

Technology Development at Babcock International

ANRC Showcase Presentation

Babcock International Group – Our Business

Our business

Marine



Nuclear



Land



Aviation



Naval engineering, support and systems

- Delivering high-value, technical and engineering support for ships and submarines to UK and other navies
- Owning, maintaining and developing critical naval infrastructure
- Designing, building and exporting world class naval platforms and equipment
- Delivering affordable digital support and solutions which enhance our customers' capabilities

Critical services: defence and civil

- Providing high-value engineering and support services in land and aviation, defence, civil nuclear and other critical sectors
- Delivering technical training services in defence and security sectors
- Maintaining and providing complex assets and equipment
- Providing integrated solutions to our customers by bringing together the right technology and suppliers

Technology: at the core of everything we do

- The technology landscape is changing rapidly.
- Customer assets are growing in complexity.
- We continue to support our customers to make better decisions.
- Our innovation and our engineering insight sets us apart.

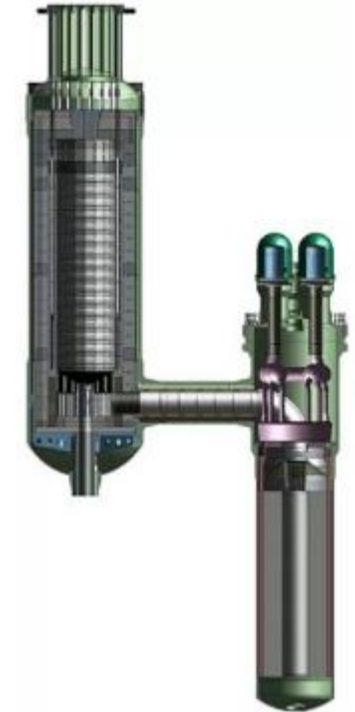


Our Nuclear Sector

Babcock operates across a number of sectors that demand cutting edge technology, high quality and operational availability.

New ideas and capabilities have wide application for use in:

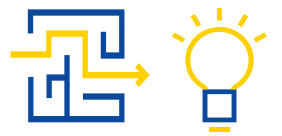
- Nuclear new build, large scale and modular, to meet net zero target
- Production of submarine components to meet UK defence needs
- Maintenance and repair of UK submarine fleet
- Life extension of nuclear assets
- Decommissioning and disposal to remove the existing nuclear legacy



Technology Case Studies

Case Study 1: Welding/AM and NDT

Current workflow separates fabrication and inspection



Fabrication



Automated Welding or Additive Manufacture (AM)



Manual Welding



24-96h
Cooldown

Inspection



Manual Non-Destructive Evaluation (NDE)

✓ 95%
Defect Free
Component

✗ 5%
Scrap or
Rework

Limitations



Welding/AM is a separate process from NDE Inspection



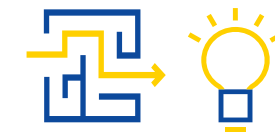
Significant delay between defect formation and detection



Repairs are costly and create scheduling uncertainty

Case Study 1: Welding/AM and NDT

Integration of fabrication and inspection



AWESIM



Inspection



Control

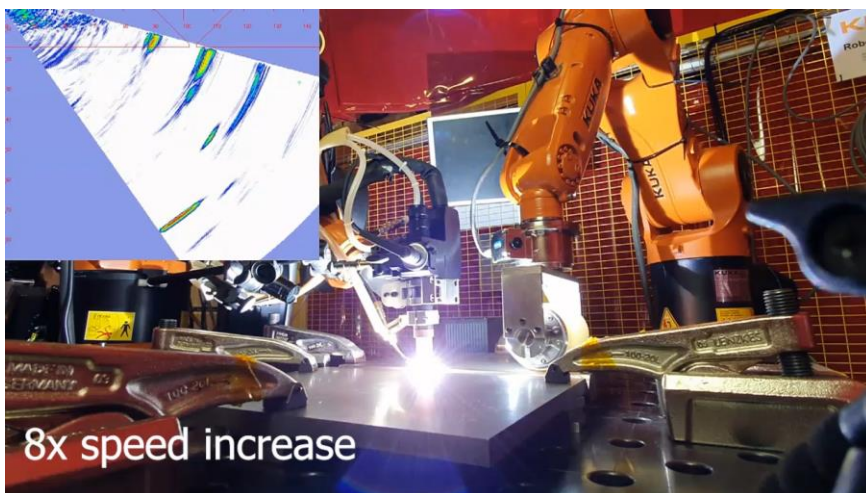


Automation

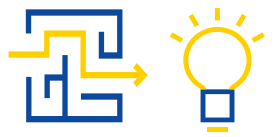
- High-temperature ultrasonic roller probe (couplant free)
- Thermal compensation and noise suppression imaging software
- Weld profile mapping with defect detection and classification
- System integration with closed-loop control and automation

