SOUR WATER STRIPPER

BENEFITS

- Reduced gas emissions
- Longer sensor life
- Reduced labor requirements

CHALLENGE

Refineries that process crude containing sulfur liberate the sulfur in various unit operations as hydrogen sulfide. Water that contains sulfide is called sour water. Reuse or disposal of sour water requires removing the sulfides from the water in a process called stripping.

The stripping process (Figure 1) uses a gas stream to force both the hydrogen sulfide (H_2S) and ammonia (NH_3) out of solution and into the gas phase for further treatment. Although air stripping can be used, steam stripping (which liberates more H_2S due to higher temperatures) is typically required in refinery sour water treatment to meet specifications for the stripped water.

Gas stripping requires that the sulfides and ammonia are both present in the gaseous form. This presents a problem because the ideal pH for stripping H_2S is below 5, since above 5, sulfide is primarily found in the form of ions (HS^- or S^{-2}). Conversely, efficient ammonia stripping requires a pH above 10 to prevent the formation of ammonium (NH_4^+) ion that cannot be stripped. Although the optimum strategy would be to use two separate stripper towers, economics usually dictates a compromise, and using a pH around 8 allows adequate removal of both gases. Injecting caustic near the bottom of the tower improves the ammonia stripping while still allowing sulfide stripping at the top.

Measuring pH in sour water can be quite a challenge for the process pH sensor. Temperatures are quite high to facilitate removal of gases. Hydrogen sulfide can poison and plug the reference, by precipitation with silver ion. Ammonia and cyanide can poison the reference by forming a complex with silver ion. These measurement problems can be so severe in sour water that certain pH sensors may become unstable within one day.

SOLUTION

The PERpH-X® Model 3500PR is the sensor of choice for monitoring sour water because it includes a poison resistant electrolyte that resists the attack of poisoning ions like sulfide. The double junction design uses two layers of porous junctions to separate the process chemicals from the silver reference, and allows the outer reference solution to be conveniently refilled with a preloaded syringe. The PERpH-X® sensor design is also available in the retractable model 3400HT, which allows sensor removal without shutting the process down.

When the Model 3500 sensor is matched with any Rosemount Analytical pH analyzer, the user is provided with diagnostics that warn of sensor breakage or coating. Rosemount analyzers greatly reduce the guesswork and maintenance involved in measuring pH. Compatible pH analyzers include the Model 5081-P and Xmt-P DC-powered HART and FOUNDATION Fieldbus analyzers, the Model 1056 pH analyzer, and the Model 54epH HART analyzer/controller. Consult the appropriate Product Data Sheet for complete details.

INSTRUMENTATION

Model 5081 pH/ORP Smart Two-Wire Transmitter

- Hand-held infrared remote control link to activate all the transmitter's function.
- NEMA 4X (IP65) weatherproof, corrosion-resistant enclosure.
- Comprehensive pH glass and reference diagnostics.
- Non-volatile EEPROM memory to hold data in event of power failure.
- HART® and FOUNDATION® Fieldbus options.

SENSOR

Model 3500 High Performance pH Sensor

- Advanced on-line sensor diagnostics for use with all Rosemount Analytical analyzers and transmitters.
- High temperature design increases sensor life at elevated temperatures.
- Rebuildable double junction reference provides longer service life in a variety of processes by using specially formulated reference SOLUTIONS.

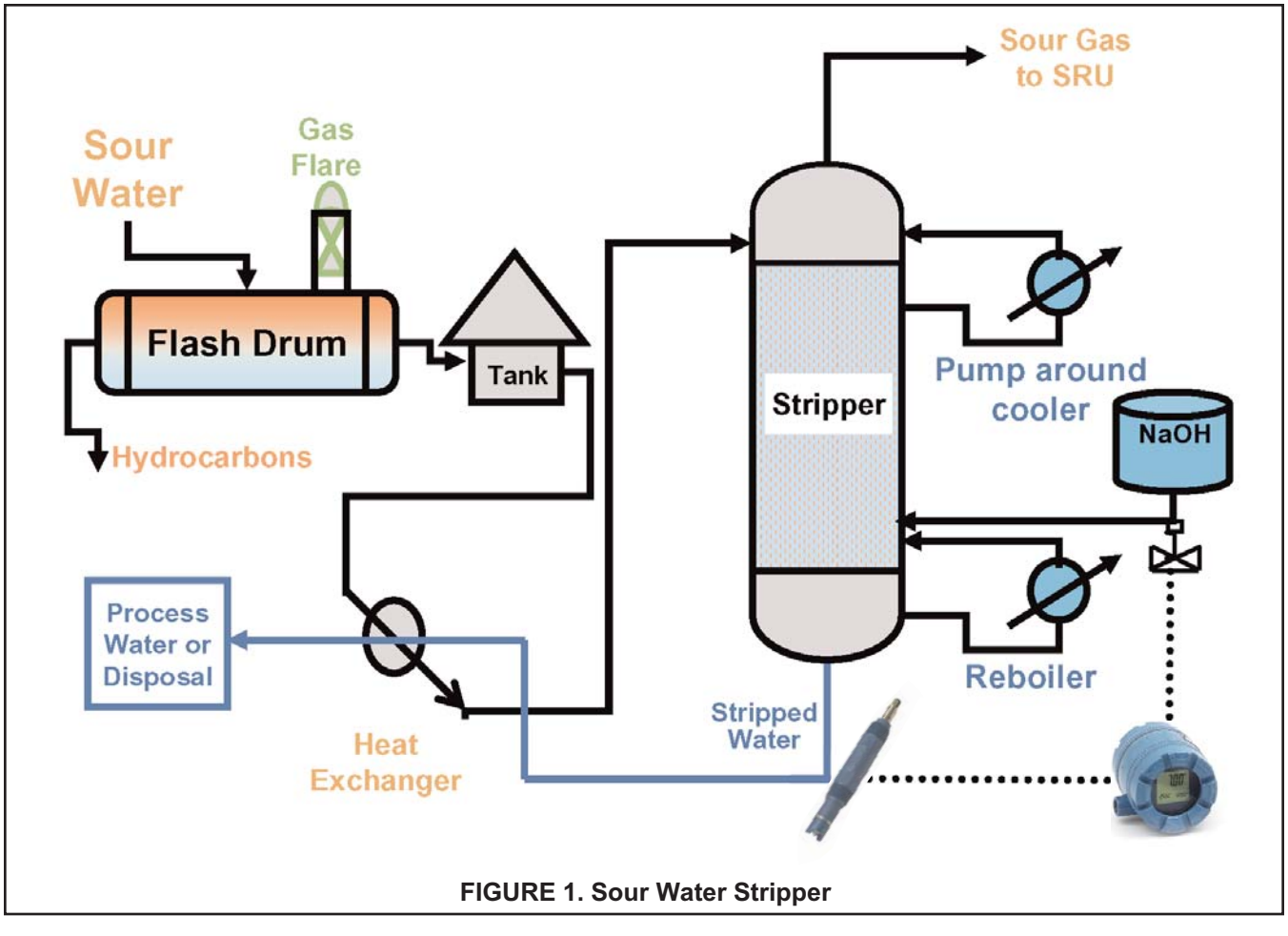

FIGURE 1. Sour Water Stripper

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