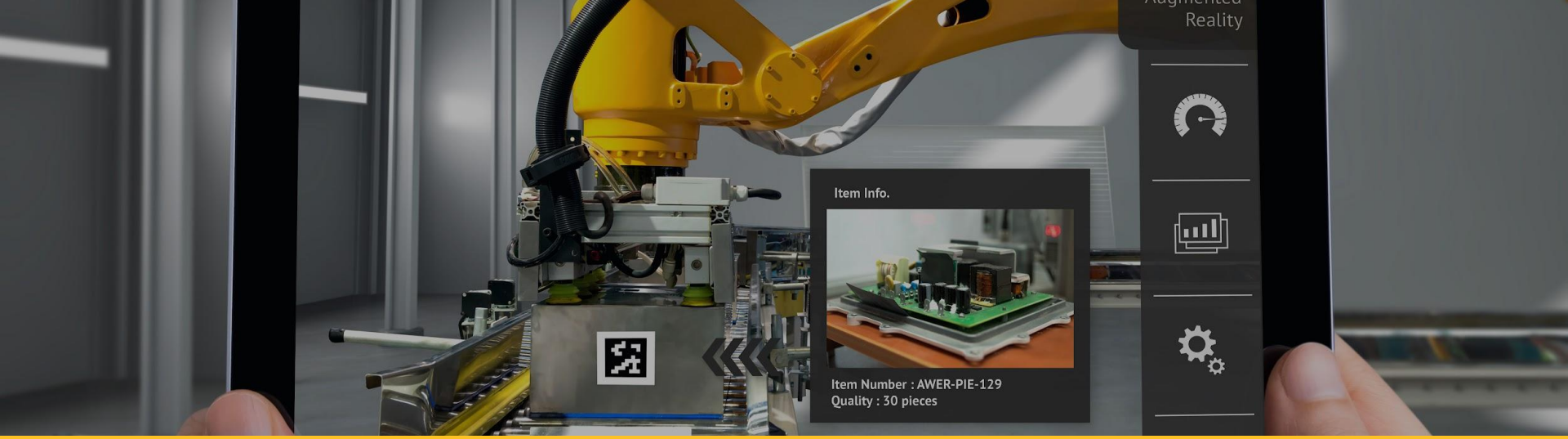


Final Showcase Event

Delivered by

CATAPULT Digital

Funded by

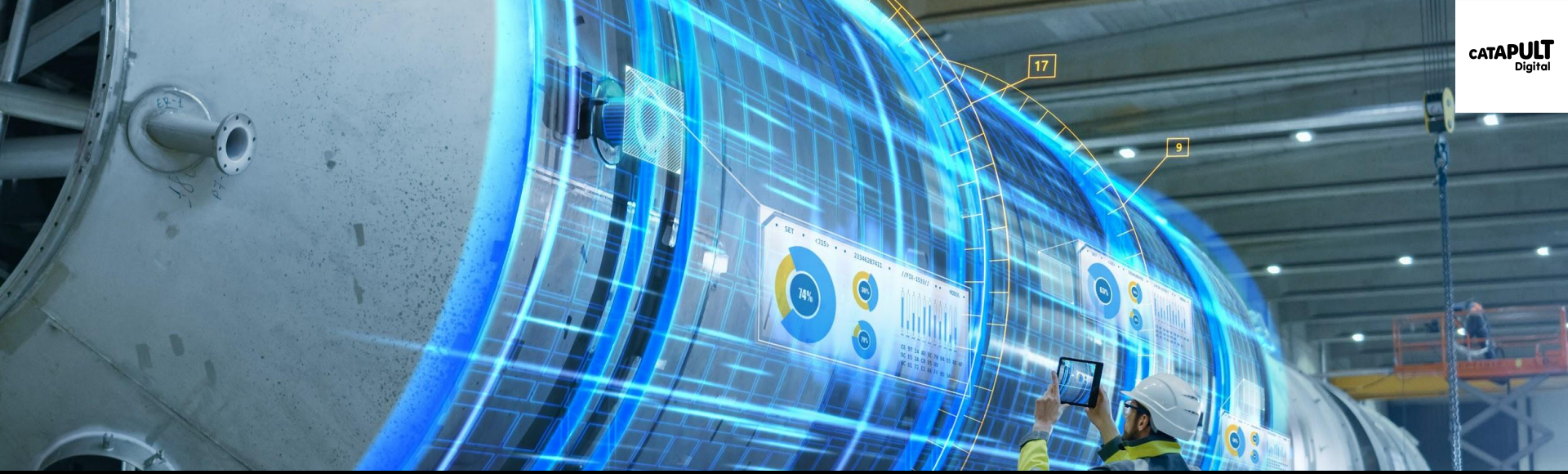
UK Research and Innovation

MADE SMARTER

TECHNOLOGY ACCELERATOR

Agenda

- **16:05 - Welcome Note**
  Dr. Jeremy Silver, CEO - Digital Catapult
- **16:10 - Programme Overview**
  Justin Cross, Head of Innovation & Programme Lead - Digital Catapult
- **16:20 - MVP Presentations**
  Babcock & Jetsoft
  Northumbrian Water Group & Riscon
  Safran Landing Systems & Total Control Pro
  BAE Systems & Machine Intelligence
- **17:00 - Message from Minister Rowley**
  Lee Rowley, Minister for Industry - BEIS
- **17:05 - Industry Panel Discussion - Taking Digital Innovation to Industrial Scale**
  Chair: Geraldina Iraheta, Chief Commercial Officer - Digital Catapult
  Nigel Harley, Internet of Things Specialist - Software AG
  Martin Male, Business Partner, Professional Services UK & Ireland - Verizon
  Sebastian Ansari, Supply Chain Transformation Senior Manager - Jaguar Land Rover
- **17:30 - Closing Remarks**
  Chris Courtney, Challenge Director - Made Smarter Innovation at UKRI



CATAPULT Digital

Welcome Note

Dr Jeremy Silver
CEO
Digital Catapult

MADE SMARTER | TECHNOLOGY ACCELERATOR

Programme Overview

Justin Cross
Head of Innovation + Programme Lead
Digital Catapult

MADE SMARTER | TECHNOLOGY ACCELERATOR

Made Smarter Technology Accelerator

Introduction

*"By 2030, the UK will be a global industrial leader in **creating**, adopting and **exporting** advanced digital technologies, shaping how the world does business"*

- Network of early adopters focused on recovering and **transforming industry** through advanced digital technologies
- Speed up understanding and **unlock known benefits** for the UK economy
- Drive innovation and digitalisation of the sector for **competitive advantage**
- Developing **cutting-edge technology prototypes** and solutions to core manufacturing challenges

Made Smarter Technology Accelerator

12 Months

7 Industry Challenge Owners

2 Technology Sponsors

14 Startup and medium business teams

5 Themes

12 Week prototyping development stage

21 Week minimum viable product development stage

2 Showcases

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CATAPULT Digital

Industry Challenge Owners

CATAPULT Digital

babcock

BAE SYSTEMS

GAF

NORTHUMBRIAN WATER living water

oneills

SAFRAN

Sainsbury's

MADE SMARTER | TECHNOLOGY ACCELERATOR

Industry Challenge Owners

babcock

BAE SYSTEMS

GAF

NORTHUMBRIAN WATER living water

oneills

SAFRAN

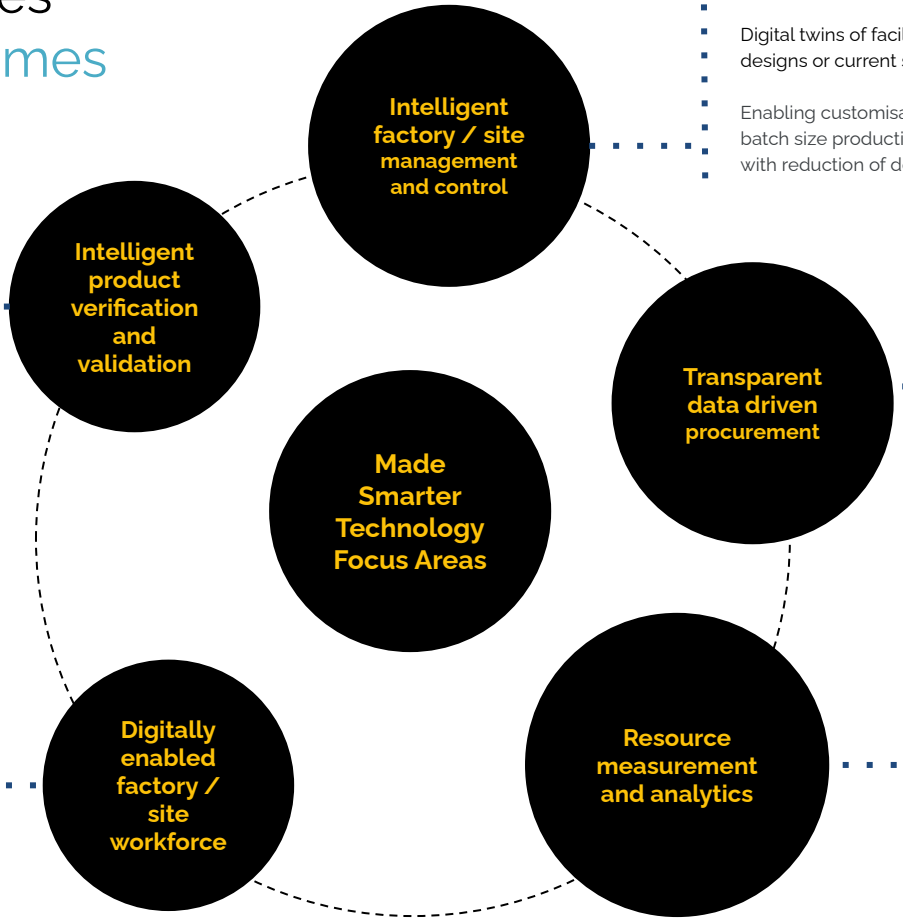
Sainsbury's

Technology Sponsors

software AG

verizon

Made Smarter Themes
and example Subthemes



Intelligent factory / site management and control

- Track and trace systems for assets and orders
- Digital twins of facilities & processes to optimise future designs or current state
- Enabling customisation: adapting processes to smaller batch size production, rapidly configurable processes with reduction of design and production time.

Intelligent product verification and validation

- Real time/in process quality monitoring
- Transforming product design through verification and validation of manufactured components
- Virtual product testing, verification and validation, quality monitoring and inspection.

Transparent data driven procurement

- End to end supply chain visibility and effective risk management
- Sustainable supply chains through distributed manufacturing capability marketplace
- Transparency of contracted manufacturing operations

Digitally enabled factory / site workforce

- Flexible /distributed manufacturing using a flexible network of supply and skills to manage volatility/disruption effectively.
- Digitally assisting workforce through understanding of real work using data from people and industrial systems, with augmented reality and work instruction
- Warehouse and logistics optimisation

Resource measurement and analytics

- Demand management, sensing and shaping
- Improved decision-making through analytics and artificial intelligence (AI)
- Dynamic, real time production planning and scheduling

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Supporting innovation across four technology layers

CATAPULT Digital

Future Networks – 5G - IoT

- 5G
- Internet of Things
- Low-Power Wide Area Networks, NB-IoT,
- LIFI including sensors, edge devices and wearables

Immersive technologies

- Extended reality
- Virtual
- Augmented
- Mixed reality
- Haptics

Artificial Intelligence and machine learning

- Natural Language Processing
- Machine vision
- Deep learning

Distributed ledger technologies and distributed solutions

- Blockchain etc.
- Permissionless
- Permissioned
- Hybrid
- Smart contracts

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Made Smarter Technology Accelerator

Industry Challenges

Babcock International Group

1. Warrior base overhaul
2. Digital shipbuilding

BAE Systems

1. Scalable AI for visual inspection
2. Dynamic workflow management

GAF

1. Asphalt material characterisation
2. Machine vision for product conformance

Northumbrian Water Ltd

1. Sewer blockages Smart Porcupine
2. Water network monitoring and real time analysis

O'Neills International

1. Product customisation
2. Automation of production

Safran Landing Systems

1. Adaptive scheduling + performance monitoring
2. Implementation of SPC no all test rigs in assembly shop

Sainsbury's

1. Microbial control in ready to eat foods
2. Increasing shelf life of products while reducing waste

Made Smarter Technology Accelerator

Programme Timeline

January

Open Call

Applications live until

22nd February

February

Judging + Selection

Final 14 teams

selected + contracted

March - May

Prototyping Phase

12 weeks

29th March - 23rd June

June

Judging + Showcase

Prototype Presentation on

23rd June

July - November

MVP Development Phase

4 teams, 21 weeks

19th July - 9th Dec

December

Final Showcase

End of programme event

9th Dec

MADE SMARTER TECHNOLOGY ACCELERATOR

Cohort

CATAPULT Digital

Ascalia

CAE TECH

DIEMinnovations

INNVOTEK

JetSoft Data Solutions for NDT

MI Machine Intelligence

METIS AUTOMATION

PENTIOT

RISCON

SINGULAR INTELLIGENCE

TotalControlPro

VOLATILE

Zetamotion

zizo Analytics. Accelerated.

