AABC Commissioning Group

AIA Provider Number 50111116

Discover how much Water You're Using and Use that Information to Optimize Your Facility

Course Number: CXENERGY1704

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Instruments Direct

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SAMPLE OPTIONAL SLIDE

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Course Description

The question all balancers need to answer is “how much water are we using.” Without this critical data, there is no basis to adjust or balance a hydronic system. This session explores the different water applications in a typical facility and breaks down the technologies on how to monitor the flow and energy from both a flow survey discovery process and a long term dedicated metering solution.

Learning Objectives

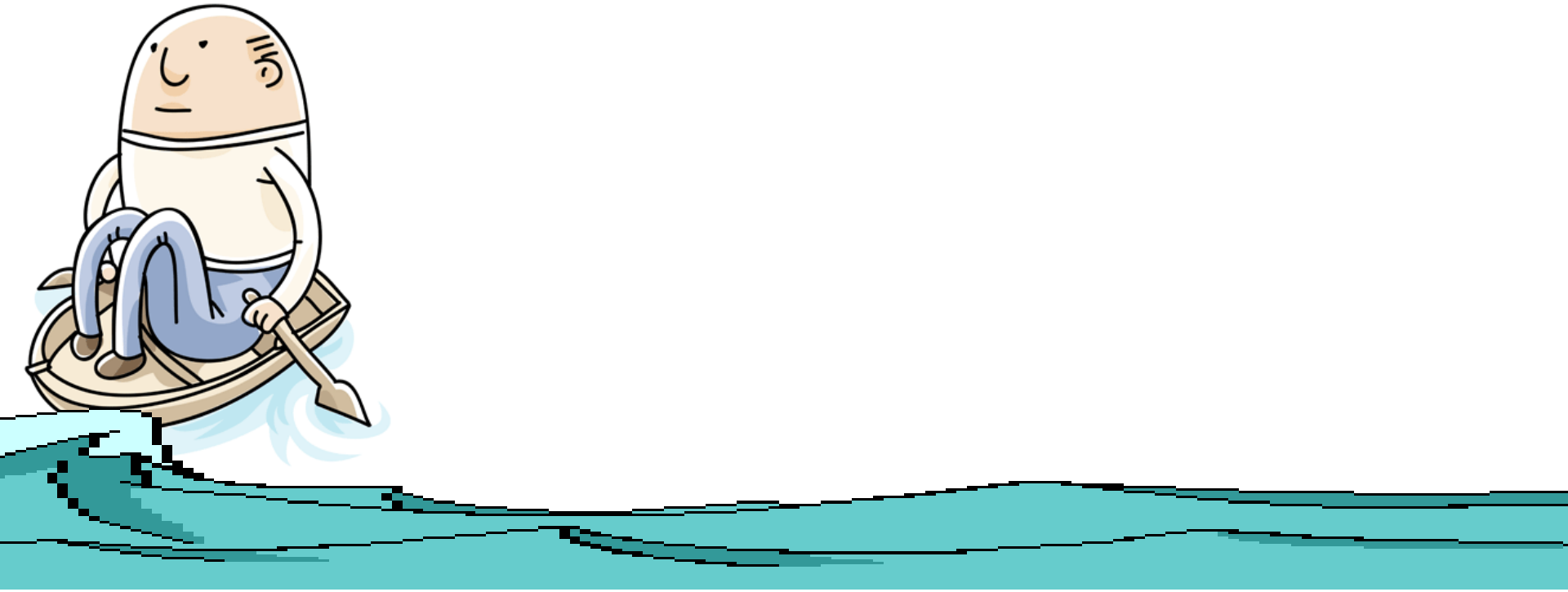
At the end of the this course, participants will be able to:

1. Learn about different water application inside a typical facility.

2. Learn about hydronic requirements and effect.

3. Learn about the performance and limitation of old metering equipment as well as the flow meter tool to better balance and commission a facility.

4. Learn about technologies and tools to optimize your facilities water usage.



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EMERGENCY
Emergency Patient Parking
Main Entrance
Physician Parking
Medical Center
EMERGENCY

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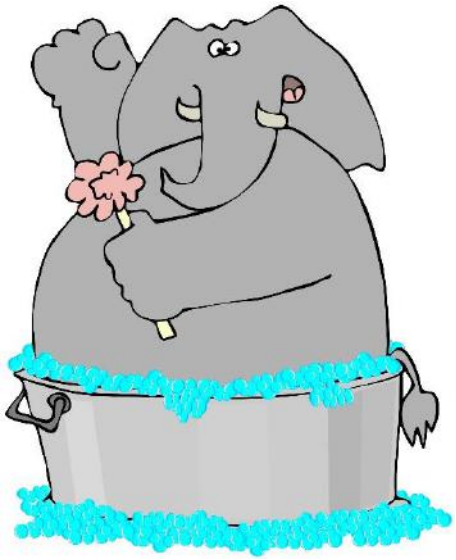
- How much water does the average person use at home per day?

Estimates vary, but each person uses about 80-100 gallons of water per day.

How much water do you use?

Bath: 35 to 50 gallons of water. Larger units, soaking tubs or freestanding tubs, 60 to 80 gallons of water



How much water do you use?

Shower: 5 gallons per min, water saver head is 2 gallon per min

How much water do you use?

Toilet flush: 3 gallons. Newer toilets use 1.5 gallons.

How much water do you use?

Dishwasher: • Newer energy efficiency 6 gallons, older up to 16 gallons. Dish washing by hand: 8 – 27 gallons

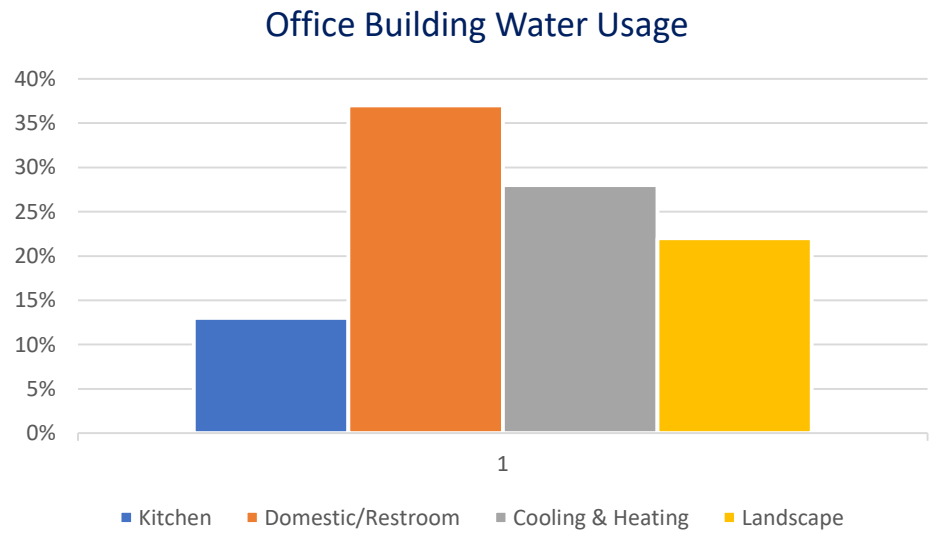
How much water do you use?

- Office Buildings, Commercial & Institutional Facilities in the USA account for 17% of the public water supply.

- Example – hotels, restaurants, office buildings, schools, hospitals, laboratories, government and military institutions.

