Question 81: Refiners operating FCCUs producing high levels of propylene have seen different or excessive product contaminants when compared to a less severe operation. In your experience, how has this impacted gasoline or LPG treating unit? What specific contaminants have you identified? What impact have you seen in amine color, consumption, or foaming tendency? What actions have you taken that have mitigated or prevented treating unit issues?

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The answer to this question depends on what is considered high levels of propylene and what is the method to achieve it. If the additional propylene is produced by the addition of ZSM-5 to a standard operation, then I would not expect to see additional effects of contaminants. However, if the propylene production is increased through higher severity, ROT, bottoms cracking, etc., then there will be additional contaminant issues.

At Shaw, we have had several recent designs with the goal to maximize production of propylene. The highest level of polymer grade propylene (PGP) is achieved using the Shaw DCC process. This process uses high reactor temperature & post-riser bed cracking to complete conversion of naphtha to LPG. Selectivity is maintained by minimizing hydrocarbon partial pressure.

Butadiene contamination may be more pronounced at the higher reaction severity. Special attention to reboiler design is important in mitigating issues of reboiler fouling. Note that downstream C4 Alkylation feed may contain oxygenates such as acetone as well as higher butadienes.

Impact on gasoline treating

Hydrotreated feed gives low RSH in gasoline. Di-olefins are slightly higher but can be handled using standard antioxidant chemical injection. Special attention to reboiler design is important in mitigating issues of reboiler fouling. Note DCC technology includes non-HT feeds as well. Several DCC units have operated more than 12 years on non-hydrotreated feedstocks, using only chemical additives to suppress gum formation.

Impact on LPG treating

There are no particular issues in LPG treating. Standard amines have been successful in over 12 years on DCC operation. There is no foaming or degradation of amine, requiring special attention. Note that normal operating procedures keep the amine clean by filtering and carbon adsorption. Reasonable acid gas loadings on the rich amine prevent corrosion in the system. In the referenced DCC unit, DEA was used as the amine, since CO2 rejection was important to off gas treating for ethylene recovery.

RSH extraction from LPG by regenerable caustic has also been successful in 12+ year's operation.

Other specific contaminants include methanol and acetaldehyde. Trace methanol is easily removed from C3 stream using a regenerable adsorbent bed. Note that some crudes contain trace arsine or mercury. These can be removed with non-regenerable adsorbent beds.

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