pH Measurement in Refining API Separators

Process Overview

In addition to refined petroleum products, refineries also produce large quantities of wastewater that has been contaminated by oil and oil-bearing sludge. This wastewater requires pre-treatment to remove these oil and sludge contaminants before it can undergo further treatment. A common process for removing the oil components is an American Petroleum Institute (API) Separator. API separators rely on differences in density to simultaneously remove both heavy oil-bearing sludge and lighter insoluble oils from water.

In a typical API separator (Figure 1), wastewater is first collected in a pretreatment area that allows sludge to settle to the bottom for disposal. A diffusion barrier slowly allows wastewater to flow out of the pretreatment area and down the separator towards the outlet. As the wastewater flows towards the outlet of the separator, lighter oil fractions rise to the surface where they can be skimmed off and disposed. Baffle plates are used to prevent the light oils from escaping into the effluent wastewater. Conveyors are often used to help separate the lighter oils at the top of the separator and push heavy solids at the bottom of the separator away from the wastewater outlet and towards the sludge disposal area.

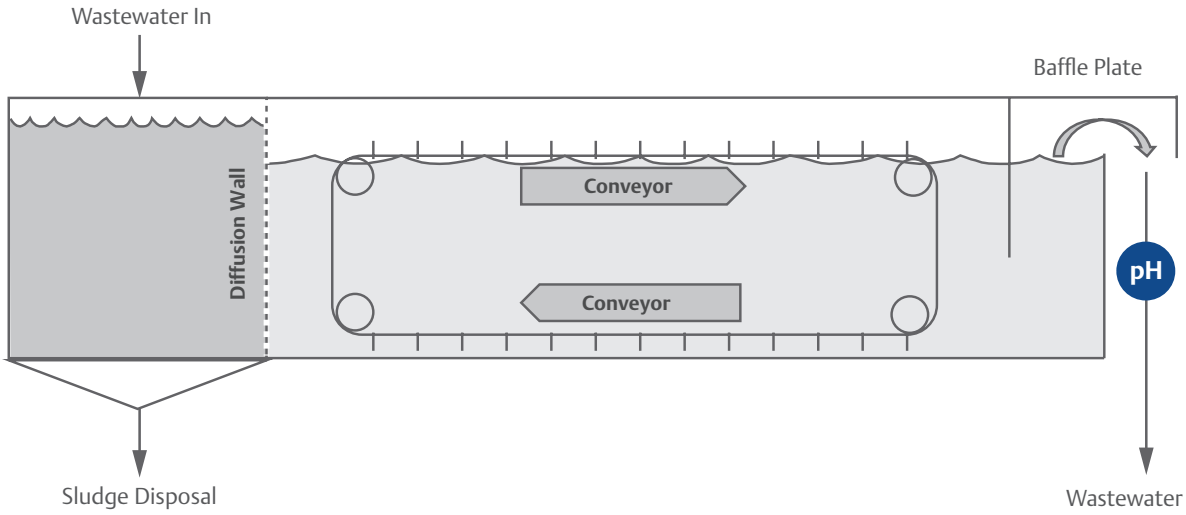
Although the API separator removes a high percentage of oil sludge and insoluble light oil components from the wastewater, soluble or emulsified oil cannot be removed by settling and requires further treatment. Therefore, after the API separator, further treatment processes are used to remove entrained oil more completely and to

condition the water to meet the specifications required for release into a stream or other local body of water. Downstream treatments can include chemical flocculation to remove emulsified oil, and special processes to remove phenols and sulfides.

pH Measurement

pH must be measured at the outlet of the API separator; it is a critical process parameter used to optimize the secondary waste treatment processes such as flocculation. However, the presence of emulsified oil at the API separator outlet makes this a challenging application for pH sensors. The emulsified oil can quickly coat and plug the reference junction on the pH sensor, resulting in slow response time and eventual failure. As a result, most pH sensors in this application require frequent cleaning and replacement.

Figure 1 - Refining Sludge API Separator Process Diagram



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The Emerson Solution

The Rosemount™ 396P pH/ORP Sensor is ideally suited for this application due to its high surface area reference junction design. The 396P reference junction design uses 0.5-micron size pores to preserve the pH signal by preventing the formation of a continuous coating on the sensor. The 396P is compatible with all Rosemount liquid analysis transmitters, including the Rosemount 5081 Explosion-proof Transmitter which has been designed for the rugged environments found in refineries and chemical plants.

Rosemount™ 396P pH/ORP Sensor

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