

# CGA Energy Nexus & Annual Technical Conference 2024

*Fuelling the Future*

## Next Generation Gas Metering

Speaker name





Paul Honchar is SR Product Manager, TURBO and SONIX Meters. Paul is responsible for all aspects of product marketing for the gas turbo meter and Sonix meter lines. Paul received a Bachelor of Science in Mechanical Engineering from the University of Pittsburgh in 1979, and has 45+ years of gas industry experience with Sensus and the predecessor companies.

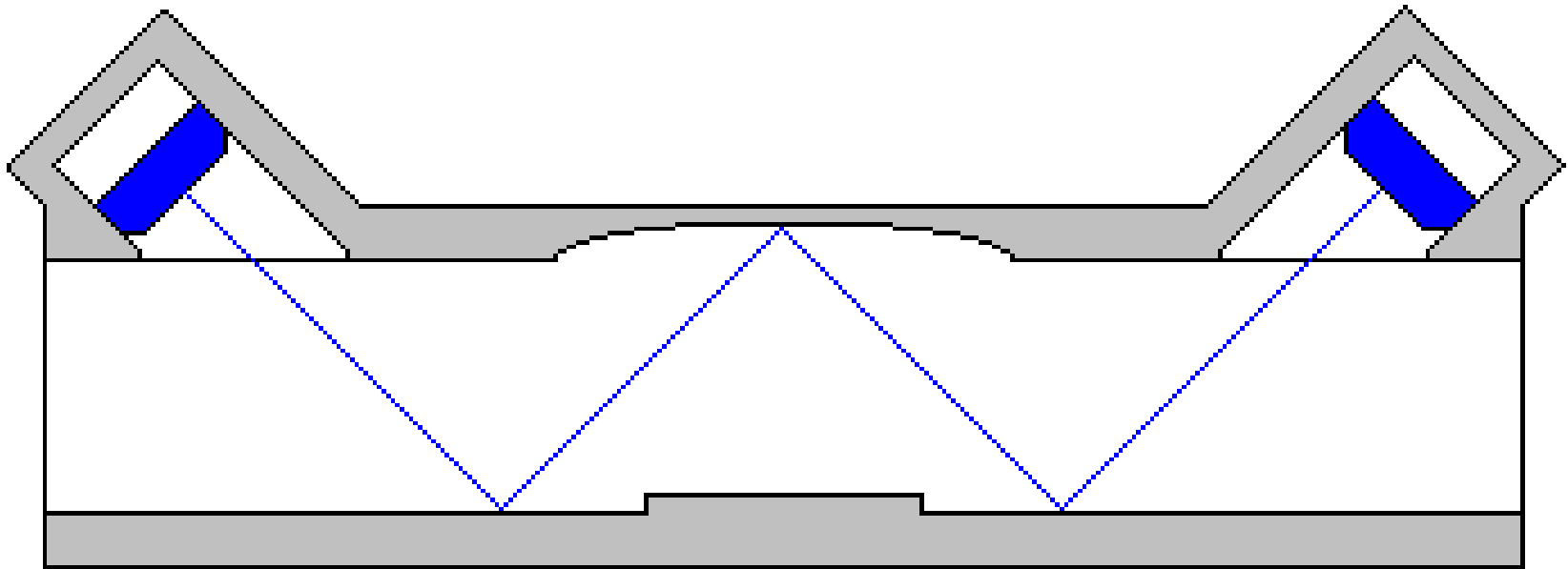
**PAUL HONCHAR**  
**SENSUS**  
Sr. Product Manager

# In The Beginning

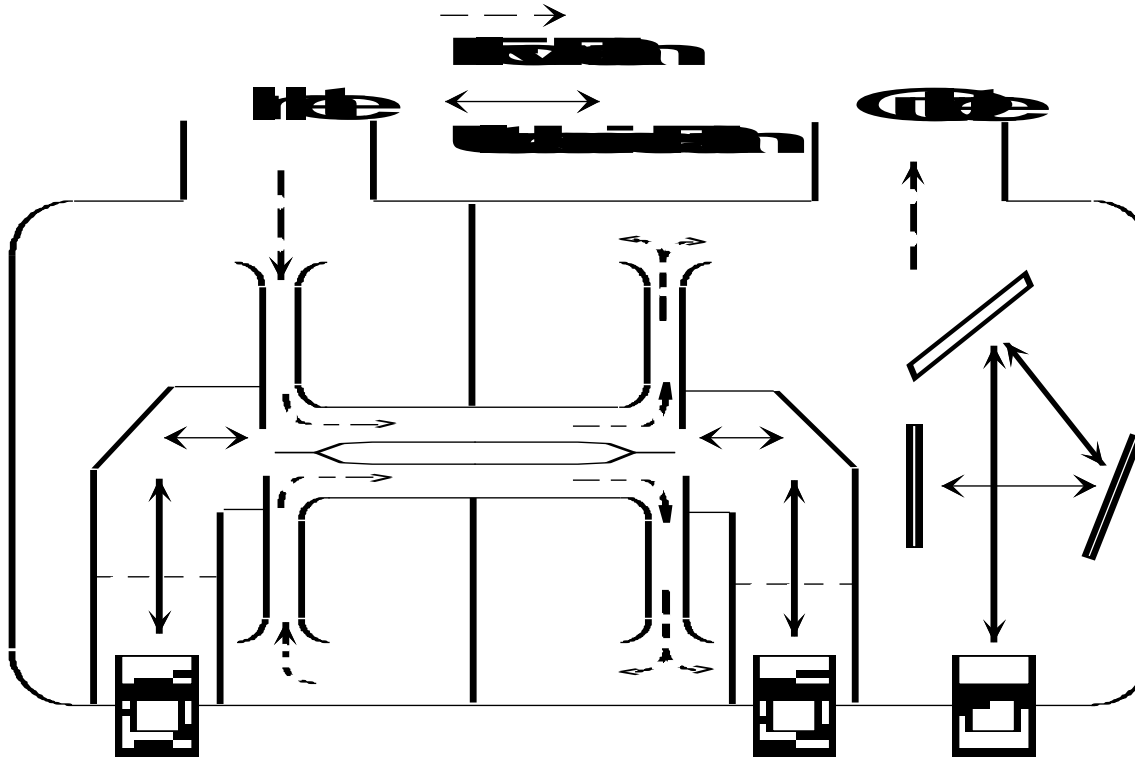
In early 1987, British Gas announced a “competition”

- Design proposals due in September 1987
- 21 proposals received
- 4 were selected for further development
  - 2 ultrasonic
  - 1 fluidic
  - 1 silicon beams

# Basic Design: Siemens



# Basic Design: Gill R&D

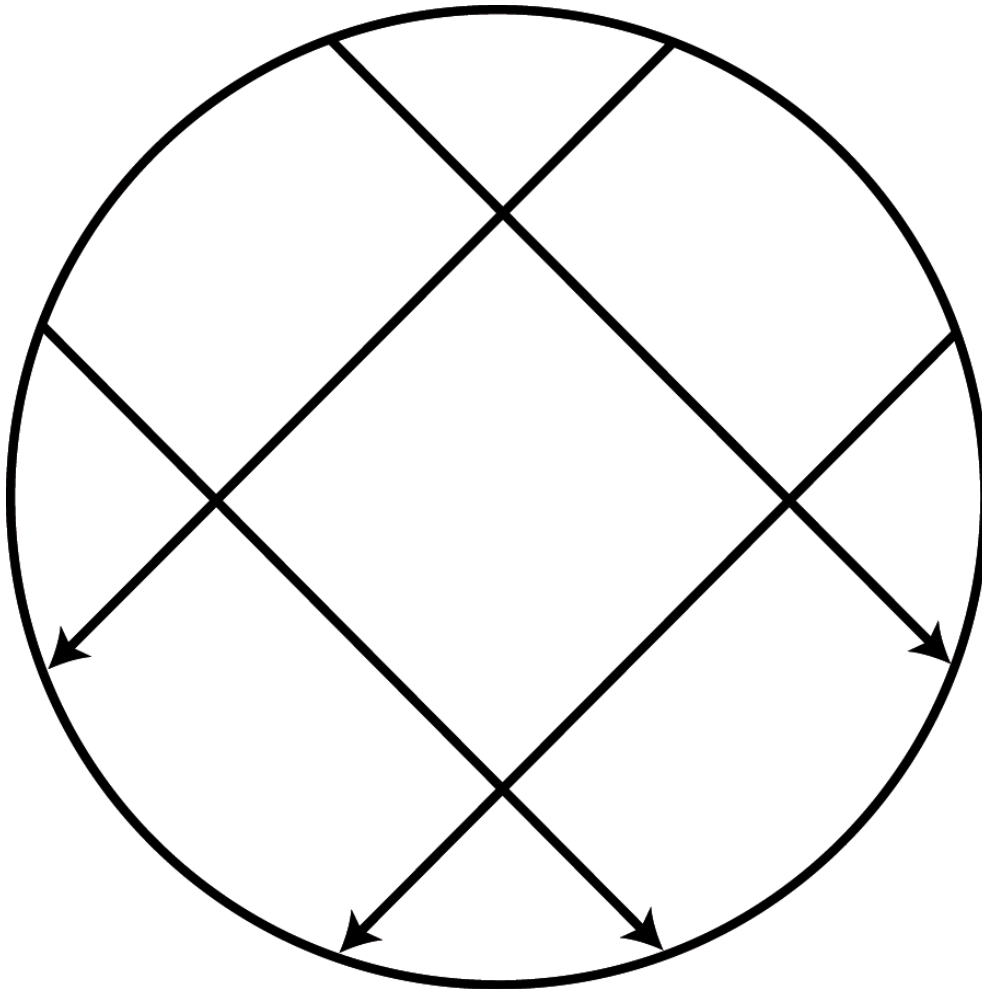


# Ultrasonic: Basics

## Sound waves

- Acoustic (audible sound)
  - 20 Hz to 20,000 Hz
- Ultrasonic
  - Generally above 20,000 Hz
- Time of Flight
  - Velocity is determined based upon transit time of sound waves

# Fundamentals of Ultrasonic Measurement



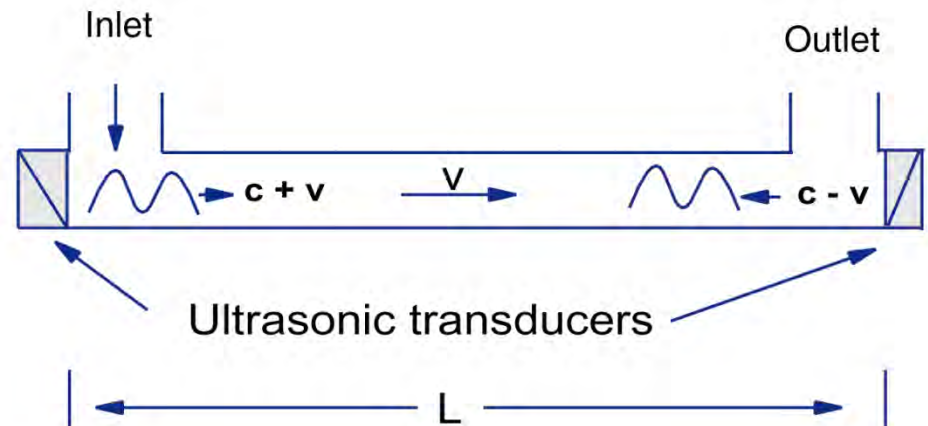
## Multi Path – High Flow

- Larger flowing diameter
- Profile of gas can change shape
- Average gas velocity requires multiple path measurements

# Fundamentals of Ultrasonic Measurement

## Single Path – Low Flow

- Pulses are produced with – and against – the gas stream.
- Pulses flowing with the gas velocity speed up
- Pulses flowing against the gas velocity slow down
- Difference = gas speed within the known area

