

# **A Novel Approach to Non-piggable Subsea Pipeline Inspection**

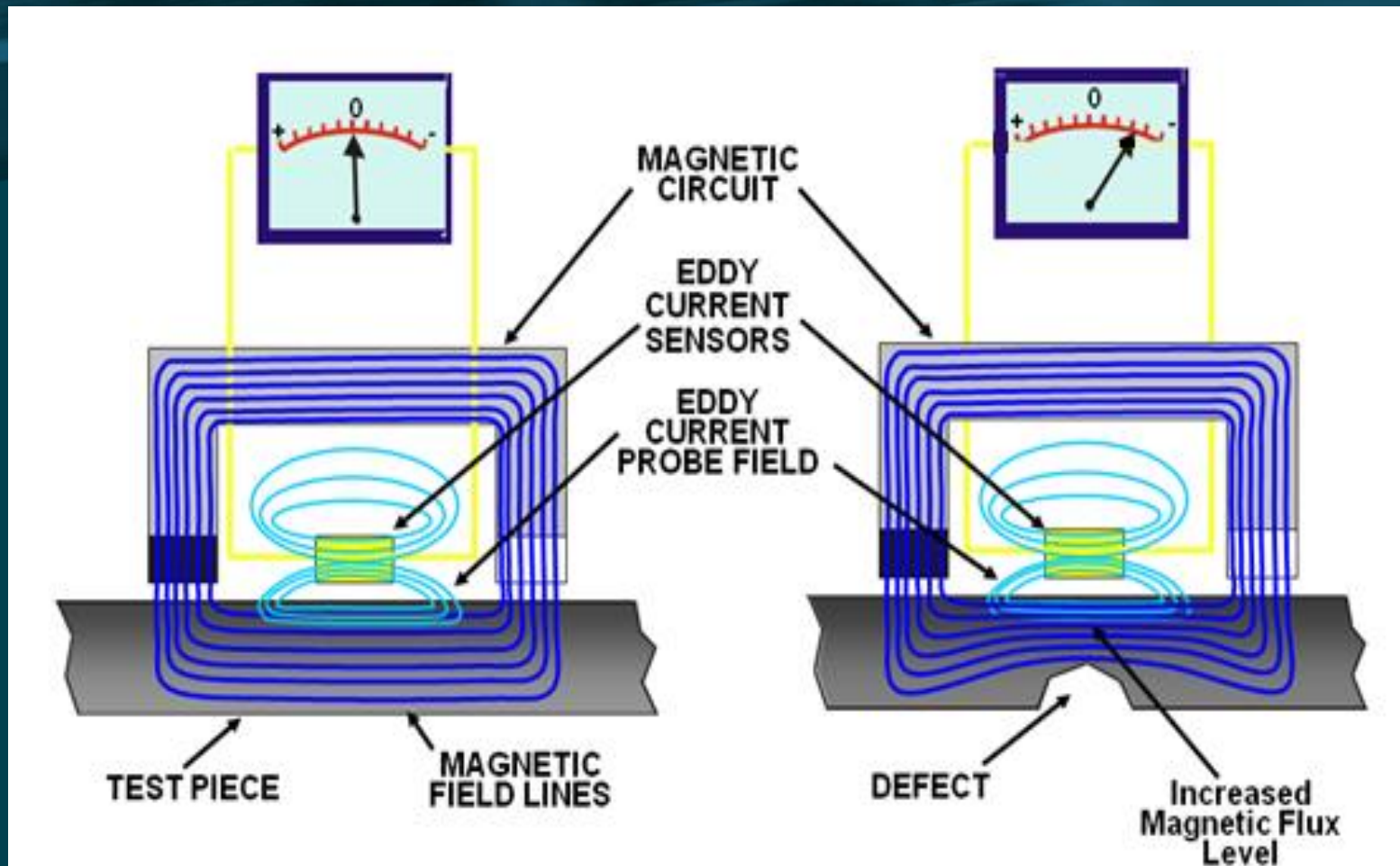
*S. Hartmann, Innospection Ltd., Aberdeen*