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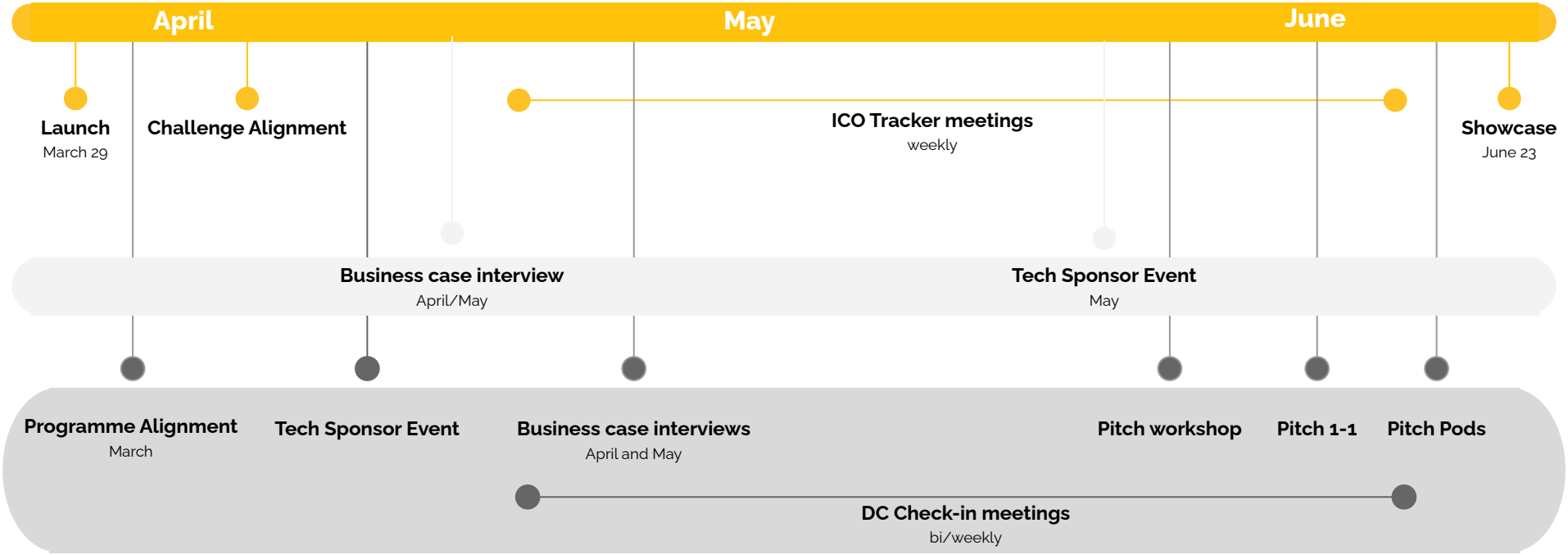
Prototype Development stage



MADE SMARTER TECHNOLOGY ACCELERATOR

MVP Cohort

Warrior base overhaul

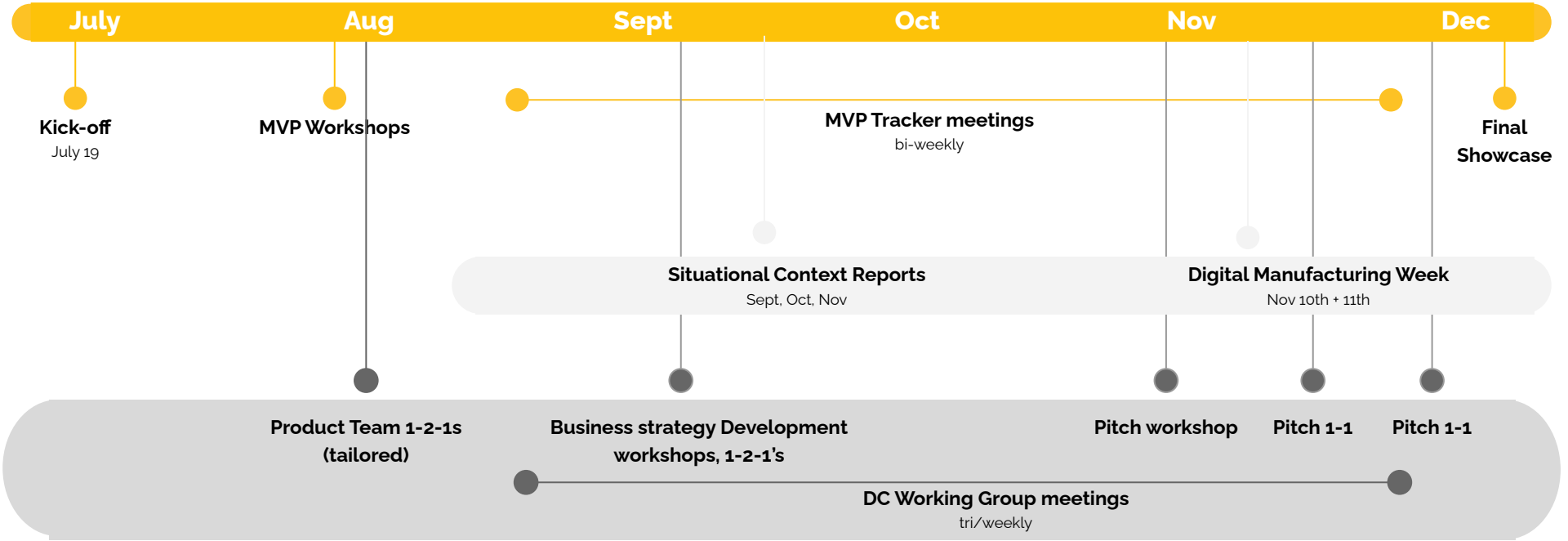
Water network monitoring and real time analysis

Scalable AI for visual inspection

Adaptive scheduling and performance monitoring

Made Smarter Technology Accelerator

MVP Development stage



MADE SMARTER | TECHNOLOGY ACCELERATOR

CATAPULT Digital

MVP Presentations

MADE SMARTER

TECHNOLOGY ACCELERATOR

babcock™

JetSoft
Data Solutions for NDT

Challenge: Warrior base overhaul

Jim Sibson,
Babcock
Group Head of Research & Partnerships

babcock™

Babcock introduction

December 2021

Classification: UNCLASSIFIED

What we do

We are an international aerospace, defence and security company.

We have a leading naval business, and provide value-add services across the UK, France, Canada, Australasia and South Africa.

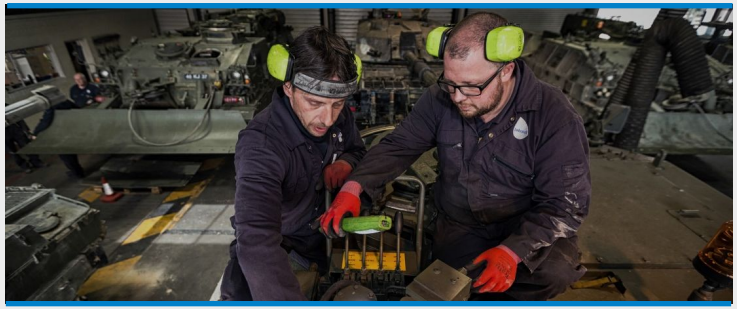
We also operate in, and export to, additional markets.

Creating a safe and secure world, together

Classification:UNCLASSIFIED

What we do UK Defence: Land

Vehicle support



- Through-life support and fleet management for c.32,000 British Army vehicles from protected mobility vehicles to main battle tanks
- Procurement activity on behalf of the customer
- Procure, maintain and repair c.2,000 army heavy construction vehicles
- Provide and maintain armoured fighting vehicles at the British Army's centre of excellence for armoured warfare training

Training

- Largest external provider of training to the British Army
  - c.21,000 soldiers every year
  - c.750,000 training days every year
- Royal School of Military Engineers (RSME)
- Royal Electrical and Mechanical Engineers (REME)

Classification:UNCLASSIFIED

Digital Overhaul – Integration and visualisation of systems

Background:

- The MOD currently own c750 Warrior Armoured Fighting Vehicles, built in 1988
- Babcock DSG is contracted to carry out a continuous programme of Base Overhauls, a key element of these is to ensure the integrity of the vehicle hull - the armoured shell of the vehicle
  - The hull is stripped down to its bare condition, critical dimensions measured using FaroArm technology and stringent Non-destructive Testing (NDT) conducted to determine any delamination of the alloy
- It is not currently possible to bring the measurements and assessments together on to the Babcock IT system. Therefore all checks are done on standalone laptops and manually extracted and entered on to a spreadsheet
  - This creates delay, does not allow for large data to be collected and analysed and does not provide for accurate recording

Objective:

- Assess, develop and deliver a joined up system that provides for 3D measurements and NDT to be collated and assessed as one, with the data available to assure hull integrity and suitability for overhaul
- Demonstrate the effective build up of information in layers and the visualisation of this information

A – Original Condition

B – Stripped to Bare Hull

C – Completed Base Overhaul

Classification:UNCLASSIFIED

babcock™

JetSoft
Data Solutions for NDT

Challenge: Warrior base overhaul

Tom Martin,
Jetsoft
CEO & Founder

JetSoft

Babcock Warrior challenge

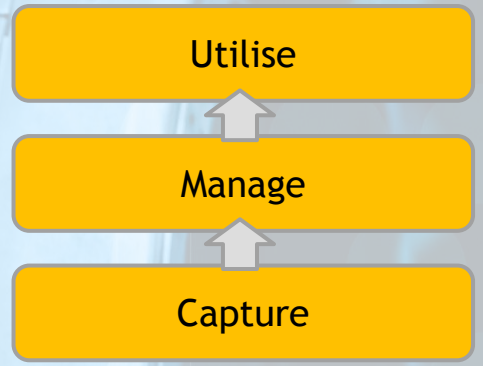
Made smarter program showcase

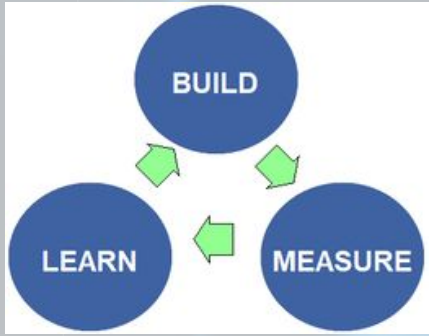
9th December 2021

Tom Martin
Tom.Martin@JetSoft.co.uk
Commercial in confidence

About JetSoft

- A software and data company
- Specialists in inspection data
- On a mission to deliver solutions which improve the capture, management and utilisation of inspection data





Inspection data has the power to revolutionise manufacturing

Harnessing inspection data offers a range of benefits, including:

- Improved Yields
- Waste Reduction
- Leaner Processes
- Increase Right First Time

Tom Martin
Tom.Martin@JetSoft.co.uk
Commercial in confidence

The Challenge

1. *"The solution should include 3D measurements and NDT to be collated and assessed as one, with the data available to assure hull integrity and suitability for overhaul"*

2. *"Babcock is looking to visualise and track information digitally so that this process will no longer be conducted through a combination of standalone laptops and manual data. We are on the search for a solution that improves capacity to recall and compare information and records, as well as traceability and time reduction"*

Tom Martin
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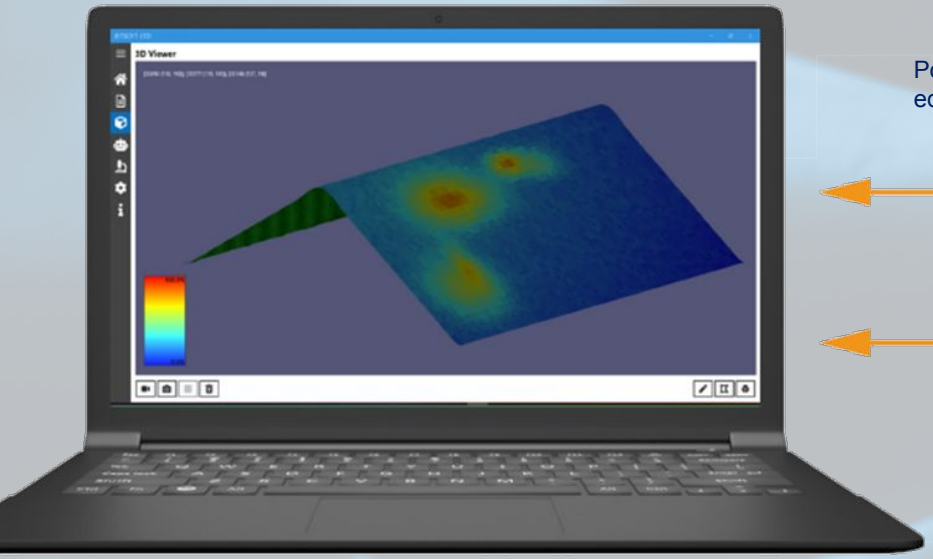
Commercial in confidence

