

Contamination Impact Assessment How to Find the Lowest Hanging Fruit in Facility Cost Reduction

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**Based on actual cases in Texas, USA*

“Frank”, an operations supervisor at ABC Refining Inc., had a particulate contamination problem. His crews were cleaning the suction screens on his kerosene pumps every 24 hours. His (6) pumps were failing, on average, every 8 weeks. The disposable filters downstream of the pumps required change-out every 18 days under normal conditions. Upsets could cause plug-off in 72 hours. The coalescing filters plugged off every 8 weeks and clay filters plugged off every 26 weeks. The costs were substantial.



As a first step, Frank sent a sample of the particulate contamination (i.e. black powder) to the lab to see what sort of contamination he was dealing with. The lab report showed a significant percentage of iron compounds, with a high proportion under 10 microns in size. Frank had heard that [magnetic separators](#) capture particles to below 0.1 microns. He purchased a magnetic separator sampling station, installed it on a kerosene slipstream, and it captured what extrapolated to 95% of contamination in the line.

Frank calculated that installing a full-sized magnetic separator would pay back in under 8 weeks, based on filter and pump repair savings alone. The magnetic separator was installed upstream of the product pump as they do not restrict flow and show a limited pressure differential.

Frank’s co-worker Mel was having foaming problems in his amine unit. Lab results showed that over 50% of the contamination was sub 5 microns. Mel decided to first install a low cost magnetic strainer in continuous operation to better understand the contaminant volume over time. Mel then installed a full-size separator. He significantly reduced filter and chemical costs, and improved process stability.



Cost Savings

Table 1 shows both the impact of pump repair costs dropping to zero and reduced filter costs resulting from Frank’s installation of magnetic separators (based on a real-life case). It does not include savings on contract labor, disposal costs, avoided volume reduction, energy savings or avoided downtime.

Table 1: First year of filter and pump parts cost reduction (6 pumps) after installation of magnetic separators.

Filters & Pump Parts	Before	After	Savings - \$	Savings - %
Media Filters	\$ 120,000	\$ 5,000	\$ 115,000	96 %
Coalescer Elements	\$ 120,000	\$ 20,000	\$ 100,000	83 %
Clay Filters	\$ 20,000	\$ 10,000	\$ 10,000	50 %
Pump Repair (parts only)	\$ 162,000	-	\$ 162,000	100 %
Total	\$ 422,000	\$ 35,000	\$ 387,000	92 %

Safety Impact

Table 2 shows how the contamination-related hazard exposure events in this particular unit dropped annually by 95%, from 120 events to just 6. This does not count the pump repairs, only removal and installation.

Table 2: Annual number of worker hazard exposure events (6 pumps) after installation of magnetic separators.

Hazard Exposure Events	Before	After	Reduction	Savings
Media Filters Change	40	4	36	90%
Coalescer Element	6	1	5	83%
Clay Filters	2	1	1	50%
Pump Remove / Install	72	0	72	100%
Total	120	6	114	95%

Based on the success of this test and after discussing with the other facility units, the facility manager implemented a facility-wide Contamination Impact Assessment (CIA) to prioritize potential further deployments.

What’s in a Contamination Impact Assessment (CIA)?

The main deliverable of a CIA is a set of heat maps for a facility showing:

 <p>SAFETY</p> <ul style="list-style-type: none"> » Frequency of planned contamination related maintenance or repair events » Frequency of unplanned contamination related maintenance or repair events » Hazard rating of above activities 	 <p>ENVIRONMENT</p> <ul style="list-style-type: none"> » Disposable filter counts » Chemical disposal quantity attributable to contamination control » Water disposal - deep well 	 <p>COSTS</p> <ul style="list-style-type: none"> » Disposable filter costs » Contamination-control related chemical costs » Abnormal pump, compressor, meter, or seal replacements and overhauls
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Figure 1 is a partial and simplified CIA Cost Heat Map for illustrative purposes only. A key revelation of such a heat map can be finding what operators consider to be “normal maintenance” events, previously invisible to management, which can now be substantially reduced by installing cleanable magnetic separators.

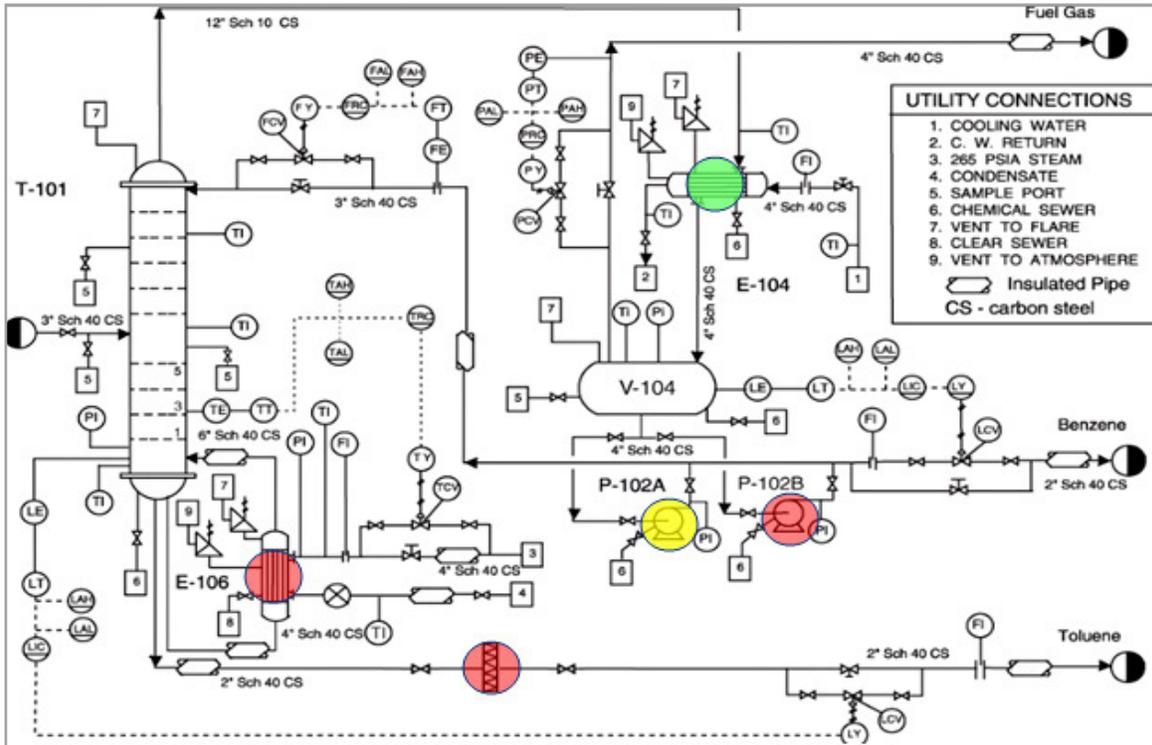


Figure 1: Simplified Example of Cost Heat Map – Color Coding Based on User Defined Cost Thresholds

Such heat maps helped the company prioritize further magnetic separator installations to achieve the greatest overall financial impact on facility performance.

Conclusion

The facility manager estimated that full deployment of magnetic separators on contamination cost hot spots in this smaller facility could save over \$11 million per year.

In addition to cost and safety impacts, acting on a CIA offers the opportunity for significant environmental benefits of substantially reduced filter and chemical usage - especially if applied to an entire facility.

To find out who's using magnetic separators and see case studies - [click here](#)

Download a white paper on amine applications - [click here](#)

To get help doing your own Contamination Impact Assessment - [click here](#)