

Eddy Current Array – erstatning for MT / PT testing

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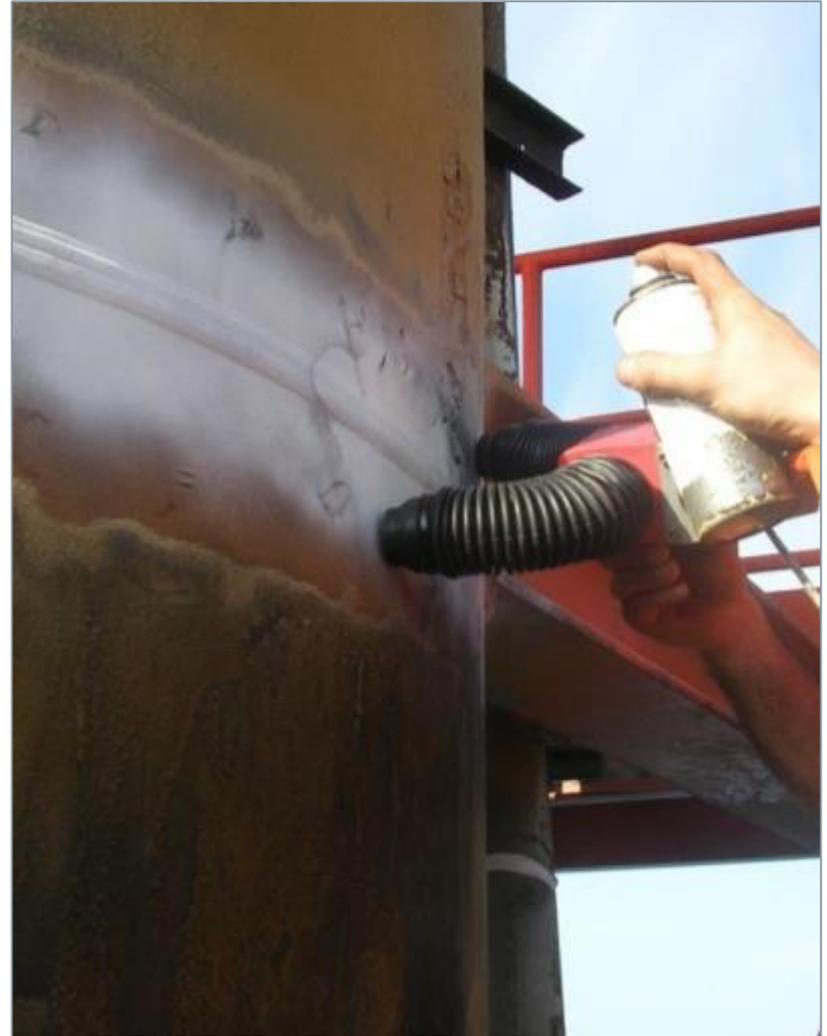
Replacing NDT techniques that require chemicals



Eddy Current Array
require less cleaning
and no need for
chemicals

Current situation

- Magnetic particle testing (MT) and penetrant testing (PT), are the most commonly used methods for surface crack detection in welds. These techniques require a lot of surface preparation, removal of paint, cleaning and the inspection itself require use of chemicals. After the inspection the surface must be prepared again for recoating including sandblasting and painting.
- This represents represent a hazard through ergonomic and chemical exposure, as well as chemicals released to the environment.



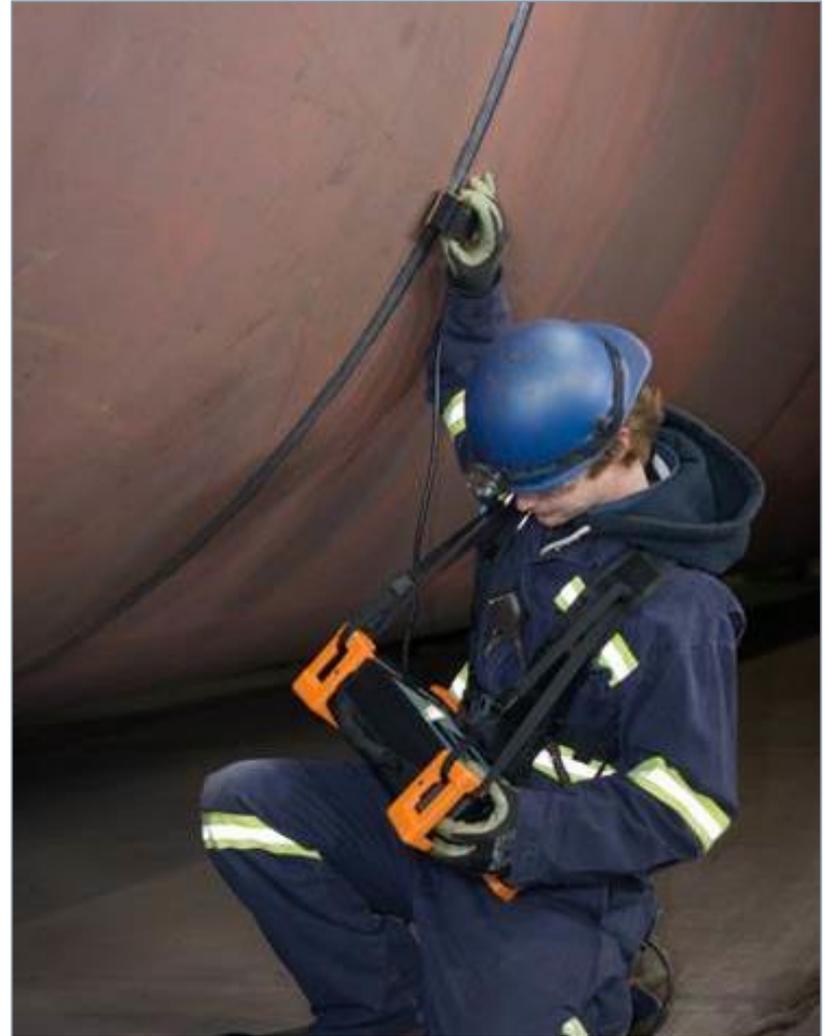
Our approach

- Eddy Current Array (ECA) is a development in eddy current technology (ET) able to replace conventional MT & PT testing.
- We use of ECA as a substitute for MT & PT will not only eliminate exposure to inspection chemicals but will eliminate the need of surface preparation and recoating in its entirety and thereby the ergonomic and chemical hazards related to it. In addition there is no environmental impact from chemicals release. The ECA method is time and cost effective, also having a positive effect on cost savings.



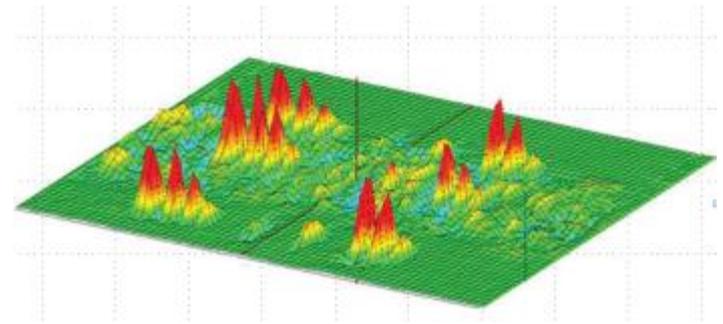
Eddy Current Array technique

- Electromagnetic NDT technique
- Manual scanning or ergonomic scanner solutions
- Portable and easy to use
- Passed all blind trials for DNV
- Approved by Norsok M601 as a replacement technique for MT and PT



Why use ECA

- No need to remove paint, up to 3mm
- No need to grind or clean surface before inspection
- Can inspect in any weather. No need for dry surface like MT/PT
- Faster than MT/PT
- Can measure cracks up to 10mm depth, MT/PT can not size
- Digital recording of inspection. MT/PT are only visual
- Environmental friendly. No use of chemicals



Eddy Current Array



- Bakgrunn
- Utstyr
- Erfaring
- Anvendelser

Hvor kommer ECA fra?

