



# **Inspection of Flexible Riser Pipe with MEC-FIT™**

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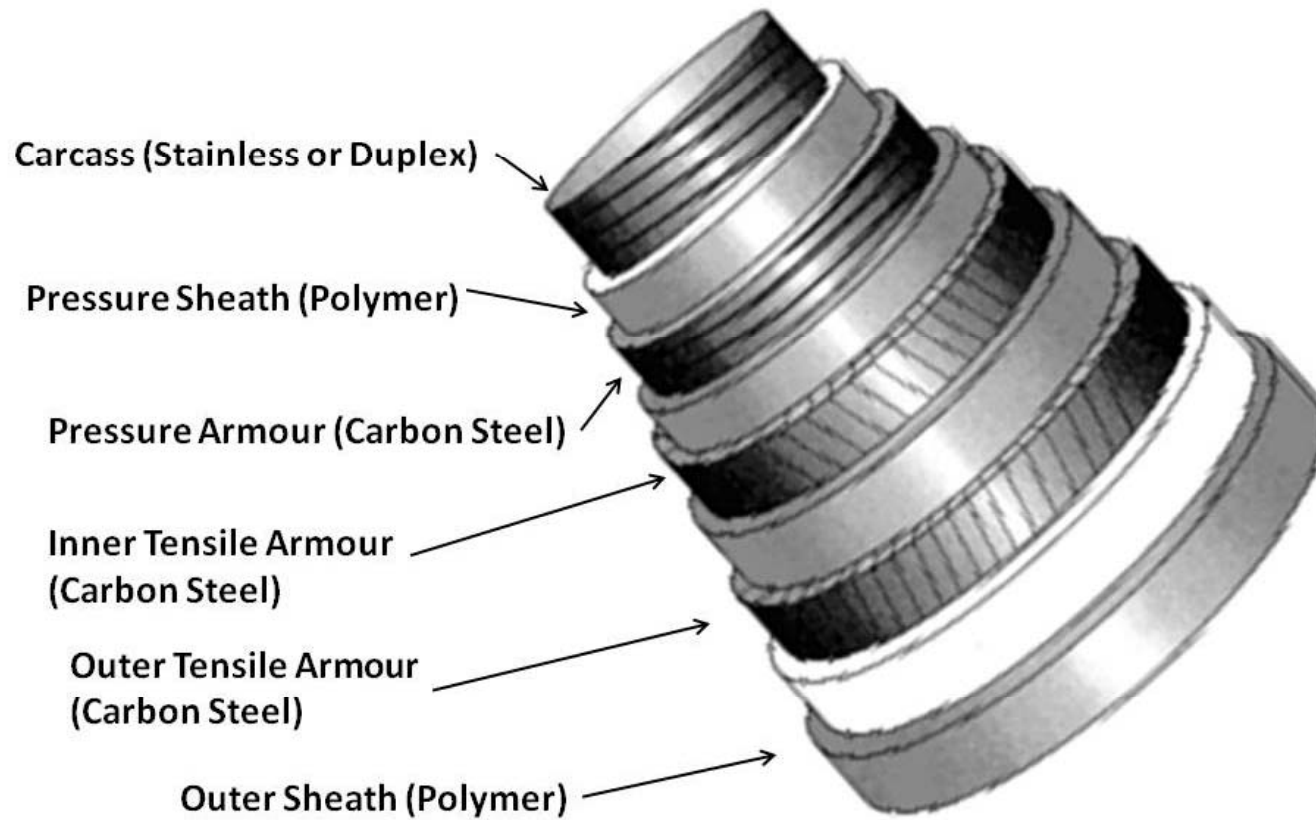
*Presented at the PPSA Seminar on 16<sup>th</sup> of November 2011  
Marcliffe Hotel, Pitfodels, Aberdeen, UK*

