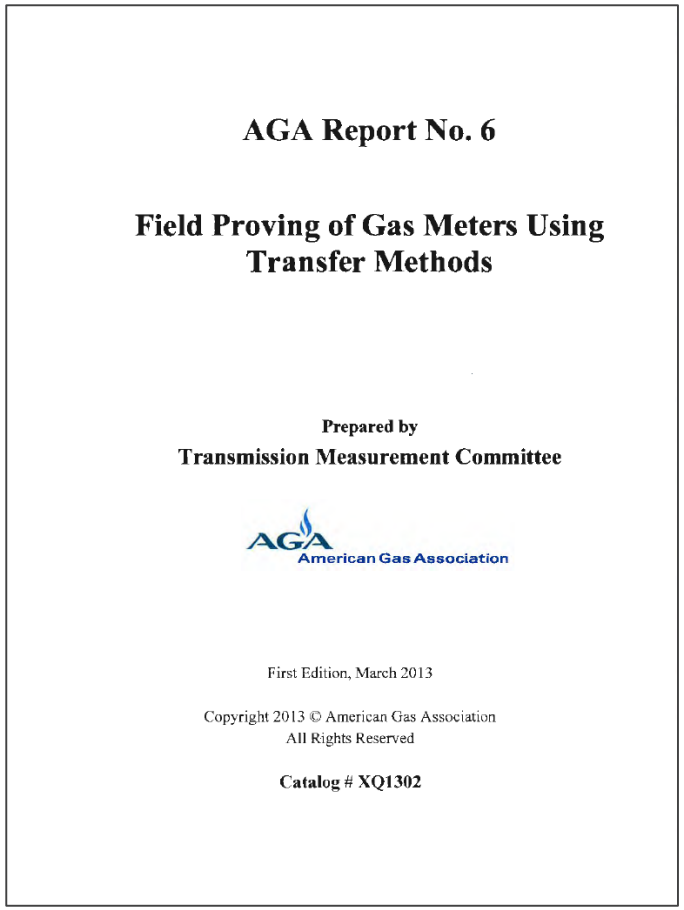
Mobile. Master. Meter.

A New Deployment of AGA 6

AGA 6 Refresher

In Situ Proving of Gas Meters



AGA Report No. 6

Field Proving of Gas Meters Using Transfer Methods

Prepared by
Transmission Measurement Committee

AGA American Gas Association

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Challenges Of AGA 6 Deployment

- Variety of Field Connection Geometries
  - Attenuation Tee and Inspection Tee (H Pattern)
  - Attenuation Tee and Elbow
  - Inspection Tee
- Choosing the Reference Meter
- Maintaining Master Meter Calibration

Overcoming The Challenges

- Need for adaptable piping which can connect to various piping configurations in the field
- Need a meter with a wide rangeability and high accuracy
- Robust testing to maintain master meter accuracy while accommodating a variety of field connection geometries

Introducing M3

Mobile. Master. Meter.

