



The 3rd Generation pH Sensor from the Same Mind that brought you the first 2.

BARBEN
Analyzer Technology, LLC

Application Review - Sour Water Strippers

Background

With the increasing price of petroleum, hi-sulfur crude stock is in increasing use to meet the global demand. The refining process for this stock releases sulfur in various operations in the form of Hydrogen Sulfide (H_2S). When in gas form, it is referred to as “sour gas”, and when carried by water, it is referred to as “sour water”. H_2S is both poisonous and flammable, so its handling and removal from process streams is considered both an economic and safety requirement.

“Stripping” the H_2S from water utilizes a gas stream to force the H_2S and Ammonia (NH_3) out of solution and into the gas phase. This stream is processed by a sulfur recovery unit to separate the sulfur from the water, allowing the water to be re-used as process water, or released as waste.

The Process

The sour water is processed through a “flash drum” to remove hydrocarbon vapors and decant hydrocarbon liquids. The stream is then fed to a stabilization tank where more hydrocarbons are removed. By removing the maximum amount of hydrocarbons from the sour water stream, better control can be maintained in the stripper tower.

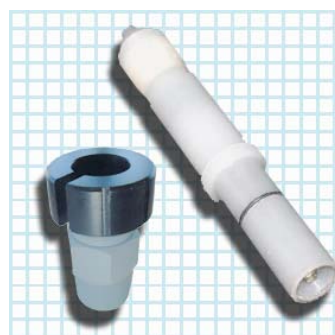
The sour water stream is heated via a heat exchanger and introduced to the top of the stripper tower. Steam is introduced at the bottom of the tower, rises, and removes any dissolved gases. The steam is usually circulated from a re-boiler to reduce total water consumption. H_2S , NH_3 , and steam rise in the column and cool near the top to 180°F. Below-spec temperature at the top can allow the formation of ammonium salts that will foul process lines.

Stripping requires that both ammonia and sulfides exist in their gaseous form. The ideal pH for stripping H_2S is below 5, since above this value sulfide primarily exists as ions (HS^- , or S_2). Unfortunately, ammonia stripping requires the pH to be above 10 to avoid the formation of ammonium (NH_4^+) that cannot be stripped. Although the most effective procedure would require the use of two separate towers, we usually find a single tower with the pH controlled around 8, which allows adequate if not

complete removal of both gases. The injection of caustic at the bottom of the tower improves the removal of ammonia while still allowing sulfide removal at the top.

The Problem

Measuring pH in sour water is a problem for most sensors, as the temperatures must be maintained at high levels to insure gas removal, and the presence of H_2S can poison and plug most reference cells. Cyanide and Ammonia can poison a reference by forming a complex with the silver ions in the electrolyte. Historically, traditional double junction references would die within a day or less when the sulfide, cyanide, or ammonia levels were very high.



The Solution

The Barben Analyzer Axial Ion Path pH sensor has proven to be a breakthrough in stripper pH measurement. The maximum temperature rating of this sensor is 140°C (284°F), providing a substantial buffer to the

temperatures maintained in the stripper. The Axial Ion Path reference cell provides 5 filtration stages to prevent the ingress of the sulfides, cyanides, and ammonia, thereby avoiding reference poisoning. Lifetime improvements over well-known competitive “gel-type” pH sensors have been in excess of 4 times. A well-known German pH manufacturer specified a pH sensor with a flowing reference utilizing a re-fillable Potassium Chloride reservoir. This sensor required replacement every 5 to 10 days. The Barben Analyzer BV551 “Quick-change” sensor that replaced it ran for over 6 months, without the necessity or hassle of refilling a KCl reservoir.

Barben Analyzer pH sensor will easily connect to most modern transmitters in use today, or we can specify a 2-wire or 4-wire Stratos transmitter. Both are available with the necessary FM/CSA hazardous duty ratings. The 2-wire transmitters offer HART, Foundation Fieldbus, or Profibus, come with a complete diagnostic suite for both sensor and transmitter, and carry a 3-year warranty.

