Proud to be part of

CATAPULT
High Value Manufacturing

About us

Our purpose

To harness the power of our pioneering mindset and engineering excellence to positively impact society

- Independent Research Technology Organisation (RTO)
- Opened in 2011
- Opened training facility in 2015
- £120 million+ in turnover
- 1000+ staff members over 600 engineers & 100 apprentices

Market sectors

Our broad experience across a range of sectors means we can transfer valuable knowledge and insights, giving us the expertise to help with your next challenge.

Energy & Utilities

Civil nuclear, Hydrogen, Electrification, Renewables & Water

Defence & Security

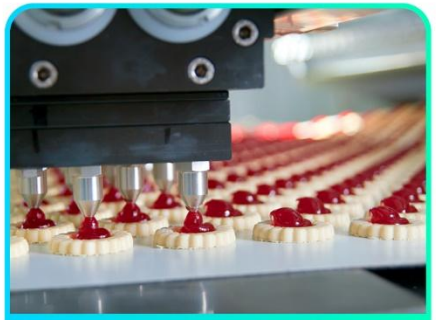
Air, Land, Sea, Platform systems, Sub systems & Government security

Built Environment

Construction, Rail & Road

Future Mobility

Automotive, Aerospace & Space



Emerging Markets

Agri-food, FMCG, Circular economy & Life sciences

Business challenges

We work with businesses of all sizes, from SMEs, start-ups, and entrepreneurs to large and multinational organisations, helping solve challenges and achieve goals.

Product innovation & development

Process innovation & development

Digital transformation & servitisation

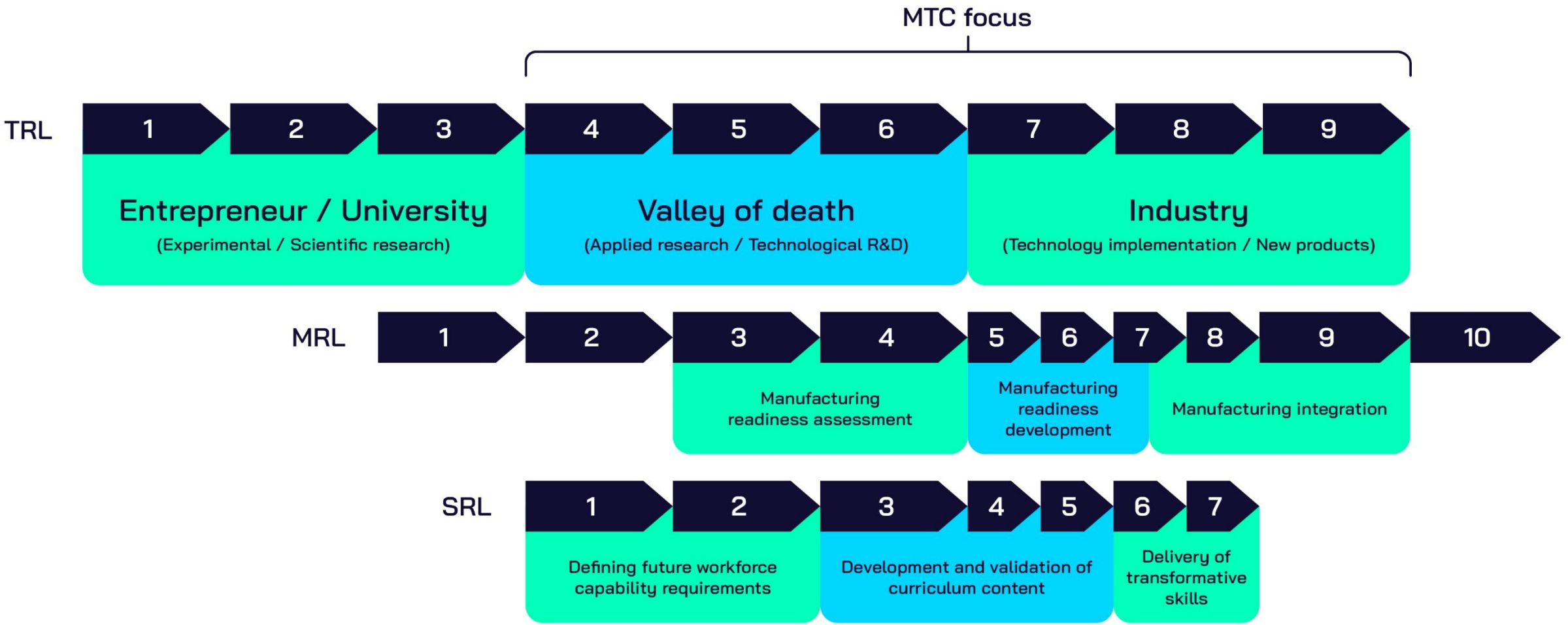
Industrialisation & scale-up

Supply chain transformation

Sustainable manufacturing & net zero

Skills & training

Bridging the valley of death



TRL = Technology readiness level MRL = Manufacturing readiness level SRL = Skills readiness level

Progressing innovation into industry

Challenges

MTC innovation toolkit

Industrial transformation	Business transformation Digital transformation Technology transformation
Digital engineering	Modelling & simulation Metrology & NDT Informatics
Advanced production systems	Robotics & automation Design & build Process, product & equipment
Component manufacturing technologies	Additive manufacturing Laser processing Advanced materials processing
Future skills	Manufacturing engineering apprenticeships Advanced manufacturing training & workforce foresighting Bespoke course creation & delivery

Solutions

MTC value

Maximising return on investment

De-risking strategic decisions

Trusted impartiality

Agnostic innovation partner

End-to-End capability support

Skills & training

Cross sector transfer of knowledge

Connecting people through events

How we work

One-to-one
Single client project

1400+ industrially funded projects

Company owns all IP generated

Government backed
Collaborative R&D projects

Involvement in 2000+ CR&D projects

IP ownership determined by partnership

Membership
Collaborative R&D projects

£10m+ total core research project value

IP owned by MTC and licensed to members

Our impact in numbers

9000+
Projects delivered

600+
Multi-disciplinary engineers

90+
Collaborative members

1200+
Apprentices trained

200+
Upskilling courses available

3500+
SMEs worked with

Our members


ABB
additiveflow
AEGIS SOFTWARE
AIRBUS
ALTUS GROUP
Amey
Ansys
ASM
Atlas Copco
ATS
AWE NUCLEAR SECURITY TECHNOLOGIES
BAE SYSTEMS INSPIRED WORK
BECKHOFF
BOC A Member of The Linde Group
BROWN & HOLMES (Tamworth) LTD Precision Workholding and Machining
CAPVIDIA
CGTECH VERICUT
CONTROL 2K everything in control
Cummins
diondo x-ray systems and services
DMG MORI
DS Smith
eos
EPICOR
esi get it right
eTEK europe
eyelit TECHNOLOGIES
fairfield
FANUC
ferrovial construction
FICO
FLOW-3D
+GF+
GKN PLC
GÜDEL
HAL robotics
HEXAGON MANUFACTURING INTELLIGENCE
hs2
iBase-t
INNEO That's IT.
IPG PHOTONICS
IPP
ITP AERO
KATRICK TECHNOLOGIES
KIER
Kingsbury
KOTEM
LANNER
LITHOZ
London Underground
LUMENTUM
MAHER
Makita
MBDA
MTA The Manufacturing Technologies Association
materialise innovators you can count on
national highways
NetworkRail
Nikon
NANODIMENSION
Origin International Inc.
Parker Aerospace
Prodtex Production / Technology / Excellence
ptc
RENISHAW apply innovation
rexroth A Bosch Company
RHEA SPACE ACTIVITY
ROLLS ROYCE
SANDVIK coromant
SENSOFAR
SIEMENS
Simportal
SMC
SPEE3D
STIRLINGX A GALLOS COMPANY
SYNOVA
THALES
TRAFNIDIAETH CYMRU TRANSPORT FOR WALES
TRUMPF
Ubisense
Unilever
valuechain
vero Software
WEIR
WITTE
XERINI
ZESTRON High Precision Cleaning
3dscannersuk
3DGBIRE ADDITIVE MANUFACTURING FOR INDUSTRY
3M

Part of something bigger

Proud to be part of High Value Manufacturing Catapult

Proud to be part of CATAPULT High Value Manufacturing

Supported by Innovate UK

UKRI Innovate UK

Founded by

University of Birmingham

Loughborough University

University of Nottingham

MTC hydrogen activities

Overview of key challenges and drivers

- **HYDROGEN** is an important solution for the hard to decarbonise sectors of industrial and domestic heat and elements of transport as a replacement for hydrocarbons
- **UK ENERGY WHITE PAPER** and the 10-point plan state latest intention for 10GW of low carbon hydrogen production capacity by 2030, along with industrial and domestic trials
- **INITIAL WORK** is supporting the evidence base for UK wide policy decisions which will quickly turn to rapid scale up and deployment, with focus likely around Industrial clusters
- **UK APPROACH** is focusing on the twin streams of blue hydrogen production through methane reforming with associated carbon capture and storage as well as green hydrogen through electrolysis