Capture Solution – Coplot

Integrating CMM positional data with handheld ultrasound inspection information



Positional equipment

JetSoft designed electronic control box
Scalable for different inspection equipment and data I/O

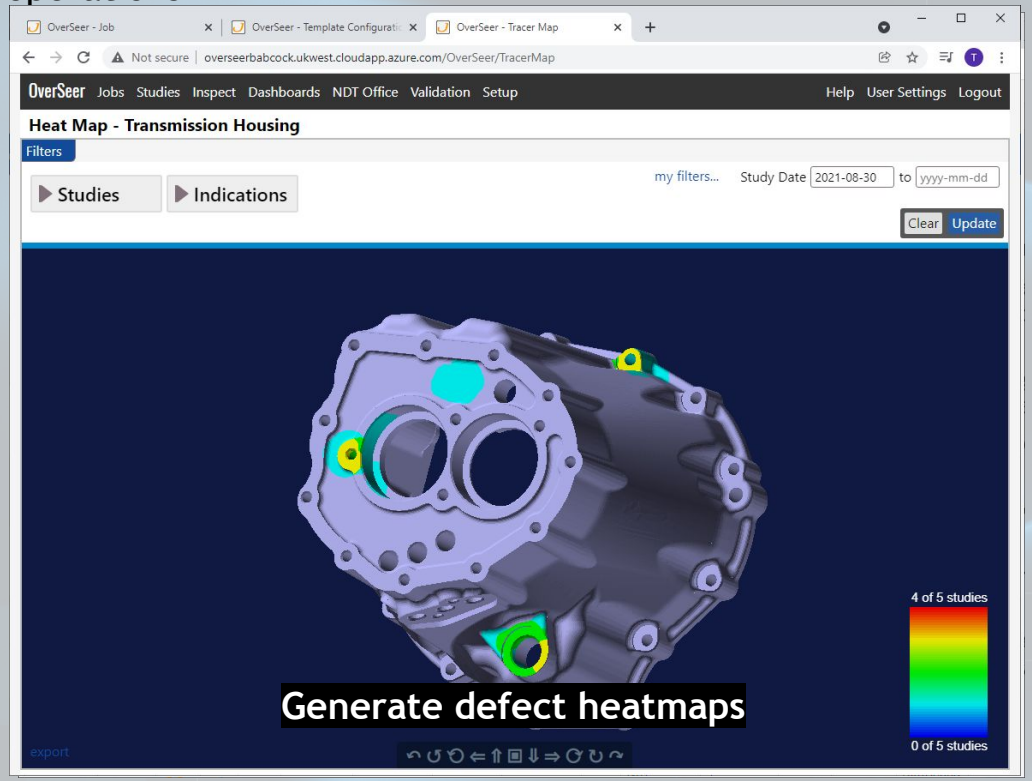
Inspection equipment

- Fuse data from positional systems with that from inspection equipment
- Agnostic solution which can be extended to support any positional and inspection equipment
- Create, view and analyse 3D inspection data
- Improved traceability from otherwise manual inspection processes
- Ensure full coverage
- Collected meta data and compile reports

JetSoft

Management solution - DigiOps

An adaptable and flexible system for digitising shopfloor operations



Generate defect heatmaps

- Deployed on premise on a centralised server to ensure data security
- Modern web interface accessible from an on-site location with no install required
- Administrative tools for digitising existing paper based processes
- Manage jobs which are collections of work items
- Associate inspection data with locations
- Progress tracking and workflow management
- Automatically catalogue inspection data from Coplot
- Tools to easily filter, find and interrogate inspection data

JetSoft

Any questions?

Tom Martin
Director
E: Tom.Martin@JetSoft.co.uk
T: +44 (0) 113 4931007

JetSoft

NWG living water

RISCON

Andrew Blenkharn,
Northumbrian Water Group
Network Performance Coordinator

Challenge: Water network monitoring and real time analysis

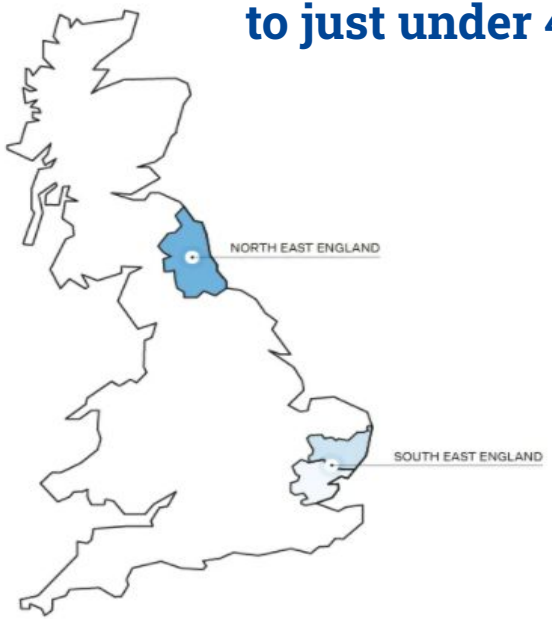
NWG
living water

MADE SMARTER TECHNOLOGY ACCELERATOR

Andrew Blenkharn

29/11/2021

NWL supplies water and sewerage services to just under 4.4 million people.



NWL employs just under **3,000** people and operates:

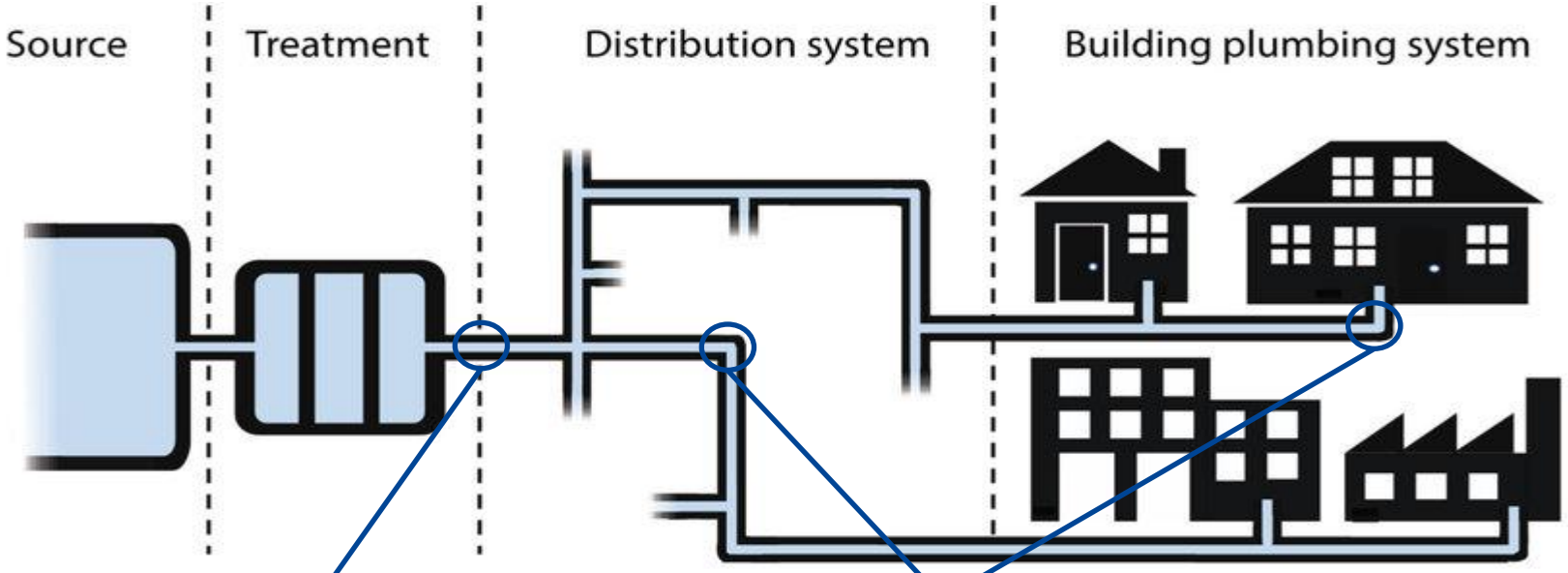
- **53** water treatment works
- **394** water pumping stations
- **341** water service reservoirs
- **26,200.20** km water mains
- **410** sewage treatment works
- **1,007** sewage pumping stations
- **30,106** km sewers

Every day we supply 1,104 megalitres (1.1 billion litres) of water.

Annual performance is monitored against a wide range of targets and is incentivised through rewards and penalties

NWG living water

MADE SMARTER TECHNOLOGY ACCELERATOR
THE CHALLENGE



24/7 monitoring.
High accuracy.

Manual sampling programme.
Customer contacts.

NWG living water

MADE SMARTER TECHNOLOGY ACCELERATOR
OUTPUTS AND EXPERIENCES

- A new water quality sensor and dashboard built from scratch
- It is currently installed on the NWL water network and testing is ongoing
- Results will determine the next phase, hopefully a wider deployment

NWG living water

NWG living water

RISCON

Challenge: Water network monitoring and real time analysis

Roger Singleton, Riscon

Managing Director

NORTHUMBRIAN WATER living water

INVENTIA UK

RISCON

Integrated Water Supply Monitoring (ITERATION)

"A partnership for a safe water future"

Made Smarter Technology Accelerator
Pitching Workshop 9th December 2021

Presented by Andrew Blenkharn and Roger Singleton

Why this journey?

RISCON INVENTIA UK

*"A **partnership** for a safe water future"*

Needs and Trends

Populations Increasing

Key Resources Dwindling

People Expect More Service

Risks are Changing (Climate)

Technology Rapidly Developing

[redacted]

How do water companies maintain a stable interface in changing times?

NORTHUMBRIAN WATER *living water*

Environment

Consumer

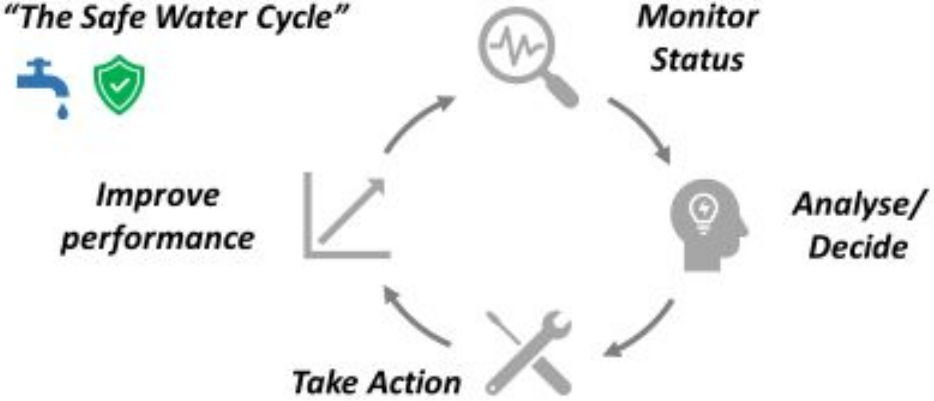
Safe water management is a **necessity!!!**

