

Electromagnetic techniques in the recent challenges faced by Brazilian oil and gas industry

Cesar Camerini

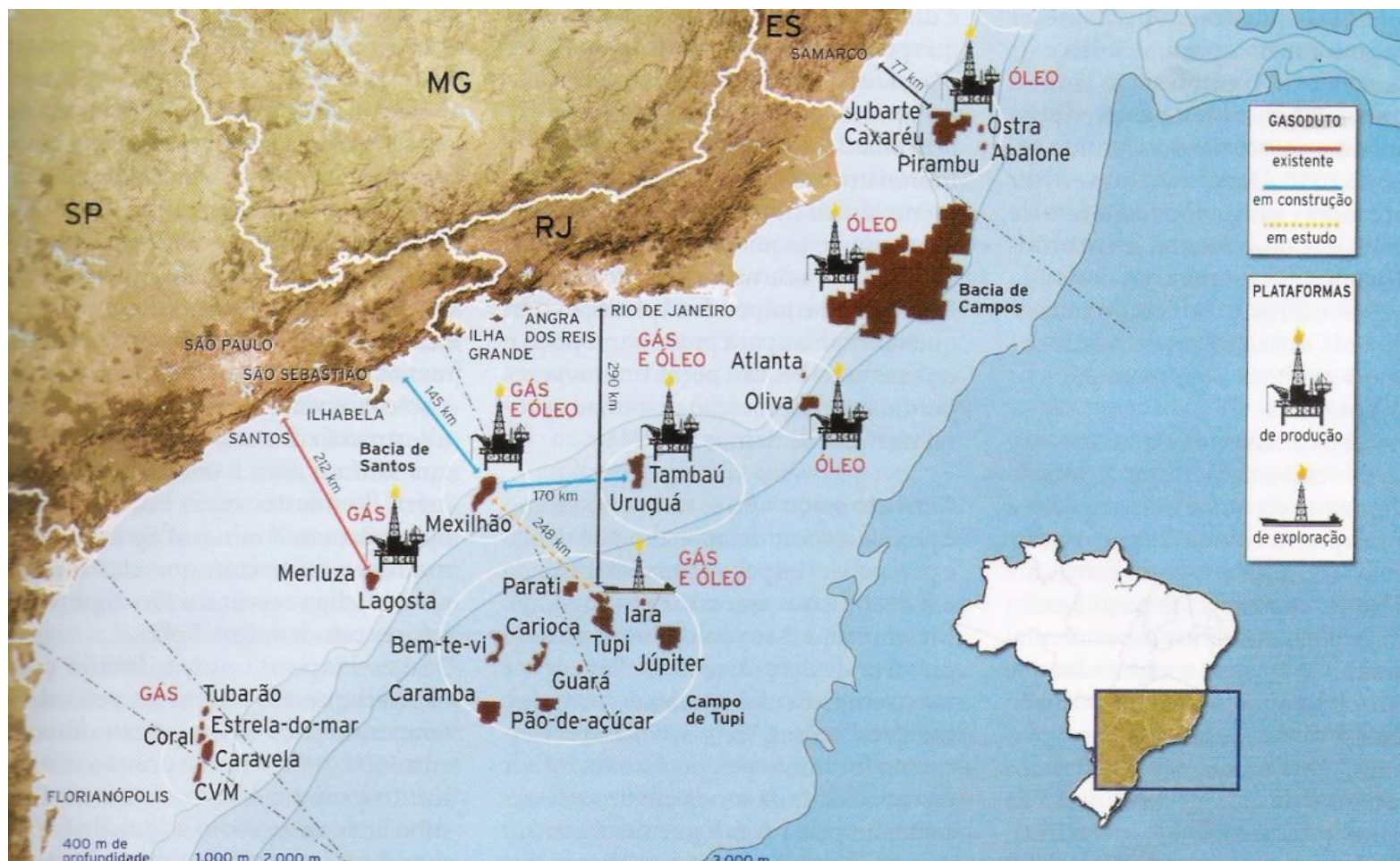
Laboratory of Nondestructive Testing, Corrosion and Welding, Department of Metallurgical and Materials Engineering, Federal University of Rio of Janeiro.

