Metering Simplified
Ultrasonic Technology

Mike Phillips- Master Meter, Inc.

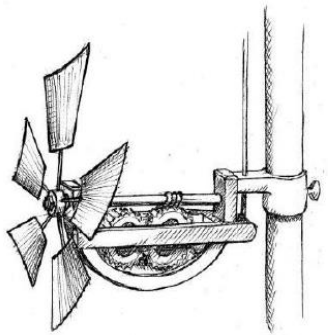
Brandon Begley- Fortiline Waterworks

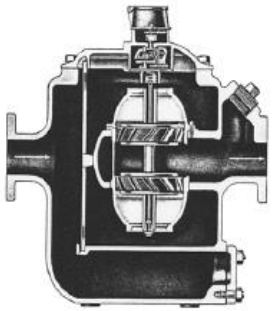


Complicated Choice

Legacy Products (still in use)

- Turbine / Propeller
  (introduced in the late 1700s)





Legacy Products (still in use)

- Compounds (introduced in 1914)
  - Mainline turbine
  - Low flow meter (Multi-jet or PD)
  - Automatic valve for diverting flow rates
- Dual or single registers

Master Meter DBC
(Dual Body Compound)

Legacy Products (still in use)

- Fire Assembly Meters (introduced in 1908)
  - Mainline meter (turbine or proportional type)
  - Low flow meter (MJ, PD, turbine or compound)
  - Automatic valve for diverting flow rates

Master Meter FSC
(Fire Service Compound)

Why it is important

- Unmetered consumption
- Inaccurate meters
- Damaged meters
- Frequent repairs

All lead to lost revenue

The 80/20 Rule

Generally 20 % of a utilities total installed meter base measures 80% of the total billable volume

20% = Commercial and Industrial meters

How Ultrasonic Works

Ultrasonic Technology

Basic Operating Principle is Sound
Two types
- Doppler-Effect
  - Best suited for wastewater and slurries

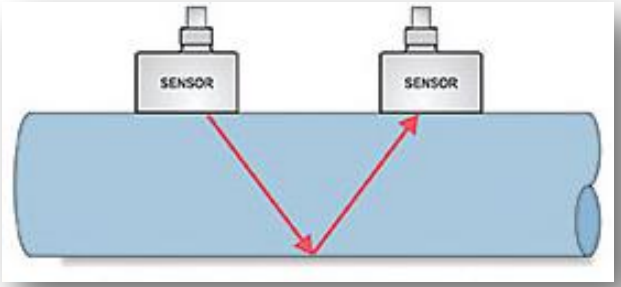
How Ultrasonic Works

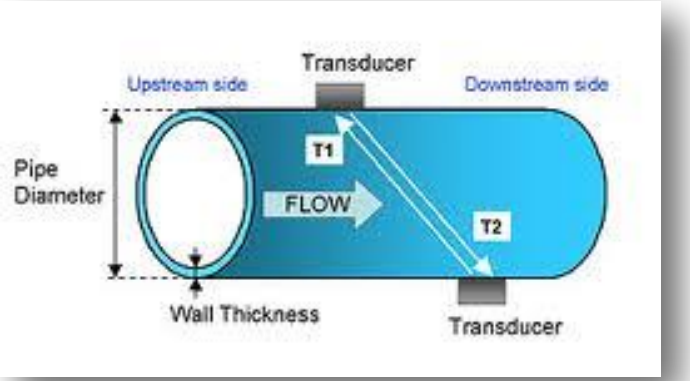
Ultrasonic Technology

Basic Operating Principle is Sound
Two types:

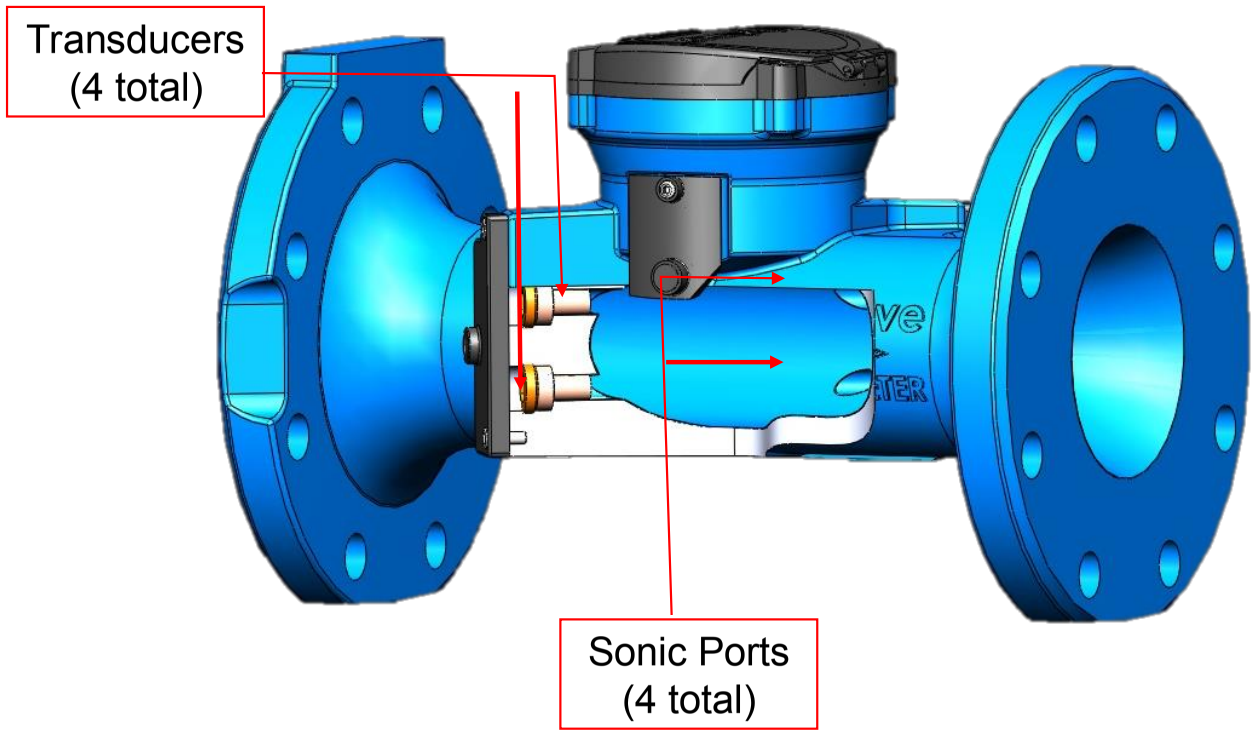
Transit Time (the Octave)

- Best suited for clean water.
- Sound waves are generated by a transmitter and are either reflected to, or sent across the pipe to a receiver.
- This same process happens in the opposite direction. (one with flow, one against flow).
- Upstream and downstream times are compared. The difference in time equates to the water velocity.
  - No time difference = no flow





How Ultrasonic Works



Measuring Principle

- Dual Beam
- Ultrasonic Transit Time
- Sing Around

Flow Direction

Ultrasonic vs. Turbine

- **3” TURBINE**
- 3 GPM Average Low Flow @ -5% - +1%.
- 5 GPM Normal Range @ + 1.5%

The 80/20 Rule

- 0.5 - 0.7 GPM Average Flow

- Toilets (‘92): Up to 1.6 USG per flush
- Urinals (‘92): Up to 0.5 USG per flush

FORTILINE WATERWORKS

Ultrasonic vs. Turbine

MASTER METER

Performance Data

Octave Nominal Size inch (mm)	† Typical Starting Flow GPM (Lt/s)	Extended Low Flow 95% - 105% Accuracy GPM (Lt/s)	Normal Flow Range 98.5% - 101.5% Accuracy GPM (Lt/s)	‡ Continuous Safe Max Flow GPM (Lt/s)	Linearity Range +/- 0.5% Maximum Deviation GPM (Lt/s)
2" (50mm)	1/16 (.004)	1/4 (.016)	1/2 - 250 (.032 - 15.77)	250 (15.77)	4 - 200 (.25 - 12.62)
3" (80 mm)	1/16 (.004)	1/2 (.032)	1 - 500 (.06 - 31.54)	500 (31.54)	5 - 350 (.32 - 22.08)
4" (100 mm)	1/16 (.004)	3/4 (.047)	1-1/2 - 1,000 (.09 - 63.09)	1000 (63.09)	15 - 700 (.94 - 44.16)
6" (150 mm)	3/4 (.047)	2 (.13)	3 - 1,600 (.19 - 100.94)	1,600 (100.94)	20 - 1,150 (1.26 - 72.55)
8" (200 mm)	3/4 (.047)	4 (.25)	5 - 2,800 (.32 - 176.65)	2,800 (176.65)	50 - 2,000 (3.15 - 126.18)
10" (250 mm)	2.5 (.16)	8 (.50)	14 - 5,500 (.88 - 346.99)	5,500 (346.99)	400 - 4,000 (25.24 - 252.36)
12" (300 mm)	2.5 (.16)	8 (.50)	14 - 5,500 (.88 - 346.99)	5,500 (346.99)	400 - 4,000 (25.24 - 252.36)

