Pipeline Research Council International, Inc.

PHMSA R&D Forum

PRCI Overview of Projects in Leak Detection

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Cleveland, OH
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PRCI Membership

LEADING PIPELINE RESEARCH WORLDWIDE

- **38 Energy Pipeline Operating Companies**
  - 21 Natural Gas Transmission; 9 Liquid
  - 8 Liquid/Natural Gas
- **3 Pipeline Industry Organization (PIO) Members**
  - Association of Oil Pipe Lines (AOPL)
  - Electric Power Research Institute (EPRI)
  - Operations Technology Development (OTD)
- **37 Associate Members & Technical Program Associate Members**
  - Australia, Canada, China, Europe, Japan, Mexico, U.S.
  - Special Membership – Australian Pipelines & Gas Association (APGA)
- **Worldwide Research Organization**
  - 43 U.S. Companies
  - 35 Non-U.S. (Australia, Brazil, Canada, China, Europe, Japan, Mexico, Saudi Arabia, South Africa)

PRCI Technical Committees

Pipeline TCs

- Inspection & Integrity
- Surveillance, Operations & Monitoring
- Corrosion
- Design, Materials & Construction

Facilities

- Compressor & Pump Stations
- Measurement
- Underground Storage

PRCI SOM Program Areas

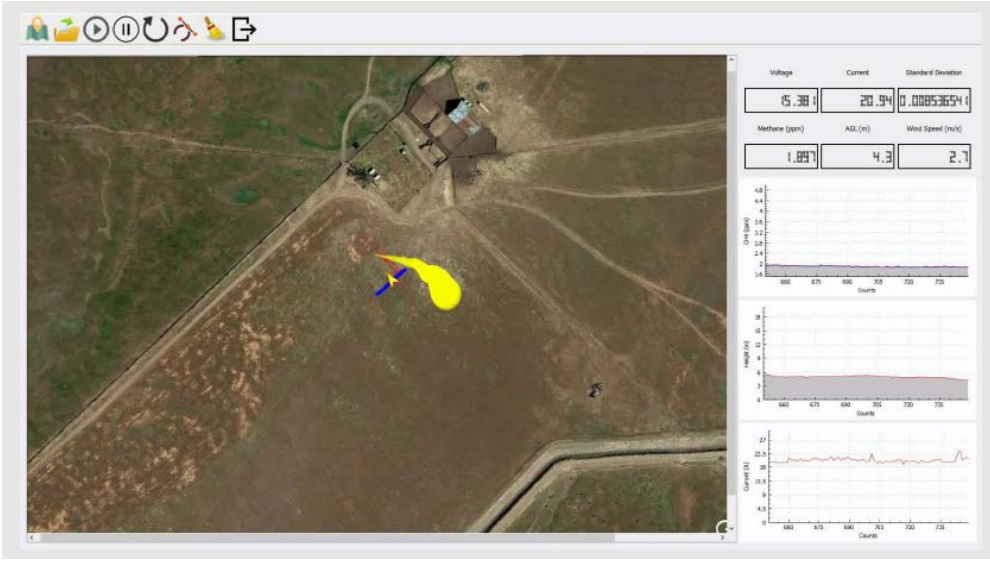
- PL-1: Continuous Pipeline Leak Detection
- ROW-3: ROW Automated Monitoring
- ROW-6: Satellite Monitoring
- DP-3: Human Organizational Factors

ROW-3 On-going Work

ROW-3H: Methane Detector UAS – Phase 2/3 Underway

- *Phase 4 approved for 2017*

- **Objective:** Phased development of a methane detector for handheld and UAS platforms (VTOL & fixed-wing) to include ethane for biogenic differentiation
  - *The sniffer optical head is an open-path, multi-pass tunable laser spectrometer and plots all data atop a 2D map in real-time on a tablet*

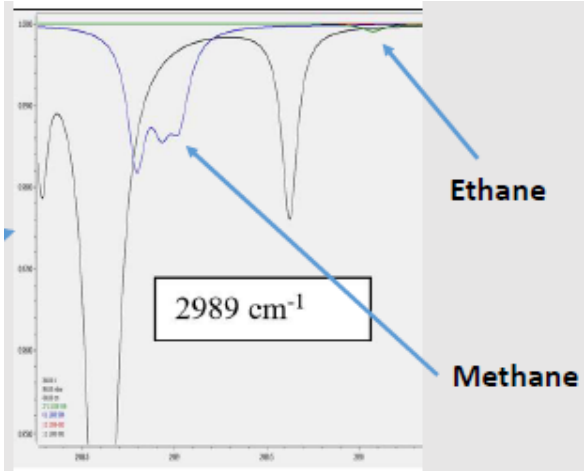


ROW-3 On-going Work

ROW-3H: Methane Detector UAS – Phase 2/3 Underway Cont.

- *Phase 4 approved for 2017*

- **Status & Expected Completion Dates**:
  - Handheld platform system validated and completed for methane (ethane TBD Phase 3)
  - Finalization of UAS system modification and flight validation underway and to be completed by end of 2016
  - Phases 3 &4 - Modification to Handheld & UAS systems to include ethane detection started and to be completed by end of 2017



PL-1 On-going Work

PL-1-2: API 1149 Update Phase 2 - A New Look at the Pipeline Variable Uncertainties and Their Effects on Leak Detection Sensitivity Software Tool

- **Objective**: Provide information that will assist the pipeline industry in:
  - *finding leaks on liquid hydrocarbon pipelines,*
  - *determine theoretical and practical detection thresholds,*
  - *fully consider all aspects of pipeline leaks,*
  - *document all research work undertaken*
  - *produce a software tool that could API 1149 calculations for day-to-day software based leak detection performance considerations (e.g. ongoing system testing comparisons as per API 1130)*
  - *Products to expand beyond original 1993 version*

PL-1 On-going Work

SCADA Data

Import | Template | Export

Receipt | Delivery | Pump Station | Valve Station

Banos

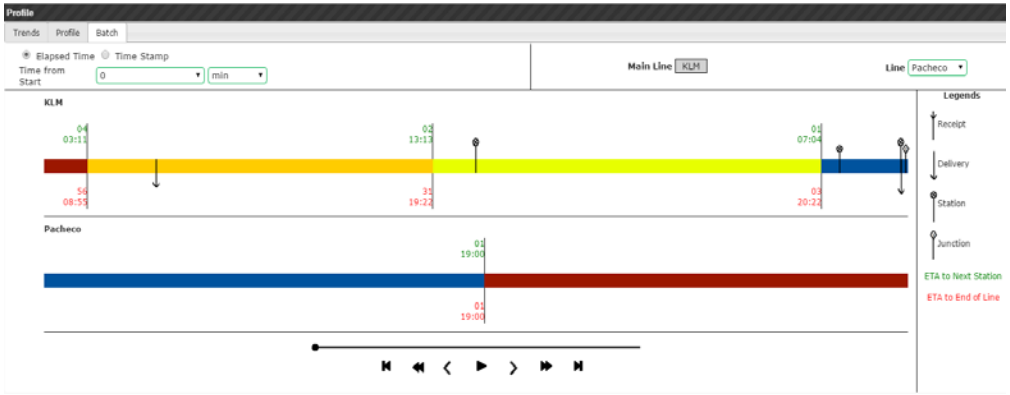
Insturment Type	Instrument	Tag Name		Is Disabled
Inlet Pressure	PT3051	BANO.PU	psi	
Discharge Pre...	PT424	BANO.PD	psi	
Binary Status		BANO.ST		

Medanos

Insturment Type	Instrument	Tag Name		Is Disabled
Inlet Pressure	PT3051	MEDA.PU	psi	
Discharge Pre...	PT3051	MEDA.PD	psi	
Binary Status		MEDA.ST		

Avon

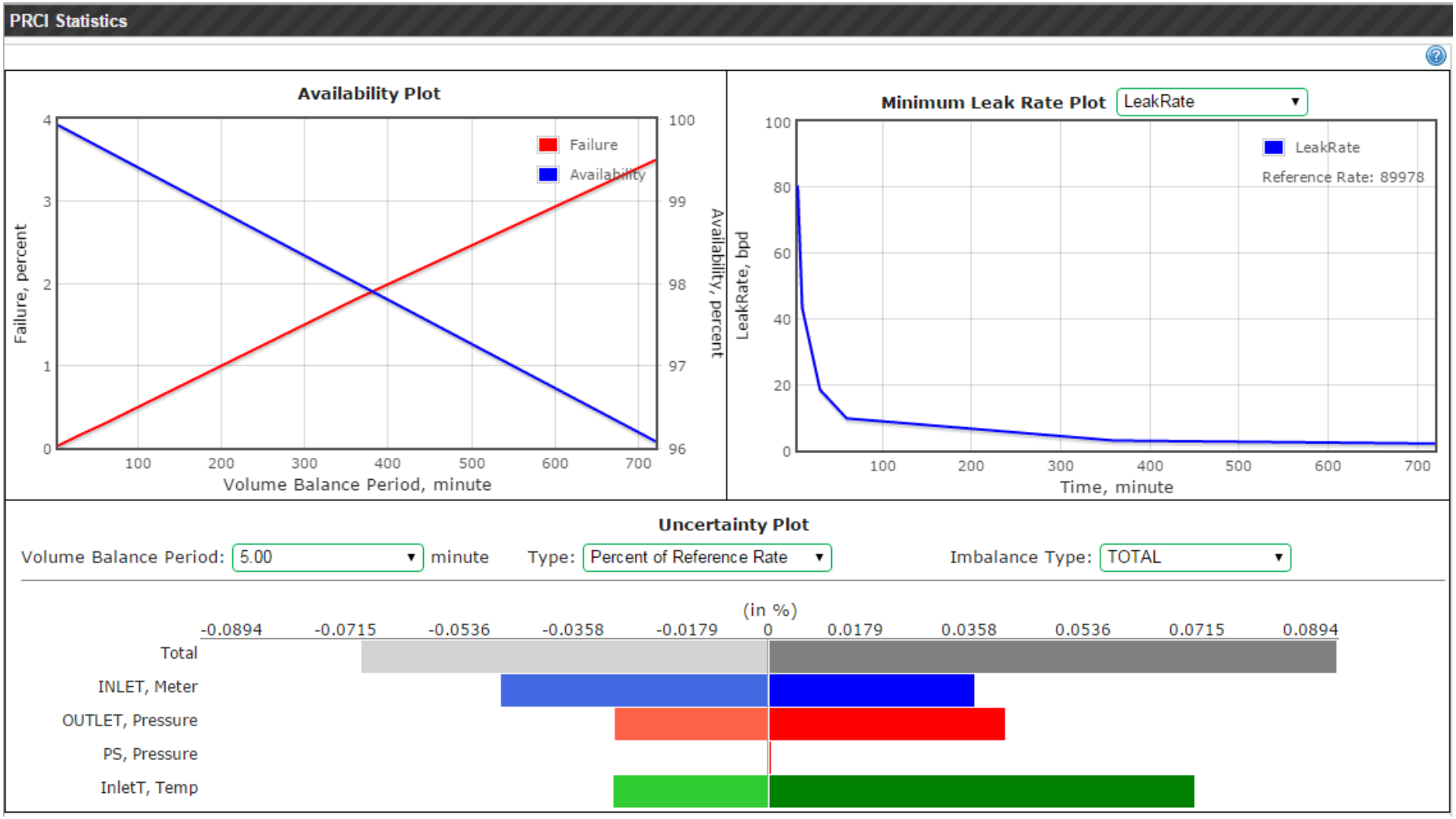
Insturment Type	Instrument	Tag Name		Is Disabled
Inlet Pressure	PT3051	AVON.PU	psi	
Discharge Pre...	PT3051	AVON.PD	psi	
Binary Status		AVON.ST		



Example Load case **Batch Demo:**

1. Inline Receipt/Delivery and Branch definitions
2. Batch definitions for linefill (and queue)
3. SCADA tag mapping for real-time transient modeling

PL-1 On-going Work



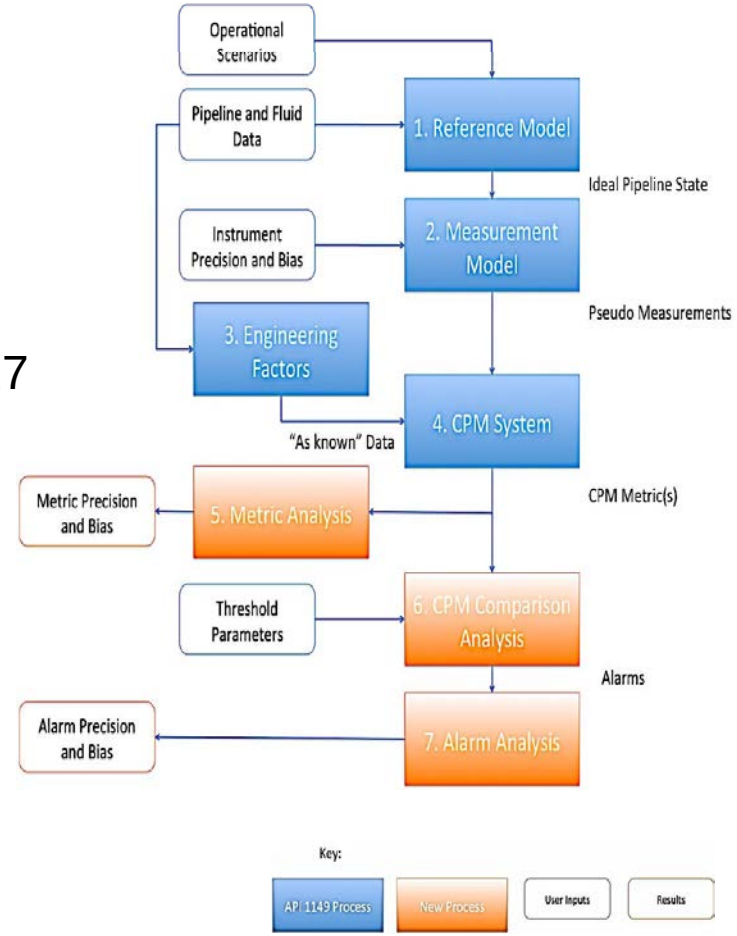
PL-1 On-going Work

PL-1-2: API 1149 Update Phase 2 - A New Look at the Pipeline Variable Uncertainties and Their Effects on Leak Detection Sensitivity Software Tool

- **Status**: API 1149 Document Updated
  - Software GUI being finalized
  - Joint API-PRCI workshop/webinar 2017

- **Expected Completion Date:**

December 2016



PL-1 On-going Work

PL-1A: Field Testing of Selected Technologies for In-situ Detection of Small Leaks from Liquid Pipelines

- **Objective**: Field testing and demonstration of commercially available Distributed Acoustic Sensing leak detection systems (2 potential technologies providers have accepted to participate, but could test up to 4 systems)

- **Status**: Initial test plan being produced for an transmission operator's site on the west coast

- **Expected Completion Date:** December 2017

PL-1 On-going Work

PL-1H: Evaluation and Development of a Petroleum Pipeline Leak Detection Cable Utilizing Polymer Absorption Sensor Technology Large Scale Testing

- **Objective**: To demonstrate a proof-of-concept cable system that inductively provides power and communications to distributed sensor nodes incorporating PAS hydrocarbon detectors. A largescale tested prototype will be demonstrated for several trials in operation-like conditions.

- **Status**: Phase 2 nearing completion
  - – demonstration of component and system Lifecycles in laboratory aged conditions
  - - Outdoor testbed construction/testing 2017/2018
- **Expected Completion Date:**

December 2018

PL-1 On-going Work

PL-1K: Numerical Modelling and Lab Simulation of Subsurface Fluid Migration

Objective:

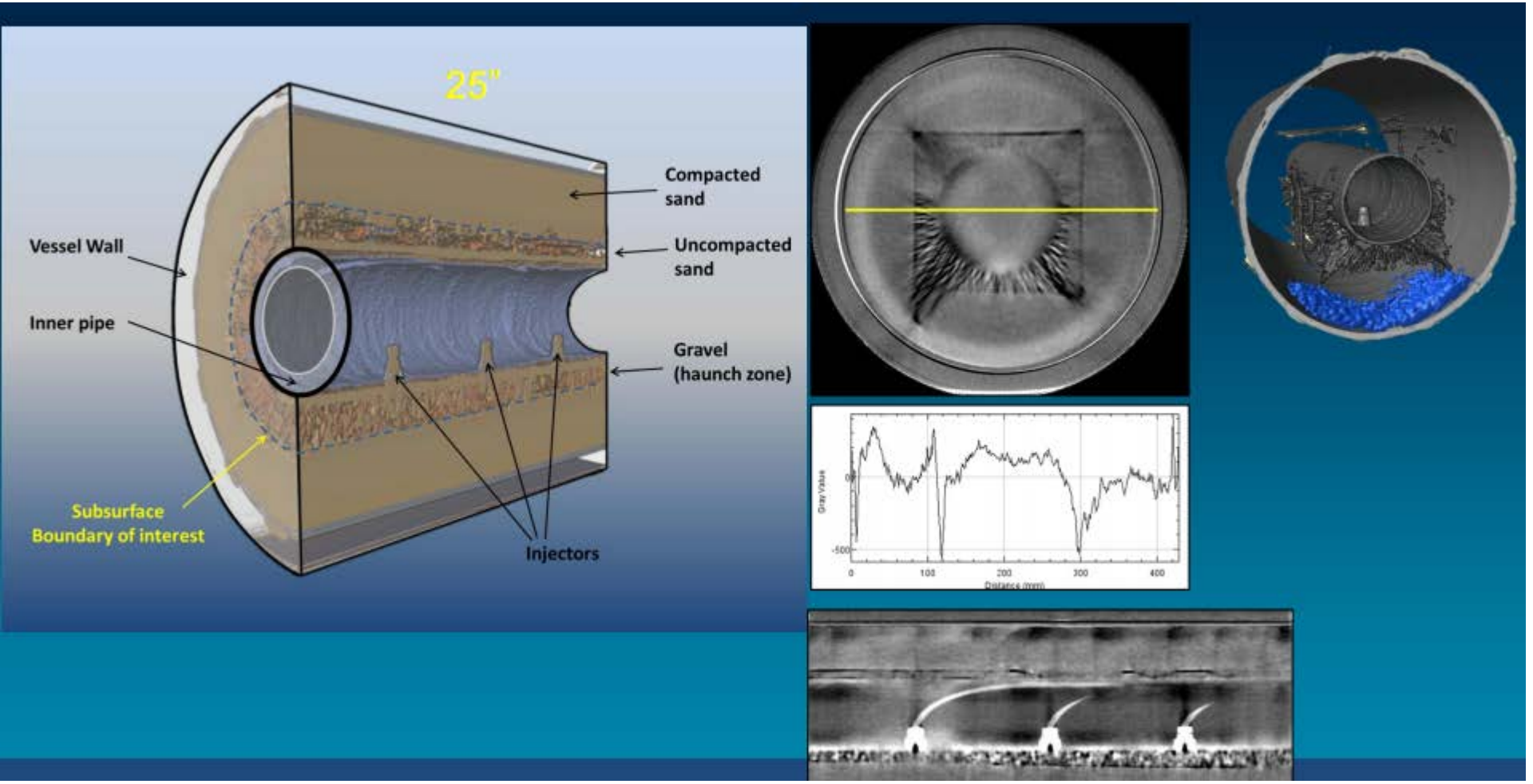
- Study that aims to predict and characterize the behavior of dense non-aqueous phase fluid (i.e. dilbit and gasoline) leaking from pipelines into surrounding geological porous media (i.e. sand and gravel).
- Integrate laboratory leakage simulations and modeling efforts.

Status:

- Final Report Under project team review
- Operators would have an enhanced understanding of leaked fluid behavior in the pipeline corridor under various environmental (temperature, moisture) and physical conditions (porous medium, engineering design).

Expected Completion Date: December 2016

PL-1K


25"
Compacted sand
Uncompacted sand
Gravel (haunch zone)
Vessel Wall
Inner pipe
Subsurface Boundary of interest
Injectors
Gray Value
0
-500
0
100
200
300
400
Distance (mm)

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