Bildgebende Darstellung der Materialbeschaffenheit mittels Wirbelstromprüfverfahren

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Kurzfassung

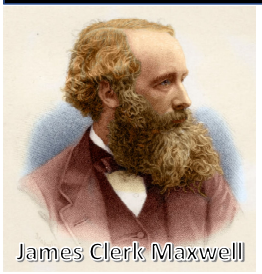
Das Wirbelstromprüfverfahren hat sich in den letzten Jahren als anerkanntes und vorteilhaftes Prüfverfahren etabliert. Die bildgebende Darstellung der Prüfungen, besonders auch durch die Geschwindigkeit, mit der sich Messdaten aufnehmen lassen, hat neue Möglichkeiten zur Qualitätssicherung an diversen Materialien und bei unterschiedlichen Verfahren durchgesetzt. In der Metall-Aditiven-Fertigung (am), wie auch beim Auftragsschweißen von unterschiedlichen Materialien (z.B. Kupfer auf Stahl), wird das Prinzip on-line, direkt während der Fertigung, eingesetzt um Fertigungsfehler unmittelbar zu erkennen und entsprechende Maßnahmen ergreifen zu können - eine Zeit- und Kostenersparnis durch die in-line Anwendung. Anwendungsbeispiele und die dafür entwickelten Sonden und Geräte werden vorgestellt.

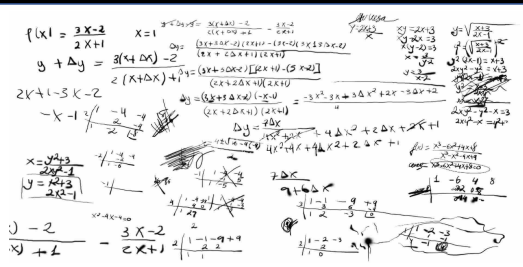
Die Präsentation wird auf Englisch sein.
The Presentation will be in English.

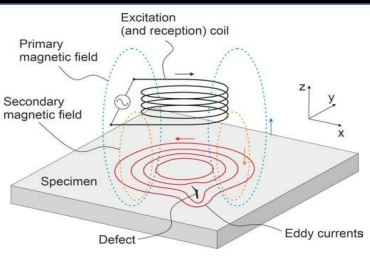
Eddy Current imaging of materials

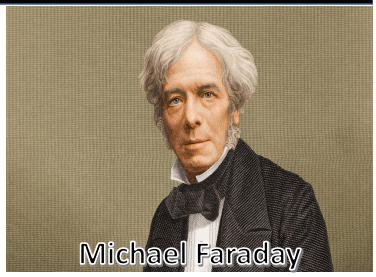
John Hansen – Managing Director and CTO, EThер NDE, St Albans, UK
Hauke Springer - Springer New Technologies Gmbh, Simmozheim, Germany

Introduction


James Clerk Maxwell






Michael Faraday

- Our historical use and understanding of Eddy Current testing methods on airframe and aerospace structures constructed of metals is well known and documented.
- From meter display instrumentation to phase plane display instruments the use of the Eddy Current method has met the challenges of industry.

Portable EC Units w/Unique features

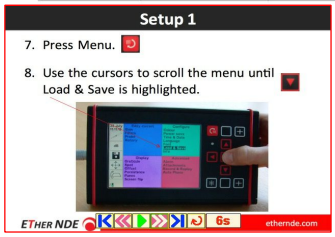
Offering industry leading eddy current performance, display and detection capability.

