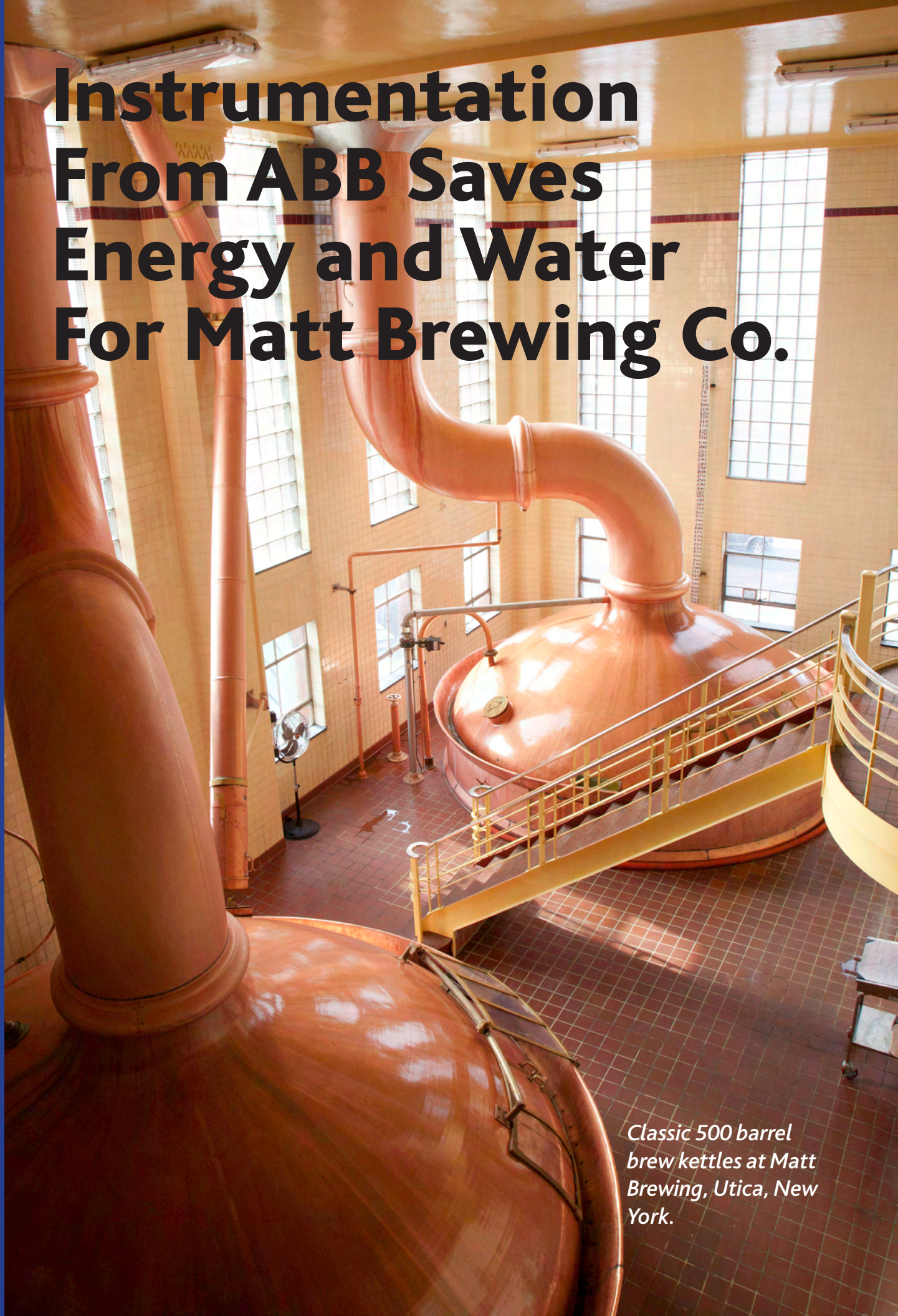
by Jim Talbot

Instrumentation From ABB Saves Energy and Water For Matt Brewing Co.



