



IBC CLEANING PROCEDURE USING DIALYSIS TO REDUCE ISO CLEANLINESS CODE FROM 23 TO <15



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1. INTRODUCTION

The present procedure defines the standardized method for the cleaning and conditioning of hydraulic oils and engine oils stored in IBC containers and drums, through the use of a dialysis filtration system (kidney loop) model HFS-4. The HFS-4 unit has a filtration capacity of 240 gallons per hour, with a nominal capacity of 34 gallons per filtration "pass," considering 7 filtration passes per drum. This process allows achieving and maintaining optimal cleanliness levels recommended by original equipment manufacturers (OEM), reducing the initial cleanliness code from 23/21/20 to 15/13/10 according to the classification established in ISO 4406.



2. OBJECTIVE

Remove solid particles and contaminants present in the oil through continuous recirculation in a closed loop, extending the service life of the fluid and ensuring suitable conditions for its use in hydraulic systems or engines.

3. EQUIPMENT AND MATERIALS

- Filtration equipment HFS-4
- ISO 16889 certified filters; Beta 4 > 4000
- Clean hydraulic hoses
- IBC / Drum / Tote with oil
- Personal protective equipment

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“ISO 16889 establishes the multi-pass test method to evaluate the performance of high-efficiency filters, defining parameters such as particle retention efficiency, the beta ratio (β_x), contaminant holding capacity, and filter media stability. The use of filters certified under this standard ensures consistent and repeatable filtration performance, which is a fundamental condition for the reliability of the **7-PASS METHOD**. This reliability allows predicting the progressive reduction of solid contamination during fluid recirculation, ensuring compliance with the cleanliness levels required by original equipment manufacturers (OEMs) and aligning with the principles of contamination control and proactive lubricant management established in the ICML 55.1 standard, as well as with the cleanliness codes defined in ISO 4406.”

TEST RESULTS		Number of Particles per Milliliter and Filtration Ratio							
Particle Size	4.0 um(c)	5.0 um(c)	6.0 um(c)	7.0 um(c)	8.0 um(c)	10.0 um(c)	12.0 um(c)	30.0 um(c)	
Initial Clean	33.66	10.07	5.07	3.76	3.14	2.32	1.82	0.38	
FILTRATION EFFICIENCY 10 %									
Upstream	21223.67	13115.53	8309.95	5612.43	3857.6	2092.49	1165.59	39.07	
Downstream	7.17	1.3	0.57	0.38	0.26	0.2	0.1	0.03	
Beta	2961.25	10122.24	14470.06	14659.33	14755.84	10537.71	11824.84	1519.33	
FILTRATION EFFICIENCY 20 %									
Upstream	22379.86	13865.7	8792.18	5936.23	4088.13	2226.69	1238.29	42.08	
Downstream	7.38	1.15	0.5	0.3	0.23	0.16	0.14	0.03	
Beta	3030.68	12103.91	17702.37	19498.58	18124.7	13820.84	8915.72	1577.88	
FILTRATION EFFICIENCY 30 %									
Upstream	22356.05	13849.88	8793.37	5945.47	4091.53	2222.26	1237.29	42.3	
Downstream	6.93	0.93	0.31	0.2	0.13	0.07	0.06	0	
Beta	3224.43	14945.91	28264.42	29400.68	31206.58	29851.22	21834.61	9999.99	
FILTRATION EFFICIENCY 40 %									
Upstream	22426.58	13901.5	8822.08	5963.31	4100.54	2227.21	1241.33	42.16	
Downstream	6.01	0.74	0.25	0.18	0.14	0.1	0.06	0.01	
Beta	3730.17	18701.58	35604.81	33335.29	29761.98	22027.37	19599.93	6324.33	
FILTRATION EFFICIENCY 50 %									
Upstream	22377.1	13856.06	8800.92	5949.28	4093.01	2220.29	1233.92	42.48	
Downstream	4.91	0.64	0.27	0.19	0.14	0.09	0.08	0.01	
Beta	4559.52	21612.58	32462.4	30772.15	29948.85	24369.01	15864.74	6371.33	
FILTRATION EFFICIENCY 60 %									
Upstream	22403.5	13881.49	8806.77	5954.81	4104.17	2236.41	1246.54	42.65	
Downstream	4.87	0.74	0.28	0.18	0.12	0.08	0.06	0.01	
Beta	4601.36	18674.65	31452.77	32879.34	35178.57	29599.6	19682.21	3198.58	
FILTRATION EFFICIENCY 70 %									
Upstream	22378.08	13867.56	8802.56	5956.31	4099.26	2228.87	1242.11	42.9	
Downstream	3.78	0.77	0.36	0.24	0.18	0.11	0.1	0	
Beta	5913.18	18009.82	24527.27	24817.95	22495.91	19666.48	12560.71	9999.99	
FILTRATION EFFICIENCY 80 %									
Upstream	22350.37	13844.73	8781.09	5930.25	4077.91	2219.13	1239.52	42.51	
Downstream	4.41	1.04	0.41	0.23	0.14	0.1	0.08	0.01	
Beta	5068.11	13369.38	21359.42	26162.87	28231.68	23223.49	16167.62	6376.5	
FILTRATION EFFICIENCY 90 %									
Upstream	22396.82	13874.47	8801.35	5946.64	4093.86	2228.76	1241.37	43.61	
Downstream	4.29	0.87	0.35	0.19	0.14	0.06	0.05	0.03	
Beta	5220.7	15886.79	25307.4	31857	30200.64	34584.17	24287.74	1635.46	
FILTRATION EFFICIENCY 100 %									
Upstream	21094.77	13008.31	8242.89	5565.56	3828.48	2081.1	1158.55	41.16	
Downstream	3.64	0.78	0.33	0.15	0.07	0.03	0.02	0.01	
Beta	5790.49	16634.66	25130.76	38383.19	51046.4	67132.19	50371.57	6860.17	
Avg. Upstream	22147.51	13711.96	8698.89	5878.47	4045.21	2199.38	1225.03	42.15	
Avg. Downstream	5.28	0.89	0.36	0.22	0.15	0.1	0.07	0.01	
Avg. Beta	4194.6	15486.86	24330.66	26761.3	26727.81	22525.32	16620.14	3677.7	
Avg. Efficiency (%)	99.98	99.99	100	100	100	100	99.99	99.97	

