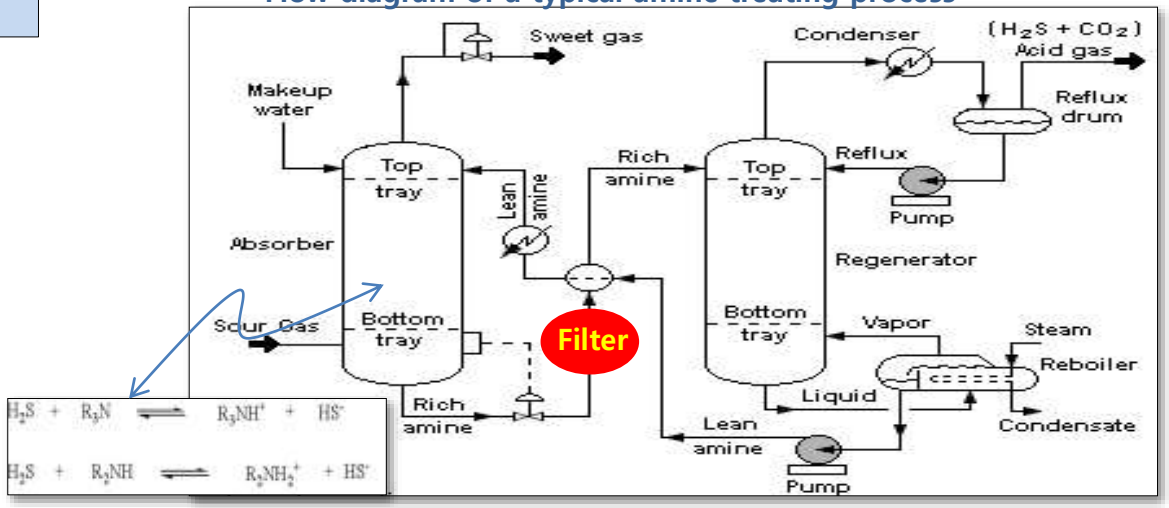
Summary of Amine Filter

The filtration and separation train provides protection of the lean/rich heat exchangers, regenerator tower, and reboilers and lean amine coolers. The benefits are: reduction in overall energy consumption, acid gas mass transfer maximisation, prevention of foaming episodes and loss of amine, maintaining the re-boiler tubes in good condition and the initiation of the problematic corrosion cycles.
Refineries have to assure amine and sulfur plant performance and reliability in parallel with production of low sulfur gasoline and diesel.

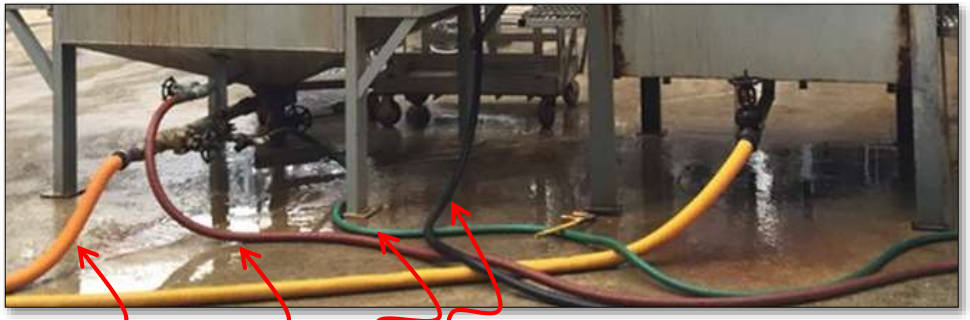
Flow diagram of a typical amine treating process



▲ Filter housing

▲Used filters

▲Cleaning tank



▲Utilities of cleaning tank

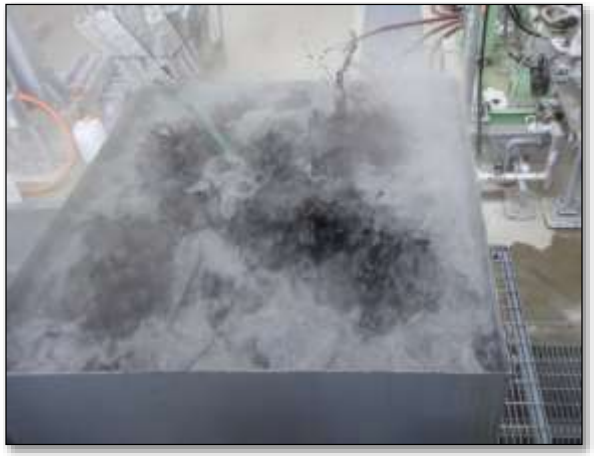
Amine filter recycling step (Cleaning Procedure)