*Dr. K. Reber, Innospection Germany GmbH, Stutensee*

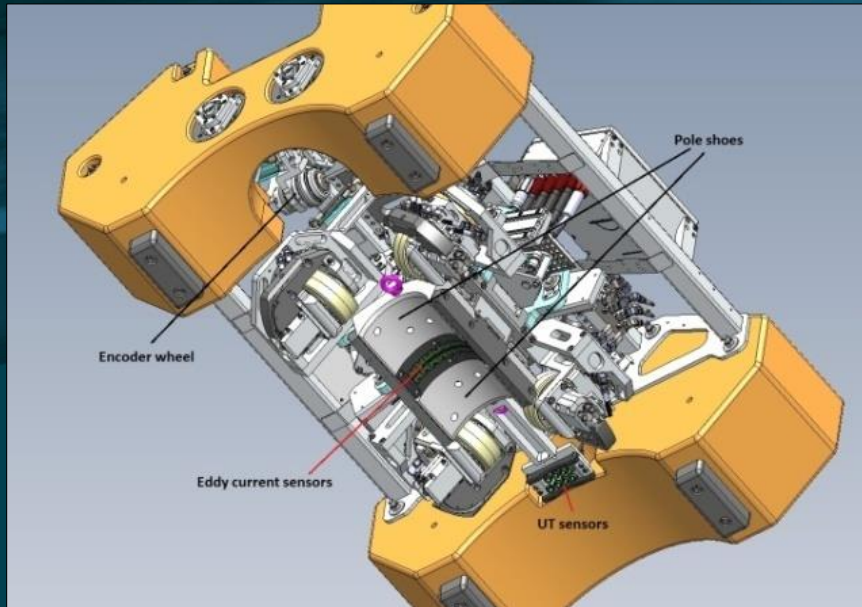
*A. Boenisch, Innospection Ltd., Aberdeen*

*PPSA Seminar on 08<sup>th</sup> November 2017 in Aberdeen*

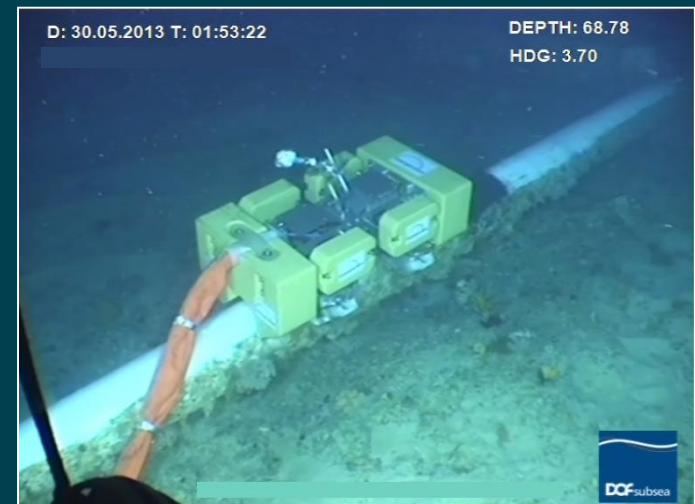
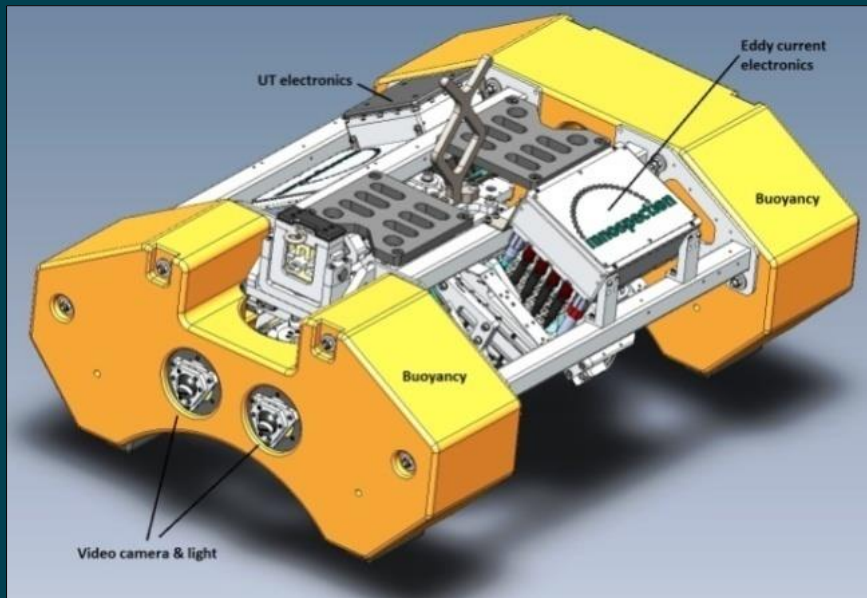
# The MEC (Magnetic Eddy Current) Inspection technology



