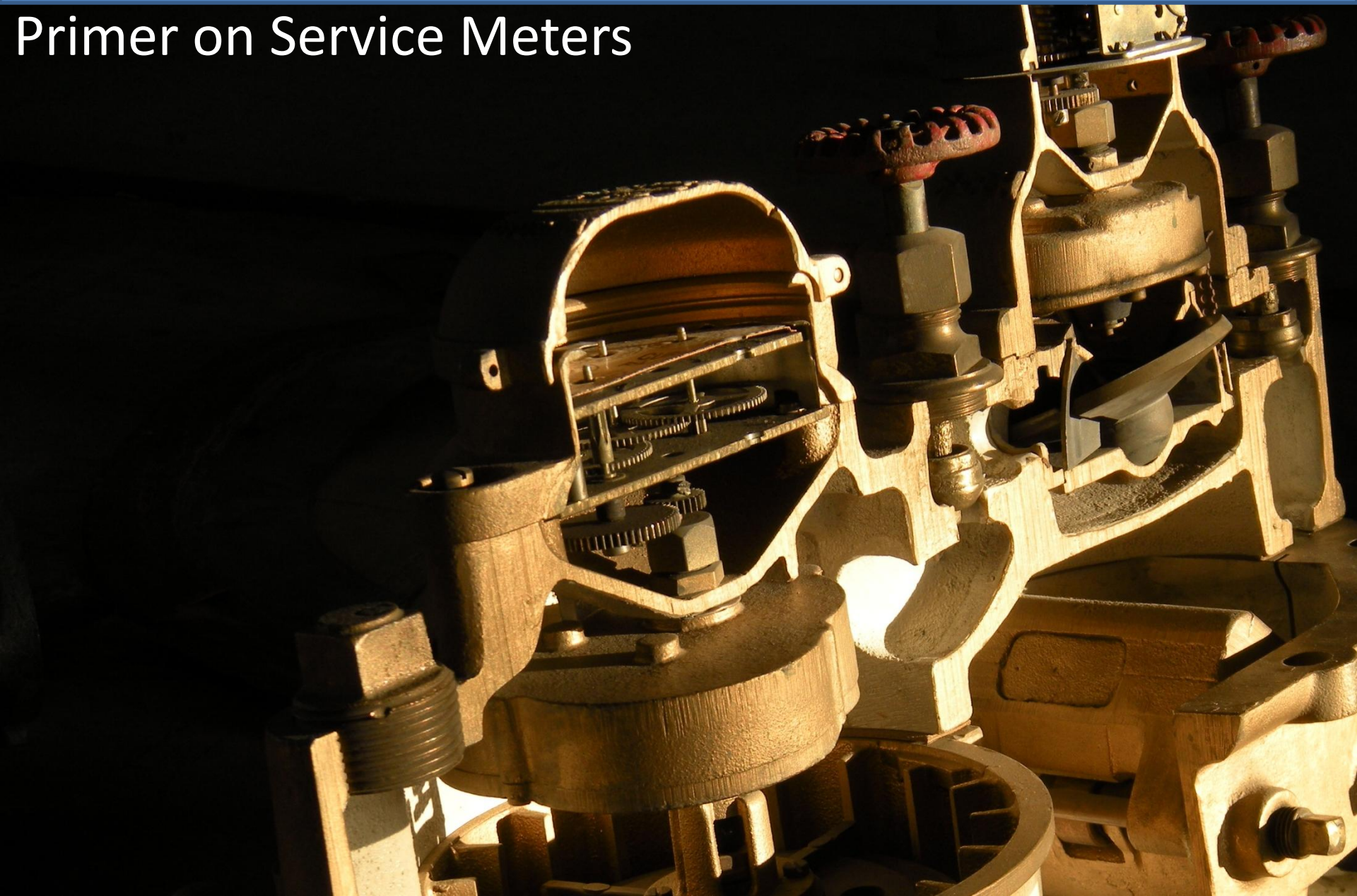
Drinking Water 101

Primer on Service Meters



Today’s Topics

- Different Types of Meters
- Reading Meters

Why do we have Meters Anyway?

Money!!

- Service Meters are Used Measured Usage
- Rate Customer Fees

- System Dynamics
- Balance Well Production for Unaccounted For Water Factoring

Types of Meters

- **Water Service Displacement Meters**
- Magnetic Meters
- Turbine Meters
- Single and Multi-Jet Meters
- Compound Meters