# What is so difficult about the inspection of flexible riser pipe?

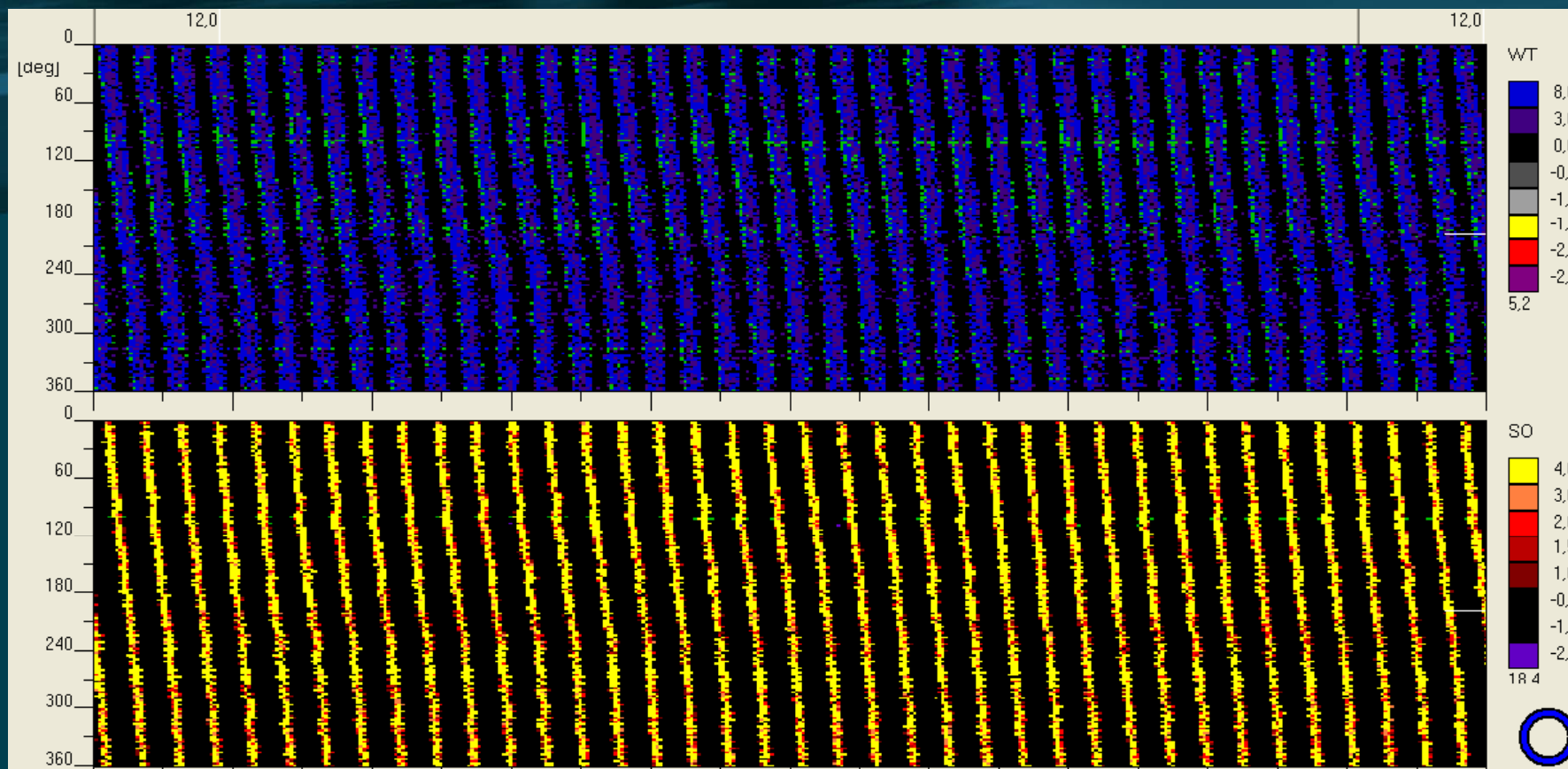


- *Material is not homogeneous through the thickness of the wall*
- *Electrically conductive and insulating material is present*
- *Ferromagnetic and stainless steel (or duplex) is present*
- *Every pipe is different in its structure*
- *There is a pronounced anisotropy due to the helical winding*

# Layers of a flexible riser



# UT pig internal measurement of a flexible riser



Courtesy of NDT Systems & Services AG

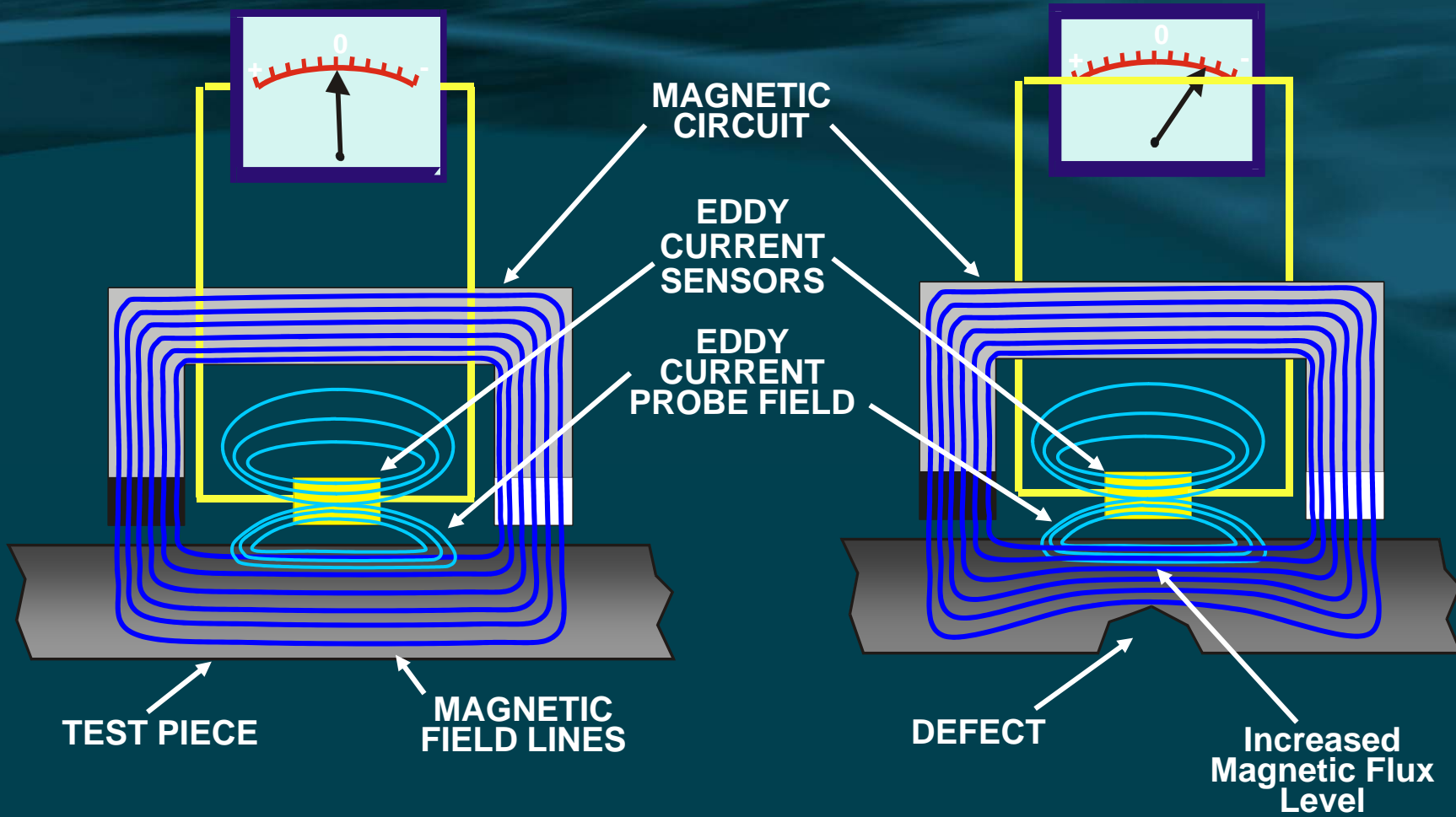
PPSA Seminar, Aberdeen November 16th 2011