1. Insert the used filter in cleaning tank

2. Fill up the Hot water to tank @ 65℃

3. pre- washing by air bubbling @ 65℃ →, 1Hr washing → Drain to sewer

4. Hot water + Cleaning Agent dumping →Air bubble washing @ 65℃ , 2Hr



5. Hot water Rinsing → Air bubble washing @ 45℃ , 0.5Hr

6. Final spray rinsing : Remove insoluble suspended solids in the final washing

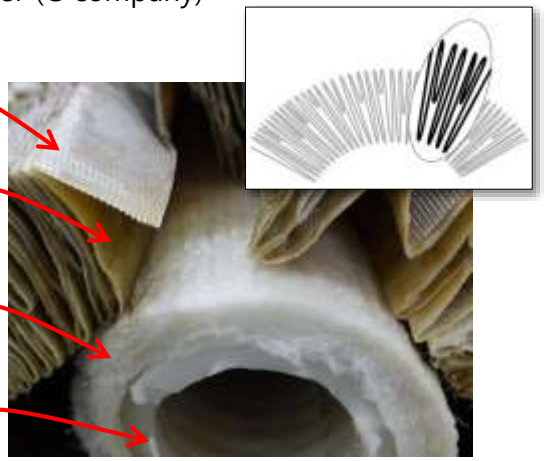
Structure of the Filter & Cleaning before and after comparison

Model Number	Micron Rating Initial Efficiency	Part Number	NSF/ANSI Standard 61	Length	Outer Diameter
742830	1 micron @ 99%	70-0708-1618-9	See NSF Note below	28.75 in (73 cm)	6.5 in (16.5 cm)
743830	2 micron @ 99%	70-0708-1619-7			
744830	5 micron @ 99%	70-0708-1620-5			
745830	10 micron @ 99%	70-0708-1621-3			
746830	15 micron @ 99%	70-0708-1622-1			
747830	25 micron @ 99%	70-0708-1623-9			
748830	40 micron @ 99%	70-0708-1624-7	No		
749830	70 micron @ 99%	70-0708-1625-4			

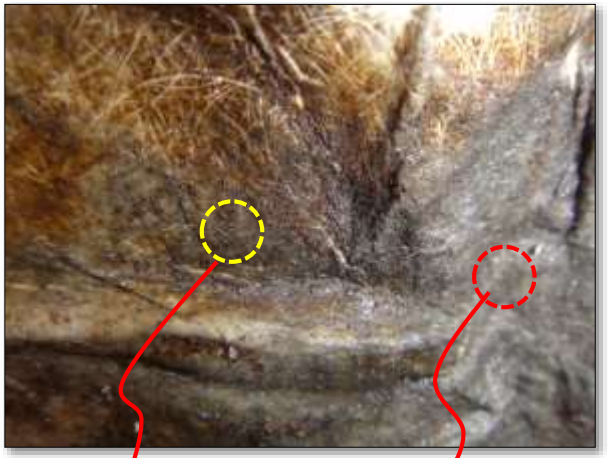
▲ The cleaning of the Amine Filter(3M) is shown (left) as well the result (right).

▲ Cleaning results of the other type filter (C company)

▲ Cleaning results of the other type filter (S company)



Chemistry & Reaction Mechanism (Deposit Materials : FeS, Fe_2O_3,Oil Residue etc.)



▲Deposit material : Fe2O3, FeS

▲Deposit material : Oil Residue, carbon

▲ After Cleaning

Oxidation of Pyrophoric iron sulphide (FeS)

$$2FeS + 3\left(\begin{matrix}-N=O\\|\end{matrix}\right) \rightarrow F2e_2O_3 + 3\left(\begin{matrix}-N-2S\\|\end{matrix}\right)$$

$$ROOC\text{-}(CH_2)_n\text{-}OH + FeS \rightarrow R\text{-}OO\text{-}(CH_2)_nCH\text{-}SO_3^{-2} + H_2O$$

