APPLICATION NOTE 6226

LET THEM DRINK BEER, OR TRY ULTRASONIC METERS

By: David Andeen, Director of Applications, Maxim Integrated

Abstract: When all of the fresh water supplies in the world are exhausted, beer can't be our answer. Aside from ultimately dehydrating us, beer production consumes five liters of water for every liter of beer brewed, in addition to all the water needed to grow the ingredients used to brew the beer. So, no water—no beer. Among the many ways we can save water, ultrasonic water meters create a great opportunity to eliminate the loss of massive amounts of drinking water lost through leaks.

What are we going to do when all of the fresh water supplies in the world are exhausted? We'll drink beer! Or, maybe not. Besides the fact that beer will ultimately dehydrate us, beer production consumes five liters of water for every liter of beer brewed.[1] And, this estimate doesn't include all the water needed to grow the ingredients used to brew the beer. So, no water—no beer.

Thinking about beer, water is used to produce everything. Beyond daily use for bathing, food preparation, and cleaning clothes, virtually all manufacturing requires water. Did you know it took almost 7,000 liters of water to make your computer?[2] And a great deal of the water used in semiconductor manufacturing processes is mostly ultra-pure water.

As living beings, we are dependent on water. Admittedly, as an environmentalist, I often hate hearing environmental stories because they make me feel helpless and never seem to have a happy ending. But there can be a happy ending here. Our water issues are so massive that solving them will take innovative solutions.

One area of approach is water distribution infrastructure. In the U.S., a third of the utilities report losing more than 40 percent of fresh water annually[3] due to leaks in water distribution systems: from leaks in the big pipes transporting water to leaks around your house. Imagine a 40 percent loss in any other commodity, such as gasoline. We simply wouldn't put up with the excessive bills and waste. But in the case of water, our most precious resource, we have closed our eyes and failed to act.

One way to correct the leaking water distribution system is with better metering. The typical mechanical meter is actually very poor at detecting flows below 30 liters per hour.[4] Worse still, mechanical meter accuracy degrades over time as the internal parts wear out. There is a better way to measure water flow today: ultrasonic waves. Ultrasonic meters are 10 times more accurate measuring water flow than mechanical meters. Given that the average U.S. household leaks 45,000 liters of water per year,[5] the average estimated leak-flow rate is five liters per hour. This isn't enough for your mechanical meter to detect, but well within the range of an ultrasonic meter. In addition, ultrasonic measurement doesn't require any moving parts, so there's nothing to wear out.

Ultrasonic sounds great, but what's the catch? It needn't be more expensive, as ultrasonic metering will more than pay for itself over time. With ultrasonic meters in an automated water meter[6] infrastructure, utilities could identify leaks and bill for what they now overlook. They could recoup revenue and tighten their distribution infrastructure. With an estimated cost of $1.50 per 4,500 liters of water,[7] utilities stand to recover $15 per customer per year. Depending on the cost of meters in volume, utilities should achieve a relatively quick return on investment. This is good for the utility companies, and we would all have a metering infrastructure that continues to perform accurately and reliably for decades...all the more reason to raise your glass next time at happy hour.

Here at Maxim Integrated, we have been working hard to solve issues like these. I suggest you check out Maxim's ultrasonic water meter, MAXREFDES70#, built to help meter manufacturers accelerate their designs to market and reduce the cost of different types of meters.

References

1. www.triplepundit.com/2010/09/how-much-water-did-it-take-to-make-that-pint-of-beer/
2. www.mnn.com/food/beverages/sponsorstory/six-ways-we-all-use-water-without-knowing-it
3. Water 20/20, http://sensus.com/smartwaternetworks
4. Evaluating domestic water meter accuracy. A case study., www.cuwcc.org/Committees/ Utility-Operations/FileId/2673
5. www.epa.gov/WaterSense/pubs/fixleak.html
6. http://techchannels.opensystemsmedia.com/signal-processing/search/? in=Sensor%20Processing%23%2520water%2520meter
7. Fair Fax Water Org., Story of Water

A similar version of this article appeared December 5, 2014 on Embedded Computing Design.

Related Parts		
MAX35101	Time-to-Digital Converter with Analog Front-End	Free Samples
MAX35102	Time-to-Digital Converter Without RTC	Free Samples
MAX35103	Reduced Power Time-to-Digital Converter with AFE, RTC, and Flash	Free Samples

More Information
For Technical Support: https://www.maximintegrated.com/en/support
For Samples: https://www.maximintegrated.com/en/samples
Other Questions and Comments: https://www.maximintegrated.com/en/contact

---