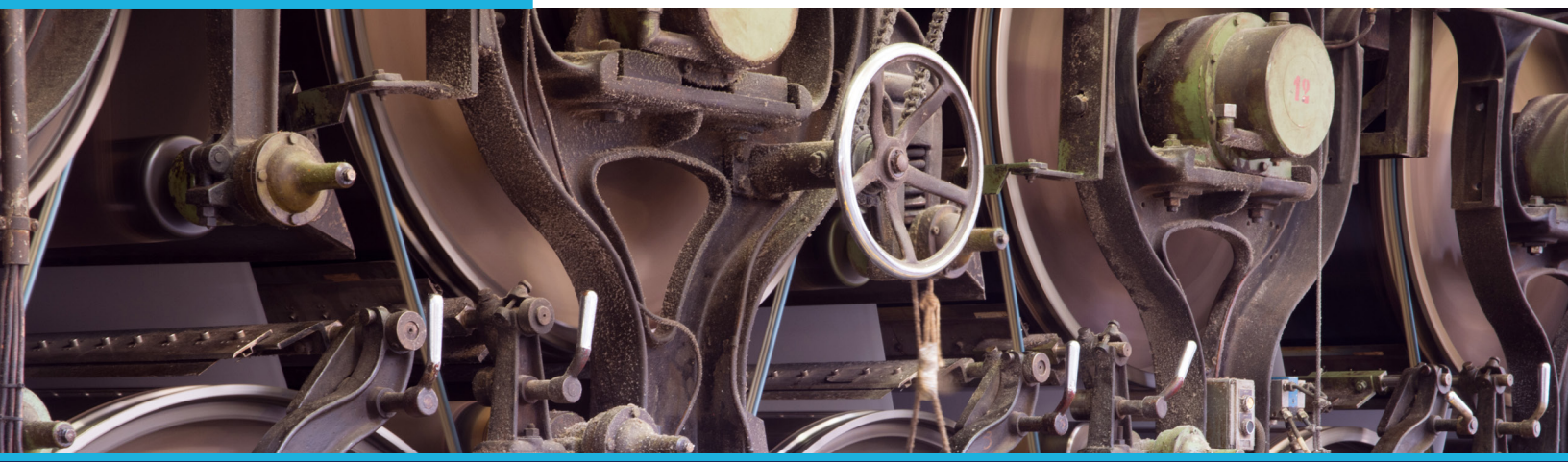
CASE STUDY • PULP & PAPER



SUCCESSFUL MEASUREMENT OF BLACK LIQUOR AND SOAP LEVELS

Customer

Kraft pulp mill in North America

Application

Intermediate black liquor tank level

Application Characteristics

Black liquor of variable density topped with a layer of soap and foam with variable density and thickness. Foam varies from a dielectric of 2 to 7, foam is very sticky and coats surfaces easily.

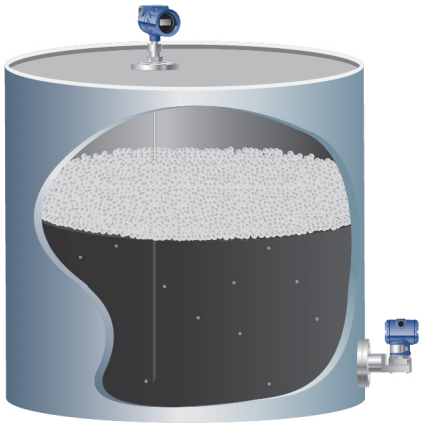
Challenge

In the Kraft pulping process, wood fibers are separated and resinous materials removed using an alkaline cooking liquor. The spent liquor, known as black liquor, is re-processed and re-used in pulping. Black liquor must undergo several processing stages before the cooking liquor is reclaimed. Containment of the spent liquor must be measured and controlled in a series of intermediate storage tanks.

Black liquor offers some unique measurement challenges. It is a highly alkaline material that varies in density, depending on what is happening upstream. Since it contains saponified resinous materials extracted from wood, a foamy layer tends to form on top. This layer can vary from a few inches of heavy thick foam to several feet of lighter foam. Several technologies including DP, non-contacting radar, and ultrasonic have been used to measure level in these tanks, but with unreliable results. Since the density of foam is much lighter than black liquor, its presence was not detected by the pressure transmitter. This problem was compounded by the variable density of the black liquor itself. When the liquid got to higher levels in the tank, the foam could spill over. Attempts to measure the foam surface

Results

- Improved safety by eliminating manual level measurement
- Reduced risk of reportable environmental incident
- Eliminated product loss from tank spills
- Reduced labor costs



Soap separates out from the liquor and forms a foamy layer on the top.

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had been made with both ultrasonic and non-contacting radar technologies, but the signal was often lost as the foam layer became lighter and higher. As a result, operators had to resort to manual methods of measuring the foam level, such as climbing to the top of the tank and doing a hand dip. This was not only a nuisance to the operators, but a safety hazard as well.

Solution

Emerson worked with the customer to find the most reliable level measurement in these intermediate black liquor tanks. The intent was to increase plant safety by eliminating the need for manual hand dips and to prevent product loss and environmental incidents through soap and black liquor spills. They discovered that a combination of technologies was required. They needed one technology to handle the black liquor and another to handle the top of the foam.

The Rosemount™ 3051L Pressure Transmitter was used to measure the black liquor level. This had already proven to be a reliable measurement for the liquid level, but a new technology was needed for the foam. The Rosemount™ 3301 Level Transmitter - Guided Wave Radar device with a single flexible probe was installed to measure the foam level and prevent spills. Because it operates at a much lower frequency than a non-contacting radar transmitter, the signal is less attenuated in foam. Even though the thickness and density of this black liquor “soap” varies, it still maintains a sufficiently high dielectric value for signal reflection. Because the microwave signal is guided along the probe and confined to a small area near the probe, the physical features of the surface do not impact the measurement. The single lead probe was chosen because it is able to handle the sticky coating created by the liquor and foam and still allow detection of the top of the foam level. This solution could handle the full range of foam density, from the thicker foam with a strong reflective radar signal to the lighter foam with a much weaker return signal.

By using the 3300 guided wave radar for foam level and the 3051 pressure transmitter for liquid level, a solution was offered that prevents tank spills, improves operator safety, reduces labor, and eliminates product loss.

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