Power and energy

There is growing support for hydrogen in deep decarbonisation

H2 production

Power generation

Domestic heat

Industrial heat

Aerospace

Rail and infrastructure

Automotive

Marine

MTC core services

DISCOVERY






DfX	PROCESS DEVELOPMENT AND QUALITY	EQUIPMENT DESIGN	FACTORY DESIGN	SKILLS AND WORKFORCE DEVELOPMENT	SUPPLY CHAIN DEVELOPMENT
Component and product Design	Technology Down-selection	Special Purpose Machines	Scenario Mapping	Future Skills Foresighting	Assessment and Oversight of Supply Chain
Physics Modelling	Additive Manufacturing	Robotic Workstations	Layout Optioneering	National Apprentice Standards Creation	Targeted Supplier Development Programme
Design for Additive	Laser Processing	End Effectors and Fixtures	Discreet Event Simulation	Upskilling and Reskilling	
Automated Design	Automation and Robotics	Bespoke Machine Builds	Virtual Build Event	Training and Apprenticeship Delivery	
	Electronics Manufacturing		Visualisation		

DIGITAL ADOPTION

Simulation and Modelling | Digital Enterprise Down-selection | Digital Twins | AI and Machine Learning | IIoT | Predictive Analytics

How MTC is helping

ADELAN

Immaterial

FORTESCUE FUTURE INDUSTRIES

AqSorp

HS2

Northern Gas Networks

ROLLS ROYCE

Supercritical Solutions

national gas

WHO MTC IS HELPING

HOW MTC IS HELPING

1. Wider understanding of sector and common industrial challenges and **creating communities** to solve problems
2. Delivering **Innovative Technical Solutions** and introducing solutions from different sectors
3. **Delivering Transformational Change:**
   - Business
   - Technology Transformation
   - Supply chain

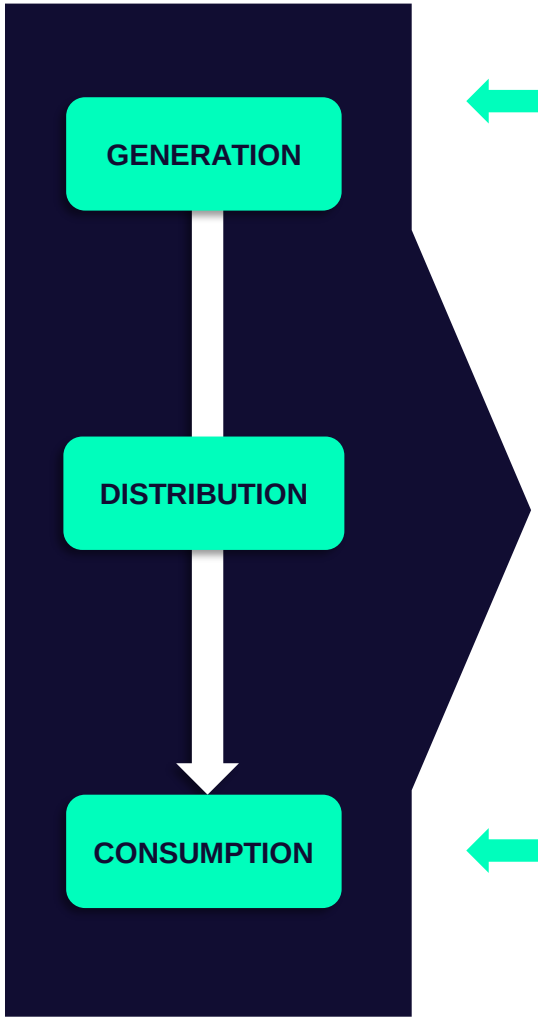
Create a **significant positive impact** on society by enabling product-based business to generate **zero carbon** economic growth and people to develop technical skills and knowledge.

TECHNICAL SOLUTIONS

- Additive Manufacturing
- Non-conventional machines
- High integrity fabrication
- Intelligent automation
- Design and simulation
- Manufacturing informatics
- Metrology and NDT
- Electronics manufacturing
- Tooling and fixturing

How the MTC is supporting the hydrogen sector

Projects across the value stream



PROJECT WHISKHY
Novel high pressure/temperature electrolyser manufacture support through BEIS (UK Govt) with Supercritical Solutions

PROJECT RECHYCLE
Near net shape processes for manufacture of electrolyser plates from recycled materials

FORTESCUE FUTURE INDUSTRIES
Supporting first plant build of electrolyser factory and wider support for Green Energy

ELECTROLYSER END PLATES
Functional parts designed via additive manufacturing with channels and integrated porous transport layer

NOVEL ELECTROLYSER DESIGN
Working with Aqsorption on a new design of electrolyser

PROJECT SHYLO
Design and build of modular hydrogen storage solution (including balance of plant)

HYGROGEN STORAGE AS MOFs
Pressure vessel construction for H2 storage

HYBRID STORAGE AND COMPRESSION
Solid state and hybrid gas storage for use for National Gas Transmission compressors

ENABLING THE HYDORGEN TRANSITION
Bipolar plate surface modification and porous transport layer testing, design of electrolyser stack components for manufacture and inspection, next gen. electrolyser manufacturing feasibility, high temperature permeation barrier coating feasibility

---

HS2
Options for decarbonisation of HS2 supply chain and logistics fleet

ADELAN
Two projects with focus on Solid Oxide Fuel Cell Manufacturing Accelerator Support through APC

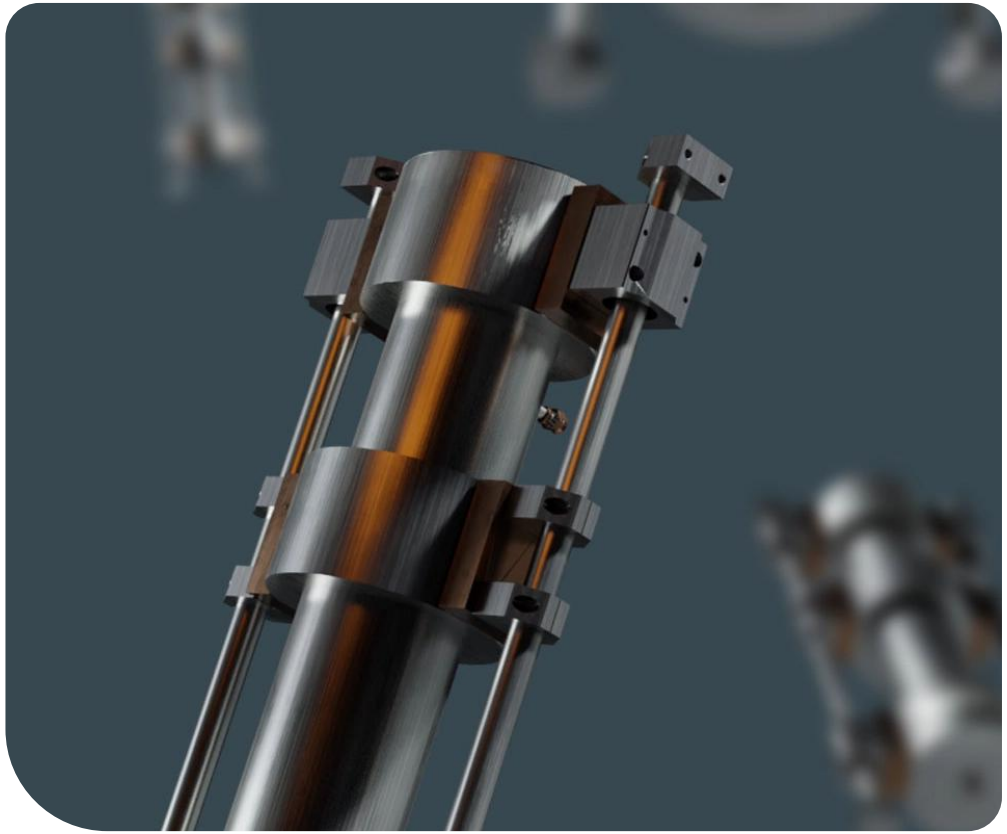
CARNOT ENGINES
Design for manufacture and assembly, supply chain analysis and lifecycle carbon analysis, supporting demonstration of hydrogen ICE for maritime

AEROSPACE PROJECTS
Multiple, many under NDA with MTC members. Includes liquid hydrogen gas turbine work with Rolls-Royce.