† Starting flows vary per meter but can go as low as the above listed flow rates.

‡ Continuous Safe Max Flow ranges listed for the Octave are for accurate flow measurement only and do not limit the Octave from meeting the Short-term Deluge Flow for fire services.

Ultrasonic vs. Turbine

Turbine

Ultrasonic

Keep it Simple

ELIMINATE:

- Installing the wrong meter type
- Excessive maintenance costs
- Gradual decrease in accuracy
- High overhead & inventory costs
- Decrease installation costs

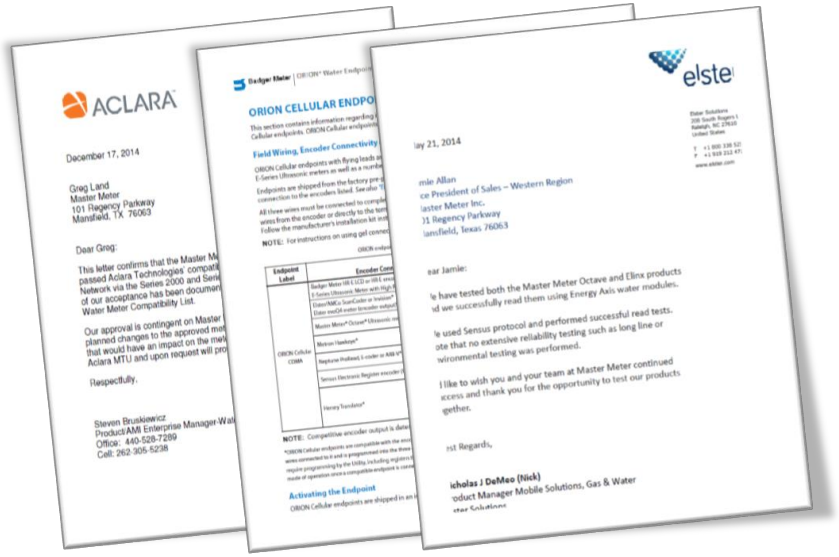
Simplified Installation

VS.

- Turbines up to 80% heavier
- Compounds up to 300% heavier
- Fire Assemblies up to 1800% heavier

Simplified Meter Selection

Ultrasonic is Migrateable



The Octave fits most meter installation services

Simplified Inventory

Ultrasonic Meters

The Octave eliminates the requirement to stock multiple meter types

Features & Benefits

Ultrasonic Technology

Overview

- ✓ No moving parts
- ✓ Sustained meter accuracy
- ✓ No strainer required
- ✓ Low flows similar to compounds and high flows similar to turbines
- ✓ FM Approval - one meter for all applications
- ✓ Reduced headloss
- ✓ Light-weight design
- ✓ No cross-over drop in accuracy

