

SOUTHWEST RESEARCH INSTITUTE®

6220 CULEBRA RD. 78238-5166 • P.O. DRAWER 28510 78228-0510 • SAN ANTONIO, TEXAS, USA • (210) 684-5111 • WWW.SWRI.ORG

July 3, 2012

Kleenoil USA, Inc.
Attn: Mr. Jerry Robin
6913 K Ave, Ste 303
Plano, TX 75074, USA

Via e-mail: jerryrobin@kleenoilusa.com

Subject: Letter Report for Southwest Research Institute® Project No. 08.15496.01.201
“Filter Testing”

Dear Mr. Robin:

Kleenoil USA submitted the following filter types shown in Table 1 for Drawdown Testing as follows:

Table 1. Filter Details

SwRI Filter ID	Kleenoil USA ID	Description
FL12-1144	KU-85	Super Duty Filter Unit (Housing)
FL12-1146	KF-85	Super Duty Cartridge

1.0 DRAWDOWN TEST

SwRI designed and arranged a Drawdown Test for Kleenoil USA to simulate the filtration capability of a proprietary bypass oil filter to clean an initially dirty reservoir of hydraulic fluid by means of recirculation.

1.1 Test Procedure

The stand was charged with 120 L of MIL-H-5606 hydraulic fluid. This fluid was then recirculated with SwRI’s cleanup filters to an initial cleanliness of 16/12 per ISO 4406. To simulate field-contaminated fluid, the system was dosed with 843.6 mg of ISO A-3 Medium Test Dust to achieve a fluid cleanliness of 23/18 per ISO 4406.

Once testing began, the system was put on a recirculation loop with a constant bypass flow of 3 quarts per minute (0.75 GPM) entering the Kleenoil filter. This test ran for a duration of



HOUSTON, TEXAS (713) 977-1377 • WASHINGTON, DC (301) 881-0226

6 hours with measurements such as temperature, inlet pressure, outlet pressure, flowrate, and particle counts of the system fluid recorded as functions of time. A centrifugal pump was used to achieve continuous recirculation in the system sump tank, in order to keep the contaminant in suspension in the system fluid. Particle counts were reported in terms of cleanliness of the fluid, as recorded by the upstream particle counter.

1.2 Test Stand Diagram

The test stand configuration consisted of a recirculation loop for the system fluid, with a bypass stream supplying fluid to the test filter. This is depicted in Figure 1 below.

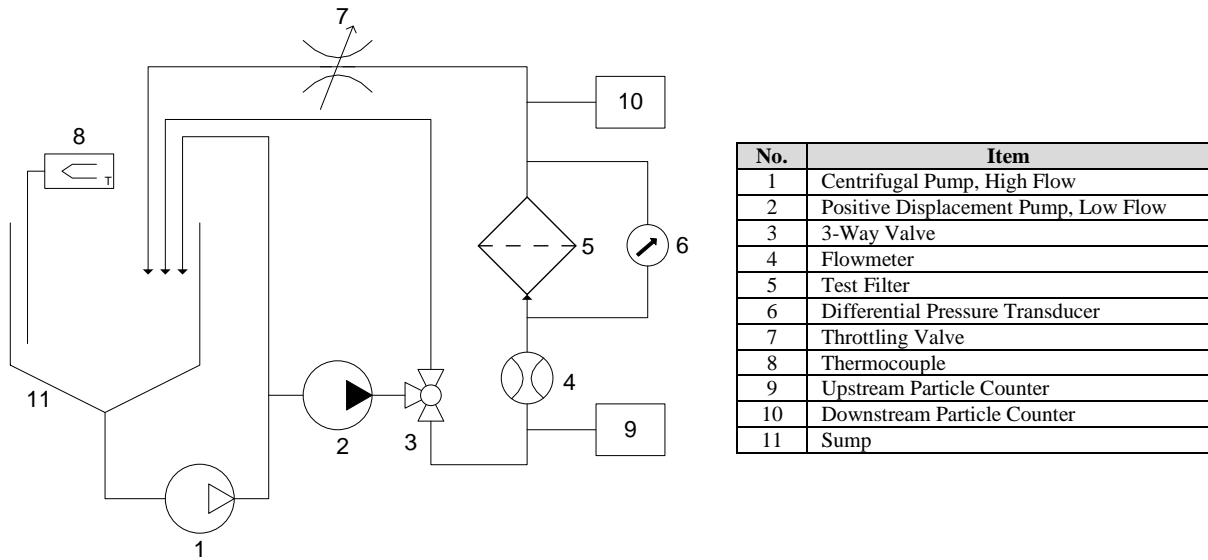


Figure 1. Drawdown Test Stand Diagram

1.3 Drawdown Test Results

The performance results of filter FL12-1146 are displayed in the following tables and figures. Additional conditions throughout testing are reported in Appendix A.