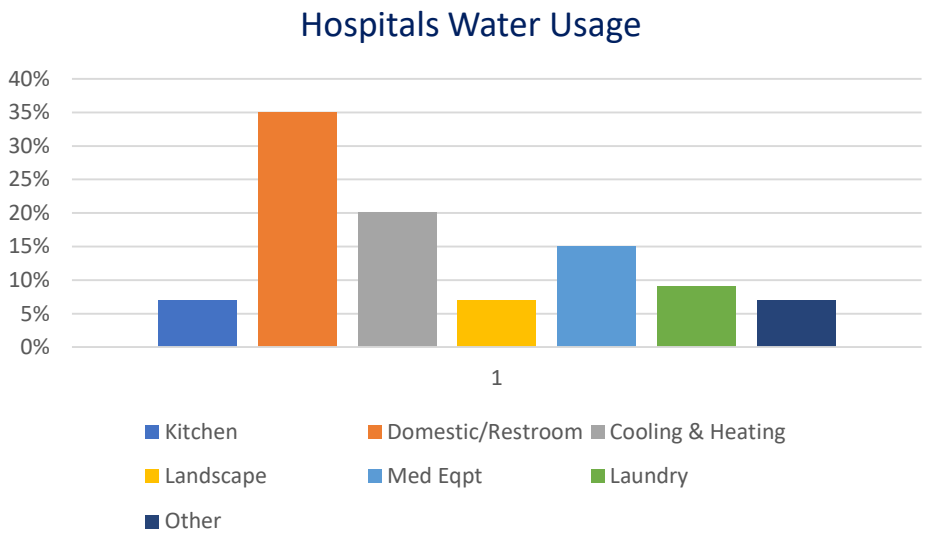
How much water do you use?

- Office Buildings



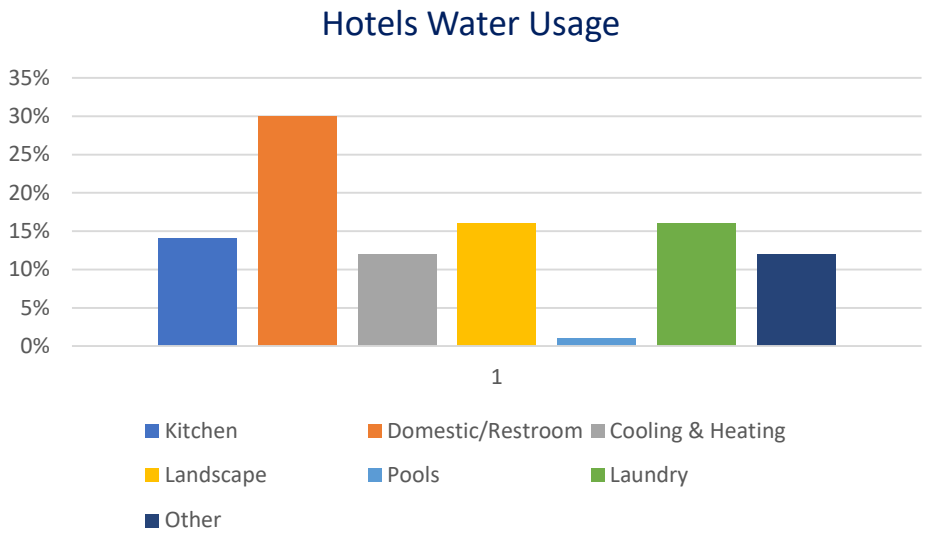
How much water do you use?

- Hospitals



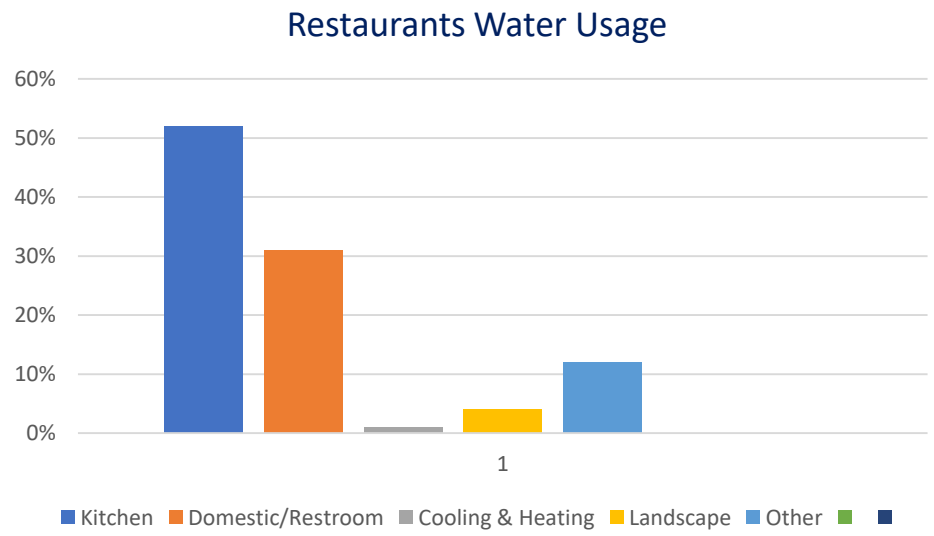
How much water do you use?

- Hotels



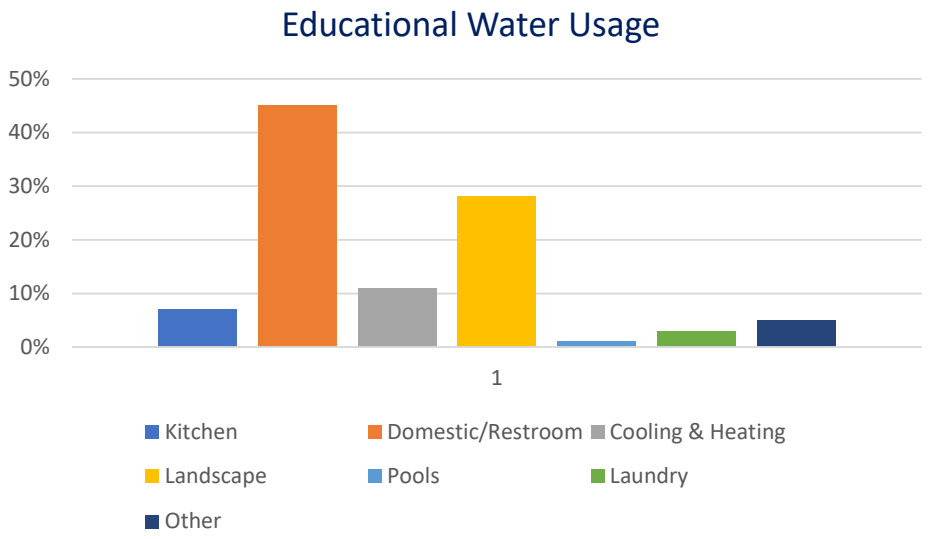
How much water do you use?