Features

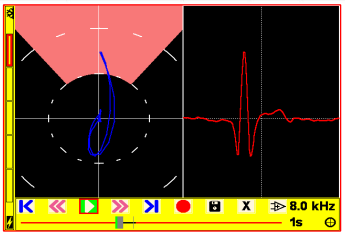
Equipment	Rotary	Data Recording	Dual Frequency With Auto-Mix	Conductivity	Guides	Loop	Trace	Enhanced Protection	Frequency
AeroCheck2	●	●			●	●	●	●	10Hz-20MHz
AeroCheck+	●	●	●	●	●	●	●	●	10Hz-12.8MHz

Features

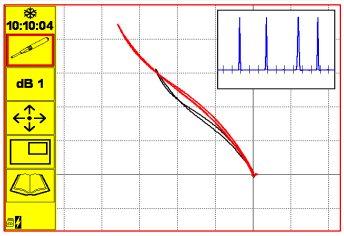
Equipment	Data Recording	Lift Off Gain Compensation	Conductivity	Guides	Loop	Trace	Enhanced Protection	Frequency
WeldCheck2	●			●	●	●	●	Single 10Hz-20MHz
WeldCheck+	●	●	●	●	●	●	●	Dual 10Hz-12.8MHz



OP & Procedure Guide



Record & Replay with Auto Mix



Trace & Loop

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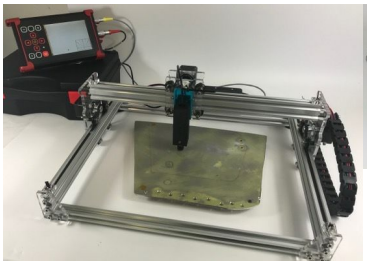
PHASECHECK Portable EC Instrument

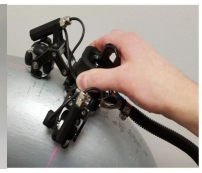
"A **picture is worth a thousand words**" – Eddy Current C-Scan imaging made easy

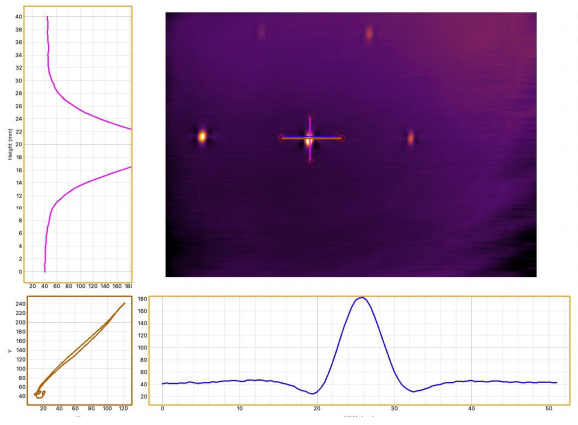
Dual Frequency High Performance Eddy Current Flaw Detector with C-Scan Capability – allows the connection of up to two encoders and two probes

The PhaseCheck instrument was used in conjunction with the EThet Imaging and Measurement Software for the detection and display analysis of these test.