Project WhiskHy – Supercritical electrolyser

Supercritical has solved the biggest inherent problem of membraneless electrolysers, gas separation, achieving over **99% purity** in both the oxygen and hydrogen outlets, with the system running at as low as **42 kWh/kg of H_2** and delivering **220 bar of pressurised gases**, without gas compressors

- 220 bar high pressure separated oxygen and hydrogen
- >50% emission reduction vs PEM
- Planet first - no iridium, no PFAS (forever) chemicals
- <€2 /kg of hydrogen, this decade
- Use case is whisky distilling



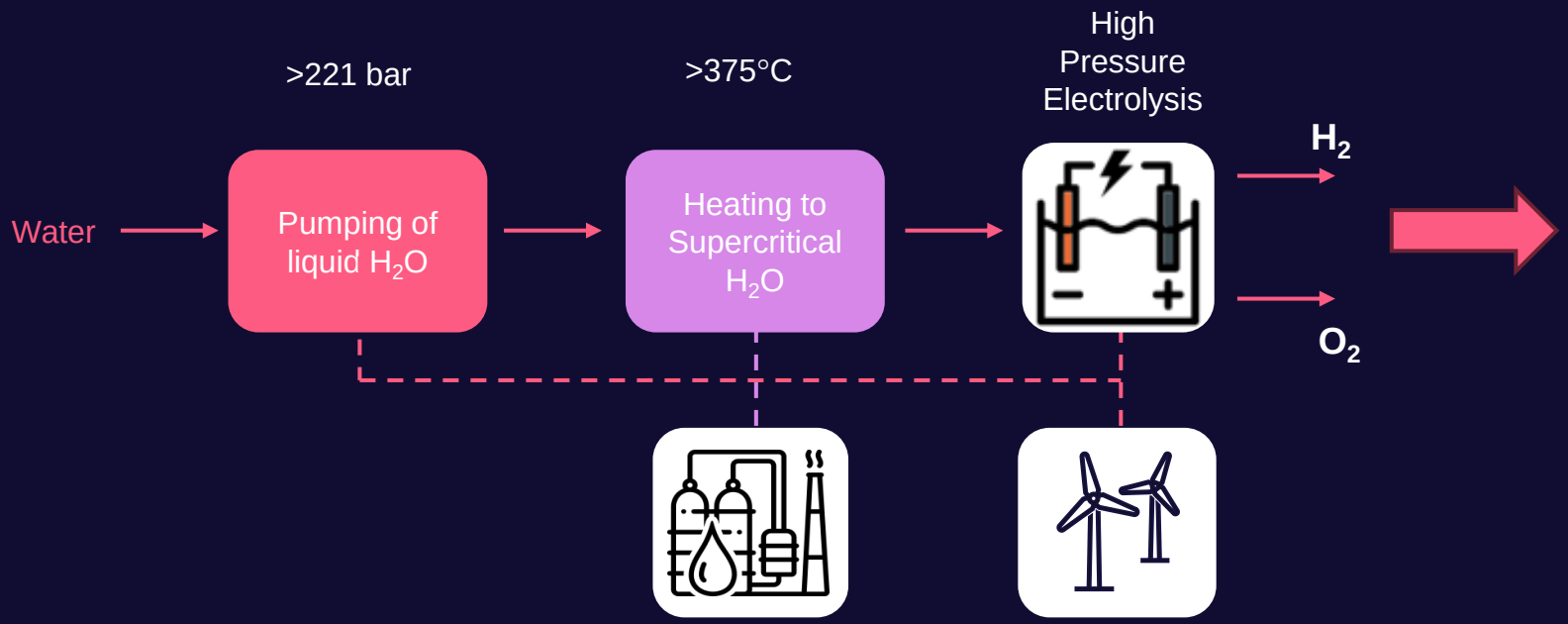
SUPERCRITICAL

where progress happens

SUNTORY GLOBAL SPIRITS

Project WhiskHy – how it works

High-level diagram of Supercritical's novel high pressure electrolysis process



WhiskHy

Zero emission hydrogen delivered at ideal industrial storage pressures of 220 bar with no compressor

Delivered to a hydrogen burner for **direct combustion** at Beam's copper whisky stills

Distillery emissions: **water**

Project WhiskHy - demonstrator

MTC is supporting the manufacture of elements of the plant utilising advanced manufacturing laser processing

Project Shylo

DESIGN, PROTOTYPE, TEST

- **CONSORTIUM** awarded £4.3m by the UK former department for Business, Energy & Industrial Strategy (BEIS now DESNZ)
- **GREEN HYDROGEN** produced by wind and tidal power stored in proprietary hydrogen system and fed into the local system
- **SAFER** and lower cost alternative to compressed hydrogen as hydrogen is locked away in a metal hydride
- **OPTIMISATION** software will optimise and manage the hydrogen hub
- **WORLD FIRST** tested in summer 2024

Shylo project principle

EFFICIENCY

- Up to 95% RTE
- Operated at ambient conditions
- No compression in storage
- Compress at point of use, if required
- Smaller compressor infrastructure
- No H2 leakage

AUTONOMY

- Smart decision making through HyAI product
- ML on the edge enabled
- Remote operation

INNOVATION

- Proprietary IP and module design
- Proprietary safety systems
- Proprietary software developed in house
- Significant know-how

PERFORMANCE

- Market beating hydrogen flow rates and system charge/discharge rates
- Commercialising materials storage

SAFETY

- Low pressure: 1% of compressed H2
- H2 bonds to material
- Low risks; benign failures
- Reduced site H&S, e.g.
- COMAH, Seveso

DENSITY

- Volumetrically dense
- H2 chemically bonded

COST

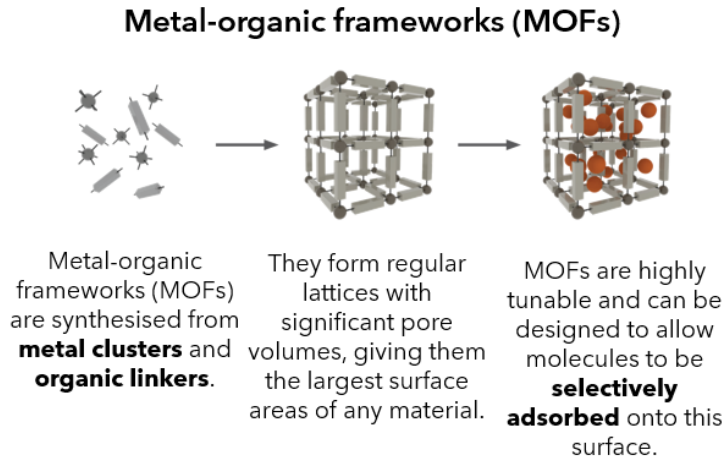
- Lower OPEX
- High efficiencies
- Lower infrastructure requirement
- Lower H&S overheads

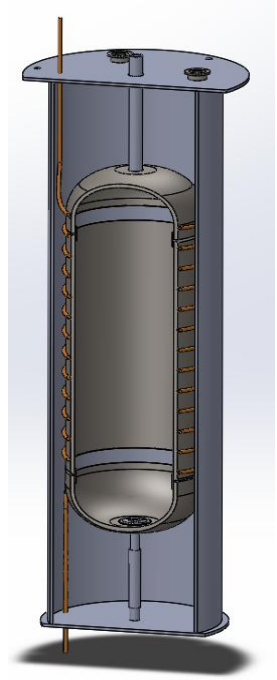
MTC supported the programme through support to the design and undertaking the full pilot build

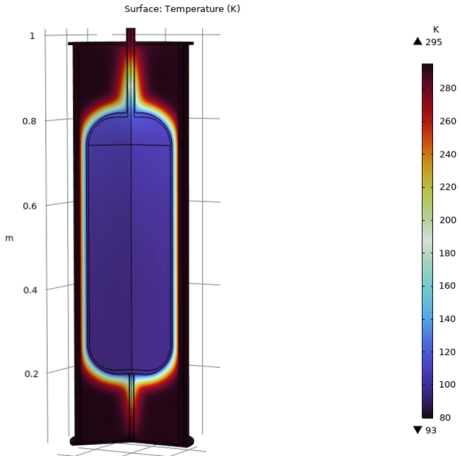
Immaterial

DESIGN, PROTOTYPE

- **Immaterial** developed a novel proprietary monolithic Metal Organic Framework (mMOF) that has superior hydrogen storage properties.
- Project funded under DESNZ Hydrogen Supply 2 funded project focuses on developing a **Cryo-adsorbed hydrogen storage demonstrator for transport applications**.
- MTC **designed and built** prototype hydrogen storage pressure vessels that is suitable for cryo-adsorbed process at 77K and upto 40 bar.
- Various **simulation processes, materials characterisation, design and safety regulations** are employed to design and build prototype vessels.
- MTC performed **Manufacturing feasibility, Technical, Economical and Life Cycle Assessments** for the MOF based hydrogen storage demonstrator.
- The analysis show that the cryo-adsorbed hydrogen storage systems have a great potential at a large scale in the future.







National Gas hybrid hydrogen storage

DESIGN

Gas turbines at compressor stations are the **largest source of emissions** on the National Transmission System (NTS). Under the Medium Combustion Plant (<50 MW) Directive (MCPD), many units will be non-compliant by 2030.

