

Snow Engineering Co. WICHITA FALLS, TEXAS	<u>ENGINEERING REPORT</u>		NUMBER 1591
	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto; text-align: center; line-height: 30px;">X</div>		MODEL AT-802 / AT-1002
TITLE Hydraulic Oil Comparison	BY V. Trotter	CHK'D CG	SERIAL ALL
	DATE 2/15/2008		PAGE OF 1 4

REFERENCE: (attachments)

- [1] AW68 ~ Texaco Rando HD 68 Datasheet
- [2] Dexron III ~ Mystic Power Lubricants Dexron III - Mercon ATF Datasheet
- [3] Dexron III ~ Pennzoil Dexron III - Mercon ATF Datasheet
- [4] MIL-PRF-5606H ~ AeroShell Fluid 41 Datasheet
- [5] MIL-PRF-83282D ~ AeroShell Fluid 31 Datasheet
- [6] MIL-PRF-87257A ~ Royco 777 Datasheet

PURPOSE:

The purpose of this report is to investigate the flammability and other characteristics of Dexron III fluid as compared with other oils. A comparison various of hydraulic fluids ranging from the older type AW68 used in the original FRDS system through currently available synthetics up to MIL-PRF-87257A.

SUMMARY:

Per the manufacturers data shown in Table 1, the selected Dexron III hydraulic fluid maintains its viscosity over a wider temperature range compared to Rando AW68, produces no foam, is available anywhere in the world and has comparable Flash Point and Fire Point ratings to MIL-PRF designated fluids.

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Table 1 ~ Hydraulic Oil Comparison

Hydraulic Oil	AW68	Dexron III	MIL-PRF-5606H	MIL-PRF-83282D	MIL-PRF-87257A
API Gravity D 1298	31.6		31.7	39.7	
Gravity, ASTM D 4052, °API		32.2			
Specific Gravity @ 60°F.	0.8816	0.86	0.87	0.85	0.838
Viscosity, Kinematic					
@ -20°C, cP., Max.		1325			
@ -30°C, cP., Max.		4250			
@ -40°C, cP., Max.		17,500			
cSt @ -40°			(D455) 434	(D455) 2,100	440
cSt @ -55°			(D455) 2345		2,045
cSt @ 40°C	64.6	35	(D455) 14	(D445) 14.4	6.88
cSt @ 100°C	8.4	7.7	(D455) 5.2	(D445) 3.7	2.12
@ 130°F, cSt (D445)			10.5		
@ 205°C, cSt (D445)				1.13	
Viscosity, Saybolt					
SUS at 100°F	334	161.1			
SUS at 210°F	54	49.9			
Viscosity Index	98	205	214		
Flash Point, ASTM D 92, COC, °C (°F)	218 (425)	218 (424)	230 (446)	238 (460)	180 (356)
Pour Point, ASTM D 97, °C (°F)	-30 (-22)	-48 (-54)	< -75	< -55	-65
Fire Point, °C (°F) (D 92)		224 (435)	230 (446)	281 (484)	195 (383)
Oxidation Stability					
Hours to 2.0 mg KOH/g acid number, D943	>6000		(D974) <0.1 mg	0.01 mg	0
Color	Amber	Red	Red	Red	
SAE Grade		10W-20			
Rust, ASTM D 665A		Pass			
Low Temp Stability, -54°C/72 hr			Pass	Pass	Conforms
Hi Temp Stability, % viscosity.			Pass	Pass	Conforms
Rubber Swell, NBR-L, %			22	18 to 30	23

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Hydraulic Oil	AW68	Dexron III	MIL-PRF-5606H	MIL-PRF-83282D	MIL-PRF-87257A
Steel-on-steel wear test, scar diameter, mm					
1 hr./167°F/ 1 kg/ 1,200 rpm (D 4172)				0.18	0.17
1 hr./167°F/ 10 kg/ 1,200 rpm (D 4172)				0.24	0.22
1 hr./167°F/ 40 kg/ 1,200 rpm (D 4172)				0.50	0.52
Foam Resistance, ASTM Seq I		No Foam	Passes	Passes	20
Particulate contamination, particle size, microns (D 4177)					
5 to 15			1200	1,331	2400
16 to 25			550	190	250
26 to 50			70	55	90
51 to 100			5	4	5
Over 100			0	0	0
Gravimetric Filtration, mg/100 ml			0.1	0.2	0.12
Filter Time, minutes			10	10	12
Water Content, ppm			55	82	65
System Seals	(not stated)	(not stated)	synthetic rubber components, excludes natural rubber	synthetic rubber components, excludes natural rubber	Synthetic elastomer

Technical Discussion:

First generation Fire Retardant Dispersal Systems (FRDS) originally used Rando HD 68 (Texaco) hydraulic fluid in the hydraulic system. Fire fighting aircraft now travel the world during all seasons and on both sides of the Equator.

Due to the flatter viscosity and better temperature characteristics of the Dexron III, the second generation FRDS will use Dexron III in the hydraulic system. The Dexron III fluid is very well suited to the geographical areas and seasonal climates

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encountered by fire fighting aircraft. In addition, it is readily available to operators in the field world wide.

Table 1 contains a side-by-side comparison beginning with the RANDO AW68 (Texaco) hydraulic fluid used in the existing system and ending with MIL-PRF designated fluids. There are three MIL-PRF fluids listed with MIL-PRF-5606H being the oldest of the group. This was superceded by MIL-PRF-83282D, which has now been superceded by MIL-PRF-87257A.

Dexron III will not sustain flame unless preheated.

Investigation of the flash point and fire point of the Dexron III compared to the other oils listed in the table reveals that the Dexron III fluid will be roughly equivalent to or better than AW68 and most of the MIL-PRF fluids shown in the table.