- Restaurants



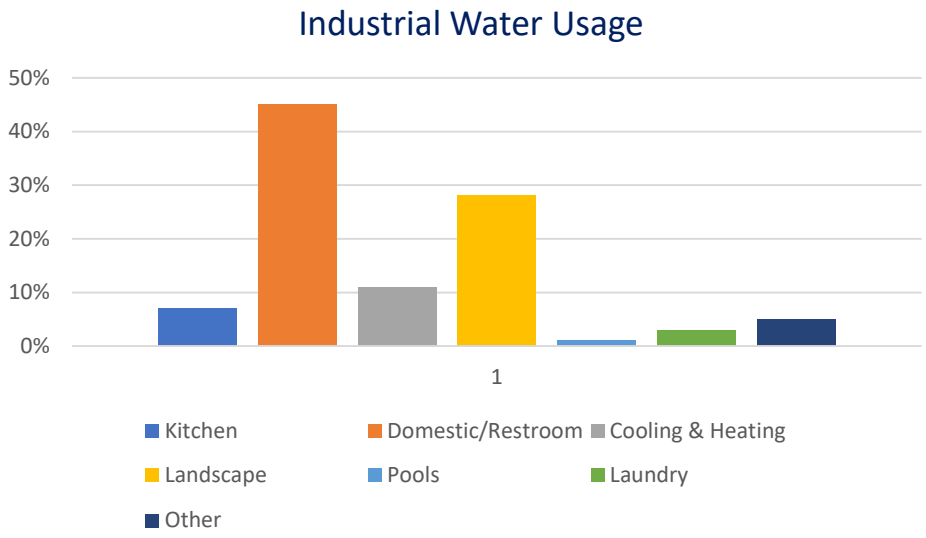
How much water do you use?

- Educational



How much water do you use?

- Industrial



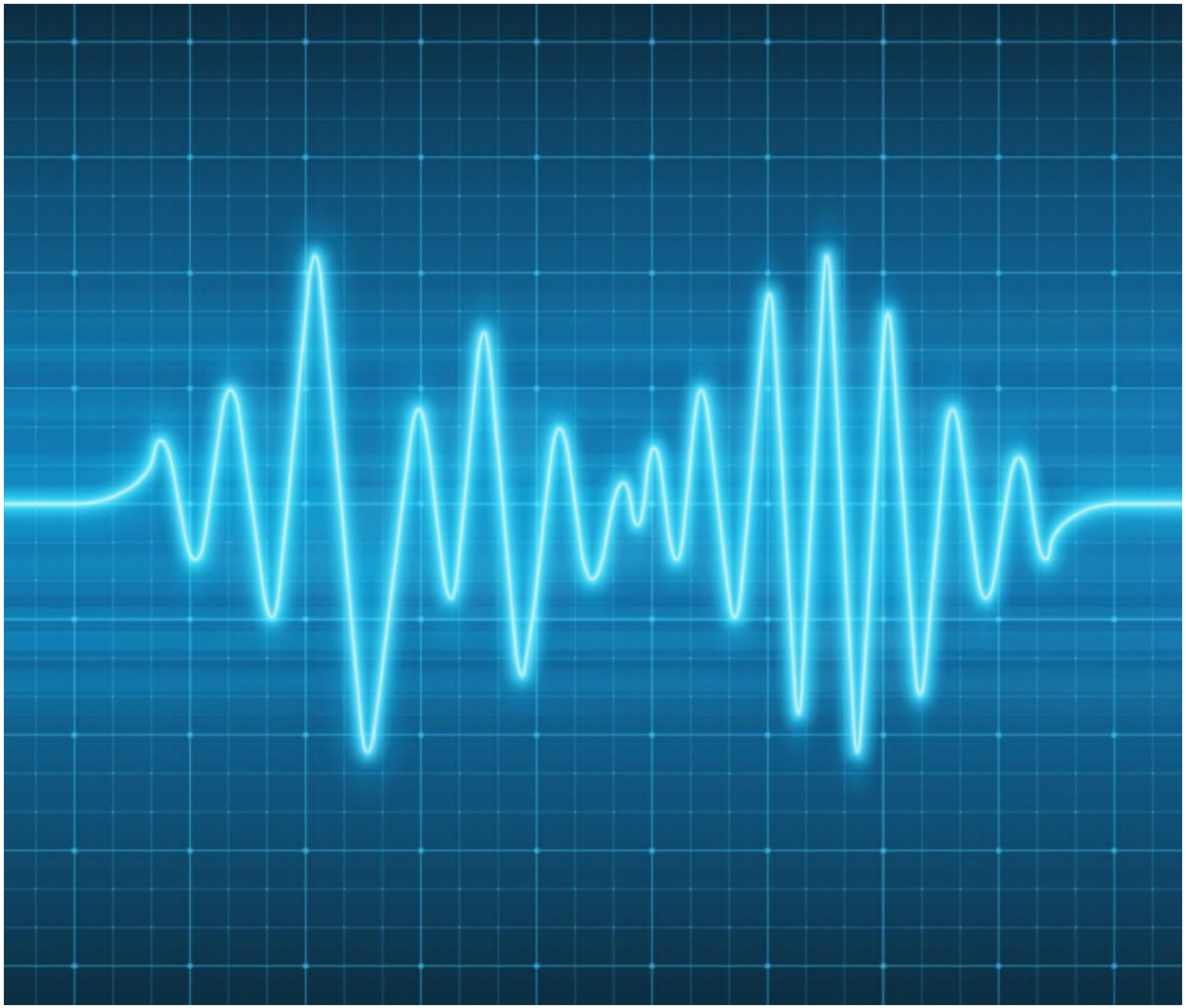
How much water do you use?

Reason for monitoring

- ***Inventory***
  - How much water are you using
  - Control or regulate a regulation
  - Control a manufacturing process
- ***Billing***
  - Support water distribution infrastructure
  - Submetering
  - Enforce usage / regulations

- How do you determine the efficiencies of your current system?
- Discover Process
- Use a reference flow meter to establish a baseline and map out your sources:
  - -Hot and Chilled water
  - -Temperature (Differential) BTU

You need a Tool to Measure your water usage.



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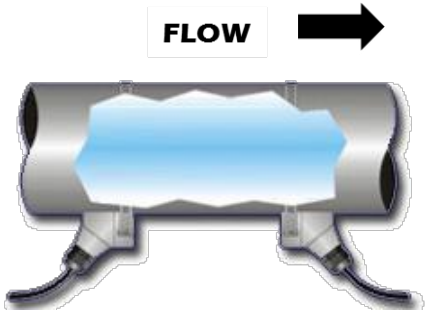
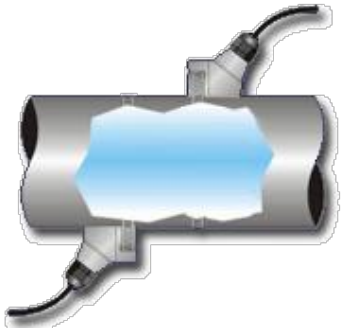
Ultrasonic Flow Meters

TRANSIT TIME TECHNOLOGY

TRANSIT TIME FLOW METERS UTILIZE TWO TRANSDUCERS WHICH FUNCTION AS BOTH ULTRASONIC TRANSMITTERS AND RECEIVERS. THEY OPERATE BY ALTERNATELY TRANSMITTING AND RECEIVING A FREQUENCY MODULATED BURST OF SOUND ENERGY BETWEEN THE TWO TRANSDUCERS.





THE BURST IS FIRST TRANSMITTED IN THE DIRECTION OF FLUID FLOW AND THEN AGAINST FLUID FLOW. SINCE SOUND ENERGY IN A MOVING LIQUID IS CARRIED FASTER WHEN IT TRAVELS IN THE DIRECTION OF FLUID FLOW (DOWNSTREAM) THAN IT DOES WHEN IT TRAVELS AGAINST FLUID FLOW (UPSTREAM), A DIFFERENTIAL IN THE TIMES OF FLIGHT WILL OCCUR.