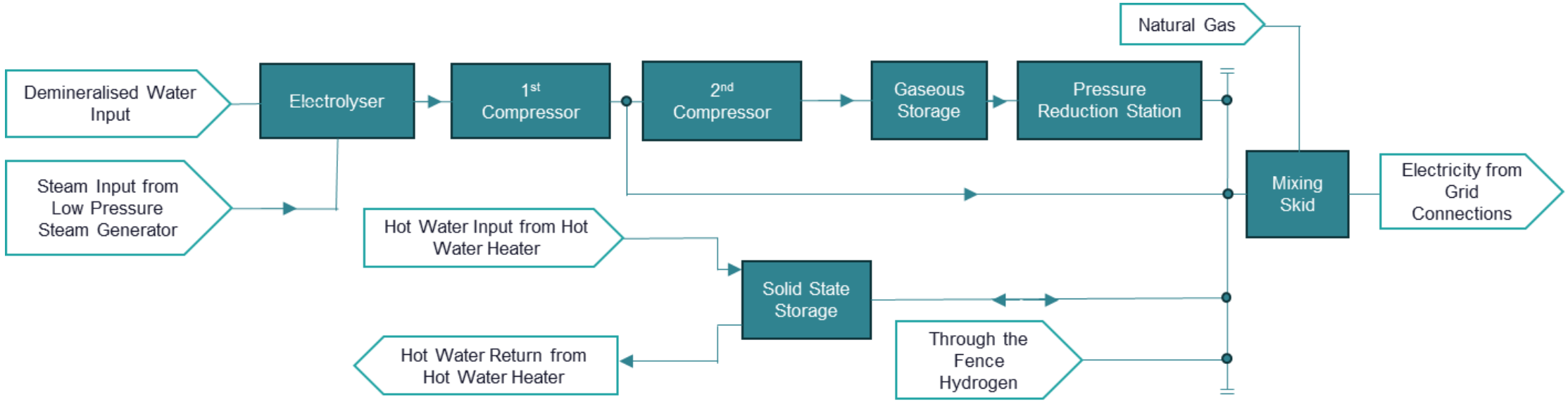
Hydrogen has shown to be a viable solution for reducing emissions from gas turbines, especially when using **green** hydrogen from renewable electrolysis. Due to the intermittency of renewable electricity generation, we will need to **store hydrogen on site** to meet demand, where a challenge on safe and cost-effective manner still appear.

Solid state storage of hydrogen is an emerging technology which will allow storage of hydrogen at high density (50-100 gH2/L) at ambient temperature and low pressures.
However, the flow rates from solid-state storage are lower then for compressed gas systems and **may not be sufficient for fuelling the gas turbines.**

A **hybrid solid-state storage system optimised by AI** could be the solution to balance long-term high density solid-state storage with short term compressed gas storage, **without entering COMAH regulations**.

This project will investigate the use of a **hybrid storage system** to provide **safe and efficient** storage of hydrogen for gas turbines.

National Gas hybrid hydrogen storage - MTC work



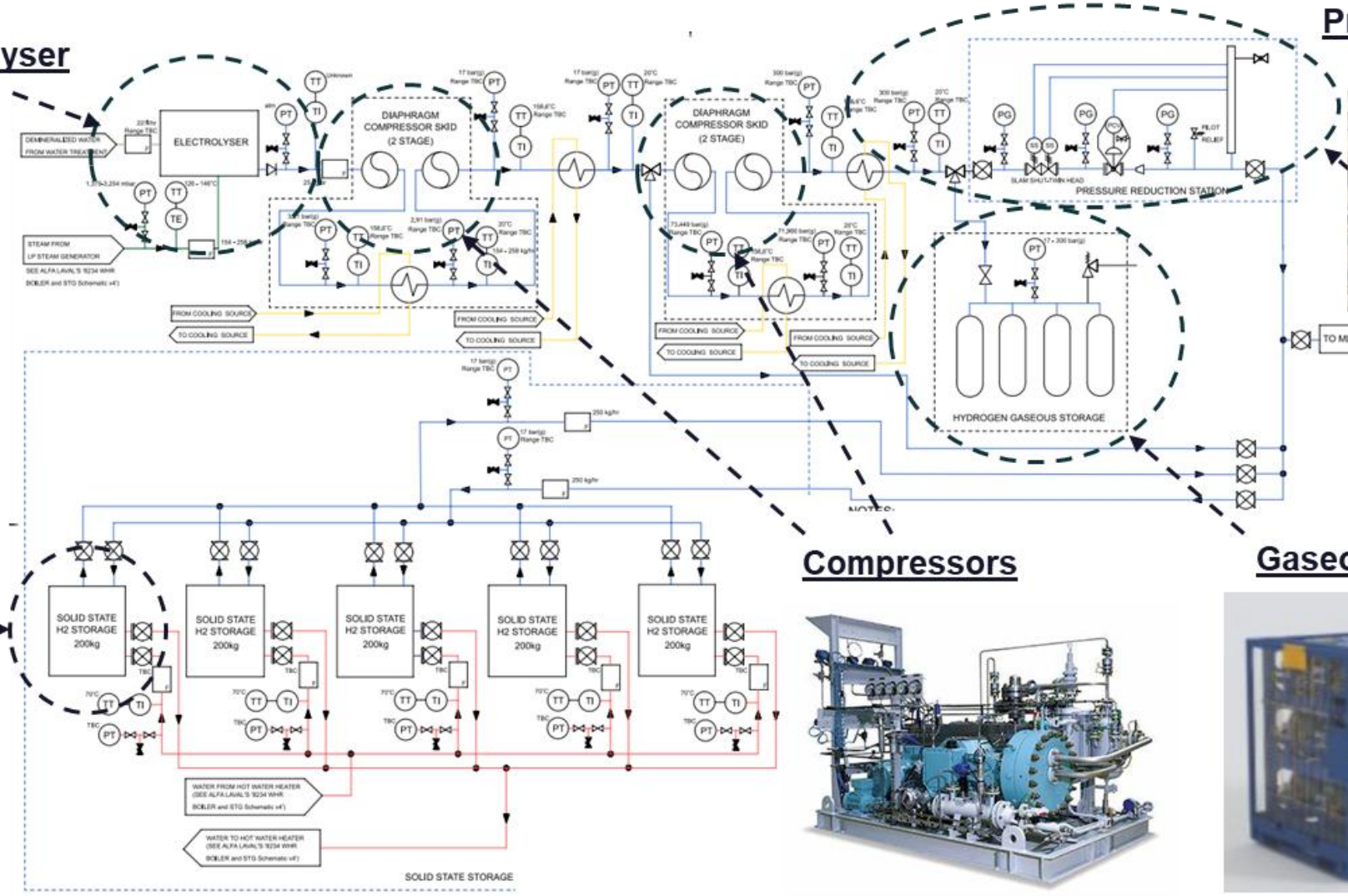
MTC Alpha Phase deliverables

- D19 – Design of Demonstration
- D16 – Energy Model Development
- D15 - Additional Storage Solutions
- D10 - Benchmarking
- D23 - Build and Test Plan
- D22 – Permit Requirements
- D21 – Site Layout
- D20 – Packaging & Deployment

