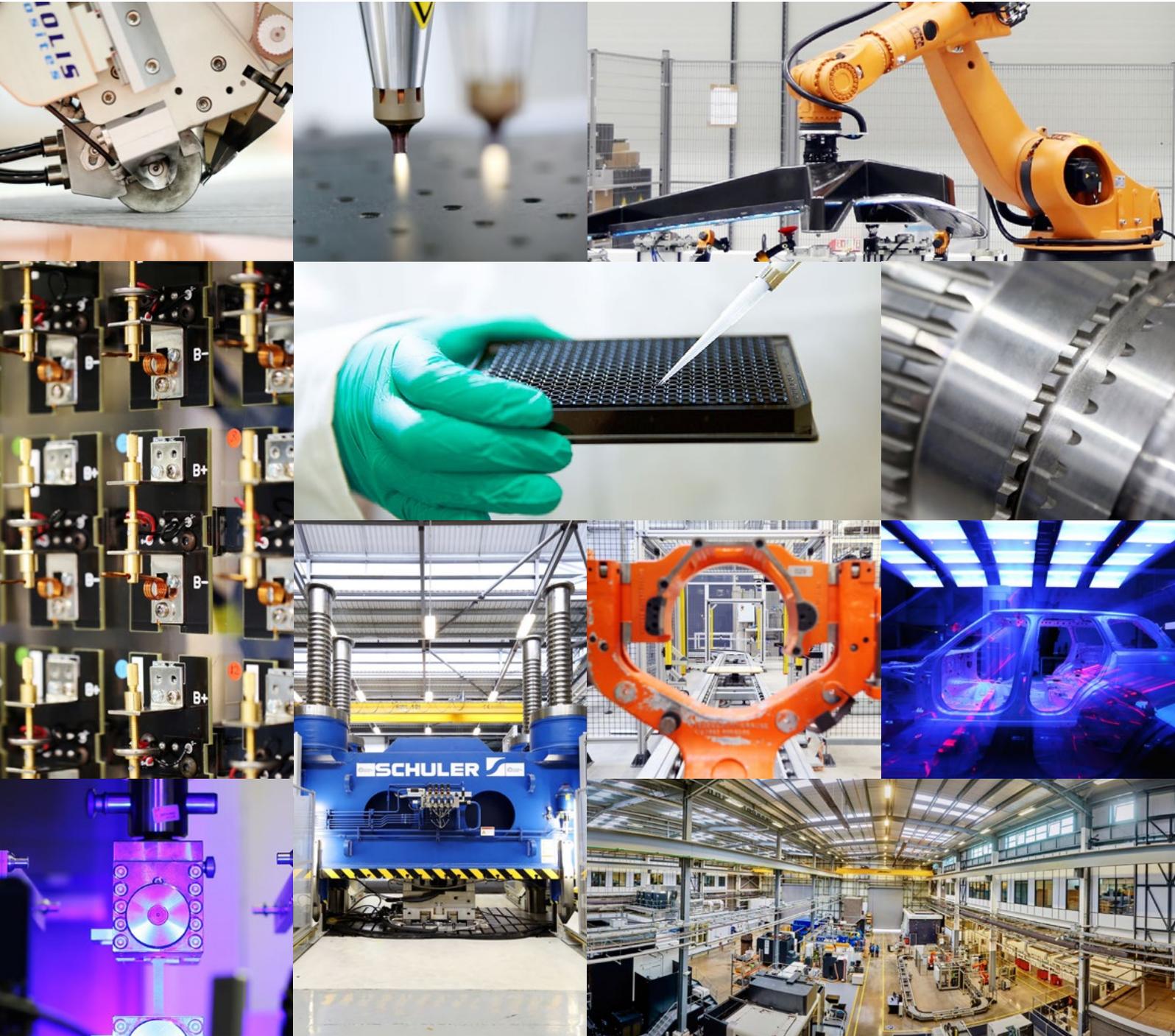
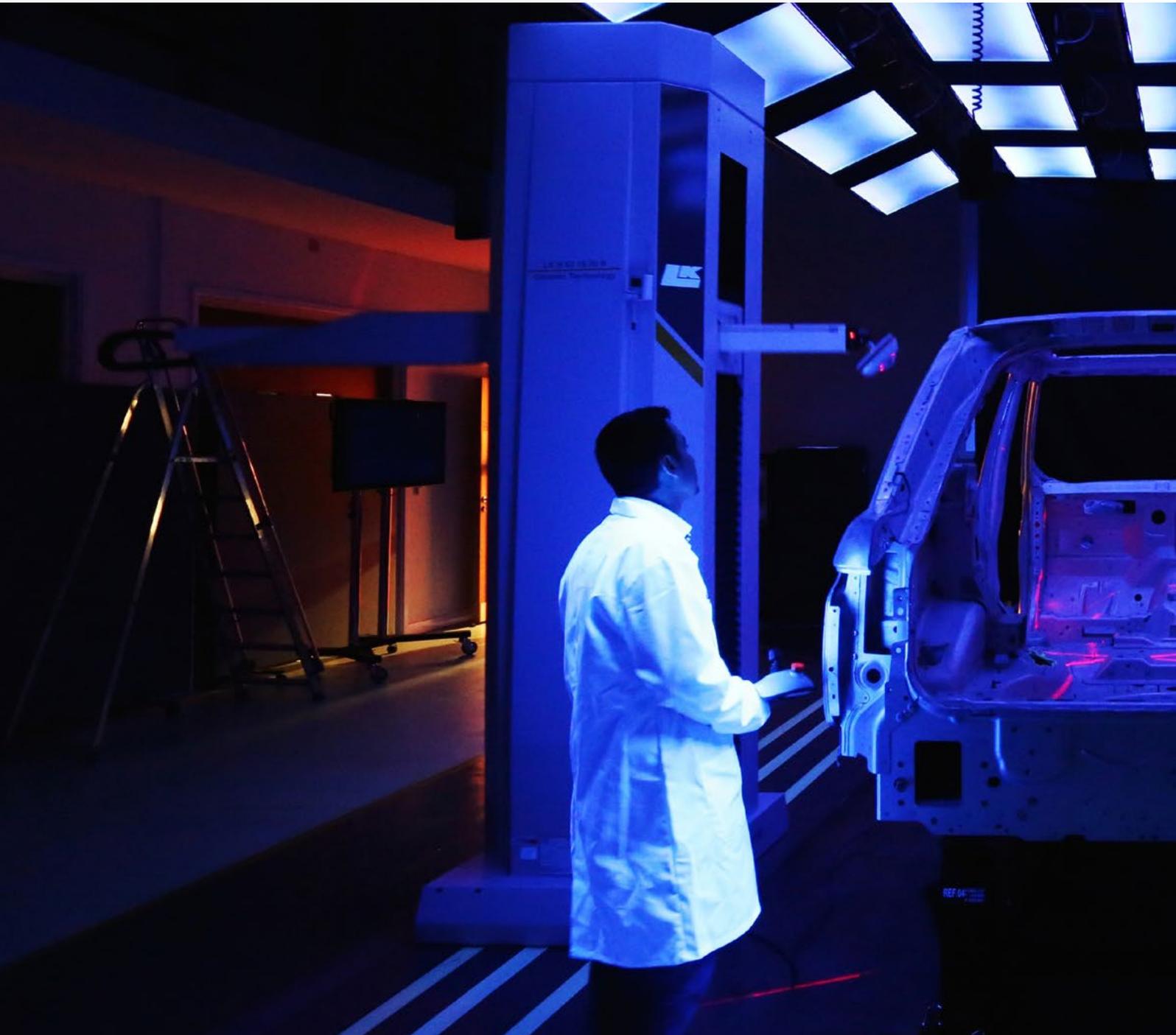


The go-to place for advanced manufacturing technologies in the UK





All-aluminium Range Rover body-in-white being scanned by the twin column computer numerical controlled (CNC) coordinate measuring machine in WMG's metrology workshop



In 10 years we will look back and see the High Value Manufacturing Catapult as a pivotal moment in supporting manufacturing in the UK.

**Andrew Peters, Managing Director –
Siemens Motions Control Plant, Congleton**

Contents

Chairman's statement	7
Chief Executive's statement	8
Performance highlights 2015-2016	10
Key milestones	12
Cross centre collaboration	14
HVM Reach	20
Success stories	26
Influencing strategy, informing policy	30
International engagement	33
Events	34
What was said about us?	36
Looking ahead	41

Our centres

AFRC:	Advanced Forming Research Centre
AMRC:	Advanced Manufacturing Research Centre
CPI:	Centre for Process Innovation
MTC:	Manufacturing Technology Centre
NCC:	National Composites Centre
Nuclear AMRC:	Nuclear Advanced Manufacturing Research Centre
WMG:	WMG Catapult



The support from the HVM Catapult will mean the difference between us being a cottage industry or becoming a global player.

Toby Peters, CEO – Dearman



At a time of tremendous global challenges, it is more important than ever to invest in the technology innovations that drive up our productivity and help us compete in the high growth markets of the future.

Bob Gilbert, Chair – High Value Manufacturing Catapult

Chairman's statement



In the past year the High Value Manufacturing Catapult (HVM Catapult) has continued to grow in both output and influence. This is particularly positive in light of a number of global factors impacting UK manufacturing such as the slowdown of the Chinese economy, a challenging steel market, struggles in the North Sea Oil and Gas industry, and uncertainty in the Eurozone and the UK's relationship with the EU.

