



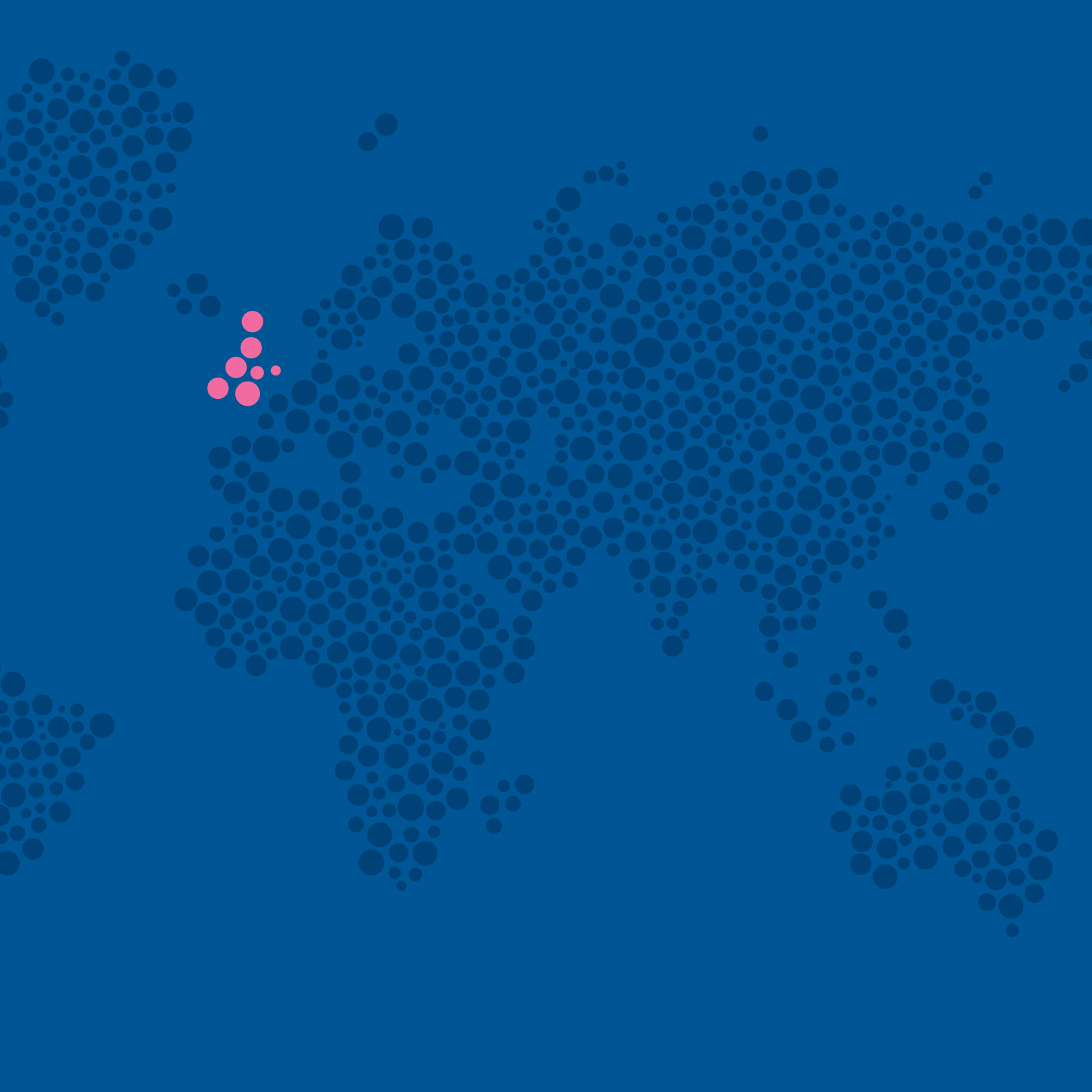
From innovation to  
commercialisation

**CATAPULT**  
High Value Manufacturing



THE CENTRE FOR PROCESS INNOVATION

# From innovation to commercialisation



# Introduction



**Bob Coxon**  
Chairman



**Nigel Perry**  
CEO

The UK process and manufacturing industries face substantial challenges and opportunities as they look to develop innovative new products, technologies and services to meet the needs of the 21st Century.

