Composing A Sonata For The Smart Water Network

Whether we like it or not, everything around us is getting smarter. And perhaps the closest water industry analogy to what's taking place with our personal phones, cameras, and other "smart" gadgets lies in the metering sector.

Advanced metering infrastructure (AMI) and the Internet of Things (IoT) have already taken water meters to a new level, one that promises only to expand. Blazing the trail has been Master Meter, which seems to unveil a new innovation every time we turn around. The latest will be the Sonata, a residential answer to solid-state flow measurement. To discuss the future of the smart water network and how this new device fits in, Water Online conducted a Q&A with Master Meter's Greg Land, product manager for solid-state measurement.

How do you define the "smart water network"?

I define it as a complete system of water management devices, sensors, and software that provides current information to the utility and end user which improves system efficiency while also helping to reduce costs or losses.

Monthly readings provide exactly what a utility needs to produce a bill and to notice trends and events such as leaks. But in some cases these events are weeks or months old before anyone can respond. A smart water network is more than an AMI that obtains multiple reads daily. At the core of it all is smart data that comes from smart flow measurement sensors that continually monitor and report not only a read, but a collection of other alarms and identifiers.

How do you see the IoT changing the metering industry? What might be possible for a utility now that wasn't before?

I see it eventually being the standard for a water system. IoT benefits the utility customer as much as the utility. Moving beyond the range of features currently found with AMI networks, the interconnected world of IoT pairs AMI data with disparate inputs from other systems to bring new paradigms in value creation. For instance, homeowners can understand and forecast their irrigation-related water consumption in view of National Weather Forecast data, soil porosity databases, and other related inputs. One data set, such as weather data, may alter the action of another data set, like scheduled irrigation, and its impact on water budgeting and AMI.

How much revenue can be lost by a utility due to non-revenue water (NRW)?

The actual dollar amount will vary based on a wide variety of factors. But, as an example of how much revenue is lost through NRW, one industry report stated that the U.S. could gain access to an additional $3 billion in self-generated cash flow by reducing NRW.

Inaccurate water meters are among several components that can contribute to a rise in NRW. When a meter begins to lose accuracy, a utility might not notice it if it's gradual, but when hundreds or thousands of meters lose accuracy over time it starts to represent itself through increased NRW. This is why it is so important to select a meter that can maintain accuracy for the life of the meter. One way to accomplish this is through solid-state flow measurement. This year at the AWWA Annual Conference & Exposition, Master Meter will present our residential solution for solid-state measurement: the Sonata.

How does the Sonata's technology help a utility curb water loss?

The technology behind the ultrasonic flow measurement of the Sonata means it will not have gradual wear and deterioration which leads to loss in accuracy and revenue. Additionally, solid-state technology allows the Sonata to improve upon low-flow measurement of mechanical meters, allowing the utility to capture lower flows with greater accuracy. The impact is immediate and lasts for the life of the meter.

What data can the Sonata collect that a traditional meter cannot?

In addition to the all-important meter reading, the Sonata will be able to help identify small leaks, excessively high consumption that is indicative of a burst pipe, and periods of reverse flow in the meter that could be a result of a cross connection or a contamination threat. A tamper alarm will notify if the meter has been removed, stolen, or momentarily turned around, which could be a sign of water theft. When it is time to replace the meter, the Sonata will notify by an alarm that the battery is reaching the end of its life.

How does ultrasonic metering technology work and what makes it precise?

Ultrasonic transit-time measures the velocity, or speed, of water by sending ultrasonic sound bursts through the water and determines the time it takes the sound wave to travel from one transducer to another. This is done both with and against the flow direction. Both calculations are compared and the difference between the two establishes the flow rate and volume of water used.

What makes this technology so precise is the meter's ability to adapt to changing factors inside the meter. For example, if the water temperature changes, the speed of sound changes slightly. The Sonata is capable of determining the water temperature so flow calculations remain precise. Another example is in the event sand, rocks, or other debris that pass through the meter. Some solid-state meters use sonic reflectors that are placed in the center of the pipe to assist in acoustic sound measurement. This leaves them exposed to damage. The Sonata does not have sonic reflectors in the flow path, meaning we have reduced the likelihood of these devices being damaged. An additional benefit of this is that we significantly reduce the head loss caused by these reflectors.

How do you address the concerns holding utilities back from investing in AMI?

A utility is a provider of one of the world's most precious resources. It's about making each of us more accountable by managing our part of the system, whether it is the family on a budget who cannot afford an unexpectedly high water bill, or a utility striving to get their NRW down and they cannot wait until the next billing cycle to see if their hard work is paying off. We are all water managers and when we work together with real-time data, we get real-time results that have a lasting impact for everyone. You can't get that in monthly readings. You need the analytics of an AMI to provide a premium service like this.

What do you say in response to a consumer concerned that smart meter systems are too invasive?

It is true more data and analysis of usage patterns are needed in a smart meter system, but the purpose of it is to reduce loss and save both the utility and the customer money.

What else are you working on that speaks to the range of Master Meter's AMI offerings?

This summer, Master Meter is releasing the residential ultrasonic flow measurement sensor, the Sonata, in sizes ranging from 5/8" to 1". Partnered with our commercial ultrasonic flow measurement sensor, the Octave, our Harmony MDM Software, and our Allegro AMI system, Master Meter is able to provide a complete solution for any utility ready to make the leap to a smart water network. ■

SONATA® ULTRASONIC METER

The Sonata Residential Ultrasonic water meter is Master Meter's next step in unifying our ultrasonic solid-state measurement profile. Utilizing advanced ultrasonic flow measurement, the Sonata greatly improves low flow measurement compared to residential mechanical meters, making it an ideal solution for addressing Non-Revenue Water (NRW). The Sonata is fully Internet of Things (IoT) ready and capable of meeting the challenges of tomorrow's smart water networks.