THE SOUND'S TIME OF FLIGHT IS ACCURATELY MEASURED IN BOTH DIRECTIONS AND THE DIFFERENCE IN TIME OF FLIGHT CALCULATED.

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Ultrasonic Flow Meters

TRANSIT TIME TECHNOLOGY

1. PRINCIPLES OF MEASUREMENT

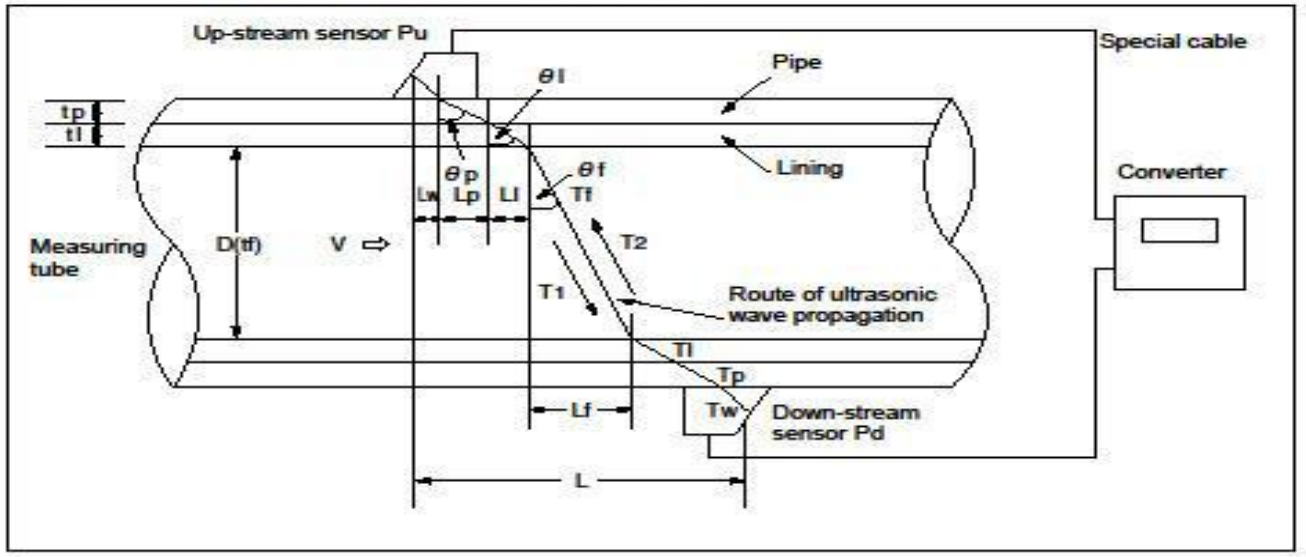

Fig. 1-1 Diagram for principles of measurement (Z method)

Sound Speeds

The speed of sound *c* is given by the Newton-Laplace equation:

$$c = \sqrt{\frac{C}{\rho}}$$

C is a **coefficient of stiffness**, the **bulk modulus** (or modulus of bulk elasticity), ρ is the **density.**

Therefore the speed of sound increases with the stiffness of the material, and decreases with the density.

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NOTE ON WATER/GLYCOL APPLICATIONS

Sound speed of Water
4,908 fps @25 deg C

Sound speed of Glycol
5440 fps @25 deg C

Typical mixture of 30% Glycol and 70% water.

30% Glycol = 1,632 fps
70% Water = 3,435.6 fps
Total 5,067.6 fps

<10% change on Sound speed – Just Program the sound speed for Water..

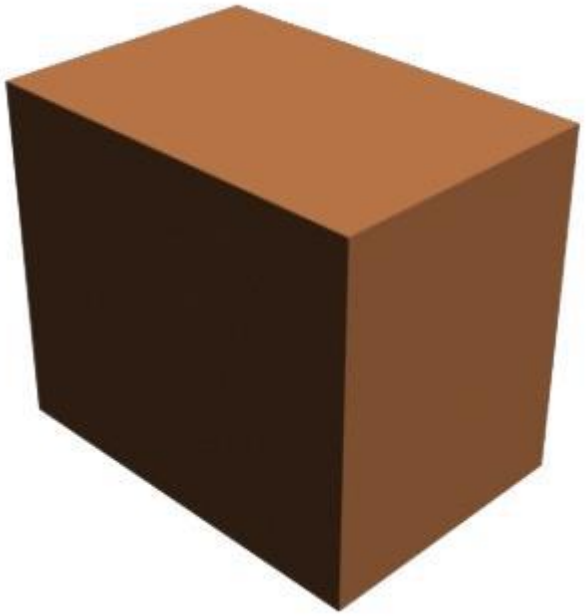
Most new technology meters auto adjust for optimal Sound Speed.

Bulk Modulus

The bulk modulus *K* can be formally defined by the equation:

$$K = -V\frac{\partial P}{\partial V}$$

where *P* is pressure, *V* is volume, and *∂P*/*∂V* denotes the partial derivative of pressure with respect to volume. The inverse of the bulk modulus gives a substance's compressibility.



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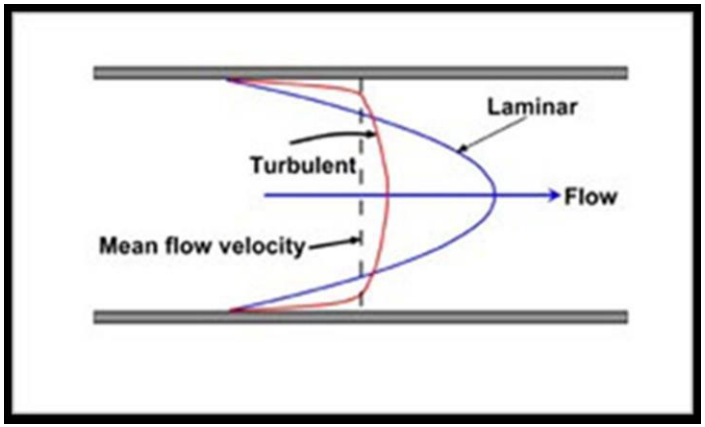
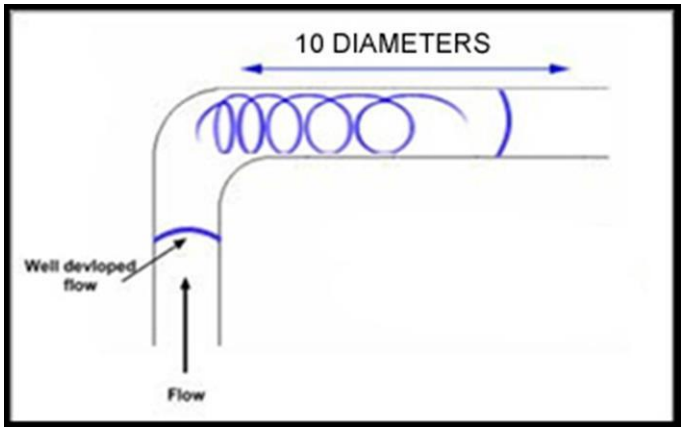
FLOW PROFILES