## Experience in pigging flexible riser with MFL?

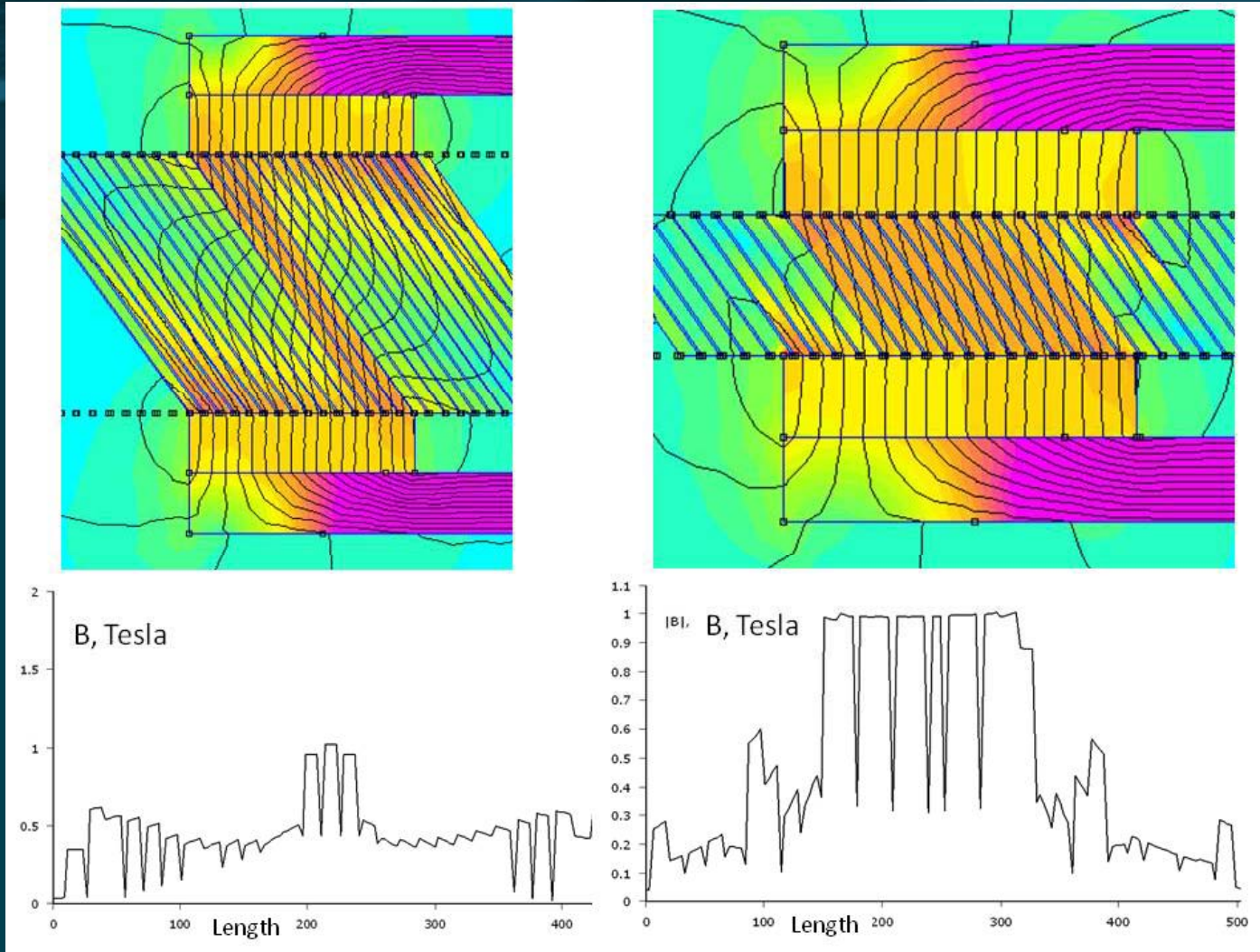


- *Potential problem are remaining ferritic particles in stainless steel carcass.*
- *Particles from previous inspection (Rust) or magnetic steel bristles.*
- *Can lead to corrosion in the carcass.*
- *Cleaning pigs adapt bristle material.*

