

# Chip Bin Level Measurement Nets Savings Over \$2.3 Million

## RESULTS

- 8% throughput improvement in Kamyr digester
- \$1.4 million in revenue from increased pulp production
- \$715,000 saved in white liquor use
- \$184,000 saved in reduced steam use



## APPLICATION

Level measurement on chip bin for continuous digester

## CUSTOMER

Large pulp and paper mill in the United States

## CHALLENGE

To efficiently produce pulp of consistent quality, continuous digesters (in this case, Kamyr digesters) depend on the reliable feed of pre-steamed wood chips of a uniform size. Wood chips are fed to a chip bin via a variable speed conveyor belt. They enter the bin through a flop gate, where a level of 75% is set to optimize pre-steaming. This step removes air and non-condensable gases, and loosens the fiber structure in the chips. Adequate pre-steaming is critical to the efficiency of the digester because it affects the penetration of white liquor into the wood fibers. Poor performance in this area means longer cook times in the digester (which means less throughput) as well as higher steam and white liquor use.

Unfortunately, chip bin level measurement has been a long-standing problem at the mill. No level technology has worked to date. The unique characteristics of wood chips combined with a vapor space of sawdust and steam mixed with resin vapors has made this a tough application to measure, and they have not been able to consistently maintain the critical 75% level. As a result, they did not usually attempt to pre-steam the chips as it often caused plugging of the Diamond Back chip bin. This plugging could be traced back to excessive soaking of the chips during level excursions below 75%. The excess soaking causes the chips to swell and block the bin's cone-shaped bottom.

## SOLUTION

The mill tried several technologies with limited success. A nuclear gauge could only provide level measurement in a partial range, ignoring the bottom third of the bin. It also proved costly to install and maintain. A competitor's 10 GHz non-contacting radar gauge with a 6 in. cone antenna was capable of loosely tracking level changes, but did not give the performance required for control.

*"We're always looking for ways to improve our operating efficiency, and this Rosemount radar gauge is moving us in the right direction."*

**Large NA Pulp and Paper Mill**  
Pulp Mill E&I Supervisor

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### SOLUTION (CONTINUED)

When the customer looked to Emerson Process Management for a solution, the Rosemount 5600 Radar Level Transmitter with a parabolic antenna and a PTFE dust cover was supplied on a trial basis. The device has run for 3 years and has only required one maintenance activity every six months; to clean the dust cover due to the accumulation of chip resins and sugars on the shroud's surface.

The mill now has a reliable level signal that tracks the true chip bin level, and the conveyor system can be run in automatic mode. Flash steam from the digester is used to pre-steam the chips and the level gauge keeps the bin level at the critical 75% mark. This has optimized absorption of white liquor into the chips. As a result, the digester runs more efficiently. This has produced better quality pulp, and reduced demand on the washers and bleaching system. The pulp mill manager reported that this led to an eight percent increase in digester throughput, from 1,250 to 1,350 tons per day. At full utilization - assuming chips are dry 70% of the time, with no downtime, and an optimal hardwood/pine chip mixture ratio - the estimated value of an additional 100 tons of pulp per day is \$1.4 million annually, which was added to their bottom line.

The mill also reported significant cost savings in steam and white liquor consumption. The use of 90 pound steam dropped by 5,000 lb./hr., or \$184,000 annually. It was essentially replaced with "free" flash steam from the digester. This steam had previously been vented to the atmosphere. Since pre-steaming improves the penetration of white liquor into the fibers, the mill was able to reduce their caustic use by \$1,400 per day, which adds up to \$715,000 annually.

With the throughput improvements, the mill has gained greater flexibility in adjusting its daily hardwood/softwood chip mixture to better meet changing market requirements. This technology worked so well it was applied to a second chip bin six months later, further improving the mill's flexibility and overall pulp production.

### RESOURCES

#### Rosemount 5600

<http://www.emersonprocess.com/rosemount/products/level/m5600.html>

#### Emerson Process Management's Pulp & Paper Web Site

<http://www.emersonprocess.com/solutions/paper/>

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*“With poor level control, pre-steaming in the chip bin was not possible. Now the digester runs more efficiently, and throughput has improved 8%.”*

**Large NA Pulp and Paper Mill**  
Pulp Mill Manager

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