Water Technologies & Solutions
case study

fouling prevention for styrene plant vent gas compressor

Styrex* chemistry triples compressor run length (18 months)

The gas feed to the vent gas compressor originates from non-condensable gases from the crude styrene accumulator. This gas primarily contains methane, hydrogen, water vapor, carbon dioxide, and small amounts of styrene. The amount of styrene in the vent gas will depend upon the cooling efficiency of the crude styrene condensers.

The primary foulant in the system is polystyrene resulting from the heat of compression. The polystyrene deposition can occur in the compressor itself or in the downstream after-coolers.

Most styrene producers inject ethylbenzene into the gas feed to the compressor to minimize fouling. Ethylbenzene acts as a wash oil to dissolve polymers in the compressor and in the aftercoolers. In a lot of plants ethylbenzene injection alone is not sufficient to completely control fouling.

As the compressor and/or after-cooler start fouling, gas throughput will be reduced, and will cause a reduction in styrene unit throughput if allowed to go unchecked. In case of severe fouling the plant will have to be shut down for cleaning.

Fouling control can be improved by injecting an antifoulant (free radical inhibitor) into the gas feed to the compressor. Free radical inhibitors will reduce the cause of fouling by inhibiting the initiation and propagation steps of styrene polymerization.

challenge

A West-European styrene producer experienced vent gas compressor fouling. Water was injected into the compressor to reduce the discharge temperature. In addition, ethylbenzene was used as wash oil for the compressor. The fouling rate depended on throughput and temperature, high in summer period, and resulted in two production stops for compressor cleaning per year.

solution

SUEZ proposed a treatment based on Styrex chemistry in order to minimize the compressor fouling. The chemical was dosed into the ethylbenzene wash oil, at a dose rate depending on throughput and temperature. In practice, the dose rate varied between 100 – 250 ppm. Treatment monitoring was done by MRA/SPC evaluation of the delta-P evolution.

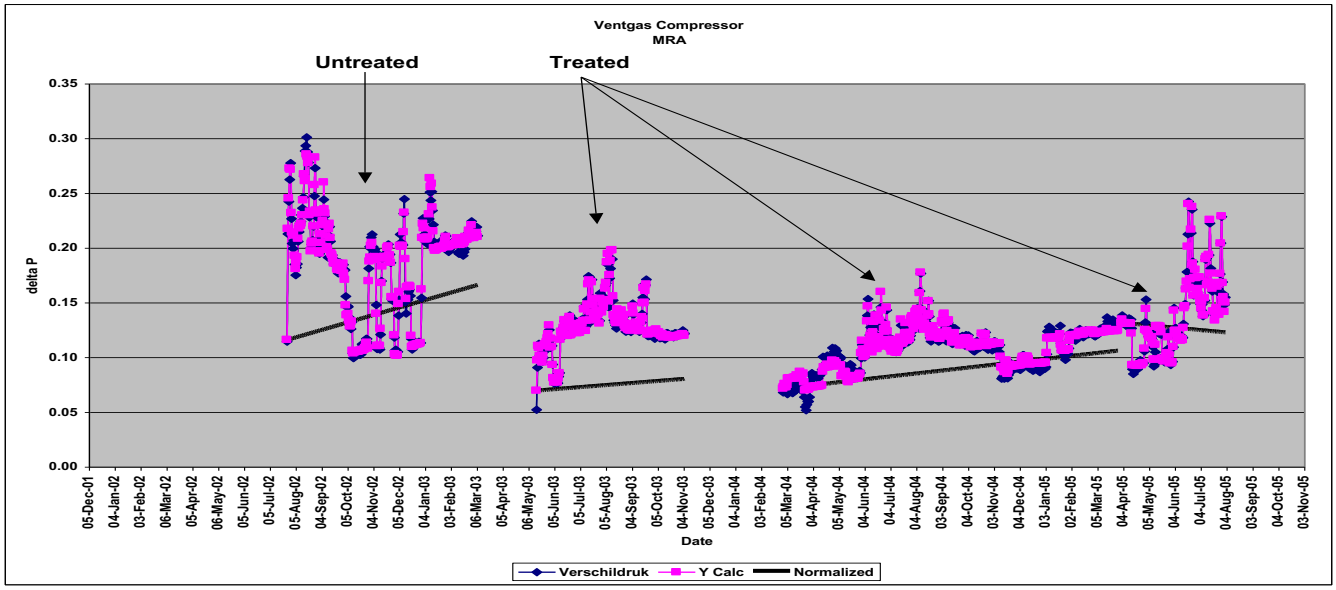
results

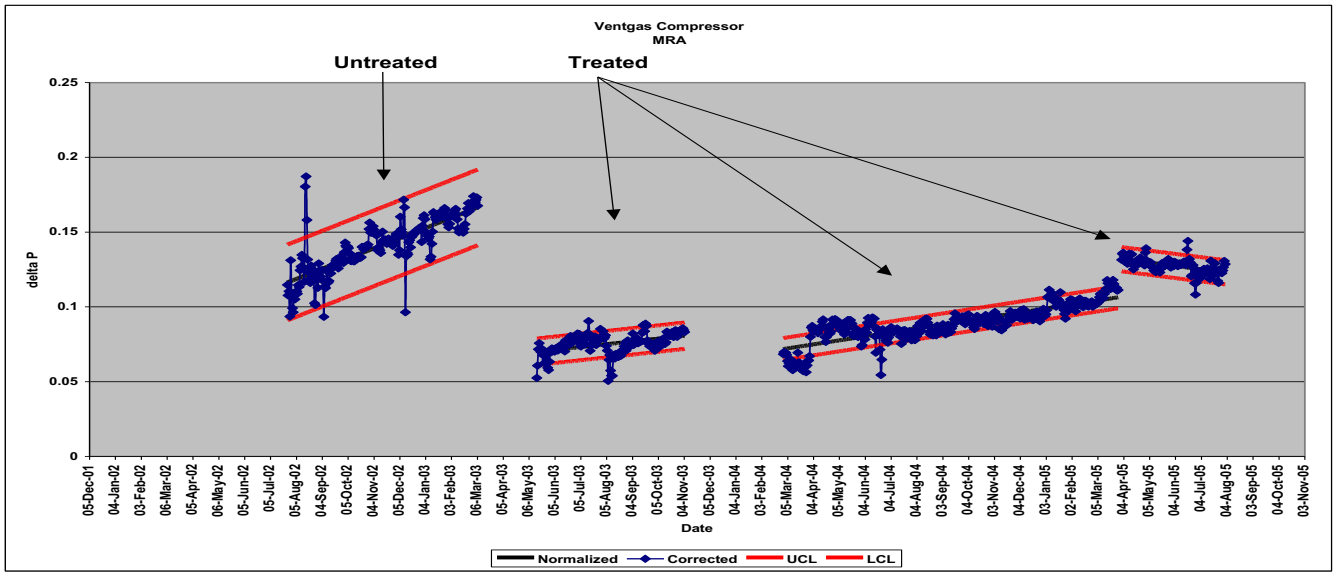
The treatment target was set at a run length of 18 months, which was achieved. The pressure drop increase was very small and at the turnaround the compressor showed to be very clean.

All this resulted in a very happy styrene producer.

Find a contact near you by visiting www.suezwatertechnologies.com and clicking on "Contact Us."

E-CHhpVentGasCompressor_EN.docx Nov-12


Ventgas Compressor
MRA
Untreated
Treated
delta P
Date
Verschildruk
Y Calc
Normalized


Ventgas Compressor
MRA
Untreated
Treated
delta P
Date
Normalized
Corrected
UCL
LCL