FORTILINE WATERWORKS

Improving Water System Operations

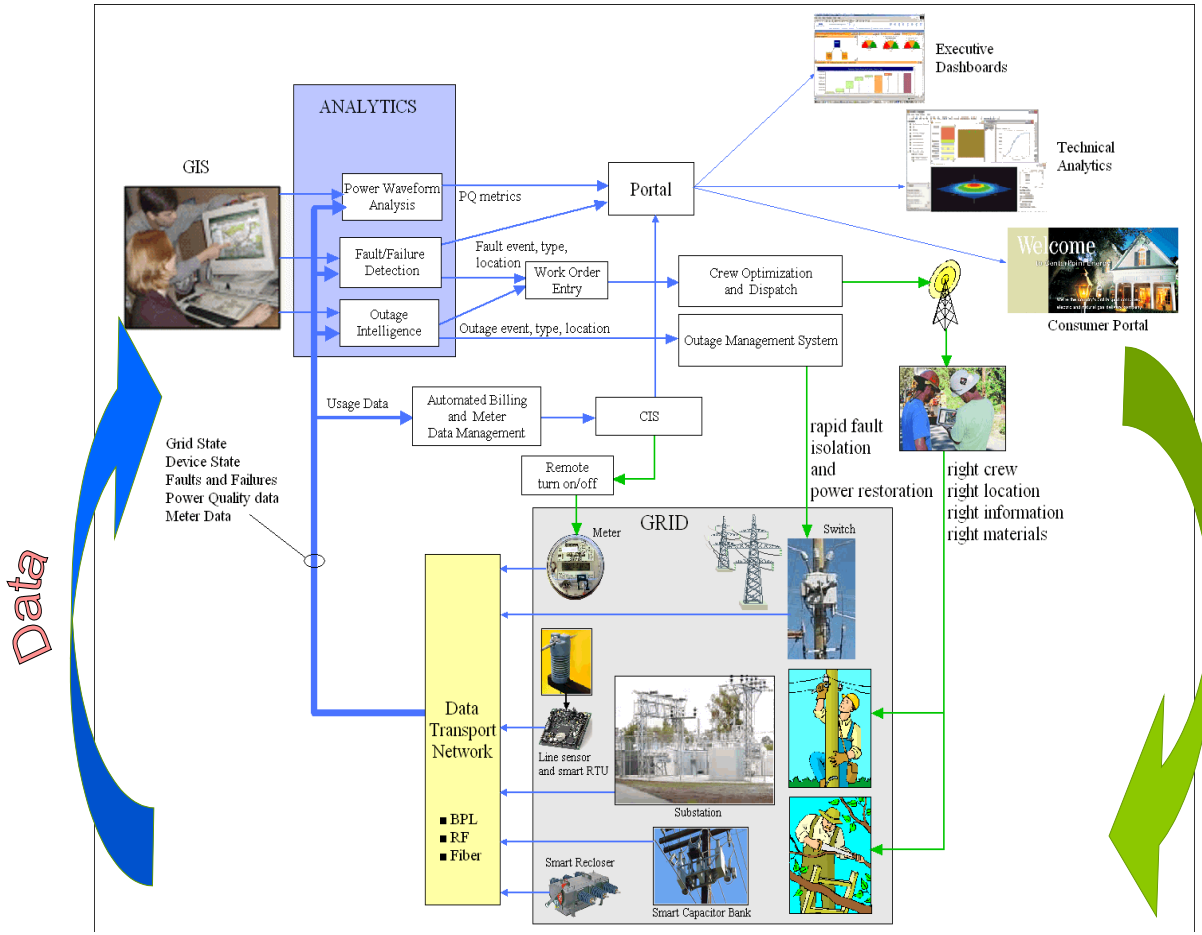
MASTER METER

AMI (Advanced Metering Infrastructure)