National Gas hybrid hydrogen storage - demonstrator design

Solid Oxide Electrolyser

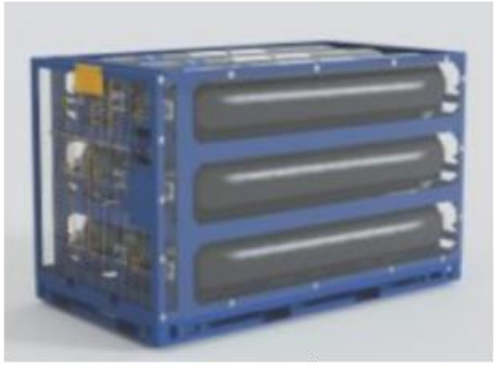
Pressure Reduction Station



Solid State Storage

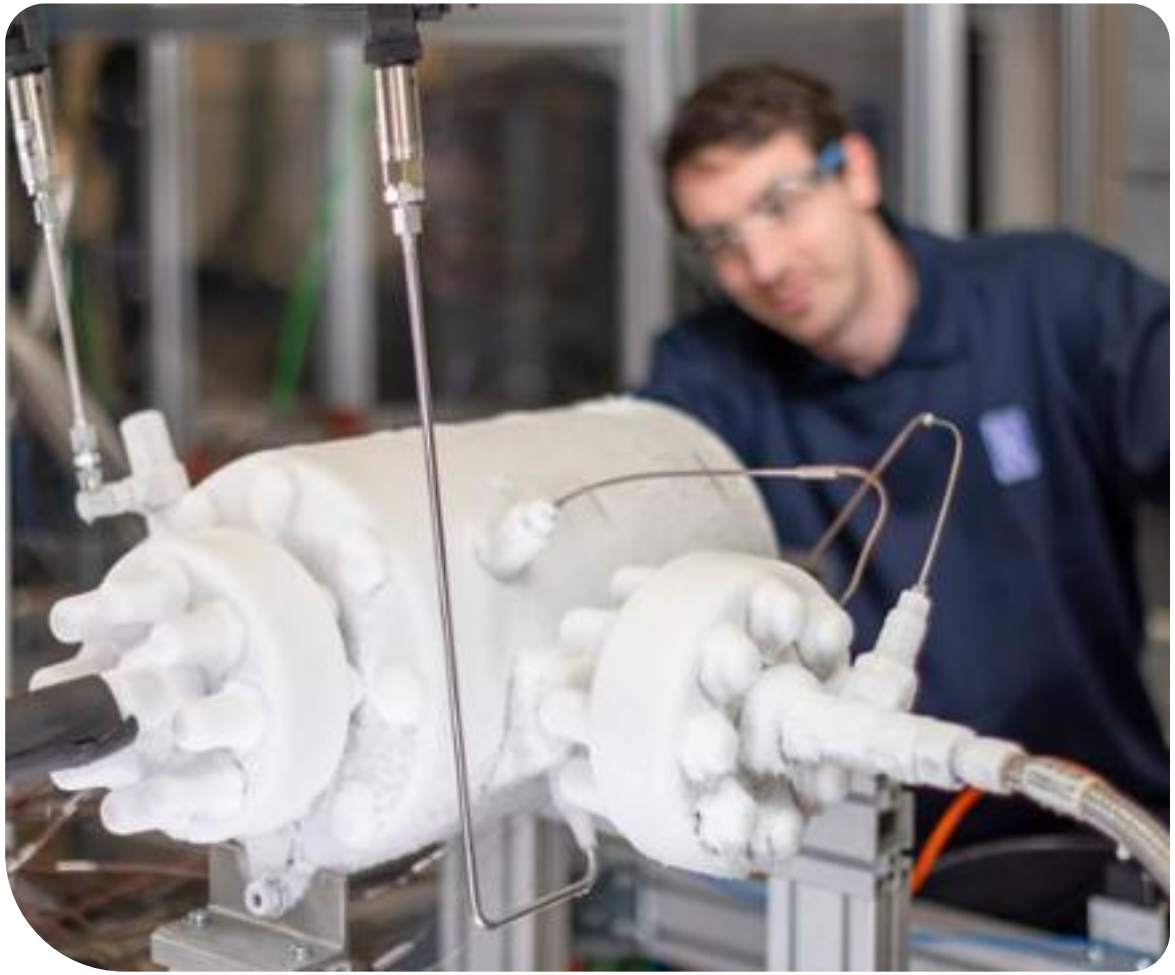
Compressors

Gaseous Storage



Rolls-Royce liquid hydrogen gas turbines

DESIGN, PROTOTYPE, TEST



ATI-funded £31.4m programme through to September 2025

A consortium led by Rolls-Royce, including Cranfield University, easyJet, Heathrow Airport, MTC, Reaction Engines, UCL and University of Oxford to develop gas-turbine control system technologies that will enable aircraft engines to operate on liquid hydrogen.

The programme and wider work is covering technologies to control and transport the fuel from the aircraft's liquid hydrogen fuel tank to the engine combustor, including cryogenic pumping, fuel metering, system thermal management, intelligent control systems and component life optimisation.

Here we can see initial tests taking place, focused on pressurizing low-pressure liquid Nitrogen to understand behaviour at cyrogenic conditions.

Carnot Engines – virtual build simulation

DESIGN

CARNOT developed an ultra-efficient thermally insulated internal combustion engine targeting auxiliary and main propulsion engines for all vessel types up to 10MW.

With the CARNOT engine still under development, additional refinement into the best approach to assemble the design was required.

MTC developed a virtual build simulation of the whole CARNOT engine following the assembly sequence. This represented the approach likely needed to build the assembly with each component coming together.

HS2 – case study

SUPPLY CHAIN DEVELOPMENT

Feasibility of hydrogen HGV fleet for HS2

Assessing the hydrogen HGV supply chain for HS2

- **HS2** through the HS2 innovation programme is investigating the use of hydrogen as an alternative fuel for HGVs for construction, starting with a dual-fuel system.
- **MTC** has supported this by mapping the hydrogen landscape and supply chain and developing a strategic business case for the use of hydrogen in HGVs, considering both risks and benefits of entering into an emerging market.
- **FUNDED** by HS2
- Hydrogen HGVS In Construction (the-mtc.org)

MTC in the regions

NORTH WEST
Supporting manufacturing growth and innovation within the Liverpool City region, and active member of the North West Hydrogen Alliance.

MIDLANDS
Supporting Midlands strategy through participating in the Technology Strategy group.

EAST MIDLANDS
Leading innovation theme for East Midlands Hydrogen.

SOUTH EAST
Supporting innovation through intention to partner and develop living labs for hydrogen business and technology development focused on transport use cases.

Future skills

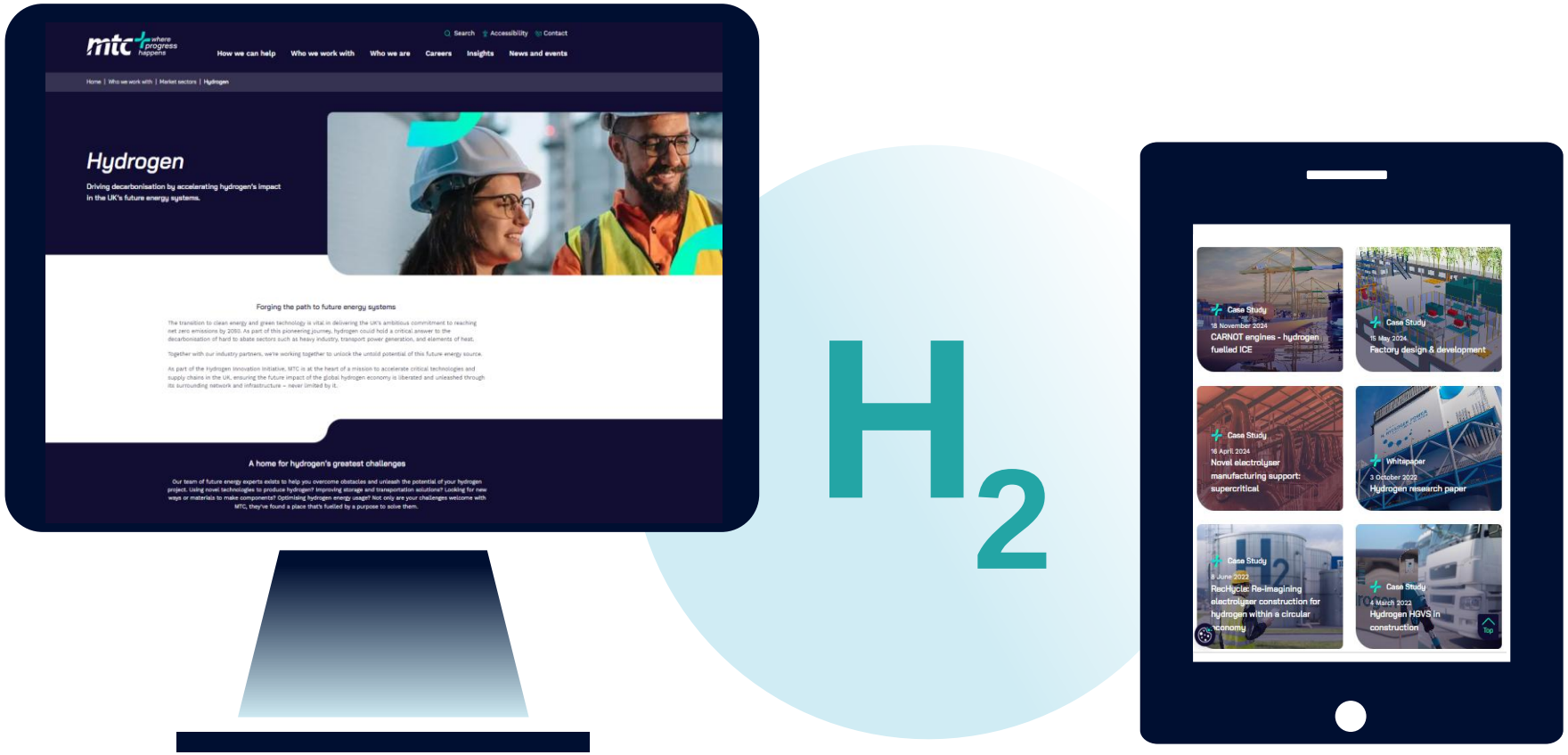
Advanced engineering apprenticeship

Seeding UK employers

Engineering upskilling

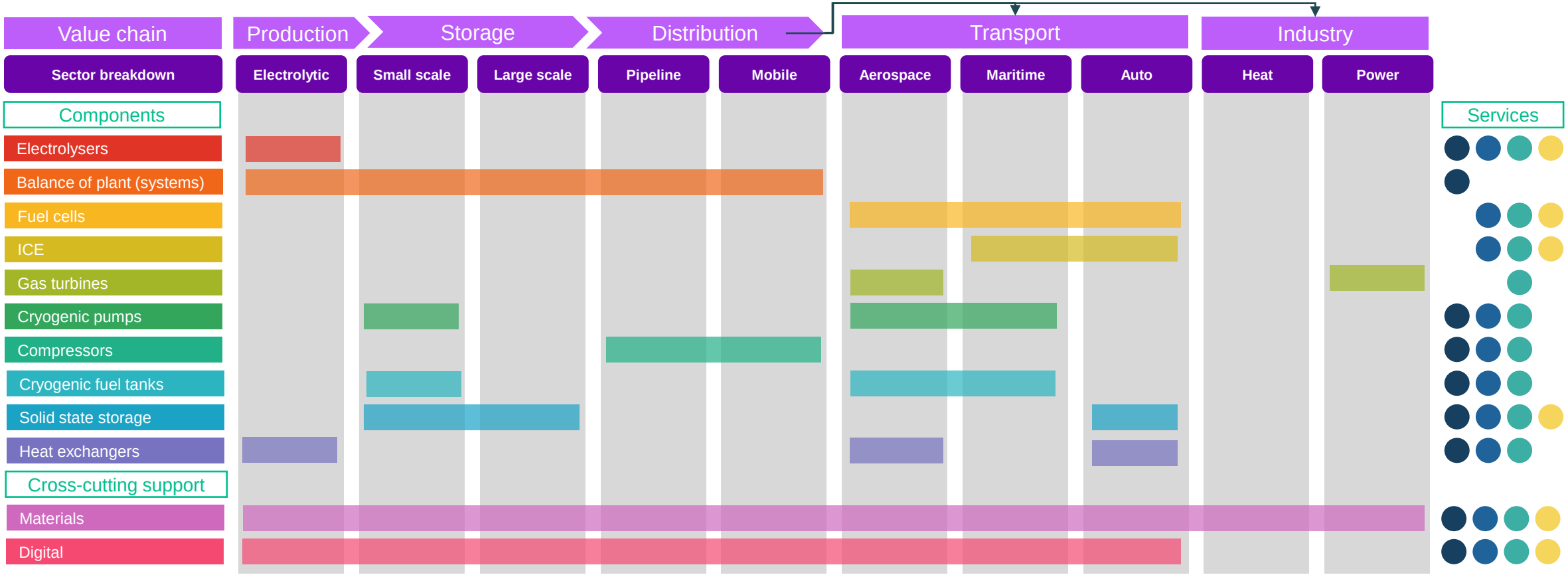
Hydrogen awareness for manufacturing

Hydrogen on MTC website



MTC hydrogen roadmaps and internal projects

MTC capability across hydrogen products



Hydrogen capability roadmap

MTC Services: Design, Prototype, Test; Design for manufacture; Manufacturing process and materials development; Automation and scale-up