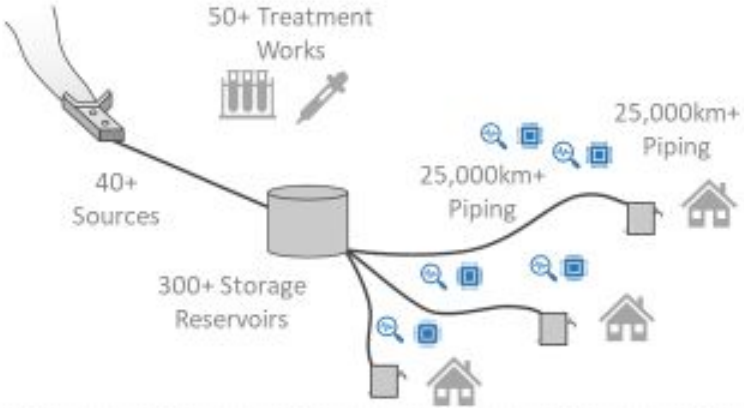
Safely Managed Water…

RISCON INVENTIA UK

*"A **partnership** for a safe water future"*

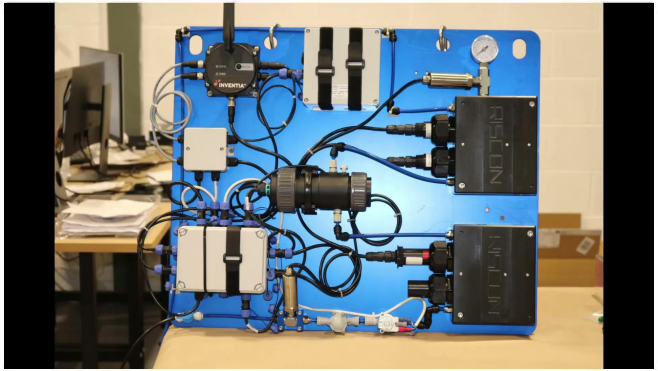
"The Safe Water Cycle"



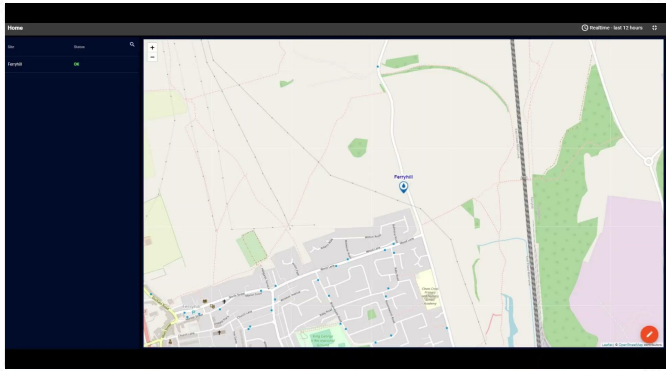


"The Solution"

Monitor



Analyse/Decide



Creating Impact…

RISCON INVENTIA UK

*"A **partnership** for a safe water future"*

Impact on Operations

Current Method
Manual Sampling

180,000
Data points per year

Sensors deployed across the network

+42 million

*200 x **MORE** data points per year*

@Estimated £100/test, reducing 25% of these manual samplings
= £4 million/annum saving *(Subject to regulatory approval)*

Regulatory Financial Impact

Current Financial Penalties
£6 million/annum

Safely Managed Water Technology

@25% improvement =
£1.5 million/annum saving

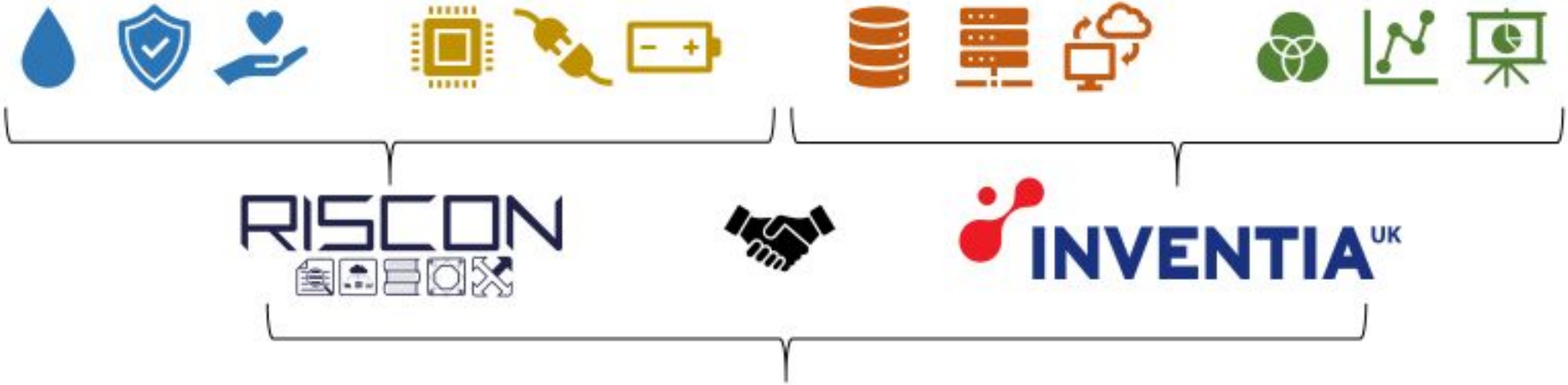
@50% improvement =
£3 million/annum saving

Two become one. Riskoa is born…

RISCON INVENTIA UK

*"A **partnership** for a safe water future"*

A holistic view…

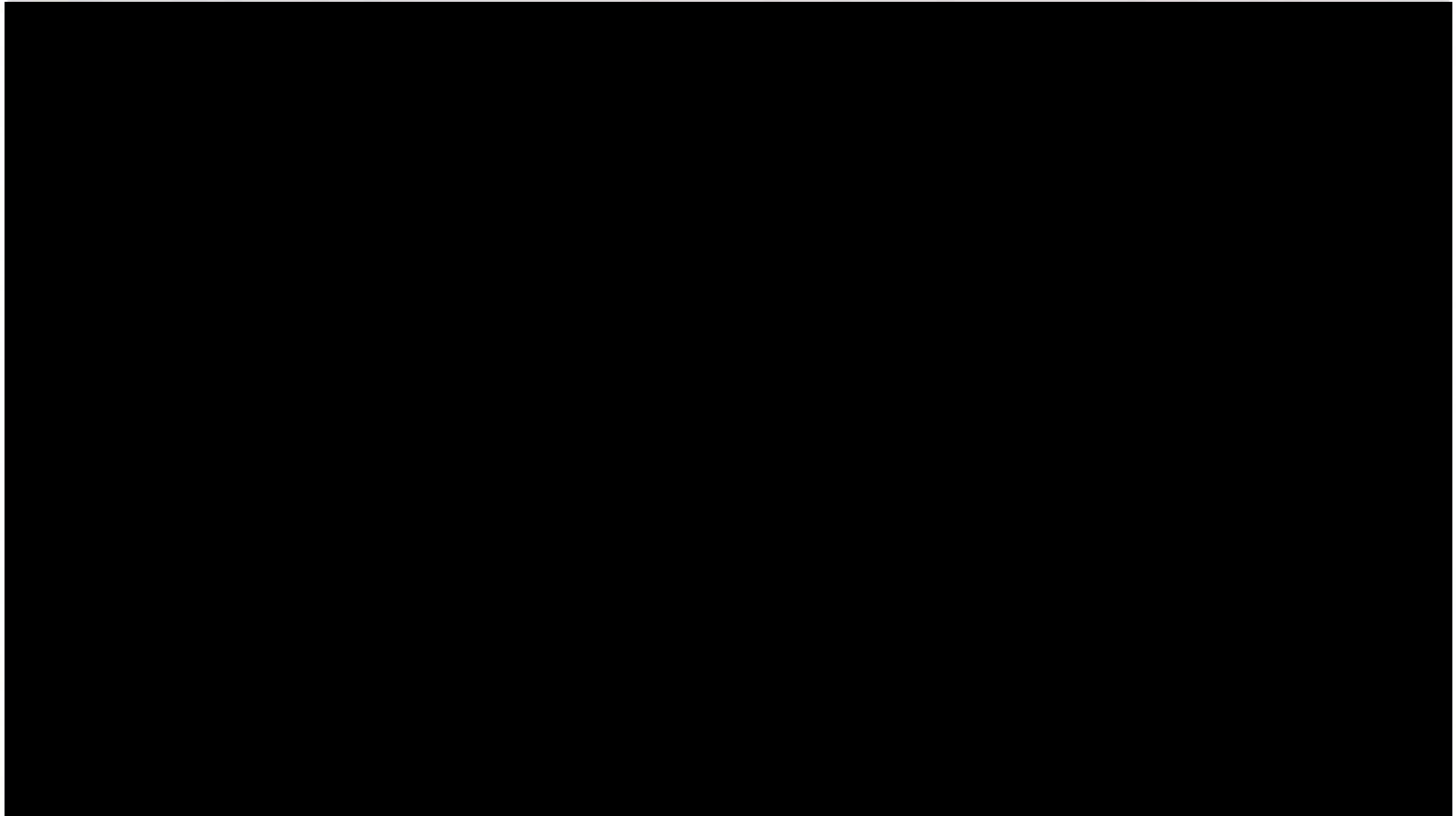


RISKOA

Watsion Clarity ©

Supporting the *Safe Water* journey…

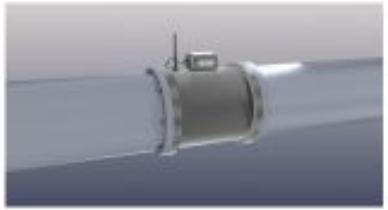
RISKOA



Where next?

RISKOA

5 Month MVP



NORTHUMBRIAN WATER living water

CATAPULT Digital

RISKOA

Watsion Clarity ©

RISKOA

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Company No: 13688831
Registered in England & Wales

Thank you for your time!!!

SAFRAN

TotalControlPro®

Challenge: Adaptive scheduling and performance monitoring

Par Eliasson,
Safran Landing Systems
Industrial Project Leader

SAFRAN

TotalControlPro®

Adaptive Scheduling and Performance monitoring in Support of Shop Floor Execution

MADE SMARTER

TECHNOLOGY ACCELERATOR

- Prioritise work effectively at work centres
- Data driving decisions is static and not live – so issues are not resolved at the right time
- Scheduling based on priority lists produced from large, complex data sets from different sources – **Result depends on the skill and experience of the planner**

- System based decision making
- Helping us making sense of complex data
- Teams can be self-sufficient in executing the plan
- Reducing lead time and inventory
- Moving to 100% OTD
- No more expediting!

SAFRAN

TotalControlPro®

Challenge: Adaptive scheduling and performance monitoring

Dorian Smellie,
Total Control Pro
CEO

TotalControlPro®

Where Passion Meets Productivity

ADAPTIVE PLANNING
for complex processes

"Net Zero, Brexit, Covid and global competition for efficiency & productivity has accelerated the drive to produce more, waste less and optimise the use of all resources; machines, materials, inventory and labour"

SAFRAN

MADE SMARTER

Part of the minimum viable product phase cohort

TECHNOLOGY ACCELERATOR

PRODUCTIVITY – EFFICIENCY - SUSTAINABILITY

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MADE SMARTER | TECHNOLOGY ACCELERATOR

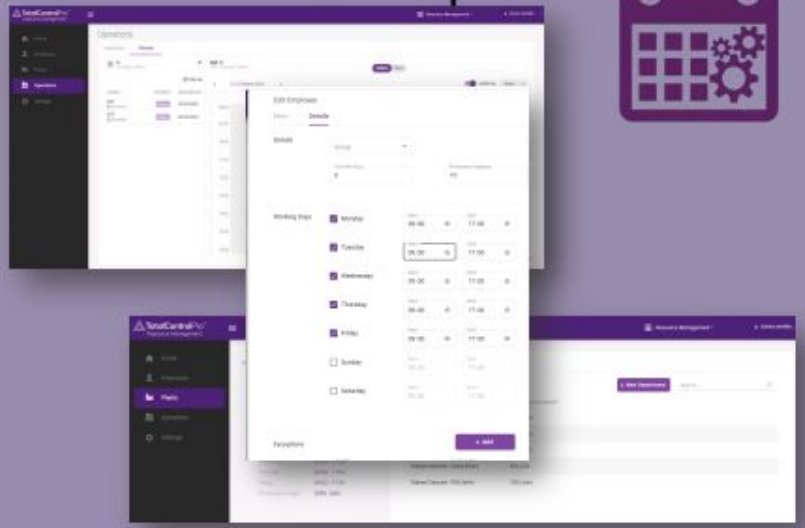
TotalControlPro®

Experts In Process

Adaptive Scheduling & Performance Monitoring

for SAFRAN

- ‘Right resources…
- …at the right place,
- …at the right time,
- …doing the right task,
- …for the right job’



Taking a Powerful Platform and making it learn

Enabling Smarter Factories

Integrated Dynamic Planning for discrete prismatic Cell Production.

Optimising productivity by applying AI and Machine Learning to shopfloor planning, scheduling and monitoring.