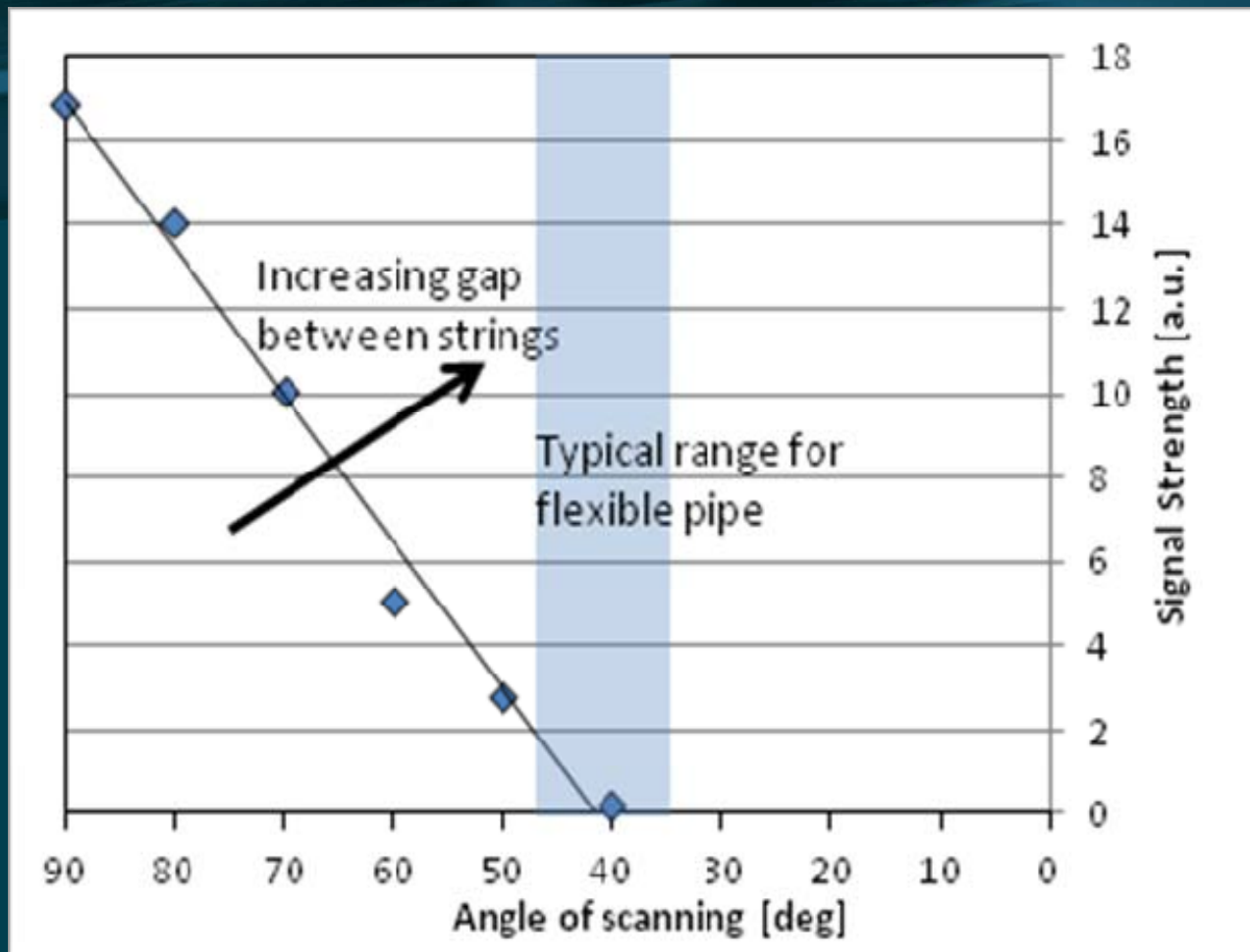
# Magnetically Biased Eddy Current (SLOFEC™)