- Utviklet primært for flyindustrien



Flyindustri



- Inspeksjon etter sprekk, lamineringer
- 9 ganger raskere enn konvensjonell ET
- Primært aluminium

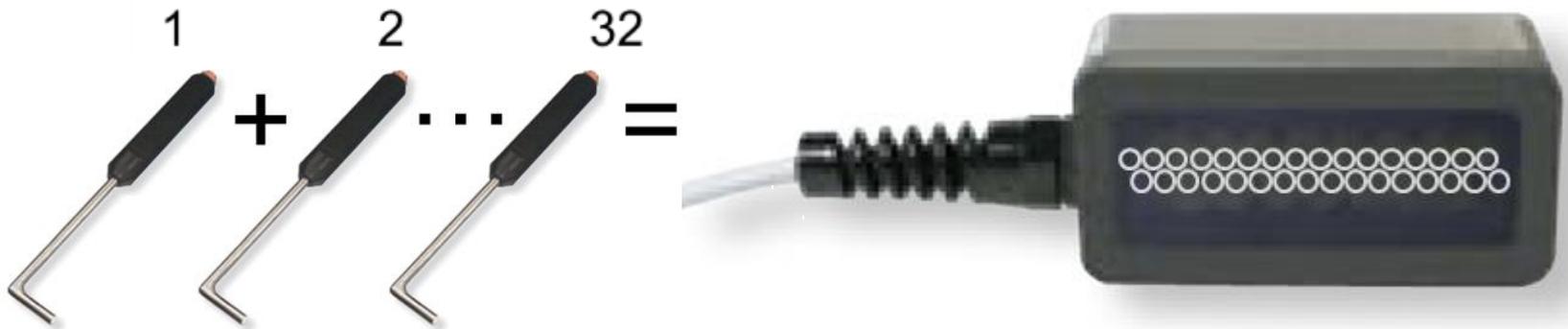
Flere leverandører

Zetec, GE
Olympus/RD Tech
EddyFi, etc

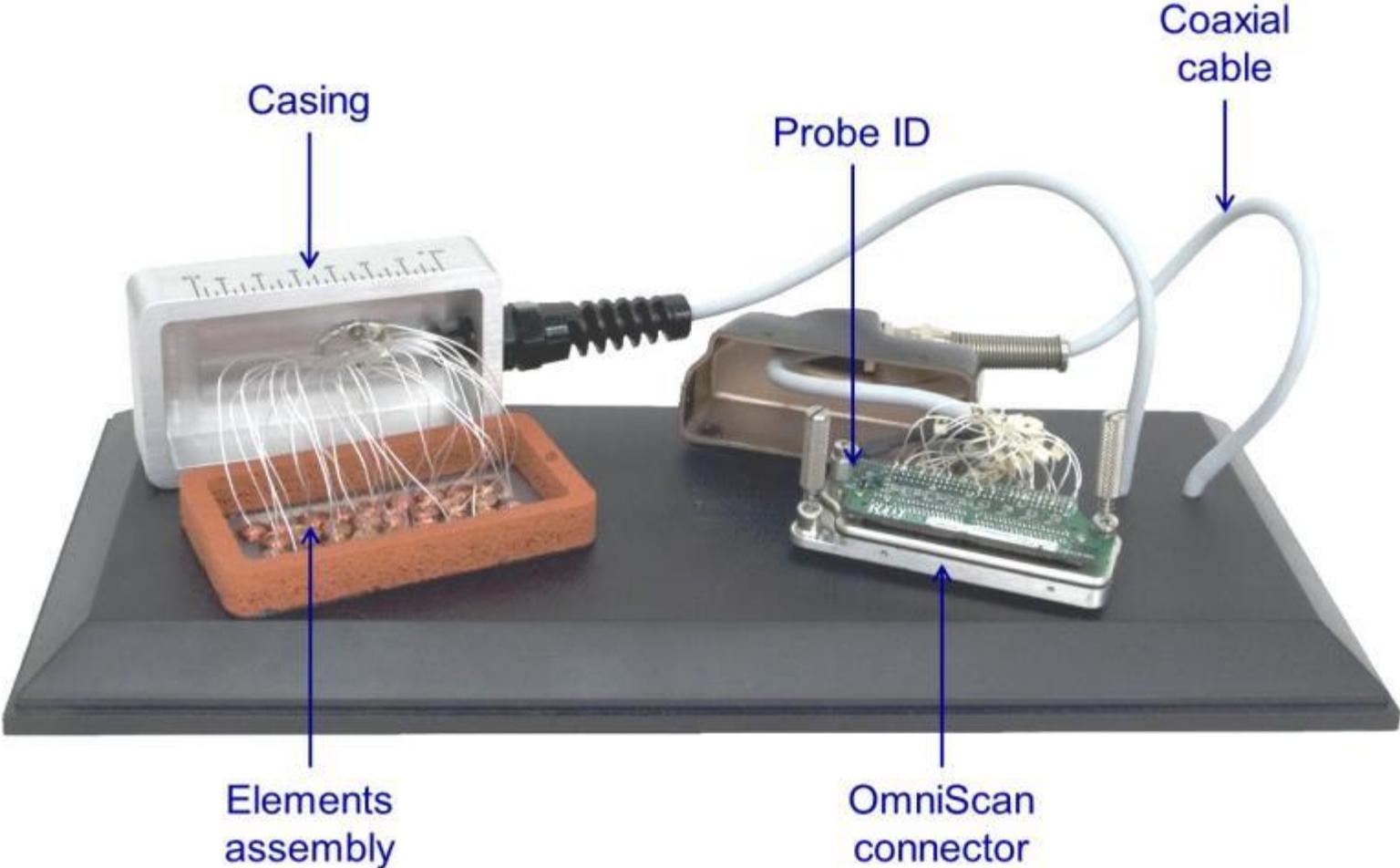


Hva er Eddy Current Array

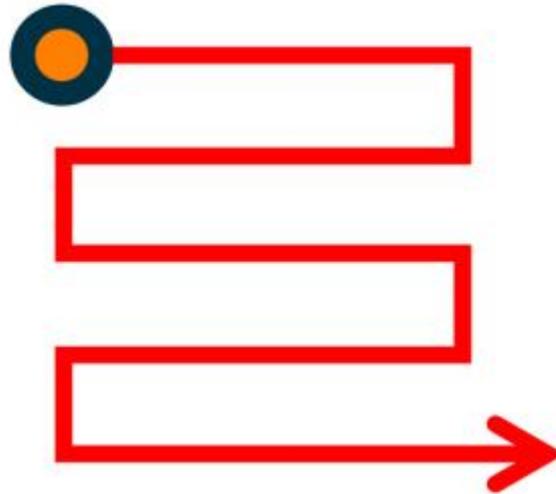
- Alle typer Eddy Current prober kan bli brukt som element i en Array konfigurasjon