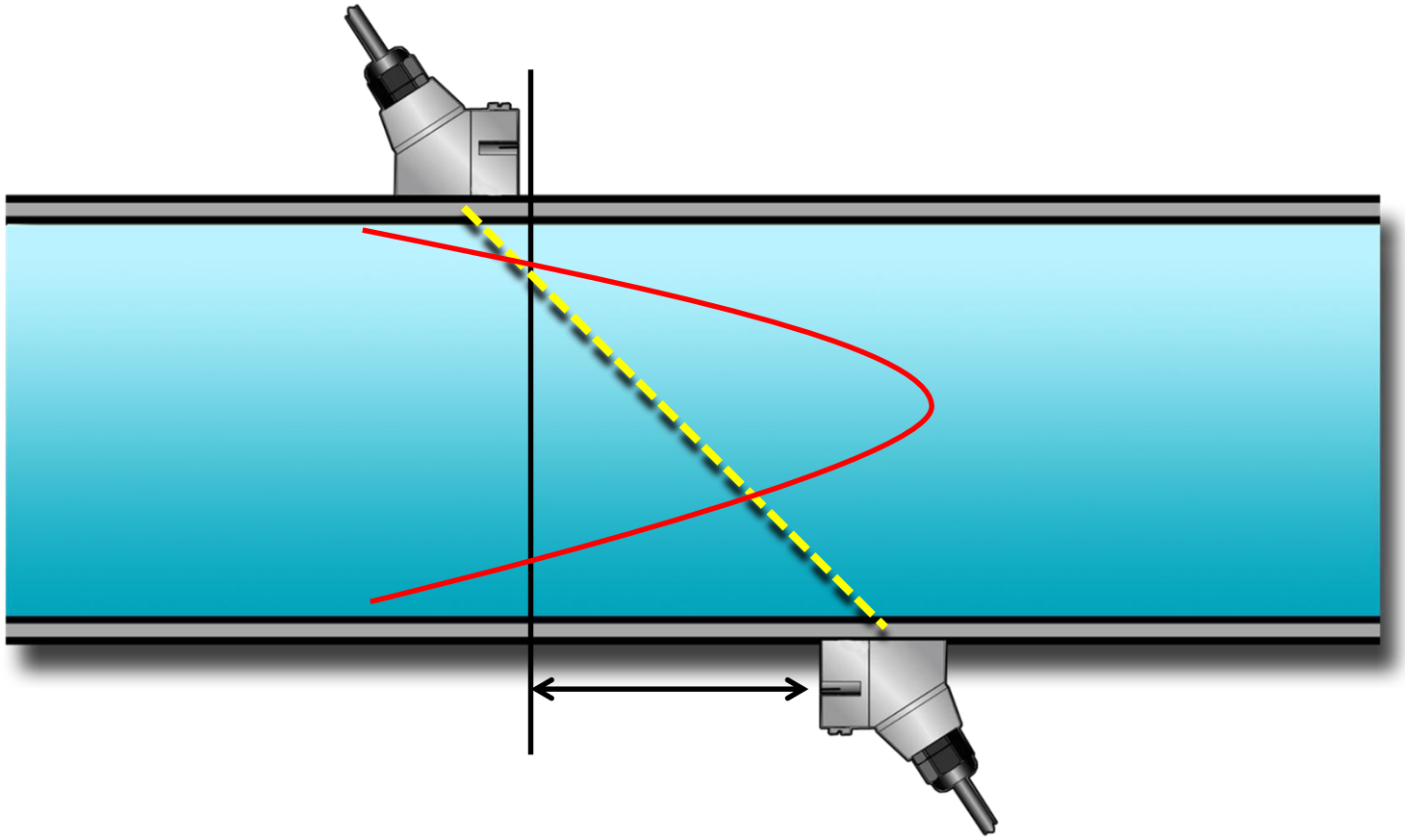
SYMMETRICAL FLOW



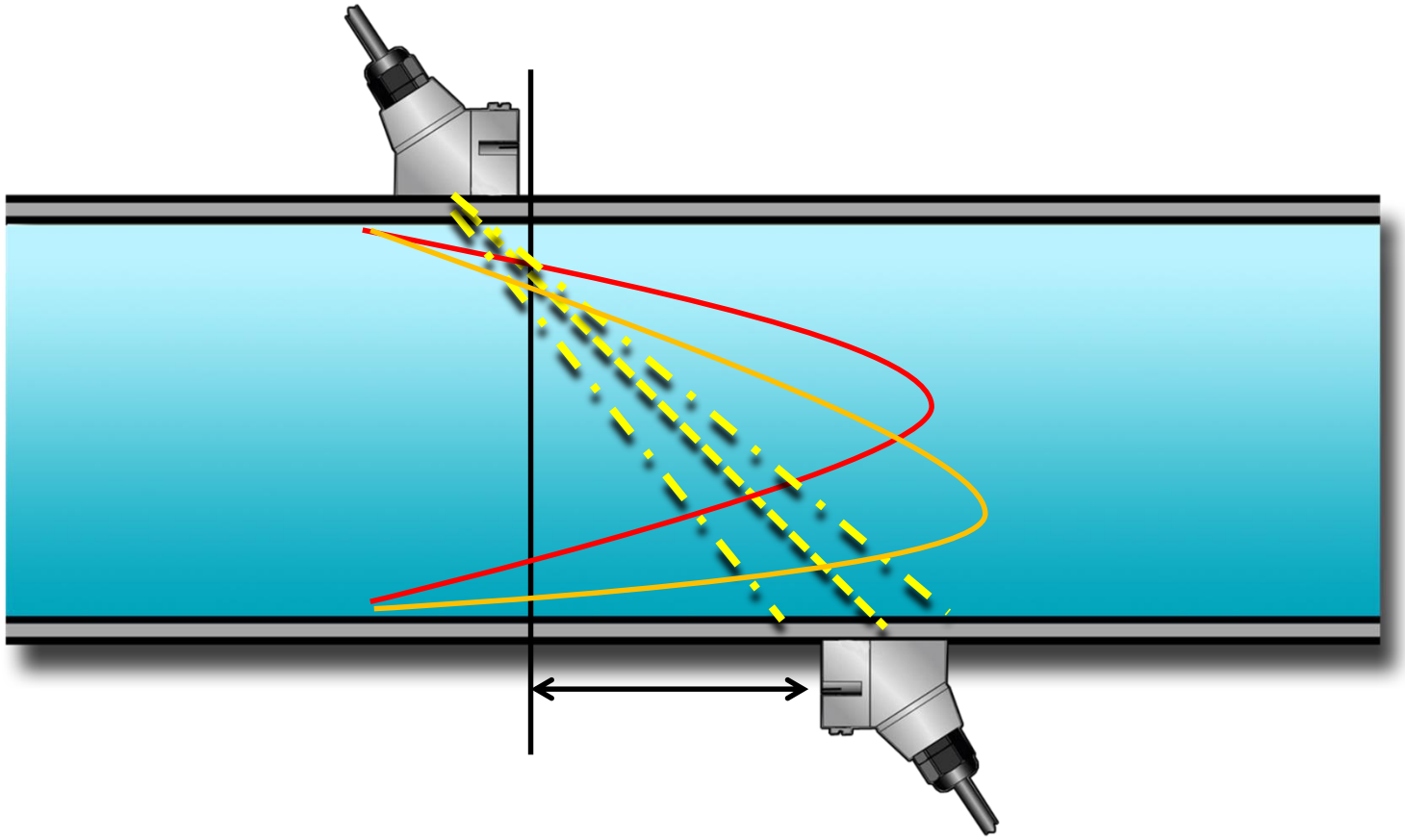
ASYMMETRICAL FLOW



Flow profile : Single (Z) path, Symmetrical



Flow profile : Single (Z) path, Symmetrical



Water Meters

Type of water you want to monitor

- ***Potable***

  - Potable water meters need to be NSF/ANSI 61 compliant.
  - Application: Clean water. Cold and hot water. Example: Drinking, edible, etc..