Technology Groups: CMT, APS, DE

Deliver Value

Hydrogen systems design and integration

- BOP design optimisation and build for safe operation and lightweighting
- Systems engineering and design of heat recovery and boil-off management systems
- Optimised design for novel boil-off strategy with valorisation
- Automated refuelling infrastructure development
- Reducing cost of balance of system equipment through improved fuel cell integration
- Increasing storage capacity, safety, and reducing cost through development and validation of solid-state storage solution
- Enabling safe and timely refuelling of fleets and off-highway vehicles through the development of remote, mobile refuelling solutions
- Boil-off management development for cryogenic storage
- Increasing durability and efficiency of H2-ICE through design including integrating new coatings, injectors and adoption of heat recovery

Develop Capability

Thermal management

- Design and manufacture of next generation hydrogen compatible heat exchangers
- Scale-up manufacturing of LH2 heat exchangers
- Development of HEX for LH2 fuel and water exhaust management thermal management for hydrogen powered aerospace
- Lightweighting power electronic systems through development of novel cooling systems

Design and process efficiency for circular economy

- Design for manufacture guidelines for Hydrogen related products
- High tolerance, low cost manufacturing development
- Manufacturing and design rulebook for hydrogen related products
- Inspection development for right-first-time manufacture and assembly of FC / EC
- Reducing the manufacturing cost of FC and EC through automation, scale-up and digital monitoring to reduce scrap
- Development of range of compressors to meet hydrogen economy needs – including cryogenic, storage and distribution
- Developing supply chain recycling paths for components containing platinum group metals

Create Capability

Materials degradation knowledge & mitigation

- Understand susceptibility of metal processing route to hydrogen embrittlement
- Modelling of material behaviour in hydrogen environment for durability assessment
- Knowledge hub on impact of manufacturing process route of material behaviour in H2
- Coating technology for high temperature permeation barrier
- Development of multi-material manufacturing technologies
- Processing of refractory materials for hydrogen atmospheres
- Development of understanding or materials degradation to support new material development and enable life time prediction of componentry
- Increasing durability and efficiency of fuel distribution line, gas turbines, H2-ICE, long-term storage and furnace components

Low cost, durable, high efficiency FC and EC

- Develop porous structure manufacturing to improve function, repeatability and cost
- Design for higher temperature operating PEM fuel cells
- Hydrogen production process simulation for design optimisation
- Radical redesign and development of manufacturing for novel electrolyser concept
- Coating technology development for lower cost electrolysis
- Porous structure manufacturing scale-up
- Reducing cost, increasing efficiency and power density of PEM electrolysers through design innovation and simulation
- Increasing the durability of AEM electrolysers building on UK research strengths
- Developing high operating temperature PEM fuel cells for aerospace, to reduce overall CAPEX
- Optimising the design of fuel cells to increase durability and efficiency

This Year (24/25) | In 3 Years | In 5 Years

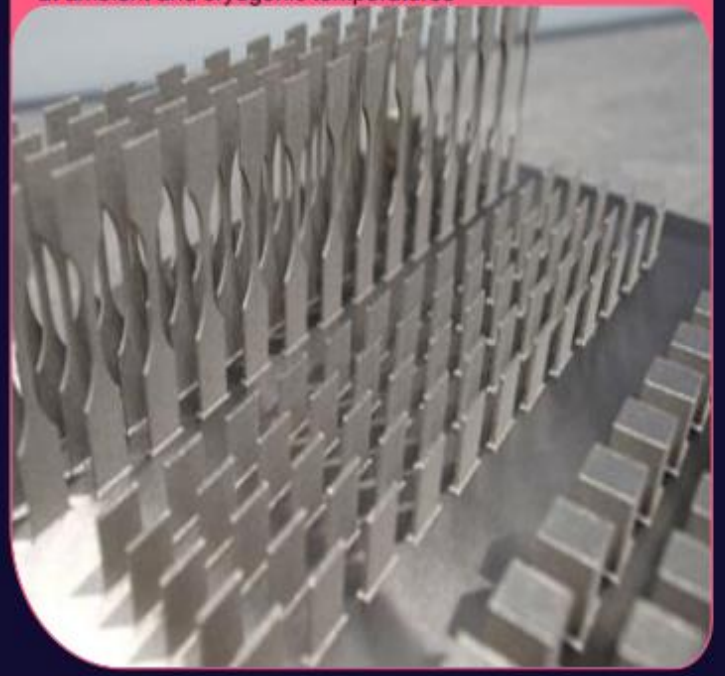
MTC internal capability research activities

Modular build for energy plant MEP

- 2 concept corner connector design
- Automated design tool, proof-of-concept

Material degradation

Testing hydrogen charged, wrought and AM material testing at ambient and cryogenic temperatures



Porous structures

Structured porosity via AM, laser drilling, and net-shape processing

Dissimilar material joining

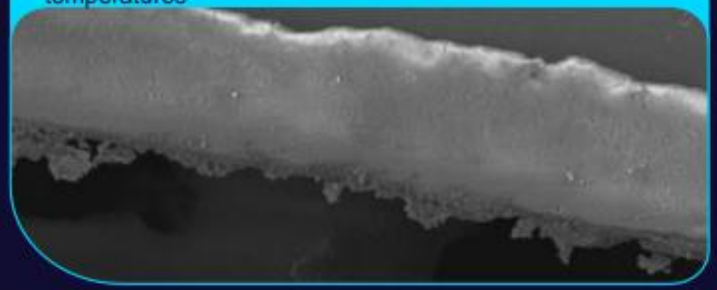
Adhesive free polymer-metal joining for lightweight storage

Next generation electrolyser design

Single cell concept design for next gen. electrolysers

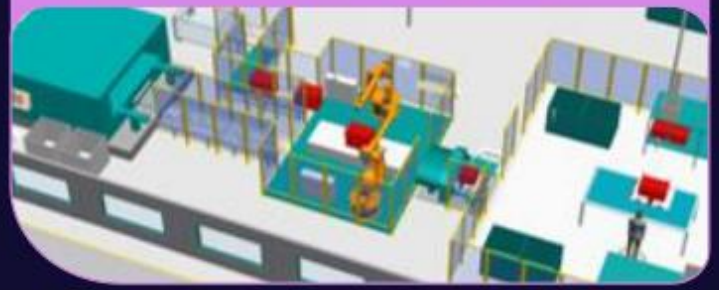
Permeation barrier coatings

Hydrogen permeation barrier coating at elevated temperatures



Stack assembly and inspection

Automation to scale up FC and EC manufacture



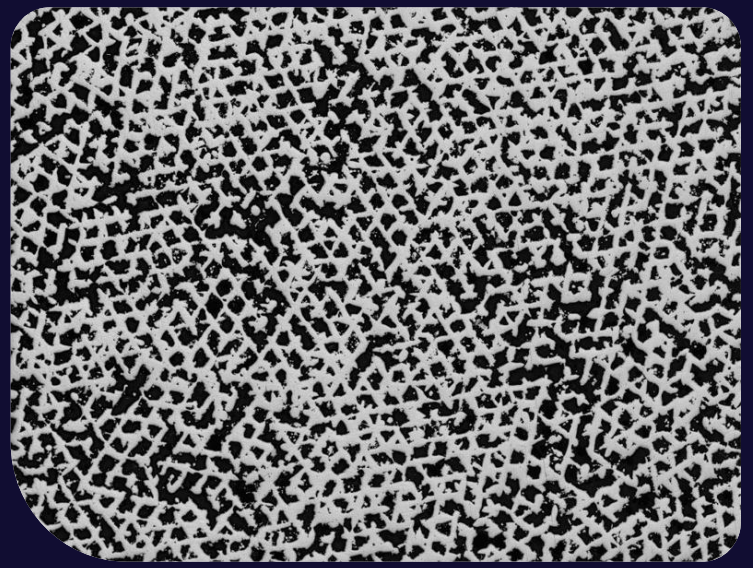
Optimisation of metallic porous structures