ECA probe innvendig



ET og ECA

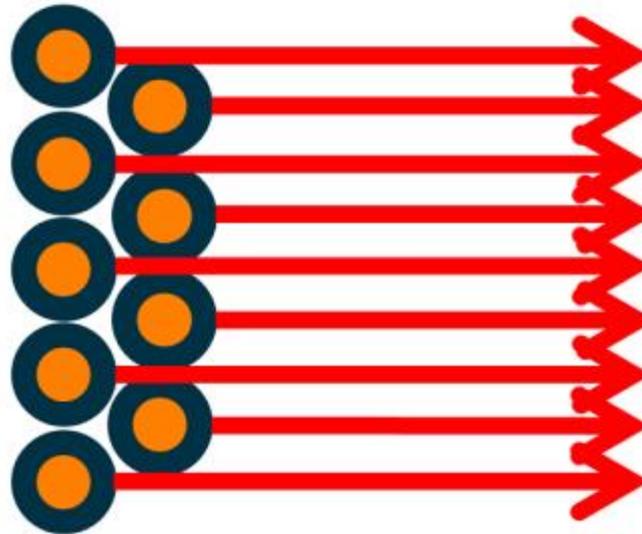


Konvensjonell ET

- En coil
- Tidkrevende
- Operatørvhengig
- Må ofte verifiseres

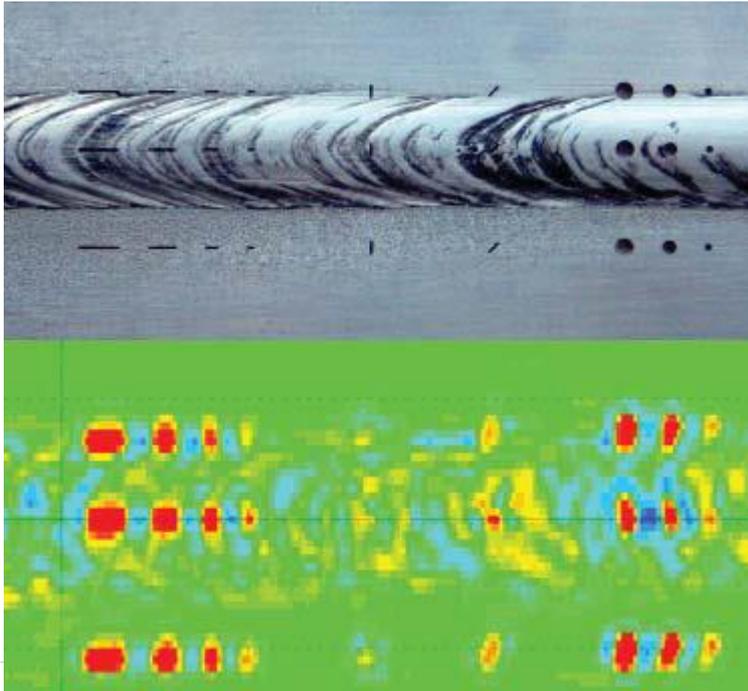
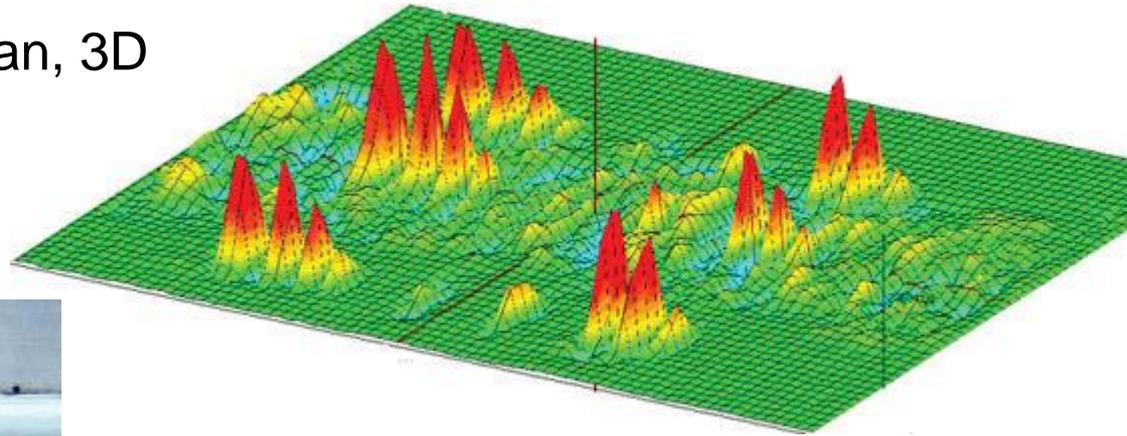
Eddy Current Array

- Raskere
- Større dekning
- Digital lagring
- Enkoder
- Reproduserbart

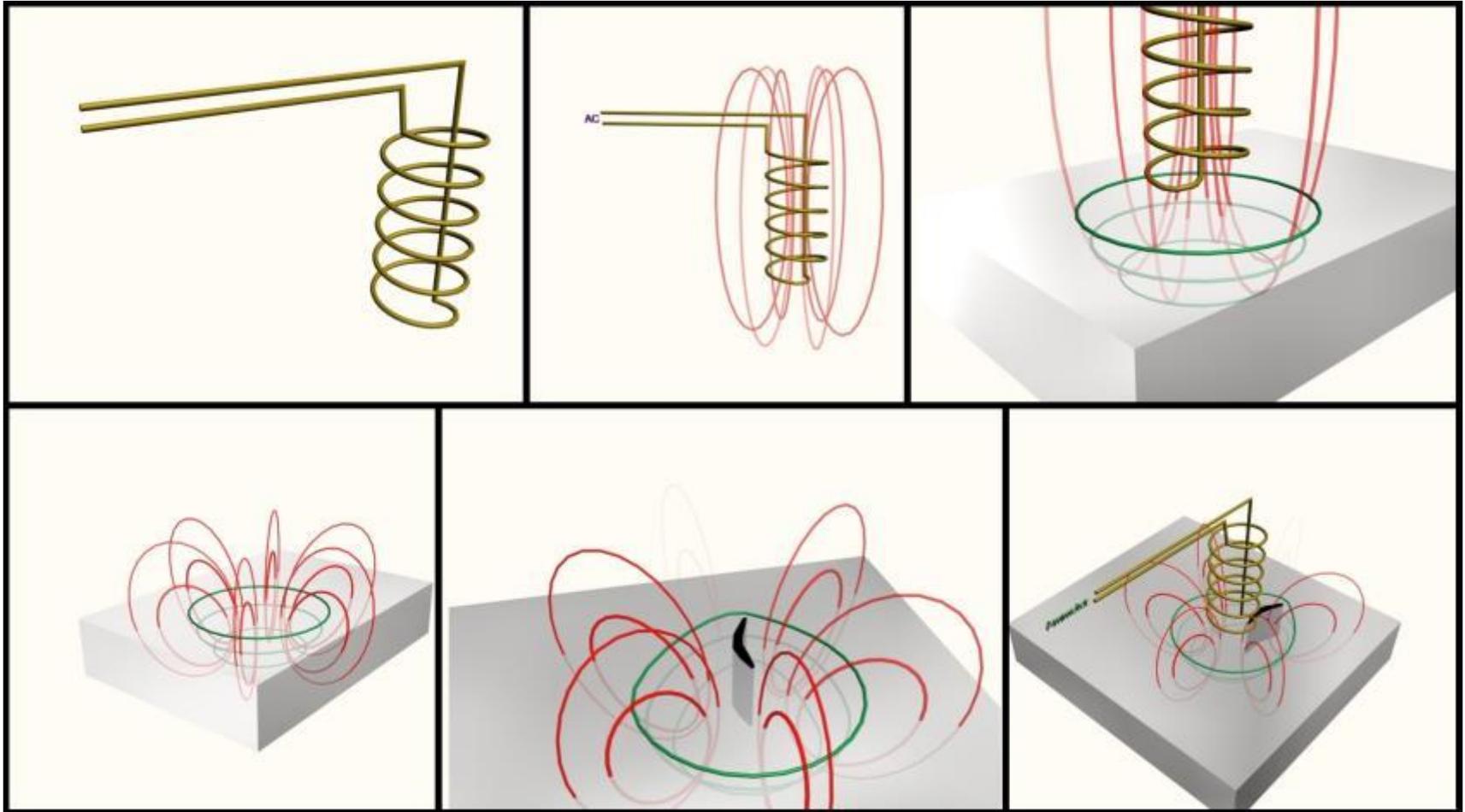


Hovedforskjeller mellom ET og ECA

- Større dekning
- Kan lagre inspeksjonsdata
- Presentasjonsformat C-Scan, 3D
- Bedre POD



Probetypen



Semi-fleksibel probe

For rør, beholdere og andre buede overflater



Tubing, instrumentrør



Fleksible ECA prober

For rør, utfordrende geometrier



Utvendig



Innvendig



- Primært SS, titan, inconell
- Inspiserer CS som vanlig ET

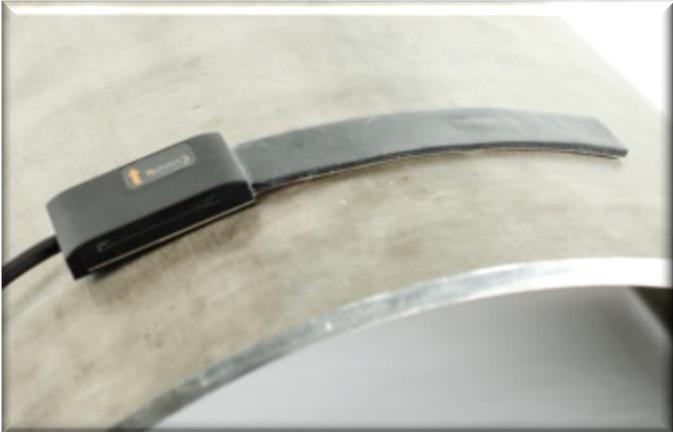
Fleksible prober forts.

