Question 56: Excluding nickel passivation. How does antimony use in the reactor riser impact the FCC operations and equipment?

MINAZ MAKHANIA (UOP)

The following antimony impacts are expected on FCC operation and equipment:

a) Excessive Antimony can end up in main column bottoms slurry is known to increase fouling of the slurry circuit exchangers. It is recommended to monitor the Sb content in the MCB product on routine basis. The injection rate should be reviewed if the Sb content in the MCB product is more than 5 ppm. Increased fouling is reported in the MCB circuit with Sb concentration in slurry as low as 20 ppm.

b) Antimony has tendency to agglomerate on metal surfaces exposed to Ecat flow, i.e. slide valves and flapper valve bushings. Some refineries have reported sticky slide valves after injection of antimony began.

c) There are recent reports of antimony deposits causing fouling of slurry filters as well.

d) Antimony trioxide is classified as an A2 suspected Carcinogen. i.e. adequate data exists that it causes cancer in laboratory animals, but insufficient evidence is available to prove that it can cause cancer in humans. The use of antimony Pentoxide is considered safe and should be used in place of antimony trioxide-based compounds. The exposure of personnel to antimony laden Ecat at turnarounds is expected to be a concern and it is recommended to stop the use of antimony at least 2 weeks before a turnaround. Also use of a dust mask will help to alleviate this concern.

TIFFANY CLARK (BASF)

A typical initial target for Sb/Ni ratio on your ECAT is 0.3. This number is adjusted based on the lay down efficiency of the Sb in the catalyst and the effect of Sb on the gas make. A typical recommended Sb/Ni ratio on your ECAT can range from 0.25-0.45.

Antimony functions by attaching to a fresh Nickel molecule in the FCC feed and preventing it from laying down on the surface of the catalyst. Efficiency of antimony in passivating Nickel and tendency to have side effects is highly dependent on the carrier and distribution method. Antimony can be water based or oil based, with oil-based antimony having a higher lay down efficiency (approx. 85% typical) as compared to water based (approx. 65%).

Impacts can be different depending on what type of antimony you are using. For this reason, it is recommended that an antimony balance be performed regularly to determine how much is remaining behind in the reactor or potentially leaving the unit with slurry. Antimony also has the potential to impact the efficiency of CO promoter and result in elevated NOx emissions or elevated CO promoter additions.

DENNIS HAYNES (Nalco Champion)

The positive impacts of antimony use in nickel passivation have been well documented. Another impact of antimony application in FCC units (adverse impact) is that antimony application is known to reduce the effectiveness of CO promoter chemistries. For units that use CO promoter additives, during application of antimony for nickel passivation, the amount of CO promoter additive required may increase.

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