- ***Non-potable***

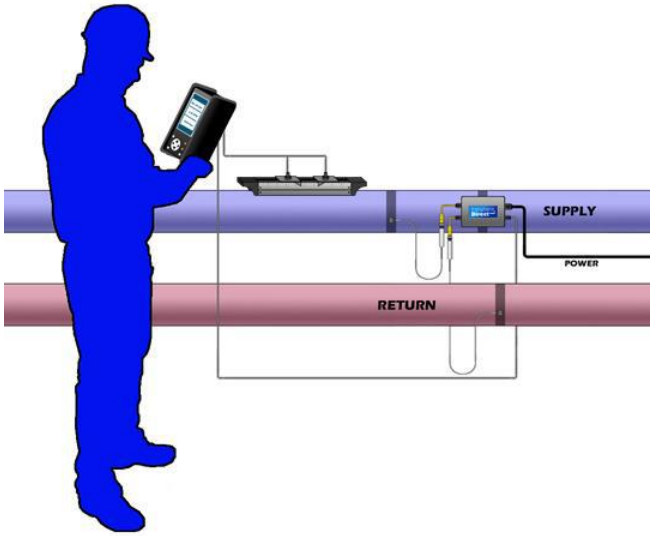
  - Application: Clean/Dirty, can contain solids or slurries. Example: Irrigation, chilled water, wastewater, process chemicals and more.

Ultrasonic Flow Meters

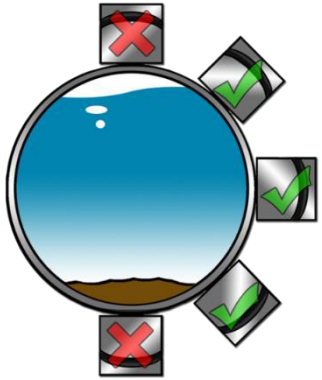
Applications

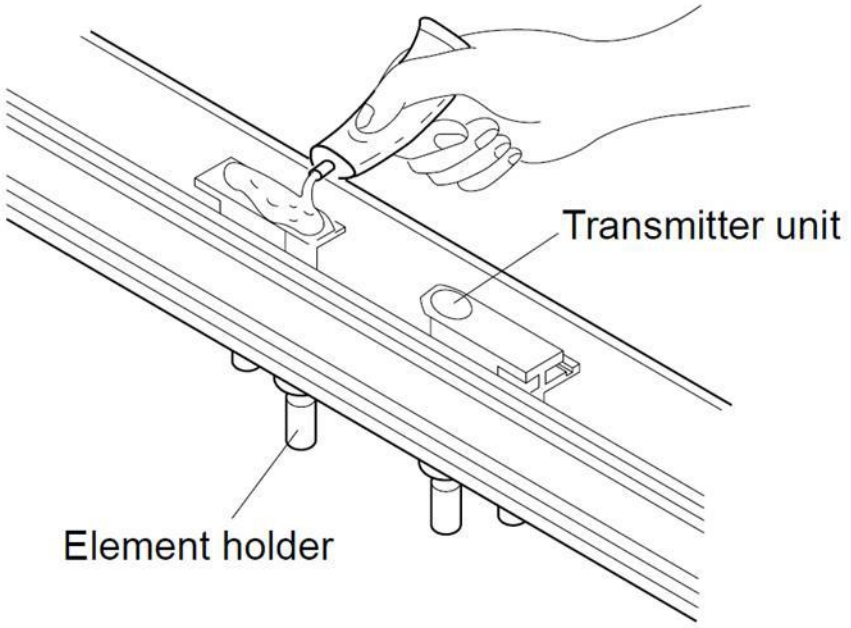
- Industrial / Manufacturing
- Agricultural
- Food / Beverage
- Government / Municipal / City / County
- Commercial
- Residential
- Submetering
- Private - Fido’s water dish

Using Portable Ultrasonic Meters

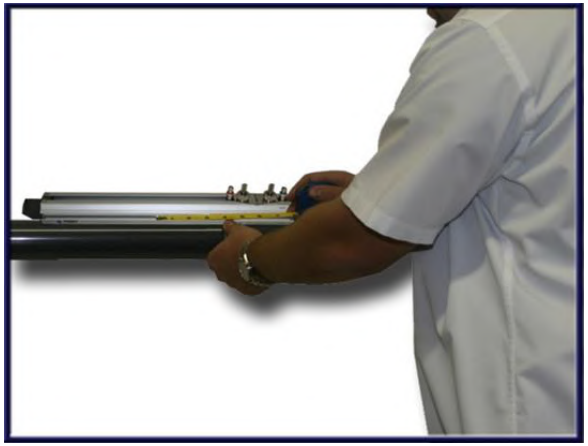


- Discover process.
- Spot check flows
- Water usage study
- Energy usage study
- Balancing Hydronic system
- Economics





- Program meter with application details
- Determine Transducer site
- Pipe/Transducer Preparation
- Adjust Transducer spacing
- Install Transducer to Pipe
- Adjust transducer knobs until sensors are snug to pipe surface.



Water Meters

Is my current water meter accurate?