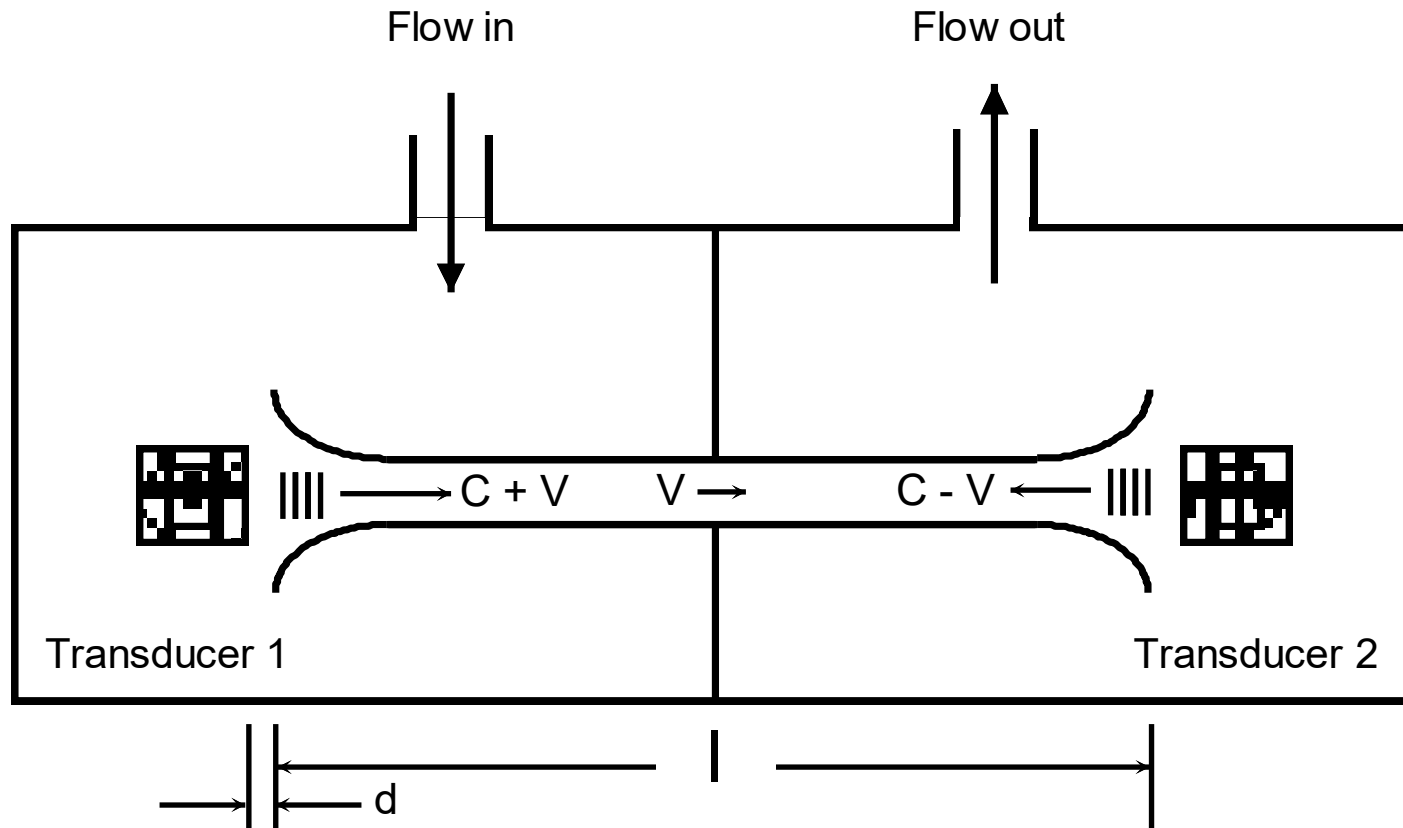




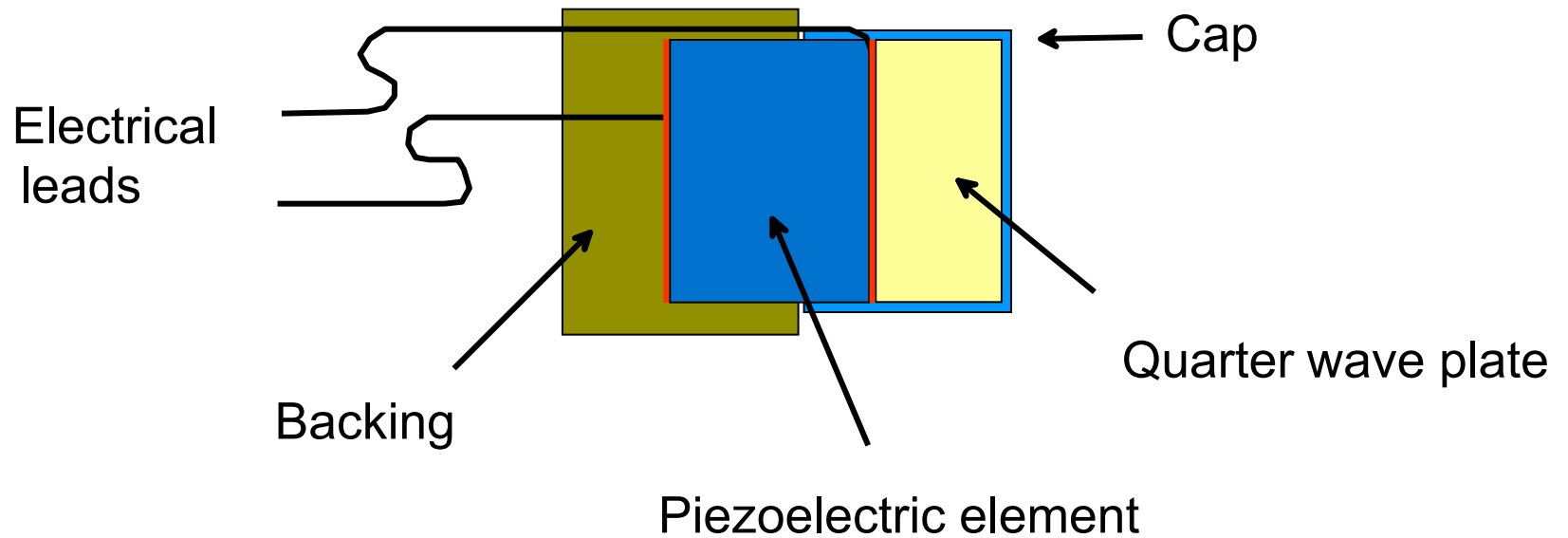
# Time of Flight Principles

- Piezoelectric transducers generate and detect waves
- Waves travel at the speed of sound of the moving fluid
- Velocity of gas is determined from the transit time of generated sound waves
- Sampling system: Spot measurement repeated at intervals averaging two seconds
- Volume (ft<sup>3</sup>) = **Velocity** (fps) **x** cross-sectional **Area** of flow tube (ft<sup>2</sup>) **x** sample **Time** (s)

