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MONSANTO TECHNICAL BULLETIN
EXCERPTS

SKYDROL®

Type IV Fire Resistant Hydraulic Fluids

LD-4 / 500B-4

Technical Bulletin

Pub. No. 9153

Fluid In-Service Quality Limits

The airframe manufacturers have established in-service limits for Type IV hydraulic fluids. These limits are listed on the following page. Continued use of a fluid that does not meet one or more of the limits can adversely affect the life of system components.

During aircraft operations, hydraulic fluid is subjected to an environment which, in time, alters certain properties of the fluid. No two types of aircraft hydraulic systems operate under the same conditions. The heat that is produced during system operation, the moisture from the environment to which the fluid is subjected, and the leakiness of the system (i.e., freedom from solids and liquid contaminants), will affect the operating life limit of the Type IV hydraulic fluid. Therefore, the operating life of Skydrol fluids is determined on the basis of both physical and chemical properties rather than by a fixed number of operating hours.

Monsanto's Technical Service fluid sampling program offers comprehensive analysis and evaluation of the fluid, with recommendations for corrective action when required.

Fluid Sampling

Monsanto suggests that hydraulic fluid be analyzed periodically to assure that it meets airframe manufacturer in-service limits.

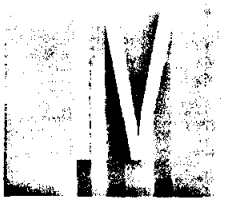
- *Routine Sampling*
  Each system should be sampled about once a year and/or whenever the airframe manufacturer suggests.
- *Unscheduled Maintenance*
  When malfunctions may have a fluid relationship, samples should be taken.
- *Suspicion of Contamination*
  Usually fluids should be drained and replaced, with samples taken before and after the maintenance procedure.

Fluid Contamination

Contamination in the hydraulic system can affect the performance of both the hydraulic fluid and the system components. Common liquid contaminants are chlorinated cleaning solvents, water, petroleum based or synthetic oils and engine lubricants. Liquid contaminants can alter the fluid fire resistance properties, affect seal performance, cause gel formation and lead to acid development.

Common solid contaminants include component wear particles as well as contamination external to the hydraulic system. Solids can cause physical damage to components as well as line and filter pluggage. Certain solids accelerate fluid degradation.

Proper in-line filtration is required to maintain a low solids contamination level. Filters should be checked and replaced as required to accomplish this. If a high contamination level persists, procedures outlined by the aircraft manufacturer and component manufacturer should be followed.



Airframe Manufacturers' In-Service Limits for Type IV Fluids

Analysis	Boeing[3]	Douglas	Airbus	DeHavilland	Lockheed	BAE	Fokker
Appearance	No cloudiness, phase separation or precipitation, any color is acceptable				No cloudiness or precipitation Color: Blue/ purple to gray	-	-
Specific Gravity @25/25	0.995-1.066	0.900-1.066	0.995-1.065	0.995-1.065	0.989-1.065	0.995-1.006	0.999-1.057
Moisture % (max)	0.1-0.8	0.5	0.5	0.6	0.4-1.0	0.6	0.6
Neutralization No. mg KOH/gm (max)	1.5	1.5	1.5	1.0	1.5	0.75	1.0
Kinematic Visc. @ 100F, cs(38°C)	6.0-12.5	7.0-12.0	6.0-12.5	7.0 - 12.5	7.0(min)	6.0 (min)	7.0(min)
Elemental (ppm max) Contamination							
Calcium	50	-	-	-	-	-	-
Potassium	50	-	-	-	-	-	-
Sodium	50	-	-	-	-	-	-
Chlorine	200	200	200	200	200	200	-
Sulfur	500	-	-	-	-	-	-
Particle Contamination #/100ml (max)	(2)						
5-15 microns	128,000	128,000	64,000	64,000	64,000	128,000	128,000
15-25 microns	22,800	22,800	11,400	11,400	11,400	22,800	22,800
25-50 microns	4,050	4,050	2,025	2,025	2,025	4,050	4,050
50-100 microns	720	720	360	360	360	720	720
>100 microns	128	128	64	64	64	128	128

[1]*Contamination means quantities in excess of those introduced as a part of the basestock or the additive package. Values above those in the as-received fluids.*

[2]*Boeing does not have specific particle contamination levels for in-service fluids. It is assumed that proper filter and fluid maintenance will keep contamination levels low. Aircraft are delivered with fluid that meets or exceeds NAS 1638, Class 9, which is listed as a reference.*

[3]***Gulfstream, Cessna, also.***