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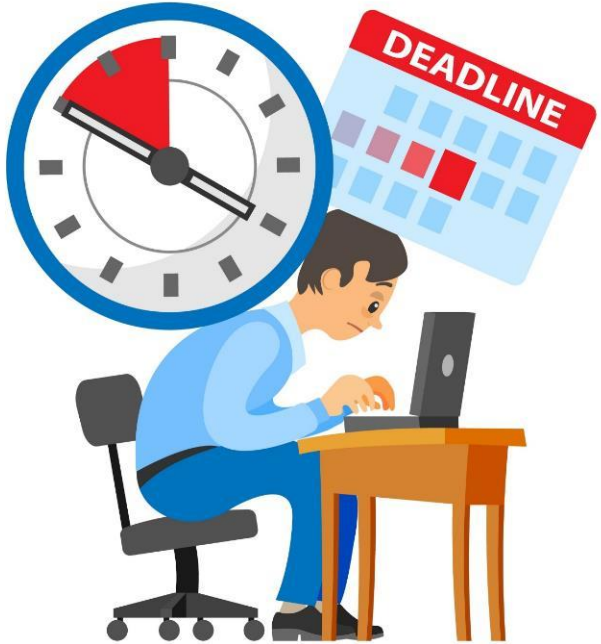
PLANNERS UNDER PRESSURE



TotalControlPro®

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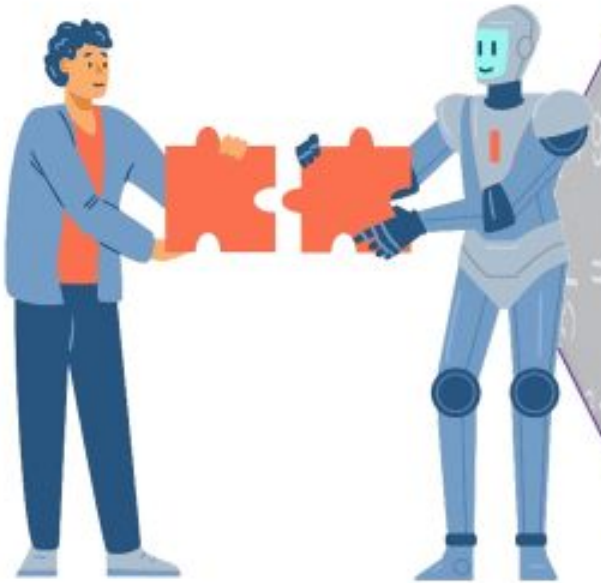
MONITOR, ANALYSE, ORGANISE, SCHEDULE, INSTRUCT & LEARN



- ‘RIGHT RESOURCES
- ...AT THE **RIGHT PLACE,**
- ...AT THE **RIGHT TIME,**
- ...DOING THE **RIGHT TASK,**
- ...FOR THE **RIGHT JOB.**

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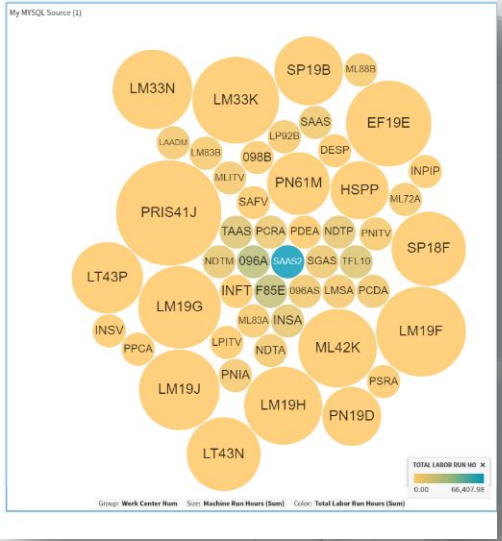
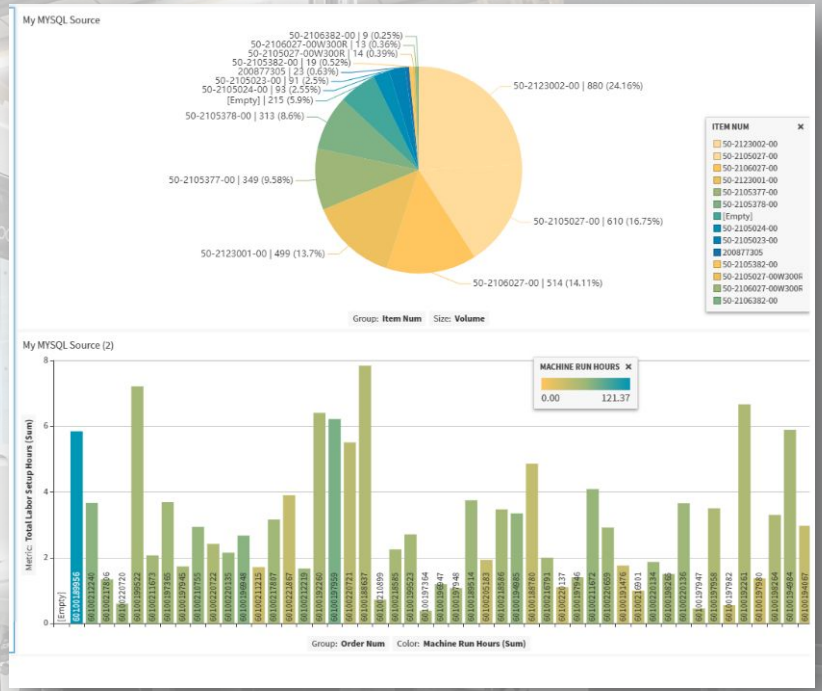
THE APPROACH
… UNDERSTAND THE ‘PAST’





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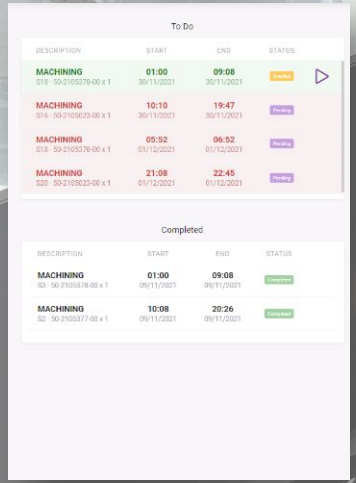
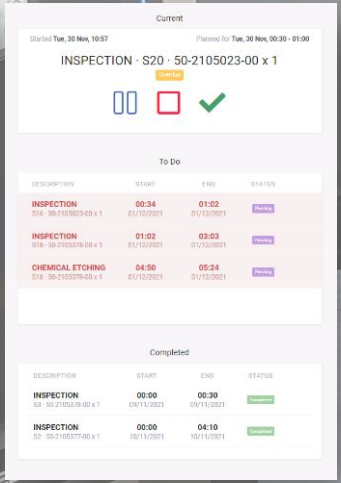
THE APPROACH
… MEASURE THE ‘PRESENT’





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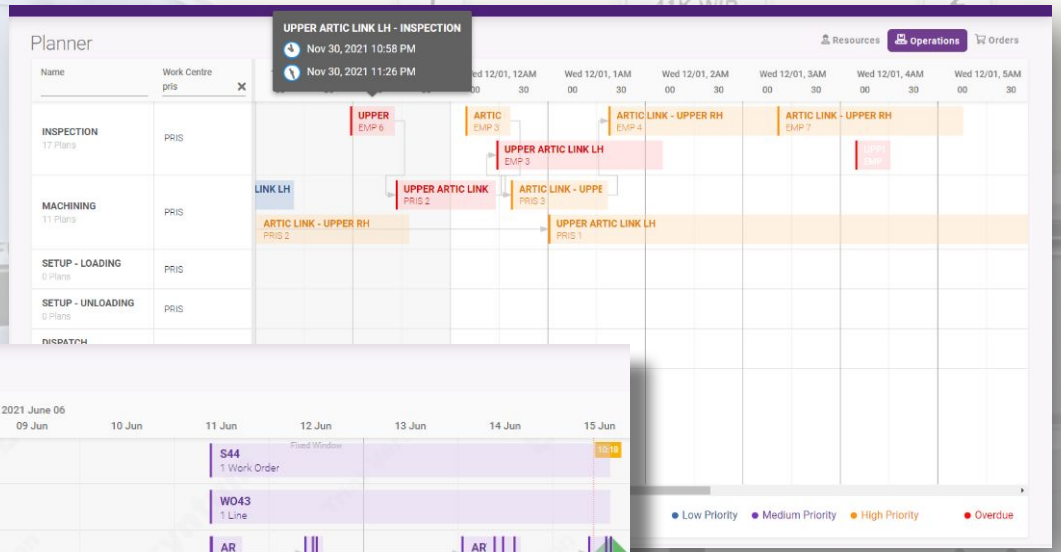
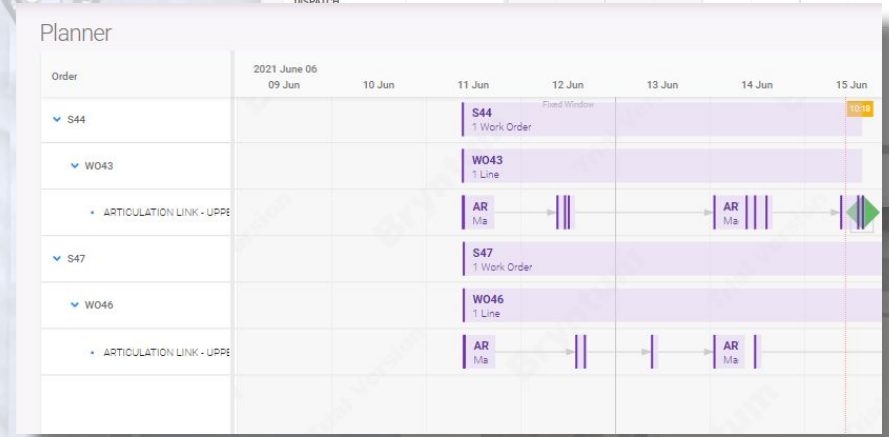
THE APPROACH
… OPTIMISE THE ‘FUTURE’





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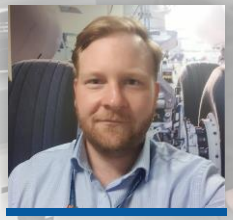
THE PROJECT TEAM



PROJECT LEAD

PAR ELIASSON
Industrial Project Lead Manufacturing Engineering

MFG TEAM LEAD

PHIL PHELPS
Production Team Leader

SCHEDULER

ALEKSANDRA PAWLOWSKA
Special Process Scheduler

PROJECT LEAD

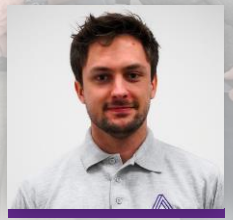
REECE DONNEKY
Project Management & Communication

MFG EXPERT

DORIAN SMELLIE
CEO, Technology & Process

MACHINE LEARNING

KISHAN SURESH
MSC Artificial Intelligence



PRODUCT OWNER

ROWAN BROGDEN
Product Owner

STRATEGY

DOLORES SANDERS
Innovate UK Women In Innovation 2019

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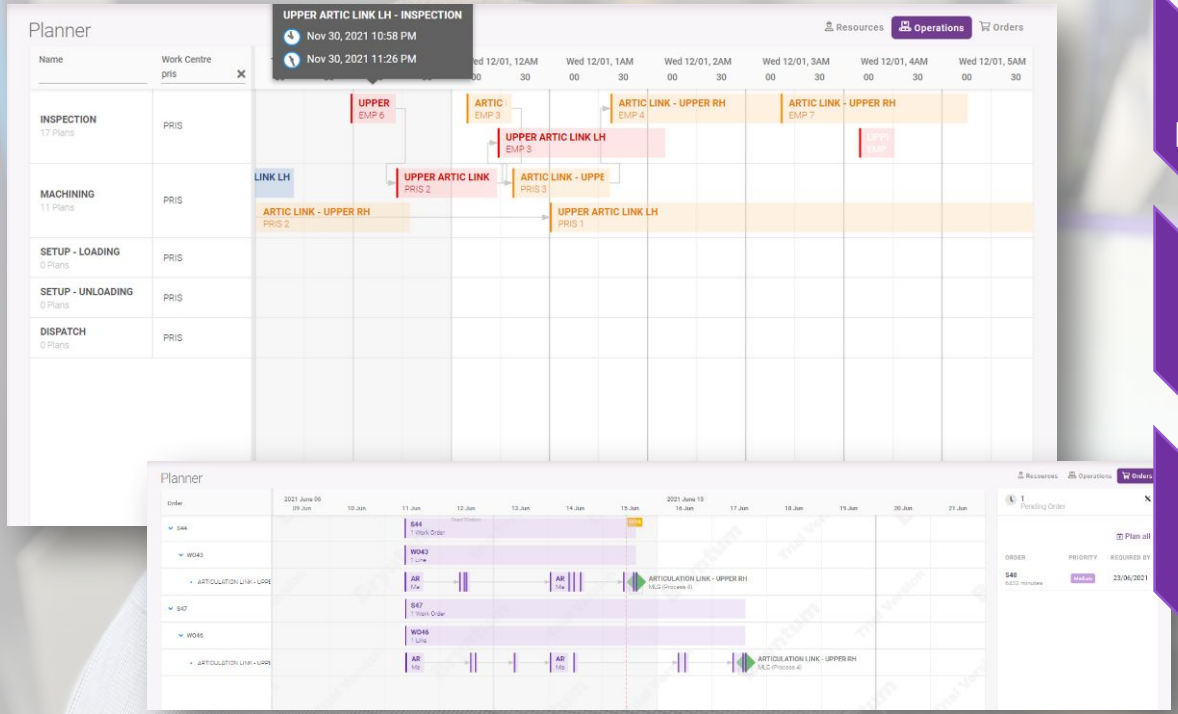
TotalControlPro™

Smart Planning Screens & Functionality Overview

Optimise against demand & resource availability - to digitally execute on the shopfloor



Work Demand

- Add/Import production demand, and augment with real time status of all resources and current workload.