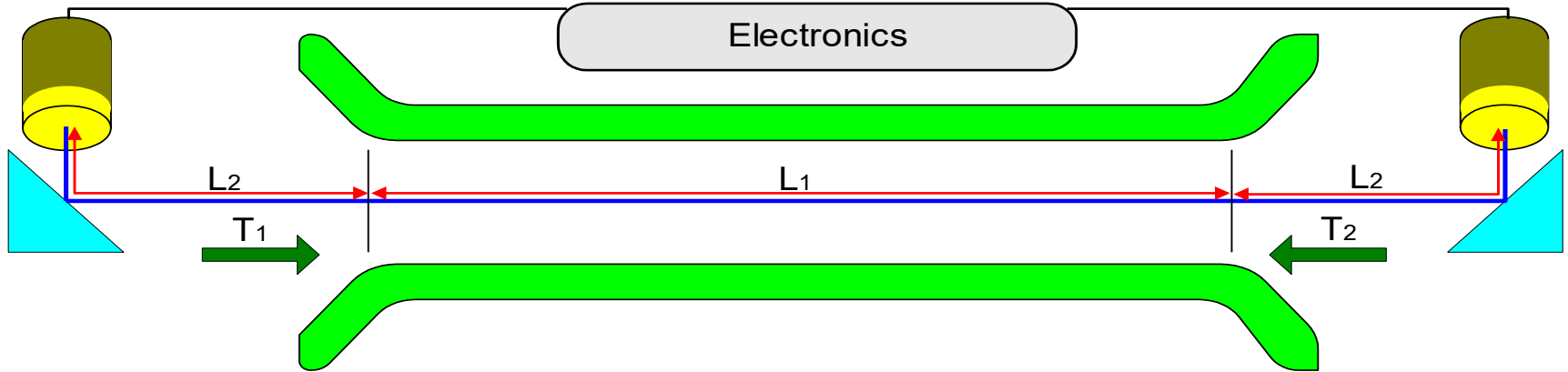
# Ultrasonic Meter Schematic



# Transducer Schematic



# Velocity Determination



$$T_1 = \frac{L}{C+V} \quad T_2 = \frac{L}{C-V} \quad \text{so} \quad V = \frac{L}{2} \left( \frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$V = \frac{L}{2} \times \left( \frac{T_1 - T_2}{T_1 T_2} \right)$$

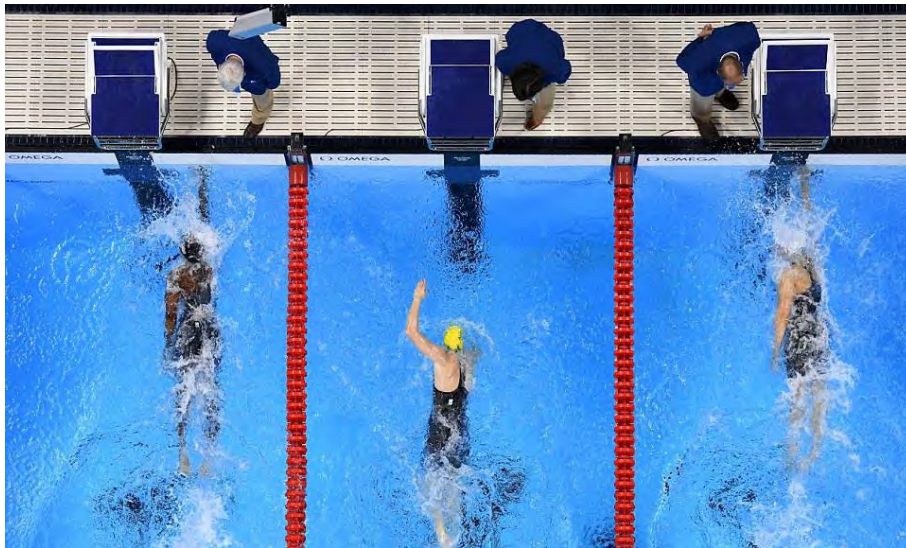
$T_2$  = Time of upstream firing  
 $T_1$  = Time of downstream firing