# Anisotropy in magnetisation



# The gap between the wires



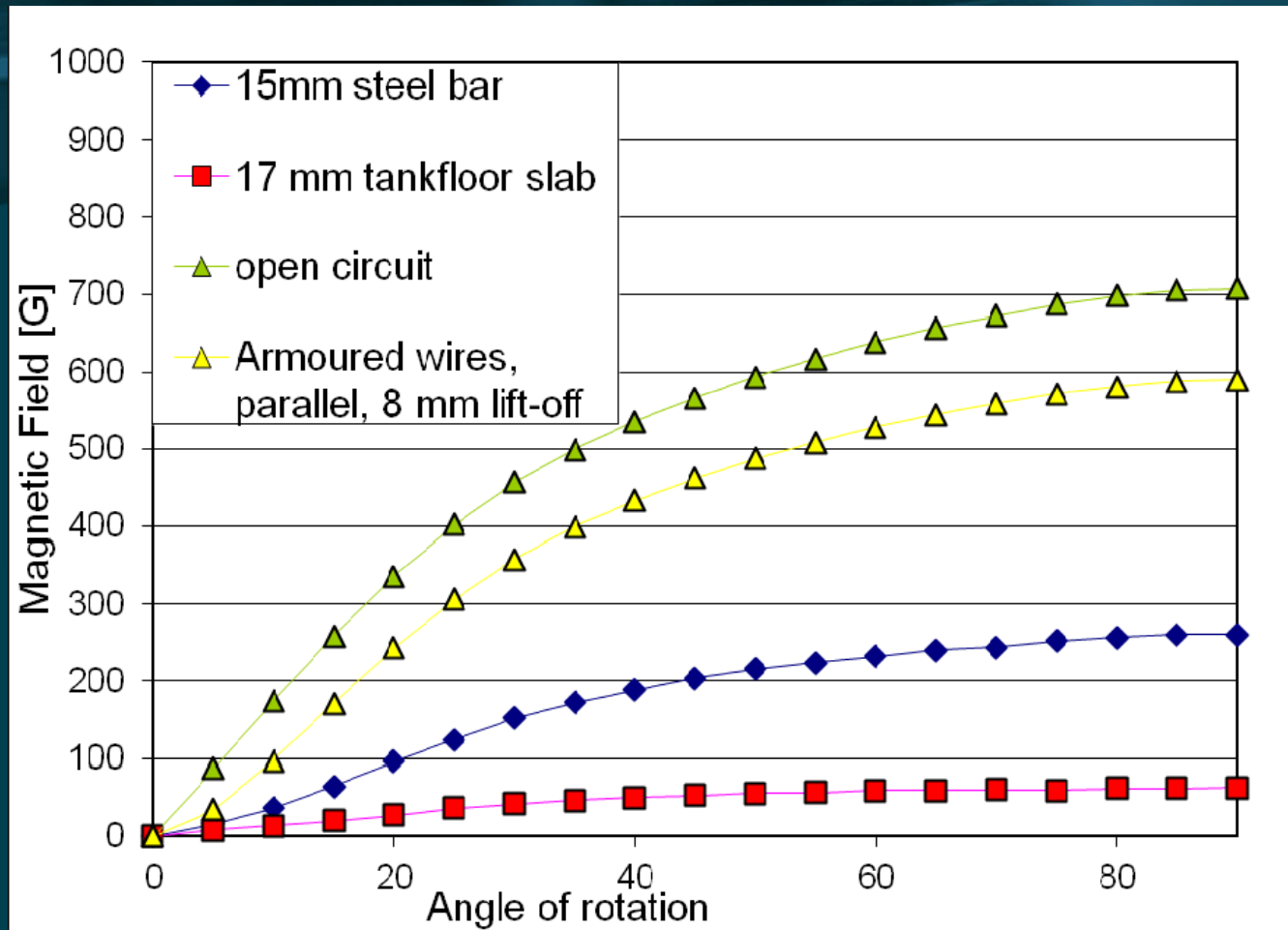


# Switchable Permanent Magnet



- *Adjust to ideal magnetisation level*
- *No electrical power required*
- *Fail safe*

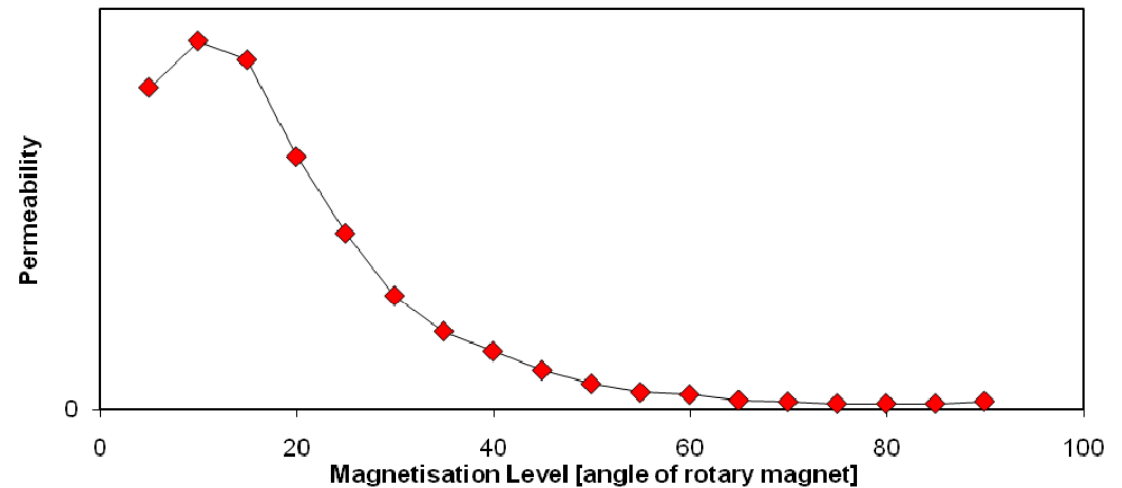
# Additional Hall Sensors to monitor the flux level



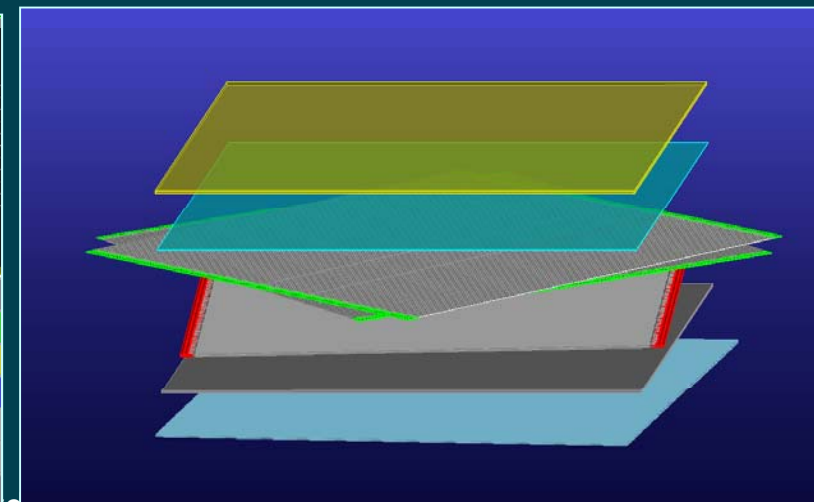
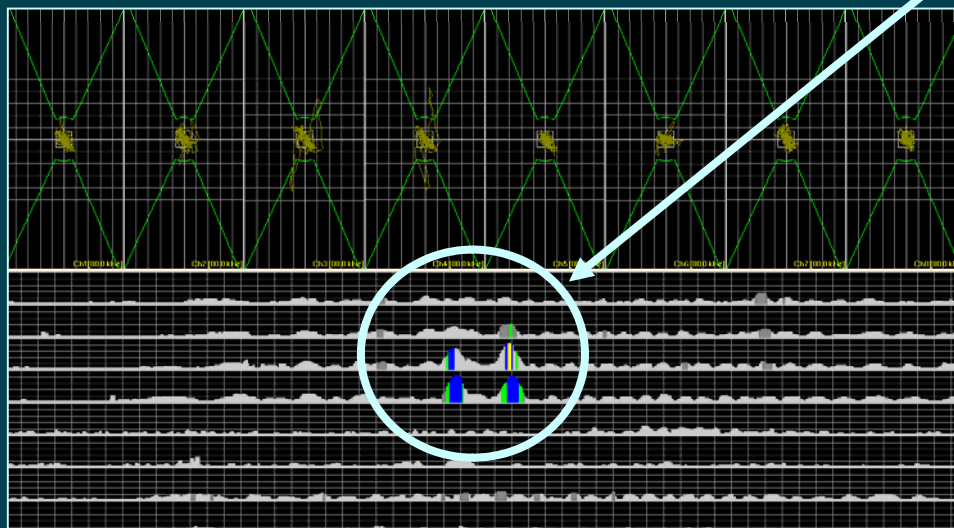
# Optimum magnetisation level