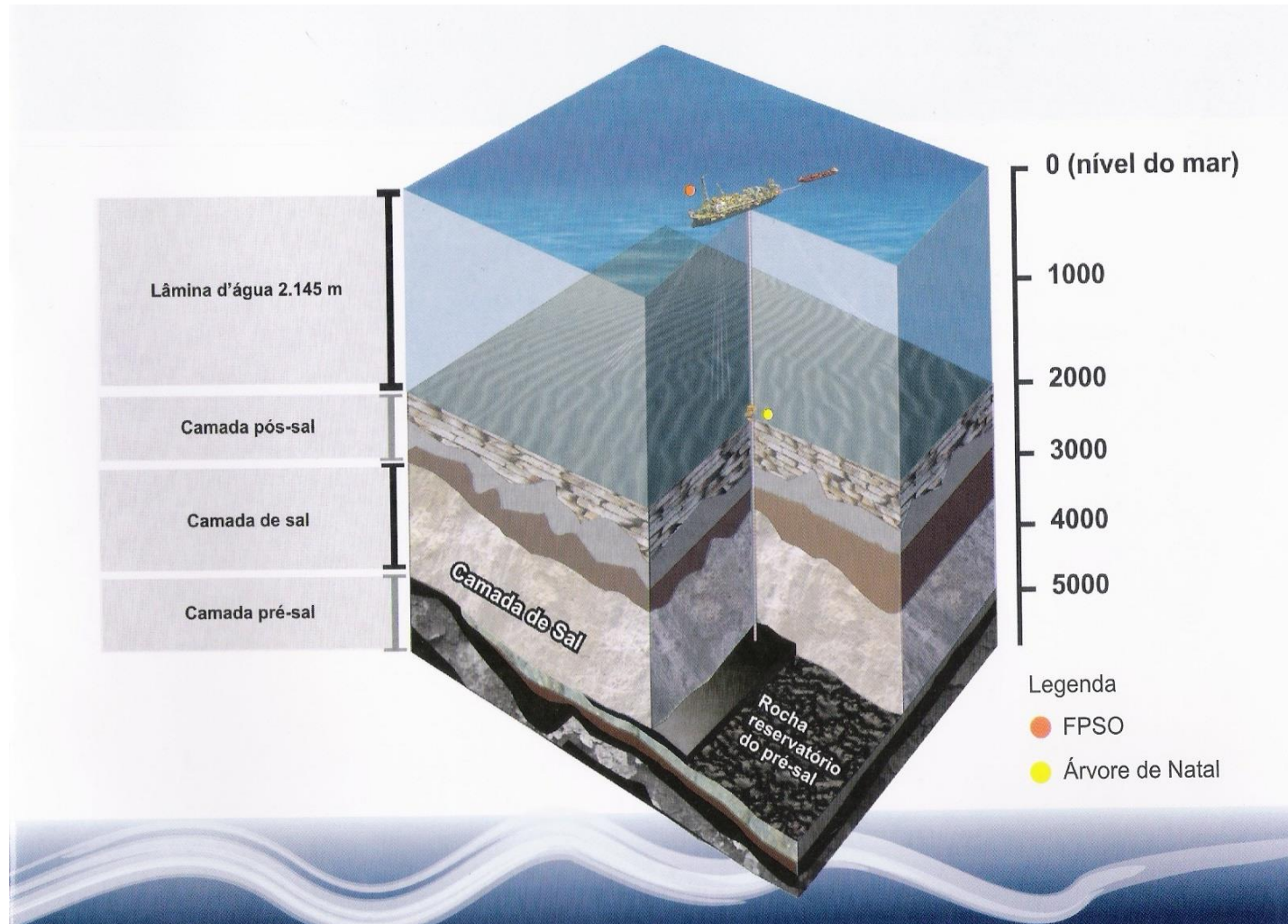


Non-destructive Testing, Corrosion and Welding Laboratory – COPPE/UFRJ



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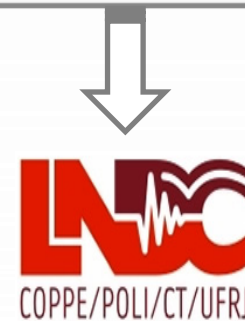




PETROBRAS in partnership with the Federal University of Rio de Janeiro funded the LND C aiming to deal with the challenge of producing oil and gas from the pre-salt area. Some of these challenges are the depth of the oil well, nearly 7,000 meters below sea level, and the presence of H_2S and CO_2 in the oil, which causes corrosion problems. Thus, LND C was equipped with the highest technology on corrosion, welding and non-destructive testing.



In
partnership
with



LNDC team

80 people

60 employees

Administrative : 10 %

Engineers: 35 %

Industrial Chemists : 15 %

Technician : 40 %

20 students

40 % MSc

20 % Dsc

40 % Under graduation



Features

- Inaugurated in April 2009.
- 8.000 m² of built area.
- 100% funded by PETROBRAS with investments over R\$ 40 millions.

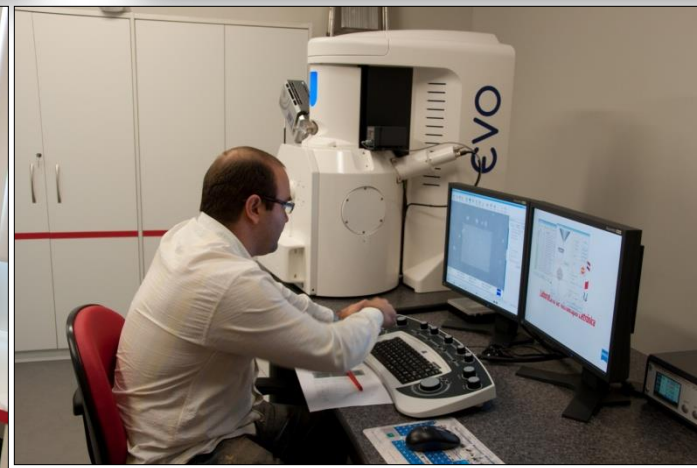


Clients and partners

- PETROBRAS.
- Wellstream International.
- FMC Technologies.
- Vallourec & Mannesmann.
- USIMINAS Brazilian Steel Plant.
- Tenaris Confab.
- Technip.
- Vale Energy solutions.
- Brazilian Navy.



Features





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Rooms for high pressure and temperature tests





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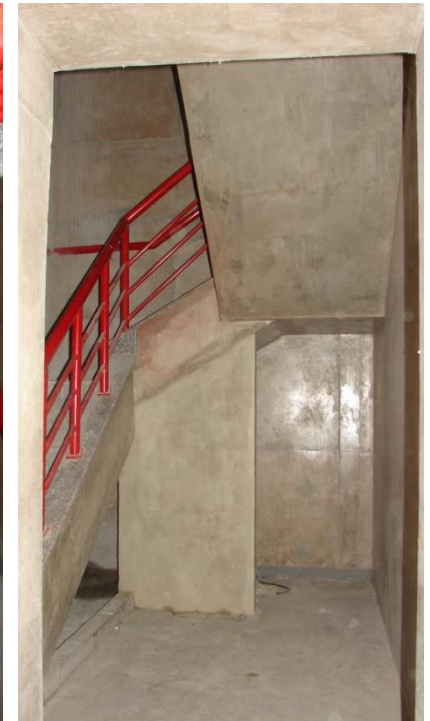
Electrochemical Lab