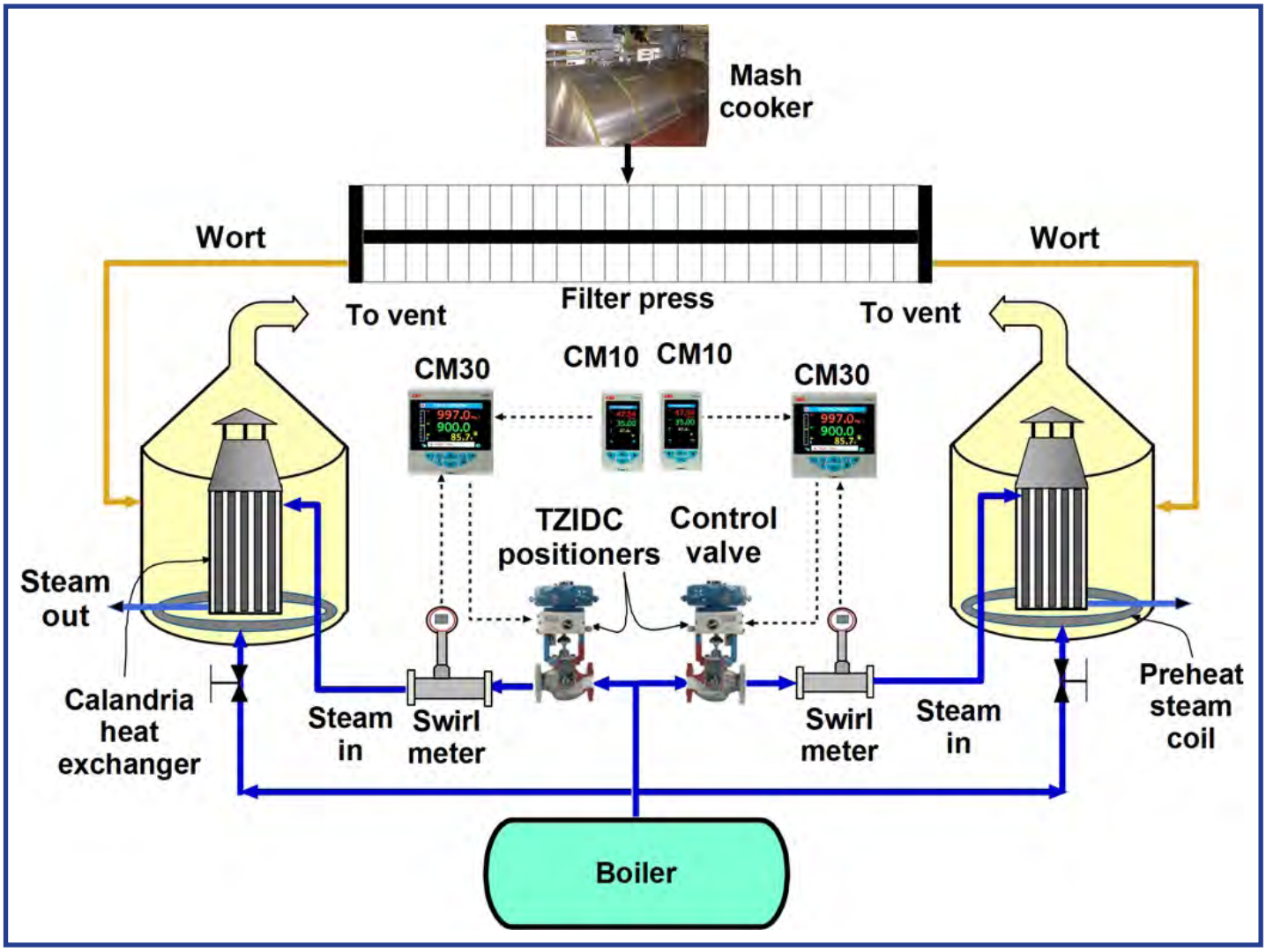
Classic 500 barrel brew kettles at Matt Brewing, Utica, New York.

Mass flow measurement of steam coupled with an associated control system has saved Matt Brewing Company in Utica, NY up to $630 a day for wort boiling. Savings result from reduced natural gas costs and water usage. The new system reduces steam use by approximately a third, depending on the brew volume and operator. It also saves about 1200 gallons of water per brew. Brewing Supervisor Rich Michaels estimates that the payback time for the instrumentation project is three to four months.

Prior to the installation of the new instruments, the brewery collected three months of data for the wort boiling operation. Measured and calculated variables included kettle volume, steam pressure and temperature, percent evaporation, and necessary water additions. Data collected was compared to that for optimum operating conditions to estimate possible savings. Michaels consulted with RL Stone Company (Syracuse, NY) on instrumentation for optimizing the wort boiling operation.