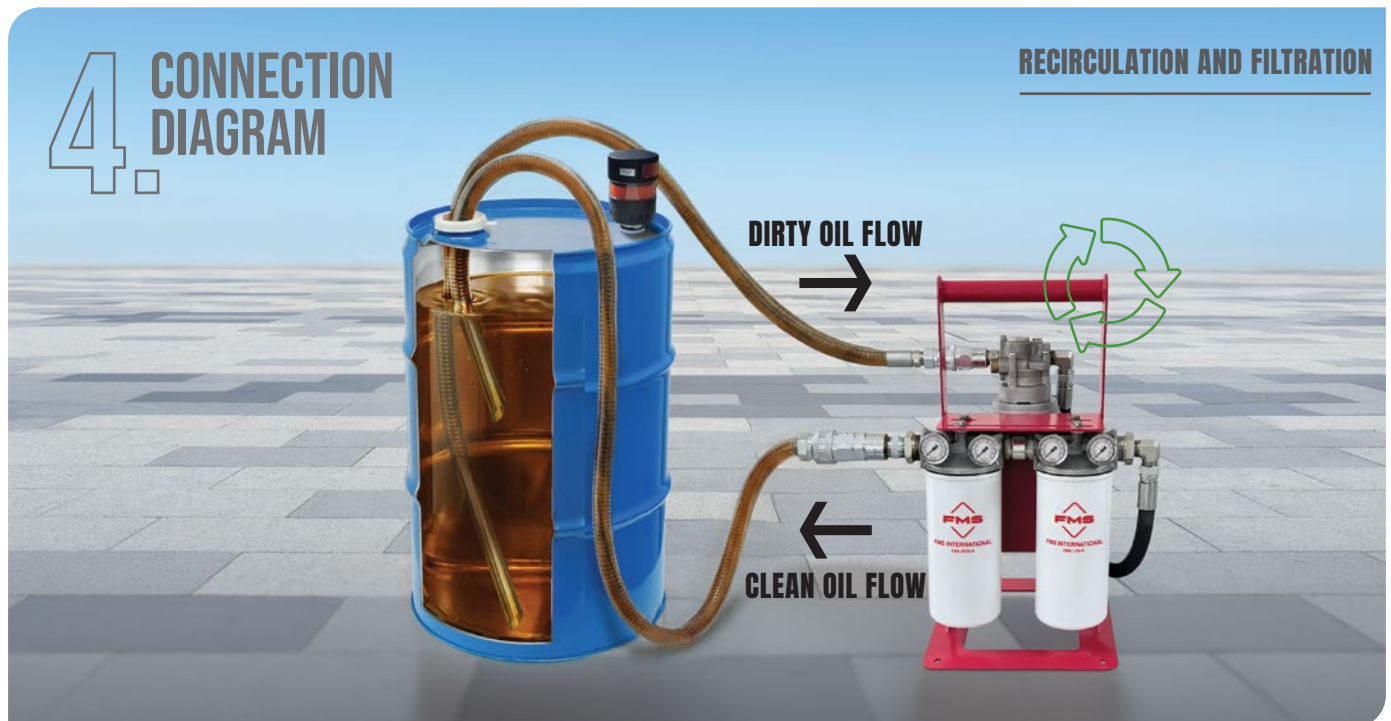
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PROCEDURE

- 1 Connect the HFS-4 suction line to the bottom of the IBC or drum.
- 2 Connect the return line to the top of the container.
- 3 Verify that all connections are clean and properly tightened.
- 4 Turn on the HFS-4 unit and allow continuous recirculation of the oil.
- 5 Maintain the process for approximately 2 hours, estimating 7 passes per hour.
- 6 Finish when the desired cleanliness level is reached.

EXAMPLE OF SCHROEDER DIALYSIS

<https://youtu.be/neqqD96kHyw>



The diagram shows the principle of closed-loop recirculation, where the oil is extracted, filtered by the HFS-4, and returned.