- *Compare open and closed circuit to obtain below curve*

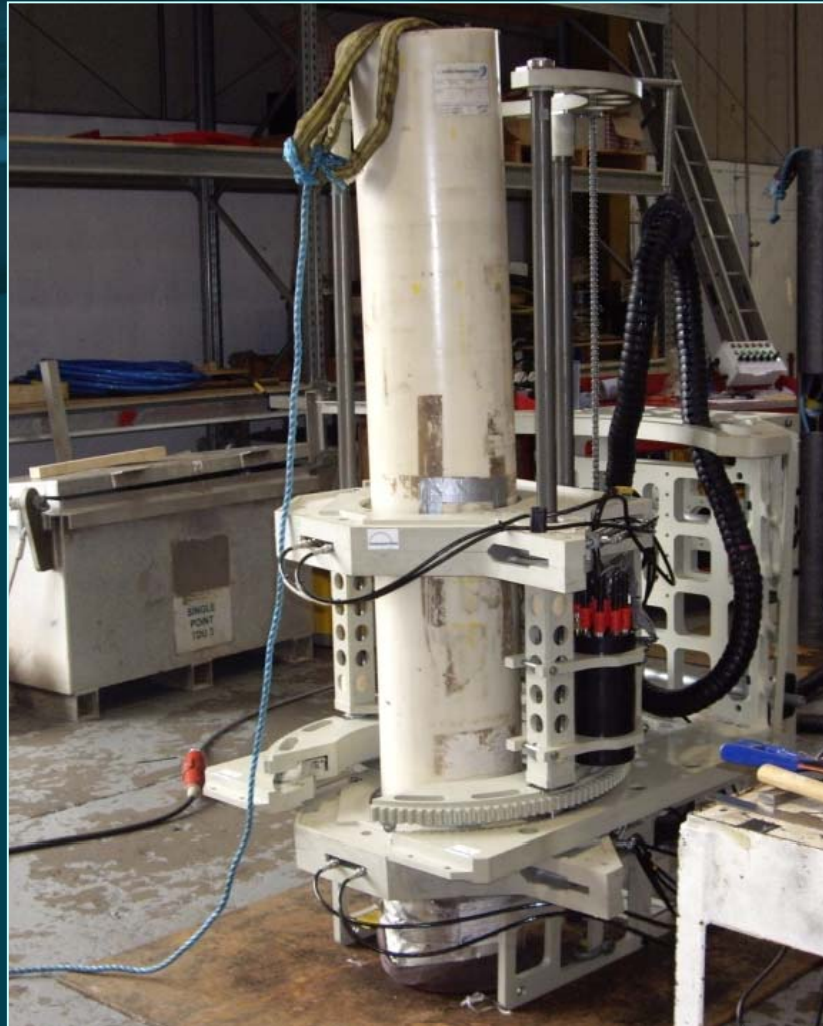


# Flexible Riser Pipe Testing



Seen November 10th 2011

# Flexible Riser Pipe Lighter Option for ROV deployment



- Scanning up/down in several steps to achieve full coverage
- Light for ROV deployment

