AMRC / MTA

MACH 2018

The **Advanced Manufacturing Research Centre** and the **Manufacturing Technologies Association** at MACH 2018

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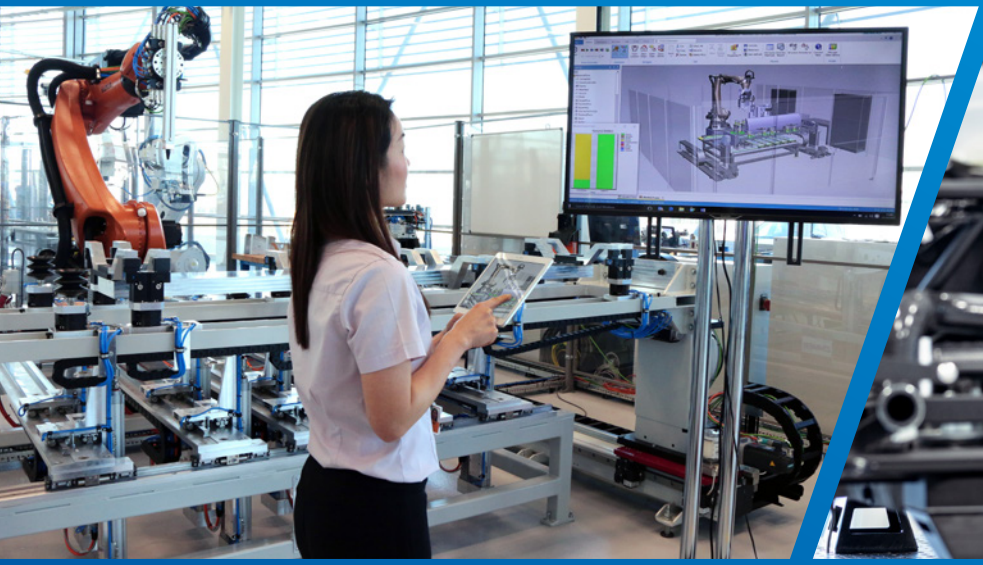
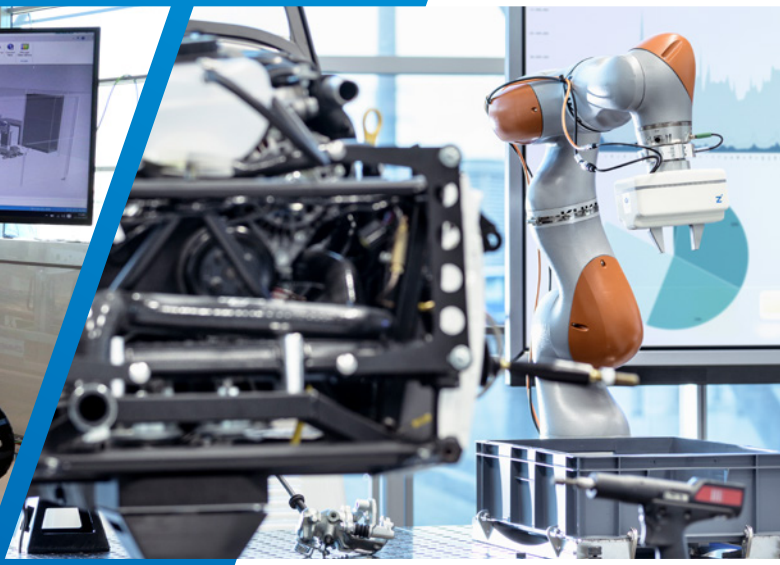
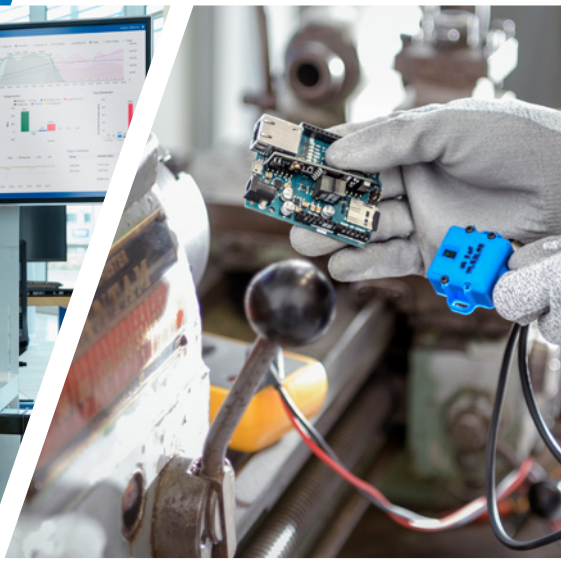
CATAPULT
High Value Manufacturing

MACH 2018







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Welcome

to the Advanced Manufacturing Research Centre (AMRC) and the Manufacturing Technologies Association (MTA) at MACH 2018.