M3 System Overview

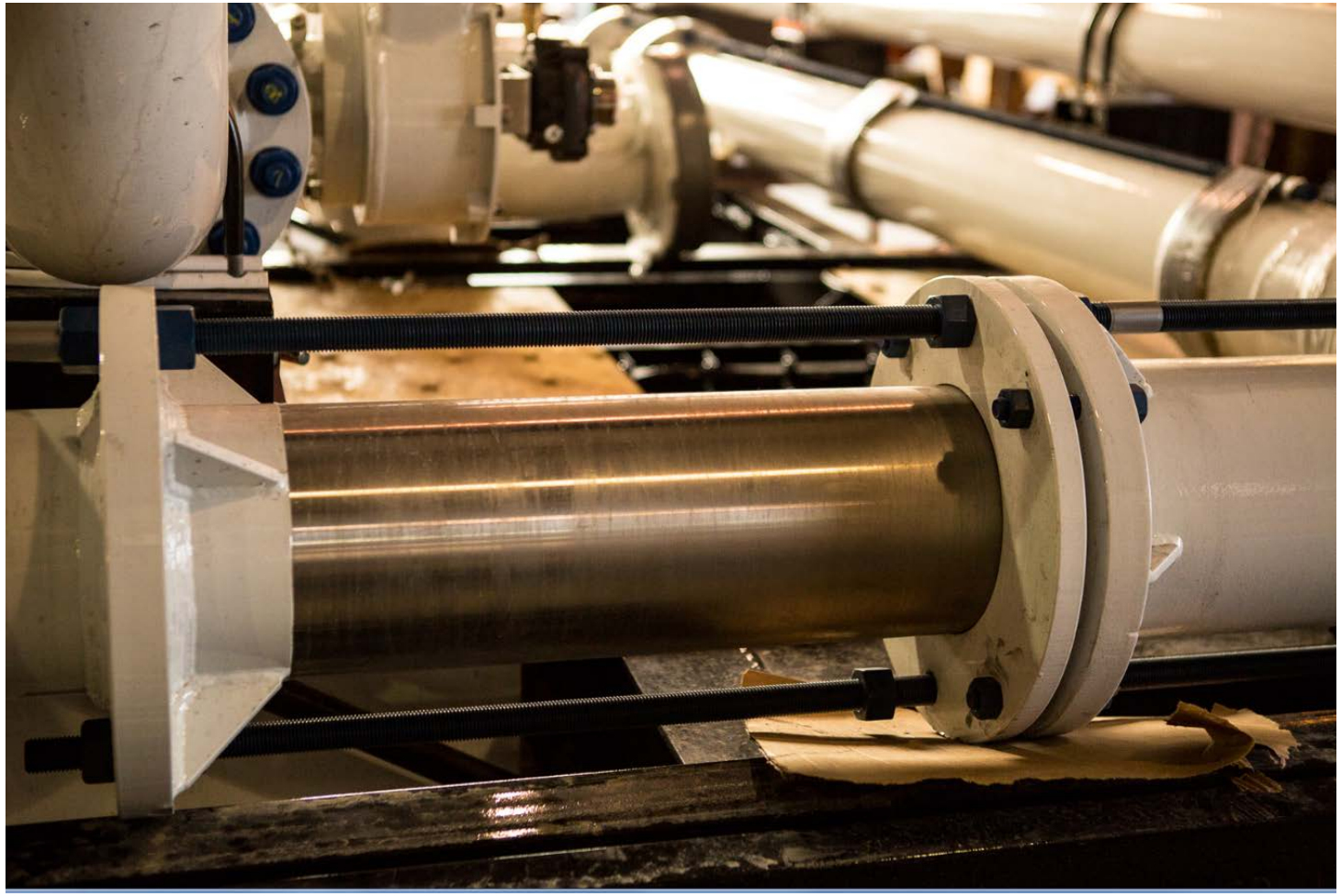
- High pressure adjustable piping
- Uses ultrasonic meter for its wide rangeability and high accuracy
- Tested in a wide array of configurations while mobile nature allows for easy recalibration at regular intervals

