> Itron white paper

Meter Rightsizing with Itron's 100W Endpoints

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Executive Summary

Utilities use water meters to measure water flow throughout their systems and to bill customers for the water they consume. If a meter is not accurate, or if it is not optimized for a particular application, it will not measure consumption accurately, resulting in revenue losses. As such, it is important to determine the ideal technology type and meter size to use.

Itron's 100W endpoint can help determine if meters are right-sized for a particular application and perform water consumption patterns to help in scheduling water meter replacements. The purpose of this paper is to help educate utilities about how to use 100W's right-sizing functionality.

The Importance of Meter Rightsizing

Water is a scarce resource in some parts of the world and demand for it grows every day. Even though water is plentiful in most of the United States, mismanagement of water sources will result in severe shortages in the future. Decisions made today will affect what happens to our water reserves. Itron is well aware of this and we are working on solutions that will help water utilities optimize the use of their assets to minimize water losses (real and apparent) in their systems.

Utilities use water meters to measure water flow throughout their systems and to bill their customers for the water they consume. If a meter is not accurate, or if it is not optimized for a particular application (wrong size or technology), it will not measure consumption accurately resulting in revenue losses.

Utilities can perform detailed analysis of field assets to determine the ideal technology and meter size to use. Determining if the meter is over or underutilized allows utilities to install the correct meter size, optimizing asset utilization and billable flow through the meter.

Functionality of the 100W

Itron added functionality to the 100W endpoint to help determine if meters are right-sized for the application and perform water consumption patterns that can be used to schedule water meter replacement. This tool can help any utility identify underperforming water meters that may need to be replaced. It can be used at any time without having to physically access the meter to add any equipment.

The goal of this tool is to complement, not replace, the use of highly accurate (but expensive) dataloggers. These highly accurate dataloggers will still be needed when extremely granular data is required.

As with the use of any datalogger, there are some limitations users need to be aware of:

- Continuous use of this tool will shorten the battery life of the 100W endpoint considerably. It is meant to be used sparingly.
- The accuracy of the readings are dependent upon the accuracy of the water meter, so before using this or any other datalogging tool, the utility has to make sure the meter is accurate.

Test Frequency

Usage patterns can change over time, so it is important to periodically test consumption rates. A meter that was ideal initially may not be the best meter a few years later. For example, a meter may have been installed at a car wash application which could have changed over time to a grocery store.

Meter performance degrades over time, so utilities replace meters on regular bases or based on random meter testing. Some utilities perform targeted studies in consumption patterns of their customers. These studies help them maximize revenue since they can determine when to replace their meters based on total consumption or on the age of their water meters.

Obtaining Consumption Patterns

Before rightsizing data can be obtained from any endpoint, it needs to be set to perform advanced datalogging using Field Deployment Manager (FDM). A handheld with FDM version 1.1 or newer will be needed. Please follow FDM instructions to before using this feature.

To obtain consumption patterns from any water meter, follow these steps:

1. Set an appropriate sample rate: This determines how often the meter is read (encoded register) or how often interval data is saved (pulse type registers). Options are: 3, 4, 5, 6, 10, 12, 15, 20, 30 or 60 minutes. If no sample rate is chosen, the default is 15 minutes. The lowest sample rate (3 minutes) will result in the most accurate readings, but this will also result in the shortest battery life.

2. Set a start time:
    a. Immediate: The test will start immediately after all remaining options are chosen.
    b. Delay: Start time can be delayed by one to 63 days in one-day increments. The test will start at midnight of the chosen day.

3. Set a run time: This will determine when the test will stop. Users can specify from one to 63 days in one-day increments. Testing will stop at midnight of the chosen day.