Supporting Encoders and Manipulators







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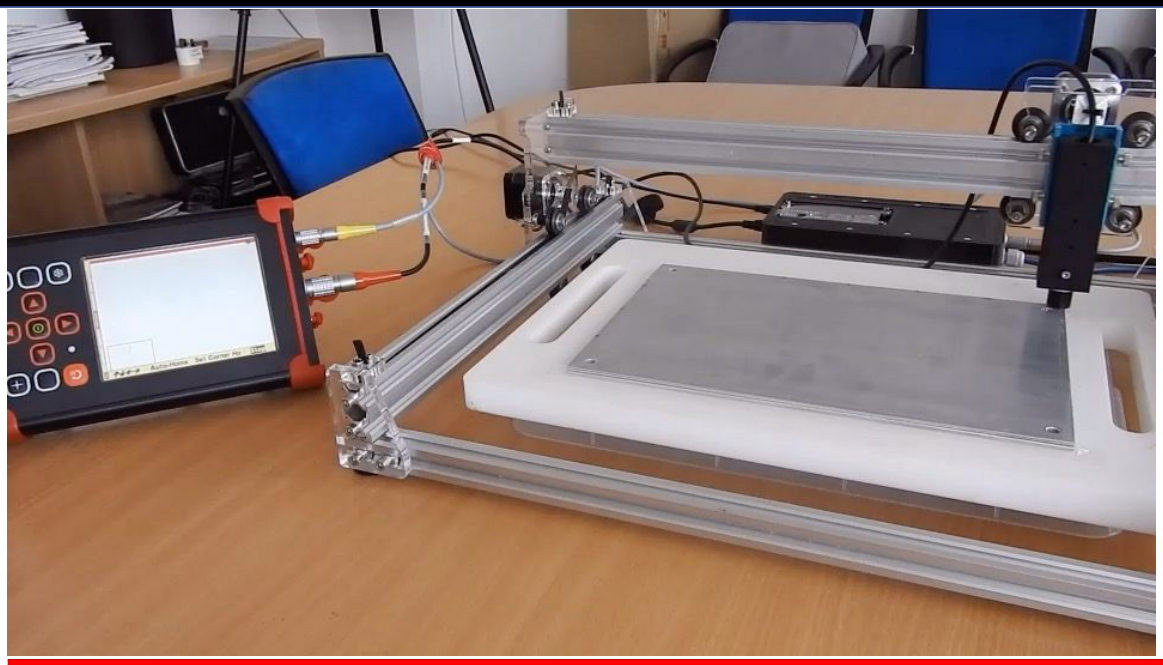
PhaseCheck

C-Scan Video



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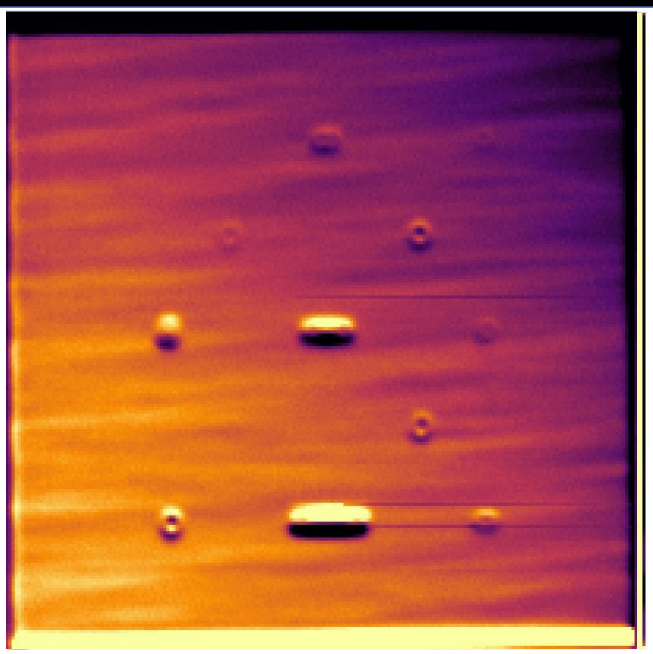
Stainless 316 Plate
2MHz Differential Bi Directional Probe

- Developed a directional EC probe both Absolute and Differential.
- 0.2mm deep by 0.2mm diameter FBH note visible
- Surface condition circa 200 um



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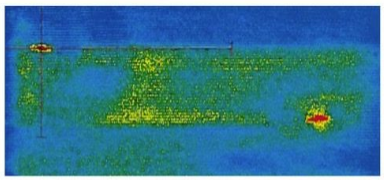
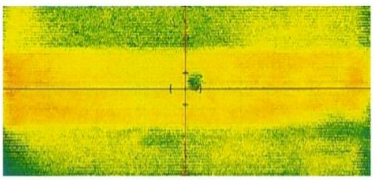
Carbon Steel Weld with Abs and 2D probe

Results on these welds are given in a paper presented at QNDE in 2018 by Manchester University, UK entitled [“Surface-Breaking Flaw Detection in Mild Steel Welds using Quantum Well Hall Effect Sensor Devices“] using co Z eqpt and R inspectors.