High Pressure Adjustable Piping

- Slip Joints
- Lap Joint Flanges
- Leveling Jacks
- Air Supports

High Pressure Adjustable Piping

Slip Joints



High Pressure Adjustable Piping

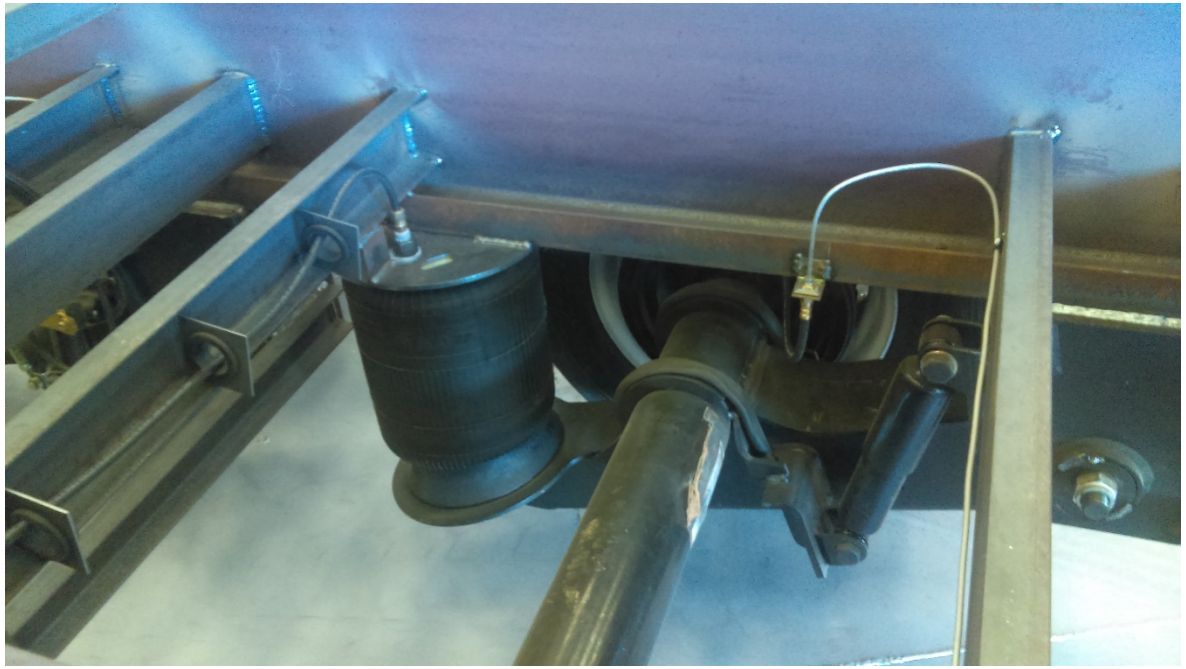
Lap Joint Flanges

High Pressure Adjustable Piping

Leveling Jacks

High Pressure Adjustable Piping

Air Supports



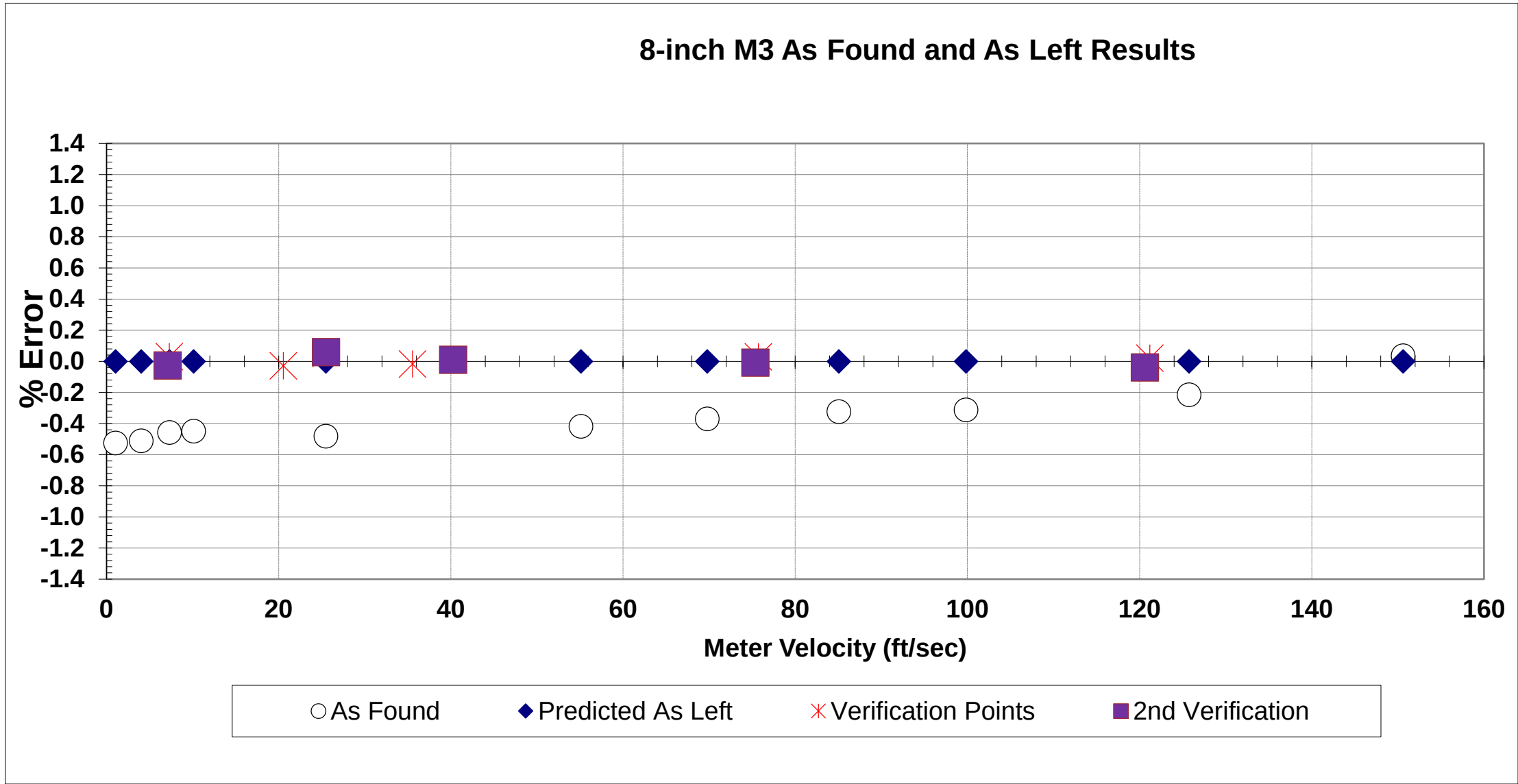
Robust Testing of Accuracy

Product Testing

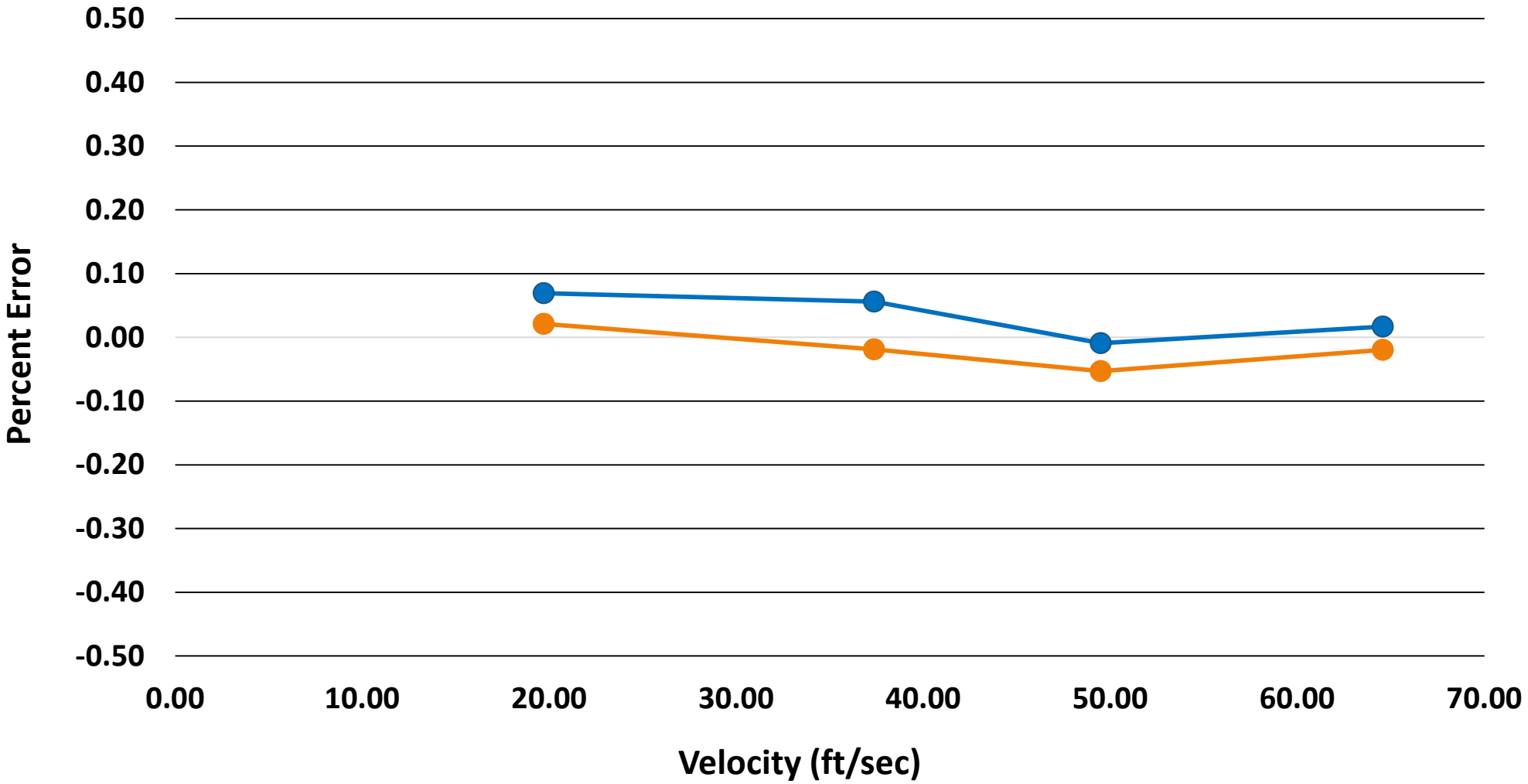
Robust Testing of Accuracy

- Extended Flow Calibration Range: 1 – 150 ft/sec
