

Case Study 9

Dry Gas Mole Sieve Bed Dust Filter

Background

A large natural gas processing complex operates (6) cryogenic trains to refine natural gas to meet pipeline quality. A critical part of the process is the use of molecular sieve beds to dehydrate the gas so that it is free of any water. Molecular sieve is dry, solid microporous desiccant, in bead form, that can selectively adsorb water at the molecular level out of the gas rendering the gas very dry. Bulk molecular sieve beads are brittle and prone to fragmentation during handling. Migrant fragments from the bed must be removed to protect critical equipment and processes downstream. Operations from this gas processing facility contacted Northeast Filter with reports of contamination issues with heat exchangers and reboiler fuel gas nozzles clogging downstream of their dehydration skid and unsatisfactory gas quality. This facility had worked with NFC in the past and asked if our VAS group could investigate the problem.

Solution

Upon arrival we were informed that the current dust filter after the mole sieve bed is rated for $1\mu\text{M}$, so they assumed the problem was somewhere after the dust filter. We first installed a temporary test filter immediately downstream of the mole sieve bed to see what the gas quality looked like at that point. Particle size distribution analysis of the captured particles indicated that 70% of the particles captured were between $5\mu\text{M}$ and $15\mu\text{M}$ in size. Particle characterization analysis indicated that the particles captured were very fine molecular sieve dust fragments. We then performed an autopsy on one of the current spent filter elements to determine if it was either a seal integrity or media efficiency issue. Significant particles were observed on the downstream side of the media clearly indicating it was an efficiency issue. NFC offered a replacement element with much higher retention efficiency and they were evaluated on (2) trains. The contamination failures on those trains were eliminated so the plant converted the other (4) trains accordingly. There has been no reported contaminations since the conversion.