Programerbar – frekvens, sensitivitet

Encoder



SS316 Pitting
SCC



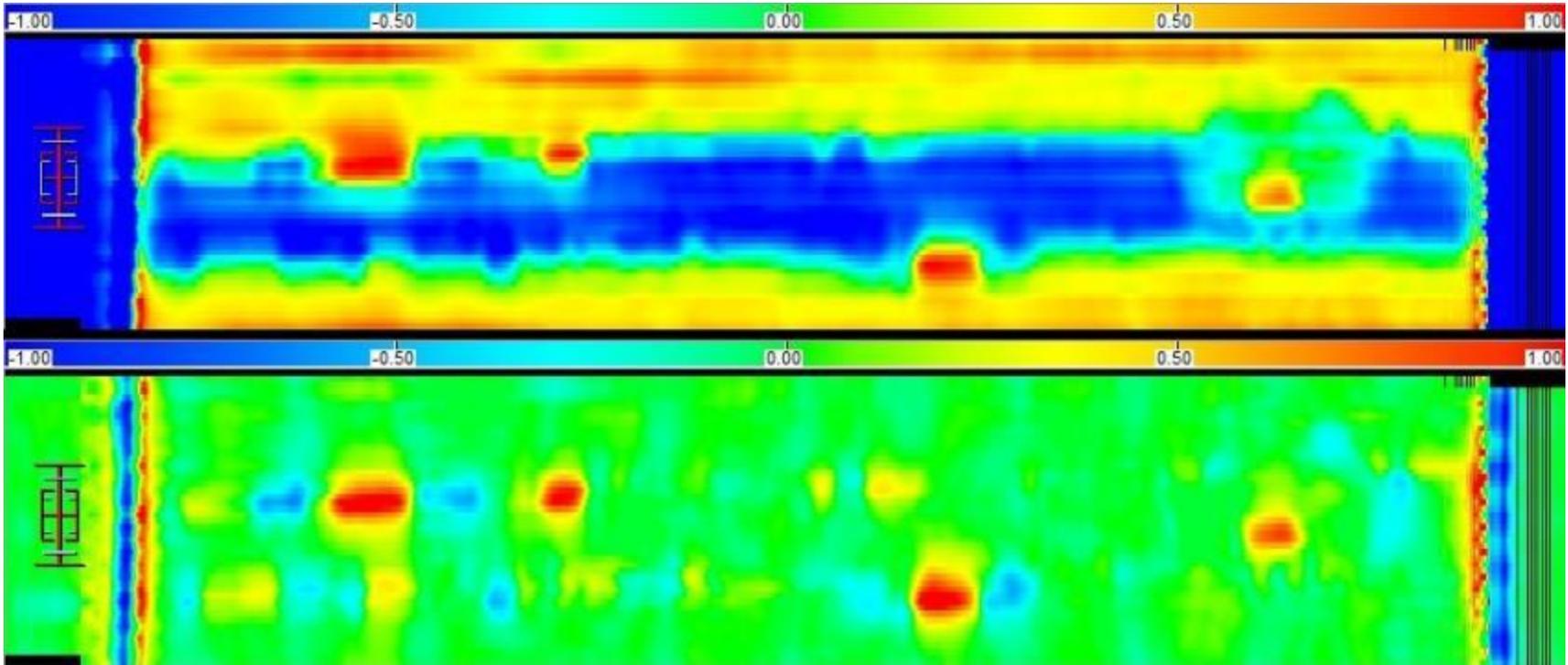
Sharck Probe – For CS sveis med cap



- 3mm coating
- C-Scan, lokasjon, lengde, dybde (0-10mm)
- Dekker Cap, tå og Haz i et scan

Sharck probe C-Scan informasjon

Kan se og lokalisere funn i sveis selv om den er planslipt og malt



Anvendelse - Tilrettelegge metoden for NCS

- Anskaffe kalibreringsemner
- Demonstrere deteksjon og sensitivitet
- Verifisere med relevante belegg



Hvorfor bruke ECA

- Trenger ikke fjerne maling, opptil 3mm
- Trenger ikke slipe overflate for å utføre inspeksjon
- Go - No Go inspeksjon
- Raskere enn MT/PT
- Kan måle dybde på sprekker (opptil 10mm for CS)
- Bedre deteksjon enn konvensjonell ET
- Digitalt opptak
 - Trending
 - Reproducere inspeksjon
- Encoder
 - Mapping
- Kost effektiv metode i både drift og stanser
- Miljøvennlig, ingen kjemikalier

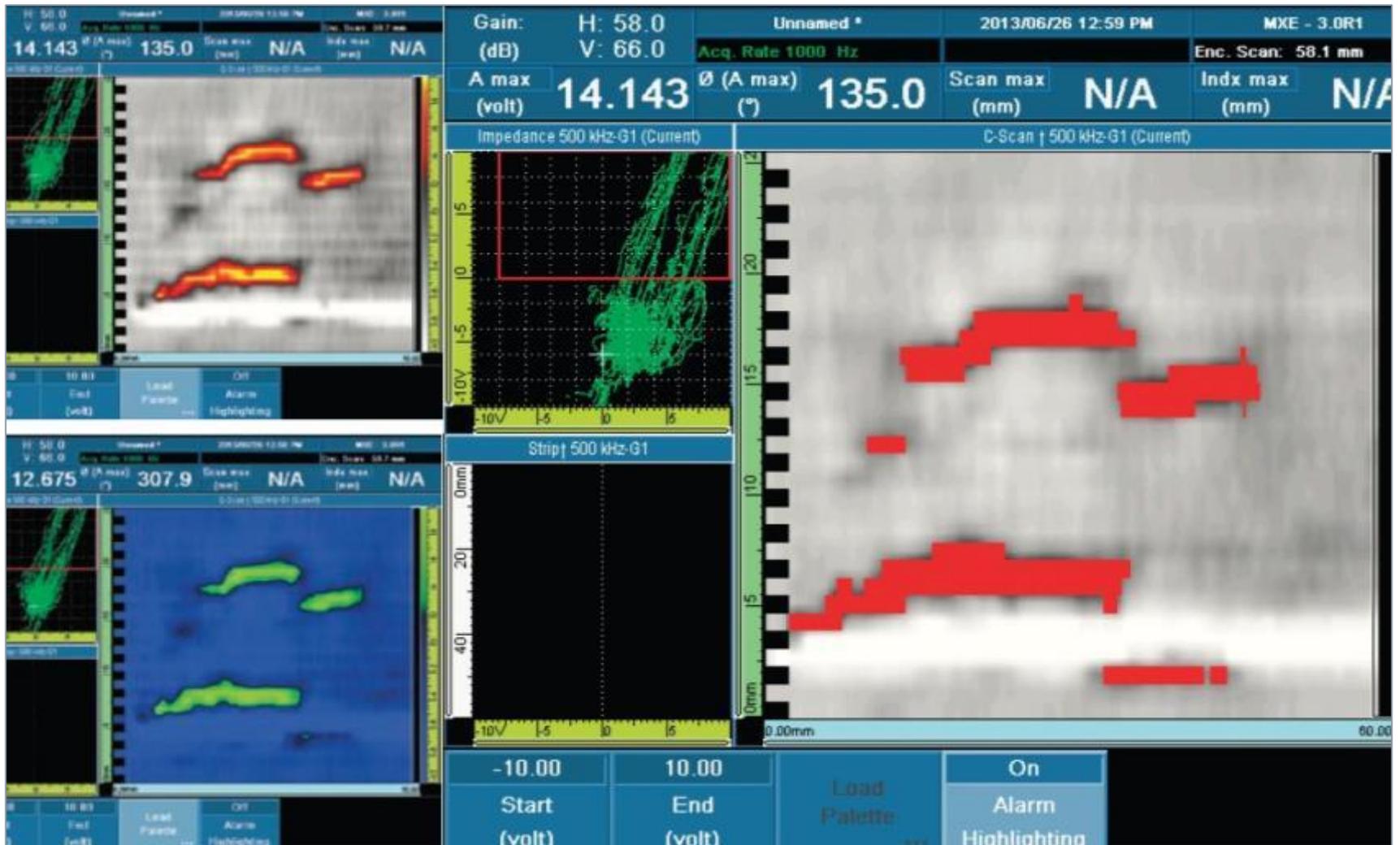
Uten belegg



Med belegg



Go-NoGo Inspeksjon



Våre erfaringer i felt



Rask metode

God dokumentasjon
av funn

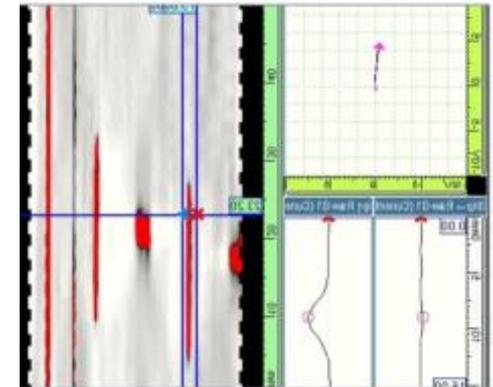
Høyere bruker
terskel

Offshore-case

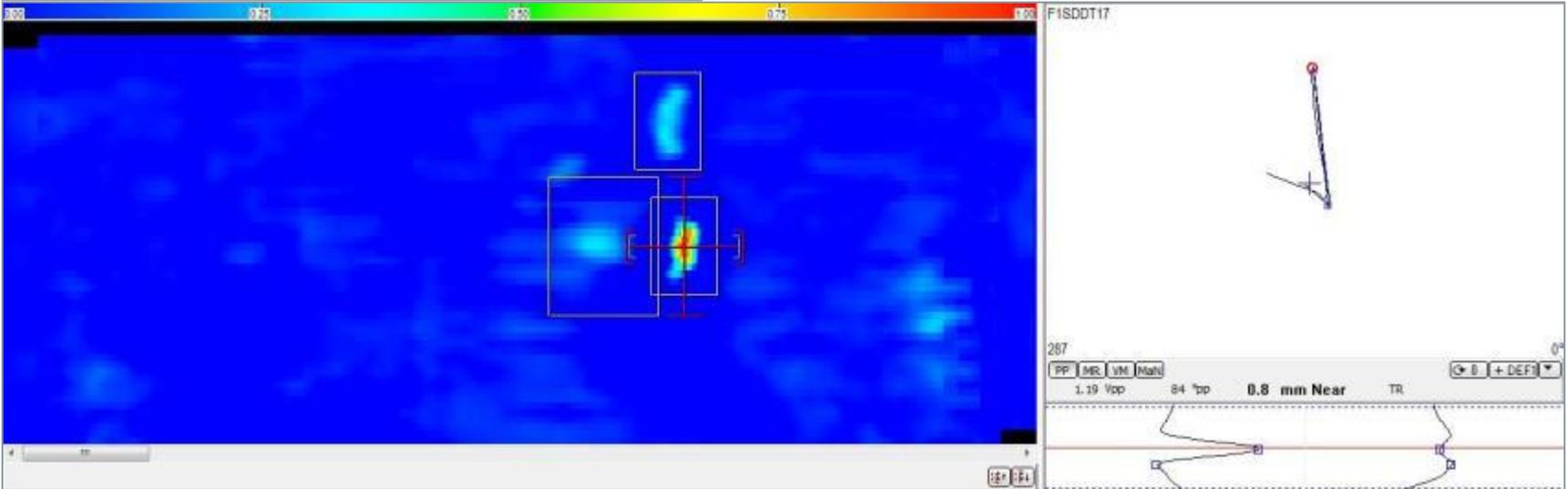
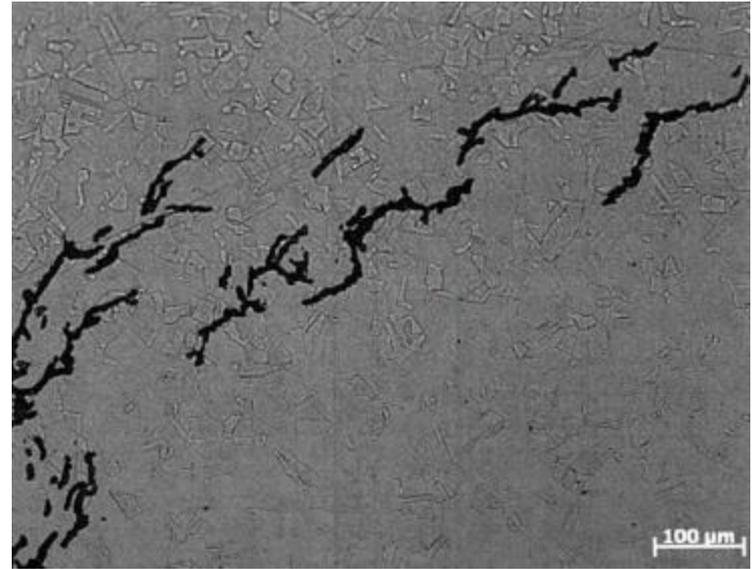
Det ble oppdaget en sprekk i et rør ved fabrikken. Rørspooler fra samme batch var allerede installert offshore.



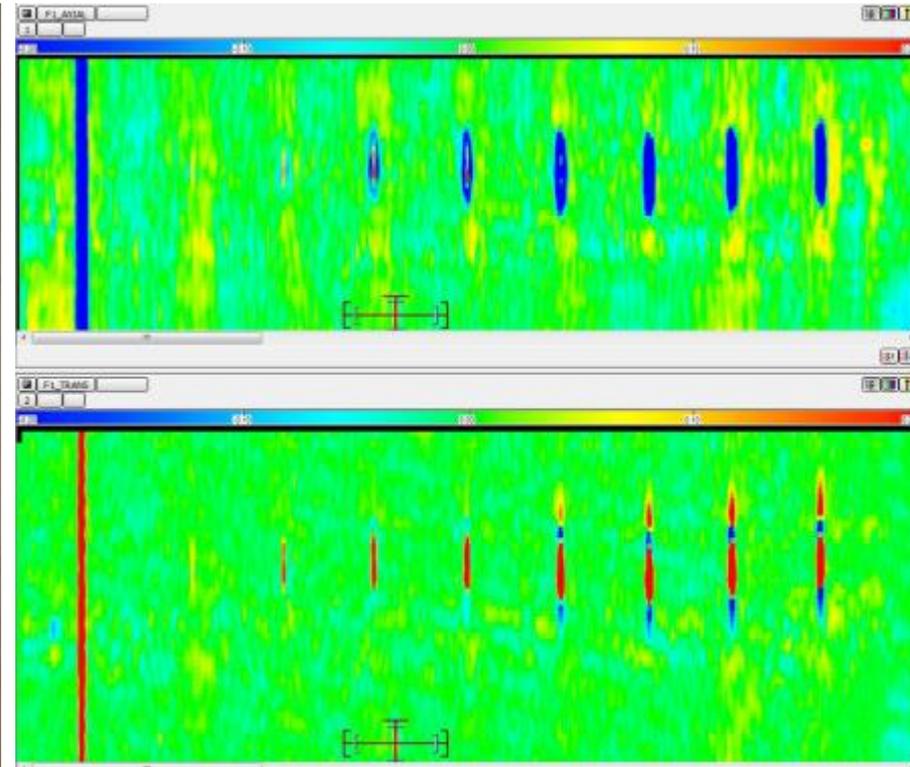
- Fikk emne fra samme batch
- Lagde kalibreringsplater
 - Superaustenittisk
- Test i lab
- Valgte probe
- Laget oppsett
- Gjennomføring raskere enn antatt



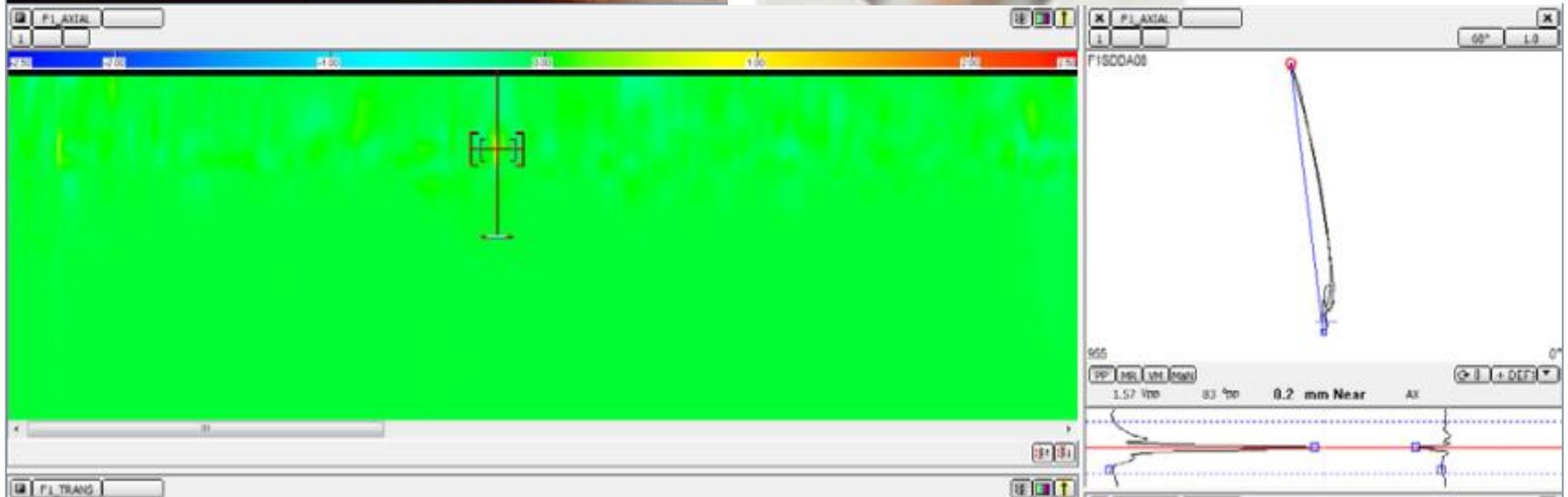
Stress Corrosion Cracking i SS316



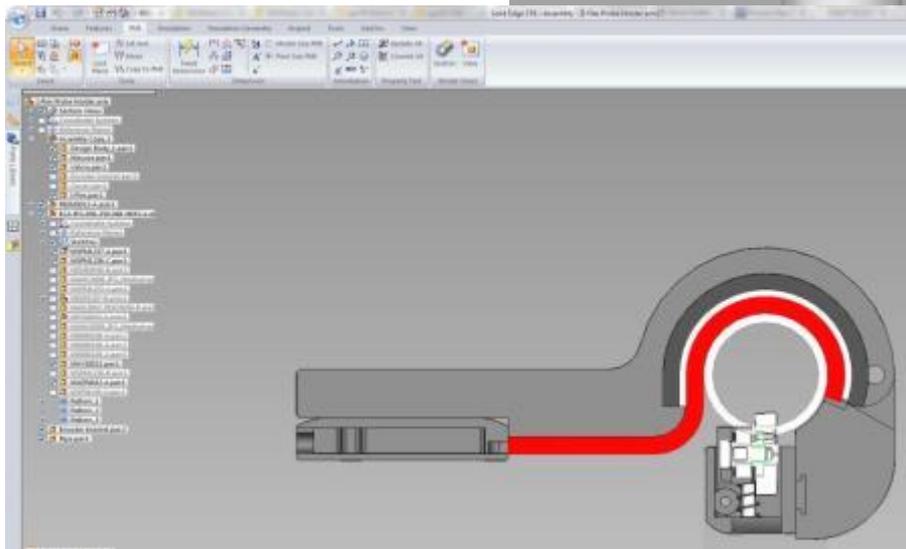
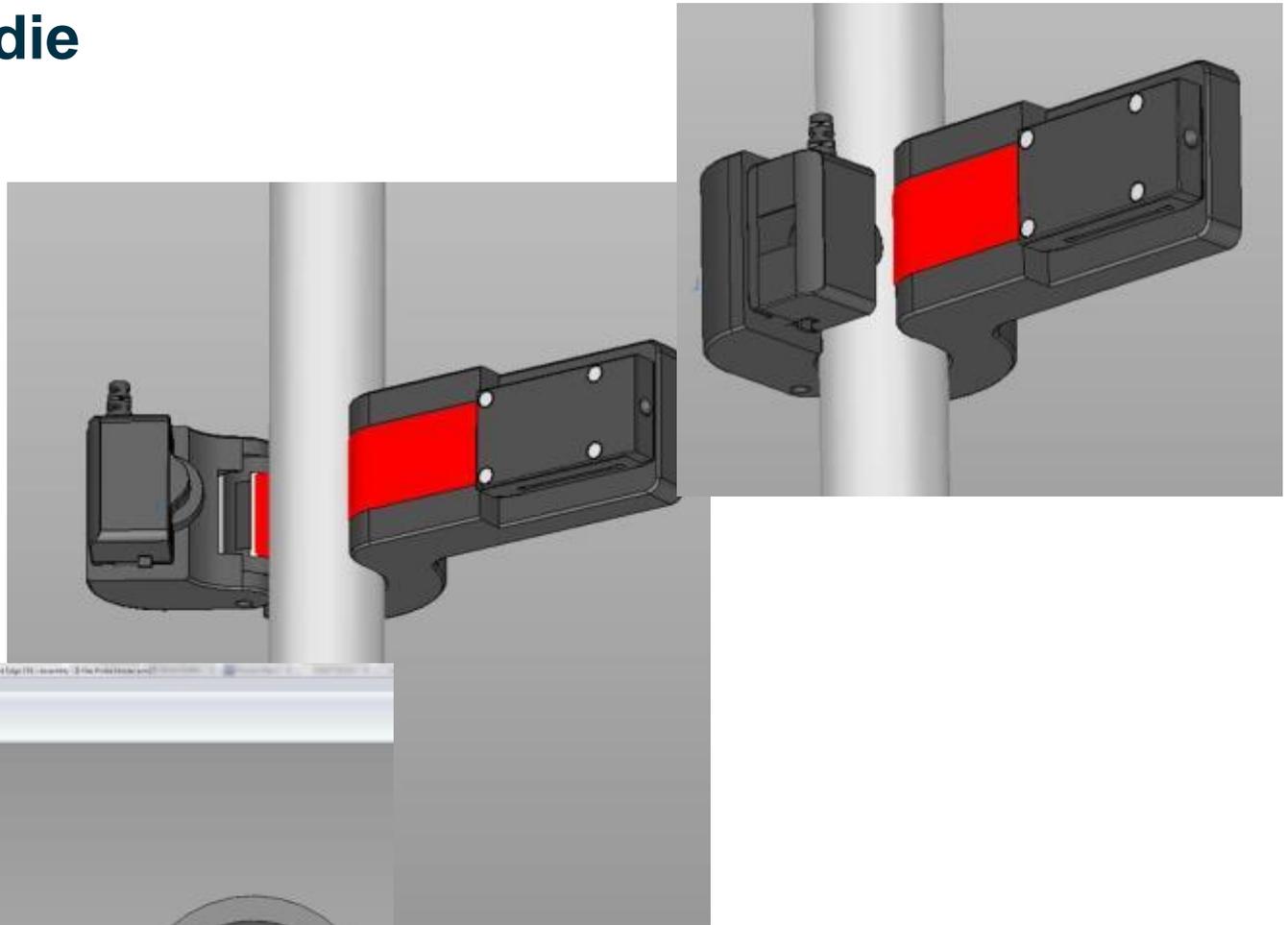
Laget kalibreringsblokker for å verifisere sensitivitet



