

Recommendation for Mixing Concentrated Acid in Large Diameter Pipelines -- Predilution



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Abstract:

Mixing concentrated sulfuric acid (93%-98%) to water or a wastewater pipeline is a common and cost effective method for managing the pH of the stream. When injecting sulfuric acid in a large diameter pipe, Komax has found that prediluting and mixing this acid in two stages provides many advantages over directly mixing the concentrated acid in the pipe.

Background:

Concentrated Sulfuric Acid has a specific gravity of 1.8 so it tends to migrate to the bottom of the mixer housing particularly at lower fluid velocities (i.e., less than 2 feet per second) which compounds the problem. Sulfuric acid has a viscosity similar to honey, and requires vigorous mixing to fully dissolve the acid in water. Additionally, there is a strong heat producing exothermic reaction that occurs during this dilution process. If water and concentrated acid are allowed to stagnate, high temperatures (over 350 °F) will occur, which can result in damage to the piping and injection system. Concentrated acid is not particularly corrosive. However, as the concentration decreases to 30%-50%, the acid becomes very reactive and will damage mixers that are constructed of Ductile Iron, Carbon Steel, or 316 Stainless Steel Static Mixer. The key to a long mixer life is to eliminate acid in the 30-50% strength concentration from

coming in contact with mixer components that are not fully compatible with the acid.



Solution: Pre-diluting concentrated Sulfuric Acid

By prediluting the concentrated acid through the use of an inexpensive “premixer” down to a safer 10% or 5% concentration, the mixer can be constructed of less costly material, and the life of the mixer will be extended for years.

An additional advantage is the larger volume of diluted acid solution will provide equal flow rates through each discharge orifice of the acid injector resulting in improved acid distribution. When injecting one to two gallons per hour of concentrated Sulfuric Acid the resultant flow exiting the injector is only 2 to 4 ounces per minute. At this flow rate all of the acid will exit the first injector orifice precluding uniform dispersion of acid across the mixer housing diameter. When the flow is measured in gallons per minute, even distribution across the diameter of the mixer is easy to maintain.

ACID DILUTION AND MIXING