It is perhaps no surprise that factory output was hit in 2015-16, but it is very encouraging that UK manufacturers maintain a commitment to robust levels of investment in buildings, plant and machinery. Investment in disruptive technology innovations will help us generate step-change improvements in productivity and help the UK compete in high growth markets of the future and the HVM Catapult is playing its part in this.

The seven HVM Catapult centres have a key role to play. We work with business to bridge the gap between research and commercialisation, taking much of the risk out of innovation by offering open access, world-class, industrial scale equipment and expertise across all aspects of manufacturing. Businesses are telling us with a loud voice that this is exactly what they need.

We have achieved another year of strong performance, with some particularly promising trends. Whilst we continue to work closely with established large companies such as Rolls-Royce and Siemens, we have seen a marked increase in the uptake of our offer by Small and Medium sized companies (SMEs). SMEs, which are fundamental to strong UK supply chains and continued employment, now make up over 50% of our customer base.

We have also seen take-up of our offer by an increasingly diverse range of sectors. Whilst established sectors such as aerospace and automotive continue to be tremendously important to us, interest from sectors such as medical technologies, construction and Oil and Gas has grown. The scope for cross-sector learning and thus for broadening the impact of our work to wider sections of the UK economy, is significant and exciting.

With persistent growth in industry demand and ongoing government support – as evidenced by the Chancellor's Autumn Statement commitment to more than double our core funding – I'm looking forward to yet another exciting period of growth and success for HVM Catapult and the companies we work with.

A handwritten signature in black ink that reads "Bob Gilbert". The signature is written in a cursive, slightly stylized font.

Bob Gilbert
Chair
High Value Manufacturing Catapult

Chief Executive's statement



As I look back on our fourth full year of operation, I'm letting our financial results speak for themselves. They are the clearest evidence that industry uptake of our offer remains very strong and we have continued to grow to meet that demand. Trading conditions have been tough for our customers but our commercial income and our collaborative research & development (CR&D) 'win-rate' shows that the appetite for manufacturing innovation in the UK is unchecked. Again, we hit the all-important targets in our established $\frac{1}{3}$ funding model: $\frac{1}{3}$ from Government, $\frac{1}{3}$ from industry and $\frac{1}{3}$ competitively won CR&D.

Our fourth year has seen us fully consolidate our position as a key part of the UK innovation 'system', acting as the bridge between the UK's excellent technology research and its market application. The HVM Catapult has now become the 'go-to' place for advanced manufacturing in the UK.

The most encouraging part of this for me is that we arrived at this point by getting on with the job, through the support of skilled, capable people and industry focused leadership in our centres.

We take our responsibility as the 'go-to' place very seriously. Our input is sought for the development of government policy on key areas such as digital manufacturing and the 4th Industrial revolution and we are supporting several inward UK investment opportunities. Our independence is valued and this in turn has led to the HVM Catapult and its centres leading and being involved in more than 100 influential forums relating to engineering and manufacturing.

Innovation in Manufacturing

In manufacturing, the continuous improvement of processes is the daily mantra in most firms. It's been the bedrock of gradual productivity improvement for decades. With fierce overseas competition from markets with lower labour and energy costs it's clear however that this is no longer enough. All nations, advanced and emerging, want a rich seam of high value manufacturing in their economies. In order to succeed in the global markets of the future, the UK needs to build on its competitive advantage in the areas of knowledge and know-how. That requires the development of this knowledge and the transfer of it into industry. In a nutshell this characterises what we do in our seven centres.

Through the year we have supported over 3,000 industrial clients to develop and deploy innovation in manufacturing. There are repeat customers, who have come to trust and value our services, but there are also many new customers.

I am particularly encouraged that SMEs now make up over 50% of our customer base. We made a conscious commitment to increase our work with SMEs, and our efforts have clearly been successful.



Government funding
delivering innovation and
stimulating high quality
bank lending in the UK.
What's not to like about that?

A combination of factors have contributed to the steep rise in SME customers which is up over 150% from last year. The good geographic spread of our centres makes our offer accessible to all. Our strong network with partners such as the Knowledge Transfer Network, trade bodies such as the Manufacturers' Organisation (EEF), and Regional Aerospace Alliances, to name but a few, helps us gain credibility with a very big industry audience. The regional outreach activities of our centres, such as the MTC's new presence in Merseyside, a proposal to develop a North West Advanced Manufacturing Centre (NW-AMRC) at the Samesbury Enterprise Zone and our support for the Manufacturing Strategy for Scotland, help us engage with companies in areas which do not have a centre in their vicinity.

Our search for innovation hungry SMEs that we can support has taken us into a new relationship with the major high street banks. They aspire to lend to the very same SMEs that we know we can help. By equipping the banks with the knowledge of the HVM Catapult offer they can guide them to our centres for help. In turn, this is instrumental in improving the lending environment for these manufacturing innovators. Although never in our original brief, we've long felt that we have a role to play to make sure that SMEs get access to funding for the technology that they have developed with us. We now have this in place.

In manufacturing, funding inevitably revolves around new equipment and capacity building. Our role is to take the risk out of developing novel capability and the banks see this process as a means of de-risking their lending.

So, the SMEs get the lending they need, the banks get a good quality lending book and we see more added value locked into the UK – a perfect symbiotic relationship. Government funding delivering innovation and stimulating high quality bank lending in the UK. What's not to like about that?

Forward view

This Review includes a "forward look", which sets out our ambitions and plans to continue to strengthen our impact and broaden the range of sectors we work with. I have no embarrassment however in committing to doing "more of the same", since our results show without a doubt that we have a very successful formula, delivering results for industry and locking in value to the UK.

A handwritten signature in blue ink, appearing to read 'Dick Elsy'. The signature is fluid and stylized, with a long horizontal flourish at the end.

Dick Elsy
Chief Executive
High Value Manufacturing Catapult

Performance highlights 2015-2016

Total value of our assets

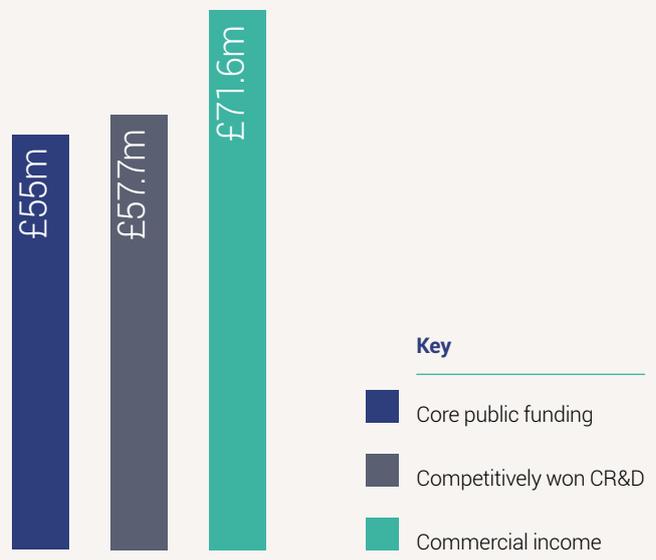
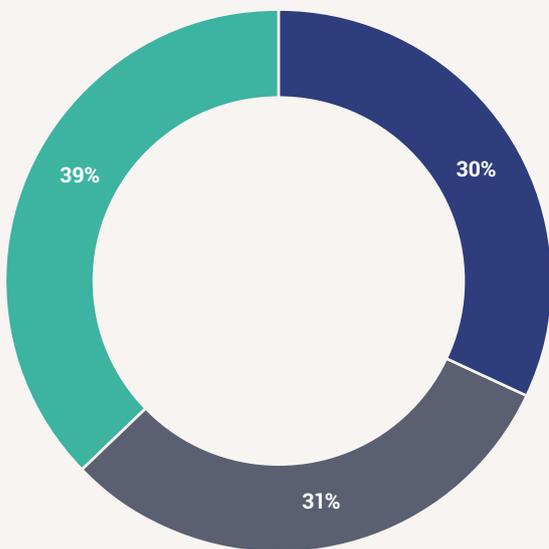
£561m

↑ Up 15.5% from 2014-15

Investment in large capital projects

£74.5m

Funding breakdown



Number of employees

1,913

Number of projects

1,878

Size of order book

£188m

→ Of which £100m is CR&D

Private sector clients

3,036

→ Over 56% of whom (1,701) are SMEs

HVM Catapult economic impact

£1 → £15

core public funding received

net benefits to the UK economy

Source: WECD Economic Impact Evaluation study 2015.
The next economic impact study is due in 2017.

Key milestones



National Centre for Net Shape and Additive Manufacturing and Aerospace Research Centre formally opened at MTC

Anna Soubry MP, Minister for Small Business Industry and Enterprise, opened the joint government and industry funded National Centre for Net Shape and Additive Manufacturing as well as the 8,000 sq ft Aerospace Research Centre at the MTC.

The aim of the National Centre for Net Shape and Additive Manufacturing is to develop

production-ready additive manufacturing processes, to overcome barriers to wide-scale adoption, and to work on legislative and standardisation issues for this emerging activity.

The new Aerospace Research Centre provides additional capacity for MTC as a hub for leading edge aerospace research in a real manufacturing environment.

AMRC launches cutting edge Factory 2050

The AMRC took possession of Factory 2050, the revolutionary, glass-walled "reconfigurable factory" at the heart of the University of Sheffield's new advanced manufacturing campus on Sheffield Business Park.