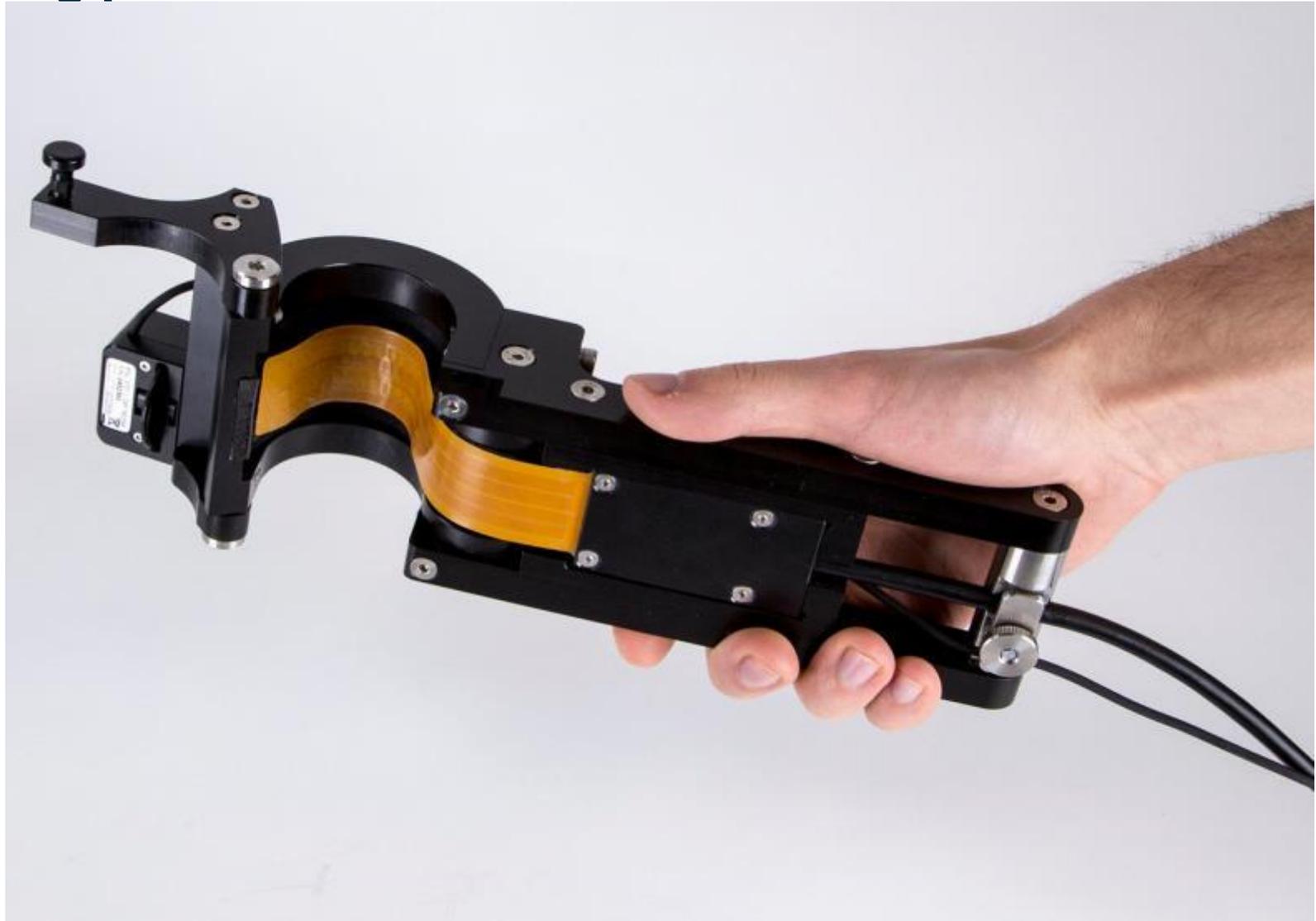
Feil i sealing surface på et juletre.



Mulighetsstudie



Ferdig produkt



Titan brannvannsrør

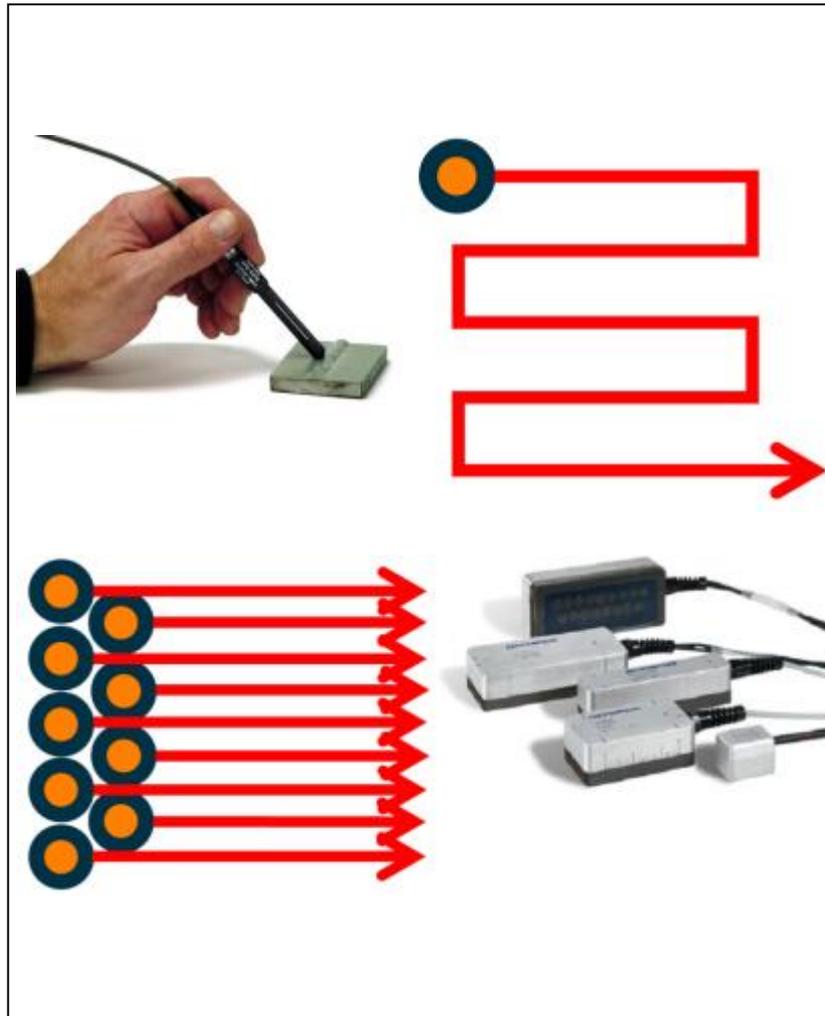


Driftsinspeksjon

- 4 utstyr, etablert i SDI
 - EddyFi Ectane
 - EddyFi Reddy, portable ECA utstyr
 - Olympus MX, med Eddy Current Array modul
- Personell:
 - P.t 4 personer som har opplæring
 - Alt personell som har min. ET2 (38), er aktuell som utførende operatør
 - Må ha kurs i bruk av utstyr og demonstrere kompetanse og bruk