<http://www.metalmat.ufrj.br/Indc/english/index.htm>

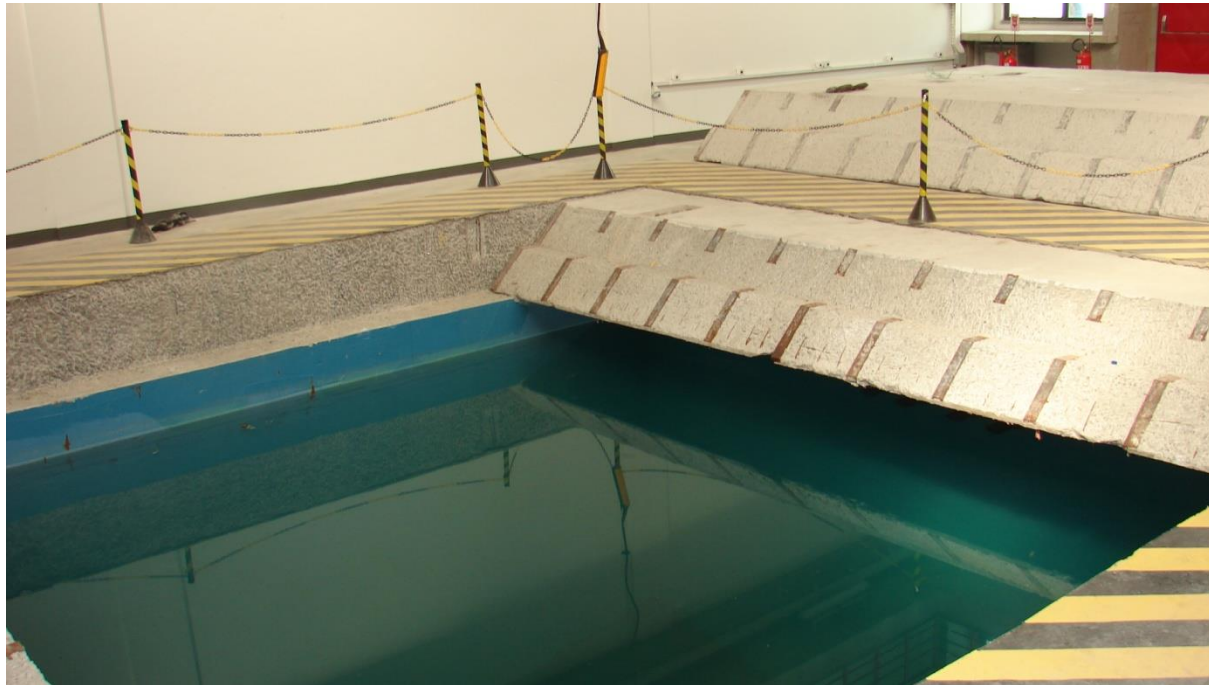
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Gamagraphy/X-Ray Bunker



Non-destructive Testing, Corrosion and Welding Laboratory – COPPE/UFRJ

Underwater Inspection Pool





Non-destructive Testing, Corrosion and Welding Laboratory – COPPE/UFRJ

Non destructive Testing Lab



<http://www.metalmat.ufrj.br/Indc/english/index.htm>

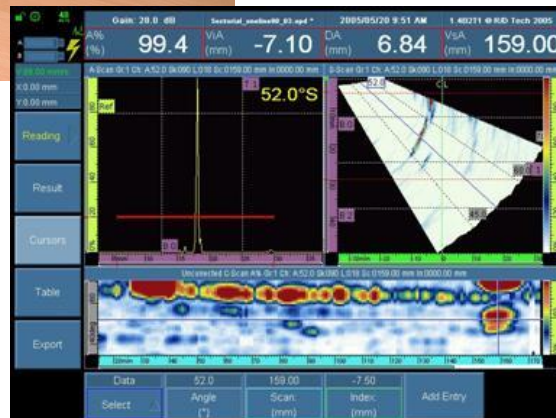


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Phased Array



OmniScan Olympus



M2M Technology

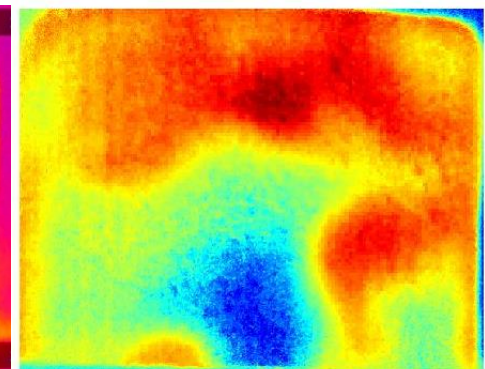
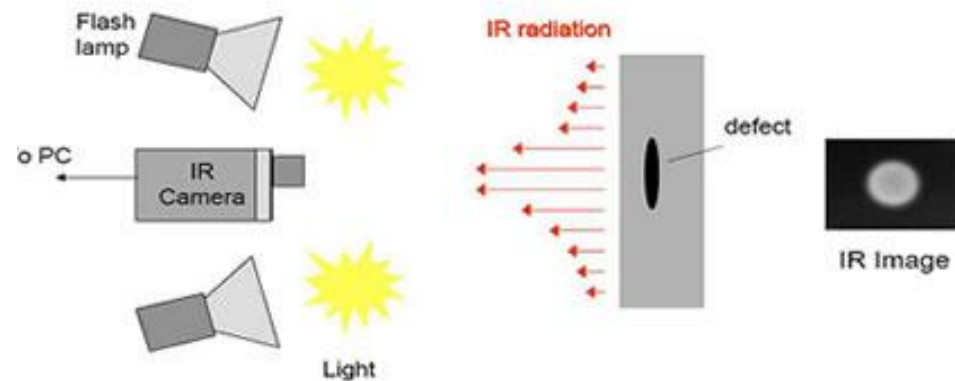


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Thermographic Inspection



FLIR SC 640 Camera.