Building

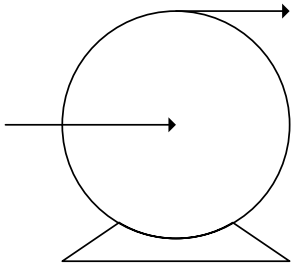
City Water / Influent

M

Flow

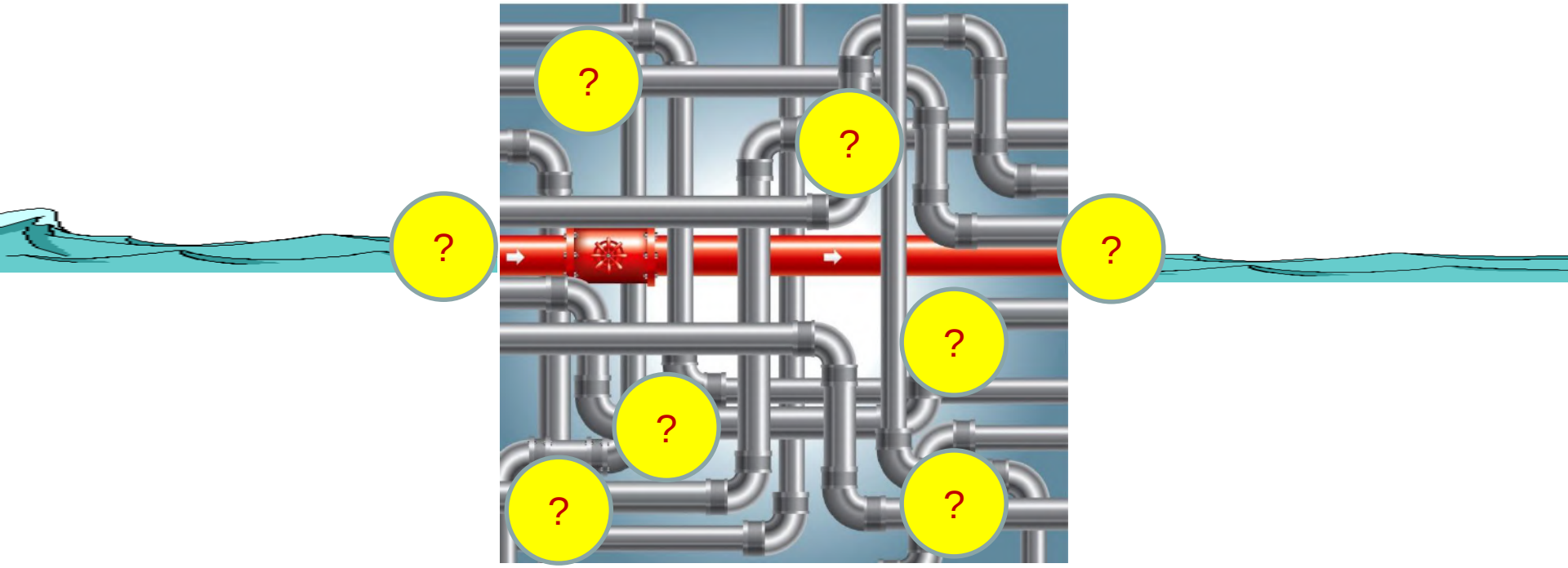
City Water Meter

Test Meter



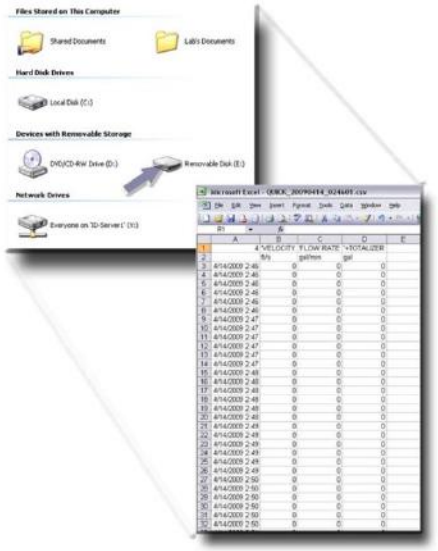
Pump

Submetering



Data Storage

- Data Collection
  Log flow rate, total & Energy (BTU)
- Save to SD card or down load to PC
- Now you can adjust, graph, copy or export your files.

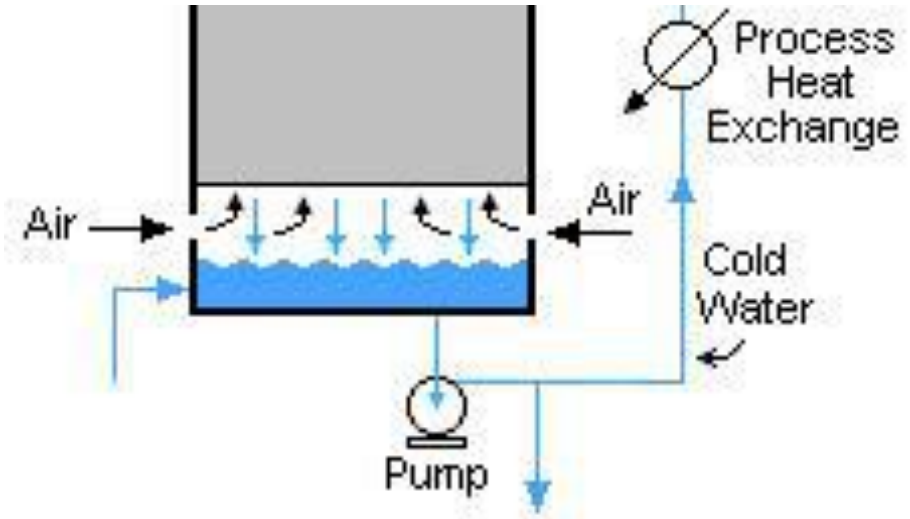


Facilities – Water usage

- Flow Study

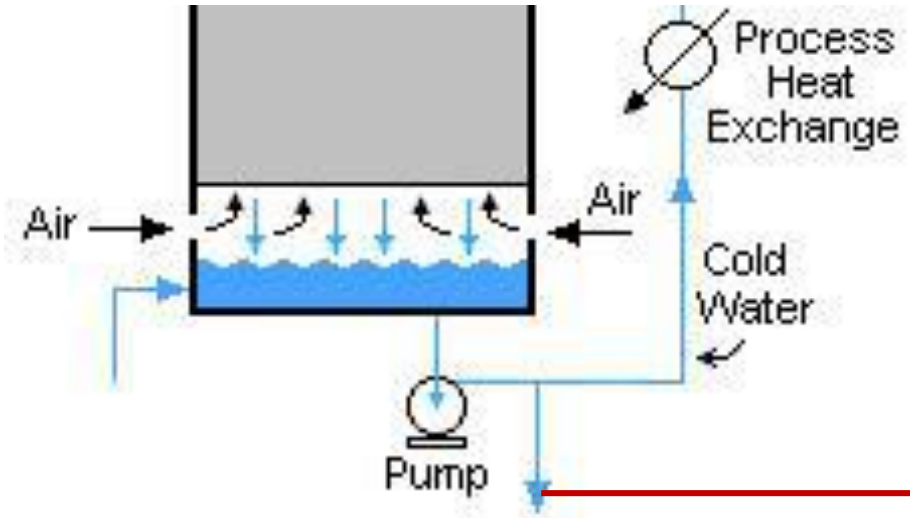
- Chiller Blow Down

Facilities – Drawoff (or Blowdown)



- Blowdown

Facilities – Drawoff (or Blowdown)

