulfur content
  - Sub-0.3 ppmw sulfur in product
- Process stable over range of operating conditions
- Polishing step not required
  - 1 ppmw target achieved by HDS alone



JP-8 Gas Chromatographs:



Raw JP-8



Desulfurized JP-8

UNITED STATES ARMY TARDEC TANK AUTOMOTIVE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

Battelle The Business of Innovation

JP8 Reformation for Combat Vehicles

Funding Source: *U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC)*

Ongoing Work (current project):

- Build full-scale 10 kWe reformer with integrated HDS system
- Conduct 300-hour system demonstration

Future Work (potential TARDEC option effort):

- Expand capability to high-sulfur JP-8 (3,000 ppmw)
- Improve system integration
- Reduced startup time (30 min.)
- Conduct 1,000-hour system demonstration

Related Work (Battelle)

- Modify technology to address road diesel (S15; <15 ppmw)
- Develop flex-fuel capability of the Battelle fuel cell power system