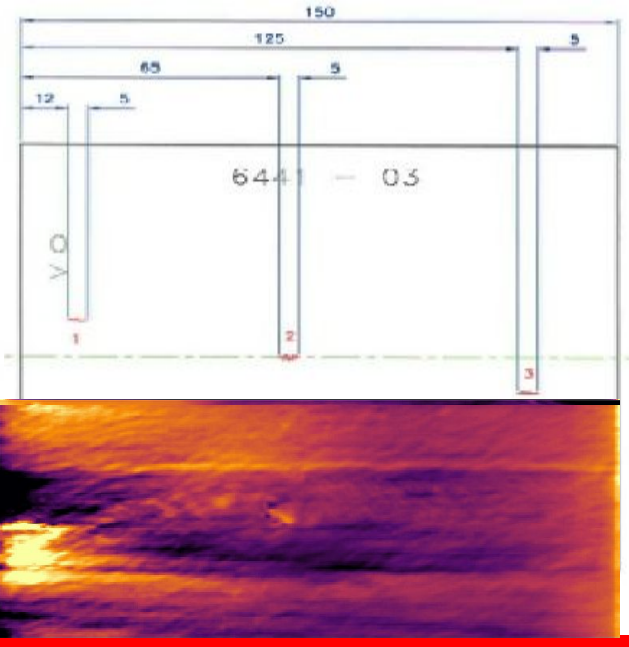


(a)



(b)

FIGURE 3. ECT phase shift images of complete weld scans of two samples from this study. (a) ECT indications of two 8 mm toe cracks on sample 6441-02. (b) ECT indications of 5 mm linear porosity cluster on sample 6441-03.



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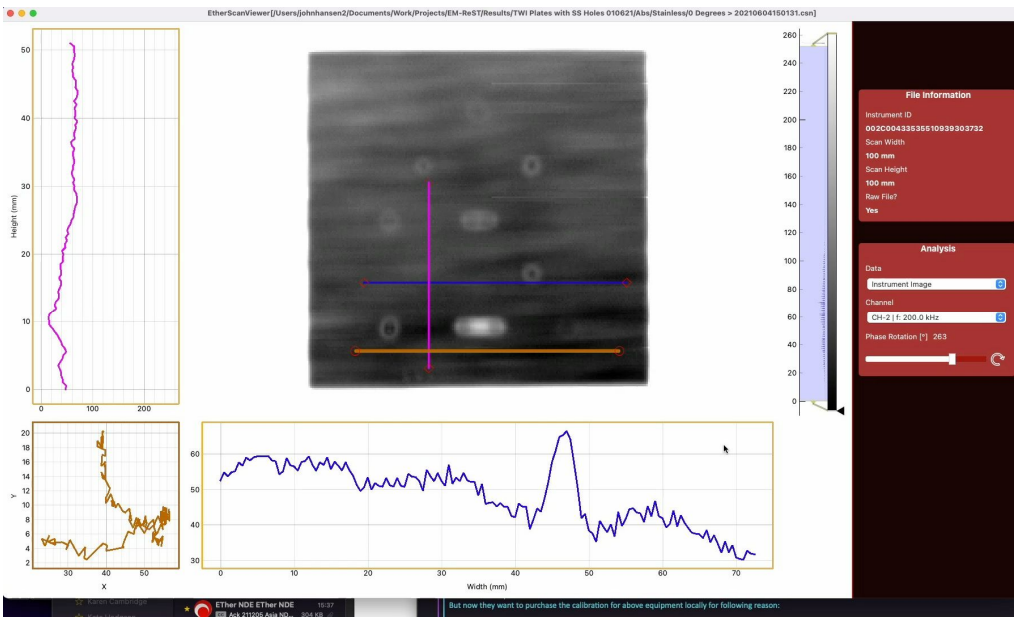
Demonstration of imaging/measurement SW