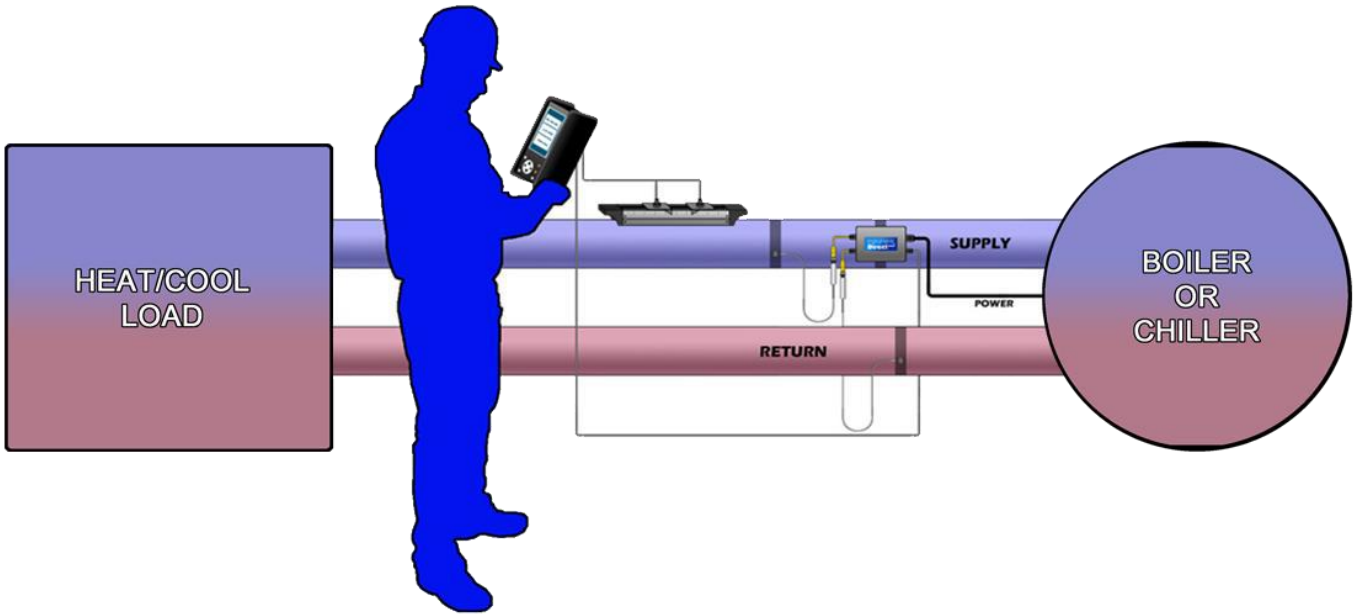


- Trap
- Blowdown

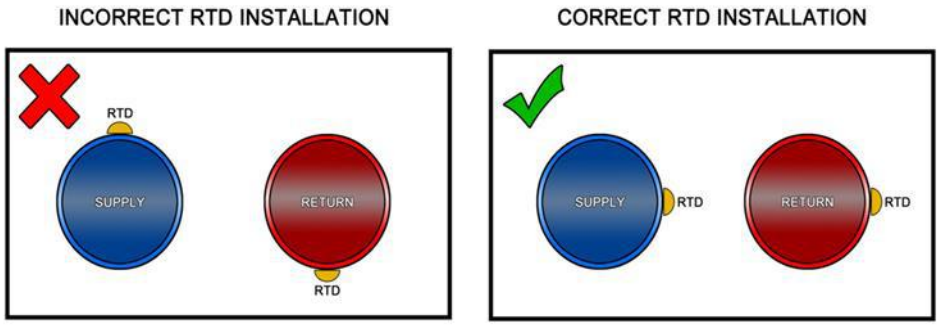
Facilities – Water usage

- Leak Detection

Energy Monitoring

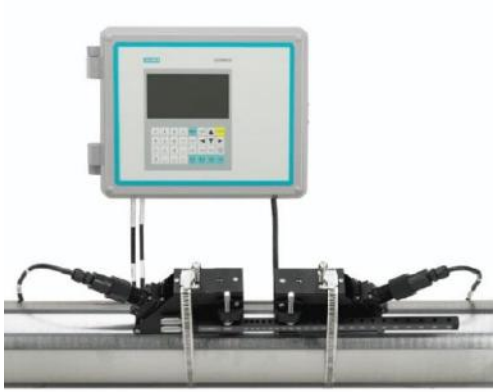


Temperature sensor mounting

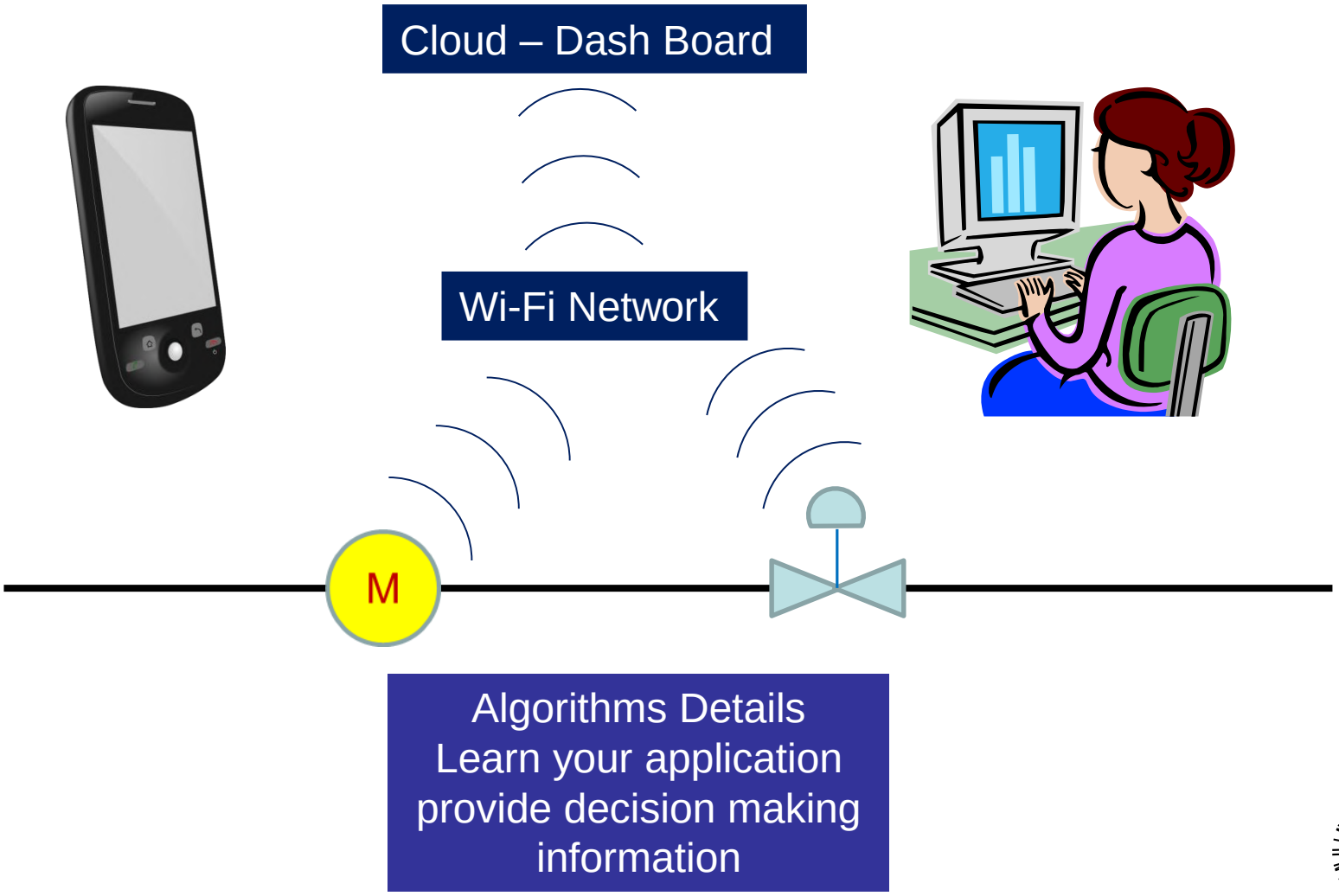


- **Mount the RTD – temperature sensors in the identical location on the supply and the return (metal) pipes. Failure to-do so will result in temperature differentials that can effect your performance of the BTU calculations**

Dedicated Metering / Submeter
Ultrasonic Transit time Flow Meters



New Technology Meter Data Collection



Summary:

- Clamp-on Ultrasonics, important tool for monitoring water usage, hydronic balancing & commissioning.
- New technology and lower cost will enhance submetering.
- More submetering will expand the number of meter test points.
- Better Data Saves Water & Energy….

This concludes The American Institute of Architects
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