METTLER TOLEDO APPLICATION NOTE

pH Measurement During Tall Oil Cooking

BACKGROUND

Tall oil is the generic name for the oil obtained during acidification of the black liquor residue from kraft digesters (pulping process). The process dissolves the fats, fatty acids, rosin, and rosin acids contained in pine wood in the form of sodium salts. When the black liquor is concentrated to make it possible to recover some of its chemical and heating value, the soaps become insoluble and can be skimmed off. The brown, frothy curd obtained is then made acidic with sulfuric acid, converting the constituents into a dark-brown fluid called tall oil. Tall oil fatty acids have typically been in high demand due to the fact that they are the cheapest organic acids available for such processes as turpentine production.

THE PROCESS

In the sulfate pulping process, sulfate soap is an intermediate product out from the evaporator after the pulp cooker. This soap contains oils, terpenes, and chemicals like sodium hydroxide and sodium sulfides at a pH from 10 to 14. The sulfate soap is neutralized with CO_2. After separation (blowing out) of CO_2 gas, sulfuric acid is added to the process in a mixer. The pH is measured before (8 to 10 pH) and after (7 to 8 pH) the mixer. The dosing of the sulfuric acid is controlled by these two pH measurements to ensure separation of sodium hydrogen carbonate from the soap oil.

INSTRUMENTATION

Sulfate soap is very oily and contains sulfides and carbonates. The oil creates a film at the membrane glass and the sulfide interacts with the free silver ion of conventional reference systems, creating a contaminated (black) diaphragm. The fluid temperature is quite high (up to 212 ^{o}F) which can limit the lifetime of the electrode.

Due to these conditions the InPro® 4200 pH electrode with Xerolyt® solid polymer reference system is recommended in conjunction with the InTrac® 777-SL. With this system the electrode lifetime increased to 3 – 5 months, compared to the 1 – 3 weeks previously experienced. The open aperture of the Xerolyt electrode is not contaminated by the high sulfide content of the process, providing accurate measurements and long electrode lifetime. The InTrac 777-SL allows sensor maintenance (cleaning, recalibration) without interruption of the process. This system is compatible with the 2100 pH analyzer.

PRODUCTS

2100 pH Analyzer

- Detachable front panel and plug-in terminals for ease of installation
- All functions accessible through the keypad for increased ease of use
- Continuous sensor and transmitter diagnostics to monitor performance
- FM certification for Class I, Div 1 & 2 Environments and CSA General Purpose Approval
- 3 year warranty

InPro® 4200 Solid Polymer pH Electrode

- Patented Xerolyt® solid polymer reference system maintains a stable potential for accurate and repeatable pH measurement and low maintenance
- Open junction eliminates reference clogging and extends sensor life
- High pressure resistance eliminates requirement for pressurizable housing
- Integral RTD for higher measurement accuracy
- Rugged IP67 rated quick connect VarioPin connector

InTrac® 777-SL Retractable Housing

- Rugged 316L SS or PVDF construction for maximum chemical resistance
- Flushing chamber for automatic cleaning and calibration reduces overall system downtime
- Patented immersion tube design isolates the sensor on retraction and guarantees complete separation of the process from the outside environment.
- Safety interlocks prevent sensor removal from housing while in measuring position
- Manual or pneumatic operation