800.993.9309

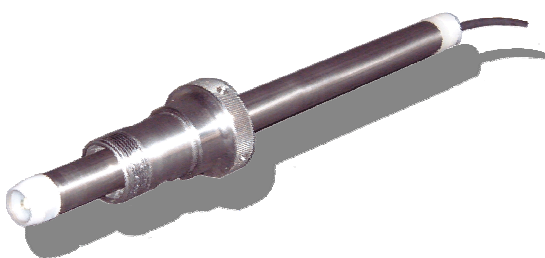
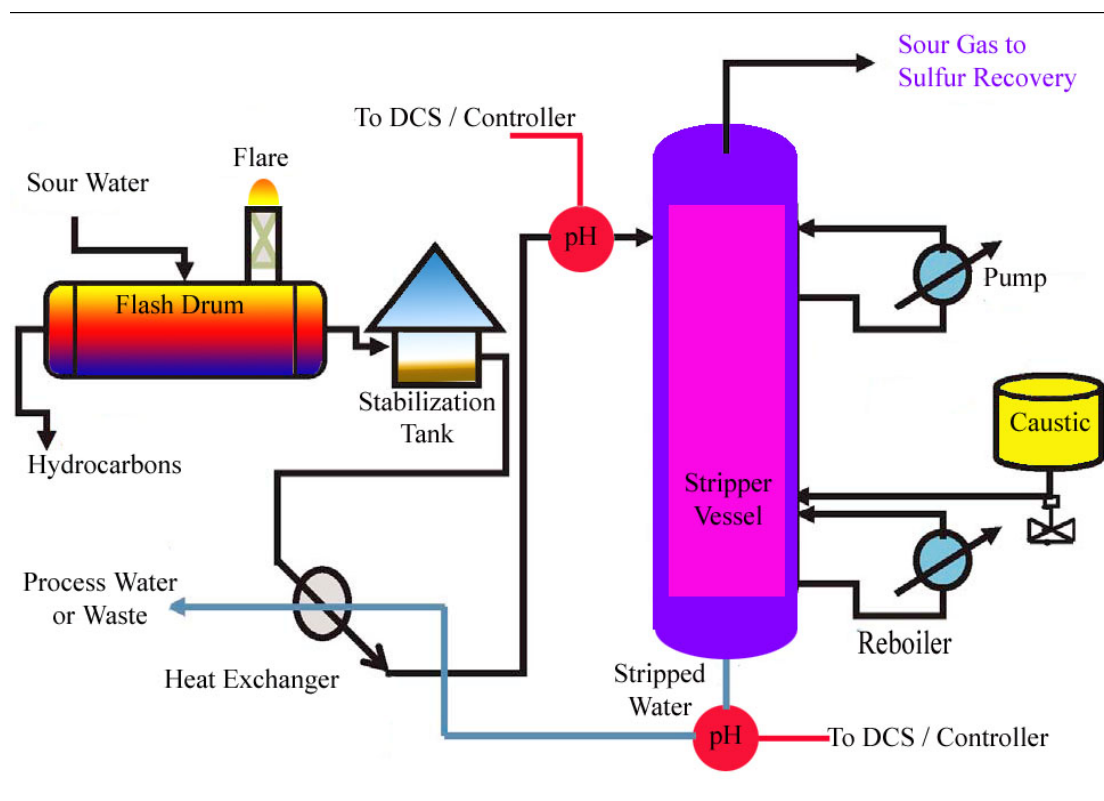
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Stratos 2-wire & 4-wire transmitters

- Rugged NEMA 4X construction
- HART, Foundation Fieldbus, and Profibus options
- Full diagnostic capabilities for both sensor & transmitter
- 3-year warranty

Model 547 / 557 ball valve insertion pH / ORP sensor.

- SS316, Titanium, Kynar, and Teflon construction insure ruggedness and tolerance to aggressive chemical process.
- Axial Ion Path reference cell resists oxidation and fouling
- Ruggedized sensor design reduces breakage and minimizes downtime and unscheduled maintenance



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