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AEROSPACE RECOMMENDED PRACTICE

SAE ARP785 REV. A

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(R) Aerospace - Procedure for the Determination of Particulate Contamination in Hydraulic Fluids by the Control Filter Gravimetric Procedure

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1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) describes a gravimetric method for the determination of particulate contaminant in hydraulic fluids by the control filter technique. With this method detectable contamination levels down to 0.2 mg per sample can be obtained with a standard deviation of ±0.1 mg.

2. REFERENCES:

There are no referenced publications specified herein.

3. OUTLINE OF METHOD:

Total particulate contamination, including both organic and inorganic material, is determined by filtering a quantity of hydraulic fluid through a preweighed, 47 mm diameter, 0.8 µm membrane filter; solvent flushing to remove filter retained oil; oven drying followed by equilibration with ambient room conditions; then a final weighing. In addition, a control filter is carried through the analysis in order to control and correct for test variables and possible sources of error. The control filter is subjected to the same procedures as each test filter with the exception of actual contaminant filtration, thereby serving as an indicator of any changes in balance calibration, changes in filter weights resulting from moisture content change (humidity variation), desorption of filter extractables, or absorption of hydraulic fluid constituents. A further function of the control filter is to provide a blank analysis run concurrently with the actual test sample. If control filter weight changes are insignificant relative to actual contamination levels, as determined after adequate testing, then the control filter or oven drying portion of the procedure may be omitted.

4. DEFINITIONS:

Tare weight of a filter is its initial weight as received after equilibration to ambient room conditions.

5. REAGENTS:

One of the following reagents (or other suitable solvents with similar properties) is recommended:

5.1 PF™ Degreaser

5.2 Envirosolv® 655

5.3 Analytical Grade Petroleum Ether:

30 to 60 °C Boiling Point or Analytical Grade Hexane or VM & P Naphtha. The text will use the term "Petroleum Ether".

CAUTION: THESE FLUIDS ARE FLAMMABLE.

5.4 Reagent Grade Isopropyl Alcohol (Acetone Free):

CAUTION: THIS FLUID IS FLAMMABLE.

6. APPARATUS:

6.1 Expendable Materials:

Membrane filters, diameter 47 mm, pore size 0.8 µm, water extractables 5% maximum.

NOTE: The membrane selected must be compatible with both the hydraulic fluid and the reagents used.

6.2 Nonexpendable Equipment:

6.2.1 Pyrex filter holder assembly, 47 mm, with funnel (approximately 300 mL capacity).

6.2.2 1 L side arm filter flask.

6.2.3 Vacuum pump or aspirator, capable of drawing 25 in Hg.

6.2.4 Flat-bladed forceps with unserrated tips.

6.2.5 Analytical or electronic balance capable of weighing to 0.05 mg sensitivity.

6.2.6 Place a porous or open container holding desiccant granules into the balance case to maintain low relative humidity.

6.2.7 Covered glass petri dishes, 150 mm diameter

6.2.8 Drying oven capable of maintaining 60 °C.

6.2.9 An assembly for dispensing clean solvent.[1]

6.2.10 Glass sample bottles, small mouth, with bakelite screw cap, scored at the 100 mL level.

6.2.11 Volumetric flask or graduated cylinder, 100 mL.

6.2.12 Optional: Zerostat-3 Anti-Static Instrument, or equivalent.

[1] There are many means of achieving this. Each acceptable procedure has in common a pressurized container with suitable filter holder so arranged as to pass the fluid through a 1.2 µm (or finer) membrane filter as it is dispensed.

7. PREPARATION OF EQUIPMENT:

7.1 Sample Bottles and Pyrex Funnel:

7.1.1 Sample bottles should be calibrated and scored, or otherwise permanently marked, at the 100 mL level as determined by transferring 100 mL of water from a volumetric flask or graduate. Graduations on the Pyrex funnel should not be used for sample size measurements since they are only approximate.

7.1.2 Bottles and funnels should be cleaned by washing with liquid detergent in water, rinsing with hot water and finally rinsing with filtered isopropyl alcohol and draining. Sample bottles should be rinsed with filtered reagent just prior to capping. Filter funnels should be rinsed with filtered reagent just prior to the filtration procedure.

8. SAMPLING:

8.1 Sample Size:

100 mL ± 5 mL. The sample bottle should be filled to the 100 mL mark with the hydraulic fluid being tested. (Smaller or larger samples may be used to meet the problem of extremely high or low contaminant levels.)

8.2 Method of Sampling:

A specific technique for obtaining samples is not detailed in this procedure. Such methods must be established by the individual agency or laboratory - each in accordance with his own requirements. However, extreme care should be taken to insure that the samples are representative of the system fluid being tested, and free of significant external contamination.

9. TEST PROCEDURE:

9.1 Preparation of Test and Control Filters:

9.1.1 Label N + 1 filters with a ballpoint pen on the filter edge. (N is the number of tests to be run concurrently on the particular type of fluid; 1 represents the control filter).

9.1.2 Weigh all filters to nearest 0.05 mg and record weights.

9.2 Filtration and Flushing:

9.2.1 Using flat-bladed forceps, insert a 47 mm filter in the Pyrex filter holder. The aluminum clamp should be grounded to avoid static discharge. INSERT A CONTROL FILTER DIRECTLY BENEATH ONE TEST FILTER IN THE PYREX FILTER HOLDER IN AT LEAST ONE INSTANCE DURING A SINGLE OR GROUP TEST RUN.