Benefits

- Real-time defect identification
- Optimisation of welding resources
- Optimisation of NDT inspectors and inspection work
- Reduces process time
- Increased schedule certainty
- Improved data and analysis algorithms increases understanding of quality
- Saves materials and process energy
- Can be retrofitted to existing systems

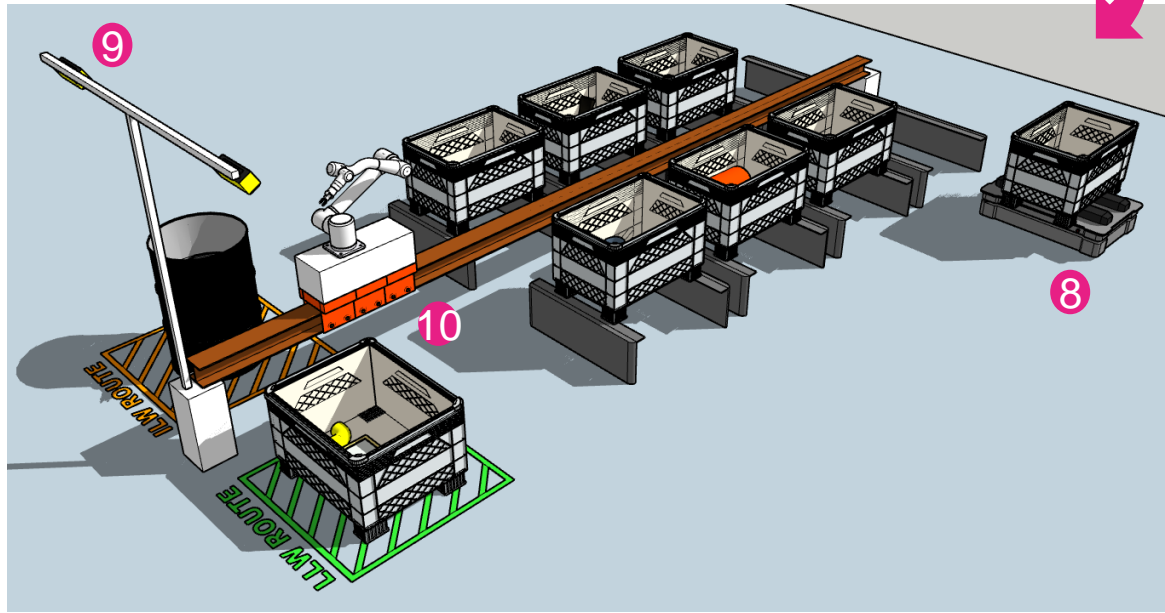
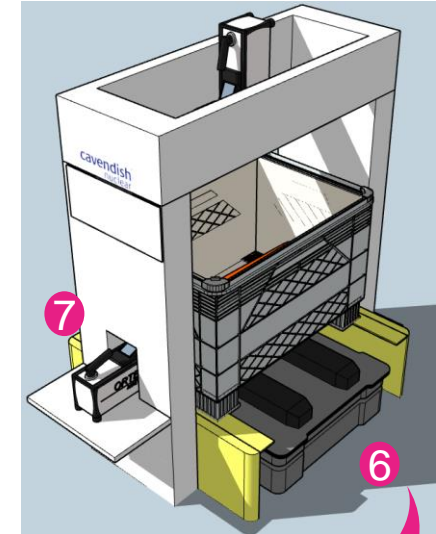
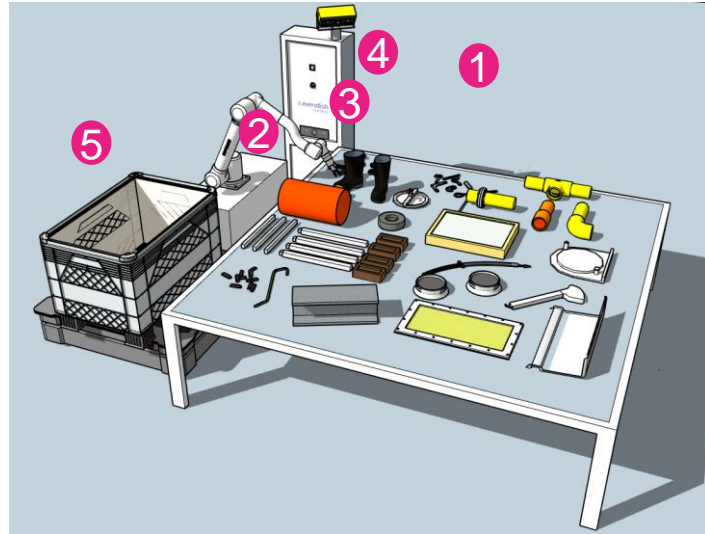


