

# Case Study 15

## Steel Mill Coke Gas Desulfurization Filtration Upgrade

### Background

A coke plant is an integral part of the steel making process and coke is the most important ingredient consumed in the blast furnace. Coke is produced by carbonization of coal in a series of high temperature ovens that form the coke battery. During the coke making process, a complex mix of volatile chemicals (Tar, Hydrogen, Methane, BTX, Naphthalene, Ammonia, H<sub>2</sub>S, Hydrogen Cyanide and more) vaporize to form raw coke gas. After cooling and separating the liquid condensate from the gas stream, the remaining coke gas undergoes desulfurization for hydrogen sulfide removal to meet environmental requirements. Once treated, it can be used as fuel gas for the coke battery, blast furnace and other heat driven steel making processes. During this process, a liquid solvent solution is used to extract the hydrogen sulfide from the gas and then recycled through a stripper. Depending on the process this solvent is typically filtered to protect heat exchangers and process equipment. Northeast Filter was invited to evaluate a large steel producers coke gas desulphurization process to provide options for improving the filtration performance of their extraction solution filters to eliminate contamination bypass and reduce maintenance.

### Solution

To better understand their issues we witnessed a filter change. The current filter design was a very tall, vertically oriented filter housing that required a platform to access the elements. The elements were depth type, very long DOE style with no gaskets. Upon opening the filter closure, the elements were not immediately visible as the vessel appeared to be packed full of solid particles with only the upper portion of the top seal springs visible. The operator performed an arduous task of removing the springs and rocking the elements to loosen them enough to be removed by a lift hoist. Autopsy of the elements indicated they were all surface loading with bypass occurring at the bottom seal. Our mission was now clear: Improve seal integrity & operator ergonomics. We provided a horizontal rental filter with pleated, O-ring sealed elements. The new design was a great improvement with change out time reduced by 75% and elimination of contamination bypass. The rental filter is still there except now they own it!



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