4. Set maximum expected interval consumption (limit): This is the maximum expected consumption for chosen sample rate. This number is based on minimum resolution, and not on actual units.
    a. Auto: 100W will use highest observed consumption scaled to chosen sample rate.
        i. For the very first test on the 100W endpoint, the module will use max hourly consumption in last 40 days scaled by chosen sample rate.
        Example:

Sample rate:	3 minutes
Register resolution*:	10 USG
Max hourly consumption last 40 days:	600 USG
Max calculated flow rate:	10 GPM (600 USG / 60 min.)
Test limit to be used:	3 (10 GPM x 3 min. / 10 USG*)

        ii. After a meter rightsizing operation has been performed: The 100W will use the highest consumption seen in last test scaled to chosen sample rate.
        Example:

Sample rate:	3 minutes
Register resolution*:	10 USG
Previous test sample rate:	5 minutes
Max consumption in previous test:	80 USG
Test limit to be used:	4 (80 USG/5 min * 3 min/10 USG*)

b. Manual: a particular value can be set manually.
Example:

Sample rate:	3 minutes
Max expected flow rate:	20 GPM
Register resolution*:	10 USG
Test limit to be used:	6 (20 GPM x 3 min / 10 USG*)

*Resolution is the minimum increment the endpoint is able to detect. A 10 USG resolution means that every time there is an actual 10 USG increment, the reading increments by one unit at the endpoint. For absolute encoded registers, minimum resolution will be determined by lowest encoded wheel. For most incremental encoders (e.g. Badger RTR and Elster Digital registers) minimum increment will be 1/10th of the normal reading resolution seen by the reading system. So if the last movable wheel of one of these incremental encoded registers shows tens of gallons, a resolution of single gallons will be available for meter rightsizing.

Analyzing Consumption Results

Results will be divided into 6 categories:

1. Number of intervals with no (zero) consumption
2. Number of intervals with consumption between 0% and 25% of chosen test limit as well as the total volume of water measured at this rate.
3. Number of intervals with consumption between 25% and 50% of chosen test limit as well as the total volume of water measured at this rate.
4. Number of intervals with consumption between 50% and 75% of chosen test limit as well as the total volume of water measured at this rate.
5. Number of intervals with consumption between 75% and 100% of chosen test limit as well as the total volume of water measured at this rate.
6. Number of intervals with consumption higher than 100% of chosen test limit as well as the total volume of water measured at this rate.

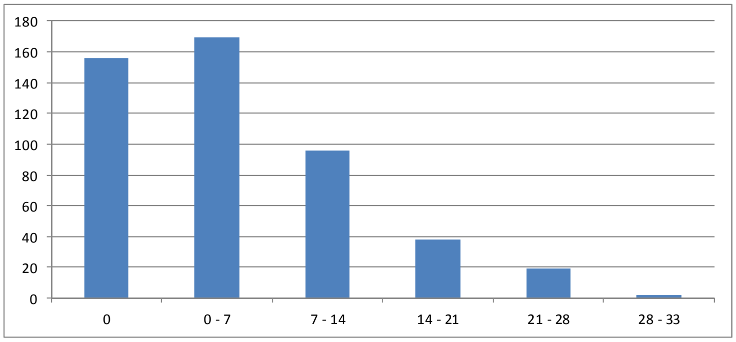
The highest consumption for chosen interval will also be reported (in case it is higher than chosen test limit).

Data from meter rightsizing tests can be easily exported into xml files. These files can be opened with programs like MS Excel. Some additional information based on meter performance can be added to help determine if recorded flows are within meter design specifications. Some of this information can be minimum flow rate at which 95 percent accuracy is expected, minimum flow rate at which normal accuracy is expected (98.5 to 101.5 percent accuracy) as well as maximum recommended continuous flow.

Graphs can then be created to help determine if the meter is properly sized for the application. See the sample Excel graph, titled “Rightsizing Graph.xlsx,” attached to this PDF.

Endpoint ID 33002471
Choose Units USG
Choose Multiplier* 1
* Minimum Reading Resolution

Rightsizing - 3 min intervals



Max. Interval Size: 33 USG (11 GPM)

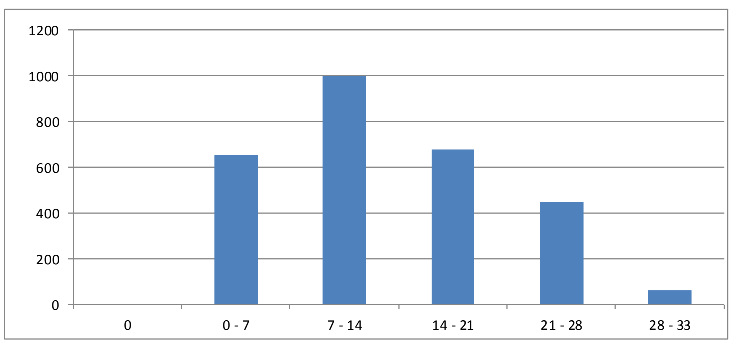
Average (GPM)	0	0 - 2.33	2.33 - 4.67	4.67 - 7	7 - 9.33	9.33 - 11
Volume (USG)	0	0 - 7	7 - 14	14 - 21	21 - 28	28 - 33
# of intervals	156	169	96	38	19	2
% of intervals	32.50%	35.21%	20.00%	7.92%	3.96%	0.42%