The AMRC is a growing network of research and innovation centres dedicated to improving the productivity and competitiveness of British manufacturing by using digital technologies and digital ideas.

The MTA is the UK's Trade Association for the companies who create and supply the technology that manufacturers use to make the products we use and rely on.

With a record of serving and representing the UK's engineering based manufacturing sector stretching back over a century – and kept close to the modern realities through its organisation of the UK's biggest manufacturing technologies trade show, MACH – the MTA has an unrivalled perspective on the industry's strengths and challenges.

Our goal at MACH 2018 is to show how digital technologies can unlock game-changing value streams for even the smallest of companies. However, the biggest barrier to realising these benefits, is often ignorance: the feeling that digital adoption is too risky and too difficult to implement.

What you'll see this week shows that adopting digital technologies is neither too risky, nor too costly.

Welcome to the AMRC and MTA at MACH 2018

Watch video

Read more

Project RAID – putting the SME in the driving seat

This may look like a standard Caterham. But Project RAID – Reconfigurable Assembly Integrated Demonstrator – is much more than a hand-built iconic British sports car.

The digital manufacturing technologies we have deployed in its construction may not improve the performance of Colin Chapman's 'lighter, simpler' classic, but they will drive race-winning performance gains in both productivity and quality.

We think Chapman would be proud of how our engineers have turned the vehicle he first designed into a high-powered showcase for digital manufacturing technologies that don't cost the earth and are simple to work with.

Half the Caterham racing car was assembled by hand as per the written instructions, the other half by employing a variety of advanced manufacturing technologies, collecting data about the various construction processes along the way. The data collected was then used to validate a second phase of construction and run discrete event simulation to find out how effective the assembly processes are, either by hand, using smart tooling or robotic assembly.

The digital aspects of the project will use the data collected to rid processes of non-value added time and provide visibility to create viable business cases to illustrate how improvements can be made in manufacturing productivity. Direct, low-level, real-time insights into the manufacturing process via seamless integration into 'off-the-shelf' MES and shop-floor software systems will reinforce strategic decisions and allow process changes to be well-informed.

The project will show manufacturers from any sector how easy-to-deploy, data-powered Industry 4.0 technologies can be tailored to any complex full assembly process with a short lead time. These technologies are hardware agnostic: the same information can be obtained from small, low cost sensors as from data collected by large, robust industrial networks of high-end equipment.

Deploying them will make SMEs as fast and nimble as Chapman's Caterham itself.

Watch video

From legacy milling to modern lean machines

The Bridgeport milling machine and the Colchester Bantam lathe are things of beauty. Every bit as iconic as the Caterham, they represent state-of-the-art British and American Machine Tooling in the decades after the War.

With the Caterham in mind, we wondered if we could turn these Beatles' era workhorses into something much closer to modern, digital thoroughbreds. The result? For less than the cost of night out at a Beatle's tribute concert, we bought a bundle of smart sensors and linked them up to a laptop to give us the kind of insights that even the most experienced engineer might have missed.

The machines have been retrofitted with a number of technologies for data acquisition including sensors, accelerometers and thermocouples to measure conditions such as vibration, temperature, current and power consumption.

As a result, we now have two machines, retrofitted with low-cost digital technology, that enable the operatives to accurately monitor the condition of the machine, and give production managers the tools to ensure process stability, high performance, and connectivity across the value chain.

The message is clear. Retrofitting a legacy system to communicate on an Industry 4.0 level can be as simple as measuring the electric current on a machine using a £10 sensor. That step alone could give a manufacturer valuable information about energy consumption and performance. **How?**

- **Utilisation analysis tracks how a machine is being run, calculates cost and finds bottlenecks to improve processes and unlock reductions in power consumption.**
- **Tracking the number of parts produced using power, spindle position, carriage position and others to identify parts produced and track automatically.**
- **Predictive maintenance of a machine using vibration, power and other information channels to assist with fault diagnostics and predict when the machine will fail or wear to schedule maintenance, reduce machine downtime and improve cost and product quality.**

Watch video

Read more

Conveying the digital message

For many of us, our only encounter with the conveyor belt is when we land at an airport and stand beside the carousel waiting for our luggage to appear. But, for industry, the conveyor is the key to many automated processes: from manufacturing, mining and food processing to warehousing, logistics and distribution.

