

BTEX Removal From Natural Gas:

Executive Summary

BTEX (benzene, toluene, ethylbenzene, and xylene) is present in natural gas streams and is being picked up in amine and glycol dehydration units, being present in the exit CO₂ and Water streams. As a result, incineration temperatures need to be increased and hence the cost of compliance with EPA emission limits (25 Tons/year) is large. Specifically, in the presence of BTEX the appropriate temperature is 1500 °F, whereas when other organics (like methane) are present one can incinerate at 1350 °F.

In order to cut down the cost of incineration, the removal of BTEX from various streams in the amine unit was researched. Different removal techniques such as minimizing absorption in the amine unit, removing in the amine unit, and removing prior to the amine treatment were researched. The best technique from an economic standpoint was the use of adsorbents in the acid gas stream. This was determined by comparing its cost with the savings produced by reducing the incineration temperature.

Adsorbents with the largest adsorption cost to extra incineration cost ratio were silica aerogels (SAG) and macroporous resins (ionic resins). The aerogels were able to remove 8 ppmv of BTEX in a 575 MMSCFD stream of natural gas from the acid gas stream saving \$100,000 when comparing the economics of removal with that of incineration. This was achieved by reducing the buying price of SAG from \$37/kg to \$34/kg at 14 cycles. Similar savings were found for ionic resins used in the acid gas stream by reducing the price of the resins from \$43/kg to \$35/kg. Both of these reductions could be achievable with long-term contracts with Cabot and Dow respectively. If the number of cycles is larger, then savings will further increase.