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Fuelling the Future

Residential Ultrasonic Smart Gas Meters

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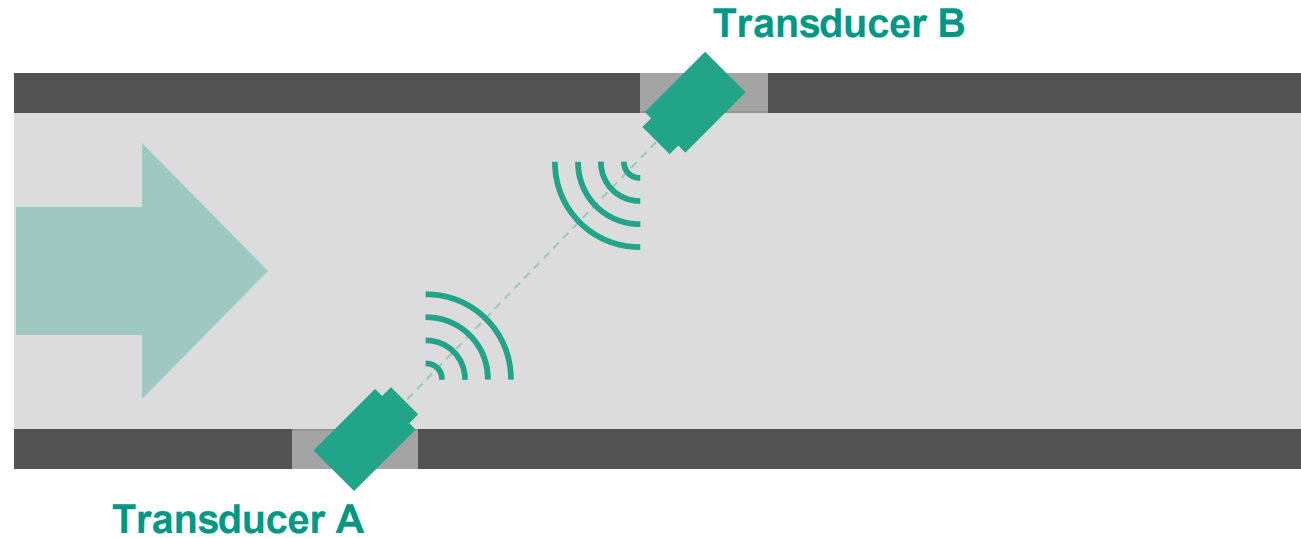
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Background

- Diaphragm meters have many moving parts and performance suffers over time
- Supply Chains for these components have become very long with intensive labor to manufacture which is difficult to find/retain
- Prices have escalated along with leads times
- State Commissions require periodic testing or sampling to insure they retain accuracy
- AMR/AMI components with different lifecycles have complicated the procurement and long-term handling of these combination meters

Principle of Operation



$$\Delta t = t_{BA} - t_{AB}$$

Ultrasonic wave pulse (frequency > 20 kHz) is generated in a transducer (A). The pulse goes through the pipe, and then received and measured by another transducer (B).

The time of travel of the acoustic wave from point A to point B (t_{BA}) is not the same as that from point B to point A (t_{AB}), which generates a delay (Δt). This difference is due to the flow stream inside the pipe: the higher is the flow velocity, the greater is the difference. Knowing the distance between the two transducers and the travel time difference, the volume flow rate is calculated.