The facility was handed over by the construction company, ready to be equipped with state of the art technology that will be used in research programmes designed to revolutionise UK manufacturing.

AMRC Executive Dean, Professor Keith Ridgway CBE, said: "We aim to make Factory 2050 the most advanced factory in the world, built to carry out collaborative research.

"It has been designed to ensure the UK's advanced manufacturing supply chain can access the expertise it needs to make the most of new challenges and opportunities"

Oil and Gas consortium established

The AFRC joined forces with the AMRC and NCC, as well as with the Oil and Gas Innovation Centre (OGIC) to establish the "Oil and Gas consortium". A dedicated business development representative from HVM Catapult is permanently located in the OGIC in Aberdeen to support engagement with the Oil and Gas industry and drive cross-industry collaboration and innovation.

This collaboration will enable the energy sector to access advanced capabilities that can drive down manufacturing costs and enhance the materials in use in industry.

2015 Autumn Statement and Spending Review confirms an increase in investment in Catapult centres

In his Autumn Statement, Chancellor George Osborne announced an increase of investment in the Catapult centres and the HVM Catapult in particular. The increase brings government funding back into line with the intended 1/3, 1/3, 1/3 funding model for the HVM Catapult.

According to EEF Chief Economist Lee Hopley: "Keeping the funding for Catapult centres on a stable footing is great news for innovative businesses across the UK. Maintaining the balance of funding between government and the private sector will help ensure the UK continues to encourage the kind of collaboration that will help innovators traverse the 'valley of death'."



National Biologics Manufacturing Centre launched at CPI

CPI officially launched the new £38m National Biologics Manufacturing Centre in Darlington in September.

The Centre is built around six core themes to help companies of all sizes translate their ideas, research and knowledge into commercial business propositions. It will provide companies with open access facilities and expertise to help them develop, prove and commercialise new and improved

processes and technologies for biologics manufacture.

The Centre was launched by Steve Bagshaw, CEO of Fujifilm Diosynth Biotechnologies and Jo Johnson MP, Minister of State for Universities and Science. The Minister said, "We want the UK to be the best place in Europe to innovate ... [T]he Centre will bridge the gap between business and academia and help to turn great ideas into commercial reality."



WMG Energy Centre opened by Sajid Javid

The Rt Hon Sajid Javid MP, Secretary of State for Business, Innovation and Skills (BIS), opened the £50m Energy Innovation Centre, part of the WMG Catapult centre in March.

The Energy Innovation Centre is the largest of its kind in Europe and offers world-class innovation capability for the development of new battery chemistries. It is at the forefront of research, providing guidance and technical know-how in energy storage;

energy management; and complex electrical systems.

The Centre includes a £13m Battery Materials Scale-Up Pilot Line for the development of new battery chemistries from concept to fully proven traction batteries, available in sufficient quantities for industrial scale testing. The Centre also includes a battery characterisation laboratory, aggressive testing chambers and an electric/hybrid drives test facility.

The NCC expands its world-class composites pressing capability

The NCC has installed a £1.3 million Pinette Emidecau Industries (PEI) Hydraulic Press as part of the expansion of its High Volume Manufacturing capability, which this year has seen an automotive OEM successfully press a complete car floor pan. This will support companies of all sizes and sectors explore reductions of part production times from hours down to minutes. This furthers the NCC capability in compression moulding processes with both thermosets and thermoplastics. The press' closing forces of 11,000kN allow

for a wide variety of processing techniques, including compression moulding, traditional Resin Transfer Moulding (RTM), High Pressure Resin Transfer Moulding (HP-RTM), Overmoulding, Wet pressing techniques and thermoplastic moulding for components of up to 1.8m x 1.3m. The fast closing speed of 800mm/s combined with high temperature of 400°C and control with an automated Infra-red heating and shuttle system enables a rapid feed of thermoplastics in to the press which is required to hit part cycle times of under four minutes.

Bulk additive manufacturing cell at Nuclear AMRC installed

The Nuclear AMRC installed a £1 million automated cell, enabling it to offer world-leading capabilities in bulk additive manufacturing.

The 10m x 5m bulk additive manufacturing cell can build high-integrity parts from the ground up, and add metal features to large forgings such as pressure vessels.

The cell features a six-axis Kuka robot arm, which initially carries a 'toptig' arc welding system,

developed by Air Liquide specifically for robotic welding applications.

The robot will work directly from a computer-aided drafting (CAD) model to lay down weld material to create three-dimensional geometries. The cell can also add non-critical structural features to large pump and valve casings or pressure vessels, reducing the initial size and complexity of expensive forgings or castings.

Cross Centre collaboration

The development of novel technologies and processes is central to UK industry grasping the opportunity to improve productivity, open new markets, create jobs and deliver a sustainable industrial base.

Our Chief Technology Officer Forum (CTO Forum) is the heart of the technical collaboration within the HVM Catapult. It comprises the HVM Catapult's CTO alongside the CTO's of our seven centres and is supported by the recently appointed team of Senior Technology Officers (STO's). Together they ensure that technology and processes can flow rapidly between the centres, across sectors and collaboratively with both industry and academia.

The core focus of this technical collaboration is to continuously and consistently:

- support the development of a UK High Value Manufacturing Strategy as well as deliver the Technology Strategy for the HVM Catapult
- oversee the HVM Catapult's technical engagement with sector strategic bodies, Research Councils, other Catapults, BIS and Innovate UK, to ensure that our work is focused in the right areas
- understand lessons learned from the implementation of technology, processes and innovation from one sector and successfully apply them to another (for example the transfer of aerospace and automotive technologies and processes into applied healthcare)
- respond to the industry needs of today but be prepared for the industry needs of tomorrow
- invest in our world class people, their skills and careers

To stay ahead of the curve we are focusing on technology areas such as:

Intelligent Structures

Embedding sensors directly into composite structures enables manufacturing process monitoring, in-service health assessment and through-life data management. This project looks at how this can be done with cost effective printed electronics which also substantially reduces the cost, bulk and mass of wiring looms and enables wireless connection to the world.

Dynamic Flow Visualisation

Virtual reality is expected to grow to a \$110 billion industry by 2020. This project will address the major current failing of industry to identify and exploit useful applications. Fluid simulation data will be visualised in a chemical manufacturing process to provide technology demonstration into a new market sector.

Additive Graphene Manufacturing

Graphene can be used to reduce the rate of energy storage loss in micro-lithium ion batteries. This project will use a novel application of graphene ink to 3D print the cathode, exploiting both the geometrical shape capability of additive manufacturing and electrical properties of Graphene.

Welding Dissimilar Materials

Multi-material joining remains critical in the future of high value manufacturing across industry sectors. This project focuses on welding non-similar material components together, which can be a highly structurally efficient method of creating complex parts or assemblies.

Selective Laser Melting with Recycled Powder

Recycling the powder used in additive manufacturing processes is key to reducing waste and cost in the future. The project seeks to understand and characterise the effects of using recycled powder to manufacture components which will enable design for manufacture to account for this material state and reduce the associated waste.

Cross Centre collaboration

Large Scale Projects (LSPs)

The HVM Catapult is undertaking LSPs which are led by the CTO Forum and which aim to:

- Identify large scale innovation programmes where the combination of market pull, technology development and high value manufacturing capability can be brought together to increase the impact and benefit to UK manufacturing. This brings together the centres, academia, industry and government to deliver unique UK capability.
- Develop next generation supply chains including the development of SMEs.

The Composites Material LSP is piloting the development and execution of multi-centre collaborative working practises. As a result of the progress to date, the UK Government's Office for Low Emissions Vehicles has aligned £40m of funding for R&D in automotive light-weighting. The HVM Catapult is now well placed at the centre of the national automotive activity focusing on composite light-weighting and is helping to shape appropriate public funding calls as well as building collaborative relationships with potential composite supply chain partners.

This year's LSP activity (together with that proposed for 2016-17) focused on high rate composite automotive component production, bringing together the collective capabilities of the NCC, WMG, AMRC and the MTC to demonstrate the viability of pre-forming coupled with HP-RTM (the most promising method for the manufacture of composite automotive components at high rate).

The objective of the HVM Catapult LSP 'pre-investment' activity is to increase confidence in the UK industrial base at a time when a number of potential supply chain companies are making decisions on whether to invest. A positive outcome will result in significant R&D opportunities for the HVM Catapult.

Capability Acquisition

The HVM Catapult's Capability Acquisition is developed and implemented through a number of cross-centre Technology Forums, centred on key technology capabilities.

The Forums bring together experts from those HVM Catapult centres which offer the relevant technology capabilities.

A key aim of the Forums is to develop and exploit additional and unique high value capability not available within the existing centres or the UK.

The following Technology Forums were in operation this year:

Automation Forum	Metrology Forum
Additive Manufacturing Forum	Modelling and Simulation Forum
Composites Manufacturing Forum	Powder Processing and Characterisation Forum
IT Forum	Tooling and Fixturing Forum
Joining Forum	Visualisation and Virtual Reality Forum
Knowledge Management Forum	

Collectively these Forums generated over 40 case studies this year illustrating the value of work undertaken to UK industry.