Positive Displacement Meters

Two Types – But only one to remember

- Piston-Type
- Nutating-Disc Type

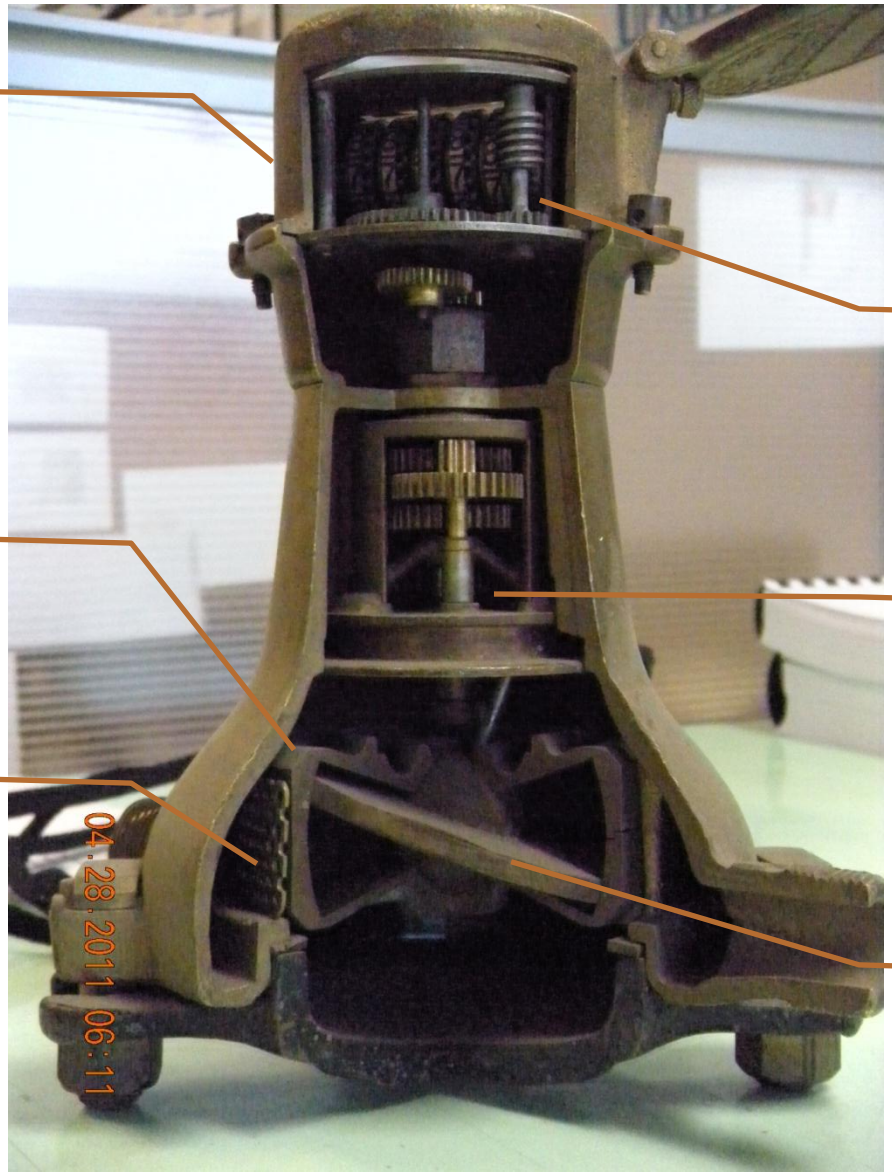
PROS

- Very Accurate at Low Flow

CONS

- Higher than Normal Head Loss from Friction
- Under Register with High Flow or Excessive Wear

Nutating-Disk Displacement Meter



Register Box

Register

Disc Chamber

Control Block Assembly

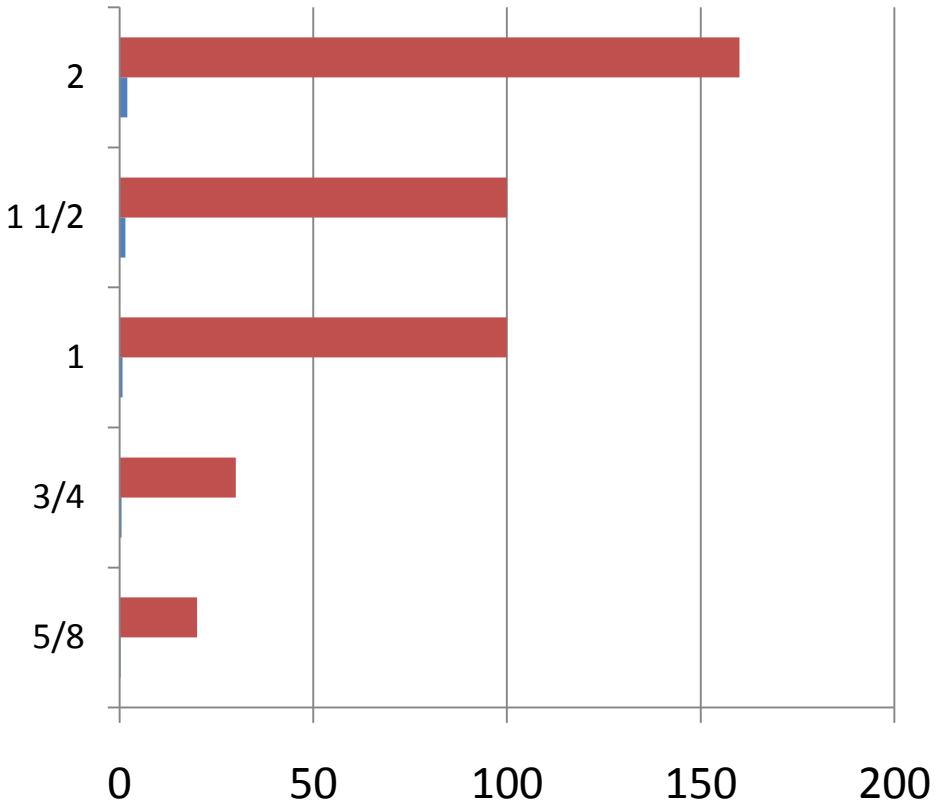
Strainer

Disc and Ball

Flow Range

Positive Displacement Disc or Piston Meters

Meter Size (inches)	Flow Range (gpm)
5/8”	¼ - 20
3/4”	½ - 30
1”	¾ - 100
1 ½”	1 ½ - 100
2*	2 - 160



Source: AWWA Water Operator Field Guide

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METER CHAMBER COMPLETE
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Types of Meters

- Water Service Displacement Meters
- **Magnetic Meters**
- Turbine Meters
- Multi-Jet Meters
- Compound Meters