Pulsed Phase Thermography

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Guided Waves Inspection

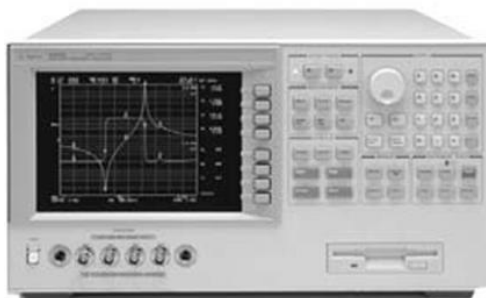


EMAT INSPECTION TECHNOLOGY



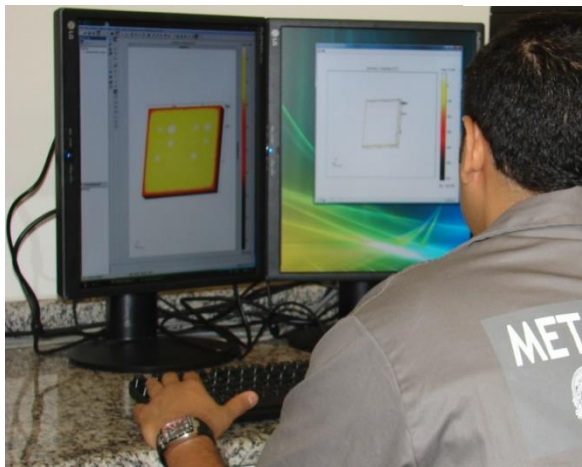
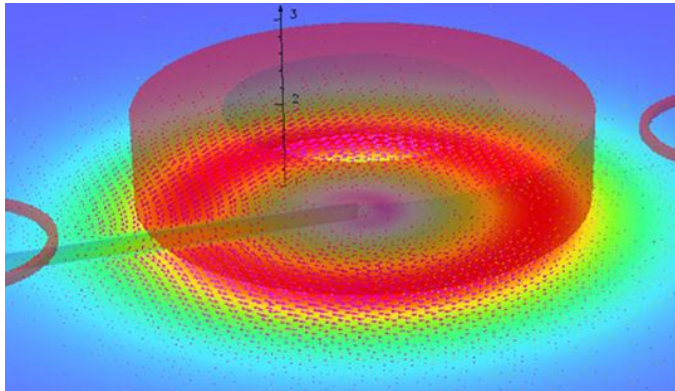
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Electromagnetic Testings



HP4294A Precision Impedance Analyzer, 40 Hz to 110 MHz

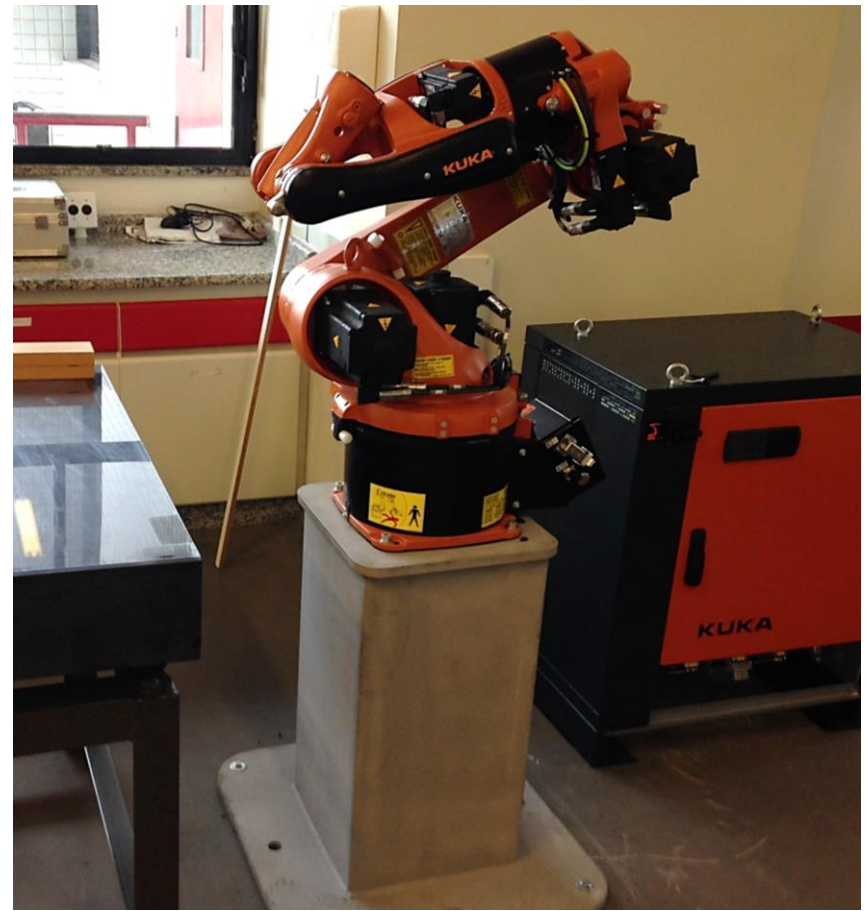
Simulations Tools





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Automated Inspection



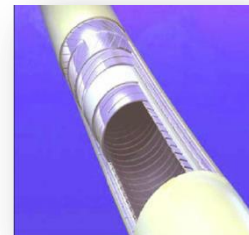
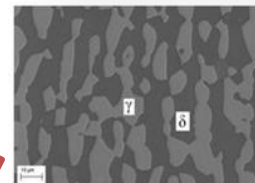
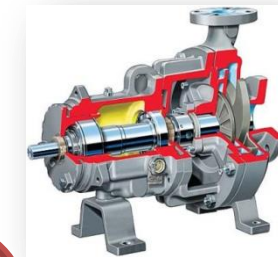
Some projects in progress using electromagnetic techniques