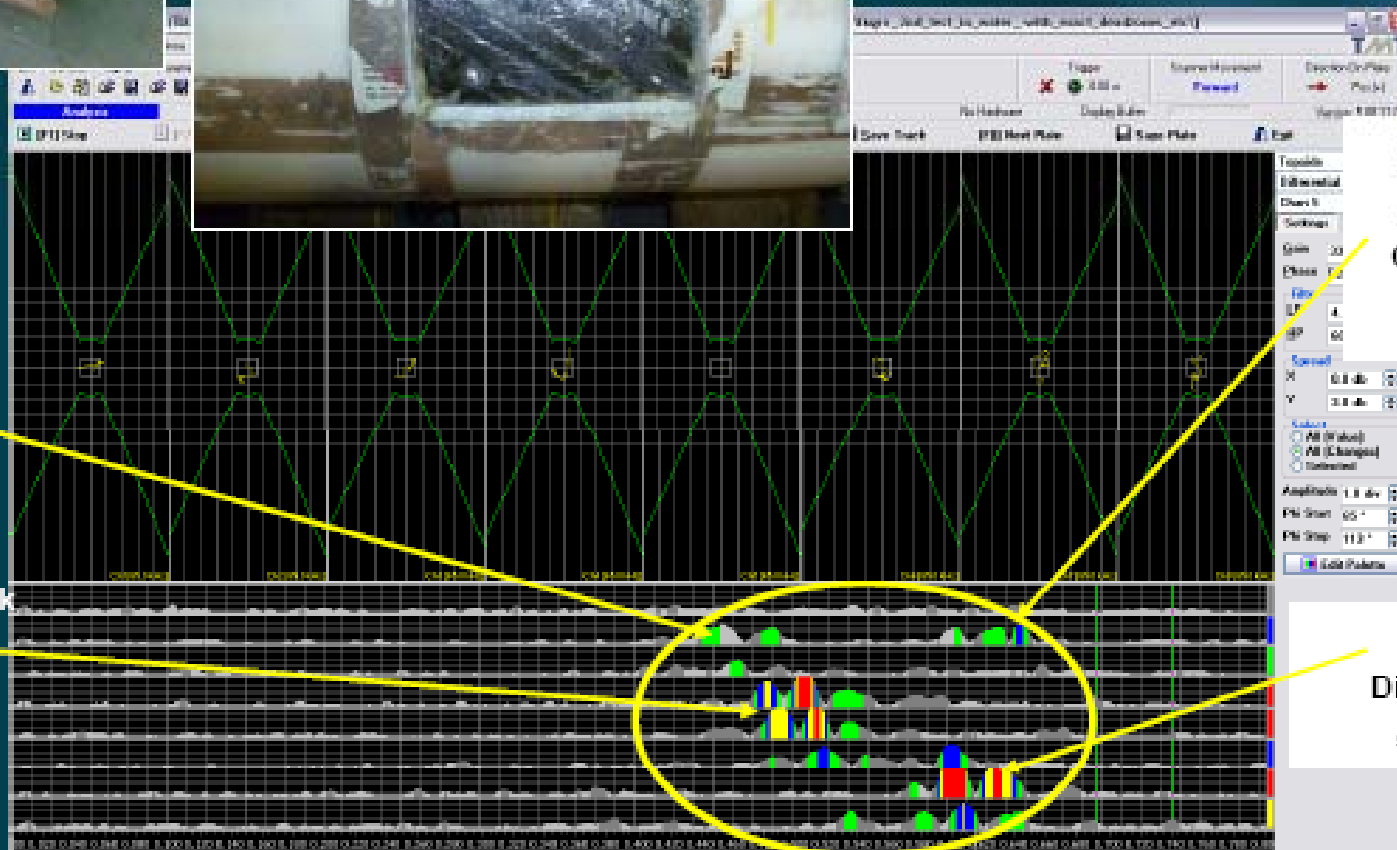
• In cooperation with



# Flexible Riser Pipe Test results



## Signal Display Test Defects



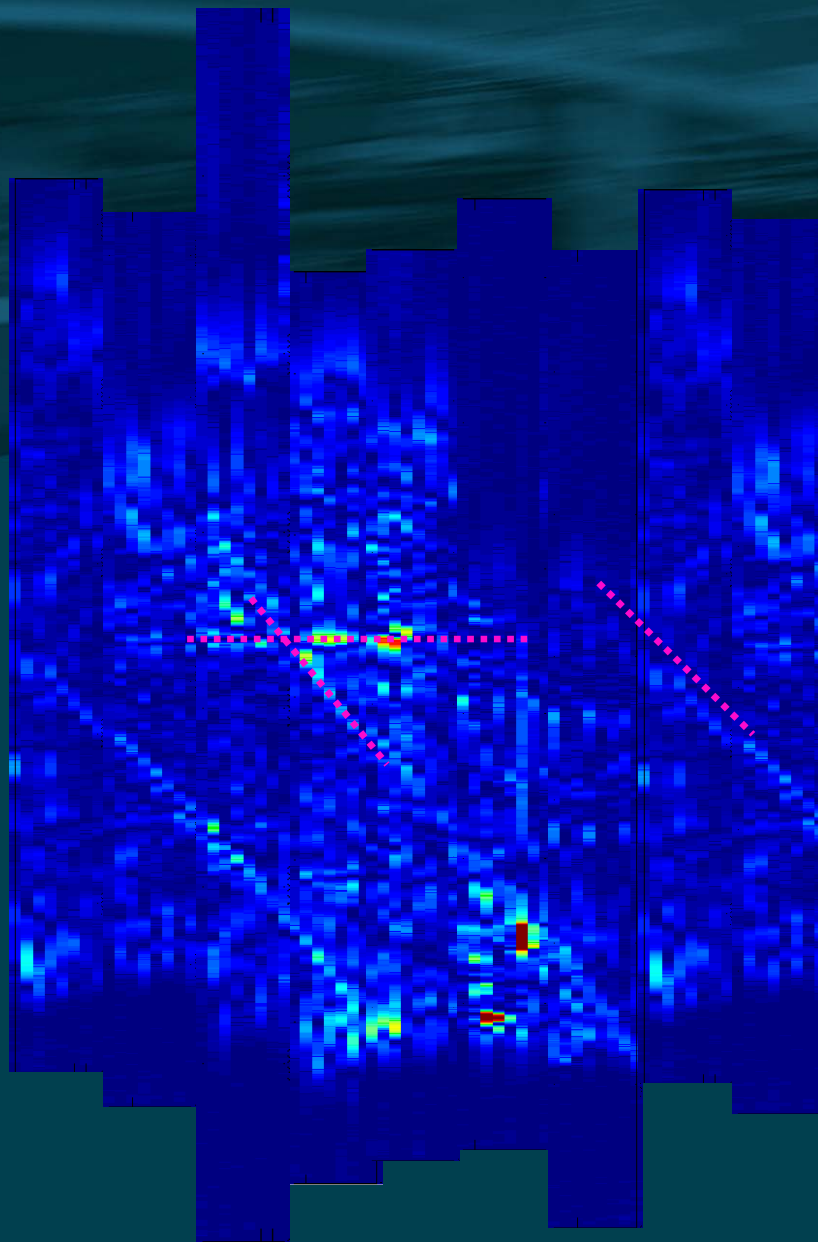
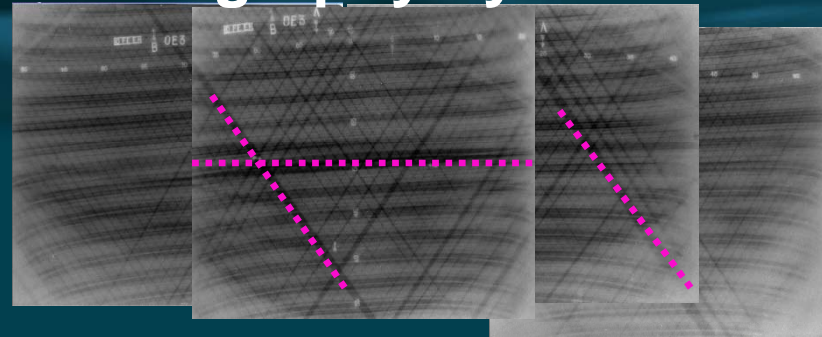
With wire  
direction  
Crack type  
1 wire

