

New Directions In Alternative Fuels

Solutions For Fully Synthetic Jet Fuel



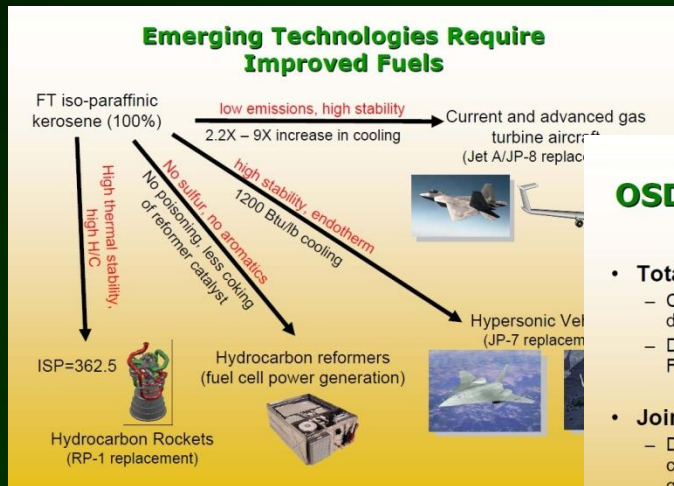
Density & Aromatics



Integrated Synthetic Fuel Incorporated
www.isfuel.com Date: 07/28/2010

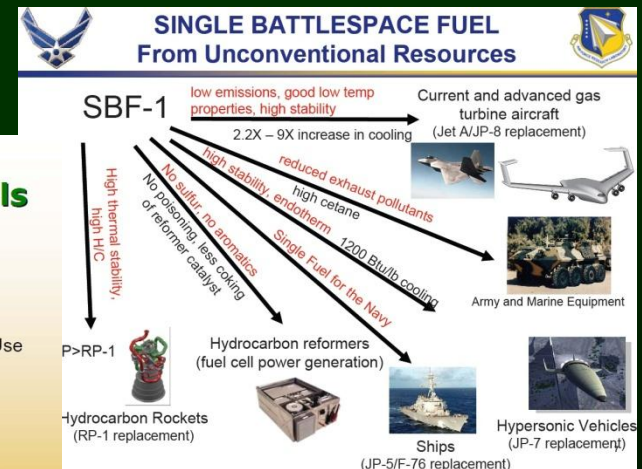
New Direction By Old Inspiration

- Single Battlespace Fuel (SBF)
- Joint Battlespace use Fuel of the Future (J-BUFF)



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



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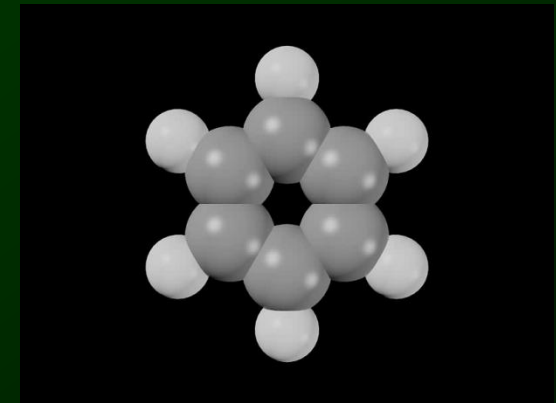
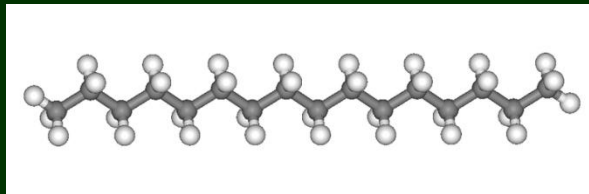


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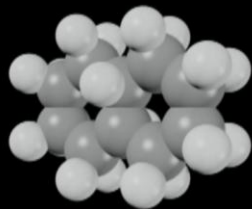
100% FT Iso-paraffinic Kerosene

- Low In Density
 - Not In Compliance with Fuel Specifications
 - Not Compatible with Equipment & Operational Requirements
- Low In Aromatic Compounds
 - Not Able To Swell O-rings
 - Not In Compliance with Fuel Specifications
 - Not Compatible with Fuel Equipment & Systems

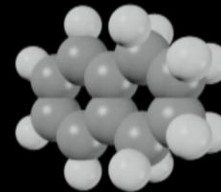


Another Fuel Program of Interest

- Dr. Schobert's fully synthetic thermally stable heat sink fuel
- Barely met heating value per specifications
- Did exhibit o-ring swell properties, yet low in aromatics
- High In Density
 - Not In Compliance with Fuel Specifications
 - Not Compatible with Equipment & Operational Requirements



