



CASE HISTORY

EVALUATION OF COMPETITOR FILTERS WITH FTC'S PLATINUM SERIES FILTERS IN HYDROTREATER SERVICE AT 40,000 b/d REFINERY, PORT ARTHUR, TEXAS.

January 7, 1998

CUSTOMER

Confidential Customer, Port Arthur, Texas

OBJECTIVE:

To compare the filtration qualities of a competitor filter with a Filtration Technology Corporation's (FTC) Platinum Series filter in Hydrotreater Unit #3 (HTU #3).

SUMMARY:

In Confidential Customer's HTU #3, frequent filter change out has resulted in high maintenance and operational cost. To investigate these problems, FTC conducted a slipstream evaluation using a single Platinum Series filter against the competitor filters that Confidential Customer is currently using in this process. During this evaluation total suspended solids (TSS) and turbidity analysis were randomly conducted for fluid quality comparisons.

Based on the test results, The FTC 70-micron test filter achieved a greater level of fluid cleanliness than the competitor filters. Effluents from FTC's filter contained 1.4 mg/L while effluents from the competitor filter contained 4.8 to 2.2 mg/L TSS. The 70-micron FTC test filter achieved an 84% filtration efficiency while the competitor filter achieved a 45% filtration efficiency. The test data also suggest that the filter life for FTC filters would be approximately six times longer than the competitor filters in this process.

Installation of the Platinum Series filters should increase fluid quality while reducing filter changes and operational cost. As a result, it is recommended that Confidential Customer install the 70-micron FTC Platinum Series filters in HTU #3.

BACKGROUND:

Confidential Customer operates a Hydrotreating Unit (HTU #3) that gathers diesel fuels from various processes, then filters and coalesces the combined streams to remove solid particles and water. Frequent change out of the current filters has resulted in increased operational and maintenance cost. A meeting with Confidential Customer personnel resulted in a field test that would simultaneously slip stream a single FTC Platinum Series filter, with the competitor filters currently used in Confidential Customer's HTU #3 process.

Consequently, FTC was invited to Confidential Customer to compare the filtration qualities of both filters. The process conditions in HTU #3 are shown on Table I.

TABLE I

Process Conditions of HTU #3

Temperature	120 °F
Pressure	40 psig
Flow Rate	1235 BPH (avg.)
Water Concentration	200 PPM

TEST METHODS:

Inline Side Stream Evaluation

Side Stream filter evaluations were conducted by allowing a slipstream of the process diesel to flow through a single FTC filter element. To achieve the most accurate comparison of the FTC and competitor filters, a flow density (gpm/ft² of filter media) through the test filter should be equivalent to the flow density of the full-scale filters in Confidential Customer's process. For this test a flow rate of approximately 50 gpm should be maintained through the test housing. Total suspended solids analyses and turbidities will be periodically conducted on both filters to determine the removal efficiency of the filters. Filter life will be determined by monitoring the elapsed time verses the differential pressure of the filters. Due to pressure limitations in the process, each filter will have a maximum pressure differential of 20 psid which will represent the completion of a filter cycle.

Total Suspended Solids (TSS) Determination

Total Suspended Solids (TSS) analyses were conducted by placing a pre-weighted nylon membrane inside of an inline filter holder. The filter holder was attached to sample ports that were located up and downstream of the FTC test filter and process filter housing. A volume of sample liquid was filtered through the filter holder until a significant reduction in flow through the holder was reached. The membranes were rinsed with solvents to remove precipitants and excess organic materials. Finally, the membranes were dried, desiccated and re-weighted to obtain the concentration of suspended solid particles in mg/L.

Turbidity Readings

Turbidity readings were conducted according to the procedure in the operating manual for the DRT-15CE Turbidity Meter. An index reference standard was used to calibrate the turbidimeter. A volume of sample was placed into the vials provided and the reference adjustment was made. The turbidity reading was taken directly from the meter and measured in Nephelometric Turbidity Units (NTU).

TEST RESULTS AND DISCUSSIONS:

TABLE II

Field Test Results

Filter Identification	Differential Pressure (psig)	Volume of Fluid Filtered (BBLs)	TSS (mg/L.)		Filter Life (Hrs.)
			Inlet	Outlet	
70 micron FTC (1 st filter cycle)	Zero	*N/A	8.8	1.4	ψ49.6
Competitor Filter (1 st filter cycle)	17	11,054	8.8	4.8	9.9
Competitor Filter (2 nd filter cycle)	2.6	20,578	4.1	2.2	14.5

* Restrictions in the discharge line severely reduced the flow through the test filter. As a result, the filtrate volume from the test housing could not be compared with the filtrate volume from the competitor filters.

ψ The filter life is an extrapolated value of FTC filters installed in Confidential Customer's HTU #3 process. It is based on the known dirt holding capacity of the FTC Platinum Series filters and an inlet challenge to the filters of 8.8 mg/L at approximately 1,117 BPH (avg. flow rate during the 1st filter cycle).

The test results show that the inlet challenge to the test and process filters varied from 8.8 to 4.1 mg/L TSS. Despite this variation, FTC's 70-micron test filter achieved a better level of fluid cleanliness (1.4 mg/L) with a greater inlet challenge of 8.8 mg/L. than the competitor filters achieved with a lesser inlet challenge of 4.1 mg/L. The best effluents the competitor filters could produce were 2.2 mg/L. During the 1st cycle the 70- micron FTC test filter achieved an 84% filtration efficiency while the competitor filters achieved a 45% filtration efficiency. The test data also suggest that the filter life for the competitor filters are approximately 9.9 hours, while the extrapolated life of the FTC Platinum Series filters in this process would be 49.6 hours. This is an increase in the filter life by five times. However, due to the fluctuation in the TSS levels the actual filter life for this application could be higher. This suggest that if the 70-micron Platinum Series filter were installed in this process the filter life could increase to approximately six times or greater than the current elements.

Turbidities were randomly taken at the inlet and outlet of both filters. However, the turbidity from the outlet of the competitor filters was consistently greater than the inlets. Effluents from the competitor filter averaged 214 NTU's, while the inlets averaged 90 NTU's. Observations of the effluent samples from the competitor filters showed them to be very hazy. The accumulation of water in the competitor filter housing could cause the diesel sample to develop a haze that can account for higher turbidities. Effluents from the FTC test filter were clear and averaged 34 NTU's.

CONCLUSIONS AND RECOMMENDATIONS:

The following conclusions were made based on the test findings.

- FTC's 70-micron test filter achieved a greater level of fluid cleanliness than the competitor filter achieved. The 70-micron FTC test filter achieved an 84% filtration efficiency while the competitor filter achieved a 45% filtration efficiency.
- Test data also suggest that the filter life of the FTC filter elements could be six times longer than the competitor filters in this process.
- Test results show that the inlet challenge to the test and process filters varied from 8.8 to 4.1 mg/L TSS.
- Due to hazy effluent samples from the competitor filters outlet turbidities were higher than the inlet turbidities, while effluent turbidities from the FTC test filter were clear.

Test results conclude that the 70-micron FTC filter provided better effluent qualities and can achieve approximately six times the filter life of the competitor filters currently used in HTU #3. The installation of the Platinum Series filters should increase fluid quality while reducing filter changes and operational cost. As a result, it is recommended that Confidential Customer install the 70-micron FTC Platinum Series filters in HTU #3.

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