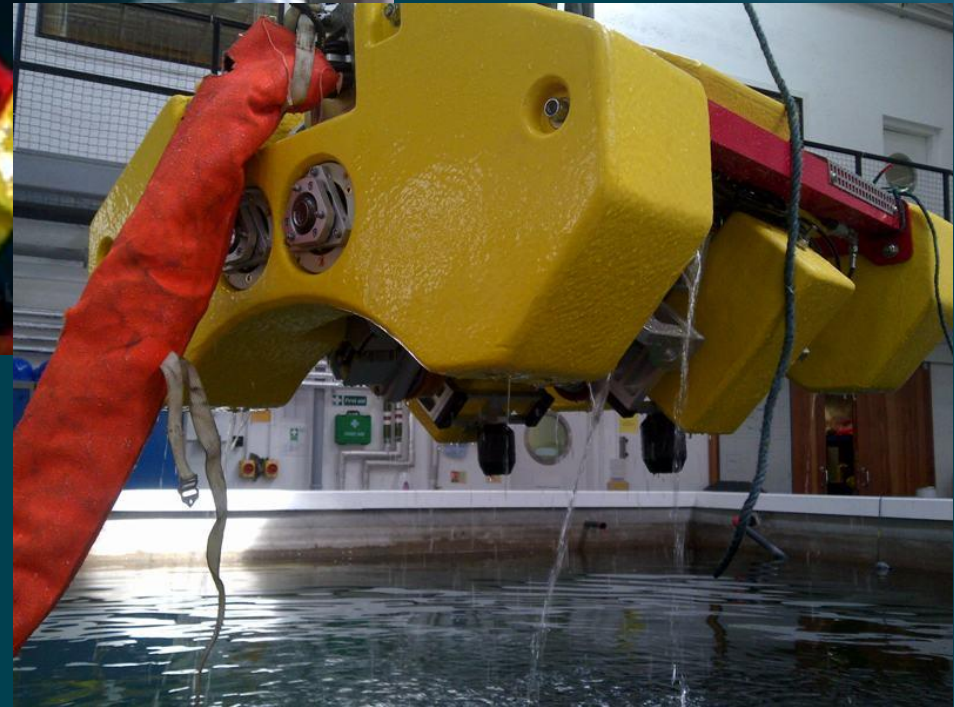
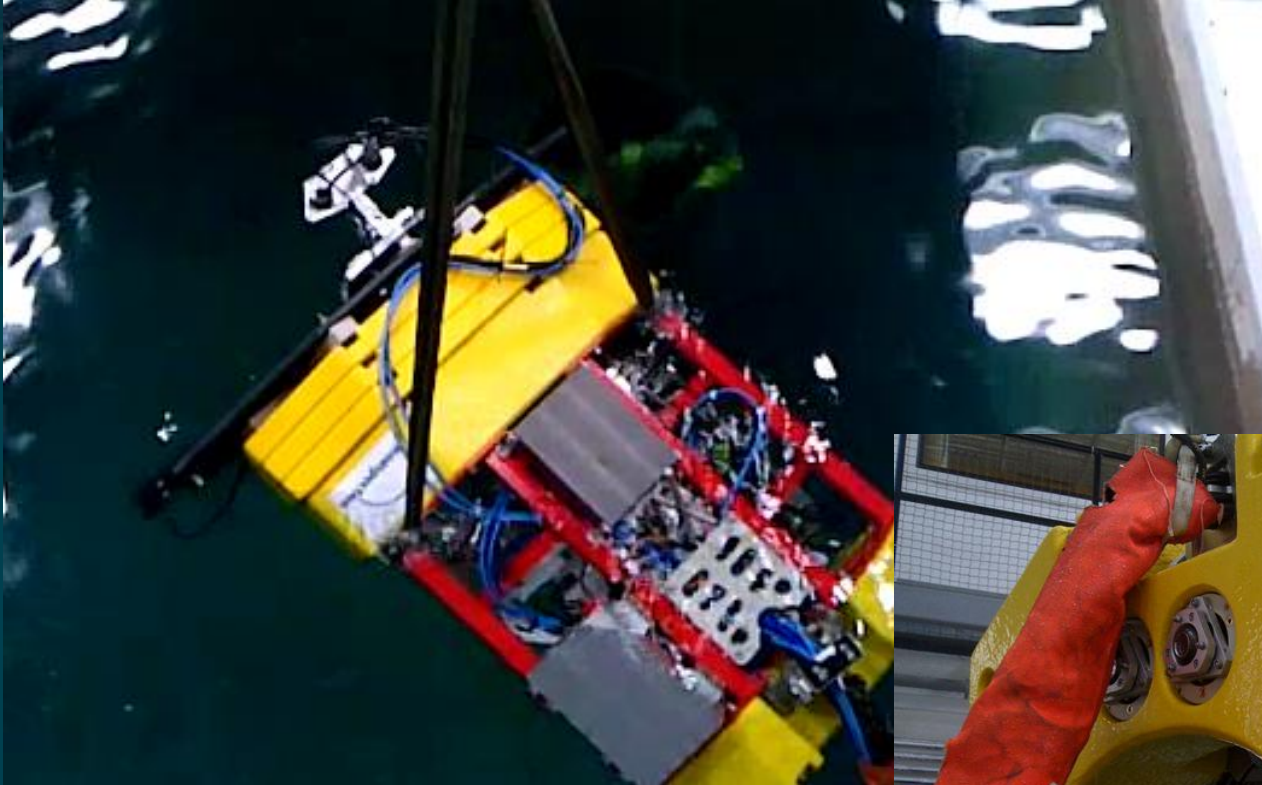
# The MEC-Combi Crawler™