Decahydronaphthalene
(Decalin) $C_{10}H_{18}$

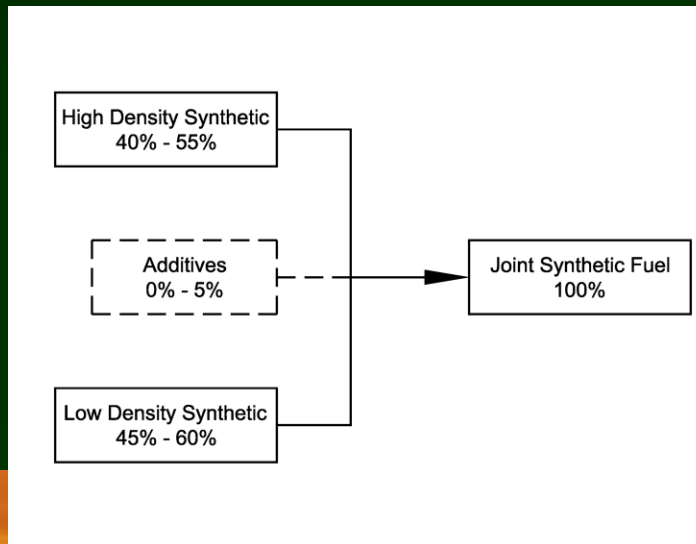


Tetrahydronaphthalene
(Tetralin) $C_{10}H_{12}$



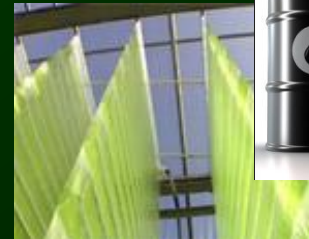
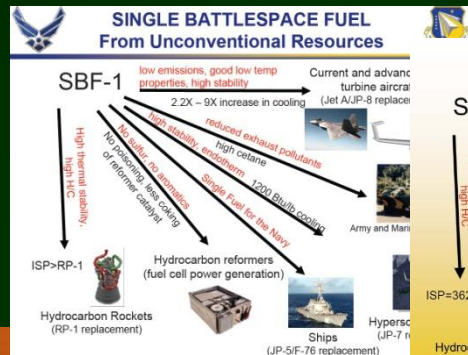
What would happen if you were to blend fuels?

- High Density Synthetic (HDS) Fuel
 - Thermally Stable Heat Sink Fuel (Bi-cyclic Rings)
- Low Density Synthetic (LDS) Fuel
 - Synthetic Paraffinic Kerosene (SPK) (Branch Chains)



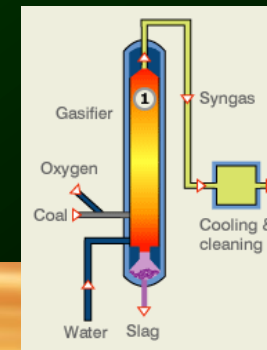
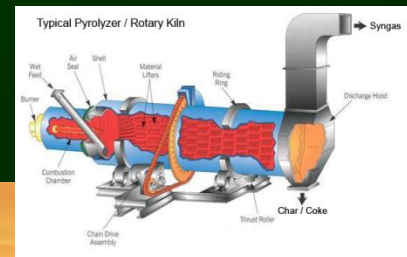
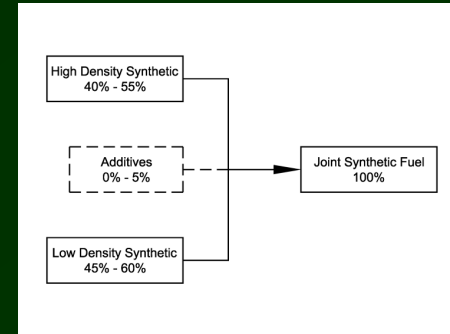
Blend Tests Showed Possible Joint Fuel Possibilities

- Fully synthetic fuel requires no crude oil for production
- A joint fuel passes both diesel & jet fuel specifications
- An interchangeable fuel is great for crisis situations
 - Emergency Relief
 - Humanitarian Efforts
 - Fuel Logistics for Jet or Diesel Shortages



Methods of Production

- Separate Site Production for Blends
 - May Be Production Cost Prohibitive
- On-site Co-generation (Pyrolysis / Gasification / Hydrogenation)
 - May Reduce Production Cost
 - Production Synergistic / Increased Efficiency
 - Initial Cost May Be Slightly Higher (Equipment Intensive)
- Integration of waste biomass and municipal waste
 - Introduced Over Time / Maintain Fuel Property

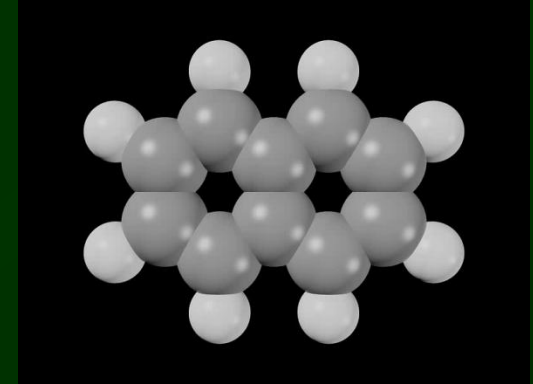


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Summary

- Joint Synthetic Fuels – Highly Desirable
- SPK / FT Fuels – Low Density / No Swell
- Heat Sink Fuel – High Density / Ring Swell
- Blend Fuel – Fully Synthetic / Joint Fuel Possibility
- Co-production Positive Economic & Production Efficiencies



How do we get started?

- Feasibility Studies
 - Confirm Process Methods & Economics
- Pilot Plant
 - Small Scale Confirmation / Test Fuel for Certification
 - Biomass Integration Test Platform
- Full Scale Plant Development



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