Magnetic Meters

- Piston-Type
- Nutating-Disc Type

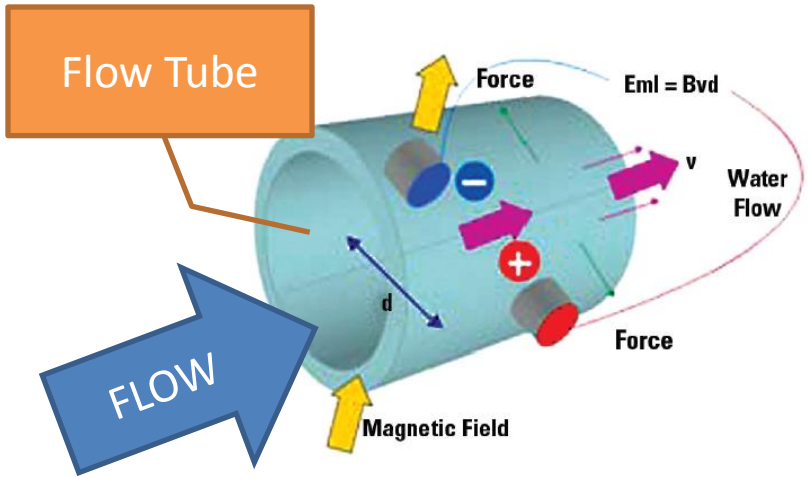
PROS

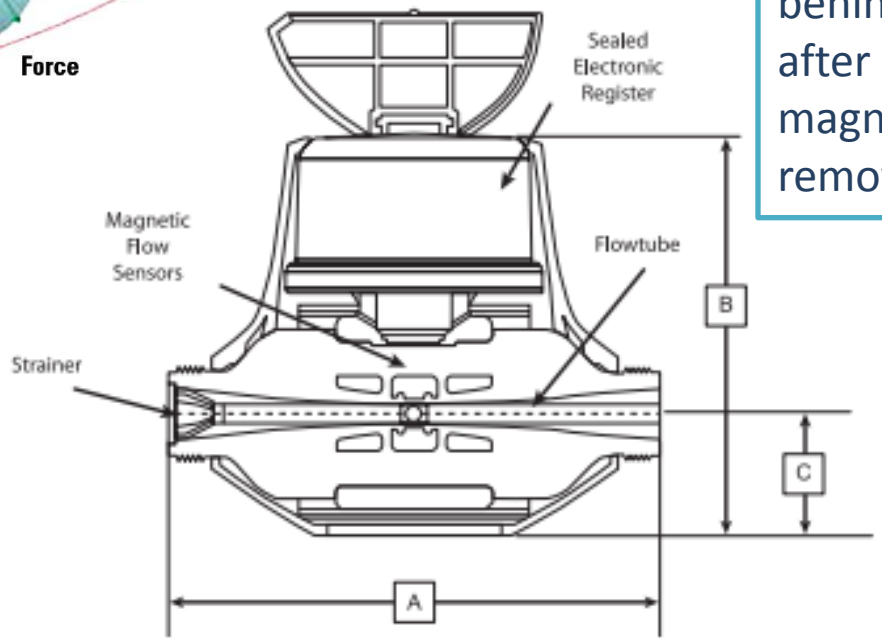
- Maintains Accuracy
- No Moving Parts

CONS

Integrated Battery places a hard limit on meter life

Mag Meter





<u>Remanent Field Technology</u>
Measures the magnetization left behind in a material after the external magnetic field is removed.

Faraday's Law

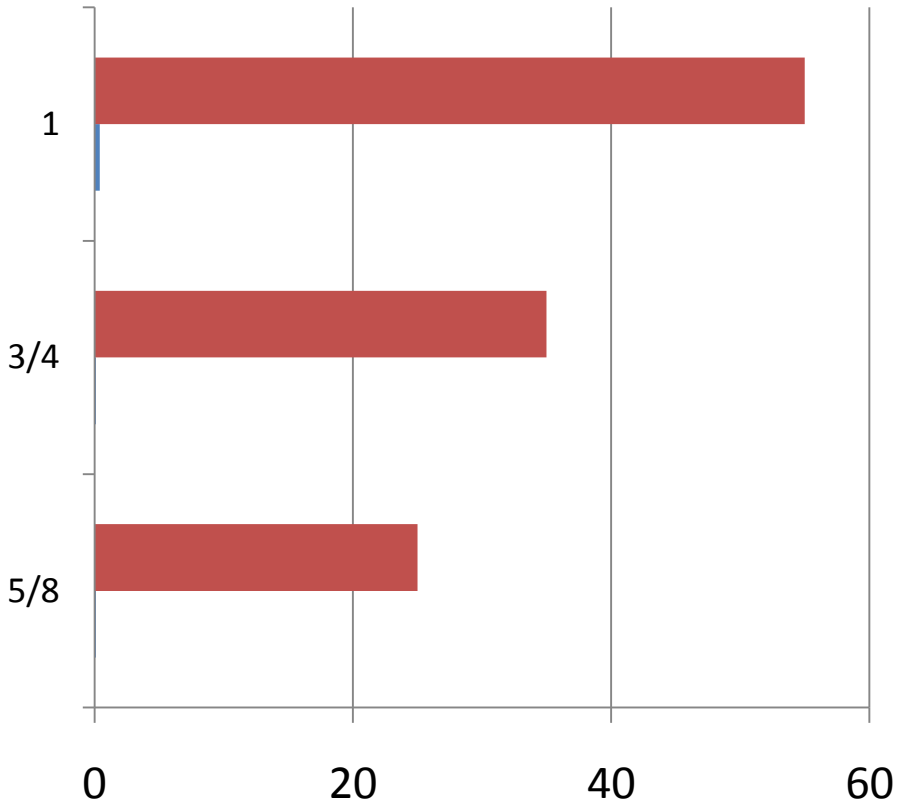
Mag meters operate on the principle of ***Faraday's Law***. The velocity of the fluid is directly proportional to an induced voltage (electromotive force) as the fluid flows through a constant magnetic field. As the velocity of the water increases, the induced voltage increases and in turn the volume of water measured is greater.