- *Crawler with axial and circumferential drive*
- *MEC Inspection Technology plus other (UT, Profiling, etc.)*
- *Adaptable to a wide range of diameter and flat surfaces*



# Testing with an adequate Test sample

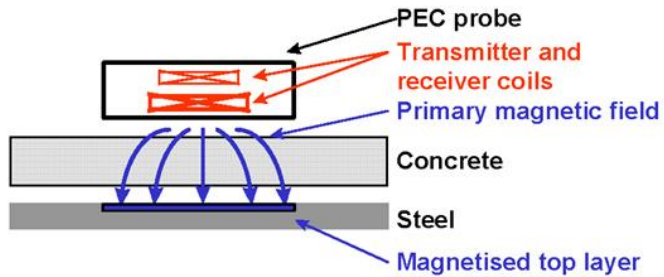


- *Tests for handling and defect detection*
- *Here in the Oceanlab near Aberdeen*

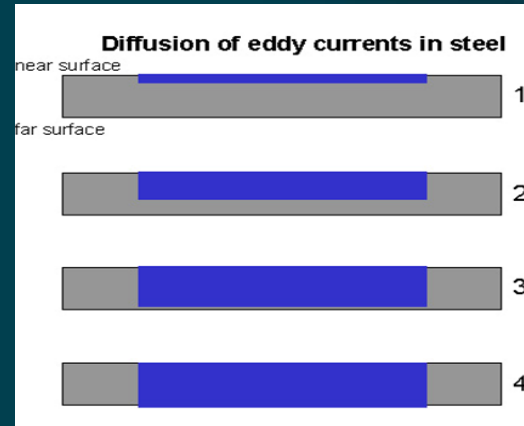
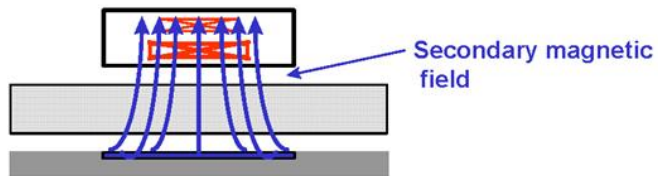
# The Pulsed Eddy Current Inspection Technology (PECT)