Technical Specifications:

AWWA Standard: Meets ANSI/AWWA Standard C715-18 and ISO 4064 rev. 2014

NSF / ANSI Standard: Compliant with NSF/ANSI 372, NSF/ANSI 61, and SDWA.

Working Pressure: 175 PSI

Liquid Temperature: 33° F – 122° F

Ambient Temperature: -13° F – 131° F for the display

Power Source: Sonata with Integrated Allegro operates on one D Cell Lithium Thionyl Chloride battery. All other Sonata configurations operate with two C Cell Lithium Thionyl Chloride batteries.

Environmental Protection: Factory potted design provides NEMA 6P (IP68) for meter pit submersion.

Features & Benefits:

- Flow sensitivity starting as low as 0.001 GPM. Powerful solution to reduce non-revenue water.
- Compliant with Safe Drinking Water Act (SDWA).
- No moving parts for lifetime accuracy.
- Prorated 20 year battery life.
- Patented obstruction free flow tube minimizes head loss and risk of damage to sonic reflectors.
- Detailed LCD features totalized flow, rate of flow, battery alarm, leak alarm, burst pipe alarm, and tamper alarm.
- Fully submersible; IP68 design.
- Optional Internal RF module for Master Meter Allegro AMI or Master Meter 3G AMR Systems.
- Optional encoder output with a wired pigtail, Nicor Compatible connector, or Itron (ILC) compatible connector, allowing connectivity to third-party AMI or AMR systems.
- Install in a wide variety of positions; horizontal, vertical, or inclined.
- IoT ready for connectivity to Smart City Networks.

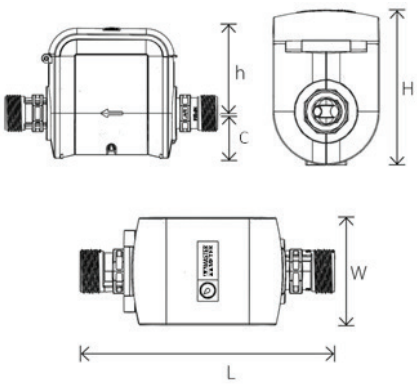
Technical Specs (Cont'd):

- **Display Units**: Multi line 9 digit LCD (Programmable flow measurement in USG, Cubic Feet, or Cubic Meters. Rate of Flow available in GPM, Lt/s, M^3/h)
- **Output Configuration**: Integrated Allegro RF module, Integrated 3G RF module, or encoder output cable with wired pigtail, Nicor compatible connector, or Itron (ILC) compatible connector.
- **Data Logging**: Internal data logger with consumption reports and alarms.
- **Construction Material**: Lead-free construction available in HP Glass Reinforced Polymer or Bronze alloy with Polymer Liner.
- **Flow Tube**: Patented flow tube design utilizes a "Z" shape sonic beam flight pattern. Sound waves are directed along the wider axis of the flow tube and aligned with the majority of the fluid flow. This oblong design of the flow tube minimizes flow disruptions near the transducers, such as cavitation, swirls, and eddies to ensure a wider range of meter accuracy. Moving the transducers to the side walls of the flow tube, rather than on the top of the flow tube, places wide beam ultrasonic soundwaves out of the general path of entrained air bubbles, which typically move to the top of an internal surface.

Operating Characteristics and Dimensions:

Sonata Operating Characteristics and Dimensions	5/8" x 1/2" (15 x 13 mm)	5/8" x 3/4" (15 x 20 mm)	3/4" Short (20 mm)	1" (25 mm)
Safe Maximum Operating Capacity	25 GPM ($5.7\ m^3/h$)	35 GPM ($7.9\ m^3/h$)	35 GPM ($7.9\ m^3/h$)	55 GPM ($12.5\ m^3/h$)
Normal Operating Range (98.5% - 101.5% Accuracy) *	0.10 – 25 GPM ($0.023 – 5.7\ m^3/h$)	0.10 – 35 GPM ($0.023 – 7.9$ m3/h)	0.10 – 35 GPM ($0.023 – 7.9\ m^3/h$)	0.38 – 55 GPM ($0.09 – 12.5\ m^3/h$)
Extended Low Flow(97% - 103% Accuracy)	0.03 GPM ($0.007\ m^3/h$)	0.05 GPM ($0.01\ m^3/h$)	0.05 GPM ($0.01\ m^3/h$)	0.11 GPM (0.025 m3/h)
Length	7-1/2" (190 mm)	7-1/2" (190 mm)	7-1/2" (190 mm)	10-3/4" (273 mm)
Width	3" (80 mm)	3" (80 mm)	3" (80 mm)	3" (82 mm)
Height	4-1/2" (117 mm)	4-1/2" (117 mm)	4-1/2" (117 mm)	4-3/4" (121 mm)
Height from Center Pipe	3" (80 mm)	3" (80 mm)	3" (80 mm)	3-1/4" (82 mm)
Depth from Center Pipe	1-1/2" (37 mm)	1-1/2" (37 mm)	1-1/2" (37 mm)	1-1/2" (37 mm)
Weight	2 lbs (0.9 kg)	2 lbs (0.9 kg)	2 lbs (0.9 kg)	2.25 lbs (1 kg)

* In the water temperature of 45° to 85° F (7° to 30° C), meter consumption is accurately measured at:
- +/- 1.5% in the Normal Operating Range
- +/- 3% in the Extended Low Flow



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