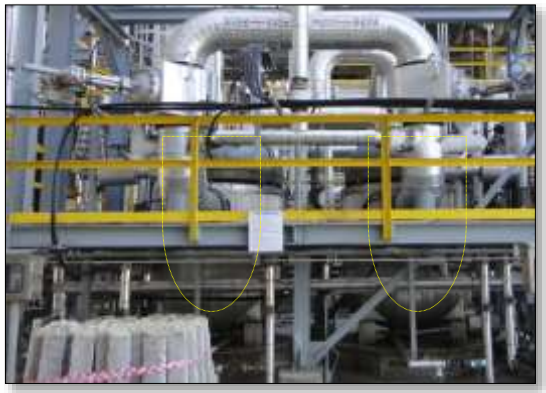
Ferric ion reduction reactions

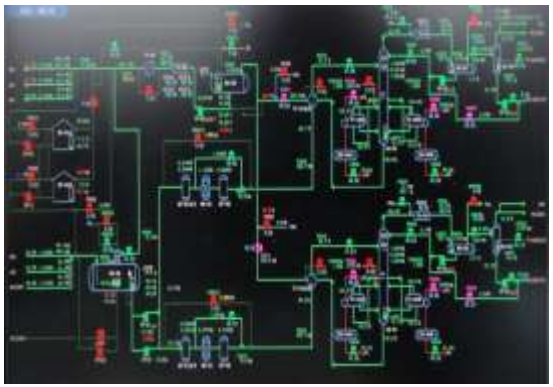
$$F2e_2^{+3}O_3^{-2} + \left(\begin{matrix}-C-\\|\end{matrix}\right)_n = O_n \rightarrow Fe^{+2}O^{-2} + (CH_2)_m + H_2O$$

Residue Oil-emulsion

$$\text{Lipophilic : } R\text{-}(CH_2)_n\text{-}\overset{\overset{O}{\|}}{C}=O \text{ : Hydrophilic}$$

Actual Applications in refineries(HDO)& Cost Analysis





Optimizing Your Return:
The filter cleaning by fine chemicals

- ECOS-chemical uses an environmentally friendly cleaning formula that is pH balanced (pH:5)
- Improved filtering performance and unit efficiency
- Reduced filter purchase costs
- Zero damage to filters
- Tested and proven results
- A formula so safe, it can be used in food prep facilities

Amine Flow Rate	Train	Filter /Housing	Exchange period	Remarks
250M3/Hr	#01	44ea/A	1~2times/month	Replacement time is depending on the operating conditions - Size L-74cm,OD-16cm - Pore size:25um
		44ea/S	1~2times/month	
250M3/Hr	#02	44ea/A	1~2times/month	
		44ea/S	1~2times/month	
Total: 500M3/Hr	2 train	176EA	4tims/month	2,112ea/year

Cleaning Tank Volume	Chemical using concentrations	Chemical Usage	Number of Filters	Chemical usage (kg/filter)	Chemical cost
1.3L*1.3W*1.0H= 1.7M3	7.0wt%	120kg	49ea	2.5kg/filter	

Filter Purchase amount	3M Filter Price/EA	Purchase costs/year	S Product Filter Price	Purchase costs/year	
2,112ea/year	US$ 400	US$ 844,800	About US$ 200	US$ 422,400	

Filter Price	Cleaning Chemical Cost per 1 filter	Remarks
US$ 400 (3M)	US$ 10/kg = US$ 25	Recycled cost with 10% to 20% of the filter price (The chemical is calculated by User Estimated price)
US$ 200 (S product)	US$ 10/kg = US$ 25	

Various types of filters used in the refinery

Pleated Filter

> Typical Applications

Refinery (Amine, Final Product…)

▲ 3M products

▲ "S" products

▲ "C" products

▲ "??" products

Introduction of 3M Filters

http://solutions.3m.com/wps/portal/3M/en_US/High-Flow/Filtration-System/

> Typical Applications

Refinery (Amine, Final Product…)

3M High Flow Filters
3M High Flow Filters are designed with state-of-the-art technology to optimize both performance and effluent quality.
Patented design allows tighter packing of usable filter media into each cartridge, resulting in an exceptionally high usable filtering surface area.
Blown microfibers feature absolute-rated particle retention characteristics.
Unique embossing process produces a more uniform pleat pattern that evenly distributes fluid through the entire structure, maximizing filter efficiency.
All-polypropylene construction is compatible with a wide range of fluids and compliant with 21 CFR.

Patented Compound Radial Pleat Design maximizes usable media surface area.

3" core allows up to 500 gpm through a single filter element.

Ergonomically designed handle facilitates fast and easy insertion and removal without special tools.

3M Purification recently launched new versions of the High Flow and 740 Series filter cartridges for use in process fluid applications containing organic and/or biological contaminants. The new products utilize a 3M polypropylene microfiber media designed to prevent premature blinding of the filter's outer surface, promoting fuller utilization of the media and resulting in an optimum combination of particle removal efficiency and contaminant holding capability.

3M-Series-740B30-Cartridges-L.pdf