

REGENERATION AND REUSE OF SORBENT MEDIA

Upon exhaustion, the adsorbent media is taken out of the unit and transported to the central regeneration facility at Maslandpur, N. 24 parganas, West Bengal, India for regeneration of sorbent and further reuse. An easy-to-operate stainless steel batch reactor is employed for regeneration. The following picture shows the regeneration facility at Maslandpur.

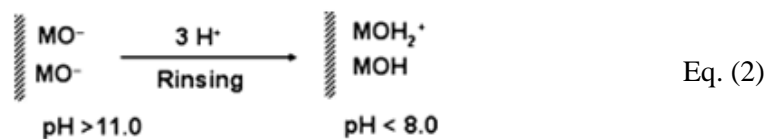


The primary reactions during regeneration of exhausted adsorbent with 2% NaOH and rinsing with dilute HCl are represented below (Eq. 1-2) where “M” represents Al(III) or Fe(III) in AA and HAIX respectively.

Arsenic desorption:

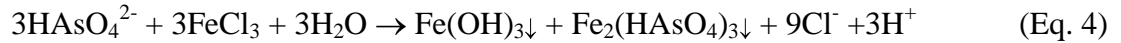
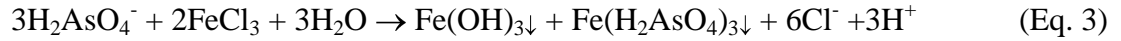


Restoration of sorption sites:



At high alkaline pH surface hydroxyl groups get deprotonated, become negatively charged, thus causing efficient desorption of negatively charged arsenic species. Subsequent rinsing with dilute acid allows formation of protonated surface hydroxyl groups and adsorbent media once again ready for further arsenic removal. Dissolved arsenic in spent caustic regenerant typically varies from 200 – 500 mg/L and arsenic is solely present as arsenate As(V). This highly concentrated

arsenic solution need to be treated further for safe disposal. Chemical precipitation process with the aid of ferric chloride (FeCl₃) is employed for removal of arsenic from the regenerant solution. The ability to chemically precipitate arsenic from concentrated arsenic solution is already established and available in open literature. The governing reactions of such a procedure describe the co-precipitation of ferric hydroxide, monovalent ferric arsenate, and divalent ferric arsenate.



Equations 3-4 demonstrate the dependence of the precipitation reaction on both pH and ferric ion concentration. Addition of Fe(III) chloride in waste regenerant and subsequent adjustment of pH between 6.5 and 7.0 prompt precipitation of arsenic and residual dissolved arsenic concentration quickly drops to less than 200 µg/L. The entire amount of arsenic virtually transferred into the solid phase along with the ferric hydroxide precipitate. The process of regeneration essentially reduces volume of disposable arsenic-laden solids by nearly 2 orders of magnitude.