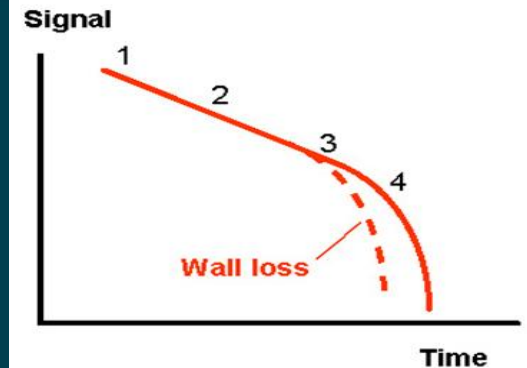
## Phase 1: Magnetisation of steel



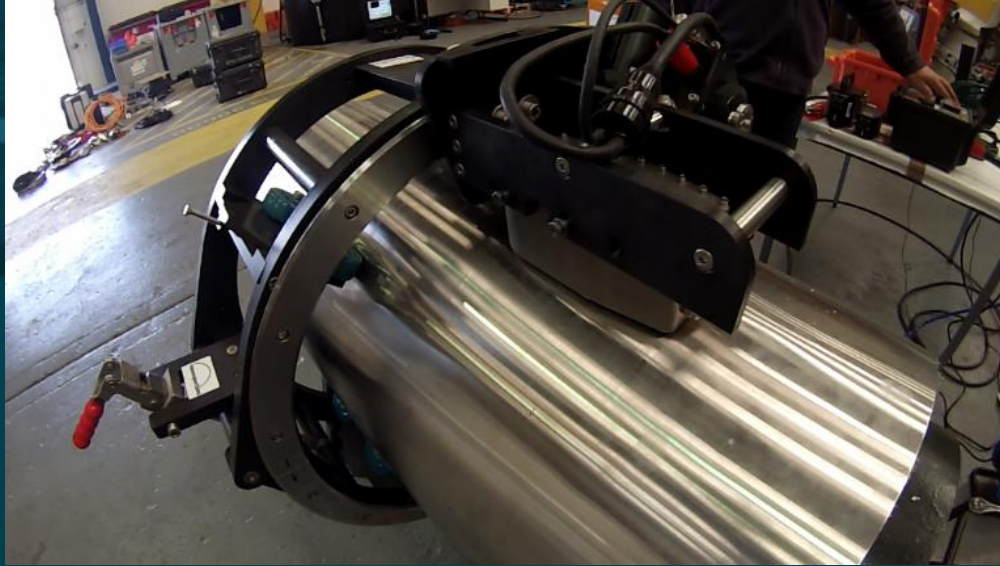
## Phase 2: Detecting secondary field



## Pulsed Eddy Current signal

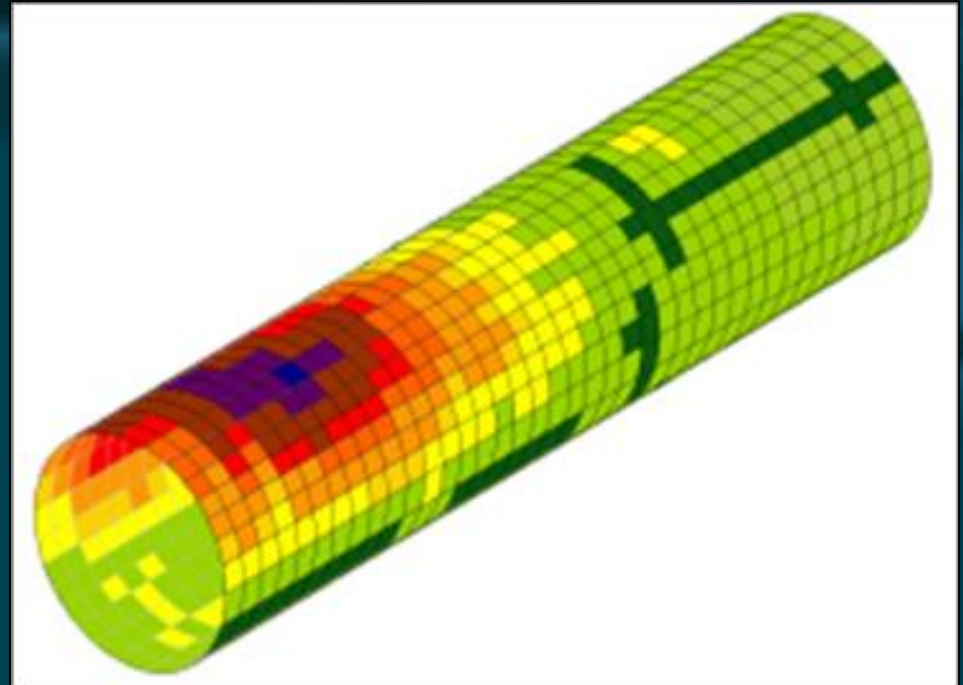


# PECT Inspection Equipment



# PECT Inspection Data Visualisation

%	Horizontal			Defect
	1	2	3	
16	89	84	91	4
15	78	60	77	
14	82	68	79	
13	96	97	92	
12	82	84	90	3
11	71	69	80	
10	72	70	80	
9	87	92	91	2
8	91	91	90	
7	91	85	85	
6	92	84	89	
5	94	95	91	1
4	98	96	92	
3	98	93	90	
2	98	93	92	
1	101	99	96	



# Inspection Technology Selection



Property of Pipe to be inspected	MEC™	PECT	UT
<b>Pipe wall thickness</b>	up to 30mm	up to 100mm	up to 50mm
<b>Coating type</b>	all electric non-conductive coatings and up to 3mm thick Monel coating	non-metallic coating and insulation including concrete weight coating	3LPP, FBE etc.
<b>Coating thickness</b>	up to 15mm	up to 250mm	up to 3mm
<b>Bends</b>	limited	1.5D x 90°	1.5D x 90°
<b>Inspection speed</b>	dynamic	static (2s per reading)	dynamic
<b>Type of defects</b>	localised external and internal defects and general corrosion / wall loss	general external and internal corrosion / wall loss	localised external and internal defects and general corrosion / wall loss