$C$  = Speed of sound in gas  
 $V$  = Velocity of the gas

# Timing

The meter has to measure the “time of flight” of the ultrasonic pulse in nanoseconds ( $10^{-9}$  sec) to achieve acceptable volume accuracy

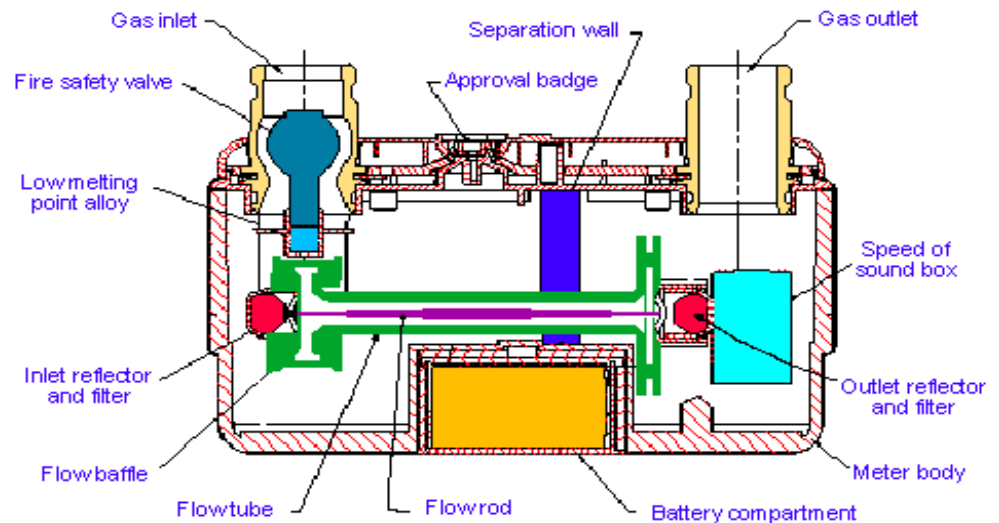
(0.000000001)



Gold vs Silver is measured in hundredths of seconds ( $10^{-2}$  sec) (0.01)

# First Generation - Europe

Beginning in 1993, 1.3 million residential single path ultrasonic meters installed in Europe



# First Generation – North America

Starting in 2000, residential single path ultrasonic meters emerged onto the North American market



# Next Generation Residential

Today, there are several single path ultrasonic meters being offered in the North American market



Sensus



Itron



Pietro  
Fiorentini



Honeywell



Landis + Gyr



# Commercial and Industrial Applications

In 2002, commercial and industrial single path ultrasonic meters started to take their places in North American markets



Sensus Sonix600/880/2000

# Next Generation Industrial and Commercial

Today, commercial and industrial single path ultrasonic meters are expanding in the North American markets, with more to come