DSS inspection

Some projects in progress

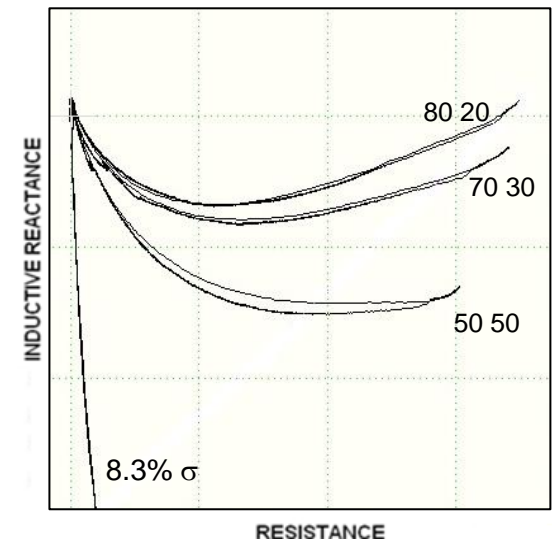
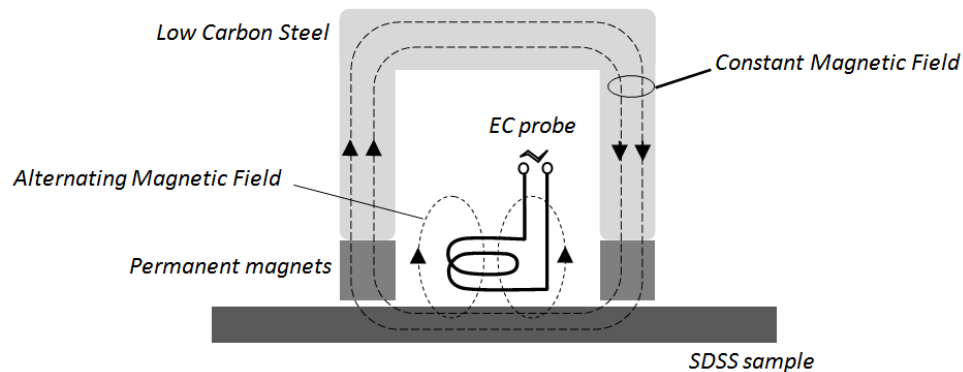
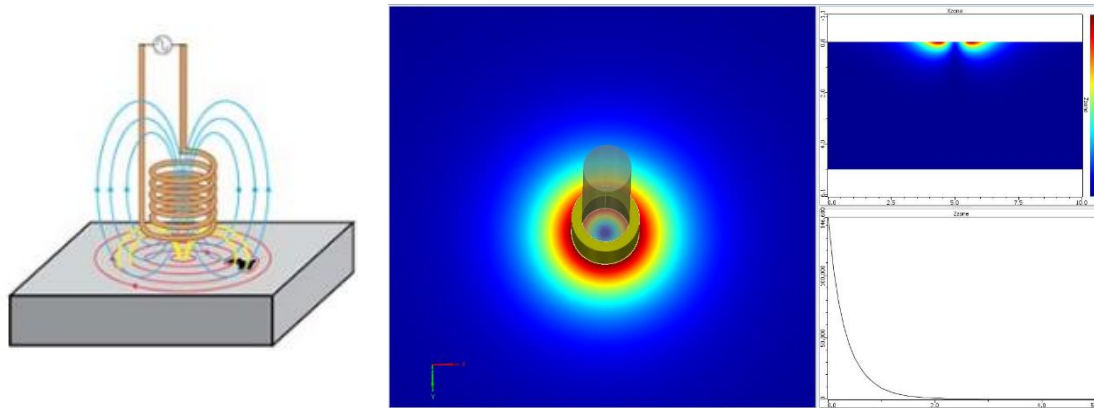
Duplex Stainless Steel Inspection

- Widely used in the marine and petrochemical industries.



Some projects in progress

Duplex Stainless Steel Inspection



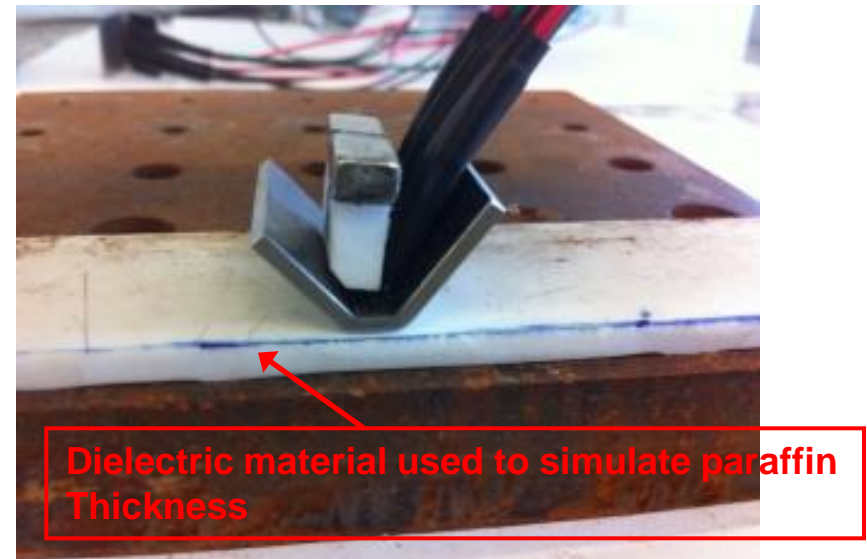
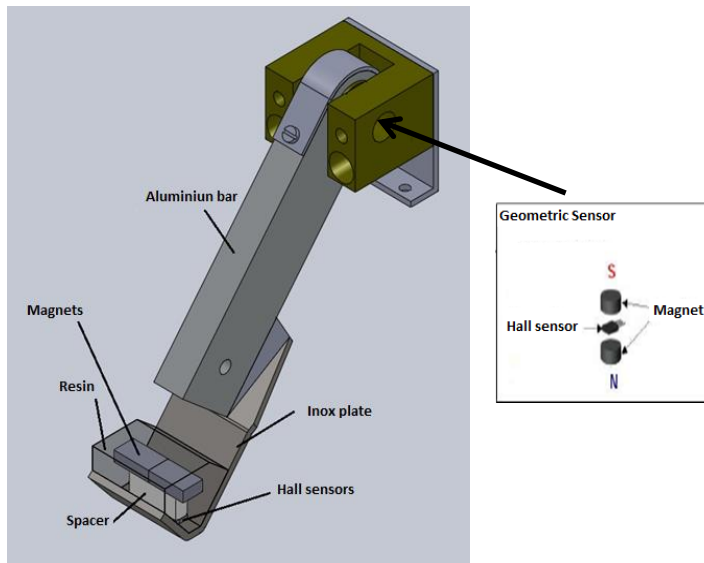
Wax deposit in pipelines

Some projects in progress

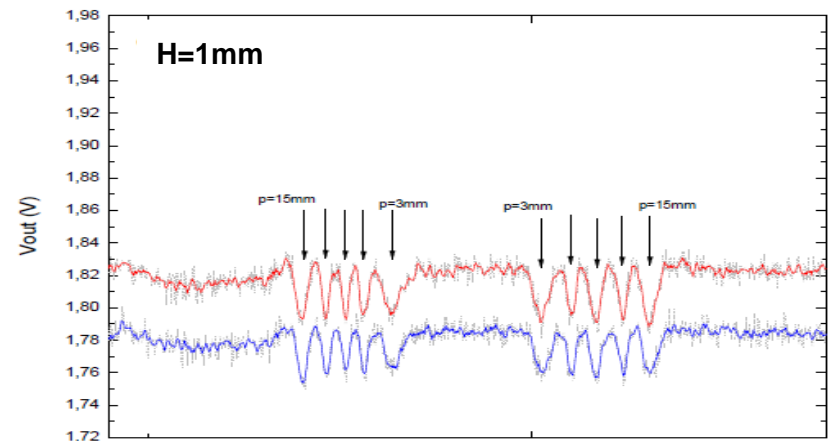
**Development of a Magnetic Sensor for
Detecting and Sizing Paraffin Deposit
Inside Pipelines**



