NACE International
Standard Practice

Design, Fabrication, and Inspection of Tanks for the Storage of Petroleum Refining Alkylation Unit Spent Sulfuric Acid at Ambient Temperatures

Contents

Section 1: General

1.1 Spent sulfuric acid, generated by refinery alkylation units (spent acid), may differ from fresh sulfuric acid (fresh acid) in several ways. The most notable differences between alkylation unit fresh acid and spent acid are the acid concentration, water content, possible contaminants from the alkylation process, temperature of the spent acid entering the tank from the alkylation unit, and the presence of dissolved hydrocarbons and hydrogen. These differences must be taken into consideration when developing inspection strategies, setting inspection intervals, performing an external inspection, and internally inspecting a tank that is in spent sulfuric acid service. This standard was developed to address these differences between fresh acid and spent acid as they may have an impact on the integrity of spent sulfuric acid storage tanks.

1.2 NACE SP0294 shall be followed for all aspects of spent sulfuric acid storage not covered by this standard.

1.3 This standard presents additions to and deviations from NACE SP0294 that apply to alkylation unit spent sulfuric acid storage.

1.4 HF alkylation unit spent acid is not within the scope of this standard.

Section 2: Corrosion Concerns

2.1 See Paragraph 2.8 of NACE SP0294.

2.2 Upset Conditions

Owners/operators should be aware that alkylation unit upsets or operation outside the normal ranges of acid concentration, water content, contaminants, and temperature, as described in Paragraphs 2.3, 2.4, and 2.5, can be the primary cause of the corrosion concerns for alkylation unit spent sulfuric acid tanks. The owner/operator should have a method to identify these conditions and notify those involved with spent acid storage tank integrity in a timely manner.

2.3 Acid Concentration and Water Content

2.3.1 Spent acid is typically lower in sulfuric acid concentration (88 wt% to 90 wt%) than fresh acid (95 wt% to 99.5 wt%) and can contain more water and be more corrosive. Water in spent acid should be less than 5 wt% to avoid corrosion. Common corrosion rate references for sulfuric acid corrosion include the sulfuric acid isocorrosion curves and corrosion versus concentration curves for stagnant conditions and ambient temperature (see Figure 1). Caution should be taken when using these references to ensure that the appropriate acid concentration is used because water content can have a large impact on the effective acid concentration.

2.3.2 The effective acid concentration should be calculated in accordance with Equation (1). As an example, for a spent acid containing 89 wt% sulfuric acid, 4 wt% water, and 7 wt% organics, the effective acid concentration would be: