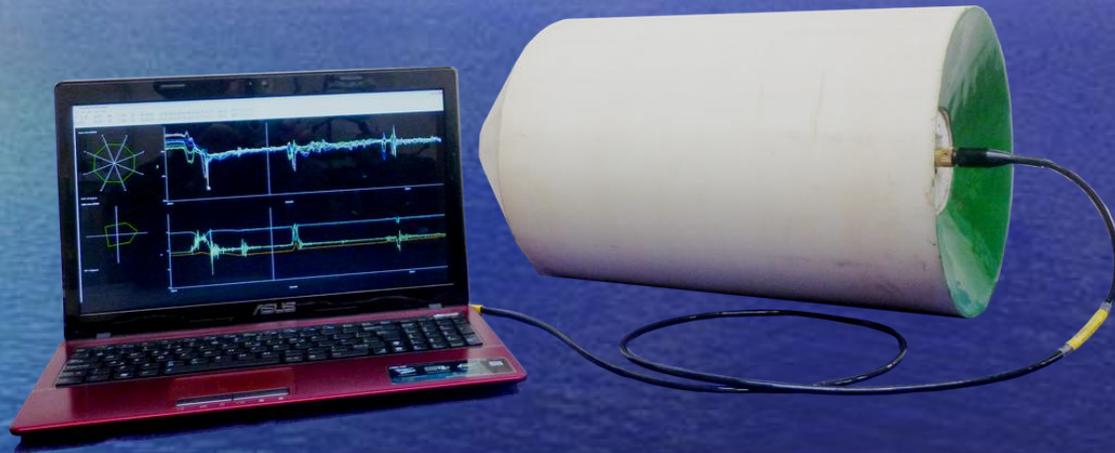


The Pathfinder

Foam Caliper Pig



Polyurethane foam pig with a pipe bore measurement system integrally moulded into the tool.

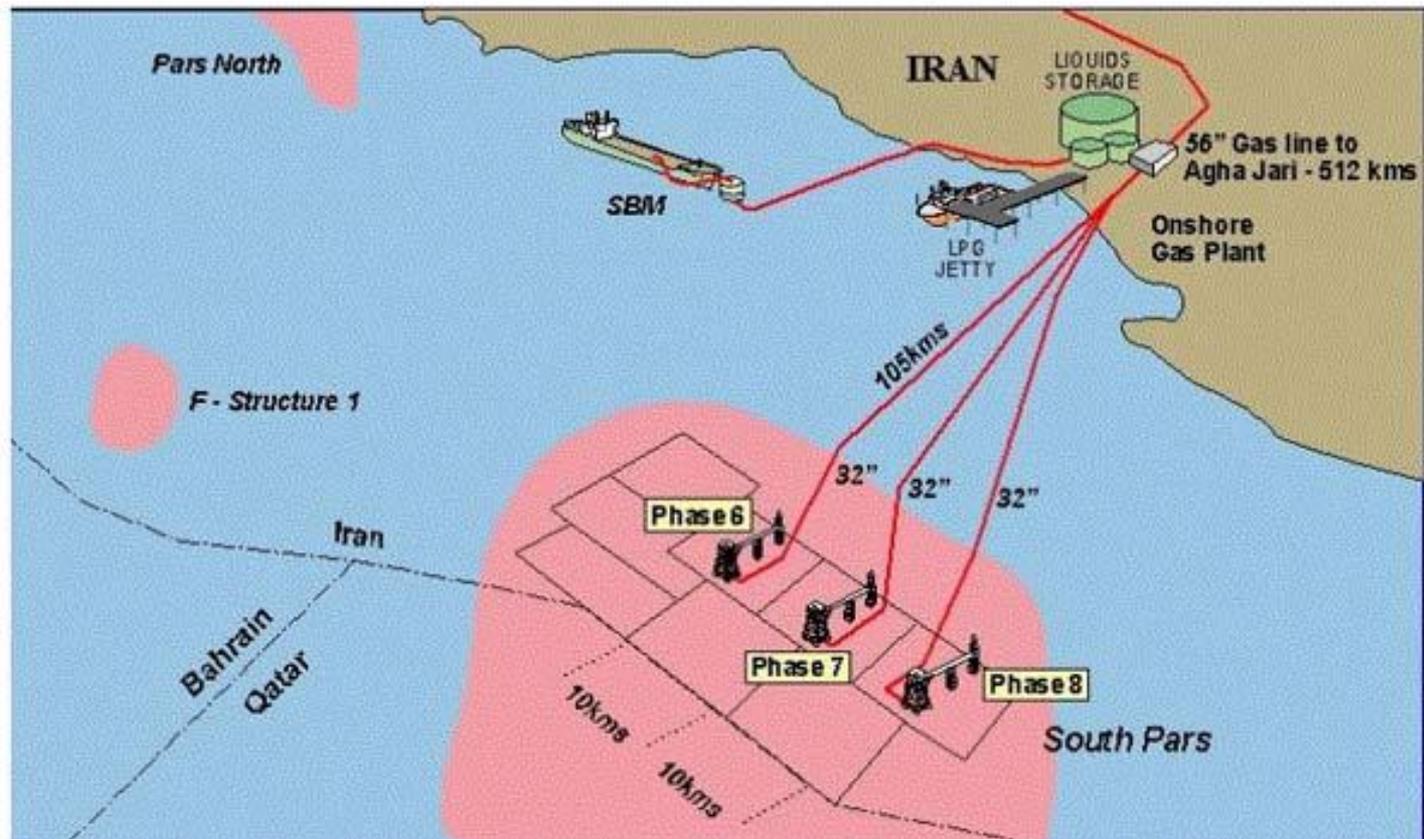
South Pars Gas Field



South Pars Gas Field

Iran – South Pars phases 6-7-8

STATOIL



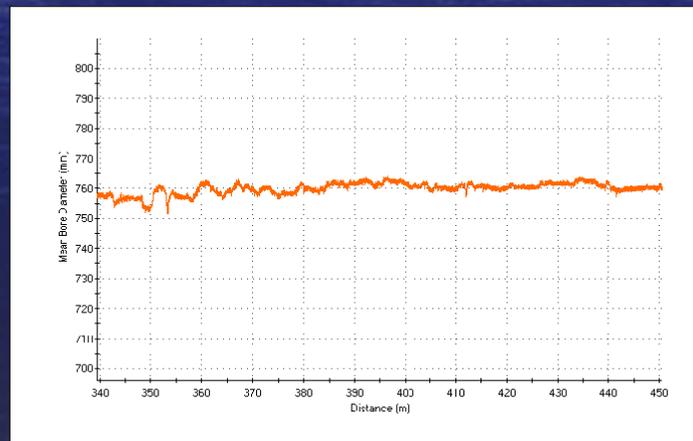
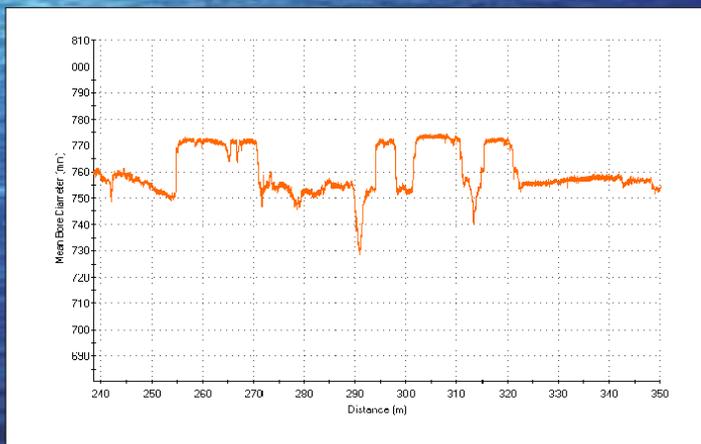
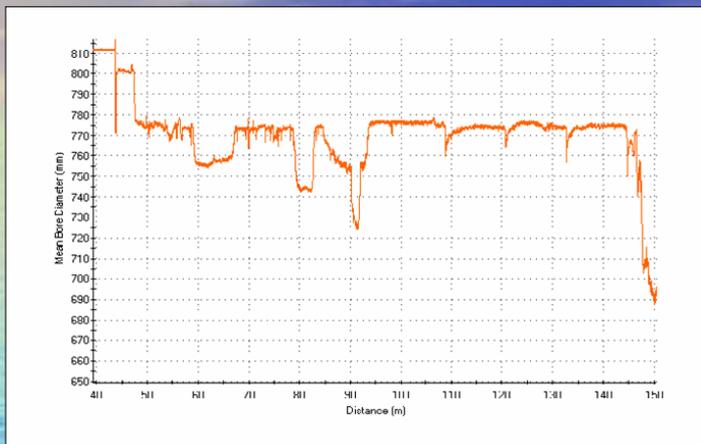
Sea Line 1 – June 2004



Sea Line 1

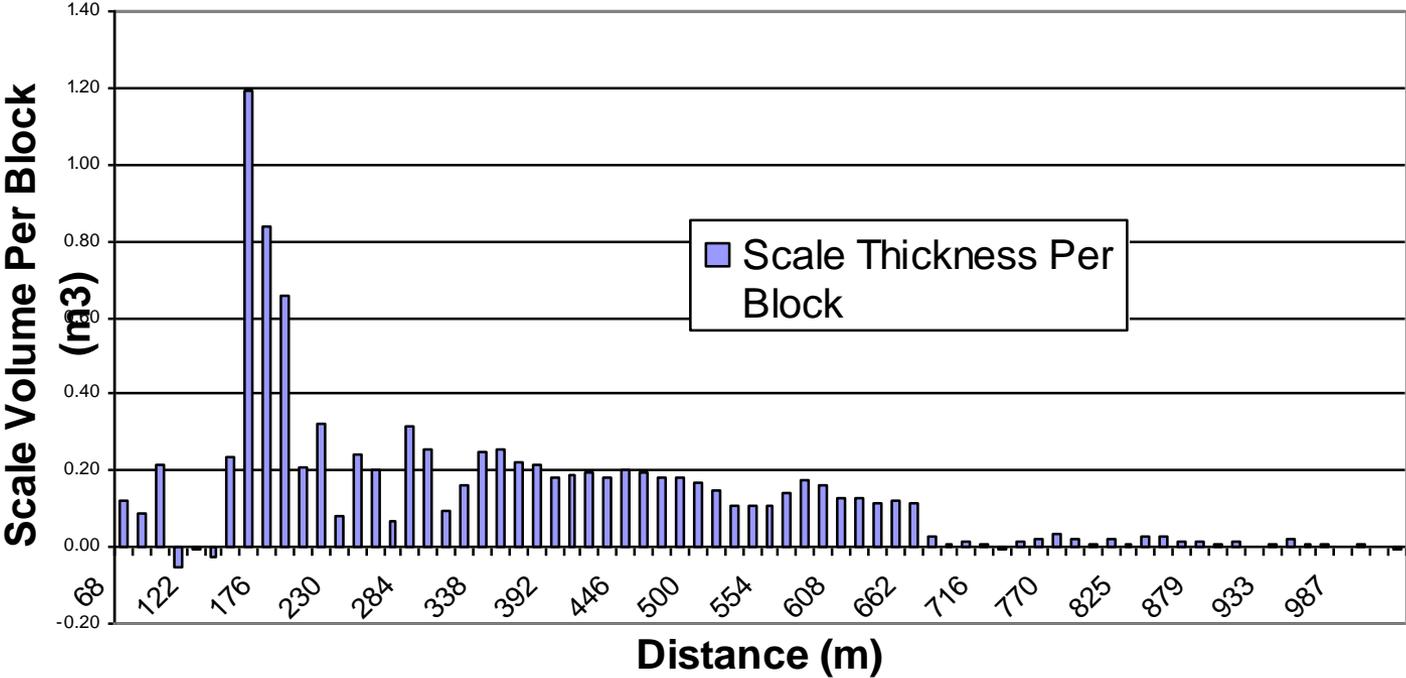


Sea Line 1



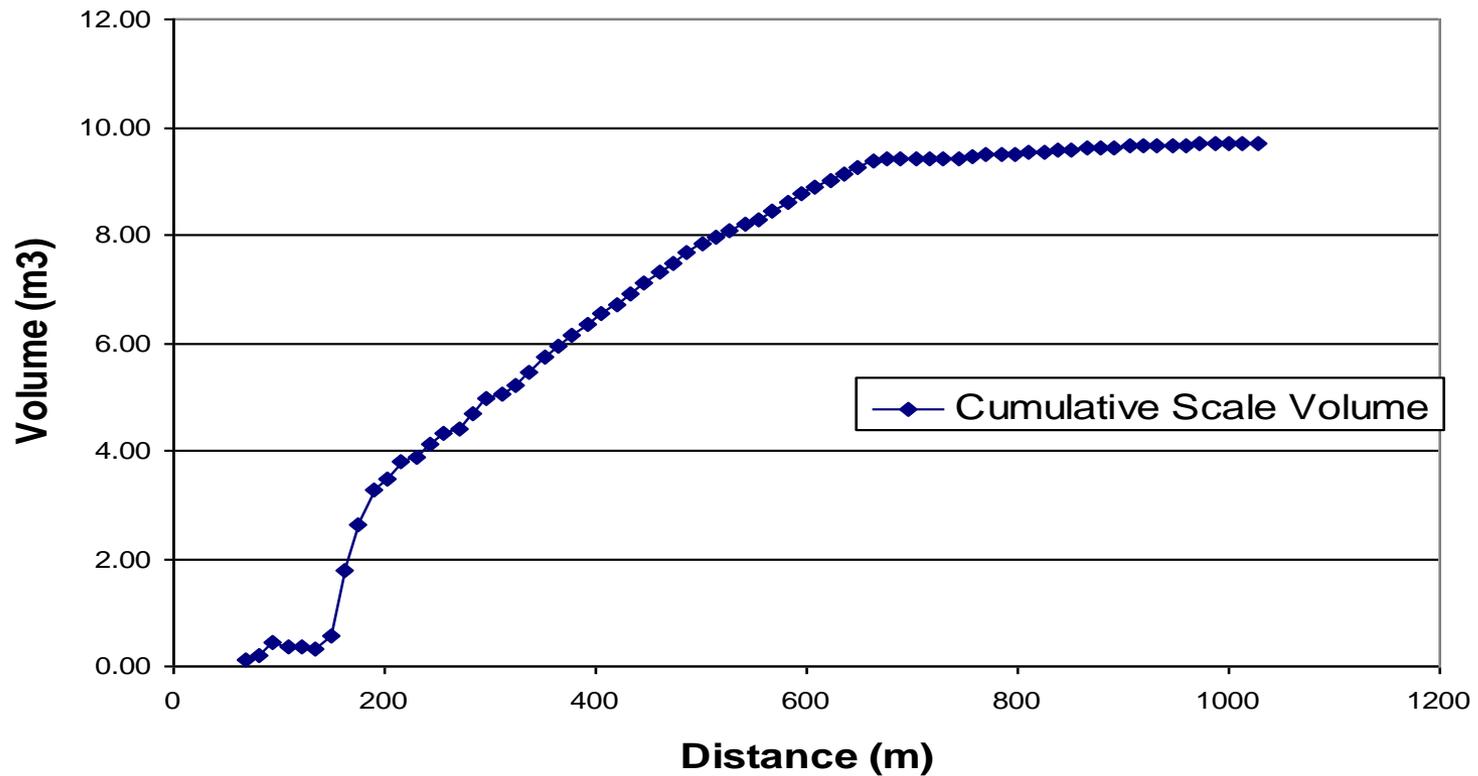
Sea Line 1

Scale Thickness - Run 2



Sea Line 1

Cumulative Scale Volume - Run 2



Sea Line 2 - 2005

- 32" Gas and Condensate Line
- Known to have hard scale deposits
- The line had not been gauged



Sea Line 2



32" Multi-Channel Caliper With 50% Bore Passing Capability



32" Multi-Channel Caliper With 50% Bore Passing Capability



Bore Proving Tool

- Assess the restrictions in the pipeline prior to putting in a hard bodied pig
- First pass measure of the thickness & distribution of deposits to help plan cleaning campaign



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Scale & Wax Measurement Tool

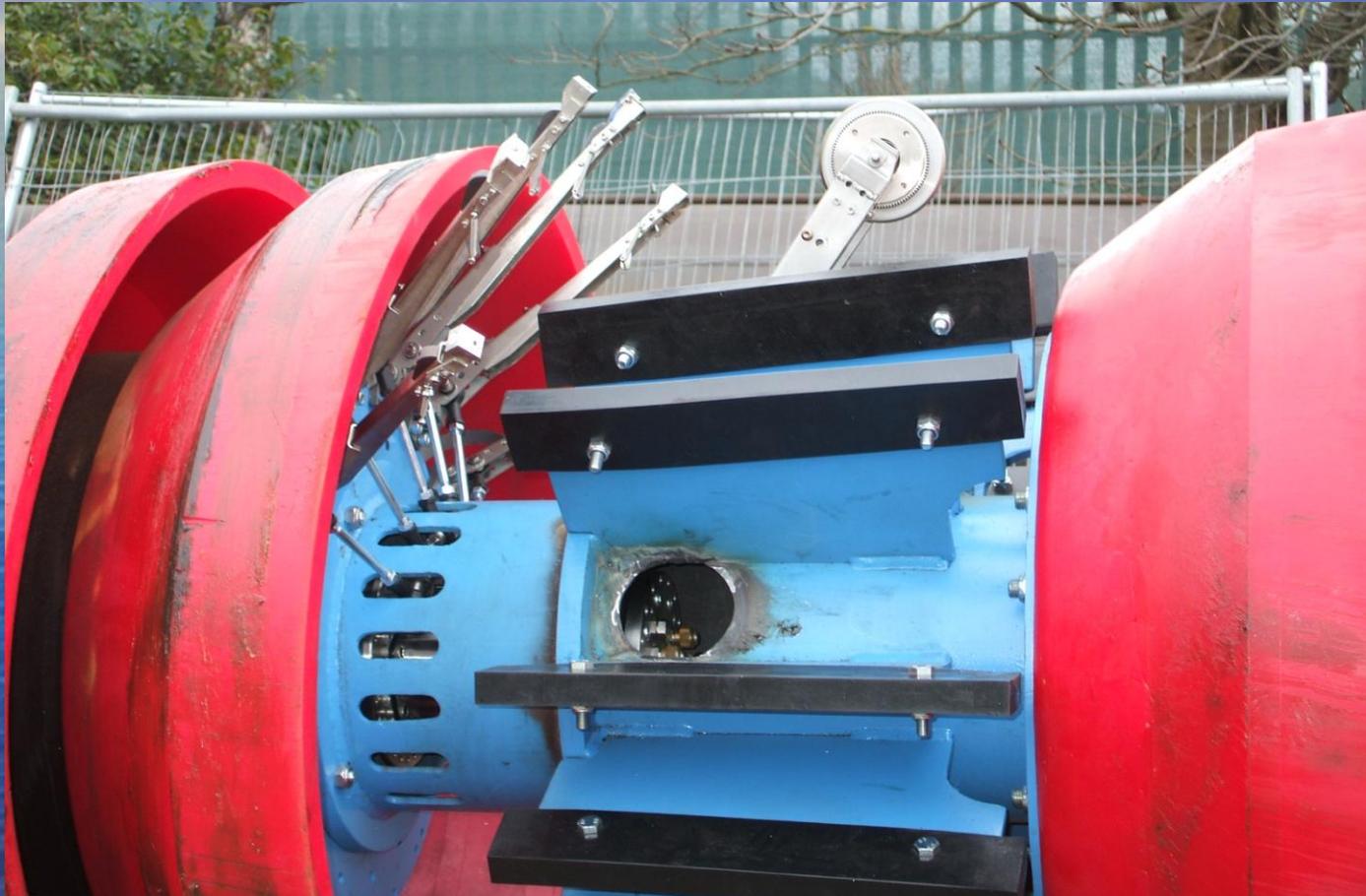
- Measure during cleaning
- Final measurement to ensure pipe clean enough for ILI tool



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Scale & Wax Measurement Tool



Scale & Wax Measurement Tool



Pathfinder Development 2009

Bore Proving Tool Requirements

- Soft Bodied – Flexible
- No External Mechanical Parts
- Measures & Records the Pipe Bore
- Useable by the Client
- Reasonably Priced

Pathfinder Development

- 2009 – Concepts & Feasibility
- 2010 – Working Prototypes
- 2011 – Operational Prototypes
- 2012 – First Job



The Pathfinder

Features

- Foam Pig – Medium to High density PU



The Pathfinder

Features

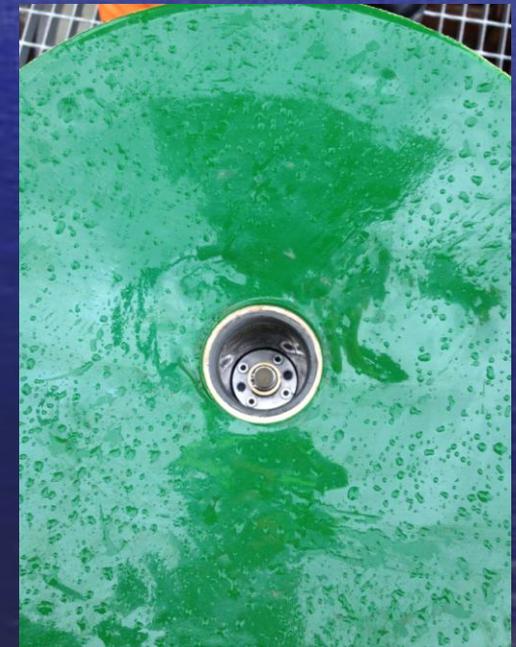
- Removeable caliper cartridge containing sensors, logger and batteries



The Pathfinder

Features

- Caliper Cartridge – Connect run plug to power up
- Simple to Load



The Pathfinder

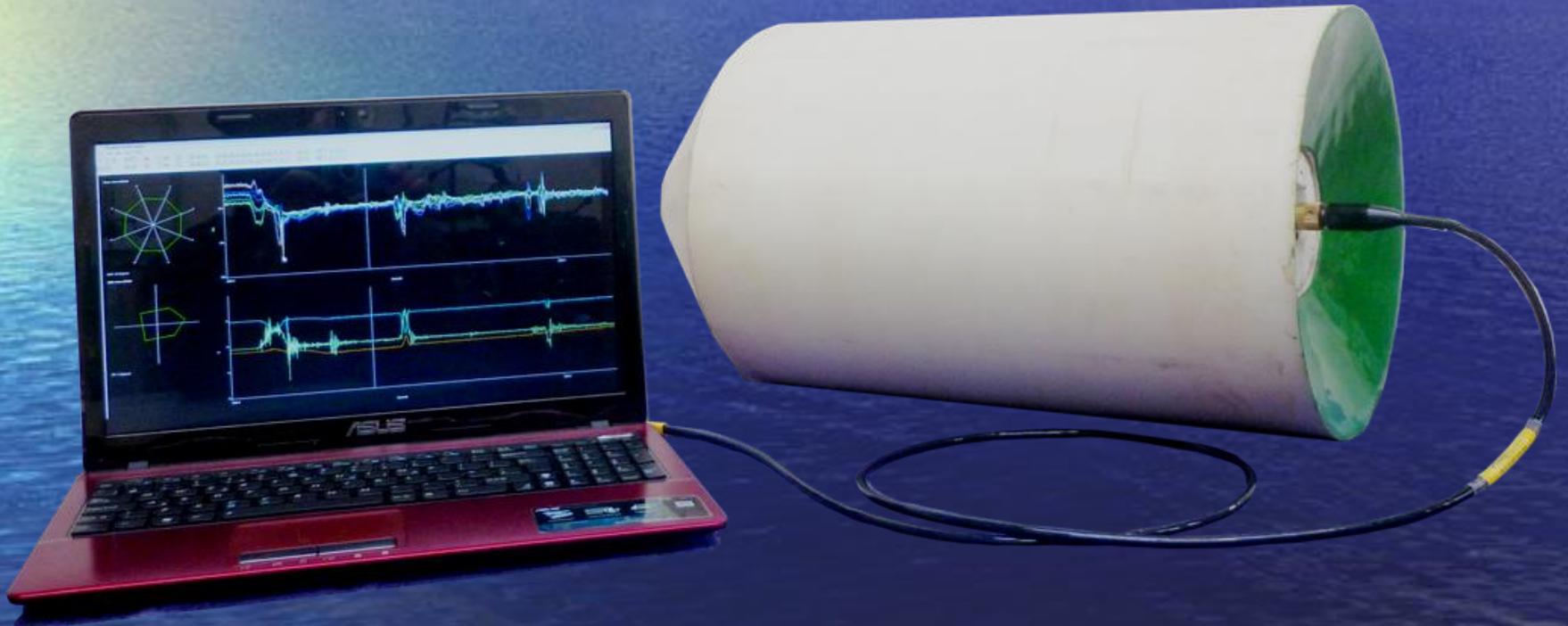
Features

- Electromagnetic Transmitter Can be added as an option



The Pathfinder

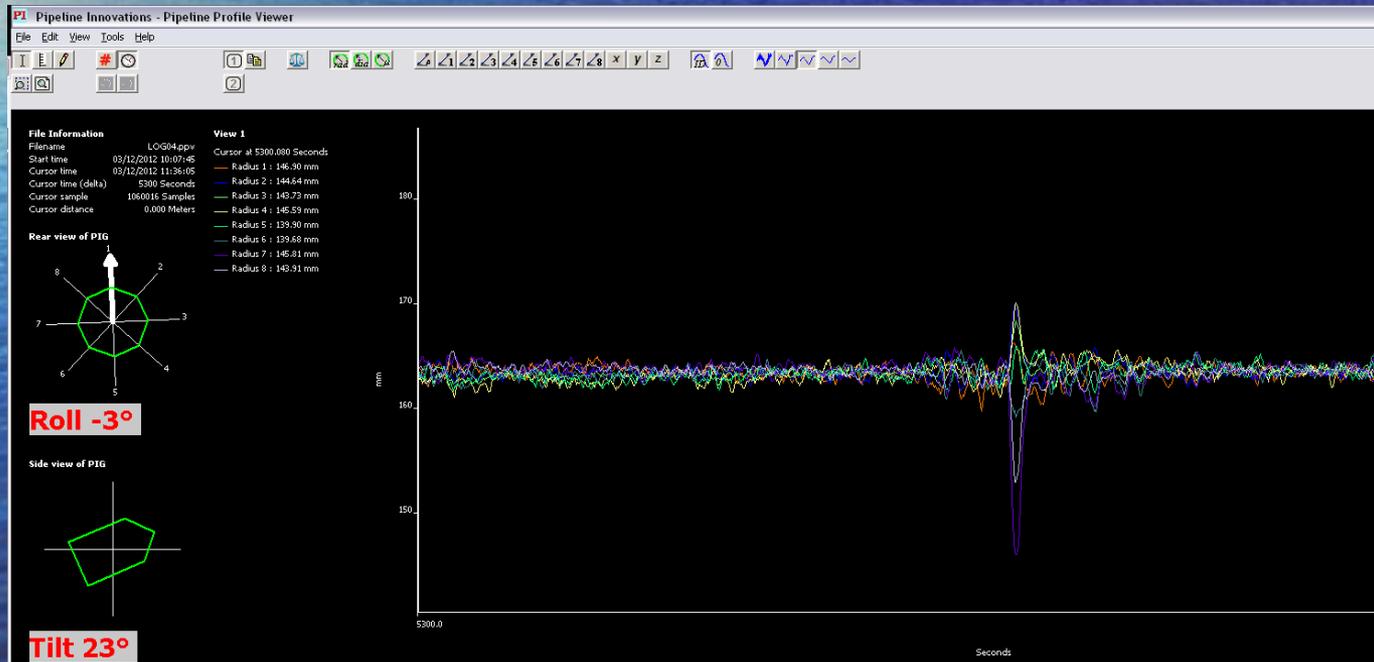
Features



The Pathfinder

Features

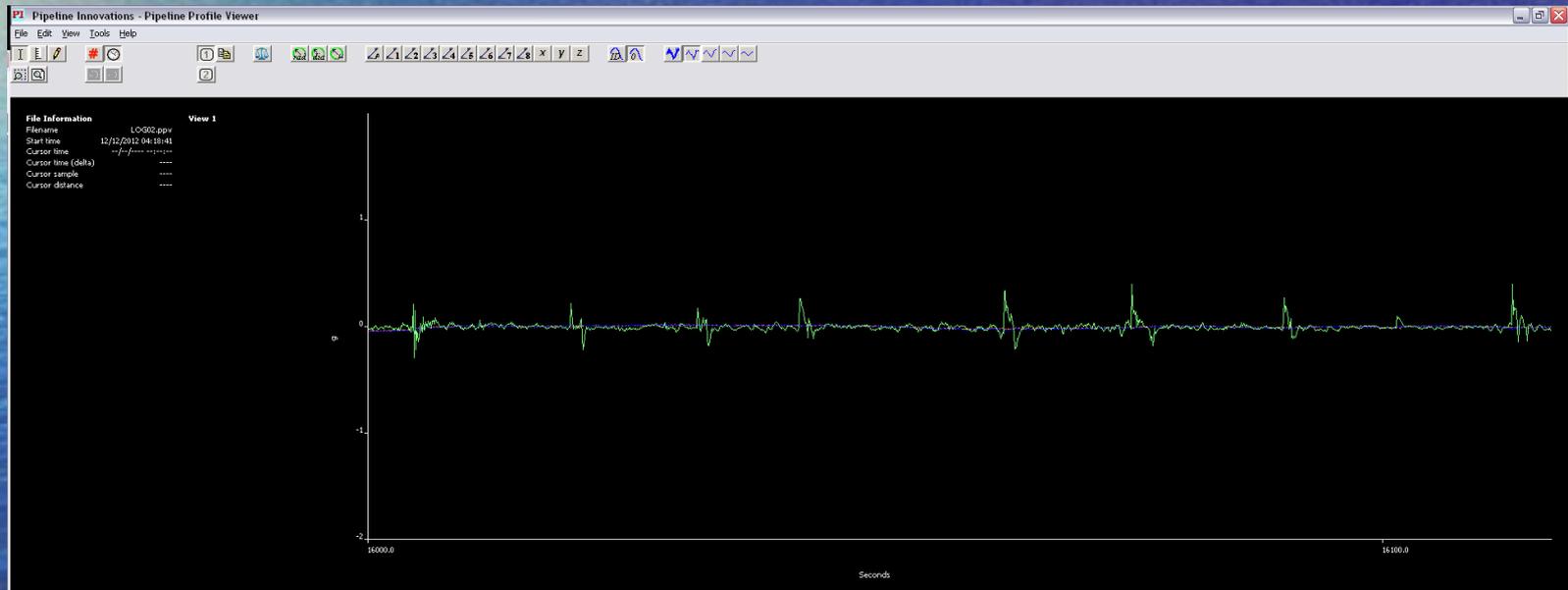
- Multi-channel system - 8 Caliper sensors
- Clock Position (Roll) & Tilt measurement included



The Pathfinder

Features

- Girth weld detection



The Pathfinder

Features

- Disposable foam body with re-useable caliper cartridge



Line K1, Naples

ExxonMobil



Line K1, Naples



Internal Anodes On Similar Pipeline

Line K1, Naples

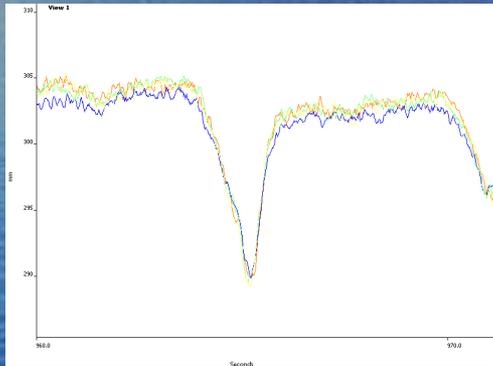


Gauging Pig Cut Out

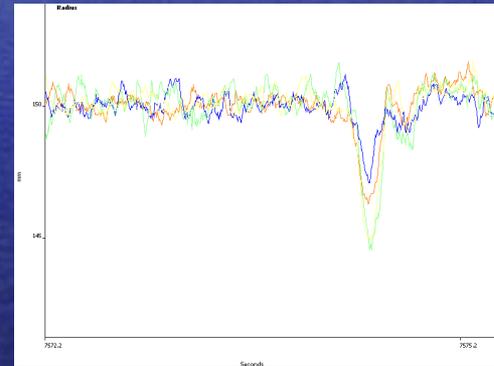
Line K1, Naples



Line K1, Naples

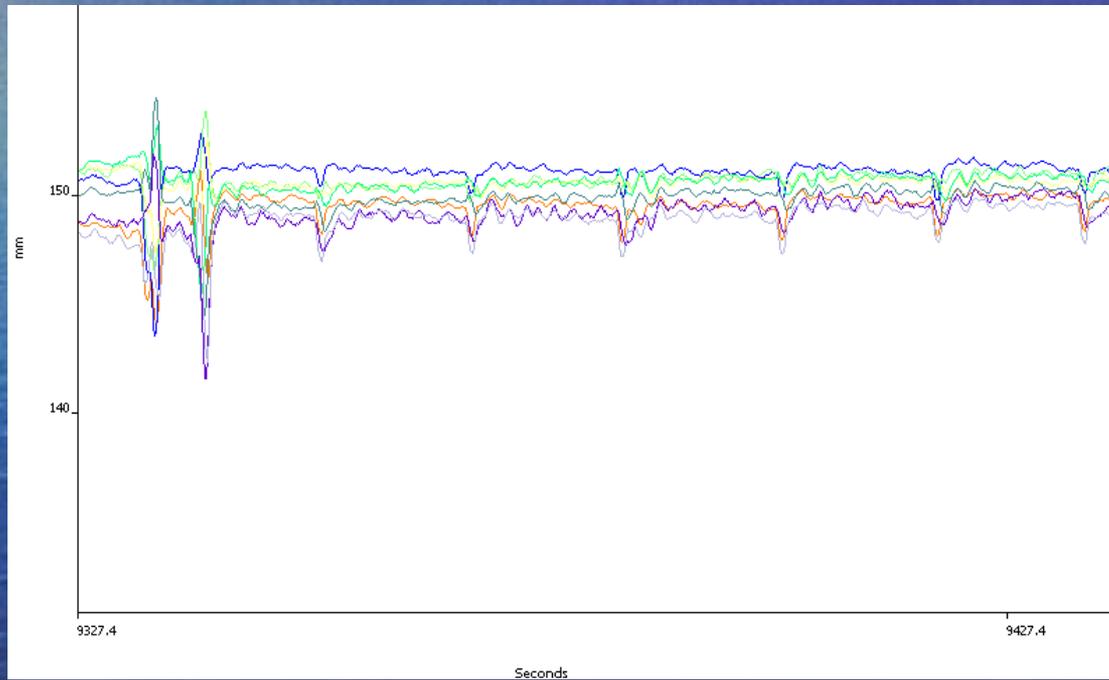


Test Loop Anode Response



Pipeline Anode Response

Line K1, Naples



Sample Of Data From Pipeline Showing 2 Bends and 6 Anodes

12" x 12km Crude Oil Pipeline

Offshore Sicily



Minor wax deposits found

12" x 29km Crude Oil Pipeline

Offshore Sicily

Looking For Wax Deposits

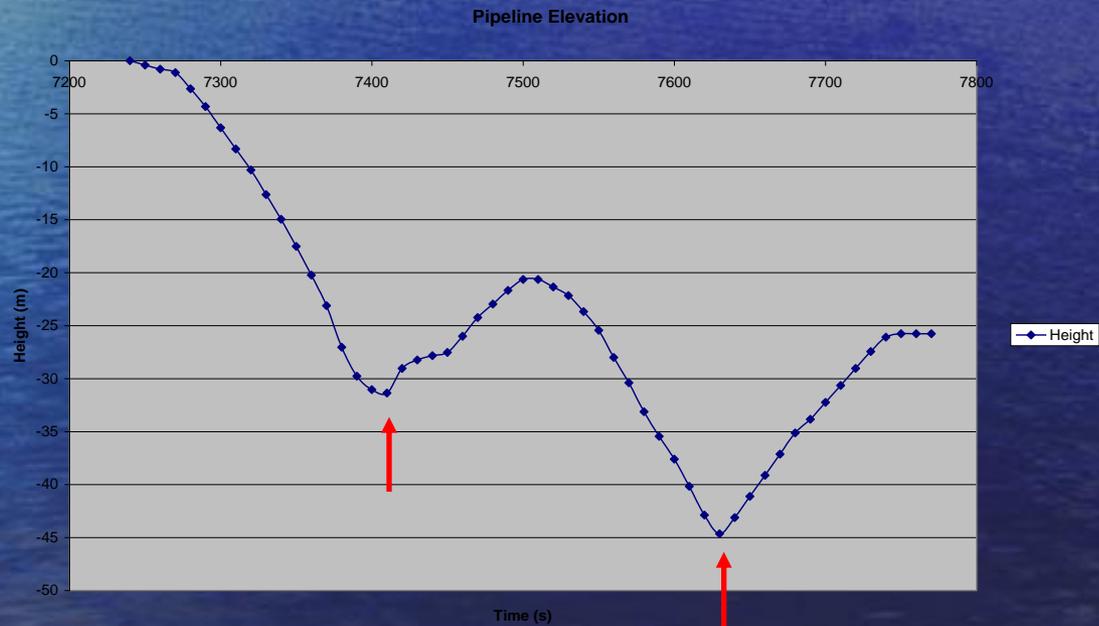


Minor wax deposits found

16" x 11km Diesel Pipeline

Onshore Sicily

Bi-di pig stuck and reversed out both ways



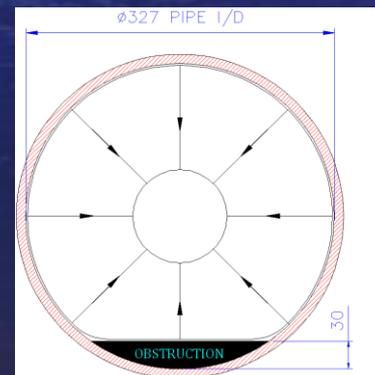
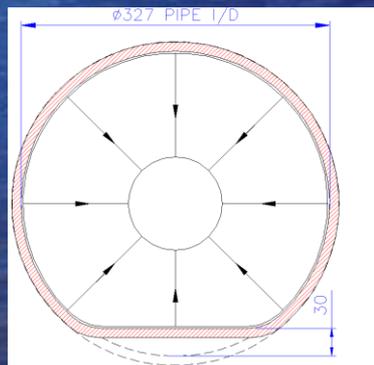
14" x 23km Natural Gas Pipeline

East Coast Italy

Cleaning prior to MFL inspection

Pressure Spikes observed 3.5hr into run

