

## REFINERY: Application Focus

### Pall Filter Retrofit improves amine plant availability by 15%

## Background

A Middle East refinery operates a large amine sweetening unit, with a total inventory of 3000 m<sup>3</sup> and the filtration flow rate across the existing lean solvent filter is 200 m<sup>3</sup>/h. The filter housing is 36-inch diameter and it holds three large diameter cartridges rated 5 µm but with no stated removal efficiency. The original process specifications required a solid content below 10 ppm.

An efficient filtration of the solvent loop is critical to capture the solid particles that contribute to foaming, fouling, and other operational challenges. The **Amine best practice recommends that the solvent filter features an absolute filter rating**. The rating and removal efficiency of an absolute rated filter are based on a test standard. This ensures an efficient and constant elimination of the solid particles. On the contrary, a commodity, non-absolute rated filter, also defined as « nominal », features an arbitrary filter rating and un-controlled removal efficiency.

### Problem

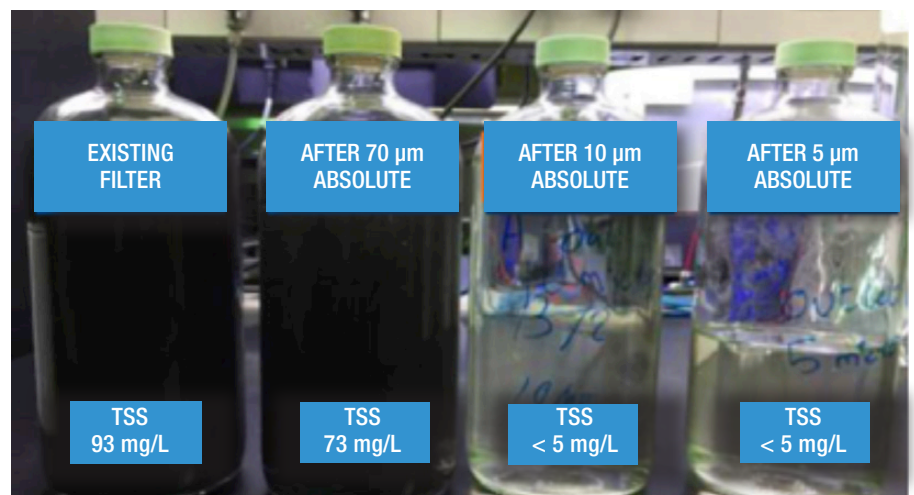
The acid gas removal unit (AGRU) had been operating well in the beginning but after the first turnaround it started to experience **foaming issues and solvent losses**. Foaming problems were continuous and **resulted in a 15% AGRU capacity drop**, forcing reduced production in unit operations generating sour gas. The refinery reported that the **solvent was visually black in color, with solid contents 100 mg/L on average**. Because of this high solid content, the filter was fouling weekly.



### Pall solution

Pall Corporation proposed to **retrofit the existing filter with absolute rated filter cartridges**, to conduct a gradual clean-up using the existing filter housing. Adaptor cages were designed and manufactured by Pall to retrofit the existing filter cartridges and to install standard, absolute rated cartridges instead.

Preliminary tests using 70, 10 and 5 µm absolute rated filters demonstrated that the solvent quality would significantly improve with Total Suspended Solid (TSS) contents **below 5 mg/L, which was even exceeding the TSS specification**. While the visual appearance of the solvent was black colored, →



Comparison of filtered solvent samples

## Pall Filter Retrofit improves amine plant availability by 15%

→ the 10 and 5 µm absolute filtered solvent was colorless and clear, as shown. The 70 µm absolute filter performed better than the existing 5 micron rated filter, which is typically observed when comparing absolute rated filters with commodity filters.

The refinery was convinced and purchased several sets of filter cartridges rated 100, 70, 40, 20 and 10 µm absolute to gradually clean-up the solvent loop. Within about 8 weeks the **solid content in the inventory dropped to below 5 mg/L**. Simultaneously foaming incidents stopped, and **production went back to normal**.

## Benefits

Overall this **retrofit solution turned to be very cost effective** for the refinery, as it required **no Capex**, only the purchase of the filter elements. The problem lasted for about six months until the solution was identified and implemented. This is assumed to have costed the refinery multi-million dollars margin losses. The **payback for the retrofit solution is estimated to be less than one month**.

As of today, the solid content is maintained at around 10 mg/L, and the filter change-out is weekly. The filter change-out frequency is about the same as before, but with the Pall filter unit price being about 30% lower, this retrofit generated an additional yearly savings of \$47,000.

## Conclusion

Commodity filters featuring a micron rating with no stated removal efficiency commonly exhibit poor filtration performance. On the contrary, absolute rated filters have a predictable and constant filtration performance.

For amine filtration, the best practice is to use filter cartridges with an absolute rating of 10 µm or below and a removal efficiency of 99.98% (Beta ratio 5000), to produce a solvent with a solid content of ≤1-5 ppm.



Pall Corporation

## Pall Industrial

25 Harbor Park Drive  
Port Washington, NY 11050  
+1 516 484 3600 telephone  
+1 800 289 7255 toll free US


Portsmouth - UK  
+44 (0)23 9233 8000 telephone  
+44 (0)23 9233 8811 fax  
[www.pall.com/contact](http://www.pall.com/contact)

*Filtration. Separation. Solution.<sup>SM</sup>*

Visit us on the Web at [www.pall.com](http://www.pall.com)

Pall Corporation has offices and plants throughout the world. For Pall representatives in your area, please go to [www.pall.com/contact](http://www.pall.com/contact)

Because of technological developments related to the products, systems, and/or services described herein, the data and procedures are subject to change without notice. Please consult your Pall representative or visit [www.pall.com](http://www.pall.com) to verify that this information remains valid.

© Copyright 2019, Pall Corporation. Pall , and SeptraSol are trademarks of Pall Corporation. ® Indicates a trademark registered in the USA. Better Lives, Better Planet, and Filtration, Separation, Solution, are service marks of Pall Corporation.