Flow Range

Residential Mag Meters

Meter Size (inches)	Flow Range (gpm)
5/8”	0.11 - 25
3/4”	011 - 35
1”	0.4 - 55
1 ½”	N/A
2*	N/A

Source: Sensus, iPearl Product Literature



Types of Meters

- Water Service Displacement Meters
- Magnetic Meters
- **Turbine Meters**
- Multi-Jet Meters
- Compound Meters

Turbine Meters

- Rotor Turns in Proportion to the Velocity of Water

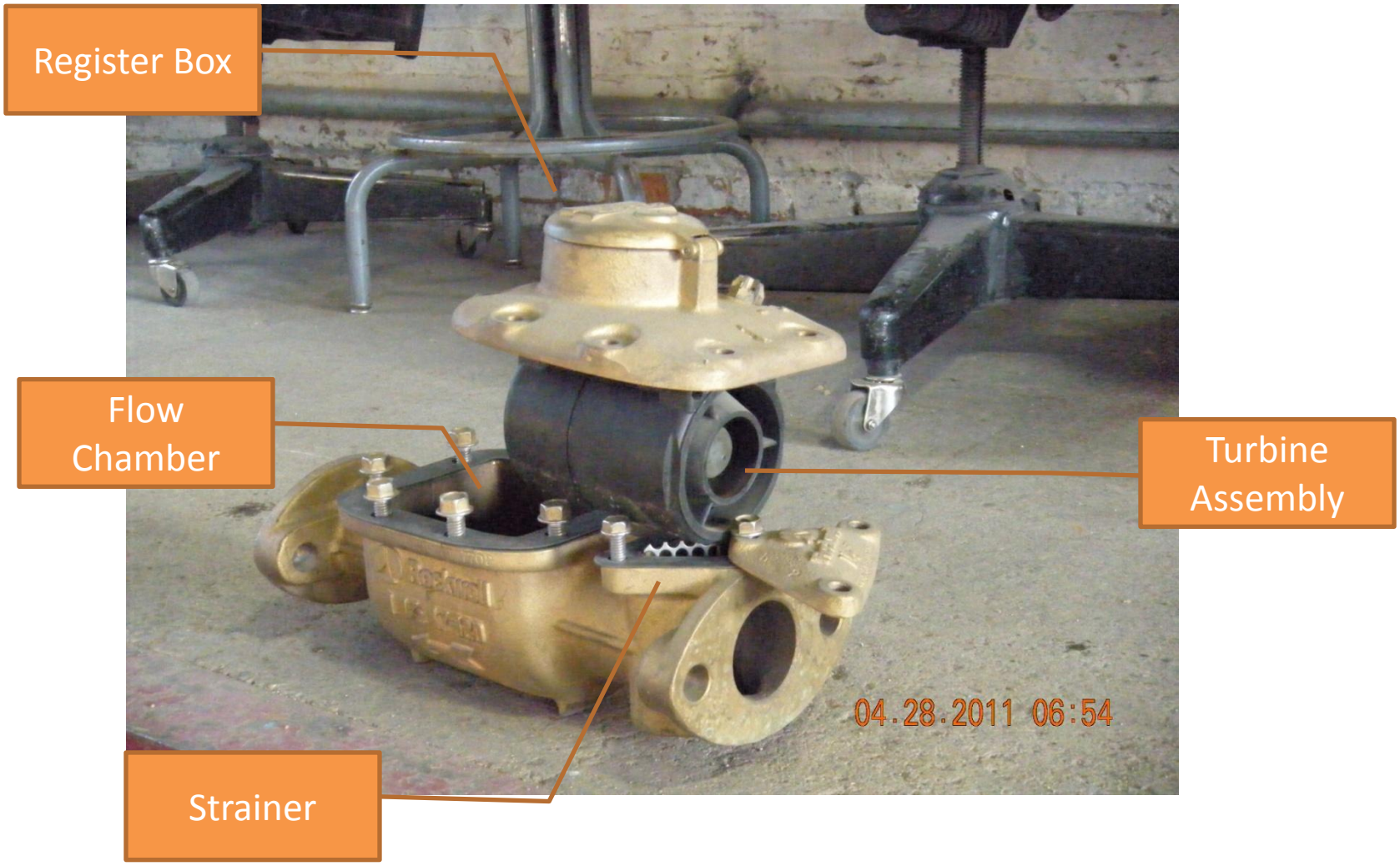
PROS

- Little Friction Loss
- Accurate at High Flows
- Handle Turbid Waters

CONS

- Inaccurate for Low Flows

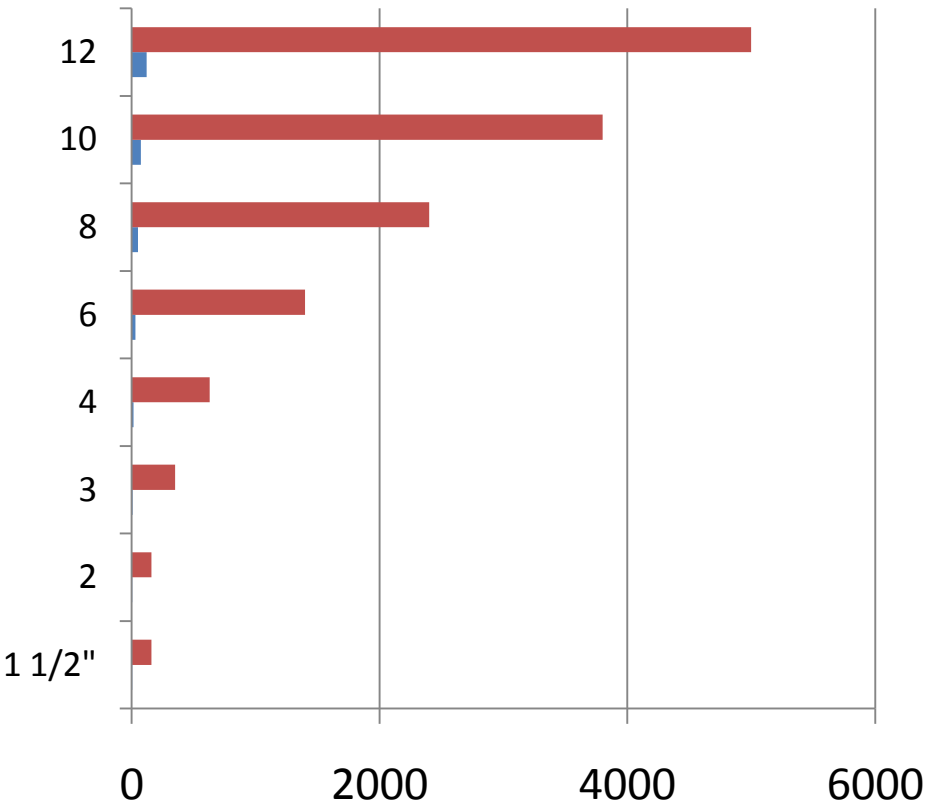
Turbine Meters



Flow Range

Turbine Meters

Meter Size (inches)	Flow Range (gpm)
1 ½”	4-160
2	4-160
3	8-350
4	15-630
6	30-1,400
8	50-2,400
10	75-3,800
12	120-5,000