- 7 Distinct Flow Calibration & Verification Tests
  - 11 Point As-Found Calibration
  - 2nd 11 Point As-Found Calibration
  - 4 Point Verification
  - 2nd 5 Point Verification (performed on Day 2)
  - 3rd 4 Point Verification (performed after M3 Skid disconnected, driven around and returns)
  - 4th Verification while M3 Skid in Series with 12” USM
  - M3 System Verifies 12” Newly Calibrated USM

Robust Testing of Accuracy



Final Proof of Concept



Proof of Concept

M3 As Standard		
Point	12" Meter Velocity (ft/sec)	Percent Error
1	64.57	0.02
2	49.49	-0.01
3	37.38	0.06
4	19.71	0.07

Proof of Concept

CEESI As Standard		
Point	12" Meter Velocity (ft/sec)	Percent Error
1	64.57	-0.02
2	49.49	-0.05
3	37.38	-0.02
4	19.71	0.02

Robust Testing of Accuracy

Field Trials

Field Trials

- Client Meter has been installed roughly 2 months
  - Expectation is that M3 will say meter is perfect
- 1st Test – M3 says field meter is off by ~0.6%
  - Depression sets in
- Diagnostics indicate buildup in field meter
  - Break apart piping and examine
  - Confirmed that buildup exists
  - Clean pipe and rerun test