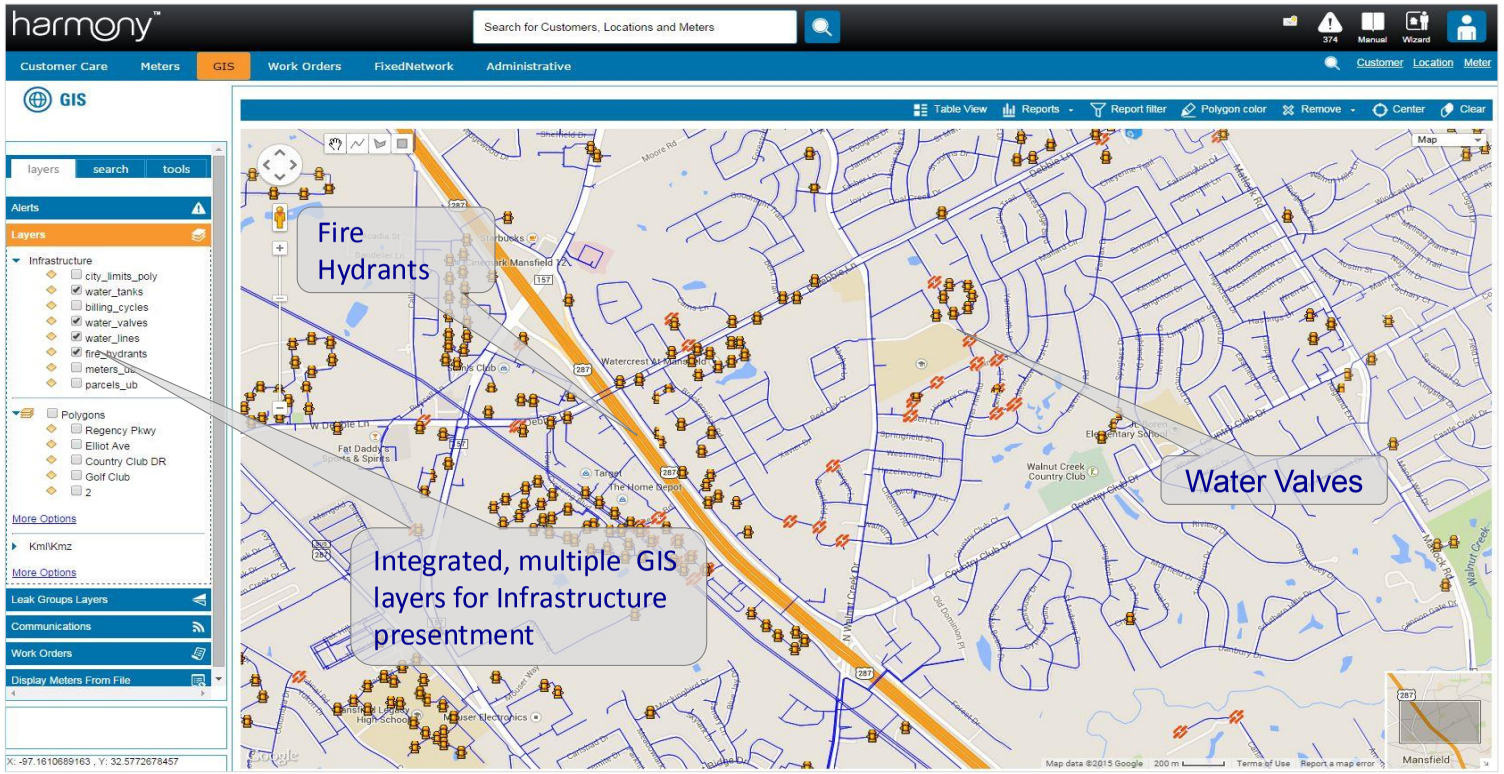
- Meter selection and accuracy
- Non Revenue Water Evaluation (DMA)
- System Leak Monitoring
- System Backflow
- Water Quality Monitoring

Smart Grid

- AMI refers to the full measurement, collection and processing of meter and other customer data
- AMI includes “smart” meters installed at each premise, a two way communications network, and data management systems
- AMI enables more granular measurement of consumption, the matching of consumption to price and more frequent transmittal of consumption data
- AMI enables a partnership between Utilities and their customers to help customers make better energy decisions



GIS / Layered Maping

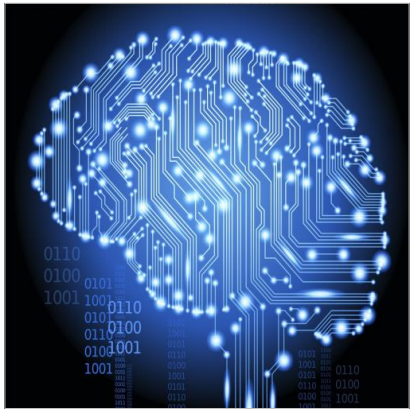


Powered by Microsoft Azure

Customer Engagement

SMS | Leak | Budget ALERTS

Final Considerations



- How will you use this massive amount of data to reach your goals?
- Customer segmentation?
- Creating value?

- Which insights are you after?
- What metrics are most helpful in your day-to-day operations?

- How do you currently track Service Reliability?
- Index customer satisfaction?

Thank You

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