First used in late 19th century, conveyors are now integral to modern production activities. As with the Caterham and the Bridgeport, we looked at how we might use cheap and easy to fit sensors to improve performance: in this case turning a basic conveyor into something smarter.

The conveyor belt system mimics a bottle filling process. As bottles pass through a series of three gates to simulate the different filling processes occurring as the bottles move down the line, i.e. for pre-filling, filling and inspection.

Each gate can probabilistically fail depending on the complexity of the task at that gate.

We collaborated with Cimlogic who fitted a single light gate to the system which detects when a 'bottle' passes and records this event. This data can then be interrogated via a digital dashboard.

This demonstrates SMEs can capture accurate real-time manufacturing intelligence using entry-level and easy-to-deploy technologies, to drive productivity and maintain quality.

A system such as this enables managers and operators to have full visibility of how performance drives production. Live data enables root cause analysis to take place if a shift is under capacity or production is lost during certain times of the day like shift changes or lunchtimes. It also demonstrates how the accumulation of many short stops can lead to an hour in unnoticed downtime per shift.


TRUMPF
SIEMENS
SAMSUNG
Total Today
141,713
69.3%
Total Yesterday
206,688
This Hour
2,727
Best Hour Today
12,937
Production By Hour
Effectiveness By Hour
Categorisation
Rate Distribution
Rate - Last 60 Mins (Rolling)
Today's Stoppages

Watch video

The Full Monty – getting under the bonnet of the Cincinnati

It may not have the legacy charm of the Bridgeport, but the Cincinnati five axis machine tool that is the star of our Full Monty film is having a full mechanical rebuild, and being retrofitted with a state-of-the-art control systems and sensors to enhance its capability.

The aim of this project is to collect data that will help identify the things we should be monitoring that have most impact on productivity, quality and performance. “We don’t really understand cause and effect,” says Peter Willoughby, Managing Director of MTT, a Lancashire-based SME who specialise in the optimisation of machine tools and are partnering this project.

By analysing this data closely, Willoughby and the AMRC machining team aim to identify ‘the low hanging fruit’ that could most affect machine availability, performance and quality. By pooling the expertise of the AMRC, our colleagues at the University of Huddersfield, and the MTT we have identified a number of key areas we want to measure and collect data on. “Until we measure them we are not going to know what impact they have on productivity.”