Table 2. Fluid Cleanliness Codes During Test

Time (Hr)	ISO 4406 Cleanliness Codes (6µm/14µm)	6 µm Counts	14 µm Counts
0.0	23 / 18	41,517	1,710
0.5	22 / 17	21,338	873
1.0	21 / 16	9,975	393
1.5	19 / 15	4,627	178
2.0	18 / 14	2,203	91
2.5	17 / 13	1,143	61
3.0	16 / 12	623	33
3.5	16 / 12	363	25
4.0	15 / 12	238	21
4.5	15 / 11	183	18
5.0	14 / 11	154	16
5.5	14 / 11	140	12
6.0	14 / 11	135	14

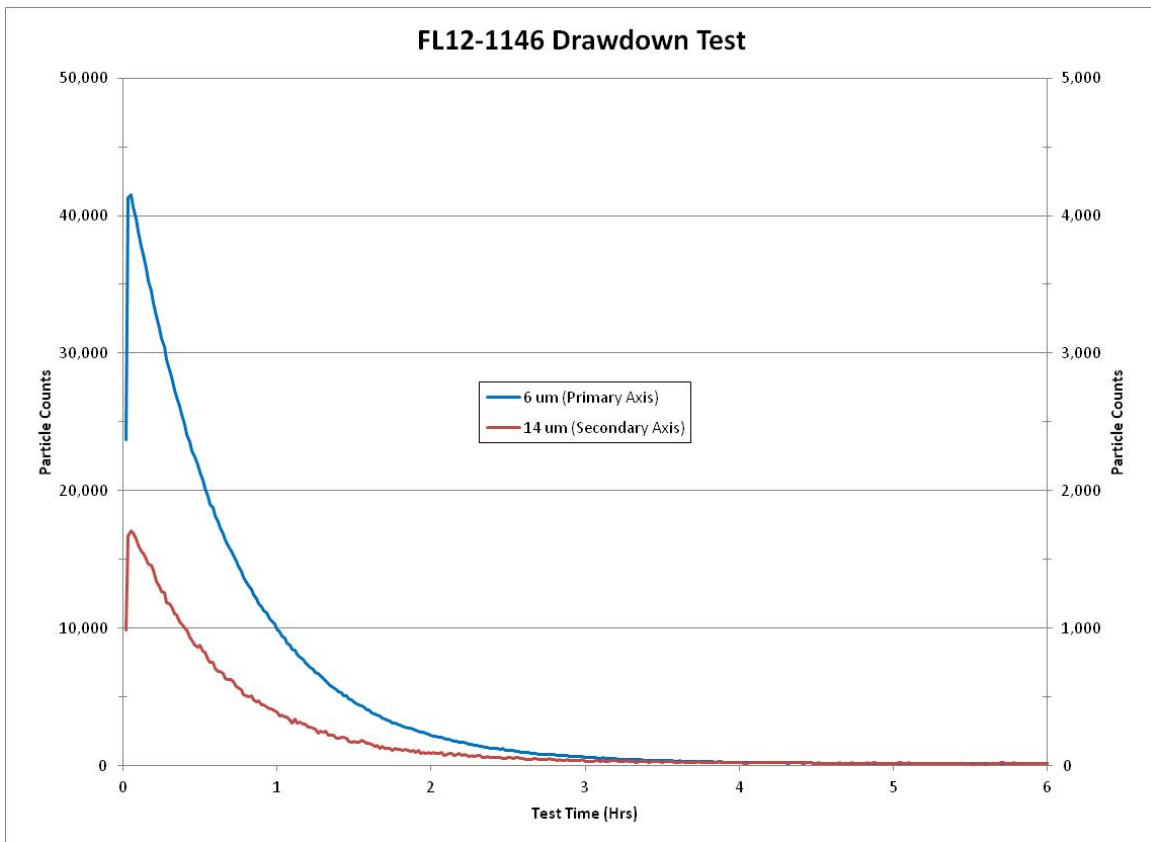


Figure 2. FL12-1146 Drawdown Test Results

If you have any questions, please do not hesitate to contact me at (210) 522-3680 or by e-mail at philip.canant@swri.org.

Prepared by:

Philip Canant, Engineer
Fuel Systems & Contamination Research
Fuels & Lubricants Technology Department

Approved by:

Gary Bessee, Director
Fuels & Lubricants Technology Department

PC/rs
Attachment

r:\working\Letter Report_100883_Kleenoil_USA_070312.docx

cc: S. Hutzler, SwRI (via e-mail)

This report must be reproduced in full, unless SwRI approves a summary or abridgement.

APPENDIX A

Drawdown Test Tabular Data

Table A-1. Drawdown Test: FL12-1146

Test Time (hr)	Flow (GPM)	Temp (°F)	Inlet Press (psi)	Outlet Press (psi)	Differential Press (psi)
0.00	0.74	73	78.2	10.0	68.2
0.25	0.74	73	76.0	9.5	66.5
0.50	0.75	73	76.0	9.5	66.5
0.75	0.75	73	76.1	9.4	66.7
1.00	0.75	73	75.7	9.4	66.3
1.25	0.75	73	75.5	9.4	66.1
1.50	0.75	73	75.5	9.3	66.2
1.75	0.75	73	74.9	9.2	65.7
2.00	0.75	73	74.7	9.2	65.5
2.25	0.75	73	75.0	9.2	65.8
2.50	0.75	73	74.3	9.2	65.1
2.75	0.75	73	72.9	9.1	63.8
3.00	0.75	73	72.7	9.1	63.6
3.25	0.75	73	71.8	9.1	62.7
3.50	0.75	73	71.5	9.1	62.4
3.75	0.75	74	72.0	9.1	62.9
4.00	0.75	74	72.0	9.1	62.9
4.25	0.75	74	72.3	9.1	63.2
4.50	0.75	74	72.0	9.1	62.9
4.75	0.75	74	71.8	9.0	62.8
5.00	0.75	74	72.4	9.0	63.4
5.25	0.75	74	72.8	9.0	63.8
5.50	0.75	74	72.0	9.0	63.0
5.75	0.75	74	72.2	9.0	63.2
6.00	0.75	74	72.6	9.0	63.6