Plan

- Model & Execute an optimum plan using a Smart & Self Learning Adaptive Planning engine.

Release

- Release the plan to all available resources – machines & people. Monitor progress & exceptions in Real Time

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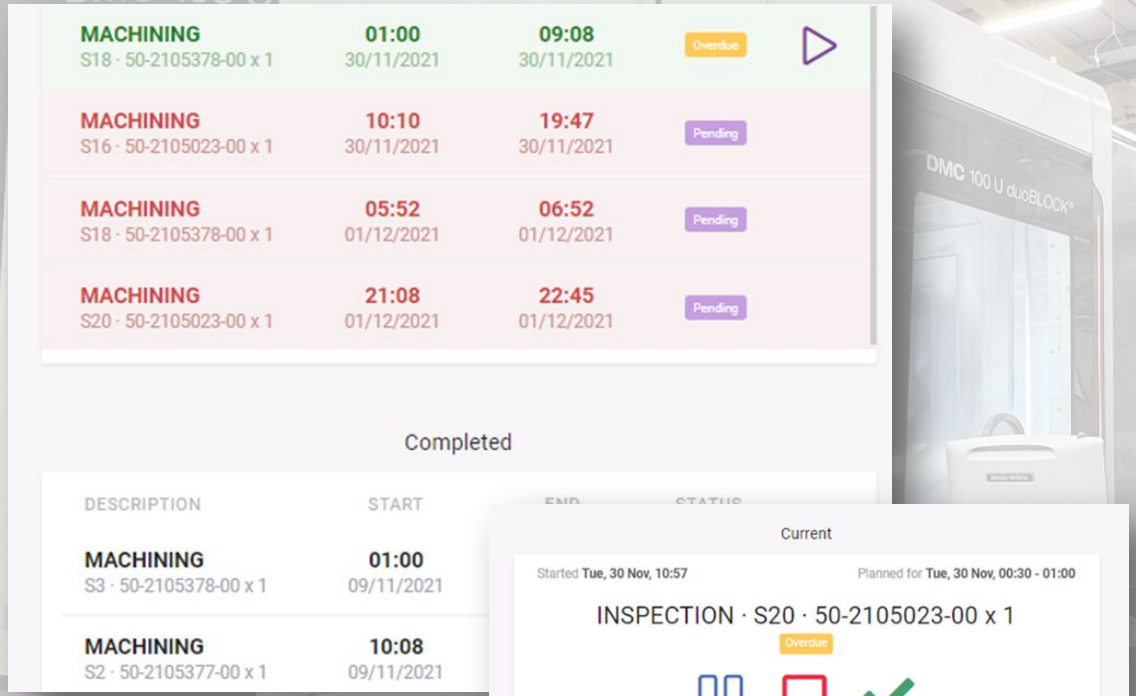
Smart Planning Screens & Functionality Overview

Optimise against demand & resource availability - to digitally execute on the shopfloor

TotalControlPro™



Present

- Present dynamic 'work to' lists & job schedules to shop floor operators

Execute

- Simple interaction to capture machine & labour work status

Monitor

- What's coming, what's ready, what's due …

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Smart Planning Screens & Functionality Overview

Live Work Flow Status Boards for each department

TotalControlPro™

TotalControlPro™ END-OF-LINE SCREEN v7.19 z0332_pds_mes 0.117 **22:45 28/06/2021**

Required Date	Job No.	Description	ID	Last Completed Stage	Current Stage	Next Stage	Final Stage
24/06/2021	WO58	RETRACTION BRACKET	000000151	**Raw Mat Supply** *completed* : 18:17 28/06/2021 *by* : Dorian Smellie	**Mach Process 1** **Idle : 268m** *expected time* : 1988m **Pending**	**Mach Process 2** *earliest arrival* : 07:53 30/06/2021 *expected time* : 2517m	**Special Process** *earliest completion* : 21:14 05/07/2021
22/06/2021	WO57	ARTICULATION LINK - UPPER RH	000000150	**Mach Process 1** *completed* : 18:19 28/06/2021 *by* : Dorian Smellie	**MLG (Process 1)** **Idle : 265m** *expected time* : 180m **Pending**	**Mach Process 2** *earliest arrival* : 01:45 29/06/2021 *expected time* : 621m	**Pnt (Process 1)** *earliest completion* : 22:05 29/06/2021
21/06/2021	WO55	LOCK LINK - LOWER	000000148	**Mach Process 2** *completed* : 11:56 24/06/2021 *by* : Dorian Smellie	**MLG (Process 2)** *started* : 22:45 28/06/2021 *worked* : 0m of 210m *by* : Dorian Smellie **Started**	**Heat Treat 1** *earliest arrival* : 02:15 29/06/2021 *expected time* : 210m	**Special Process** *earliest completion* : 00:15 02/07/2021
	WO56	RETRACTION BRACKET	000000149	**Mach Process 1** *completed* : 18:14 28/06/2021 *by* : Jamie Marham	**Mach Process 2** *started* : 18:20 28/06/2021 *worked* : 1m of 2517m *by* : Dorian Smellie	**MLG (Process 2)** *earliest arrival* : 16:41 30/06/2021 *expected time* : 210m	**Special Process** *earliest completion* : 12:05 04/07/2021

DESCRIPTION	WO NO	ROD BY	LAST STAGE	CURRENT STAGE	NEXT STAGE	
UPPER ARTIC LINK LH Stopped	WO18 Low Priority	01/12/2021	MACHINING PRIS41K 1 hour ago	MARKING EMP 1 0 of 26 mins 1 hour ago	INSPECTION 77 minutes 3 hours ago	
ARTIC LINK - UPPER RH Pending	WO20 High Priority	03/12/2021	INSPECTION EMP 6 1 hour ago	MACHINING PRIS41L 0 of 488 mins	INSPECTION 89 minutes 2 hours ago	SPECTION In 1 day
UPPER ARTIC LINK LH Started	WO21 High Priority	03/12/2021		INSPECTION EMP 6 62 of 30 mins 1 hour ago	MACHINING 447 minutes In 12 hours	INSPECTION In 2 days

Real Time
- Live shop floor visibility of workflow

Insights
- Real time insights of actual against plan

Response
- Instant ability to respond to stoppages & exceptions

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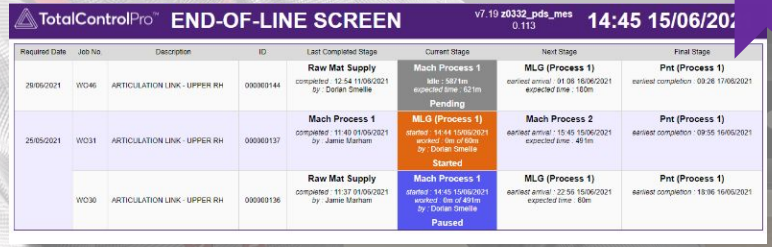
MONITOR – PLAN – EXECUTE – LEARN - OPTIMISE



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THE RESULT

"Make complex scheduling decisions based on large, real-time datasets, and allows us to move from **expediting**, **to a 100% agile planning and scheduling processes**."

- "…spend their time on value added activities,
- "…transformation of **utilisation** KPI's including a 10% improvement in **OLE** & **OEE**
- "…improve **on-time-delivery**, and significantly reduce **inventory costs…**"
- "…make significant inroads to the company **Net Zero** targets"
- "Reduction of asset downtime and optimisation of production output can generate a **10x return on investment** for Safran, and payback in 2 full production months… !!"

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IMPACTING SUPPLY CHAINS

Net Zero, Brexit, Covid and global competition for efficiency & productivity has accelerated the drive to produce more, waste less and optimise the use of all resources; machines, materials, inventory and labour.

AGILE

Adaptive, Flexible & Self Learning

ACCESSIBLE

'Software As A Service' subscription - **Modular** & **Scalable**.

AVAILABLE

A digital 'Tool Box' for **SME's** & **Corporates.**

AFFORDABLE

Cloud Native to deliver **ML/AI** at a fraction of **Cost** & **Time**.

Deliver on Manufacturing Made Smarter Challenge to

Raise Productivity

by **30%**

by 2030

MADE SMARTER

Part of prototype cohort TECHNOLOGY ACCELERATOR

MADE SMARTER

Part of prototype cohort TECHNOLOGY ACCELERATOR

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TotalControlPro®

Where Passion Meets Productivity

ADAPTIVE PLANNING
for complex processes

"Net Zero, Brexit, Covid and global competition for efficiency & productivity has accelerated the drive to produce more, waste less and optimise the use of all resources; machines, materials, inventory and labour"

SAFRAN

MADE SMARTER

Part of the minimum viable product phase cohort

TECHNOLOGY ACCELERATOR

BAE SYSTEMS

Machine Intelligence

Challenge: Scalable AI for visual inspection

Kevin Pickup, BAE Systems
Lead Technologist, Product Verification

Made Smarter Accelerator – Final Showcase

BAE Systems & Machine Intelligence Ltd

November 2021

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BAE SYSTEMS

BAE Systems – Air Factory of the Future

The FACTORY OF THE FUTURE aims to revolutionise the manufacture of aircraft and help to meet the customers demand of producing the next aircraft platform in -

50% of the time at 50% of the cost

A major part of realising this challenge is to embracing Digital Manufacturing, through deployment of automation and machine learning.

Military Aircraft manufacture does not involve high volume rates of production – typical rates:

20 – 200 units per yr

(This goes against typical ML requirements that often demand large datasets)

Performance of product is extremely demanding resulting in high levels of product verification

Key is to assist inspection and augment manual checks, not to take over these roles with automation

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BAE SYSTEMS

BAE Systems – Air Factory of the Future

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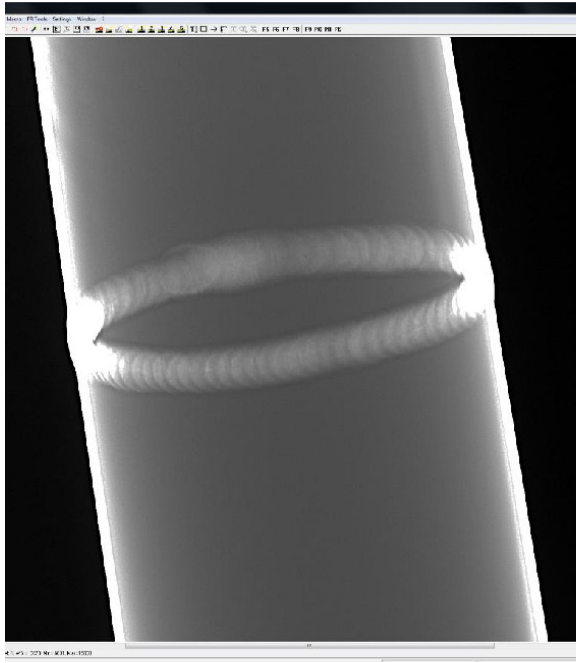
BAE SYSTEMS

The ICO Statement

Automated inspection of aircraft 'manufacturing data' of low volume manually inspected processes.
Perform qualitative checks with Go/No Go output.
Scale to quantitative checks and provide visual output for operators from various input data streams



USE CASE: DIGITAL RADIOGRAPHS OF PIPE WELDS

Current State

Manual verification of process quality

Manual viewing of Process data.

Issues

Labour Intensive – SME utilised to view what is effectively good data

Does not sit with Digital Manufacturing & I4.0 philosophy

Challenges

Traditional AI solutions are not Governance friendly

Work best on high volume data – something we do not have

Inspector acceptance of machine learning

Catch All.

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BAE SYSTEMS

Automated Inspection – Key Requirements

TRACEABLE & REPEATABLE – Governance of the process is key, being able to understand decision process ML has derived.

