AQS-SYS fixed water pipe monitoring system

System overview

- Leak detection and location by correlation using accelerometers or hydrophone sensors.
- Automatic analysis of daily correlations.
- Leak size estimation categories by A, B & C for small leaks.
- All pipe material supported.
- All pipe diameters supported.
- Typical installation 300-500 meters apart. Depending on pipe material (see table below).
- Accurate leak detection from 1.5 mm (1/16") leak sizes at 3 bars at over 300m distance.
- The sensors can be easily installed on aboveground & underground hydrants or valves.
- 3.5G/4G Cellular communication.
- Sound files can be downloaded.
- Provides pipe condition assessment.

The table below describe the average number of sensors needed for an AQS project and the spacing recommended between the sensors when planning the installation.

Avg Spacing/Coverage	ACC	Hydrophones
Metal	300/500 m	
AC	250/300 m	
PVC	150/250 m	250/300 m
PE	-	150/250 m
Large Pipes	-	500/700 m

Please note, this table represents the spacing and coverage of sensors in a city topology where the pipes layout is not a straight line but a grid of pipes. In straight line topology the spacing and coverage are identical and the distances are much higher. For example, in a straight line of metal pipe the spacing and coverage would be 1,200 m rather than 300 m spacing and coverage of 500 m of pipes.

On average for 1 KM of Pipe:

- 2 ACC sensors for Metal
- 3 ACC sensors for AC
- 4ACC sensors for PVC
- 3 Hydrophones for PVC
- 4 Hydrophones for PE
- 2 Hydrophones for Large Pipes

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Installation and sensors types

Aboveground installation:

Aboveground installation is performed on aboveground fire hydrants.

Specially designed rigid enclosure ensures safe and robust installation, as well as excellent acoustic coupling.

The sensor is fastened to a base with hidden bolt.

Underground installation

The sensor can be installed in valve pits and on underground fire hydrants. The sensor and electronic enclosure unit are separated by a cable in order to adjust to different valve pits configurations and depths. The enclosure unit fits most valve boxes. The vibration (accelerometer) sensor has magnetic base that easily attached to valve or hydrant. The hydrophone can be attached to the hydrophone opening or to a similar fitting that enable connecting the Hydrophone's 1” male sensor thread, in some cases air release valve will be installed to ensure automatic air release.

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Data Analysis

- Cloud based server
- Multi-sensor correlation-based leak detection
- Automatic adaptive filtering of signals
- Leak intensity estimation
- Automatic interference filtering: irrigation, pumps, PRV, etc.
- Statistical analysis and trending of leak development
- Sensor registration and leaks managements via Android app
- Pipe condition assessment

Web based data presentation

- Tabular and map-based presentation of leaks
- Extensive reporting capabilities
- Leak life cycle management

SW Interfaces

- Presentation of leak and sensors on GIS ESRI
- Interface to Event Management Software
- Interface to Asset Management Software

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Belowground Accelerometer Sensor Specifications

- Frequency range: 1-2000Hz; Sensitivity: <1 micro g
- Dynamic range: 20 Bit
- Water-proof enclosure: IP 68
- Temperature range: -20° to 60° C (-4° to 140° F)
- Power: Lithium Metal 3.6V battery
- Work time: 5 years of operation at standard conditions and 1 sample per day.
- Advanced time synchronization of less than 1ms using RF
- Comprehensive self-test upon installation
- Enclosure Dimensions: 238 x 80 x 61mm,
- Enclosure weight: 600g (not including cellular antenna)
- Sensor dimensions: D=53mm H=52mm, cable length: 2-5meter,
- Sensor weight: 150g

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Belowground Hydrophone Sensor Specifications

- Frequency range: 1-2000Hz; Sensitivity: <1 micro Pa; 16 Bar pressure rating.
- Dynamic range: 20 Bit
- Water-proof enclosure: IP 68
- Temperature range: -20° to 60° C (-4° to 140° F)
- Power: Lithium Metal 3.6V battery
- Work time: 5 years of operation at standard conditions and 1 sample per day.
- Advanced time synchronization of less than 1ms using RF
- Comprehensive self-test upon installation
- Enclosure Dimensions: 238 x 80 x 61mm,
- Enclosure weight: 600g (not including cellular antenna)
- Sensor dimensions: D=42mm H=54mm, cable length: 2-5meter,
- Sensor weight: 180g
- Sensor material: SS316
- Sensor threads: 1" BSPT or NPT

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Aboveground Sensors Specifications

- Frequency range: 1-2000Hz; Sensitivity: <1 micro g
- Dynamic range: 20 Bit
- Water-proof enclosure: IP 65
- Temperature range: -20° to 60° C (-4° to 140° F)
- Power: Lithium Metal 3.6V battery
- Work time: 5 years of operation at standard conditions and 1 sample per day.
- Advanced time synchronization of less than 1ms using RF
- Comprehensive self-test upon installation
- Enclosure Dimensions: 230 x 100 x 86mm
- Enclosure weight: 750g

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