Some projects in progress



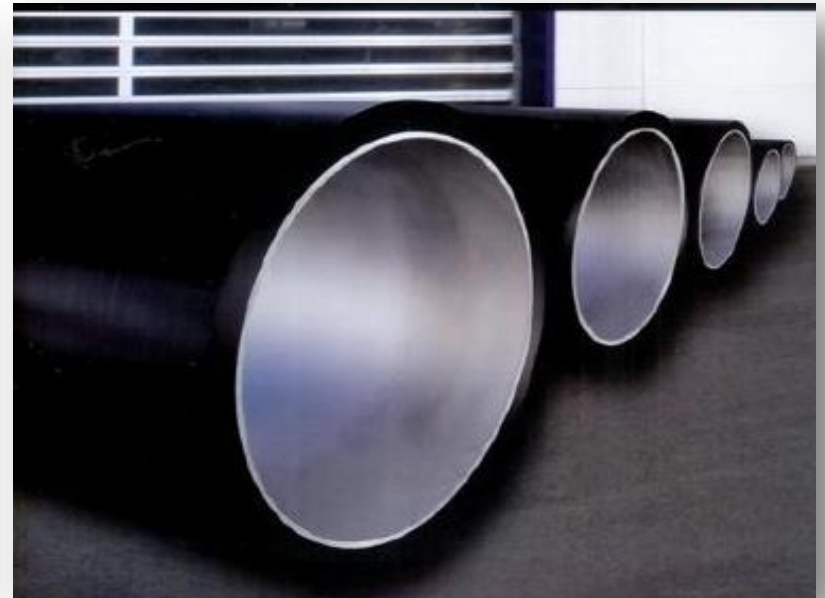
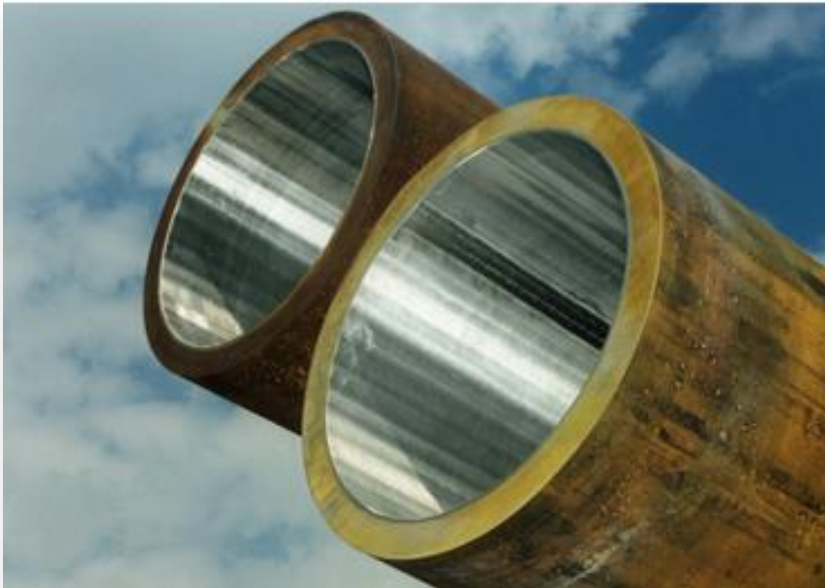
The aim of the project is:
 → Detect paraffin presence
 and its thickness in pipelines