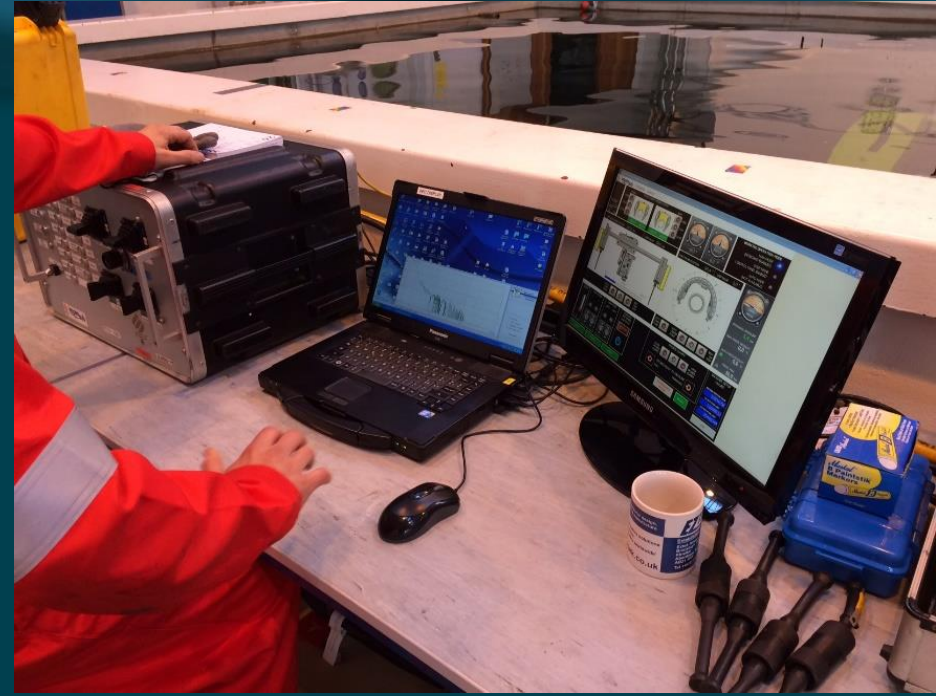


# Case Study 1: PECT Subsea Pipeline Inspection



*Factory Acceptance Testing*

# Case Study 1: PECT Subsea Pipeline Inspection



*Wet Testing*

# Case Study 1: PECT Subsea Pipeline Inspection



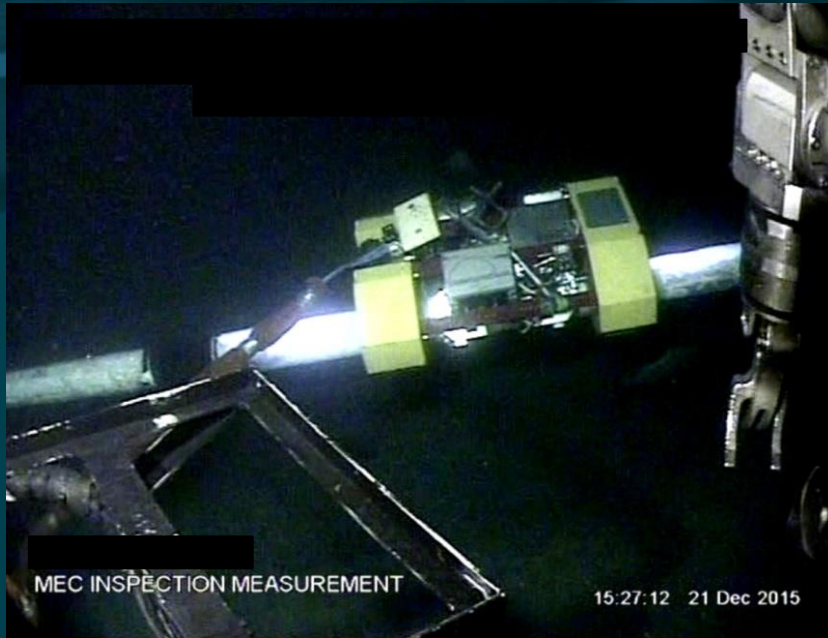
*Subsea Inspection Operation*

# Case Study 2: MEC-Combi Crawler™ Subsea Pipeline Inspection



*Subsea Tool Deployment*

# Case Study 2: MEC-Combi Crawler™ Subsea Pipeline Inspection

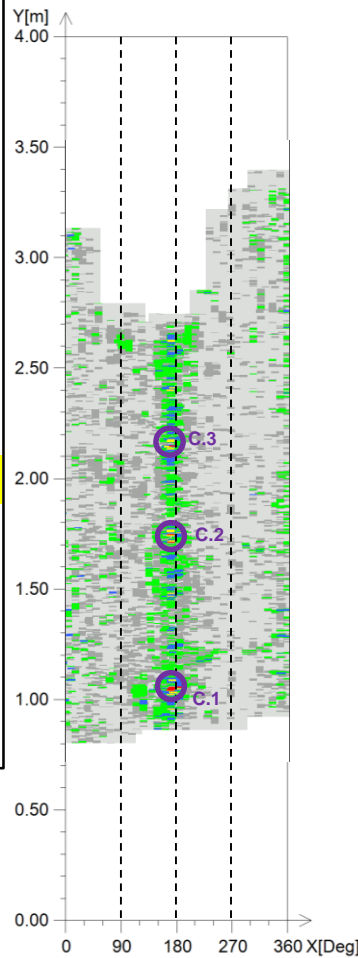