Source: AWWA Water Operator Field Guide

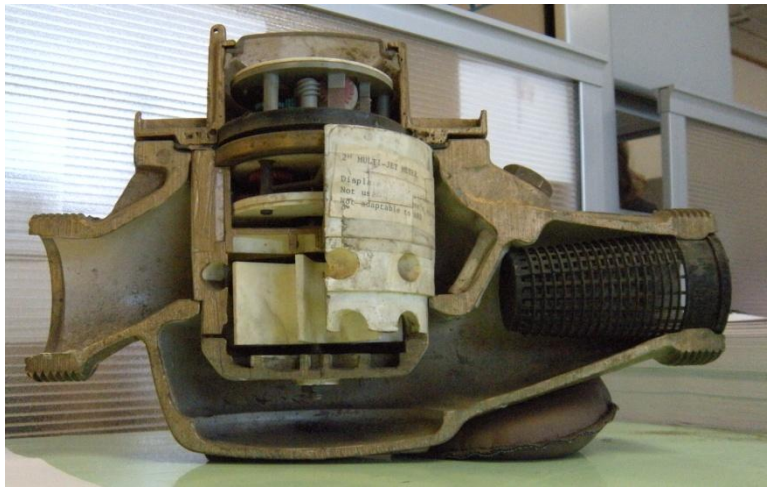
Turbine Meters

Types of Meters

- Water Service Displacement Meters
- Magnetic Meters
- Turbine Meters
- **Multi-Jet Meters**
- Compound Meters

