

CASE STUDY

Overview This case study is reflecting a successful retrofit of an amine filtration system for one of Saudi Aramco's Gas Plants. The plant was originally designed as a gas collection & compression center to process trapped gas from the oil field, but it has become one of the centerpieces of Saudi's Master Gas System. The plant was one of the first five major gas treatment plants. Later it has been expanded to maintain a steady supply to the Jubail Industrial Complex. Royal Dahlman has performed an analysis of the installed two pre-coat filtration units in a DEA loop which each treat 10% slipstream of the amine loop. Each filter was equipped with 48 metallic plate and frames. As Royal Dahlman has gained a lot of field experience from the filtration systems which we have supplied to gas treatment plants all over the world, we were able to quickly and accurately identify the root cause of the problem after we have performed on site pilot testing.

Operational constraints The subject gas plant was suffering from a high solids content in the amine system causing plugging of expander tubes, strippers, absorber trays and piping. The aim of Royal Dahlman's involvement in problem solving was to lower the plant's operational filtration costs and significantly lower the total solids count in the amine system. Before the retrofit of the system, operator personnel were required to carry 7 bags of pre-coat 10 meter upstairs to add this into the mixer. This could potentially cause personal injuries. The existing pre-coat plate and frame type filters were not performing well and as a result the excessive solids contamination was causing major fouling of the cooler tubes as shown in Picture 1. This severely impacted the heat transfer and capacity of the plant. On Picture 2 the fouled plate and frames (internals of the pre-coat filter with the metallic mesh filters) are shown. The plates were found to be plugged for at least 25% of their total surface area with pre-coat material. This was causing lower throughput over the filters and a rapidly increasing pressure drop. As a result, high TSS contaminants in the DEA caused corrosion, erosion, wear and tear of process equipment in the plant. Overall the plant was suffering from bad performance, partly caused by the malfunctioning filters.

RETROFIT
OF AN AMINE FILTER

Picture 1: Fouling of cooler tubes



Picture 2: Plate & Frames partly "plugged" with pre-coat

The improvement After the investigation of these operational problems Royal Dahlman designed and proposed a "new", and improved, filter system that could be installed directly into the existing pre-coat filter, with no welding required to the existing vessel. The Royal Dahlman cartridge filters had demonstrated to be able to reduce the TSS level significantly.

As a result, it was concluded that retrofitting the pre-coat filter to make use of the Royal Dahlman High Flow High Solids cartridge filter system was a sound technological and commercial improvement, please refer to Picture 3, to see how the unit was retrofitted. With this retrofit, equipment reliability

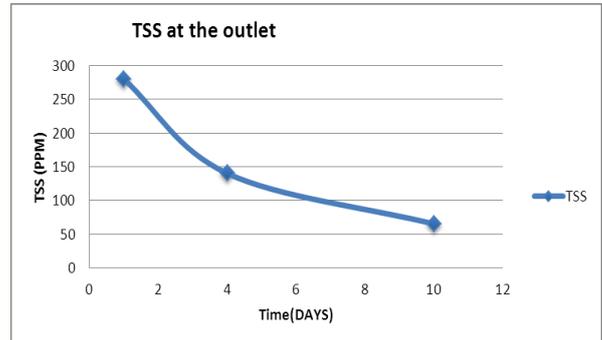
Reduction of maintenance and operating costs The pre-coat system required the operation of mixers and slurry pumps. Also it required a large quantity (7000 gallons) of demineralized water for each filter cycle (approximately every two months).



Picture 3: Retrofitted pre-coat filter to cartridges

The operation of one pre-coat filter required roughly 6-10 hours of slurry preparation for each filtration cycle. After the retrofit, the use of mixers, pumps (and related maintenance), demineralized water and related costs have been eliminated. The operator involvement (for replacing the filter cartridges) has been reduced to a mere 2 hours, instead of the previously required 6-10 hours.

DEA quality The quality of DEA (such as TSS, color, etc.) became excellent after the cartridge filters were installed. This further improved and extended the life and usability of the DEA while improving the absorption capacity of acid gases due to the highly pure solution. As a result, the filter lifetime of the filter cartridges further improved. Below you can see two different samples of the amine. The sample on the left was taken from the outlet of the pre-coat filter and on the right the amine from the outlet of the cartridge filter. Their differences speak volumes.



Above you see the graph of the DEA quality showing the TSS value after starting the cartridge filter system. During the operation of the pre-coat system, TSS values continuously spiked above 250ppm. Note that due to the large volume of particles still remaining within the system, element change-out was carried out twice within the first month. With each change-out of the elements, over 100kg of solids has been removed from the system.

Conclusion Based on an old family business founded in 1886, Royal Dahlman has grown to be a major supplier of all kinds of filtration systems and products. At Royal Dahlman we combine transparent business values with hi-tech solutions which can then be realized in our modern production facilities.

An important aspect of our business is our dedication in finding technical solutions and not pushing a particular product range. This gives us an unique edge in the market place since Royal Dahlman is not tied to using any particular system or method. We are able to choose the best and most appropriate technology and then design and manufacture the most favorable solution.

In this particular case we have found a low Capex technological sound solution to solve the customers problem.

Our commitment to finding solutions does not stop when the system is delivered. As a long established company our aim is to build-up long term relationships with our clients, based on trust and our reputation for delivering quality and value for money.