

# Application Note

## Company Profile

Fully Integrated Pulp & Paper Mill, Canton, NC

### Problem

When completing an instrument upgrade on a process, the temptation is often to replace the existing instrumentation with updated models based on the installed technology. In doing so, the user may be missing the opportunity to dramatically improve the measurement accuracy and reduce operating costs for little or no additional upfront investment.

During a recent upgrade of a recovery boiler at a fully integrated Pulp & Paper Mill in Canton, NC, the project manager was faced with a decision. Water flows in the recovery boiler were accomplished using differential pressure (DP) transmitters reading across orifice plates. The instrumentation was pneumatic and had been installed in the late 60's and early 70's. It was clear that the transmitters needed replacement as part of the upgrade. The orifice plates had been installed with the original transmitter installation and had not been removed and inspected since. During the past 30 – 35 years the likelihood that the orifice plates had experienced significant wear and tear was high. The question facing the project manager was whether to replace them with new electronic smart differential pressure transmitters or to look at other technologies.

### Solution

**MagneW Two-wire PLUS.** At the suggestion of the local Yamatake distributor, AC Controls, the project manager began to consider alternatives. One solution presented was electromagnetic flow metering. Normally this application would not be a candidate for magmeters because of the installed cost of a 4-wire magmeter. With the advent, and subsequent enhancement of the two-wire loop-powered version, magmeters can be a cost effective solution to a wide variety of liquid flow applications.

A thorough cost comparison between selecting smart transmitters and new orifice plates versus

the installation of two-wire loop-powered magnetic flowmeters was completed.



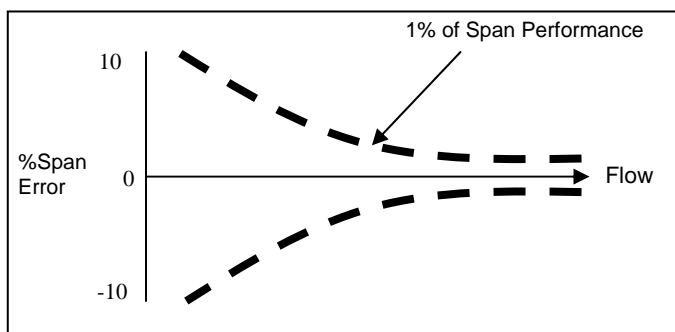
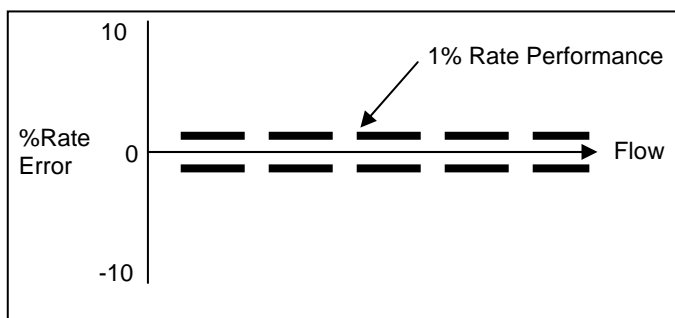
The result of the analysis showed that for a 1" line size the total installed cost, taking into consideration all costs associated with a DP/orifice installation, favored the MagneW Two-wire PLUS.

### Additional Factors:

Because the two-wire magmeter is loop-powered, it draws its power and transmits its output over a single twisted pair of wires in the same fashion as a differential pressure transmitter, thus the wiring costs are equal for the two approaches. The integral design of the flow tube and transmitter electronics means that it can be installed directly in the process with no additional provisions for mounting. The obstruction-less design of the flow tube results in no pressure loss and, therefore, lower overall operating costs. There is no concern with plugging or leaking in the impulse lines.

The biggest advantage of the two-wire magmeter is a more accurate flow measurement compared to the DP/orifice plate combination.

The magmeter is a percent of rate device, meaning any measurement error is expressed as a constant percentage of the actual flow measurement. The DP Transmitter is a percent of span device, meaning that the accuracy is a percentage of the upper span value. The error is a percentage of the upper span value and the absolute magnitude of the error remains constant as the actual measurement changes, but when expressed as a percent of actual flow it becomes increasingly more significant as the flow rate decreases. The following figures illustrate this important difference in performance.



This fact, combined with inaccuracy of the orifice plate itself, make the MagneW Two-wire Loop-powered magmeter a significantly more accurate device for flow measurement of conductive liquids.

## Represented by:

The magmeter provides turndown capability of 33:1 versus 3 or 4:1 for the DP/orifice combination. This provides for greater control in varying operating conditions.

Advantages of the Loop-powered Electromagnetic Flowmeter:

- High accuracy flow measurement (percent of rate)
- Superior turndown performance
- Obstruction-less design
- Simple installation
- 24 volt loop-powered (can use existing wiring)
- Suitable for installation in hazardous locations
- Pulse output available for flow totalization

When weighing the two approaches, the project manager recognized he could get the advantage of magnetic flowmetering with essentially the same initial investment, and could realize ongoing operating and maintenance cost savings as well. They installed four 1" magmeters on this project and have completed a successful startup. They have since installed the two-wire magmeter on two additional applications.

In summary, the refinement of the two-wire magmeter has given process engineers a new tool for liquid flow measurement. No longer do they need to consider the availability of line power at the desired measurement point. Two-wire magmeters are available as Class I, Div. 1 models perfect for applications in hazardous locations. Yamatake even offers a remote version with separately mounted flow tube and transmitter, providing the designer with even greater flexibility. For upgrades or new installations the two-wire magmeter offers significant advantages over other flow devices.