Multi-Jet Meters

- Multi-Blade Rotor
- Cylindrical Measuring Chamber



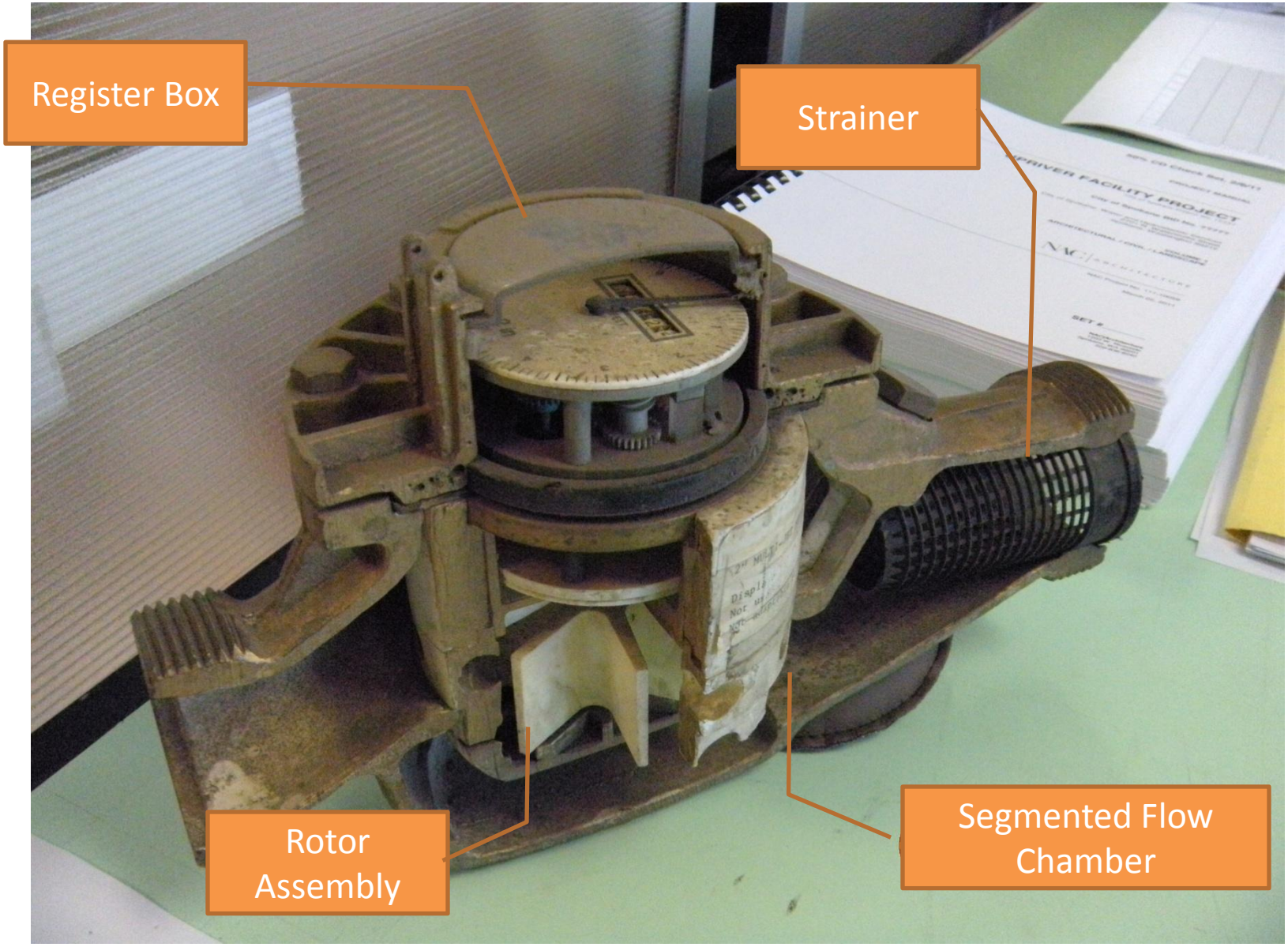
PROS

- Suitable for Low to Mid Range Flows
- Less Wear than Disc-Type

CONS

- Same Head Loss to Positive Displacement

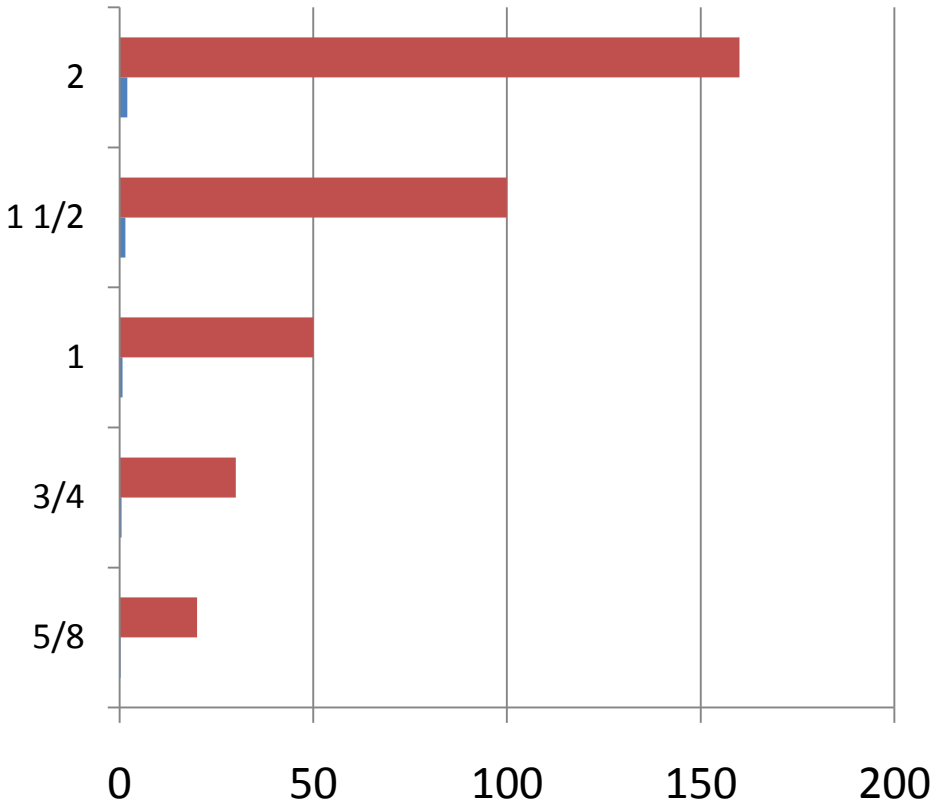
Multi-Jet Meters



Flow Range

Multi-Jet Residential Meters

Meter Size (inches)	Flow Range (gpm)
5/8”	¼ - 20
3/4”	½ - 30
1”	¾ - 50
1 ½”	1 ½ - 100
2	2 - 160



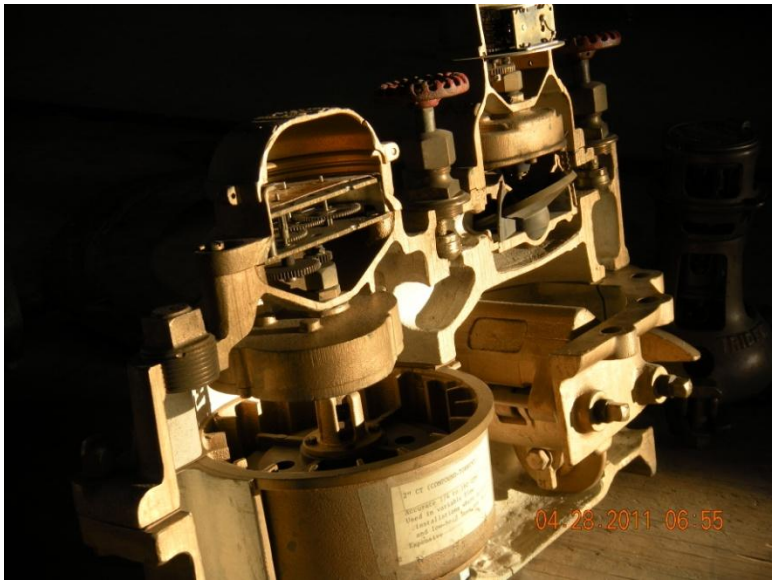
Source: AWWA Water Operator Field Guide

Types of Meters

- Water Service Displacement Meters
- Magnetic Meters
- Turbine Meters
- Multi-Jet Meters
- **Compound Meters**

Compound Meters

- 2-in-1 Design
- Displacement
  (Low Flow)
- Vertical Turbine
  (High Flows)