CONFIDENCE – Able to provide self assessment of performance and work with inspectors to become a

ADAPTABLE – The same underlying 'Traceable & repeatable' technology to be able to be adapted to multiple data streams, inclusive of live image review

SCALEABLE – BAE has a *wide range of inspection processes* from manufacturing sub-assembly build checks to in-service airframe skin maintenance inspections.
All *heavily reliant on inspector skill*, all with the same major challenge - limited image dataset availability. There is major potential for much wider application across the business.

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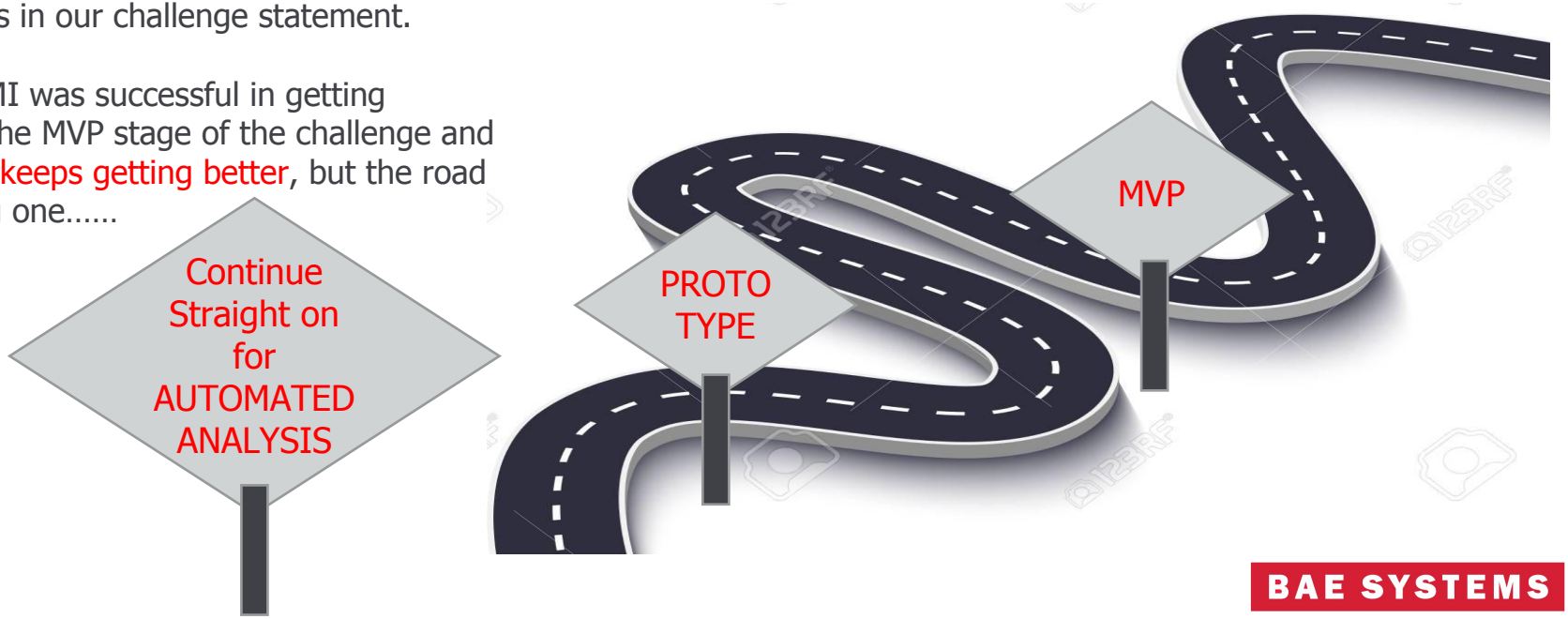
BAE SYSTEMS

The Road SOOO far.....

BAE Systems were partnered with Machine Intelligence - Inventor of AI software for visual based inspection systems

In the Prototype stage MI quickly proved their novel application of ML was a promising way of meeting the requirements in our challenge statement.

Thankfully MI was successful in getting through to the MVP stage of the challenge and the product keeps getting better, but the road is still a long one.....



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BAE SYSTEMS

BAE SYSTEMS

Machine Intelligence

Challenge: Scalable AI for visual inspection

Simon Harding,
Machine Intelligence
Director

Machine Intelligence

Made Smarter Technology Accelerator Programme

BAE Challenge :
Scalable Artificial Intelligence For Defect Detection

Machine Intelligence

Machine Intelligence

- Started in 2012

- Developing AI technology
  - spin off from academic research

- Consultancy: control, vision, measurement, software
  - manufacturing and science sectors

Scalable AI For Defect Detection

Machine Intelligence

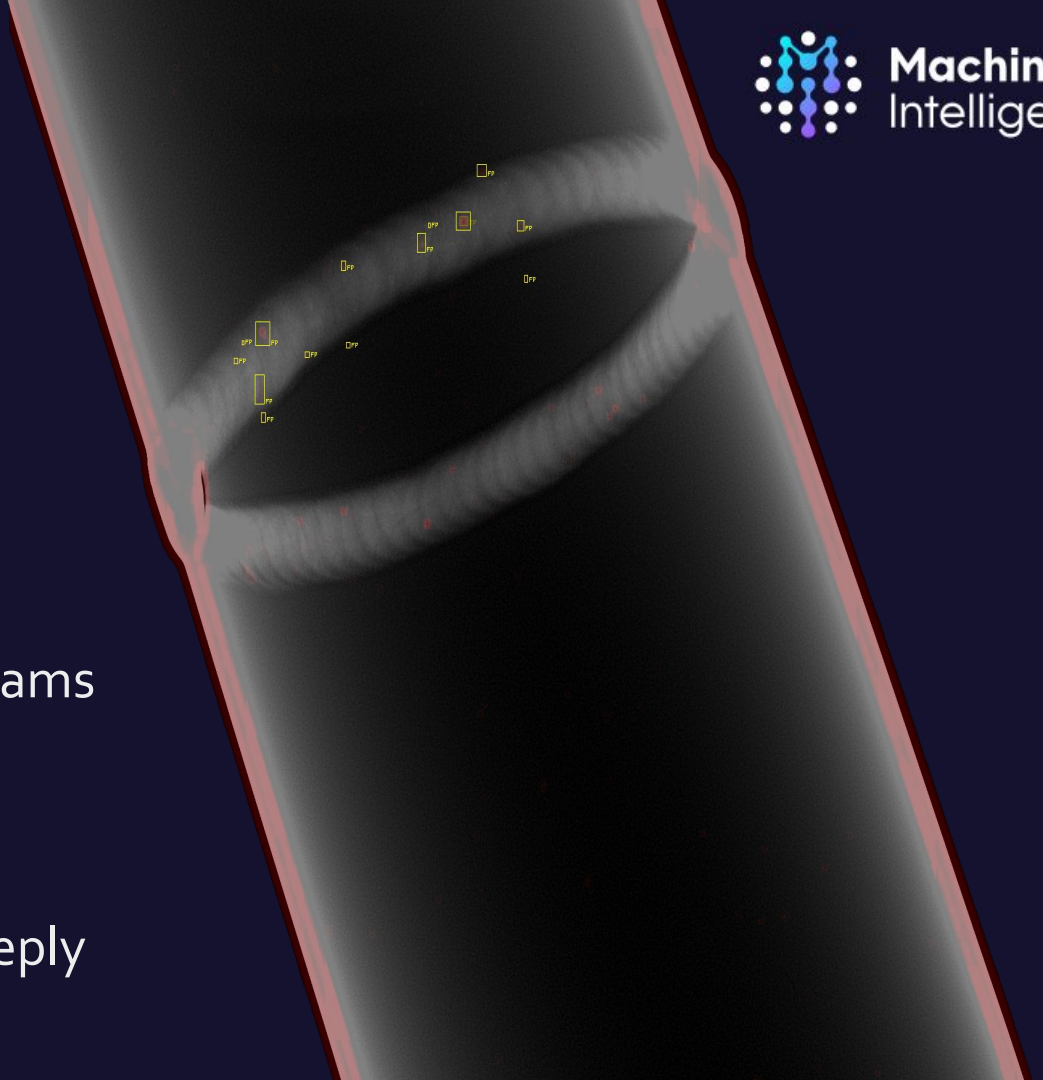
BAE's MVP target problem:

- Visual inspection of digital x-ray weld images
- Time consuming, laborious, skilled
- Critical importance for BAE
- Needs to work with the operator

Our Solution

- Our machine learning system
  - ✔ Unique technique
  - ✔ Small training set
  - ✔ Rapid set up time
  - ✔ Generates computer programs
  - ✔ Understandable output

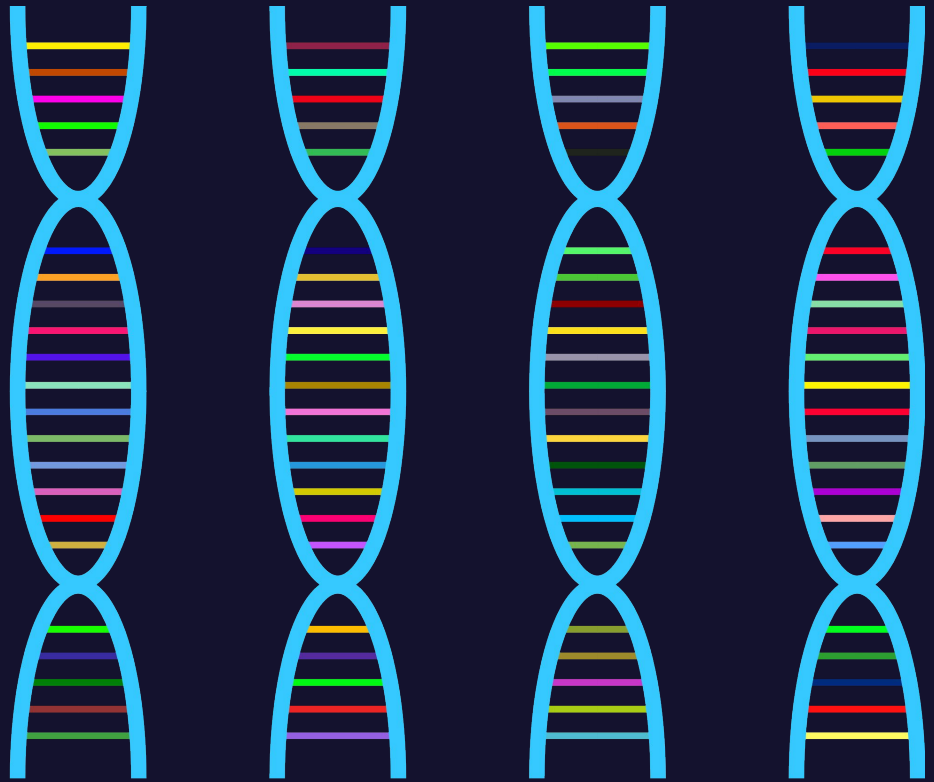
- New software to integrate deeply with BAE process



Machine Intelligence

Our technology

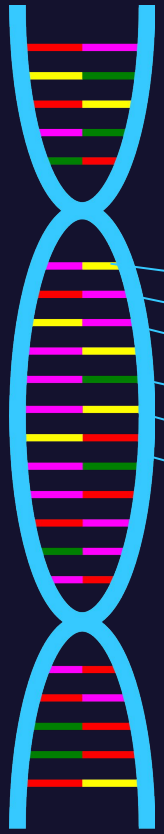
Machine Intelligence



- Bio-inspired
- Genetic programming
  - Outputs computer programs
  - Application agnostic
  - Easy to add domain knowledge
  - Scalable