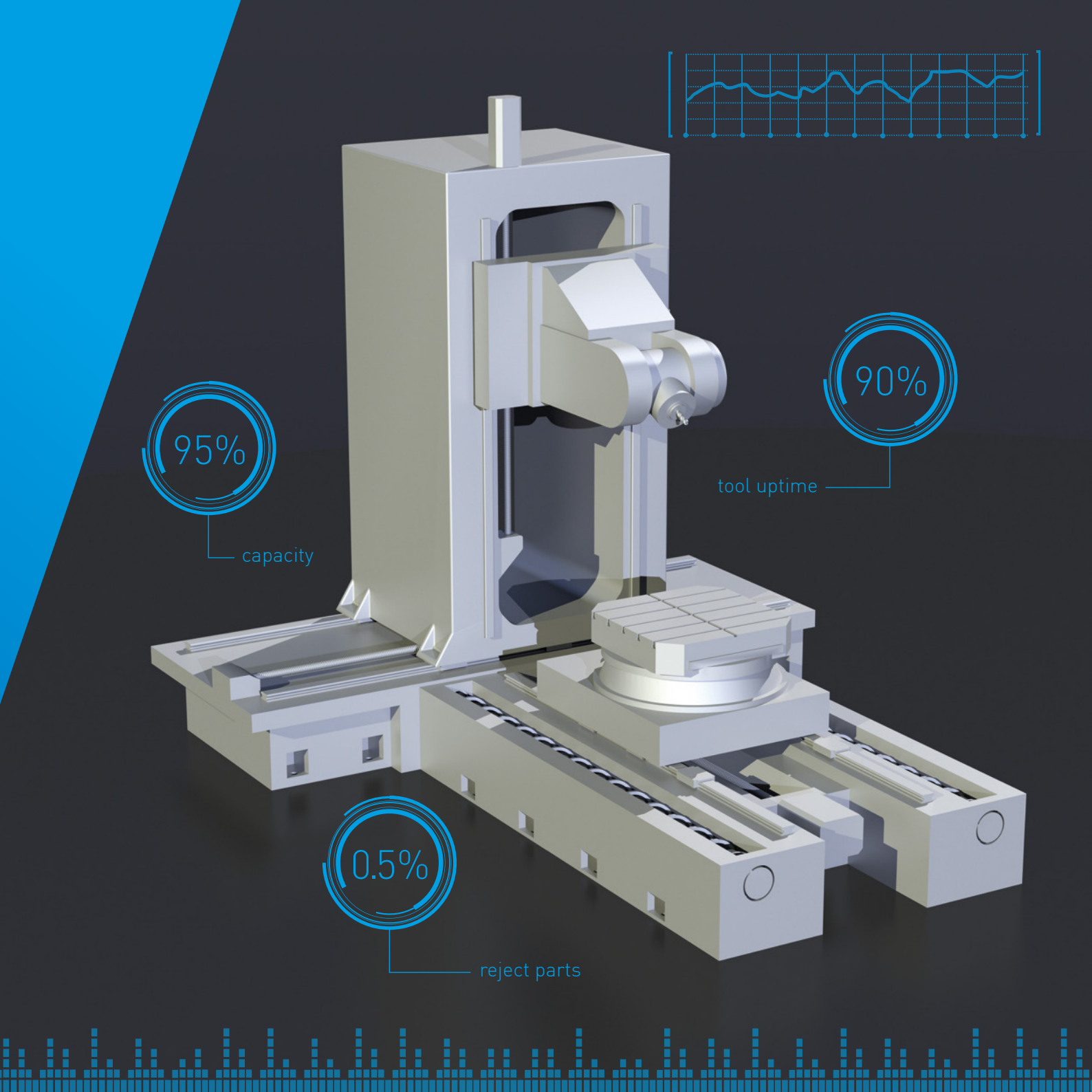
“This is the very much the opposite of David Brailsford and his marginal gains. It is all about identifying the quick and easy wins that come from adopting digital applications.”

What the Full Monty will do is tell the production manager why his machine tool’s uptime is 70% when it should be 90%; why it is running at 80% of capacity and not 95%; and why his machine is producing reject parts at a rate of 5% when it should be 0.5%.

Having identified where these issues are coming from, it then becomes possible to fix them.

“We might think that the machine is running at 80% because the motor isn’t big enough, but it just be a blocked oil filter; until we get under the bonnet and get the right data, we won’t know.”

The Full Monty will be pealing back the mysteries of the Cincinnati and getting to the naked truth.


95%
capacity
90%
tool uptime
0.5%
reject parts

Find out more

Integrated Manufacturing Group (IMG)

AMRC Factory 2050 is home to our Integrated Manufacturing Group (IMG) whose work spans robotics and automation, integrated large volume metrology, digitally assisted assembly and manufacturing informatics.

The Group is developing ways of meeting demand for high variation and mass customisation, intelligent machines and process that monitor and optimise their operations, techniques to shorten lead times and ramp production up and down rapidly, ways of handling and making sense of big data, human machine collaboration and techniques for digitally assisted assembly.

We are leaders the development of augmented reality solutions with smart connected tools and devices, used for complex assemblies where automation is not applicable.

We are equally adept in integrated large volume metrology – including the design, development and process improvement of inline inspection and verification techniques used during the manufacture of large components and complex assemblies.

Our research into the smart applications of robotics and automation have led to partnerships with the leading names in aerospace and defence. A collaboration with BAE Systems has de-risked a major robotics investment for the company and is now on the way to achieving significant, six figure cost savings for the company. We are working with our composites team to find new ways of using robots to work with novel materials in a way that has never been done before.

We are also at the forefront of manufacturing informatics, integrating sensor and measurement systems, data collection, analytics, visualisation and decision making to drive step changes in the manufacturing processes.