Field Trials

Field Trials

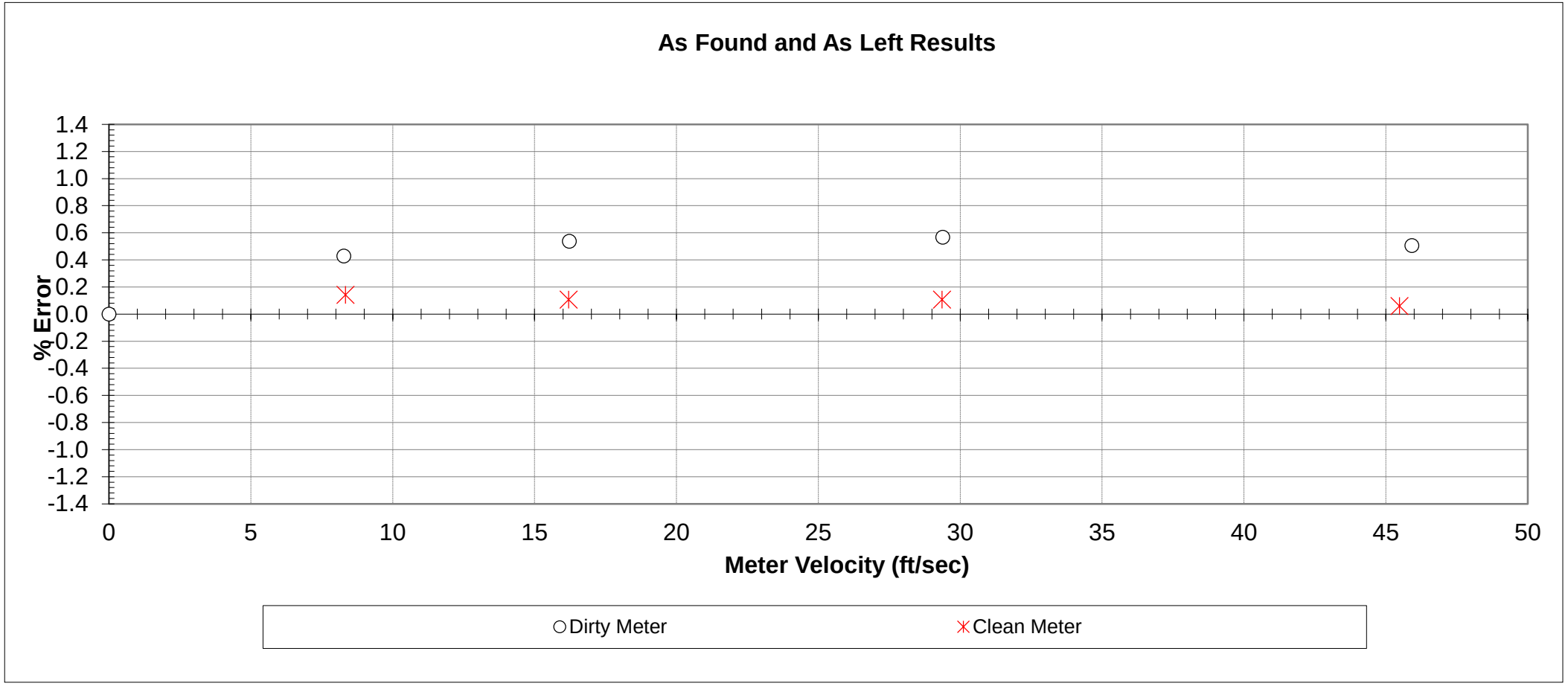
- 2nd Test – M3 reads a difference with the field meter of ~0.10%
  - Euphoria sets in
- M3 team is on cloud nine. Client is in shock.
- 2 month old meter installation was *ACTUALLY* 0.5% off

Field Trials – Economic Results

- Station runs roughly 200MMSCFD or $600K/day
- 0.5% = $3,000/day or $1,095,000/year
- M3 mitigated over $1 million/year in exposure from measurement inaccuracies
- Paid test would have been roughly $30,000
- Client ROI on M3 would have been 10 days