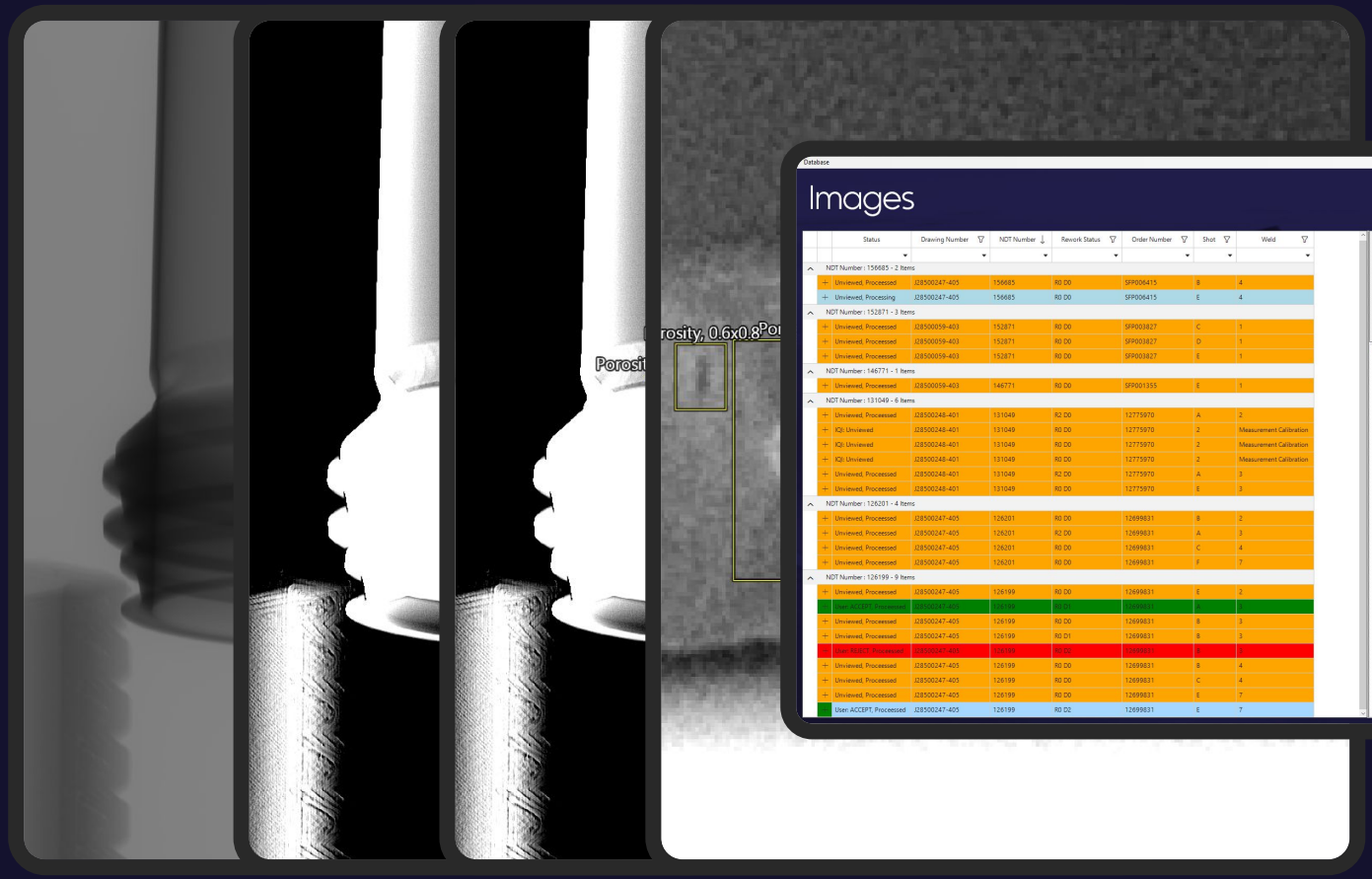
Our technology

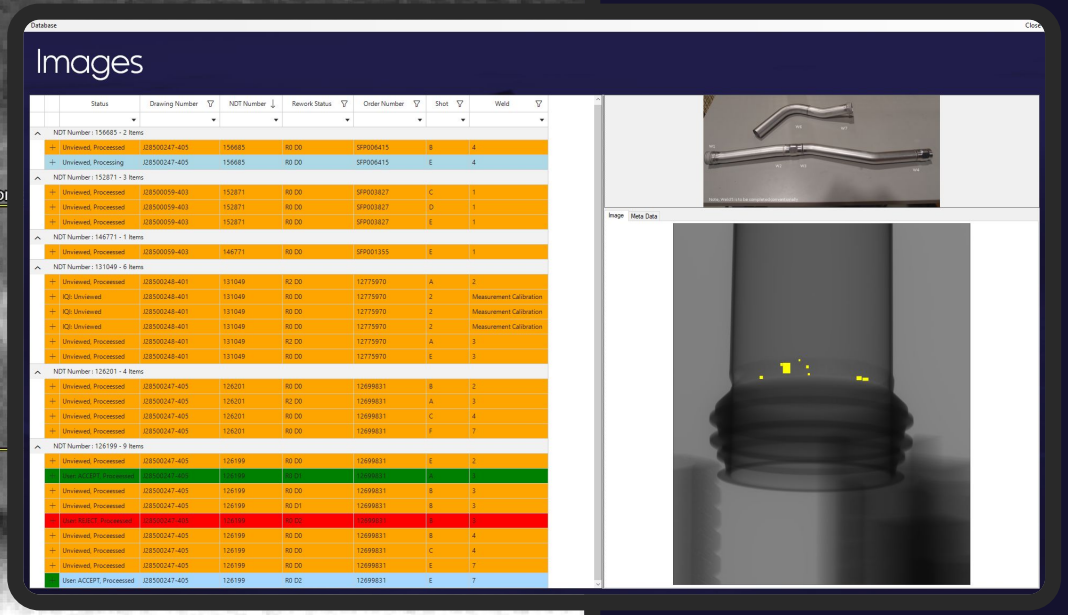
Machine Intelligence



```
Node1 = Laplace(Inputs[0], 13)
Node2 = LocalNormalize(Node1, 12, 1)
Node3 = LocalNormalizeWithGauss(Node2, 6, 7)
Node4 = LocalStats(Node3, 8, 5, Range)
Node5 = SmoothGaussian(Node4, 1, 18)
Output = Threshold(Node5,12.3)
```

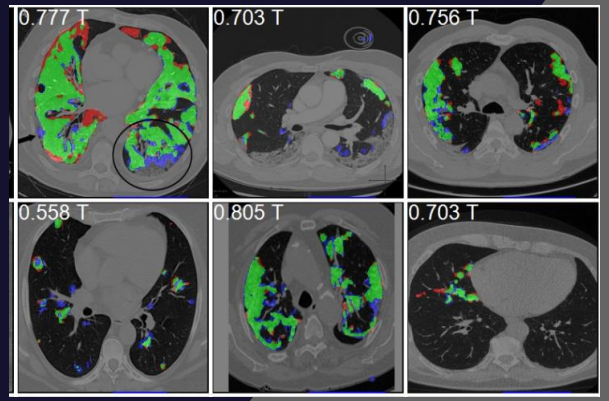
Machine Intelligence

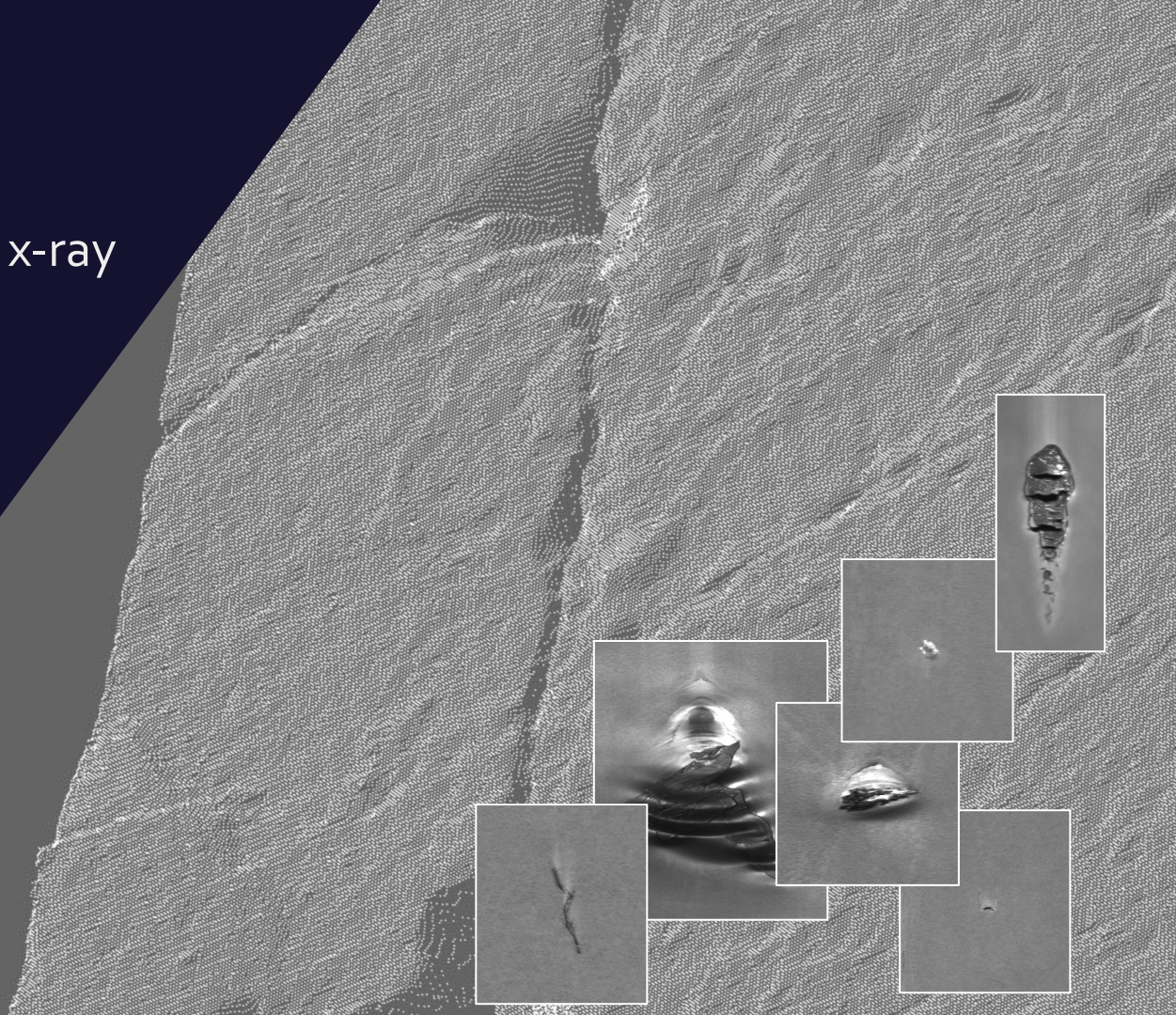




Where next?

- Technique is broader than x-ray
  - Visual images
  - Ultrasound
  - Surface scans





Where next?

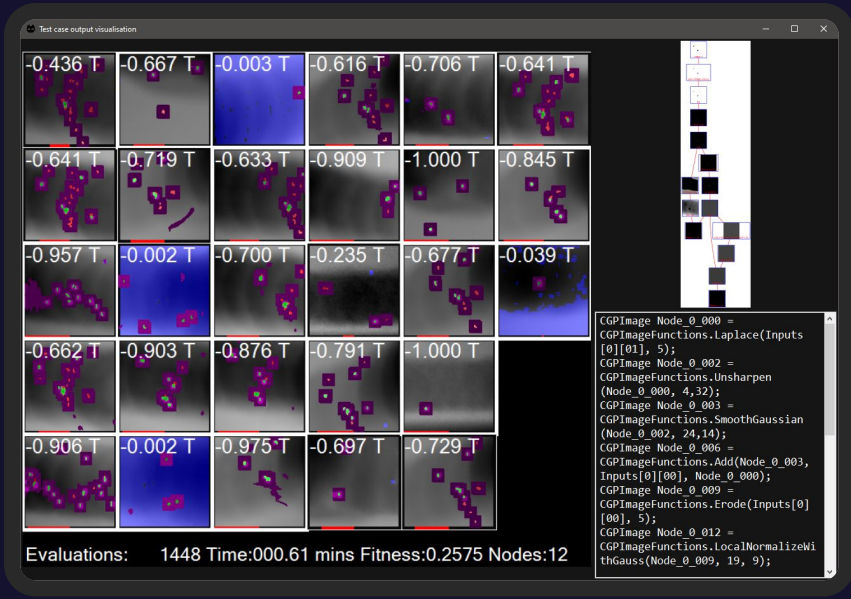
- Elsewhere in BAE
- Similar sectors:
  - Manufacturing
  - NDT & QA
- Adjacent markets:
  - Food & drink
  - Medical
- Do you have any ideas?

Summary

- Working with BAE, we have demonstrated a new visual inspection system

- It works in a novel way and is easy to use

- With use in inspection:
  - Reduce waste – net zero
  - Spot issues early
  - Raise quality
  - Empowering



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simon@machineintelligence.co.uk

Taking Digital Innovation to Industrial Scale

Industry panel discussion

MADE SMARTER

TECHNOLOGY ACCELERATOR

Industry panel discussion

Geraldina Iraheta,
Digital Catapult
Chief Commercial Officer

Sebastian Ansari,
Jaguar Land Rover
Supply Chain Transformation Senior Manager

Nigel Harley,
Software AG
Internet of Things Specialist

Martin Male,
Verizon
Business Partner, Professional Services
UK & Ireland

Closing Remarks

Chris Courtney
Challenge Director
Made Smarter Innovation at UKRI

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