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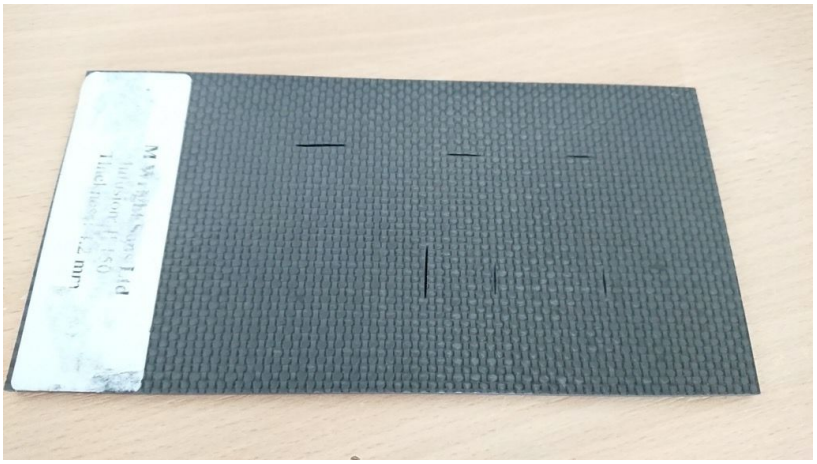
Carbon Fibre Notched 4.2 mm sample



Notches

Left to Right

Top

2.3mm deep by 17mm

1.28mm deep by 12mm

0.7mm deep by 10 mm

Bottom

2.5mm by 18mm

1mm by 11mm

0.9mm by 10.5 mm

Sample nominal 4.2mm but Right side 4.3mm left side 3.8mm

CFLUX

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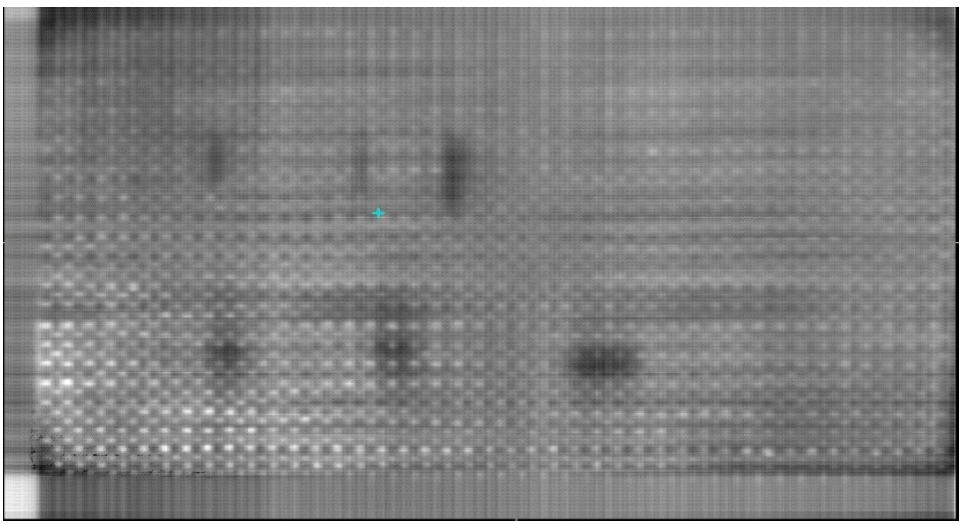
4mm Sample with surface notches



2MHz Pencil Probe at 4MHz @ 0.25 mm resolution (164215)

