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## Question 4: What are your best practices for controlling caustic strength in an isomerization unit scrubber? How frequently is the caustic refreshed?

### DAVINDER MITTAL (HPCL Mittal Energy)

There are some other related important factors for controlling and maintaining caustic strength like:

- PERC injection in feed
- Wash water tray integrity
- Stabilizer off gas quality
- Scrubber skimming
- Operational load
- Quality of packing
- Contaminants
- Fresh caustic batch preparation and analysis

**PERC Injection in feed:** It is quite important to optimize PERC injection in feed as guided by technology supplier as otherwise the HCl concentration in off gas can go too high (normal range 1500 - 2500 ppm). This will lead to rapid depletion of caustic strength due to neutralization effect, thereby requiring frequent fresh caustic make-up.

**Wash water tray integrity:** The wash water tray in scrubber column also significantly impacts caustic strength in the column. If the tray is heavily leaking due to mal-operation or mechanical fault, the water leakage from the tray to scrubber bottom will lead to loss of caustic strength very rapidly (due to dilution), requiring frequent caustic make-up. Hence, it's important to ensure on regular basis that that scrubber chimney tray is operating well and is leak proof.

**Stabilizer Off gas quality:** The hard re-boiling stabilizer can lead to slip of higher hydrocarbons (C5+) in off gas leading to some condensation despite higher caustic temperature. This may lead to foaming and loss of caustic along with off gas.

**Scrubber skimming:** The scrubber bottom skimming on regular basis will remove top caustic layer laden with some light oil and avoid foaming and loss of caustic due to entrainment. This will be reflected in high pressure drop across scrubber and increase of pH of wash water (> 8.5). The impact can be minimized by regular skimming at least once a week.

**Scrubber gas/liquid load:** The actual gas/liquid load if higher than hydraulic capability of scrubber, will lead to loss of caustic due to entrainment and will be reflected in high pressure drop across scrubber and increase of pH of wash water (> 8.5).

**Scrubber internal condition:** The poor quality of raschig rings due to too high ash content (Ash: 0.5% max, Carbon: 99.5% min, mechanical strength > 650 Kg/m<sup>2</sup>) and dilution of ashes in presence of caustic may lead to damage of carbon raschig rings resulting in high pressure drop across scrubber and loss of

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caustic due to entrainment.

**Contaminants:** Normally, aqueous caustic do not possess any contaminants that impacts ISOM scrubber operation. However, if the caustic is already polluted with acidic components (such as H<sub>2</sub>S or HCl), it will have detrimental impact on alkalinity of the caustic solution. This shall impact overall neutralization effect of the caustic solution during normal operation and reduction in caustic strength will be observed more frequently requiring fresh caustic make-ups.

It is quite important to follow fresh caustic strength and develop necessary guidelines for preparing batch to avoid over dilution or higher strength than required. We are following UOP-209 method for caustic strength analysis.

During changeover of caustic, it is important to perform detection tube analysis for HCl at top of scrubber (normally less than 0.1 ppmv) at the beginning to ensure no HCl slippage.

**RICK DENNE (Norton Engineering Consultants, Inc.)**

Tight control and monitoring of the chloride injection is key to scrubber performance. The dosing should be monitored and recorded by both the draw-down glass on each operating shift and by tank level on a weekly basis the unit engineer. Over-injecting of chloride will result in faster caustic spending. The scrubber's outlet gas stream should be monitored and recorded for HCL content via a hand detection tube each operating shift as well.

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