## ***Preparation and execution of subsea operation:***

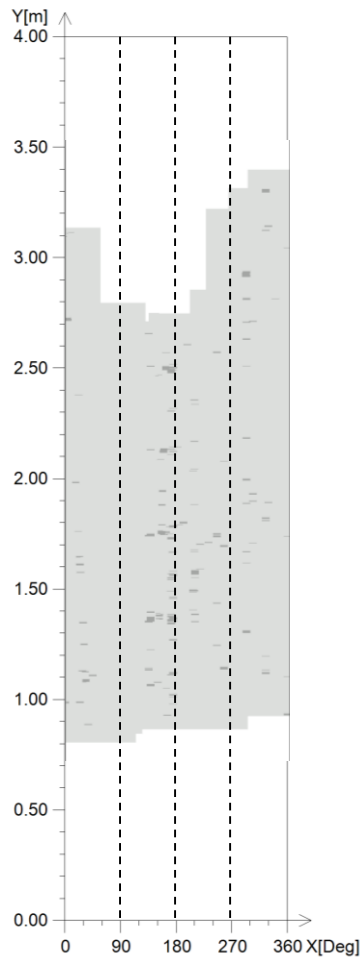
- ***Full Circumference inspection required on subsea pipeline***
- ***Several spots have been selected (high point, low point, etc)***
- ***MEC-Combi Crawler crawls around the pipe to measure full circumference***

# Case Study 2: Section of scanned Subsea Pipeline

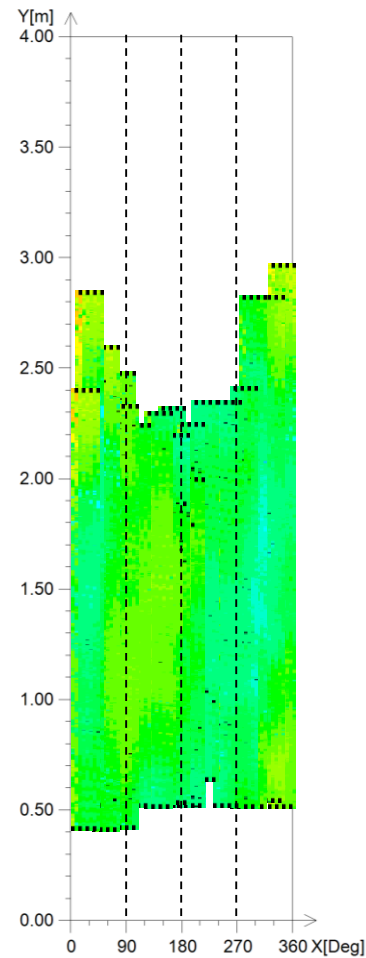
**MEC-Data:  
Internal View**



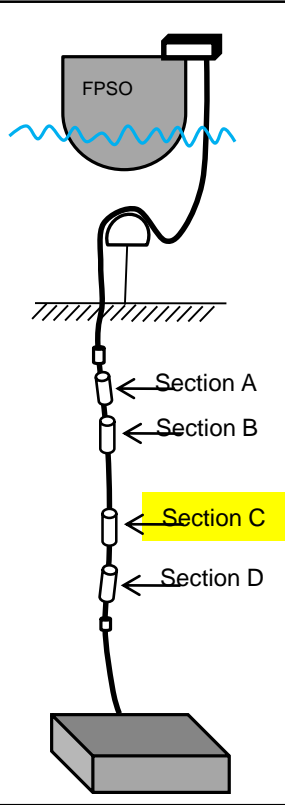
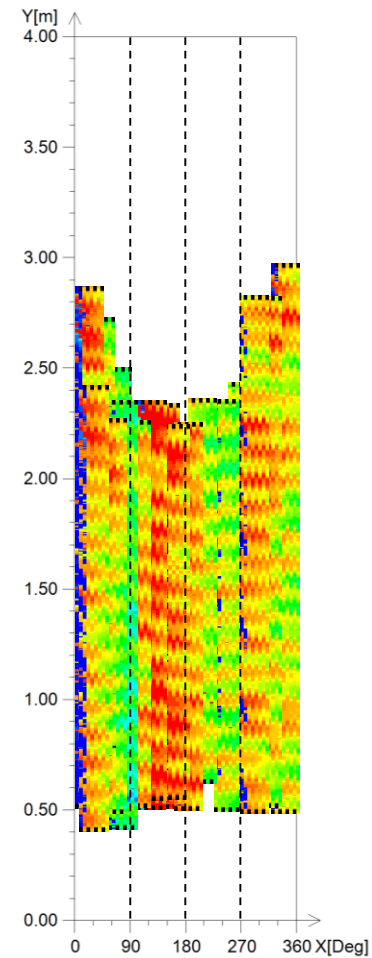
**MEC-Data:  
External View**