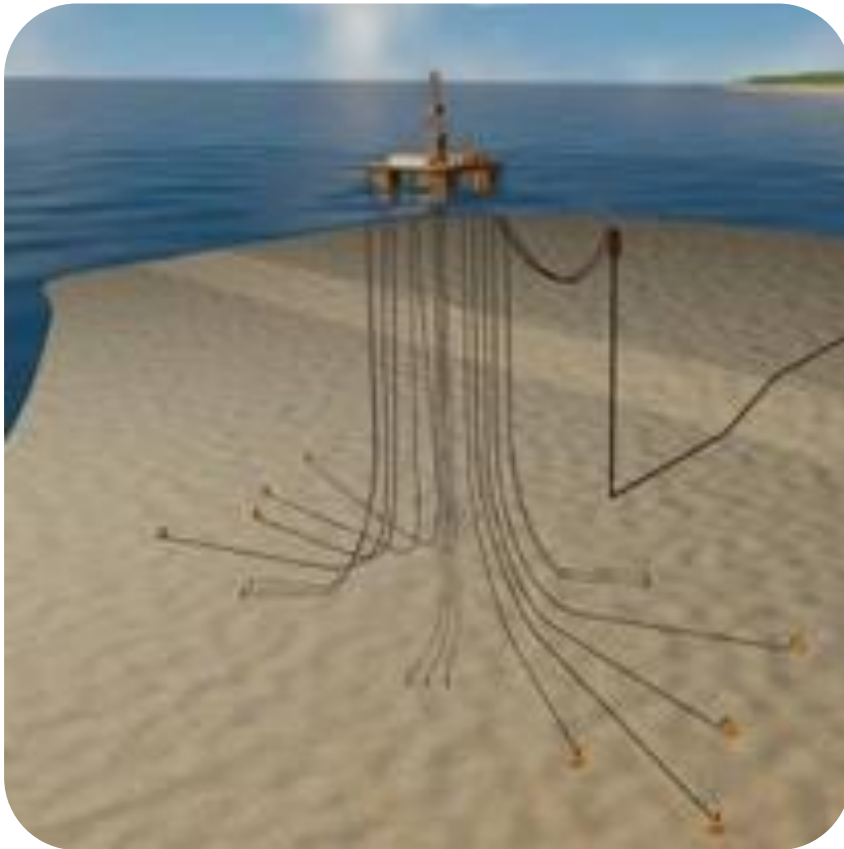
Clad material inspection

Some projects in progress

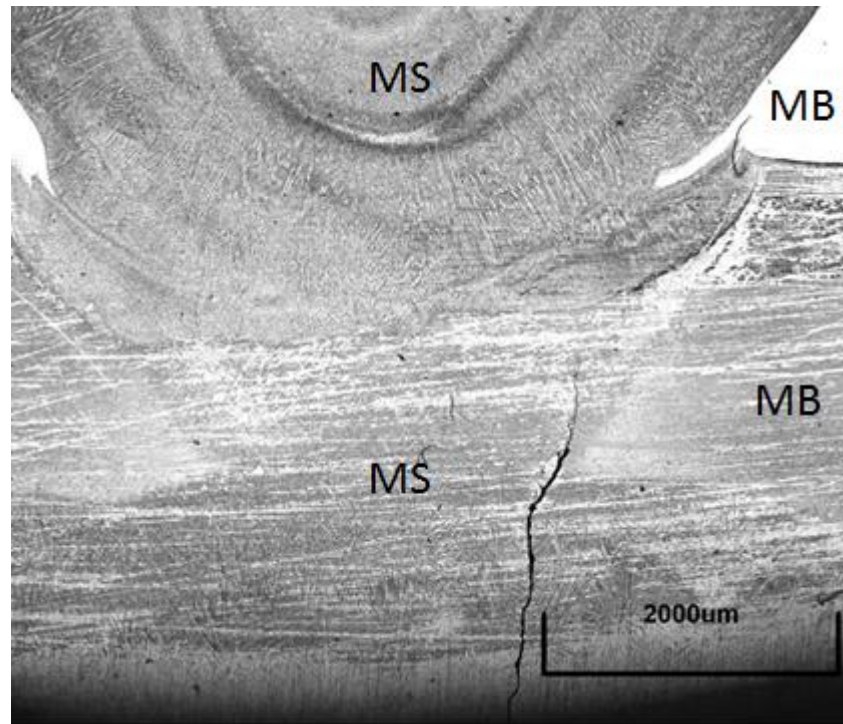
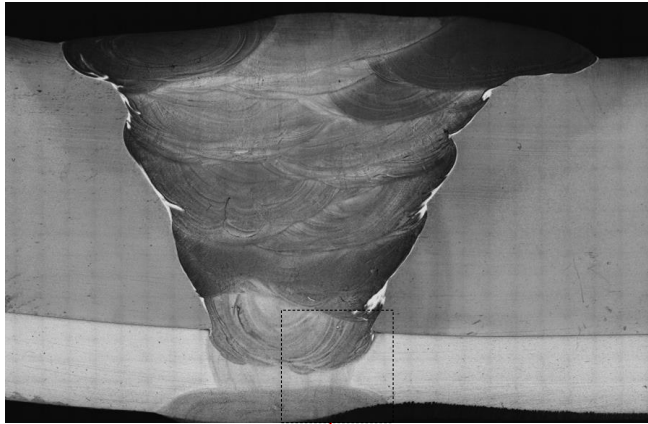
Inspection of clad pipes



Some projects in progress

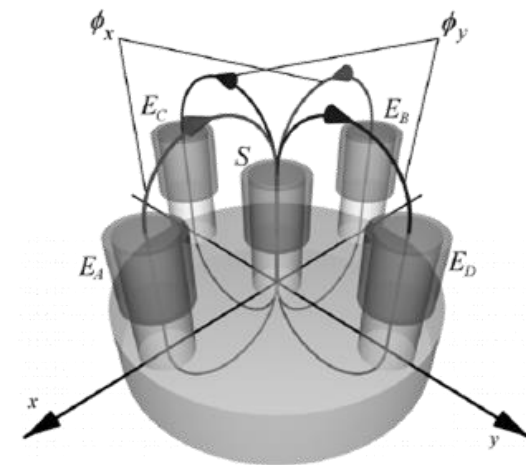
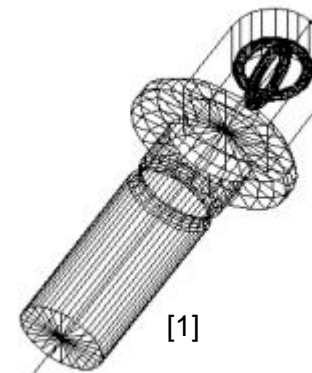
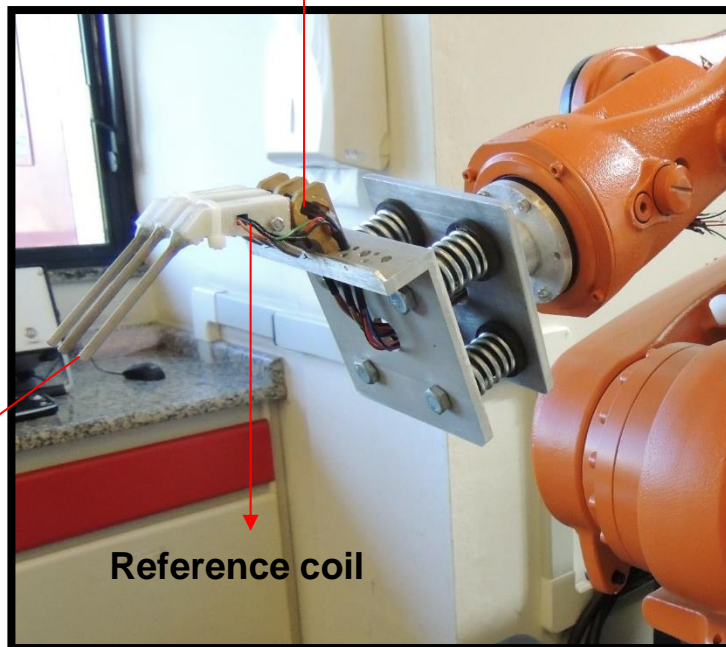