Pathfinder identified 2 restrictions 3hr 20min into run



12" x 2km Crude Oil Pipeline

Offshore Sicily

Cleaning prior to MFL inspection

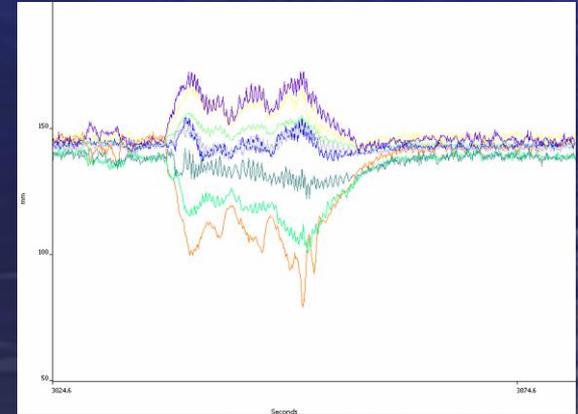
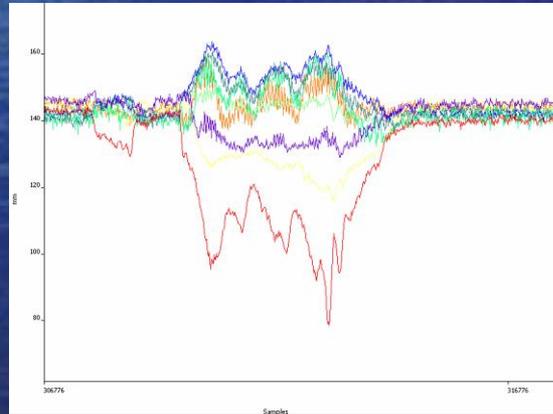
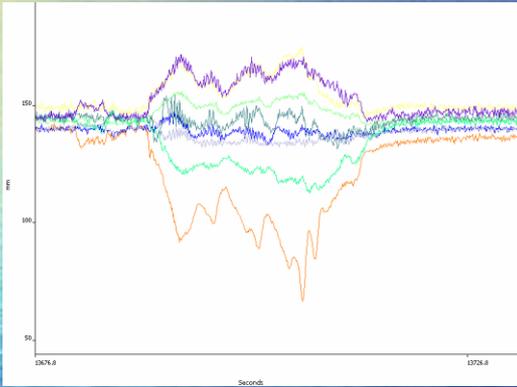
Pathfinder looking for hard scale or wax deposits

Data analysis showed large anomaly 12 min into run



12" x 2km Crude Oil Pipeline

Offshore Sicily



12" x 2km Crude Oil Pipeline

Offshore Sicily

	Max Dent Depth	Max Bore Restriction	Est Length
Run 1	74mm	100mm	15.2m
Run 2	63mm	86mm	13.4m
Run 3	66mm	94mm	12.8m

12" x 2km Crude Oil Pipeline

Offshore Sicily



Pathfinder Development 2009

Bore Proving Tool Requirements

- Soft Bodied – Flexible
- No External Mechanical Parts
- Measures & Records the Pipe Bore
- Useable by the Client
- Reasonably Priced

The Pathfinder

Technical Data

Pig Sizes	To suit nominal pipe bores 4" to 16"
Foam Pig Body	Medium density polyurethane
Operating Pressure	20bar standard – 200bar option
Caliper Sensors	8 independent caliper sensors
Orientation Sensors	Roll and Tilt
Data Download	USB interface to laptop or PC