Question 8: Fixed bed reforming and CCR reforming recycle gas compressor washing to remove salt deposits. What is the frequency? What is the typical deposit composition? What is used to wash the compressor?

LANCE TALLMAN (CITGO Petroleum)

Fixed Bed Reforming

The recycle compressor is water washed at every catalyst regeneration (typically once per year) after the chlorination step. In addition, if there is any extended outage for mechanical work, the compressor will be water washed anytime there is an opportunity to do so as precaution. Steam condensate is used as the source of water. The deposits are mostly ammonium chlorides and are readily removed by a hot condensate wash. On a rare occasion, if the compressor develops a high vibration, there could be a need to perform a compressor wash.

CHRISTIAN ARNOUX (Valero)

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- Nitrogen from the NHT causes ammonium chloride salt build up in cold areas of Reforming units
- Intermittent water washing can be done, but water is a Reforming catalyst poison and must be minimized
- Compressor washing during T/A is a good practice
- Bar-ing (or rotating) the recycle compressor during T/A is a good practice

RUSS WILTSE (UOP)

During normal operation of a Fixed Bed Reforming Unit the Recycle Gas Compressor internals may become coated with a fine powder like deposit. This material is expected to mostly be ammonium chloride salts which are a by-product of having some organic nitrogen compounds in the Reforming Unit feed. These organic nitrogen compounds will breakdown across the catalyst bed and form ammonia. This ammonia can combine with the trace HCl in the recycle gas to from ammonium chloride salts which can deposit in low temperature sections of the unit. These areas may include the Combined Feed Exchanger, Product Condenser, Stabilizer Column, and the Recycle Gas Compressor. These ammonium chloride salts are water soluble and as such can be removed with a water wash.

UOP recommends washing the recycle compressor during each regeneration before starting the carbon burn. The wash is recommended before the carbon burn to reduce the risk of compressor vibrations and corrosion. During carbon burn the regeneration gas will be wet and it is possible to have some of these deposits spall off the rotor. This could cause balance problems that would result in high compressor vibrations. There is also a concern for under-deposit corrosion if these salts adsorb moisture from the wet regeneration gas.

UOP has observed refiners using a range of different solutions to water wash Recycle Gas Compressors. These mixtures are typically comprised of a basic solution with non-sudsing detergent. UOP typically recommends ~2% soda ash solution with 0.1-0.3% non-sudsing detergent such as Calgon, Cascade, tri-potassium phosphate, etc. It is important to discuss these chemicals and the wash procedure with the compressor vendor to ensure the wash will not cause unexpected harm to the compressor. For example, high concentrations of carbonate may damage aluminum components in the compressor. After the salts have been removed the compressor should be flushed with clean water and treated with a corrosion inhibitor.

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