Work undertaken by our Technology Forums this year included:

- The **Automation Forum** made significant progress on a best practice guide aimed at industry.
- The **Additive Manufacturing (AM) Forum** delivered a number of AM workshops for, and with, industry and with the UK Additive Manufacturing Leadership team will be publishing the UK Strategy.
- The **Knowledge Management (KM) Forum** undertook a comprehensive study to identify, evaluate, highlight and disseminate best practice both at the HVM Catapult centres and externally. The report will be used as a basis for a cross-centre HVM Catapult knowledge management approach.
- The **IT forum** has developed a number of reports setting out proposed guidelines and standards across the HVM Catapult centres relating to the use and sharing of big data sets, mobile device management, cyber security and use of video conferencing.
- The **Metrology Forum**, in collaboration with the National Physical Laboratory, organised three industry workshops to set out the importance and role of metrology in manufacturing. The events were held in three different HVM Catapult centres and were well attended by small and SMEs in particular.
- The **Powder Processing and Characterisation Forum** undertook a review on the recyclability of uncured metal powders used in laser-melting additive manufacturing processes. The review found that powder reuse results in increased oxygen content of the feed stock and hence the parts being constructed. This can have desirable effects on the strength of parts made by this process, but has also been known to diminish impact performance. This knowledge has now been adopted by UK industry.

Cross Centre collaboration

Skills development

In developing these technologies and processes it is important to recognise that we are also equipping talented people with invaluable transferable skills and with long term high value careers.

We have continued with our Visiting Fellowships Programme with the Engineering and Physical Sciences Research Council (EPSRC). This is now well established and 17 fellowships have been awarded. These fellowships are successfully transferring world leading research into product and manufacturing development in industry.

We are committed to continuously extending our reach into a wider range of sectors. This year the CTO Forum has engaged with the UK infrastructure and construction sector in particular. Working in collaboration with these new industry partners has demonstrated that technology and processes used in the automotive and aerospace industries can be successfully applied to build rail infrastructure, power systems, hospitals, schools and housing. Doing this can significantly:

-
- **reduce costs**

 - **improve safety**

 - **accelerate programme delivery**

 - **reduce waste**

 - **improve quality**

 - **develop high value careers**

It is envisaged that this work will translate into several building and infrastructure projects in 2016-17.



The fellowship is enabling me to work more closely with industrial engineers to optimise human performance and usability of new manufacturing technologies. The collaboration between engineering and social science it brings is an important future direction.

**Dr Sarah Fletcher – Cranfield University,
EPSRC HVM Catapult Fellow**

HVM Reach

The HVM Catapult Reach programme is delivering manufacturing innovation support specifically tailored to SMEs to ensure that our supply chains grow stronger and that more of the economic value generated by global OEMs and Tier 1 manufacturers is captured in the UK.

The programme is designed to encourage and support the participation of SMEs with HVM Catapult centres. It does this in three ways:

1

Providing funding to the HVM Catapult centres to allow them to invest in equipment and resources which are of a scale and sophistication that makes them relevant to a broad range of SMEs

2

Enabling the HVM Catapult centres to recruit and sustain skilled individuals who not only have the technical knowledge but also the practical experience of working with SMEs whose challenges go beyond simply answering the technology questions

3

Increasing participation of SMEs with the HVM Catapult centres by making the initial engagement more accessible

The HVM Catapult Reach programme recognises that innovation is not just about new technologies of the future but is also about introducing the best current technologies into SMEs who have recognised the need to invest and to innovate. The programme will increasingly offer guided support to the implementation of tools and techniques that will deliver step-changes in an SME's capability and productivity.

Rather than being a highly specified programme of activity, the Reach programme comprises a suite of approaches tailored to the specific offer of our centres and the markets they serve.

During its first year, the Reach programme has already generated very significant results, with SMEs now accounting for over 50% of HVM Catapult customers, a 20% increase from 2014-15.

Civil Nuclear Sharing in Growth (CNSIG)

Civil Nuclear Sharing in Growth (CNSIG) is a high-intensity business development programme to develop the UK manufacturing supply chain for civil nuclear. CNSIG is part-funded by government through the Regional Growth Fund, and supported by industry leaders including Rolls-Royce.

Ten participating companies are receiving a four-year programme of business development and training worth £1 million, tailored to the specific needs of their business. This includes shopfloor manufacturing improvement, process improvement, leadership development and specific nuclear sector knowledge.

To date (Q2 2016), the 10 companies have reported that CNSIG has helped them secure around £250 million of orders, creating or safeguarding 3,000 jobs.

CNSIG has helped
secure approximately
£250 million
of orders

Fit For Nuclear (F4N)

F4N is a unique service to help UK manufacturing companies get ready to bid for work in the civil nuclear supply chain. F4N lets companies measure their operations against the standards required to supply the nuclear industry – in new build, operations and decommissioning – and take the necessary steps to close any gaps.

F4N has been developed by the Nuclear AMRC, with the support of its top tier partners including Areva and EDF Energy. These industry leaders are using F4N to identify potential companies for their own supply chains.

Over 300 companies have completed the online F4N assessment, with most receiving ongoing support and development from the Nuclear AMRC. Over 70 have successfully completed the programme, and have their company details listed on the Nuclear AMRC website.

In 2015-16, with support from the Regional Growth Fund, F4N offered match funding worth an average of £10,000 to help companies put business and manufacturing improvement projects into action. More than 110 projects were funded, with participating companies reporting that the funding will help create over £48 million of added value in their businesses and over 550 jobs. The Nuclear AMRC is now working with industry and government partners to further develop the programme and help even more manufacturers get ready for nuclear opportunities.

Over 300
companies have completed
the online F4N assessment

Innovation Support for the UK Metals Sector

CPI and the AMRC have jointly responded to the changes and challenges facing the UK metals industry, by offering a fully-funded Innovation Support Programme for SMEs in the metals processing sector.

The 3-stage programme is fully funded by the BIS and is designed to help identify and implement the next generation of processes and manufacturing technologies that will prepare metals processing companies for the future.

The Innovation Support Programme is aimed mainly at small and medium sized businesses operating across the UK's metals processing supply chain, and consists of three components:

- The Innovation Integrator – a diagnostic business tool
- Communities of Practice
- Re-training and up-skilling courses



Innovation will be key to securing a more sustainable future for our metals industries which is why the government is backing the sector with this scheme. I am pleased this funding is going to CPI which is based in Redcar, following the recent closure of the steelworks there, and hope it can help the supply chain there and throughout the UK.

Anna Soubry MP – Minister for Small Business

HVM Reach at the AFRC

AFRC has focused primarily on Scotland by establishing an eight strong SME team, undertaking 245 engagements and establishing of a range of projects. Examples of these are:

- Mechatronics specialists Clansman Dynamics who will develop a new product to play a leading role in the AFRC's £8m ATI funded investment in isothermal forming
- Whisky – where the generic industry needs evaluation for controlled cask filling led to a major equipment opportunity for Prometica
- Oil and Gas – where support for Sea Tiger Marine resulted in an Energy Catalyst submission worth £100,000
- Watch making – where Paulin have been given manufacturing guidance on high-end watch case development
- The UK metals sector – where ALFED has established an 'innovation group' to enable members to collaborate and innovate.

AFRC is also developing a fully interactive diagnostic to assess Readiness for Innovation. This builds on EU funded work in Strathclyde and has been informed by other diagnostics used elsewhere in the HVM Catapult, notably at CPI. This approach been successfully applied to AFRC's engagements and it forms the 'front door' of their regionally focussed activity over the next year.

HVM Reach

HVM Reach at AMRC

The AMRC with Boeing had 478 engagements with SMEs, covering a very wide range of activities and technological areas:

- Supply chain programmes – including supply chain knowledge, company capability assessment, tailored research and improvement projects
- Projects in areas such as machining processes, design, modelling and software, metrology
- AMRC Forum – the successful, established networking forum focuses on technology transfer and peer to peer networking. The forum addresses topics linked with AMRC research and in the last year this has covered Industry 4.0, grinding, additive manufacturing, virtual reality
- Specific research projects for individual businesses covering many technology areas and market sectors including design, prototyping, testing, development and improvement of manufacturing processes
- Commercial research and development as part of national and European funded projects – SMEs are members of many consortia

HVM Reach at the NCC

The UK Composites Strategy 2016 highlights the opportunity to grow the current £2.3bn composites product market to £12bn by 2030.

- This is a significant opportunity for the UK to grow its domestic supply chain to meet demands of emerging sectors in which there are companies yet to adopt composites. The NCC and specifically its Reach programme offers SMEs the support required to do this. This programme in 2015-16 has seen the development of services directly targeted at the community:
- Set up an SME centre with equipment at SME scale and 'cells' to enable them to work with the NCC
 - Support for 'solution' advice, de-risking the uptake of composites, or the development new composite product or processes
 - Access to design and simulation approaches, with the SME software support centre being completed in 2017
 - A gateway to the wider HVM Catapult network

HVM Reach at the MTC

During its initial year the MTC SME Reach programme:

- Developed and launched the 'MTC Change Handbook', a practical guide to introducing new technology and equipment to smaller businesses. This contains over sixty value accelerators, addressing a dozen scenarios typically faced by SMEs. Over a thousand handbooks have already been issued
- Recorded engagements with 150+ SMEs (more than 150% of the target number)
- Supported 21 SME projects (more than double the target number) – generating industrial revenue from new clients through matching days. Several companies have taken follow-on commercial projects

During 2016-17 the MTC SME Reach programme will:

- Focus on driving SME engagement in the North West through an 'SME engine' of four dedicated manufacturing practitioners
- Implement a geographical roll out plan to widen the MTC SME Reach offer to even more businesses

HVM Catapult worked with

over 1,700
SMEs

SMEs made up

over 50%
of all industrial customers

HVM Reach at WMG

WMG's multi-disciplined SME team comprises a mix of talented and experienced engineers, materials scientists, designers, marketers and systems experts from industry and academia. As well as accessing these experts, through the dedicated SME centre, businesses can also use WMG's world-class equipment and facilities. Specialisms include connected factories and products; materials development, characterisation and selection; and product validation and verification.

