## Question 97: What technologies and adsorbents are you using for net hydrogen off gas chloride traps and what operating problems have you experienced? What are the criteria for changing out the adsorbents and how often are the beds changed?

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There are various adsorbents available for effective chloride treating of the hydrogen-rich net gas stream, including activated aluminas, promoted aluminas, and zeolites. Valero has moved away from the alumina products towards a best practice of using the zeolite products, not only for reasons of cost per quantity of chloride removed, but also for ease of changeout and completeness of chloride removal. The alumina products can present certain operating issues, such as:

- Green oil or red oil formation, which fouls downstream compressors, fuel gas system piping and burner tips
- Organic chloride breakthrough, which occurs long before HCl breakthrough, yet is difficult to detect
- Powdering of the adsorbent (disintegration), which can lead to significant compressor reliability and maintenance
- Hydrocarbon freeing requires an extended hot nitrogen strip, as steam out will leach chlorides from the bed, potentially causing corrosion in associated piping

The zeolite products generally do not form the green or red oils associated with polymerization reactions due to acid activity, and can be steamed out without leaching chlorides, which results in faster bed change-out. They are also more effective at removing both organic and inorganic chlorides, whereas the alumina beds pick up primarily inorganic HCl, while forming organic chlorides as the adsorbent chloride loading increases.

Adsorbent change-out timing is best estimated using a chloride uptake calculation, verifying the inlet gas HCl content on a daily basis, and with the gas rate, maintaining a running estimate of the total chloride loaded on the bed. When that estimated level reaches ~90% of the represented saturation capacity of the adsorbent. Since organic chlorides are present, yet are extremely difficult to measure, the uptake calculation is only an estimate. A cross-check of the estimated chloride loading at change-out with samples at different levels of the adsorbent bed can provide feedback as to the ratio of organic:inorganic species in the feed gas, which can be used to adjust the uptake calculation for future treater load

Tags

Compressors

Corrosion

Hydrogen

Process

Reactor Vessel

Year

2008

Submitter

Operator