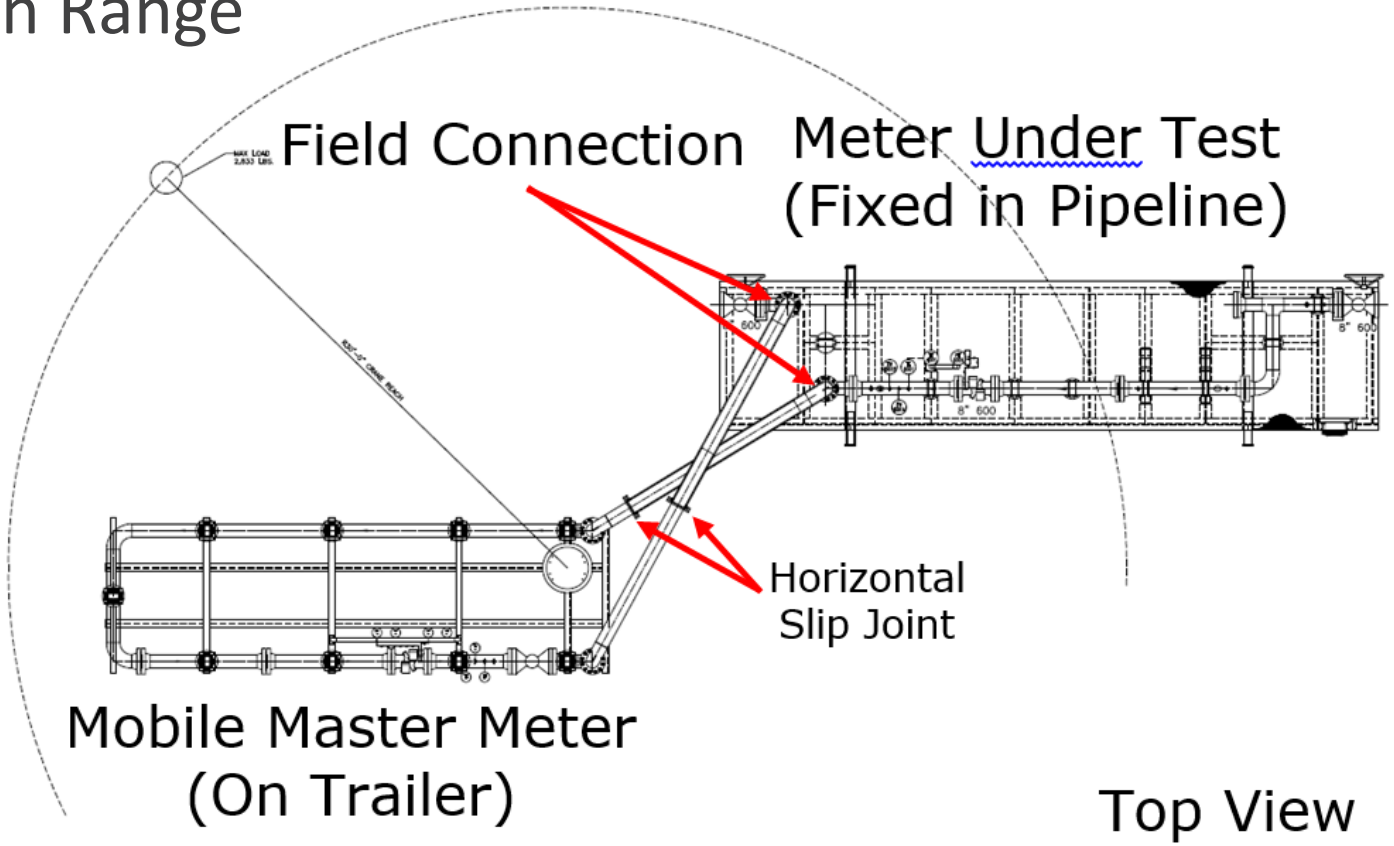
8” Field Trials - Results

12” Field Trials - Results



System Parameters

- Verifies 4”-12” Meters (check velocity chart)
- 15’-25’ Field Connection Range
- 150#-600# ANSI



System Deployment-M3

- General Meter Validation
  - Aged Meters
  - Suspect Meters
    - LAUF
- Meter Maintenance
  - As Found As Left Service

Credits


CEESIowa
A
M3
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Thank You!