Features & Functionality

- ❖ ANSI B109.6 Compliant
- ❖ High Accuracy with no moving parts to wear
- ❖ Data:
 - Hourly to Monthly Volumes
 - Temperature of Gas, Meter Case or Ambient
 - Meter Pressure
 - Seismic Detection
 - High Resolution Inputs
 - Meter Performance
- ❖ Communication:
 - Radio Public & Private Bands
 - CatM1 & NB IoT
- ❖ Gas Shut Off via Network or Autonomous Decision Made by the Meter
 - Excess Flow, Pressure, Temperature, Seismic, Tamper, Air, Non-Payment, Leak Calls

Hourly Consumption Data

- Hourly Volumes allow analytics for leak detection, enhance safety for “soft close” policies and emergency response
- Residence flow never falls below 5 cfh indicating leakage on customer piping
- Monitoring of flow rate during “soft close” with ability for network shut off for excess flow
- Excess flow at residence during mud slide or other natural disaster indicates damage to customer piping
- Air detected or low pressure detected during pipeline damage
- Pipeline System Modeling based on hourly consumption with time of use for all customers

Temperature and Pressure Data

- Accurate TC due to electronic components
- Ambient temperature can provide input to shut off valve for fires
- Meter pressure data provides performance data for the regulator with situational “lock up” testing at high flow and low/pilot flow
- High pressure alarms communicate regulator AOC prior to customer complaint of gas odor
- Low pressure alarms can be used to identify outages

High Resolution, Meter Performance & Seismic Data

- High Resolution consumption can be used for leak testing
- High Resolution Data may be used as forensic data to investigate home damages
- Meter Performance Data may be used like DP on Rotary meters if unchanged the meter has retained accuracy
- Seismic Data can link valve shut off to event that created excess flow

Communication

- Public radio
- Private radio
- Public cellular/IP
- Private IP
- Interoperability for multiple manufacturers
 - Meter Manufacturers
 - Communication Manufacturers
 - Data Integration

Shut Off Valve

- Autonomous Shut Off
 - Excess Flow
 - Excess Pressure
 - Excess Ambient Temperature
 - Seismic Followed By Excess Flow
- Network Shut Off
 - Empty Home With Flow Beyond Normal Pilots
 - Gas Leak Reports
 - Non-Payment
 - Network Latency

Deployment

- Accelerated project integrating to existing network
- Accelerated project installing network or enhancing existing network
- Gradual installation to existing network utilizing existing funded meter work
- Gradual Installation to new network utilizing existing funded meter work
- Utility collection and data management
- Cloud Hosted service for collection and data management

Deployment to Installed Network

- Accelerated project integrating to existing network
 - Installed battery life is the timeline driver and geographic deployment driver
 - Increased labor and project related needs are capitalized with reduced work/cost in post deployment years
 - Existing IT System Integration is utilized

Deployment With New Network

- Accelerated project with new network
 - Network build out is the driver for geographic deployment
 - Increased labor and project related needs are capitalized with reduced work/cost in post deployment years
 - IT systems must be built and integrated – Head End, Meter Management, Customer Information and Billing
 - Consideration should be done for data types and purpose/programs it will be used for

Deployment On Public Network

- Accelerated project utilizing public network
 - Increased labor and project related needs are capitalized with reduced work/cost in post deployment years
 - Utility can decide geographic deployment considering public network availability
 - IT systems must be built and integrated – Head End, Meter Management, Customer Information and Billing
 - Consideration should be done for data types and purpose/programs it will be used for
 - Communication costs and network collection costs can be integrated with meter purchase price to capitalize into BC 163

Deployment On Public Network

- Gradual deployment
 - Utility can decide geographic deployment considering public network availability
 - Routine/Planned O&M meter changes can be utilized as deployment schedule moving those costs to capital
 - Levelized workload and meter purchase may fit within GRC Budgets
 - IT systems must be built and integrated – Head End, Meter Management, Customer Information and Billing
 - Consideration should be done for data types and purpose/programs it will be used for
 - Communication costs and network collection costs can be integrated with meter purchase price to capitalize into BC 163

Benefits

- Reduced size and weight make for compact MSA's, reduced shipping costs and storage space both at warehouse locations and on service trucks
- 20-year life cycle capital asset refresh and depreciation schedule
- Possibility to modify or remove statistical sampling programs for meter accuracy
- Safety Shut Off
- Regulator Performance data and alarming
- Hourly data analytics for customer safety and pipeline system modeling