CFLUX

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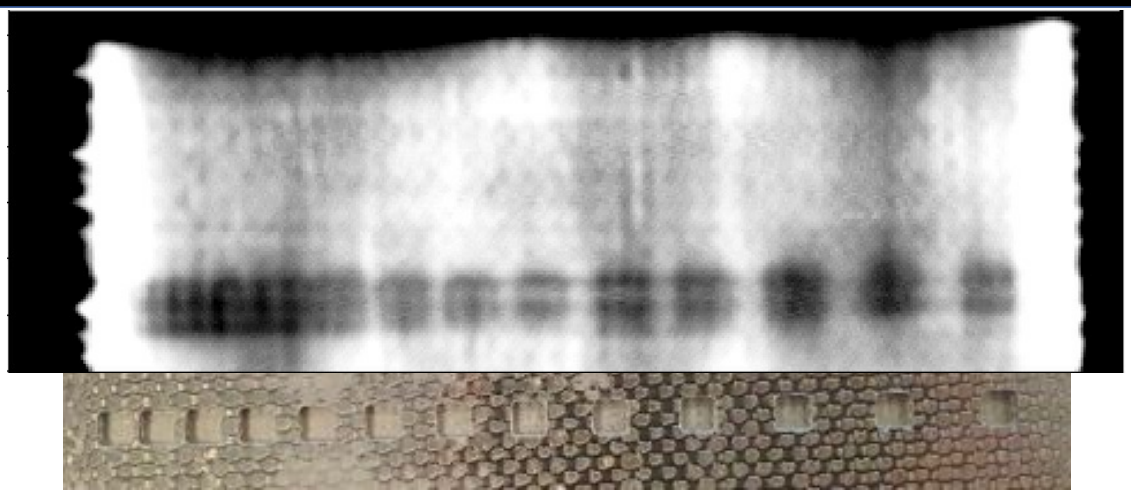
4.2 mm Resolution Sample



8mm TX-RX Probe @ 9MHz scan of 50% depth 6x6mm FB squares

CFLUX

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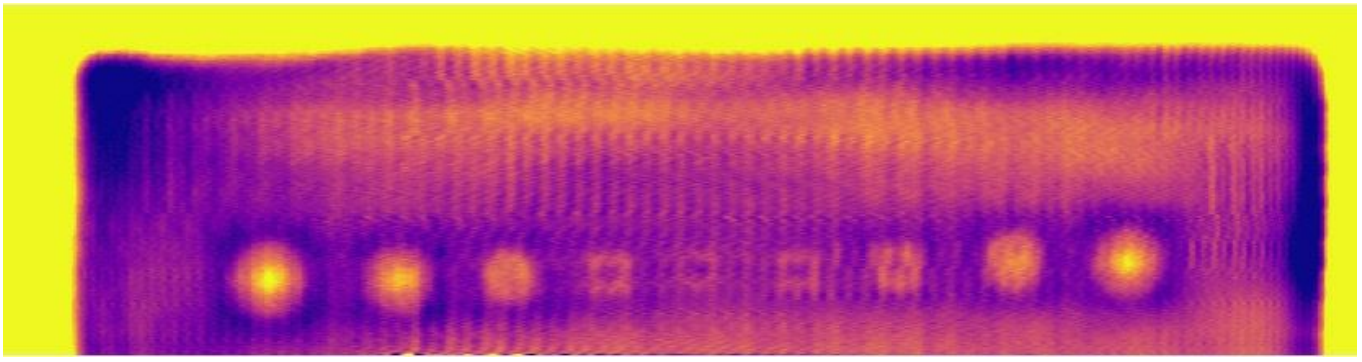
3mm CFRP 2 by 2 Twill 8 ply Sample Scan



