Evaluation of Storage Effects on Commercial, Biodegradable, Synthetic or Biosourced Hydraulic Fluid

Bridget Brosnan
US Army RDECOM
Fuels and Lubricants Technology Team
April 21, 2006
### Evaluation of Storage Effects on Commercial, Biodegradable, Synthetic or Biosourced Hydraulic Fluid

**Author(s):** Brosnan, Bridget

**Performing Organization:** USA TACOM 6501 E 11 MILE ROAD WARREN, MI 48397-5000

**Sponsoring/Monitoring Agency:** TACOM TARDEC

**Availability:** Approved for public release, distribution unlimited

**Notes:** The original document contains color images.
In 2001-2002, testing was performed to determine if commercially available, biodegradable, bio-based hydraulic fluid could meet or exceed the performance requirements in military combat/tactical hydraulic fluid specifications:

- MIL-PRF 46170
- MIL-PRF 6083
• Synthetic Hydrocarbon-based fluid (PAO)
• Rust Inhibited
• Fire resistant
• High flash point
• Class II biodegradable
• Poor low temperature properties
• In 2005, FLTT evaluated the same bio-based, biodegradable hydraulic fluid to determine the effects of long-term storage
  • 23 samples
  • 3 years in storage
Tests Conducted

• Flash Point ASTM D 92
• Fire Point ASTM D 92
• Galvanic Corrosion ASTM D 6547
• Kinematic Viscosity ASTM D 445
• Low Temperature Stability FTM 3458.1
• Lubricity (4-Ball) ASTM D 4172
• Pour Point ASTM D 97
• Total Acid Number ASTM D 664
• Water Content ASTM D 6304
General Findings

No Significant Property Changes
- Fire Point
- Galvanic Corrosion
- Kinematic Viscosity
- Low Temperature Stability
- Lubricity (4-Ball)

Observed Property Changes
- Flash Point
- TAN
- Water Content
4%-6% overall decrease in flash points

ASTM D 92 Flash Point

Reproducibility: 18degC
ASTM D 664 Total Acid Number (TAN)

39%-40% increase in TAN

Reproducibility 0.44

Sample IDs

TAN (mg KOH/g)

A B C D E F G H I J K L M N O P Q R S T U V W

ASTM D 664 TANs

2005
2001-2002
• Two dissimilar metals
  • Alloy Steel Disks
  • Brass Clips
• Electrolyte
  • Bio-based Hydraulic Fluid
Conclusion

• Bio-based hydraulic fluids are not suitable for long-term storage
• Products are not suitable for use in military combat/tactical equipment