WMG have a long track record of growing SMEs through giving them access to new research-led technologies and becoming more competitive. WMG advocates the importance of establishing the right business model where SMEs can take forward new ideas through to commercialisation by introducing innovative new products, services, and processes.

Businesses are encouraged to become part of the WMG SME community through engaging with the regular and popular Polymer Innovation Network and Internet of Things Meet-up, which provide networking opportunities, access to supply chains and thought leadership. Over the past year, WMG has engaged with over 1,000 small businesses, on a diverse range of projects, including 400 members attending their open innovation platforms.

SME engagements increased by

165%

from 2014-15



HVM Reach

Working with High Street Banks

We collaborate with High Street banks, recognising the role they play in providing not only access to finance, but also professional guidance and advice to small and medium sized manufacturing companies in particular.

Royal Bank of Scotland

The 'Future Fit' study by NatWest and Royal Bank of Scotland found that many medium sized companies struggle to combine the day-to-day management of their business with the development of bold and practical plans for the future.

Solutions proposed to address this include so-called Progressive Mentorship, where businesses would receive support such as a technology audits to help them improve and modernise their business, and professional guidance in areas such as financial planning, leadership skills and risk management.

We'll do whatever we can to make sure we have a prosperous manufacturing sector. We have developed an excellent knowledge base through many years of providing support to industry. But we want to learn more and keep pace with our clients' ever-changing environment.

One way the bank is doing this is through developing strategic alliances with growth accelerators and technical experts such as the HVM Catapult, who are a critical facilitator in cutting edge innovation and who also play a part in sharing of best practice, encouraging collaboration and unlocking investment.

Dialogue with HVM Catapult has been very encouraging and pilots are being undertaken. I am confident these will lead to further expansion of the progressive mentoring approach.

**Richard Hill, Head of Manufacturing –
Royal Bank of Scotland**

You can read the Future Fit study at:
[www.nw-businesssense.com/
manufacturing-report-2016.html](http://www.nw-businesssense.com/manufacturing-report-2016.html)

Barclays

The HVM Catapult represents a significant opportunity for the Barclays manufacturing client base and the UK manufacturing sector. Through engagement with the HVM Catapult, we at Barclays have experienced first-hand the value of the work being undertaken. We encourage our bankers to discuss with their clients the opportunity for engagement to help support companies, especially our SME customer base, to turn their great ideas into reality.

Manufacturing bankers from Barclays have visited Catapult locations alongside SME customers to better understand the work that they do. The ability to access such an array and depth of knowledge in a world class manufacturing setting is truly game-changing for some companies. The opportunity to collaborate in this way is unique and the benefits are tangible. We have been inspired by the energy and engagement of the Catapult team and the equipment and locations themselves are impressive.

Where we have introduced clients to the Catapult the experience has been universally positive. Feedback indicates that they have high hopes for the benefits that they expect to flow from their interactions. We remain committed to offering continuing support to our clients in their discussions with the HVM Catapult to help all parties to achieve their ambitions.

**Michael Rigby, Head of Industry –
Manufacturing, Transport & Logistics,
Barclays**

Lloyds Banking Group

At Lloyds Banking Group we recognise the fundamental role that manufacturing plays in the UK and really value the Catapult network and its power to give SMEs the opportunity to collaborate with experts in their field.

I've seen first-hand how the partnership between the Catapults and industry has increased the rate of innovation, helping SMEs to refine and develop their products and find the best route to market.

From helping a bicycle manufacturer to develop their wheels for use in the automotive market to advancing a design company's use of the latest 3D printing techniques to improve production – these are just some of the examples of this valuable collaboration.

As part of Lloyds Banking Group's support to the industry, we work closely with the Catapults and at the MTC in Coventry are investing £5m into their state of the art training facility at the recently opened Lloyds Bank Advanced Manufacturing Training Centre to improve the pipeline of apprentices coming into the workforce.

By working together with industry and maintaining a keen focus on research and development, we are optimistic that we will be able to develop the next generation of world-leading engineers, using the latest manufacturing technology to make world-leading products.

**David Atkinson, UK Head of Manufacturing –
SME Commercial Banking,
Lloyds Banking Group**



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David Atkinson, UK Head of Manufacturing –
SME Commercial Banking,
Lloyds Banking Group

Success stories

1

AMRC's automation research is on track to save BAE Systems millions of pounds in machine tool capital cost

A research project to enable robots to accurately machine holes in composite aircraft components, has matured into a production system and is on track to save BAE Systems millions of pounds in capital and operational costs over the coming years.

The Robotic Countersinking technology was developed through collaborative research, led by the AMRC and involving Kuka Systems UK.

The development technology de-risked the process enabling the design of a production system. This production system has now been installed at BAE Systems in the UK, where it will be used to process a wide range of composite components for military aircraft.

Ben Morgan, head of the AMRC's Integrated Manufacturing Group, said: "We have been able to develop a cost effective solution with the latest state of the art control systems.

"The architecture of the system will allow the technology to evolve over time and embrace the ideas behind Industry 4.0. We're now advancing the development system further, enabling process monitoring and generating 'Big Data'. Analysis of this data, i.e. 'Data Mining' will provide an understanding of quality in process."

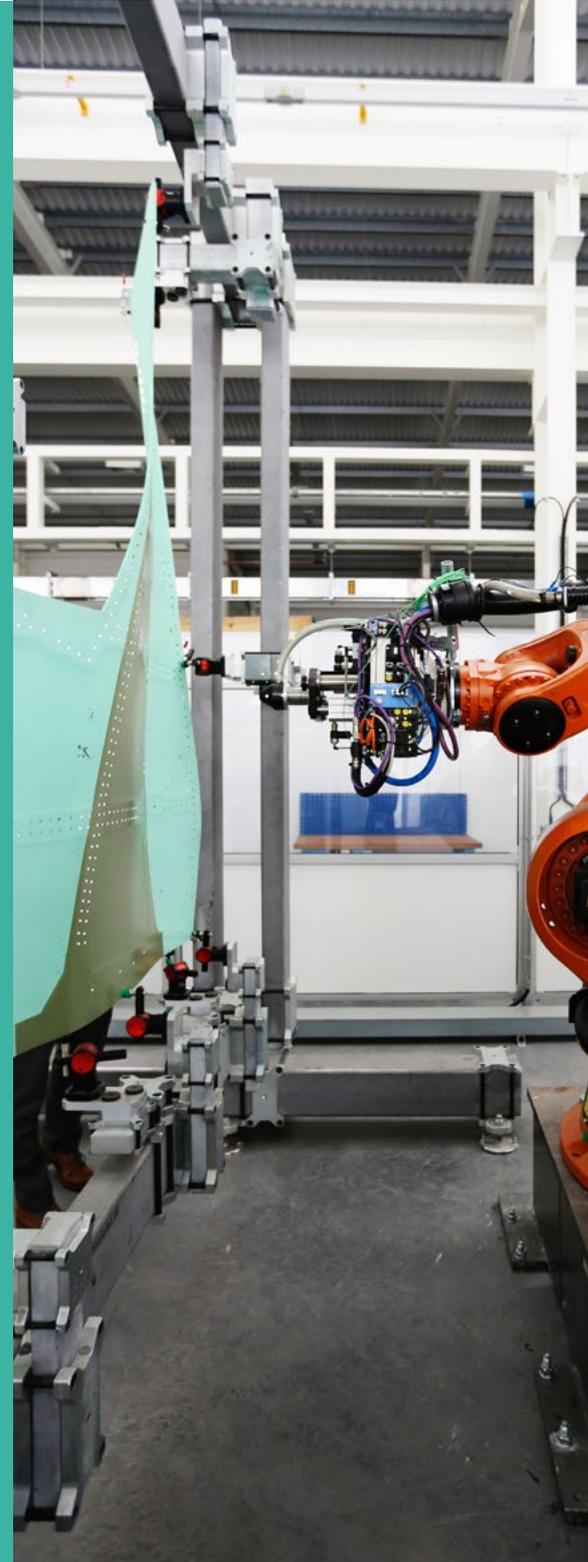
The Robotic Countersinking technology includes the use of multiple robots to automatically handle composite components and then countersink high tolerance pre-drilled fastener holes.

Non-contact metrology integrated with the machining robot locates predrilled holes and corrects the robot's position before countersinking.

A separate robot provides support to the component eliminating expensive holding fixtures. The system is controlled via the latest S7 Siemens PLC and includes the use of Augmented Reality to aid component fixturing.

Austin Cook, from BAE Systems, said: "Since we began working with the AMRC in 2006 it has supported the development of key manufacturing technologies ranging from high performance Titanium machining to advanced automation for military components.