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Some projects in progress

Hall sensor



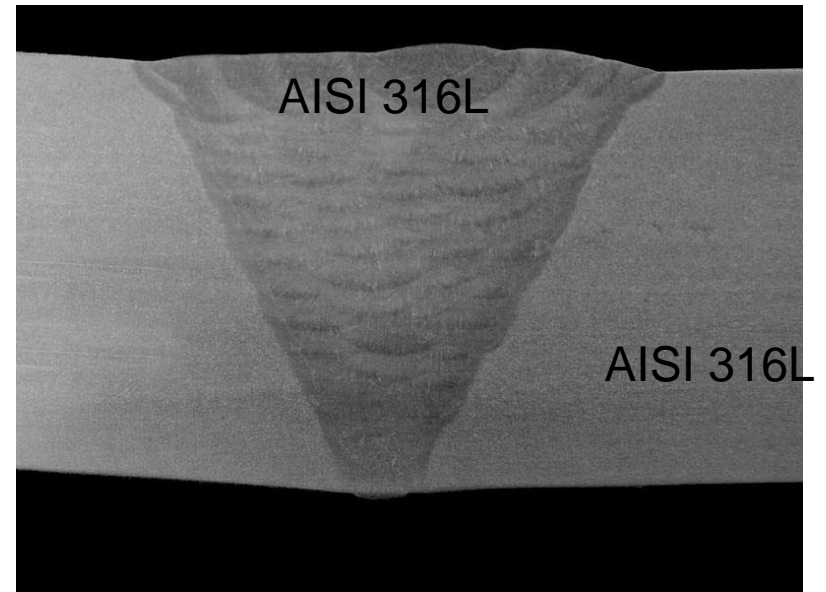
West Pomeranian University of Technology, Poland [2]

[1] Research, Development, and Technology Turner-Fairbank Highway Research Center, Virginia, USA

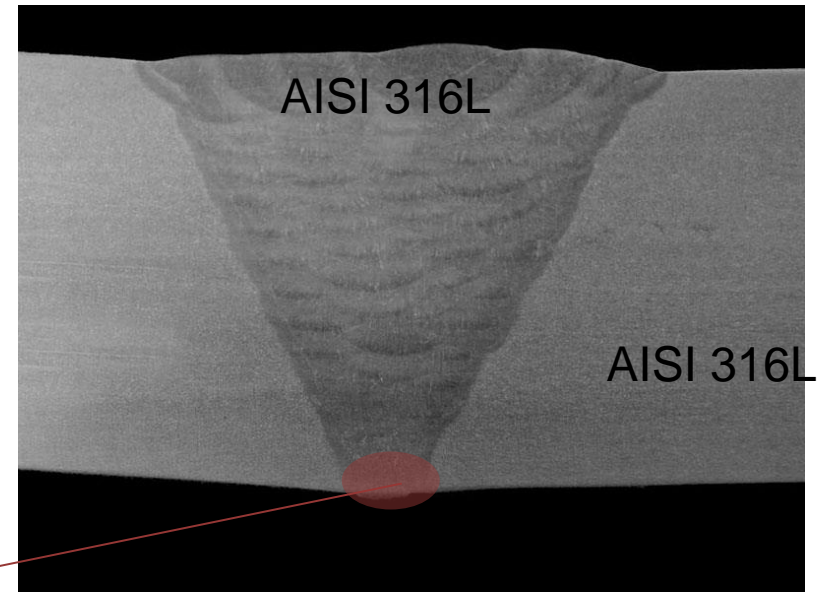
[2] T. Chady, M. Enokizono, "Multi-frequency exciting and spectrogram-based ECT method", J. Magn. Magn. Mater., t. 215, ss. 700–703, cze. 2000

C-Mn steel in the welding root of AISI 316L steel

Some projects in progress



Some projects in progress

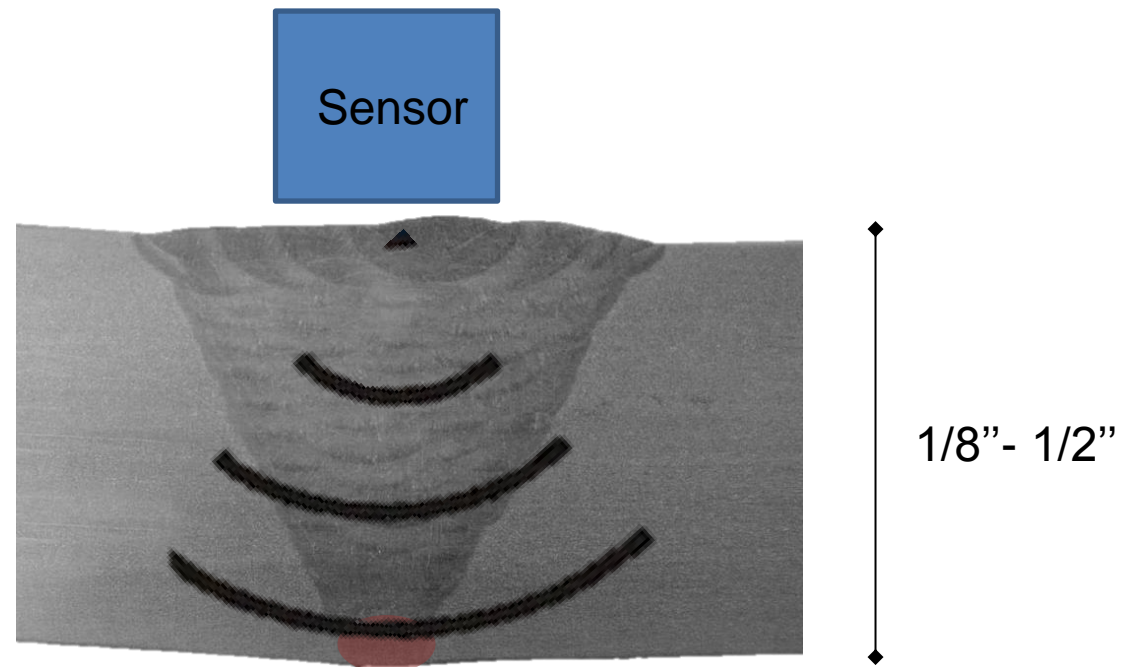


C-Mn

Some projects in progress



Some projects in progress



Thank you! Questions?

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