FBH  
Dia 10mm  
5.0mm

FBH  
Dia 10mm  
3.0mm

Transverse Crack  
type  
2 wires

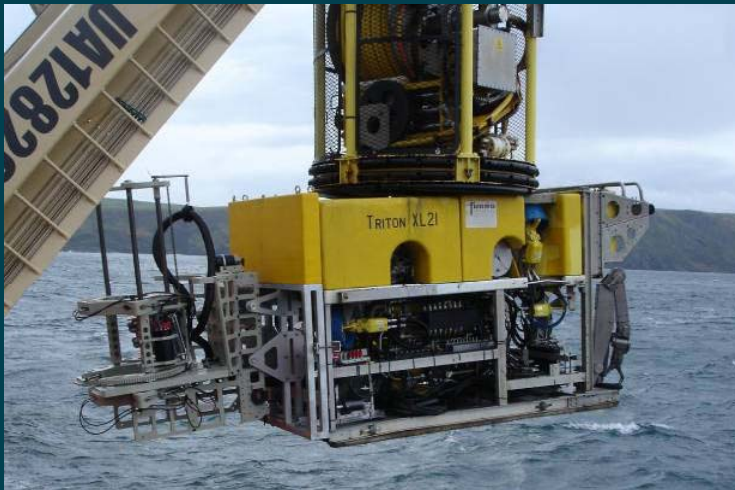
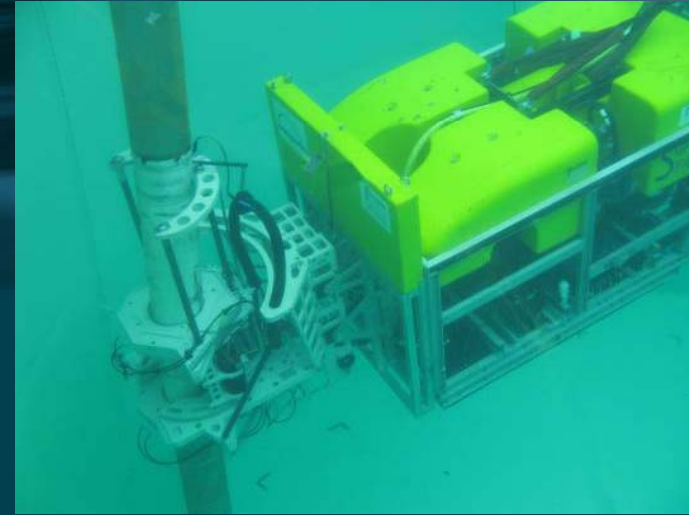
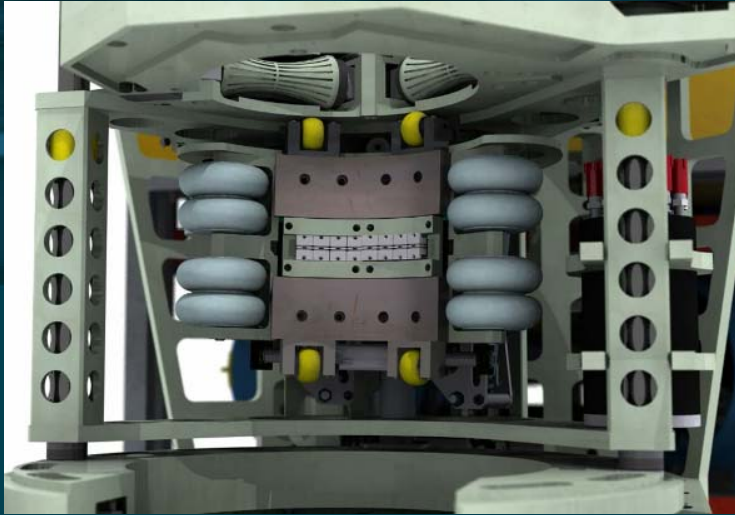
## Radiography by Oceaneering



Signal from  
unlocked  
Zeta-Wire

Two gaps in armoured  
wires (probably top layer)

Scans using MEC-FIT



• In cooperation with





# Spin-offs Crawler with UT Sensor



PPSA Seminar, Aberdeen November 16th 2011