**UT Data:  
Wall Thickness**

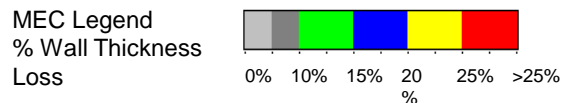


**UT Data:  
Stand-off**

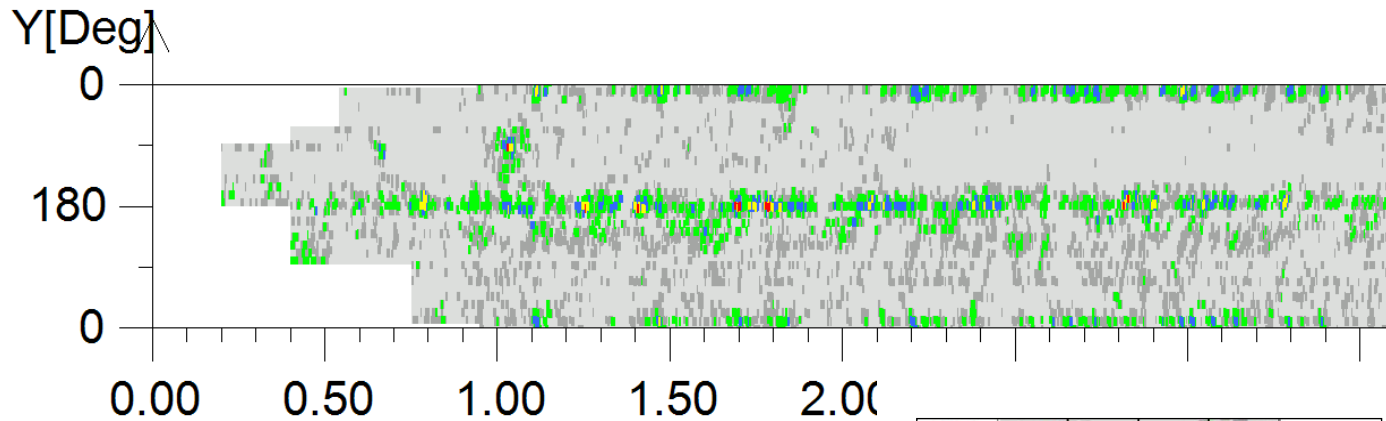


**Results:**

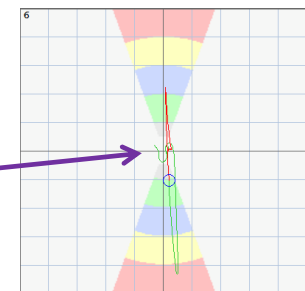
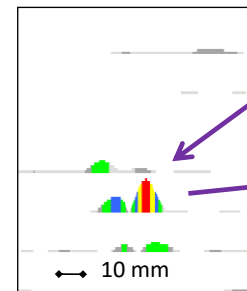
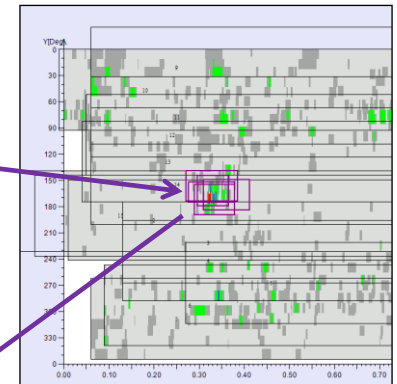
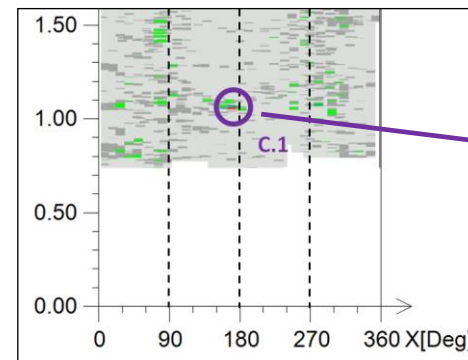
One line of corrosion at 6 o'clock with several relatively deep pits.



# Case Study 2: Level of Detail for inspected Sections



*The level of accuracy is not a merely a screening. It is high resolution inspection comparable to ILI results. With multiple scanning even more reliable.*



# Conclusions



- *An automated external subsea inspection of pipelines is possible with a number of technologies*
- *Pulsed Eddy Current and Magnetic Eddy Current are versatile for inspection through coating and imperfect cleaning*
- *Data quality comparable to ILI can be achieved. With multiple scanning and different technologies even better.*



# THANK YOU FOR YOUR ATTENTION

Innospection Limited

Howemoss Avenue

Kirkhill Industrial Estate

Dyce - Aberdeen - AB21 0GP

United Kingdom

P +44 (0) 1224 724 744

F +44 (0) 1224 774 087

Web:

[www.innospection.com](http://www.innospection.com)

[info@innospection.com](mailto:info@innospection.com)