9 embedded 1mm thick 10x2mm dia discs

CFLUX

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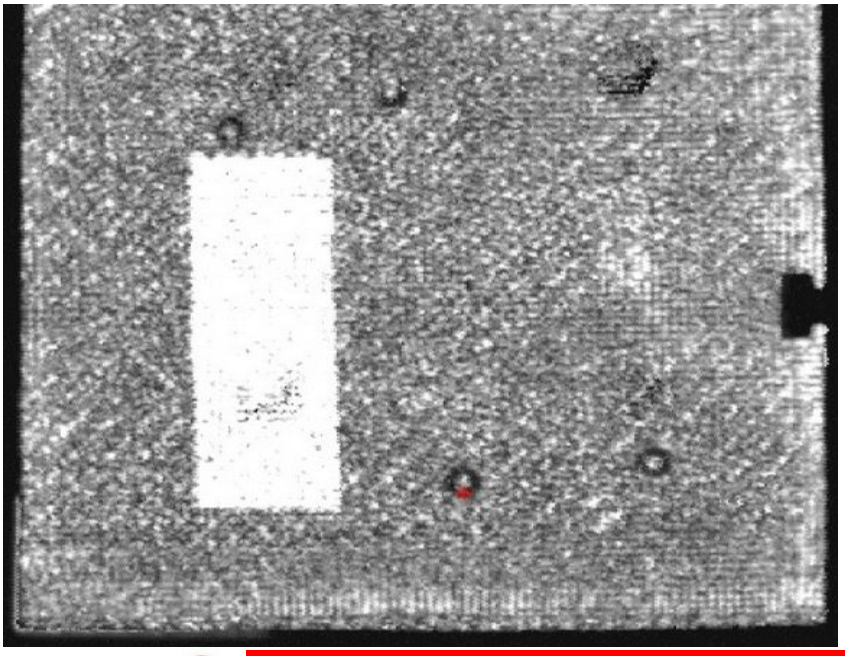
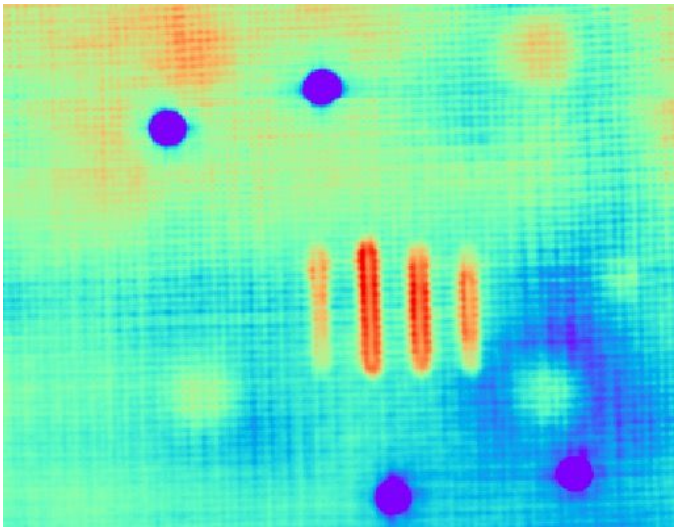
UT Compared with EC