MMO - AIM

Eddy Current Array



Scope

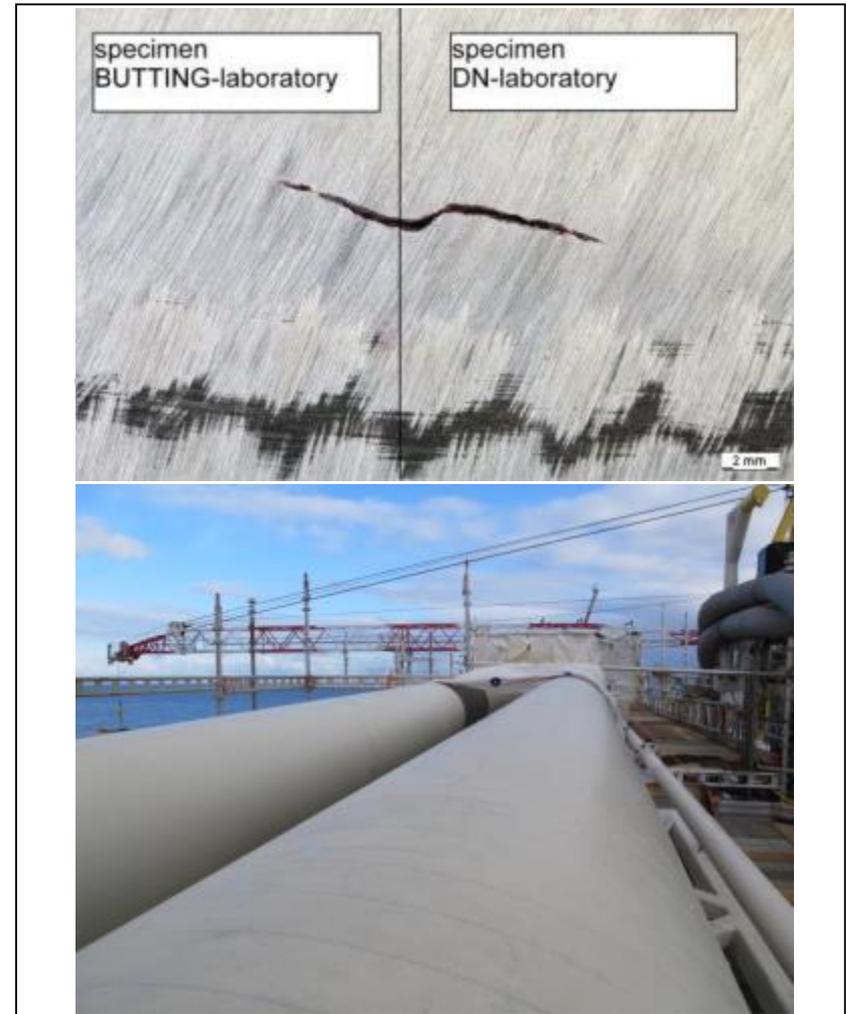
- Eddy current testing (ET) is a well known inspection method in the oil and gas industry and is recognized for its ability to detect flaws hidden under coating. ECA is basically ET coils arranged in an array, thereby increasing coverage and PoD, reducing cost and inspection time while still keeping the 100% green aspect of ET.
- ECA is predominantly used in the aviation industry today, but AIM has for some time seen the benefit of the technology and are working towards introducing it to the oil and gas industry.
- AIM has done excessive testing in the lab at Kokstad on materials commonly found on offshore installations and onshore refineries with good results. We are confident that this technology will, to a great extent, supersede MT and PT inspections and as a result, reduce the use of and need for chemicals and paint removal.
- The challenge now lies with convincing customers that this is the green inspection method for the future. Also we need to broaden confidence, competence and knowledge within AIM and then market the service as one of our advanced inspection methods.
- At the “Overflate 2013” convention we held a presentation about the technology, our progression and our lessons learned, and received a great deal of interest from clients, both external as well as internal.

MMO - AIM

Eddy Current Array

Results – a success story from Kristin

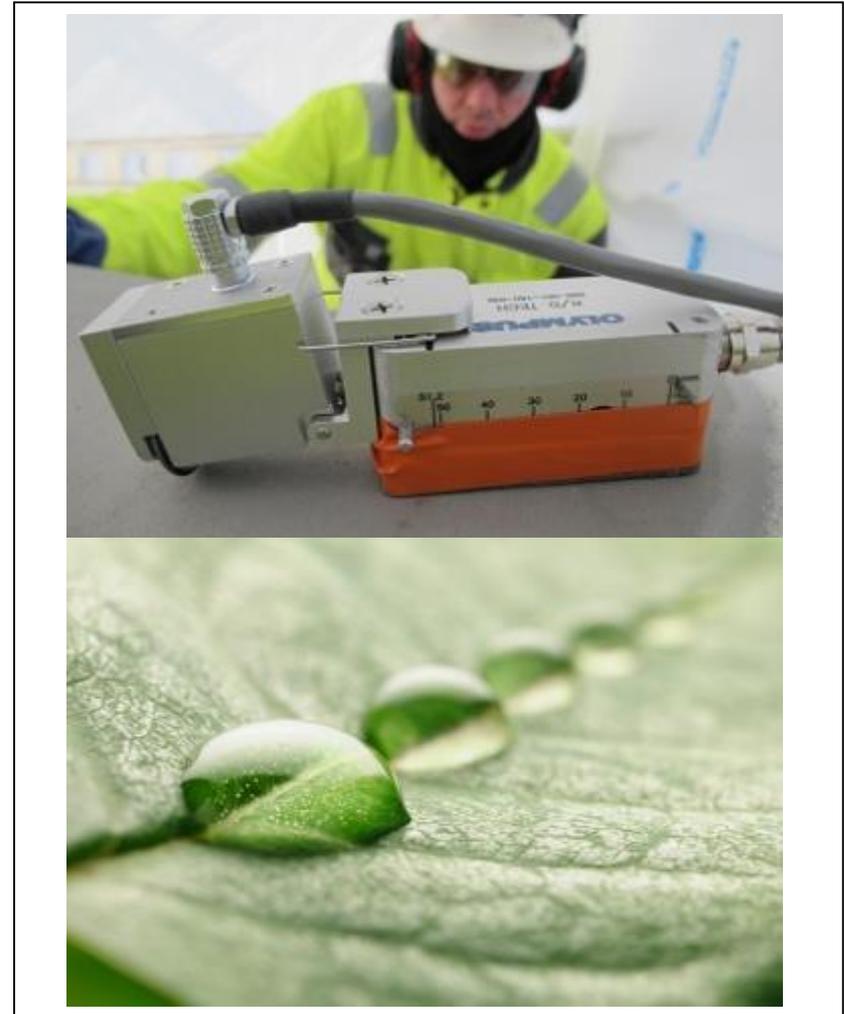
- In early 2013, AIM was challenged by the Kristin LPP project in Aker Solutions MMO. A crack had been detected in super austenitic piping produced for the project. The crack was detected during inspection at the factory, but pipes from the same batch had already been installed and painted offshore. The challenge was to inspect the 18" and 20" pipes without delaying the project, running up cost or remove the paint. AIM answered by offering the ECA inspection. Two calibration blocks were made from cut pipe of the same batch, provided by the project. Spark eroded cracks were made in the calibration blocks and one block was painted to the same standard as the pipes offshore. In march, two inspectors from the eddy current group within advanced inspection in AIM, travelled to Kristin. Approximately 60-70 meters of pipe was inspected in 12 days in freezing cold temperatures, which would have made MT or PT almost impossible. No paint was removed, the LPP project kept moving forward working around the two inspectors, no cracks were detected, the pipes were cleared and the LPP module was installed as planned on Kristin.
- A rough/low estimate on HSE benefits on this one job:
 - Eliminated apx. 60 hrs. sweep blasting of piping + preparations
 - Eliminated apx. 70 hrs. of recoating (incl. metallizing) + preparations
 - Eliminated use of apx. 100L inspection chemicals
 - Eliminated use of apx. 210 L. of coating chemicals (incl. epoxy, aluminium, silicone paint)



Eddy Current Array

Summary

- Today, magnetic particle testing (MT) and penetrant testing (PT), are the most commonly used methods for crack detection. They both depend on clean, bare metal surfaces and a lot of surface preparation is needed as possibility of detection (PoD) will always be limited to the cleanliness of the surface (i.e. cracks with dirt or oil residue will not be detected). Surface preparation and recoating after inspection include sandblasting and use of chemicals/paint, which represent a hazard through ergonomic and chemical exposure, as well as chemicals released to the environment. MT&PT inspection technique themselves also rely on use of chemicals.
- Following the hierarchy of controls, elimination or substitution are first priorities to prevent loss from hazards related to an activity.
- Eddy Current Array (ECA) is a development in eddy current technology (ET) able to replace conventional MT & PT testing.
- Use of ECA as a substitute for MT & PT will not only eliminate exposure to inspection chemicals but will eliminate the need of surface preparation and recoating in its entirety and thereby the ergonomic and chemical hazards related to it. In addition there is no environmental impact from chemicals release. The ECA method is time and cost effective, also having a positive effect on cost savings.



Rope Access instead of scaffolding

- Major cost saving
- HSE friendly.
- No need for scaffolding





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