Sensus Sonix IQ 425



Itron Intelis 425



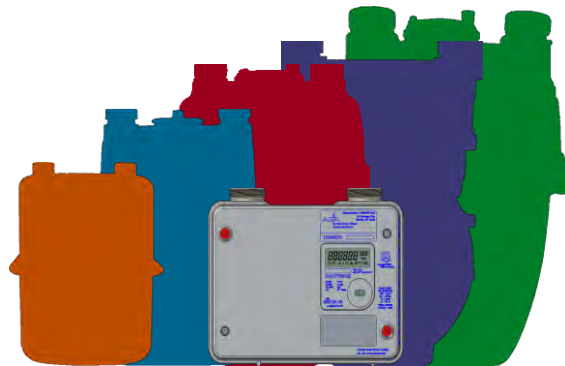
Sensus Sonix IQ 1000

# Ultrasonic Meter Benefits

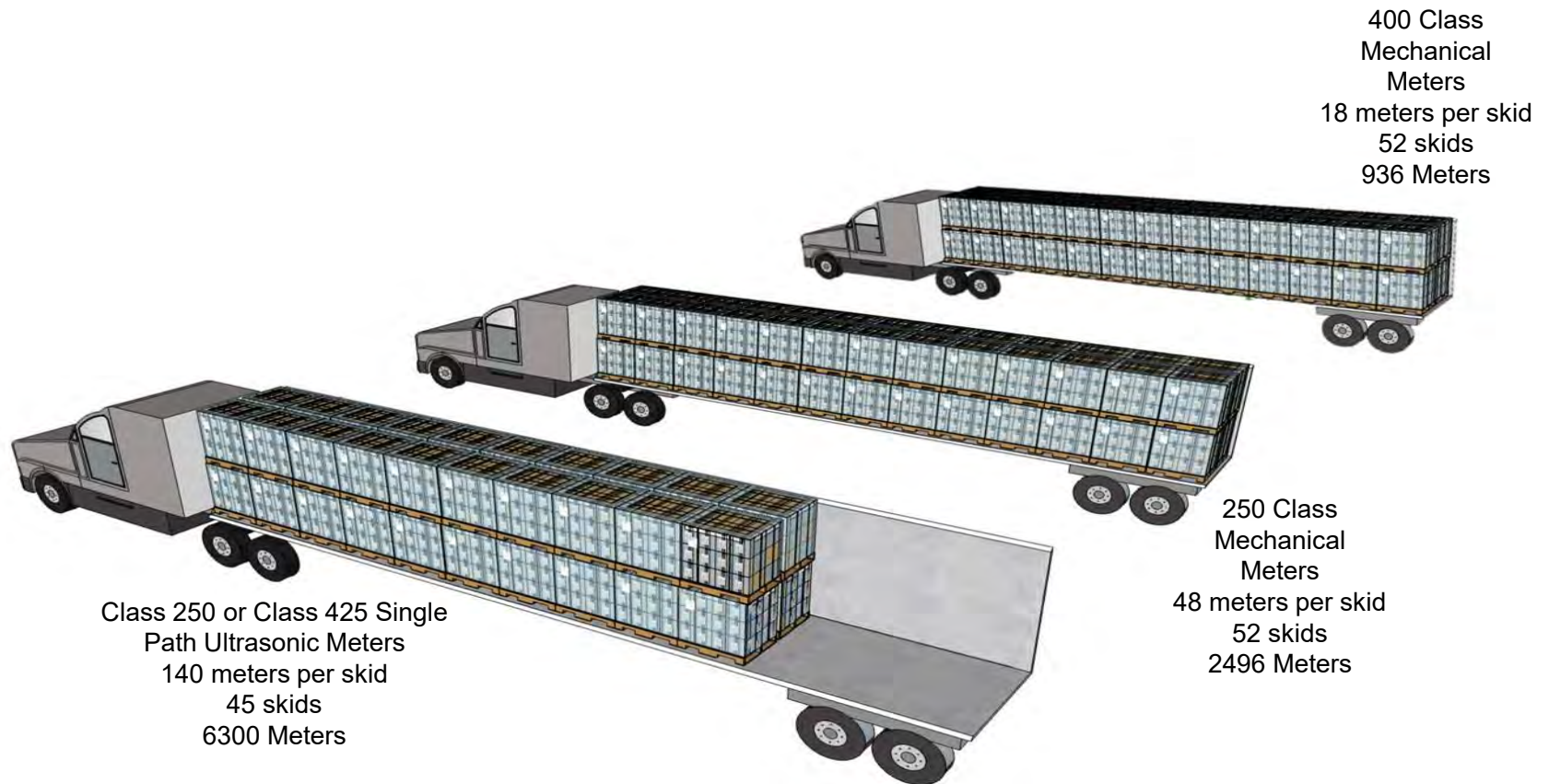
- Initial and retained metrology accuracy
- No moving parts
- Integrated radio for two-way communication
- Integrated valve, pressure, temperature and other sensors
- Scrolling LCD display with detailed information
- Data log and alarm log history
- Built-in theft and tamper detection
- Measurement and environment health checks
- Enhanced security
- Edge intelligence
- Scalable pulse outputs
- Laser etched information

# Ultrasonic Meter Benefits

- Compact footprint - fits in those tight closets, sub metering, multi-tenant applications
- Integral radio results in one asset to manage over the meter/radio's life
- Less space and less weight
  - Savings in fuel for transportation
  - Less chance of injury while handling or transporting
  - Less warehouse space for staging
- Go green with less than half the packaging and pallets to dispose



