A major US Gulf Coast refiner wanted to increase the amount of high acid crude processed to improve the refinery’s profitability. Typically, as crude oil TAN levels are increased, the risk profile for high-temperature naphthenic acid corrosion increases within the crude unit. Higher amounts of naphthenic acids can lead to higher rates of corrosion in the desalted crude oil, diesel, gas oil, and bottoms circuits—negatively impacting unit reliability and performance. The existing naphthenic acid corrosion program relied on a traditional industry-standard phosphorus-based inhibitor.

As TAN levels increased, the refiner became increasingly concerned about the growing amount of phosphorus in their gas oil circuits. Reactor bed data suggested that, as the dosage of the traditional inhibitor was increased to maintain acceptable corrosion control, the increased level of phosphorous in the gas oil was negatively impacting downstream catalyst activity. Since the refiner wanted to continue to process the discounted high acid crude, Baker Hughes, a GE company (BHGE), offered an alternative corrosion inhibitor solution with low-phosphorous concentrations.

First, the BHGE team conducted a SMARTGUARD™ naphthenic acid corrosion risk assessment study to understand the impact of the increased crude TAN on the crude unit’s corrosion potential. Then, based on those findings, the team implemented a new low-phosphorous SMARTGUARD naphthenic acid corrosion inhibitor program into the light vacuum gas oil (LVGO) and heavy gas oil (HVGO) circuits to provide corrosion protection for the high TAN circuits and reduce the impact of phosphorus on the downstream catalyst.

With the use of the BHGE SMARTGUARD naphthenic acid corrosion inhibitor, the customer was able to push gas oil TAN levels as high as 2.0 mg KOH/g, maintain corrosion rate KPI compliance of < 5 mpy, and reduce phosphorus levels by > 50%. This was a successful improvement over the industry standard product the refiner had previously used. In addition to demonstrating the ability to control corrosion with less phosphorus in the treated streams and achieve 100% KPI compliance, catalyst activity data showed marked improvement with the lower phosphorus levels from the SMARTGUARD low-phosphorus inhibitor.

Challenges
- Maintain 100% corrosion rate KPI compliance with HVGO TAN levels up to 2.0 mg KOH/g
- Reduce phosphorus levels in hydrocracker feed streams by a minimum of 50%

Results
- Achieved 100% corrosion rate KPI compliance of < 5 mpy with new inhibitor treatment
- Reduced phosphorus levels in treated streams by > 50%
- Reduced rate of catalyst activity loss in downstream reactor beds
These key performance indicators increased the customer’s confidence in their ability to push higher crude TAN without sacrificing asset reliability or reactor bed catalyst run length. The greater flexibility in crude diet translated into $150K USD of incremental profit per day realized by the refinery.

Contact BHGE to learn more about our low-phosphorous SMARTGUARD corrosion inhibition program and how you can improve the efficiency of your processing operations.

SMARTGUARD naphthenic acid corrosion inhibitor provided the required corrosion protection while minimizing the impact of phosphorus on the downstream catalyst.