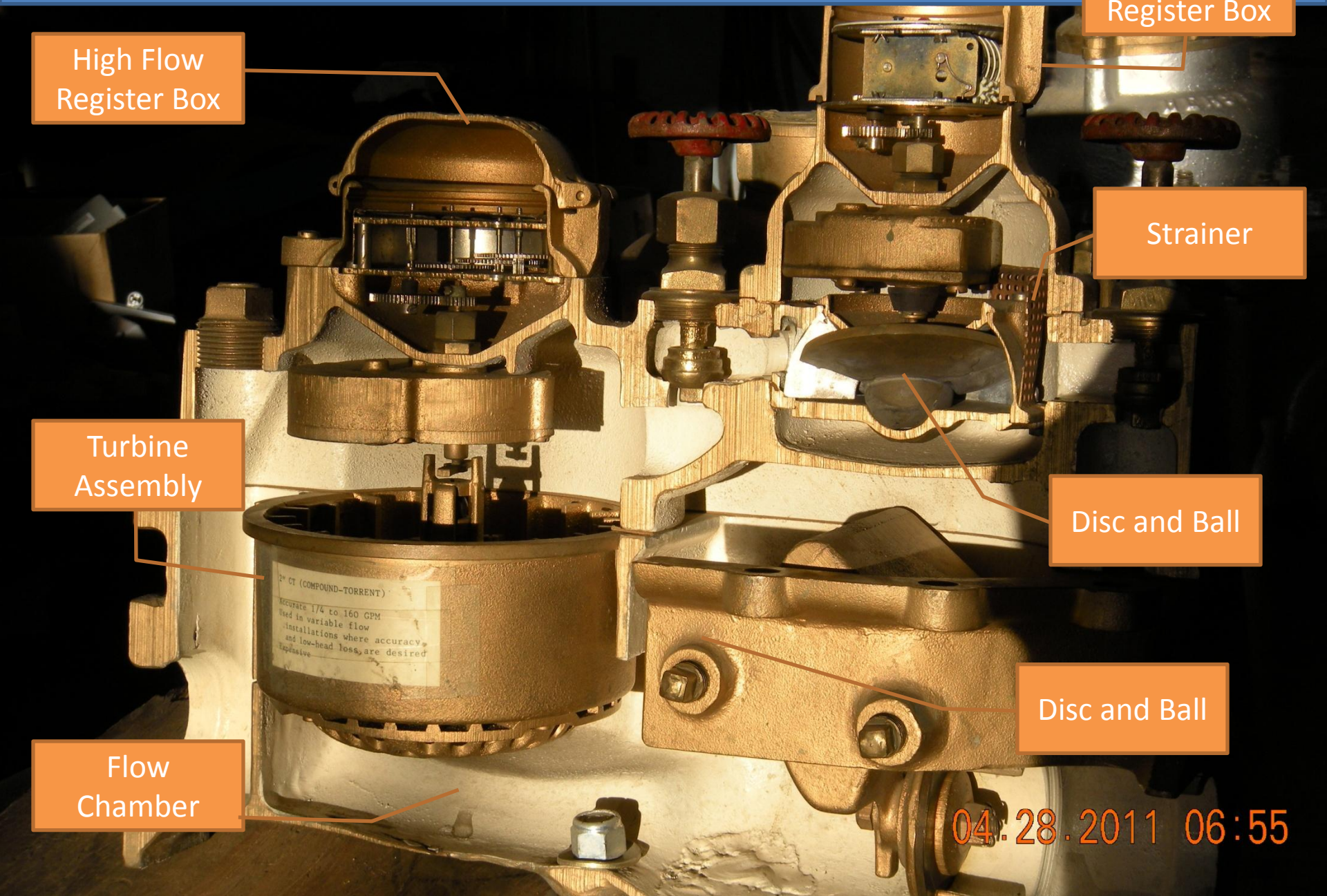
PROS

- Wide Variations in Water Demand on Single Service

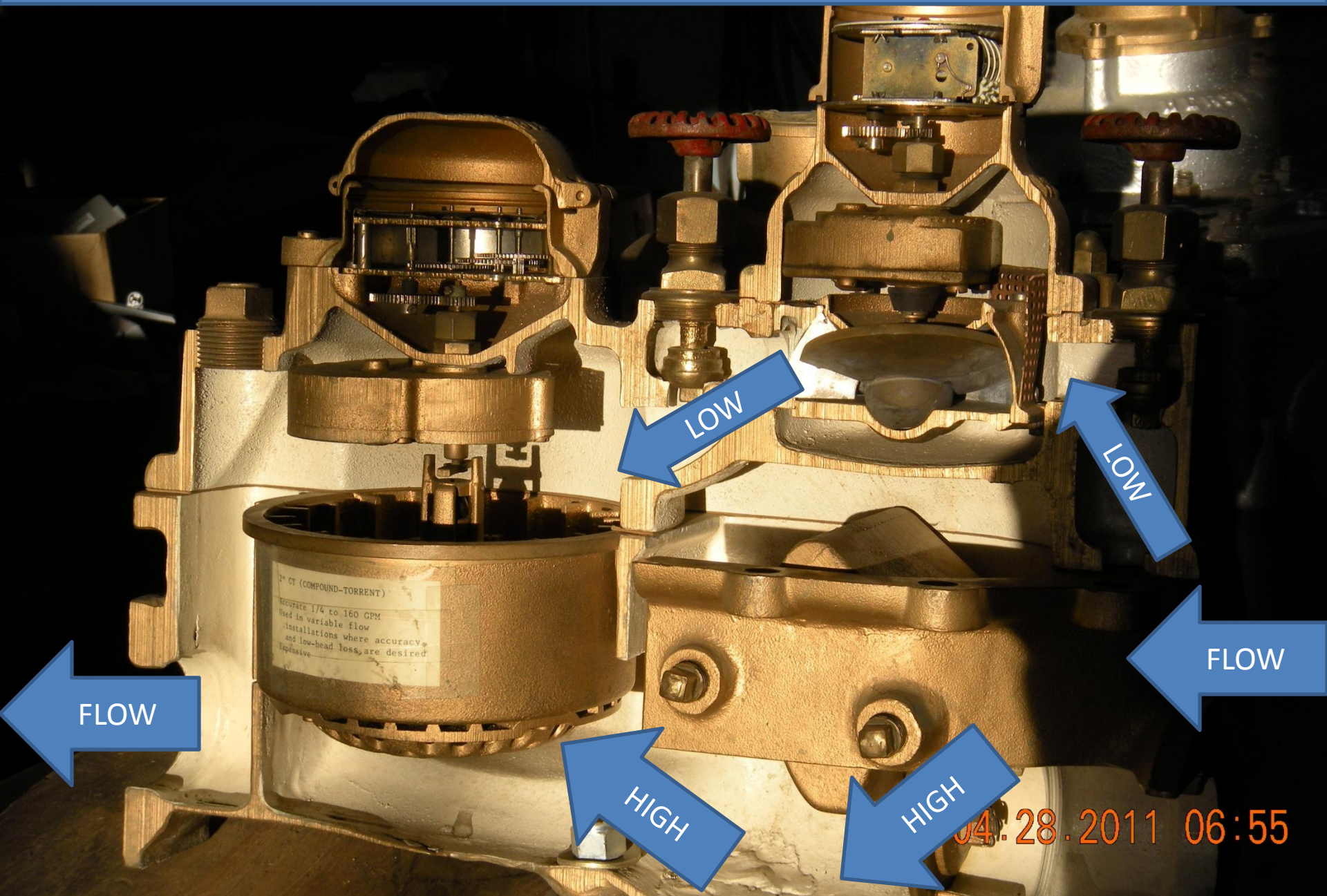
CONS

- Small loss in accuracy at transition points

Compound Meters



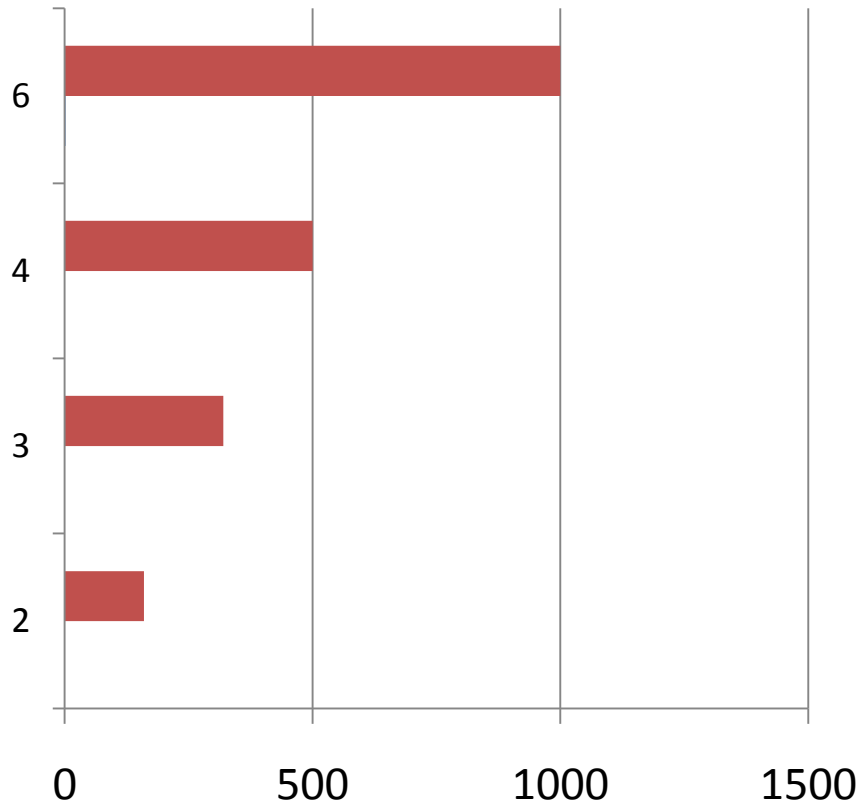
Compound Meters



Flow Range

Compound Meters

Meter Size (inches)	Flow Range (gpm)
2	¼ -160
3	½ -350
4	¾ -630
6	1 ½ -1,400



Source: AWWA Water Operator Field Guide

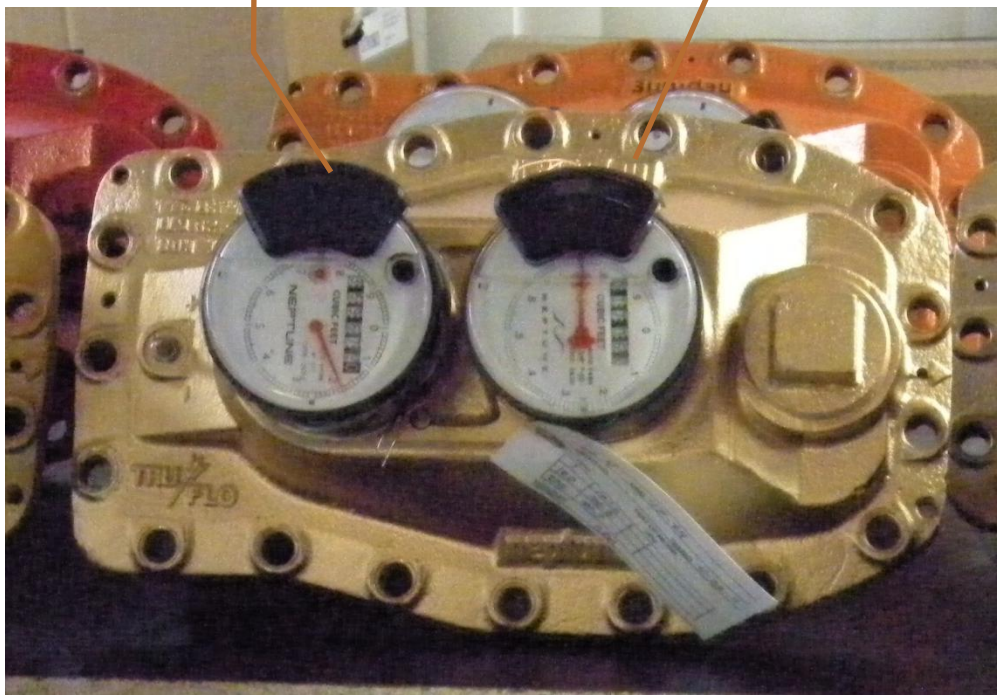
Compound Meters – Another Type

Turbine Assembly

Disc and Ball (not shown)

High Flow Register Box

Low Flow Register Box



General Meter Installation Checklist

	Yes	No	N/A
Installed Horizontally, with isolation valves before and after?			
Are there a minimum of 5-diam length of straight pipe installed and 3-5 lengths after?			
Is a strainer installed before a turbo or compound?			
Is a UL/FM strainer installed ahead of any meter providing fire service?			
Is a bypass installed for repairs?			
Is the meter before any backflow assembly			
If in a pit/enclosure, is remote reading device installed			
Test plug installed after the meter?			
If in pit/enclosure, is the opening large enough to remove meter?			
Was the appropriate smallest sized meter selected?			

Source: AWWA Water Operator Field Guide