# Shipping Benefits – Trailer Layouts

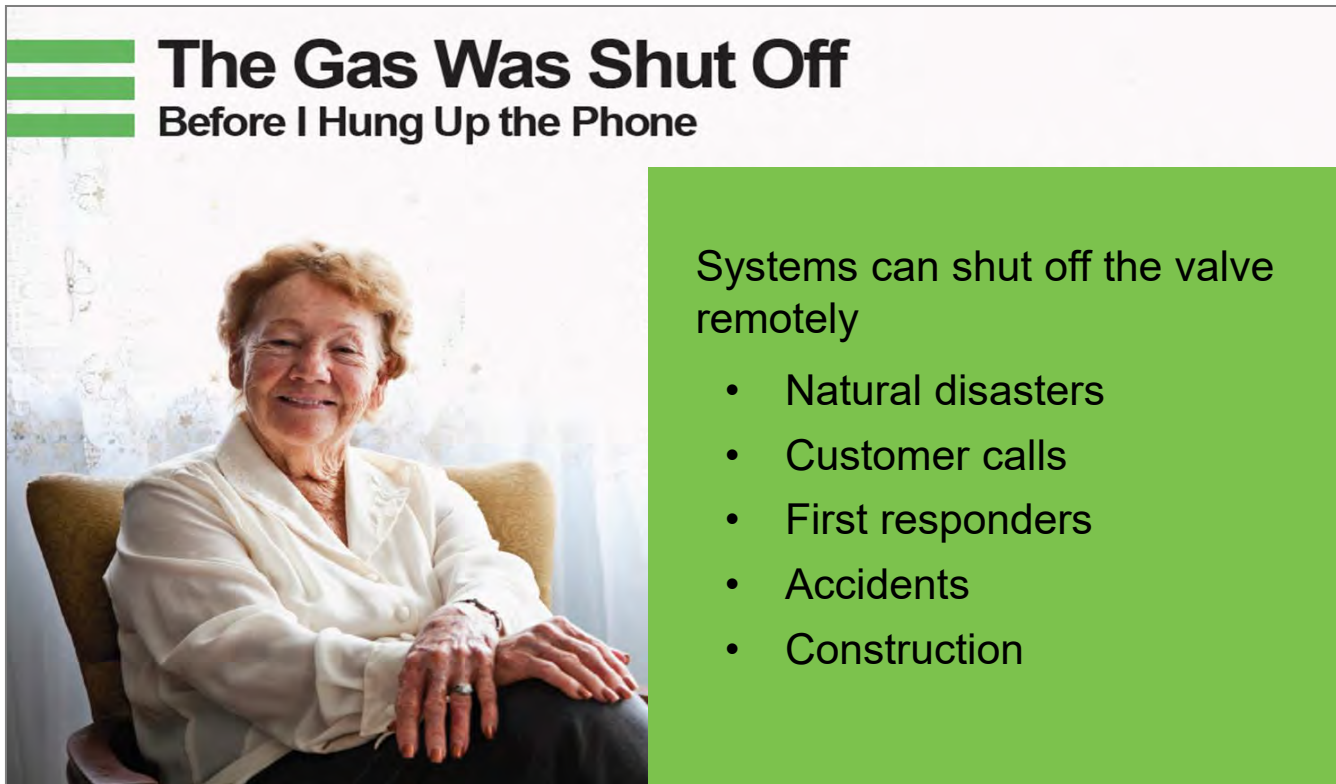


Typically, the number of residential ultrasonic meters is limited by trailer weight, not volume



# Remote Communication - Shutoff

## Customer Safety – Faster Response Time




**The Gas Was Shut Off**  
Before I Hung Up the Phone

Systems can shut off the valve remotely

- Natural disasters
- Customer calls
- First responders
- Accidents
- Construction

# Automatic Shutoff

## Mitigation of Life & Property Loss




**The First Responder to the Fire**  
Wasn't Called First

Internal monitoring can shut off the valve

- High pressure
- Low Pressure
- High temperature
- Air in meter
- Reverse flow
- Excess flow
- Other events

# Local Communication - Shutoff

## Employee Safety



**He's Watching Out for the Local Gas Man**  
Are You?



Meters can have the valve shut off locally via short distance radio (handheld), or direct connect optical cable



ANSI B109.6  
January 2024

# **SINGLE PATH ULTRASONIC GAS METERS**

## **(Under 1400 Cubic Feet Per Hour Capacity)**

### **Secretariat**

**400 North Capitol Street, NW – 4<sup>th</sup> Floor**  
**Washington, DC 20001**  
**U.S.A.**  
**Catalog No. X62401**

Complimentary Committee and Task Group Copy - DO NOT SHARE

# Sensus DuBois Manufacturing is Measurement Canada Approved to verify and seal SonixIQ Meters



# Summary

Mechanical diaphragm meters are still a solid choice for basic measurement. They have been workhorses for gas measurement for nearly two centuries. However, they have limitations to their future application in smart gas networks.

Single path ultrasonic meters offer forward thinking utilities the opportunity to embrace the next generation of smart gas measurement. The solid-state digital platform already offers features and benefits well beyond traditional assets. This technology can provide solution to problems that we have yet to be encountered. The data analytics will reshape how the industry manages business.

It's your choice, choose wisely!