"We collaboratively research new innovative solutions at various maturity levels. The AMRC, and in particular the Integrated Manufacturing Group, has helped us mature the Robotic Countersinking technology from technology concept to full scale production demonstrator, de-risking along the way, and helping to catapult the capability into our business."





Reducing inspection time from over 3 hours to just 15 minutes

NCC Tier 1 Member, GKN Aerospace, sought to develop an automated measurement process. The project aim was to use a non-contact laser scanner to achieve an equivalent inspection, with an increased level of automation. The inspection time would be reduced, increasing productivity within the overall composite manufacturing process.

Thanks to the networking opportunities and facilitated collaboration at the NCC, INSPHERE Ltd, a Bristol-based SME specialising in metrology, worked with GKN to explore opportunities for automation. Using the cutting-edge facilities at the NCC, the inspection took place on a large machine tool with full integration between the measurement system and the machine tool controller. The project delivered a completely automated non-contact inspection.

This collaborative project enabled both INSPHERE Ltd and GKN Aerospace to find a way of reducing the time spent measuring and reporting in the final inspection phase of the composites manufacturing process. Inspection time was reduced from over 200 minutes (three hours) to just 15 minutes, replacing a labour-dependent process with one requiring a single push of a button. This work enabled GKN Aerospace to go on and conduct commissioning studies at their manufacturing facility, showcasing the innovative work conducted at the NCC.



Breathalyser glucose testing

Applied Nanodetectors Ltd worked with CPI on developing a simple breathalyser test for daily monitoring of glucose levels in diabetics. A non-invasive handheld breath test device has the potential to replace the 'prick test' methods used today and would significantly improve patient monitoring and self-management.

The collaboration is part of the recent Innovate UK project 'Plasense' which developed a low cost and scalable method for printing sensors onto flexible plastic substrates. Further work will look at upscaling the sensor and integration into a point of care diagnostic device. The project is a key breakthrough for the monitoring of glycemic levels and if commercialised, the technology could revolutionise the way in which we monitor glucose.

"Working with CPI has helped to accelerate the sensor development cycle and utilise plastic electronics technologies to obtain the most cost effective manufacturing solution."

Dr Victor Higgs, Managing Director – Applied Nanodetectors Ltd

Success stories



Glenammer Engineering Industrial Test Sieves

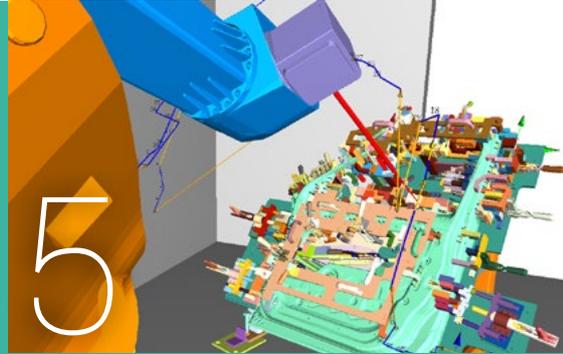
The AFRC developed a methodology to enable industrial test sieves manufacturer Glenammer Engineering to accurately measure the mesh dimensions of backing-mesh supported sieves. Such accurate measurement is a prerequisite to the in-house certification of all the company's mesh sizes, which is critically important as the sieves are used in industry sectors and test environments with the most exacting standards.

The AFRC used its high-resolution non-contact measuring equipment to establish the optimum measuring parameters. These were subsequently repeated to demonstrate consistency of the process.

Knowing that non-contact optical measurement of mesh size in back-mesh supported sieves is attainable will help the company explore future innovation and product designs. The results established by AFRC researchers, will allow Glenammer to expand their business and explore developments in product design.

"We were a bit in awe of working with the AFRC at first but once we sat and discussed our project with their staff our fears evaporated and the whole experience was a very good one."

Allen Matthews, Director – Glenammer Engineering



RLW Navigator: outstanding research with industrial relevance

The Remote Laser Welding (RLW) Navigator was a 3½ year collaborative programme led by WMG with twelve industrial and academic partners including STADCO, Jaguar Land Rover and EnginSoft (a UK SME). The programme developed software solutions to enable the implementation of RLW technology, effectively taking it from new concept to production, in-line with the primary purpose of HVM Catapult.

The main barrier for adoption of RLW has been the lack of methodologies for precise and effective planning and simulation of its application, leading to time-consuming (and expensive) trial-and-error procedures.

The new solution developed a range of new capabilities including:

1. Jig and fixture design and optimisation
2. Selection and optimisation of welding joining process parameters
3. Off-Line Programming (OLP) of remote welding robots
4. In-process joint quality monitoring

The results from the RLW Navigator programme led to the first ever fully digitally developed RLW process. The RLW Navigator project has enabled the adoption of RLW (over the incumbent Resistance Spot Welding) leading to greatly improved productivity (up to five times faster and with 60% less floor space), reduced costs, enhanced flexibility and reduced weight through RLW optimised design.



Colston Engineering drives change with F4N

Wiltshire-based Colston Engineering is a long-established engineering subcontractor serving clients in transport, defence and civil nuclear.

Managing Director Matthew Heaton, signed the company up for the Fit for Nuclear (F4N) programme. The initial online assessment flagged training and skills as key areas of improvement. The company was able to access external funding to support management and shopfloor supervisory training, and Heaton introduced regular meetings to drive improvements and make sure that all of Colston's 30-strong workforce were on board.

Colston completed its F4N action plan and is taking further steps identified by Nuclear AMRC supply chain specialist Martin Ride. "Martin's audit gave us the next level to go for, to align ourselves with what guys like Alstom are going to require. It's making sure these guys know who we are, and being involved in all the major programmes that are going on. We want to increase our customer base, and let people know that we're here and what we can do."

F4N has been the big driver for change, Heaton says, by helping his team focus on the steps they needed to take to drive improvements and achieve the goal of doubling turnover in the next five years. "Fit For Nuclear has really made us think about what we do, and what we're good at."



Development of new thread-rolling processes for the aerospace industry

Arrowsmith Engineering manufactures bespoke components for aerospace clients, handling metals including titanium and magnesium. The company needed to develop new processes for thread-rolling – a difficult cold forming process which can be performed on any ductile metal to produce smooth and precise threads.

A joint engineering team from the company, the MTC and the Coventry and Warwickshire Aerospace forum developed a set of new techniques resulting in manufacturing processes that kept quality high and manufacturing costs down. The innovative technologies employed have allowed Arrowsmith to produce components that could previously not be made to the standard of accuracy and quality achieved. As a result, Arrowsmith has increased its standing with its customers as a competitive and innovative supplier and has made significant improvements in quality, and by reducing manufacturing waste has reduced its costs.

"While the aerospace primes are seen to be investing heavily in new technologies, it's really important that the supply chain keeps up. Advanced engines need advanced engineering solutions at every stage, so this research is crucial for the industry. By working collaboratively, we're improving the quality and scope of that research, while upskilling our own engineers and sharing our expertise."
Jason Aldridge, Managing Director – Arrowsmith Engineering

Influencing strategy, informing policy

We are increasingly recognised as the go-to place for UK advanced manufacturing. We contribute our expertise and insights to help shape the future of UK manufacturing by leading and taking part in over 120 high-profile strategic partnerships and forums.

Strategic groups and forums that we take part in include:

Advanced Materials Leadership Council	Member
Aerospace Growth Partnership Board	Member
Aerospace Growth Partnership Manufacturing Working Group	Chair
Aerospace Technology Institute Specialist Advisory Groups	Member
AIRTO Board	Member
All Party Manufacturing Group	Member
Automation Advisory Board	Chair
Automotive Council UK Manufacturing Group	Chair
Automotive Council UK Technology Group	Member
BIS Manufacturing Advisory Group	Member
Centre of Nuclear Excellence	Member
Chemistry Growth Partnership Supply Chain	Member
CIMCOMP Steering Board	Member
Composites Leadership Forum	Member
Composites UK	Director
Construction Leadership Council	Member
EARTO	Member
EPSRC Centres for Innovative Manufacturing Advisory Boards	Member
HVM Steering Group	Member
Industrial Biotechnology Leadership Forum	Member
Metals Council	Member
Midlands Aerospace Alliance Board	Non Exec
Midlands Engine Innovation group	Chair
National Skills Academy for Nuclear Manufacturing	Member
National College for Advanced Manufacturing Interim Board	Chair and member
Nuclear Capabilities Group	Chair and member
Nuclear Decommissioning Authority	Advisor
Nuclear Industries Council	Member
Nuclear Innovation Research Advisory Board	Chair Industry Group
Through Life Engineering Strategy Group	Co-chair
Women's Business Council Board	Member





HVM Catapult is one of Europe's leading manufacturing technology development centres providing The Manufacturing Academy of Denmark (MADE) with access to world-class facilities and leading experts within the field of Manufacturing. During the past year MADE has had the opportunity to introduce many of our industrial partners to the HVM Catapult team and facilities with the aim of establishing joint project opportunities for industrial partners in the UK and Denmark.

Nigel Edmondson, Managing Director – MADE



International engagement

In response to the opportunities and challenges of an increasingly globalised manufacturing environment, international engagement continues to be an important part of HVM Catapult's efforts to deliver step changes in productivity and competitiveness and solving 'big problems' for whole value chains.

International engagement remains focused around four key objectives:

Raise the international profile of the HVM Catapult;

Influence manufacturing related policy and work programmes;

Develop beneficial partnerships for future collaborative R&D; and

Secure EU funding to help deliver our mission and vision.