KUKA


amroccs
Active
Complete
Window Sealant Inspection
Engine Nacelle Inspection
Cargo Door Hinge Replacement
Engine Nacelle Inspection
Description:
A dent with a 50mm radius has been detected on the engine nacelle panel P34577-A.D
Captures:
Image to 3D
New
Open
360
New
Open
Short Range 3D
1
2
3

Find out more

Intelligent machining

Developing innovative techniques and optimised processes for machining high-performance materials, the AMRC's Machining Group has been the engine room of some of our most transformative improvements in productivity and quality, with truly step change advances in aerospace machining for the likes of Rolls-Royce and Boeing.

We achieved 50% productivity increases in the manufacture of Rolls-Royce's discs, which made it economic for the company to invest in excess of £200 million in an advanced production plant in the North of England.

We are now developing sophisticated digital simulation tools that integrate the different aspects that affect machine tool and machining performance, the result of which will be significant reductions in energy consumption; reduce machine tool life cycle costs, with a reduction of O&M costs in the range of 25%; getting production processes that work as planned faster; and first-time-right part manufacturing.

Our work with MTT – illustrated at MACH in the video – will also demonstrate how UK industry could make a game-changing approach to the in-service support of manufacturing. We aim to show how this will improve productivity, raise technology levels and improve sustainability of manufacturing throughout the UK's supply chain.

The ultimate goal would be for manufacturers to be contractually provided with machine tools with guaranteed quality, performance and availability. SMEs would gain access to cutting edge CNC machines while the responsibility for maintaining machine capability would reside with the experts.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DRIVE LOAD DISPLAY

AMRC / The University Of Sheffield.

To find out more about how we can help your business, contact
Ben Morgan Head of the Integrated Manufacturing Group/Factory 2050

b.morgan@amrc.co.uk T: **+44 (0)114 222 4991** M: **+44 (0)7834 184 652**

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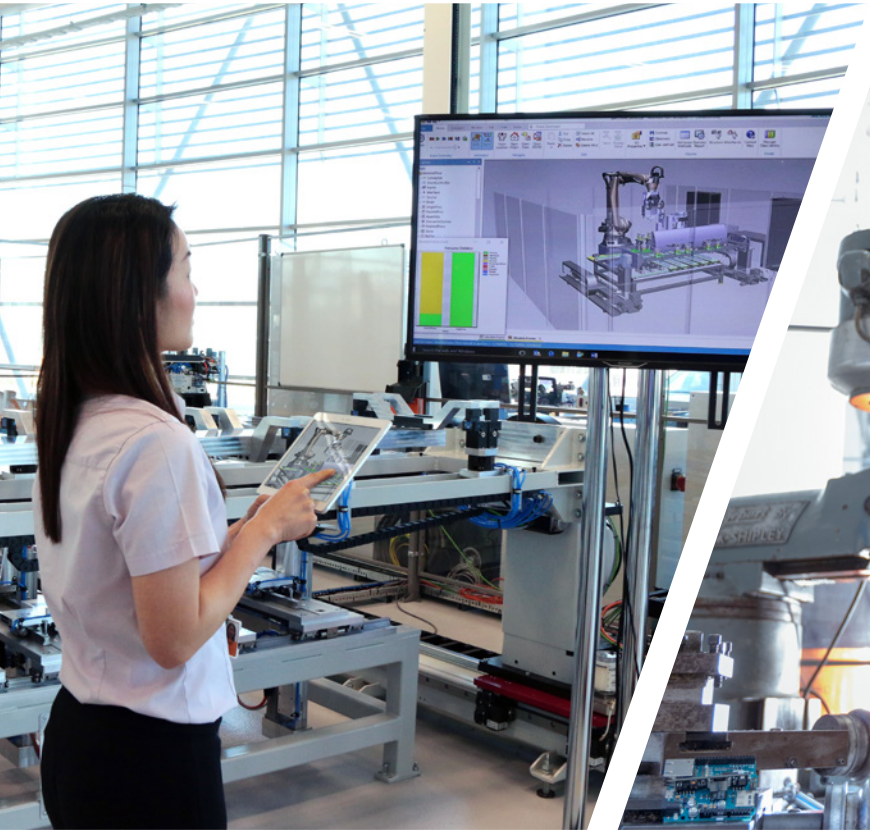

CATAPULT High Value Manufacturing

HIGHER EDUCATION hefce FUNDING COUNCIL FOR ENGLAND

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AMRC Factory 2050, Europa Avenue, Sheffield, S9 1ZA