Case Study 2: Autonomous Waste Sort and Seg.



OptiSORT: An integrated, autonomous technology that sorts and segregates radioactive waste from decommissioning into optimally packed containers

- 1 Waste items identified at laydown area using machine learning
- 2 Robot arm picks up waste item
- 3 3D point cloud of waste item produced
- 4 Waste item materials identified using combined X-ray Fluorescence and Raman Spectroscopy
- 5 Robot arm loads waste item onto an Auto Guided Vehicle (AGV)
- 6 AGV delivers waste item to assay station
- 7 Waste item undergoes Hi-Res Gamma assay to determine waste category and is weighed
- 8 AGV delivers waste item to buffer store
- 9 Packing optimisation system calculates optimal packing regime from point cloud taken at Step 3
- 10 Second robot arm packs waste item into correct waste container (Low or Intermediate Level Waste)



Case Study 2: Autonomous Waste Sort and Seg.



Safer

Remove operators from high hazardous situations

Faster

Increase productivity via autonomous processes and improved waste handling

Lowering costs

Reduce costs by effectively segregating waste to prioritise recycling and optimise disposal

OptiSort
Autonomous Sorting and Segregation of Radioactive Waste

Market Leading Technology

First of its kind technology

Optimised waste

Optimised packing with full inventory records

Scalable

Modular design means technology is easily scalable and transferrable

Technology and Innovation Direction

Technology Strategy and Outcomes



Babcock's **technology focus** areas are:

- Data collation, exploitation and analytics
- Autonomous systems and automation

Supported by developing **key capabilities** in:

- Optimised asset maintenance and support
- Rapid prototyping
- Manufacturing automation
- Novel methods of characterisation, monitoring equipment and systems
- Development of representative digital models

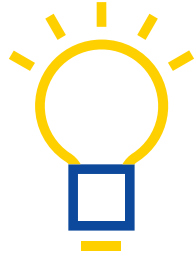
Outcomes

Babcock will lead in the exploitation of data and analytics to provide value added engineering support

We will become expert integrators of technology

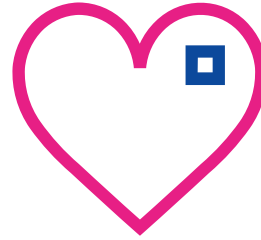
**Creating a safe and
secure world,
together**

Our Principles



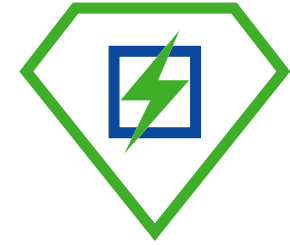
be curious

We believe in positively challenging the status quo and asking 'how might we?'.



be kind

We believe in being kind to ourselves, kind to each other and kind to the planet.



be courageous

We believe in being brave, ambitious and determined.



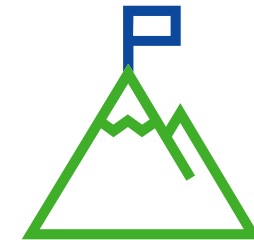
Think : outcomes

We believe in measuring success by the results we deliver and the positive impact we make.



collaborate

We believe Babcock is greater than the sum of its parts.



own and deliver

We believe our collective success depends on individual actions.

cavendishTM
nuclear
part of Babcock International Group