Illustrating the Orthogonal nature of UT and EC





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On Loom Inspection Video

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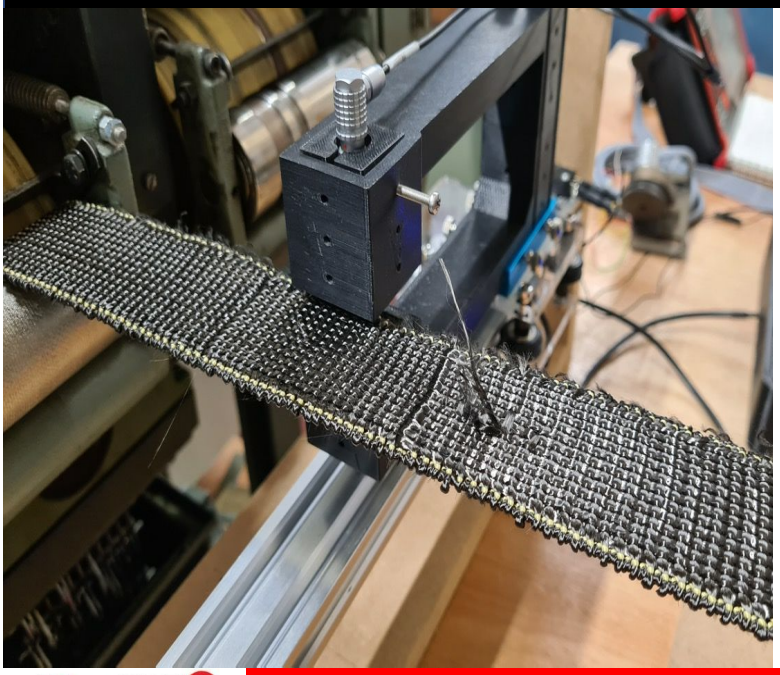
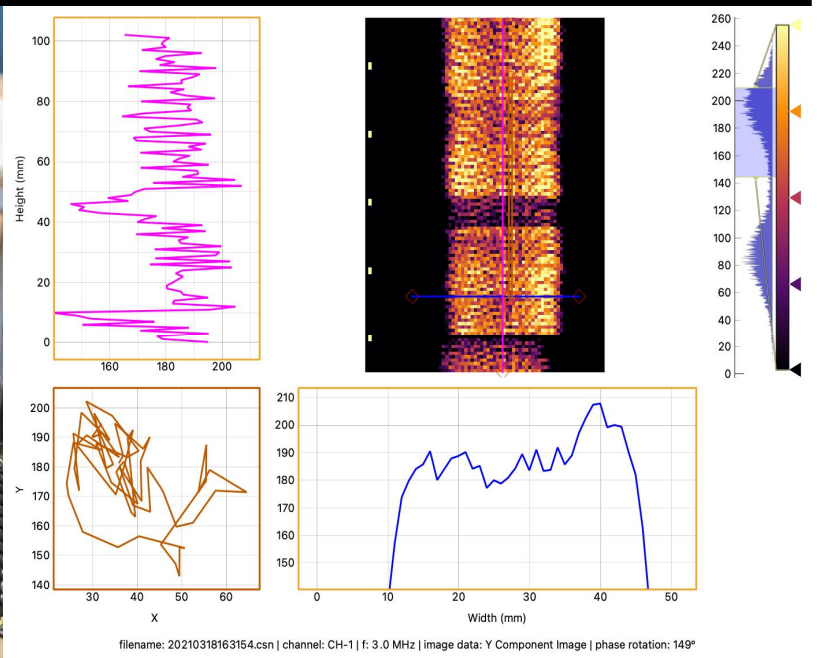
Defects detected





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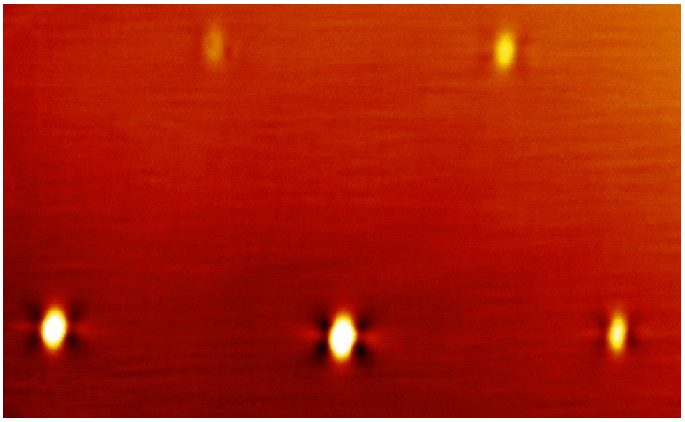
CONCLUSION

Why is this important?

"A **picture is worth a thousand words**"

Eddy Current is no longer held to the conventional conductive metal's applications.



As the industry is tasked with making lighter, cheaper parts and structures while still maintaining strength and integrity, Eddy Current methods are being re-visited to see how they can be applied to meet the detection criteria and demands of industry.

There is no silver bullet you still must ask the basic questions in order to best determine the method to use. With the advent of more powerful imaging and processing of raw data and probe design, Eddy Current continues to add its name to new and emerging processes.

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