We remain an established and well respected organisation on the European stage. In spite of intense competition and unprecedented levels of oversubscription, our centres have continued to be successful in securing collaborative projects from the Horizon 2020 programme.

In Europe and beyond, we have been increasingly recognised and referred to as a benchmark of good practice, participating in several case studies, hosting international visits and delivering key note addresses to the international manufacturing community. Consequently, we have excellent relationships with our international counterparts including Fraunhofer in Germany, TNO in the Netherlands, MADE in Denmark, Irish Centre for Manufacturing Research (ICMR), Finnish Metals and Engineering Competence Cluster (FIMECC) and a host of international higher education institutions with a strong manufacturing pedigree.

We continue to work as part of a European consortium developing a proposal for the EU Added Value Manufacturing Knowledge & Innovation Community (KIC) – a flagship programme of the EU established to foster innovation and entrepreneurialism.

Our membership of the European Association of Research and Technology Organisation (EARTO) – has enabled us to have a say in the development of relevant EU initiatives such as the proposal to establish a European Innovation Council. Similarly, EARTO's work on the economic 'footprint' of Research and Technology Organisations has informed the design of our own Impact Evaluation Framework.

Looking forward, we are working with key UK stakeholders, and our European colleagues at the European Factories of the Future Research Association (EFFRA), to help to help inform the research and innovation priorities for the final round of Horizon 2020 and beyond.

Events

The HVM Catapult centres held numerous events throughout the year, ranging from showcase events aimed at businesses, training workshops, seminars, lectures and exhibitions. In addition, the HVM Catapult participated in a range of large industry shows and provided keynote speeches at major manufacturing related conferences and events. This chapter presents a selection of the events we took part in during the review period.



National Manufacturing Debate

Cranfield University
19-20 May

Dick Elsy was a keynote speaker and joined the panel discussion on the impact of re-shoring of production to the UK. The HVM Catapult had an exhibition stand at the event and Dick was interviewed by IETtv. The discussion fed into a White Paper on the UK's Capability to Reshore Production.

Subcon

NEC Birmingham
2-4 June

HVM Catapult teamed up with UKTI and Centaur to organise a large drop-in advisory area at the Advanced Manufacturing Show. Dick Elsy gave the opening speech at The Engineer Innovation Conference, which ran alongside the show. This was the first time that Subcon, The Advanced Manufacturing Show and the Engineer Conference ran simultaneously in the same venue.

Leading Business By Design

Birmingham City University
18 June

Dick Elsy took part in the panel discussion the 'Leading Business by Design' event, organised by the Design Council. The event brought together key delegates from industry and academia to discuss the role of design in different aspects of successful business.

Big Bang West Midlands

Ricoh Arena Coventry
25 June

HVM Catapult with MTC and Holovis International had a large stand at this event, aimed at raising young people's interest in a career in science, technology, engineering and mathematics (STEM) subjects. Secretary of State for Education Vicky Morgan spoke to the MTC apprentices about the role of education in encouraging STEM uptake.

13th International Cold Forming Conference

AFRC Glasgow
2-4 September

HVM Catapult had a stand at this event, organised by the AFRC. The Conference focused on achieving step changes in cold formed product weight and process flexibility for future products. Over 130 international delegates attended, listening to over 30 presentations, seeing demonstrations, participating in tours of AFRC and visiting 18 international exhibition stands.

CENEX Low Carbon Vehicles Event

Millbrook
14-15 September

HVM Catapult exhibited alongside WMG at this event, which is the UK's premier low carbon vehicle event, hosted at Millbrook. Dick Elsy spoke on the panel of the 'building the propulsion nation; UK capabilities development' seminar.



Metals Strategy Launch

BIS Conference Centre London
19 October

The HVM Catapult supported the launch of the UK Metals Strategy, which sets out to demonstrate how productivity can be improved through the implementation of its findings. The launch was attended by Anna Soubry MP, Minister of State for Small Business, Industry and Enterprise.

Cross Catapult SME event

Technology Innovation Centre Glasgow
26 October

The HVM Catapult worked with Innovate UK and the other Catapult on the cross Catapult event aimed at local SMEs. John Swinney, Deputy First Minister for Scotland delivered the keynote speech.

Advanced Engineering Show

NEC Birmingham
4-5 November

HVM Catapult again had a significant presence at this show, which is the biggest of its kind in the UK. In addition to a large corporate stand representing all 7 centres, we had a feature stand with examples of cutting edge UK engineering innovation including the Rolls-Royce Trent 900 Fan system, the Dove fan blade, the Invictus Catamaran and the Arion1 land speed record-breaking bike.

Innovate 2016

Old Billingsgate London
9-10 November

HVM Catapult exhibited alongside the other Catapults at Innovate 2015, the largest multi-sector showcase of UK innovation. We also held surgery sessions and fielded keynote speakers to various sessions during the event.

TRAM UK 2015

AMRC Rotherham
10-11 November

TRAM (Trends in Advanced Machining, Manufacturing and Materials) is an international conference and exhibition focused on transferring advanced manufacturing technologies to the business leaders in the aerospace sector.

Hosted by the AMRC, the event returned to the UK for the first time since 2009, attracting over 300 attendees from 15 countries.

Transforming our Future Conference: Robotics and Autonomous Systems

Royal Society London
13 November

Dick Elsy chaired a session at this high-level conference which brought together national and international leaders in robotics and autonomous systems across academia, industry and government to scope the long-term vision (20 to 30 years) and challenges in this exciting and rapidly developing field.

From Industry 4.0 to Digitising Manufacturing

MTC Ansty
26 November

Over 200 delegates from the UK and overseas attended this event at the MTC, focusing on Industry 4.0 and its impact on the manufacturing industry in the UK and elsewhere. Representatives from Fraunhofer, TNO and other RTO's shared their experiences and insights and had the opportunity to engage with delegates from MTC and other HVM Catapult centres during the day.

New Statesman roundtable

Portcullis House Westminster
11 January

Dick Elsy took part in this round table on the topic of UK productivity. Other panel members included Angela Eagle MP - Shadow Secretary of State for BIS, Juergen Maier - CEO of Siemens UK, James Selka - CEO of the Manufacturing Technologies Association and Mick Ord - MD BAE Systems Naval Ships.

BIS outreach programme

BIS Conference Centre London
12 January

HVM Catapult organised a bespoke session for BIS staff in London, Sheffield and Cardiff on the work done in our centres, the impact we have on industry and the expansion developments over the past year.

EEF National Manufacturing Conference

QE-II Centre Westminster
24 February

HVM Catapult was the official conference partner at the EEF National Manufacturing Conference in Westminster. Over 800 top UK manufacturing decision makers and policy makers came together for a day of celebrating UK manufacturing, hearing inspiring speakers and topical panels and discussing issues of importance as a community.

We had a high-profile presence at the conference exhibition and our Supervisory Board member Hamid Mughal OBE joined the main stage. We hosted an industry lunch on the topic of transfer of technology, with a thought provoking contribution from David Scott, Lead Structural Director of Engineering Excellence at Laing O'Rourke.

JEC World Composites Show

Paris
8-10 March

With more than 1,300 exhibitors, and over 37,000 visitors from across the globe, this is the largest international show for the composite industry. The NCC hosted the UK Pavilion with Composites UK (the composites trade association) and UK Trade and Investment. The UK Pavilion consisted of the sponsoring partners and 15 other UK companies.

What was said about us?



Fostering an environment in which innovation thrives has to be a priority when thinking long-term, and these Catapult centres, which bridge the gap between businesses, academia and some of the UK's world-class research centres, are instrumental in achieving that.

Chris White MP – member of the Business, Innovation and Skills Committee



The key thing is making a plan and delivering it. We have learnt this from the Catapult, they deal with problems very quickly, and have great discipline in delivery...they have been instrumental in raising our standards, helping us to compete.

Paul Read – James Fisher Nuclear



The chancellor's enthusiasm for an industrial strategy for Britain is hugely welcome, as is his promise to continue to support Catapult centres, the successful incubators of new business ideas and product development.

Terry Scuoler, Chief Executive – EEF



The future belongs to manufacturing companies who push the boundaries of technology and innovation. The HVM Catapult centres are exciting environments that showcase the art of what's possible and that's just what we need in order to respond to the challenges of Industry 4.0 and lead Britain into The Future of Making Things.

Asif Moghal, Senior Industry Manager – Autodesk



We are securing the place of UK Manufacturers at the forefront of the Fourth Industrial Revolution, which is why we have invested £300m over five years in the High Value Manufacturing Catapult to support the commercialisation of the innovation and new technologies that will be crucial to UK manufacturing success.

**Anna Soubry MP – Minister for Small Business, Industry and Enterprise
3 March 2016**



There is a large amount of science and good ideas around, but there is a big gap between there and bringing those things to market and them resulting in hard capital investments.

We have found the Catapult centres in particular to be very useful in bridging that idea-to-execution gap, and we believe that there is huge potential for them to do more.

**Paul Harris, Director of Economic Development – Rolls-Royce at Productivity Select Committee
21 October 2015**



The Catapult helps manufacturers turn innovative research into real-world success.

**Secretary of State Sajid Javid at the EEF National Manufacturing Conference,
24 February 2016**



A strong mix of commercially savvy people who understand for instance how to protect your IP, or how to identify value in your supply chain.

