Managing Corrosion in your atmospheric crude and vacuum distillation units is key to unlocking the full potential of your refinery

The ability to process a wider range of crude feedstock is the single most important factor in securing future refining margins:

- Lower cost and availability of high sulfur and TAN feedstock
- Ensuring availability when market conditions are good
- Ability to quickly adjust and adapt to new feedstock blends and product markets

Increasing plant availability and opportunity crude utilization of 1% can provide an estimated 10 cents/bbl. margin benefit, resulting in 3.65M$ annual profit for a 100k bbl./day refinery.*

*the values stated are estimates only. For a more detailed evaluation please contact your local Emerson representative.

The Crude Distillation Unit is the first major unit in the refinery. Therefore, it is the first processing unit to be exposed to hot crude oil feedstock and provides feedstock for all of the rest of the units in the refinery. Its purpose is to distill the crude feedstock into various fractions, according to their boiling point ranges. This will ensure that each of the downstream refinery units will have feedstocks that meet their specifications. Typical boiling point cuts from the atmospheric crude unit include gas, naphtha, gasoline, kerosene, diesel, heavy gas oil and residue that is fed to the Vacuum Crude Unit for further distillation and separation under vacuum.

Due to the large variations in operating temperatures and process fluids encountered in this processing unit, many forms of corrosion can take place in different areas of this process. A major focus is on naphthenic acid corrosion (localized corrosion) and high sulfur corrosion (sulphidation) that takes place in high-temperature parts of the process. Materials of construction in this process affect the refinery operating window, with respect to the crude diet that can be processed, throughput, etc. Corrosion is a challenge for the entire distillation process, but the risk is particularly elevated in the vacuum distillation process, since the corrosive components are often concentrated in the high-temperature residue flow from atmospheric distillation into this area. Another area of concern is in the atmospheric distillation overhead system (the top fraction off the distillation column), where steam condenses and causes dew point corrosion due to the local formation of hydrochloric acid.

COMPLEX CORROSION CHALLENGES

Multiple corrosion drivers:

- This is the first unit that sees the hot crude oil
- The distillation unit feeds the rest of the refinery – any outages or upsets affect the availability of the entire refinery
- Increasing chloride content due to poor desalter performance – particular affecting overhead system
- Frequent process changes – for example, to adjust fractionation output ratios
- Increasing sulfur content in the crude
- Increasing TAN from crude feed changes
- Concentration of problematic components through the process

CORROSION MITIGATION CHALLENGES

Chemical treatment optimization is challenging

- Undertreating means corrosion is not brought under control
- Overtreating can cause process problems
- Operators don’t have adequate visibility of how the mitigation strategy is performing
CORROSION MONITORING IN REFINERIES

REAL-TIME CORROSION MEASUREMENTS
Emerson offers the widest portfolio of best-in-class measurements to combat corrosion in refineries. Real-time corrosion measurements that provide greater insight into the performance of your atmospheric and vacuum distillation units are key to driving the refinery to its maximum capability. The Permasense non-intrusive ultrasonic wall thickness sensors measure plant integrity and the actual metal loss whilst the Roxar inline corrosion probes measure the process corrosivity. This means that the corrosion risk and impact of the risk on the asset itself can be measured and monitored. Combined with the Roxar FSM technology for area coverage and localized corrosion detection in specific high-risk areas, they deliver a complete insight into how the plant is coping with the corrosion demand placed upon it. Class-leading data visualization and analytics enable you to turn these insights into value-adding actions.

CONTROL OPTIMIZATION AND CORROSION MITIGATION
Verifying and optimizing your corrosion mitigation strategy is key to maintaining availability and performance of the crude unit. If using chemical treatments, controlling cost when adapting to an ever changing and increasingly aggressive crude feed blending strategy is enabled through online monitoring of inhibiting effectiveness. Whether you are simply trying to monitor the corrosion inhibitor effect in protecting your heat exchangers, or are trying to optimize an expensive high temperature naphthenic acid corrosion inhibitor treatment program for the entire unit, a balanced insight to both fluid corrosivity and wall thickness changes is needed.

MAXIMIZING IN SERVICE LIFE AND PROFITABILITY
Combining data from the wall thickness monitoring sensors and inline corrosion probes, leveraging wirelessHART data retrieval, delivers real time insights into the actual condition of strategic sections of the distillation units. This enables enhanced online decision making to safely maximize the performance and profitability of both the Atmospheric and Vacuum Crude Distillation Units.

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