Min Flow (GPM) (-5%) 0.75
Min Flow (GPM) (+/-1.5%) 3
Max Cont. Flow (GPM) (+/-1.5%) 25

Interval Size (min): 3
Total Data: 1 Days 0 Hours 0 Min

Endpoint ID 33002471

Consumption Profile - 3 min intervals



Max. Interval Size: 33 USG (11 GPM)

Average (GPM)	0	0 - 2.33	2.33 - 4.67	4.67 - 7	7 - 9.33	9.33 - 11
Volume (USG)	0	0 - 7	7 - 14	14 - 21	21 - 28	28 - 33
Interval Total (USG)	0	654	1001	678	449	62
Interval % (USG)	0	23.00%	35.20%	23.84%	15.79%	2.18%

Approx. % of intervals under Min Flow (disregarding 0 consumption intervals) (-5%):	0.00%
Approx. % of volume under Min Flow (-5%):	0.00%
Approx. % of intervals under Min Flow (disregarding 0 consumption intervals) (+/-1.5%):	52.16%
Approx. % of volume under Min Flow (+/-1.5%):	23.00%
Approx. % of intervals over Max Continuous Flow (disregarding 0 consumption intervals) (+/-1.5%	0.00%
Approx. % of volume over Max Continuous Flow (+/-1.5%):	0.00%
Max Observed Flow vs. Max Continuous Flow:	44.00%

Based on the results of the consumption analysis, the appropriate meter size can be determined.

Creating a Consumption Profile

The spreadsheet attached to this PDF, titled "01.xlsx," can be used to graph data obtained from FDM after meter rightsizing data is extracted. Once these files are obtained, users can follow these steps to create similar graphs to the graphs shown above:

- Save "01.xlsx" file to your computer.
- Save "Rightsizing.xlsx" file to same directory as "01.xlsx" file.
- Open FDM log file using MS Excel 2007 or later version (see a sample FDM file attached to this PDF). To do this, first start MS Excel, then choose "File" then "Open". Make sure "All Files" option is selected for file type and then open log file. Choose to open as "XML Table" if asked how to open this file.
- Open "01.xlsx" file.
- Copy first row from log file into first two rows of "01.xlsx" file making sure columns align (column A of xml file is copied to column A of "01.xlsx" file). This is very important since data will be mapped according to headers for each column and headers in these log files may change based on jobs performed. Save "01.xlsx" file and leave it open.
- Find "ExtractRightsingDataCommand" line for desired endpoint. Copy this line to second line of "01.xlsx" file making sure columns align (column A of xml file is copied to column A of "01.xlsx" file).
- Open "Rightsizing.xlsx" file.
- Print results if desired. A PDF file converter could be used to save files for archival purposes.

Before creating reports for another endpoint in the same log file, close "Rightsizing.xlsx" file (changes do not have to be saved), copy new "ExtractRightsizingDataCommand" line to second line of "01.xlsx" file. Save "01.xlsx" file and leave it open. Open "Rightsizing.xlsx" file again.

If data from a different log file needs to be analyzed, start process from the beginning.

Conclusion

Meter rightsizing is important to the optimization of water delivery. Using these simple steps, utilities can gather consumption data and determine if their meters are accurate. By performing this routine meter check, meters can be replaced as needed to optimize asset utilization and billable flow.

About Itron

At Itron, we're dedicated to delivering end-to-end smart grid and smart distribution solutions to electric, gas and water utilities around the globe. Our company is the world's leading provider of smart metering, data collection and utility software systems, with nearly 8,000 utilities worldwide relying on our technology to optimize the delivery and use of energy and water. Our offerings include electricity, gas, water and heat meters; network communication technology; collection systems and related software applications; and professional services. To realize your smarter energy and water future, start here: www.itron.com.

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Publication 101111WP-01
01/11