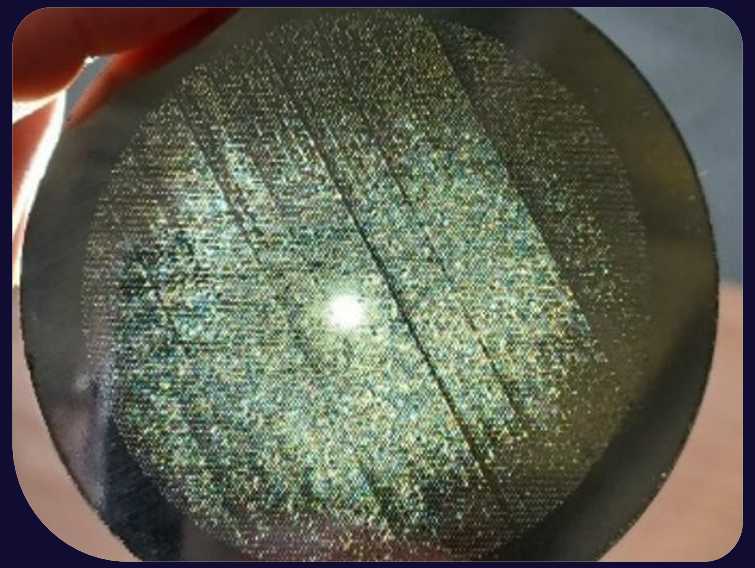
Drivers

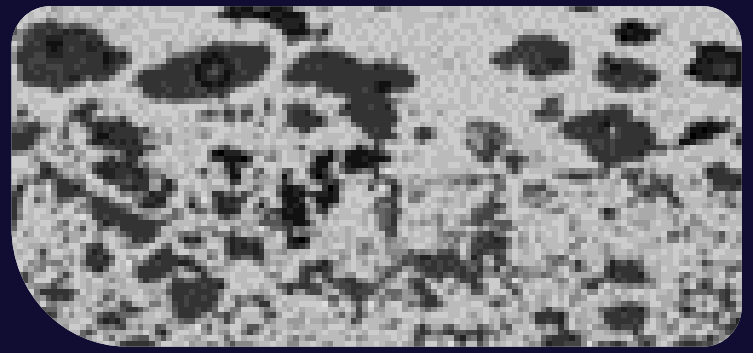
- **THE TAILORING** of porous structures (including graded features) is becoming of greater interest in thermal management and gas separation technologies
- **APPLICATIONS** include filtration systems, heat exchanges and porous transport layers (electrolysers and fuel cells)

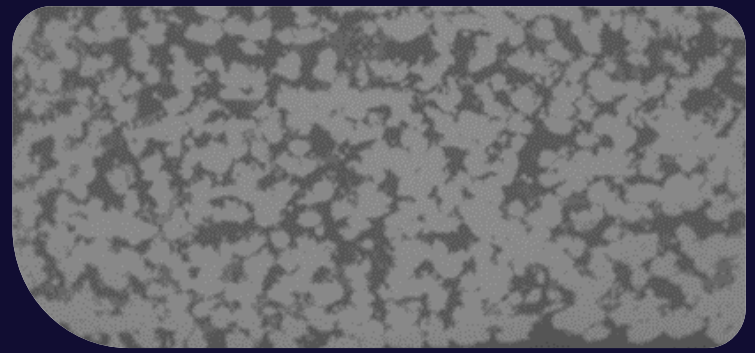
Demonstrator project

- **CREATION** of material demonstrators showcasing MTC's capability to manufacture porous structures
- **FOCUS** on metals
- **INVESTIGATION** using field-assisted sintering technology, additive manufacturing and laser drilling





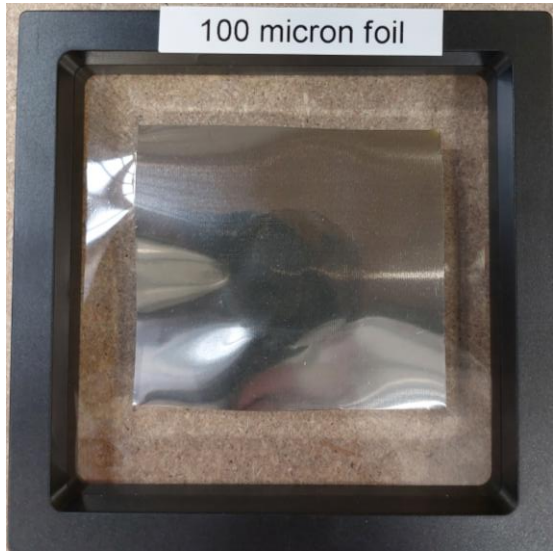


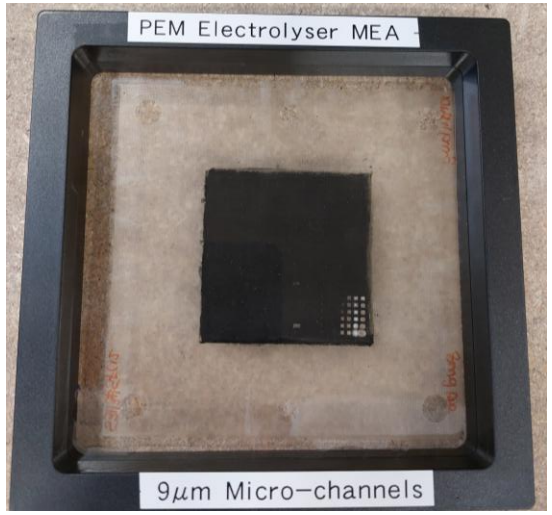


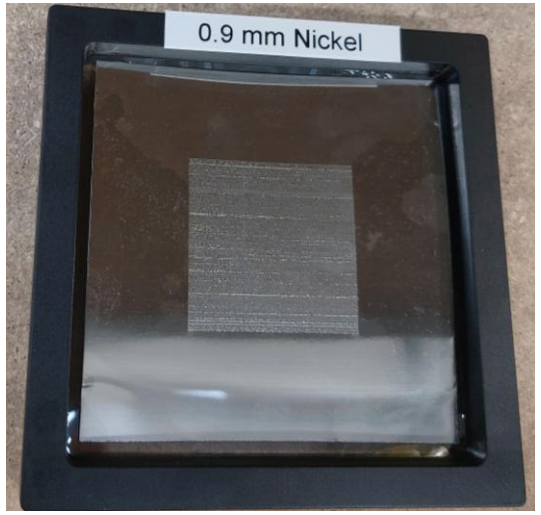
(Source: MTC)

Source: MTC

Laser drilling trials examples



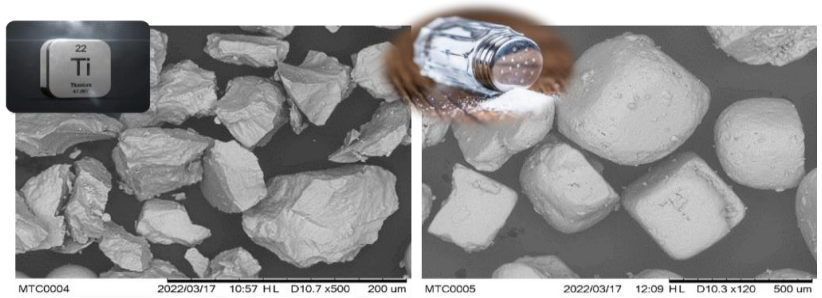




Project RecHycle

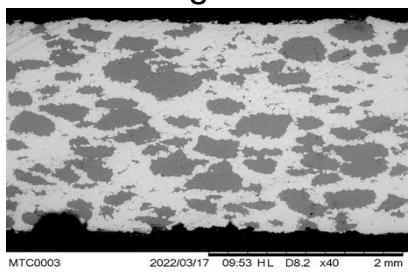
Re-imaging Electrolyser Construction for HYdrogen within a CircuLar Economy

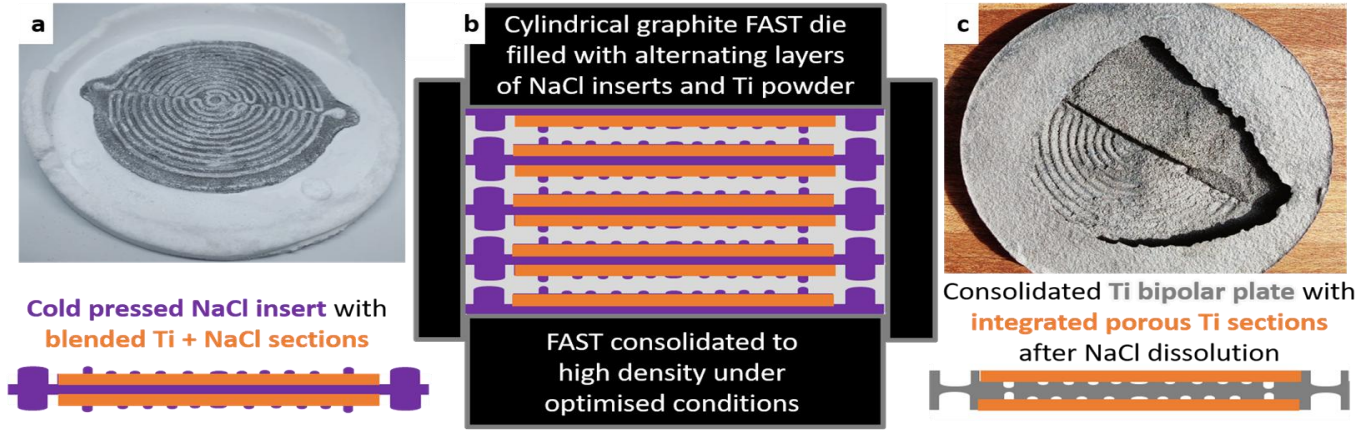
Supporting the drive towards cost-effective hydrogen production by utilising net shape manufacturing of electrolyser components with sustainably sourced powder materials



