

CORROSION SENSORS IN PROCESS VESSELS

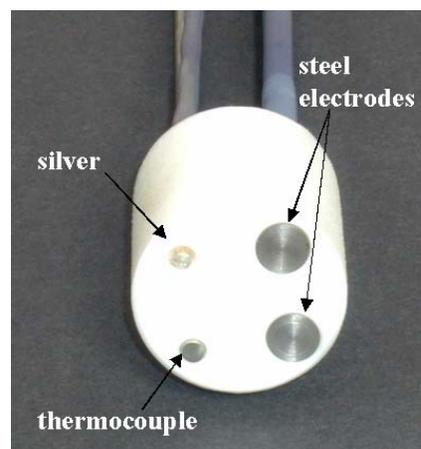
Electrochemical Noise Probes used to Assess Corrosion in Real-Time

First-of-a-Kind Field Deployment in Operating Digesters for Papermaking

In the Pulp/Paper Industry, digesters are the reaction vessels in which aggressive chemicals are used on wood chips to separate cellulose for making paper. Over the last decade, reports of unusually high corrosion rates for digester vessels have become increasingly common. The trend appears to be applicable to relatively new vessels as well as older vessels that have previously exhibited only modest corrosion rates. Coincident with observations of increased corrosion, there have been a number of process changes in the industry mandated by environmental concerns, production goals, or energy requirements. Some of the changes that introduce uncertainties in process flow/chemistry include modified cooking schemes, closed-cycle chemistry and accumulations of non-process elements, and grade transitions to meet product requirements. The goal of this project is to assess digester corrosion in real-time using electrochemical noise probes in operating vessels in an attempt to correlate changes in corrosion activity with changes in operational variables. Identification of particularly aggressive process conditions and/or more suitable materials for vessel construction is a priority.

Corrosion Probe

The probes are installed at various locations of interest and consist of dual working electrodes representing the material under evaluation (connected to each other via a zero-resistance ammeter), a silver reference electrode (connected to the working electrodes via a high impedance voltmeter), and a thermocouple. Fluctuations in potential and current noise are simultaneously measured every second along with temperature and the process control data. The information is used to assess corrosion form (general, pitting, etc.), and relative intensity as a function of operational parameters.



Preliminary Results

- In one particular vessel, corrosion was found to be a strong function of the Douglas fir content of the furnish, with higher concentrations much more aggressive to the carbon steel vessel than mixtures of spruce and pine containing lesser amounts of Douglas fir.
- In another vessel, type 309LSi stainless steel overlay proved to be a totally corrosion resistant alternative to the carbon steel construction material that suffered extraordinarily high corrosion rates.
- Start-up and shut down transients can be very corrosive events. Other process data does not routinely correlate to changes in corrosion activity.

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