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Refinery Case History

Decontamination of HF Alkylation Units

EnvTech Inc. has developed a state-of-the-art cleaning process for HF Alkylation Units. Most chemical cleaning contractors rely on a three phase procedure using an acid for polymer and scale removal. Some utilize an ammoniated chelation process that has a low pH step as the initial phase. The best way to demonstrate the advantages of EnvTech's single phase cleaning and neutralization process is by comparing it with these alternative techniques.

Inhibited HCL, Sulfuric Acid and Ammoniated Citrate

The problems associated with these processes include:

- **Excessive Corrosion** - Corrosion inhibitors are inhibitors not preventers. Inhibitors slow down the corrosion rate of hydrochloric acid on carbon steel, but high temperatures, high liquid velocities, high iron levels and particularly HF concentrations above 0.25% compromise the inhibition performance. EPRI (Electric Power Research Institute) developed guidelines for the boiler industry regarding the use of HF for silica removal. They determined that the maximum level of HF present in the cleaning solution should be 0.25%. The HF is not inhibited nearly as effectively as the HCl. Temperature becomes a factor since polymer removal does not effectively occur at temperatures below 180° F while inhibition benefits begin to diminish above 140° F.
- **Unnecessary Exposure of Personnel & Equipment** - Exposure to the problems associated with hot acid solutions, particularly those containing levels of HF is unnecessary because EnvTech has developed a widely tested and proven non-acidic method.
- **Excessive Time Loss** - Acid cleanings require that both phases (acid phase and neutralization phase) be rinsed thoroughly. This results in more than doubling the amount of downtime necessary to effectively clean & neutralize a system.
- **Excessive Waste Water Generation** - Acid cleanings generate more than twice the volume of waste water and the acid phase needs to be neutralized once it has been drained from the system.
- **Increased Risk To Personnel and Equipment** - Even after the system has been cleaned the complex nature of piping systems containing numerous "dead legs" invariably traps acid solution containing some level of un-neutralized HF in the system.
- **The use of ammonia creates unnecessary personnel risks as well as significant challenges for the refinery's waste water system.**

Refinery Case History Continued

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The EnvTech Difference

The Benefits of ETI Cleaning & Gas Freeing Solution

- EnvTech's proprietary "Clean & Gas-Free" process utilizes a strong 8.8 pH buffer. As a result, neutralization is effected immediately upon contact during the initial phase of the cleaning. In addition, "dead legs" filled with acid are avoided since the solution that fills them is buffered. **Unnecessary corrosion is eliminated because the water that is introduced to the system is buffered. Personnel are not exposed to the risks associated with circulation of hot acid solutions containing levels of HF.**
- EnvTech's proprietary chelant is utilized to create a "single phase" removal of Iron Fluoride deposits in combination with the neutralization chemistry. This mixture has proven excellent for polymer removal and can be heated to as much as 100° C without adverse effects.
- The EnvTech chemistry can, in most locations, be drained directly to the refinery's waste water system. Where fluoride levels present a concern, EnvTech has developed a procedure for reducing the concentration to below 50 ppm.
- This single phase method reduces the duration of the cleaning and neutralization of an entire Alkylation unit to **under 48 hours** and in some cases to 24 hours. This single benefit often encourages many turnaround management teams to utilize the EnvTech Difference.
- EnvTech has demonstrated the effectiveness and reliability of this process throughout the world. Due to the number of HF projects performed, the skill level and experience of ETI personnel is unmatched.
- EnvTech engineers work closely with the refinery's HF Alky team to develop a detailed procedure that ensures all aspects of the system are neutralized in order to avoid leaving any pockets of HF for mechanical teams to discover. In addition, EnvTech is able to offer many cost cutting suggestions. Good planning and detailed discussions involving the EnvTech engineering team early on, create an excellent synergy and worthwhile results.

References available upon request