Utilising titanium waste streams

Dissolvable shape holding inserts



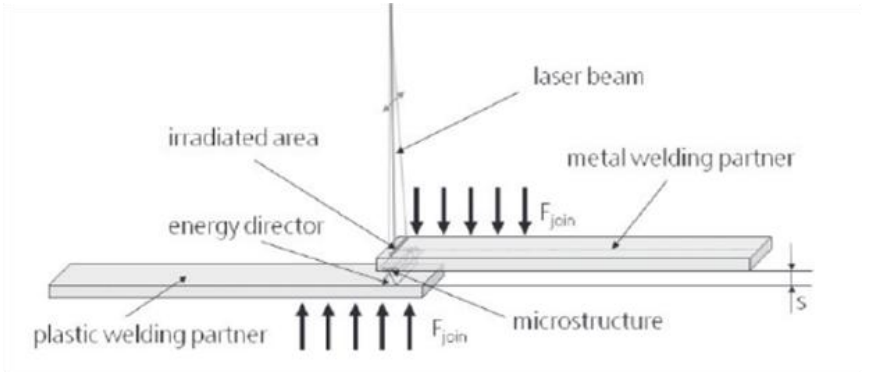


Innovative space-holder technique allows freedom to re-imagine bipolar plate design and integrate the porous transport layer

Dissimilar material joining

Drivers

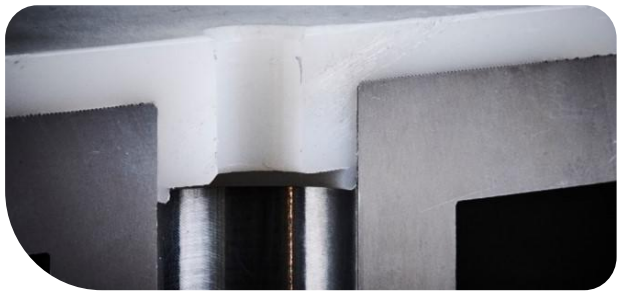
- **JOINING** of dissimilar materials requires development in many applications for enhanced sealing and joint integrity, and tailored heat and electrical conductivity
- **APPLICATIONS** include fusion, type-IV hydrogen tank storage and electrical powertrains



(Schricker et al., 2020)

Demonstrator project

- **CREATION** of two demonstrators showcasing MTC's capability to join dissimilar materials
- **POLYMER-METAL** adhesive free joining
- **COLLABORATING** with the National Composites Centre (NCC) on applications



Hydrogen permeation barriers

Case study: hydrogen permeation barriers and functional testing

Overview

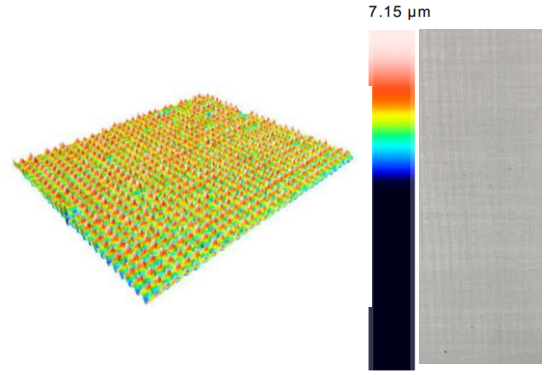
MTC measured the performance of a range of ceramic coatings to assess their suitability for use at high temperatures in fusion applications as tritium or hydrogen permeation barrier.

The challenge

- Stainless steels are widely used due to their excellent mechanical properties, corrosion resistance and resistance to hydrogen embrittlement. However above 700°C the corrosion and hydrogen embrittlement resistance is reduced significantly.
- In fusion applications the stainless steel would be exposed to high temperatures and high concentrations of hydrogen presenting a risk of the steel failing due to hydrogen embrittlement.
- A suitable coating is needed that allows steels to be used in the fusion environment.

↓ 20x

Reduction in H2 permeability



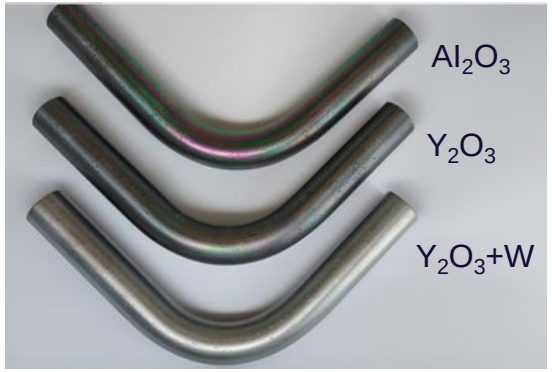
Laser surface texturing

MTC's solution

- Alumina, Yttria and Yttria + Tungsten coatings were selected. Physical Vapour Deposition (PVD) was used to coat P91 pipe demonstrators.
- Laser surface texturing was carried out on the P91 steel substrate to increase the adhesion of the coatings.
- The hydrogen permeability of each selected coating was measured at temperatures up to 450°C.

Benefits to the client

- Application of a few microns of ceramic was shown to increase the resistance to hydrogen embrittlement by a factor of 20 at 450°C greatly reducing the rate at which hydrogen embrittlement of steels occurs in fusion applications.
- A novel laser texturing technique and development of the scratch testing methodology provided a solution to increase the quality of coating therefore extending the service life of the fusion components.



Coatings on P91 steel pipes

Low cost electrocatalyst coatings

Case study: novel low-cost hard-facing materials for hydrogen energy applications

Overview

MTC explored the feasibility of using of low-cost Tungsten Carbide (WC) based materials for water electrolysis applications as a low-cost coating replacement for platinum.

The challenge

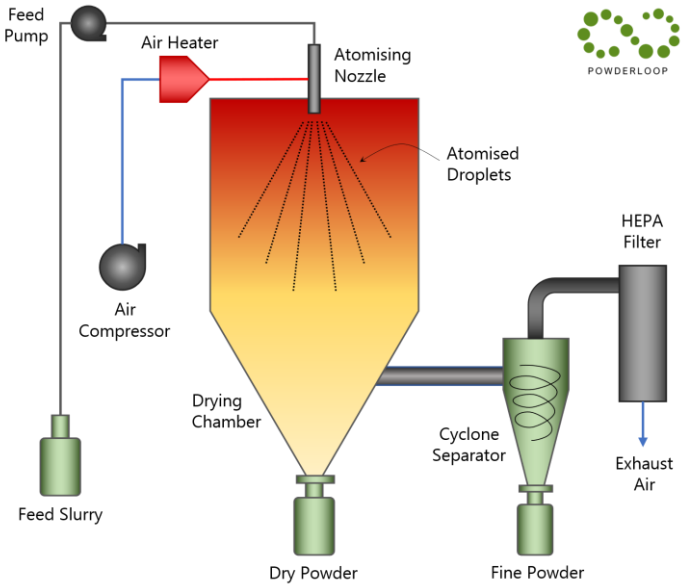
- One barrier to industrial-scale hydrogen generation is the processing cost, partially driven by the high cost of platinum in electrolysers.
- This project investigated tungsten carbide-based materials as a low-cost and energy efficient feedstock alternative to platinum.
- A wide range of WC-based materials have been tested for Hydrogen Evolution Reaction (HER) performance. There exists a research gap for electrodes based on WC-metal additives combinations which could increase HER performance of the electrodes.

MTC's solution

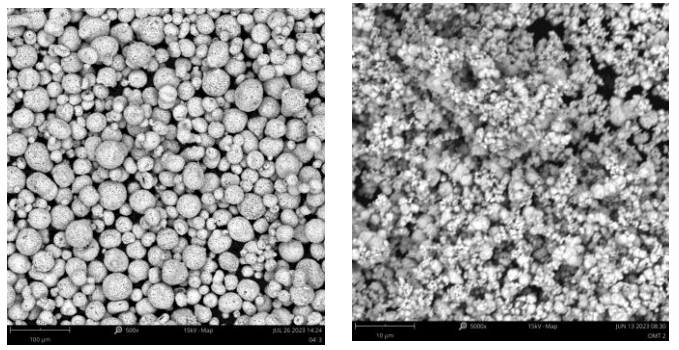
- Powderloop Technology Ltd, will manufacture WC-based metal powders using an energy-efficient environmentally friendly method.
- MTC will formulate and deposit electrocatalyst coatings.
- Our Royce partner will determine functional performance by conducting electrochemical measurements.

Benefits to the client

- This project will help develop a UK-based supply chain for future energy materials and ultimately help enable the scale-up of cost-effective hydrogen generation, supporting future clean energy solutions.
- The analysis of electrocatalyst performance will identify potential improvements required for the catalyst material synthesis process, and future insights for Powderloop.



Powder Agglomeration Process



Tungsten Carbide Powder

Thank you

mtc where progress happens

Proud to be part of CATAPULT High Value Manufacturing