Ian Goodman – Goodwolfe Energy



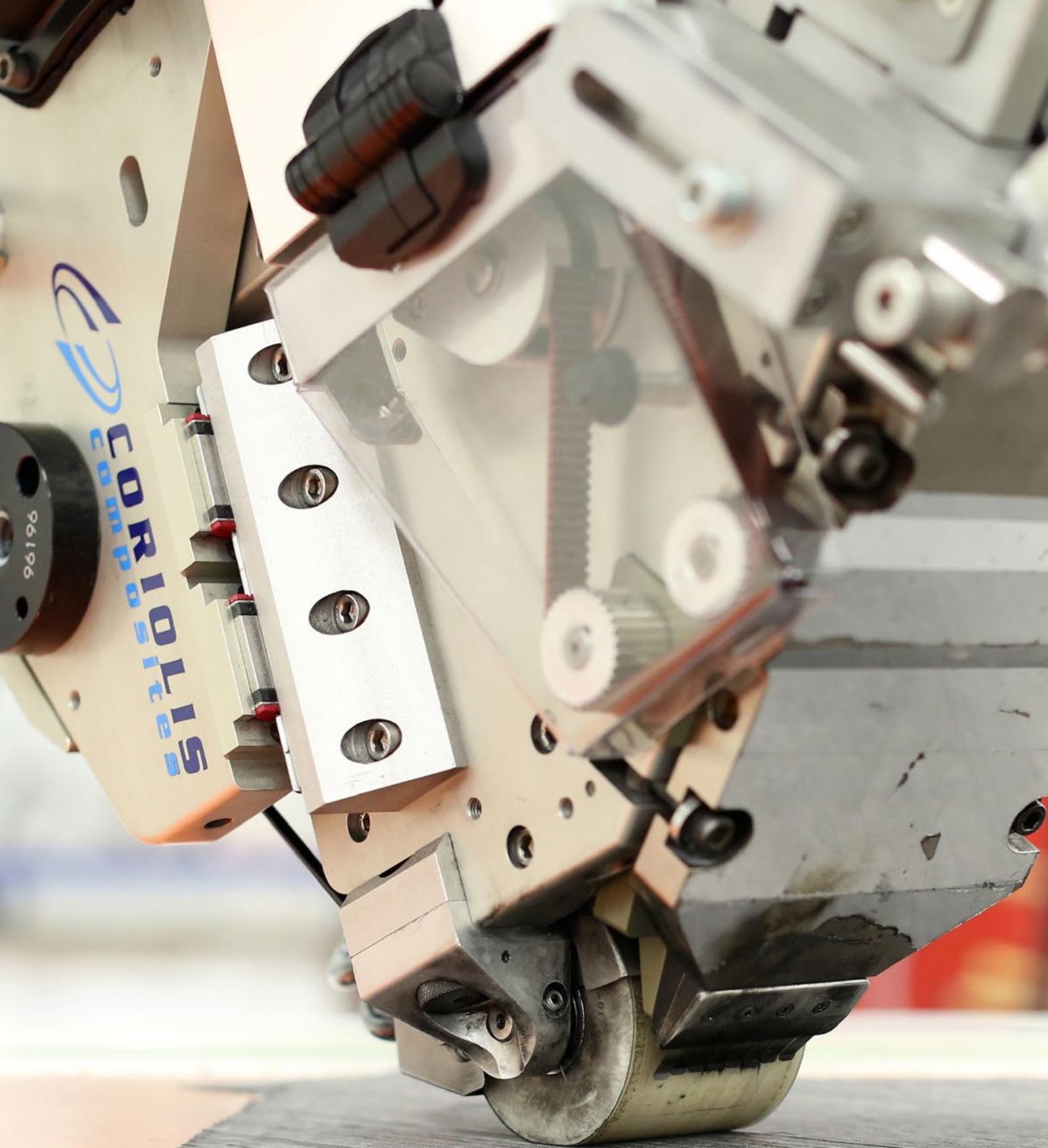
We wouldn't have been able to set up our own facility, we would have needed to invest tens of millions to access these kinds of technologies... there are other centres but they are all abroad.

Richard Price – PragmatIC Printing



The atmosphere in the HVM Catapult centre is excellent, there is a real buzz.

James Farrar – Wilde Analysis



HVM Catapult in the media

Total number of online articles

3,883



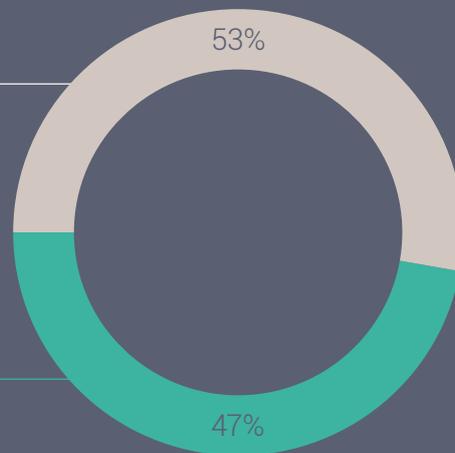
Up 47% from
2014-15

2,060

UK articles

1,820

International articles



Coverage in national titles, including:

theguardian

The Telegraph

FINANCIAL TIMES

**The
Economist**

theENGINEER

THEManufacturer
www.themanufacturer.com



The establishment of the High Value Manufacturing Catapult, with its seven centres across the UK, provides critical infrastructure to companies wishing to grow.

The Manufacturer
www.themanufacturer.com

www.Microlac.com



It took me longer to get through MTC security than it did to get my analysis problem resolved once inside.

Chris Brown, Engineering and Quality Manager – Aculab



Looking ahead

The HVM Catapult provides manufacturers with access to technology and expertise which enables them to more readily pursue, and in turn benefit from, innovation. The bulk of our forward work plan is driven from industry identified needs. This plan helps industry to grow, anchors jobs and investment in the UK and ultimately makes a positive impact on the UK economy. This approach, which has proven incredibly successful thus far, will remain our primary focus for 2016-17 and beyond. We make no excuses for building our strategy on "more of the same".

We recognise, that the future context for UK Manufacturing will be very different from today. Mass customisation; robotics and autonomy; new energy and infrastructure; advanced materials; new business models, big data and artificial intelligence are changing the manufacturing landscape. More than ever before, innovation is critical to sustaining and growing the contribution to GDP from the UK manufacturing base.

With this changing landscape the need for clear leadership in UK advanced manufacturing is fundamentally important. We believe the most significant part of this leadership role is the ability to observe the bigger picture and set out the right framework and direction for manufacturing innovation. The HVM Catapult is uniquely positioned to do this by establishing and delivering on our Technology Strategy, creating the right conditions for us to work with industry in order to:



Stimulate and de-risk investment in innovation while accelerating growth and anchoring high value development activity in the UK.



Deliver step changes in productivity and competitiveness and solve 'big problems' for whole value chains.



Enable the UK to move towards more digitally connected factory and supply chains.

The ability to embrace this leadership responsibility and set the context for manufacturing innovation in the UK, whilst remaining aligned with industry's needs, is exactly what makes the HVM Catapult so much more than 'the sum of its parts', and what makes us the 'go-to' place for advanced manufacturing in the UK.

Looking ahead

Our Technology Strategy is ever evolving. The strategy focuses on areas where the HVM Catapult centres can, by working together, increase the benefit to the UK manufacturing base through the provision of increased innovation, capability and capacity to meet industrial need, and through the creation of strong collaborative relationships with universities, and the Research Councils.

The HVM Catapult Technology Strategy encompasses four main aims:

1

To develop large scale projects to help to transform major UK manufacturing markets and supply chains

2

To develop a cohesive and influential engagement strategy for the HVM Catapult with the national sector strategic bodies and associated organisations

3

To create collaborative relationships with Universities and the Research Councils

4

To strengthen capability and competence

Increasing our provision

Through our HVM Plus programme, we will seek to establish and extend our presence into additional industrial sectors. We plan to work more extensively with industries such as:

- Construction
- Oil and Gas
- Food and drink
- Healthcare and Medical Technologies

Support for SMEs through the HVM Reach programme - providing a suite of bespoke services for small businesses that will benefit from innovation - will intensify. We will build on our engagement with financial institutions to help to provide easier access to finance for innovation hungry SMEs, with reduced risk for lenders, in a 'win-win' scenario that we're committed to exploit.

We intend to offer further support to SMEs by extending our presence beyond the current geography with multiple centres working together to provide greater regional 'outreach'. This will come in the form of a combination of facilities and resources, to broaden SME engagement and to ensure a presence which is local to key target markets.

Beyond our national borders our efforts on international engagement, in particular within the EU, will continue. The HVM Catapult centres will continue to access sources of EU funding to support collaborative R&D.

Funding and Finances

In order to deliver our industry focused agenda, we are committed to maintaining our funding model whereby we seek to generate broadly equal amounts of income from:

- **Core funding** from Innovate UK (including the additional allocation for HVM Plus and HVM Reach) – for long term investment in infrastructure, expertise and skills development.
- **Collaborative R&D projects** – funded jointly by the public and private sectors and awarded on a competitive basis.
- **Commercially funded R&D contracts.**

This funding model remains as important as ever in ensuring that we focus our attentions where industry wants it, while at the same time ensuring that this offer to our customers is at the very cutting edge of advanced manufacturing.

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CATAPULT
High Value Manufacturing

We work with
Innovate UK