The new instrument system measures and computes mass flow rates of steam to control heat for boiling the wort in 500 bbl (15,000-gallon) kettles. The boiling operation continues for 90 minutes, evaporating about 5 to 10% of the solution.

Below: ControlMaster 30 units receive mass steam flow rates based on flow and temperature values measured by ABB Swirl meters. CM30 control signals go to TZIDC positioners mounted on Fisher control valves. Steam-heated calandrias within the kettles heat and mix the wort.



Family brewing operation

The Matt Brewing Company, a family-owned business founded in 1888, makes the Saranac brand of specialty products. Nick Matt and his nephew Fred Matt currently head up the management team at the brewery. Under the leadership of these third and fourth generations of the Matt family, the brewery continues to craft beer to the exacting standards set forth more than a century ago and have been adopting new technologies to enable the highest quality with improved energy and water conservation. The brewery currently makes up to 30 varieties of Saranac beer during the course of the year with distribution to about 20 states.

After mashing the sweet wort flows to a filter press that separates out the grain. Matt Brewing sells the spent grain to local farmers. The livestock love it!

From the filter press, the wort, goes into one of two steam-heated kettles for boiling. One kettle boils wort while the other undergoes cleaning and preparation. A manually operated coil for steam at the bottom of the kettle preheats the wort.

Measuring mass steam flow

As the wort temperature reaches the boiling point, the steam in the bottom preheat coil shuts off and the recently installed automatic steam heating system takes over. From the steam header, the saturated steam

Tight piping geometry led to the choice of Swirl meters, which have minimal straight pipe requirements.

flows through a control valve and ABB Swirl flowmeter before reaching the kettle. Michaels notes that the Swirl meter requires minimal upstream and downstream straight pipe compared to other flowmeter types. "Our existing piping geometry was tight," says Michaels, "leaving very little space for straight pipe to condition the steam flow. The Swirl meter contains built-in straightening vanes, saving us the expense of re-piping the brewhouse."

From the flowmeter, the saturated steam flows to the top of an internal boiler in the kettle called a calandria. The calandria is essentially a shell-and-tube heat exchanger. Wort rises through the tube bundle in the calandria while heated by the down-flowing steam, which begins to condense. A deflector at the top of the calandria distributes the wort and prevents foam formation. The internal calandria efficiently provides both heating and mixing of the wort.

When starting a batch, the operator dials data representing the volume of wort in the kettle into an ABB ControlMaster CM10. This unit calculates the optimum mass flow rate of steam based on wort volume, and feeds that rate to the ControlMaster CM30 as a setpoint. The CM30 provides indication, recording, math functions, and proportional/integral control of the steam mass flow.

View of calandria within the Matt Brewing Co. brew kettle

Controlling Heat To the Wort

The CM30s receive the steam mass flowrates from the Swirl meters and then convert these values to engineering units that are familiar within the brewing process. The CM30s then compare the actual vs. desired flow rate and develop a control signal to maintain the predetermined setpoint.The 4-20 mA control signal goes to ABB TZIDC intelligent electro-pneumatic positioners installed on the existing Fisher control valves. An I/P module within the TZIDC positioner precisely regulates air flow to pressurize and depressurize the valve while minimizing air consumption.

The displays for the CM30s indicate the desired steam mass flow rate (the control setpoint) based on the kettle volume, the measured steam mass flow rate in lbs/hr, and the percent control valve opening.

Operator dials wort volume of kettle in CM10 prior to wort boiling operation.

Control Panel containing the ABB CM30s and CM 10s.

The CM30 controller can also display steam flow rate trends. The CM10 displays wort volume in the kettle dialed in by the operator.

"Depending on the atmospheric pressure, we need to control the steam pressure to get more or less Btus of heat into the kettle," says Michaels. "A pound of steam represents so many Btus. The controllers maintain the optimum mass flow of saturated steam for wort boiling, avoiding overheating that can adversely affect the brew," he says.

The new system for controlling steam has generally reduced required steam pressures from 24 to 12 psi. "The results," says Michaels, "are better quality and shelf life for our products with the added benefits of reduced energy and water usage."

Next Steps

Michaels says he's considering adding a system to automatically send a signal value for wort kettle volume to the CM10 controller, eliminating manual entry. The brewery also plans to add a system for reclaiming the energy from plant wastewater to generate "green" electricity for the plant.

By Jim Talbot. a freelance writer based in Ambler, PA