The global population is inexorably rising, and as such demand and consumption of all manufactured goods and services mirrors this growth. Yet pitched against this growth in consumption is an increasing pressure on the earth's finite supply of natural resources. These two conflicting drivers will continue to converge until the conventional processes and methods of supply can no longer meet the rising demand. As such, in this environment there is an overwhelming need for global manufacturing innovators to develop products which reduce the consumption of natural resources.

In response, The Centre for Process Innovation (CPI) was established and since its inception a decade ago has worked to provide commercially

viable solutions to meet this growing global challenge.

CPI uses applied knowledge in science and engineering combined with state-of-the-art development facilities to enable our clients and partners to develop, prove, prototype and scale up the next generation of products and processes. Working with our experienced team, companies can significantly de-risk the development process and can bring products to market faster while reducing the environmental impact and costs throughout the manufacturing cycle.

During the last decade we have worked with over 2,000 companies and organisations including SMEs, Universities and large corporate



clients globally. We have successfully completed over 350 public and private projects with a total value in excess of £300M. Moreover we have worked with a host of FTSE 100 companies and FTSE 250 companies to help them develop improved products and processes to grow their business.

By integrating our £55M worth of diverse capital equipment with the expertise of our renowned team of engineers, process developers and scientists, we have participated in almost 60 European Projects to the value of over £120M. These projects are helping UK manufacturers bring new

technologies, products and services to market, creating value for the UK and enhancing commercial competition globally.

More recently, CPI has played a pivotal role in the successful creation and launch of the UK government's High Value Manufacturing Catapult. This cross supply chain initiative heralds a sustained investment into manufacturing and CPI's proven ability to assist companies in the development and delivery of the next generation of products and processes is vital to its success. Most importantly, the High Value Manufacturing Catapult brings

*CPI is the home of the UK's National Centres for Printable Electronics, Industrial Biotechnology and Anaerobic Digestion.*

together individual innovation centres in a collaborative network that creates something even greater than the sum of its parts – a single network covering high value sectors from pharmaceuticals to power generation, where knowledge gained in one area can be transferred to others.

Being part of the High Value Manufacturing Catapult, our challenge is to introduce our low cost, low carbon manufacturing approach to build and enhance supply chains across the process and manufacturing industries to bolster economic stability.

All the while, CPI continues to make great progress toward its vision of becoming a world-class centre of innovation for the process industry, stimulating a more innovative, sustainable and competitive sector by reducing the risks associated with innovation and allowing businesses to benefit from growing international demand.

During the last decade we have worked with over 2,000 companies and organisations including SMEs, Universities and large corporate clients globally.

In 2011 CPI joined the High Manufacturing Catapult which is integrating discreet manufacturing and process industries to improve UK supply chains.

CPI has helped its partners to create almost 60 European projects with a total value of over £120m.

In 2012/13 CPI had a turnover of £15m.

# Our philosophy

## **Better...**

Improved product design, quality and performance with increased functionality and embedded intelligence, ideally at no extra cost of raw material or feed to product.

## **Faster...**

Higher process yields, reduced manufacturing time and faster conversion of raw material or feed to product with shorter time to market.

## **Cheaper...**

Lower capital cost, manufacturing design and process cost. How? By moving batch processes to continuous processes, increasing digital prototyping and automation in manufacture, reduced manufacturing and lower capital requirements.

## **Greener...**

Increased use of natural materials, materials based on waste, reuse or recycling with lower carbon footprint processes and products. Reduced manufacturing time, reduced waste, near net shape production. Preferably with design for reuse and recycling addressed.

## **Lower carbon...**

All the above reduce the carbon footprint, but there is also a need to capture and store remaining carbon dioxide and other emissions.

## **Safer...**

All manufacturing suppliers need to understand and act upon safety imperatives and the associated culture to create safe products and processes

the future  
inspired...

*To date we have  
successfully  
completed over 350  
public and private  
projects with a  
total value in  
excess of £300m.*

inspired



# About CPI

The Centre for Process Innovation is a UK-based technology innovation centre and part of the High Value Manufacturing Catapult. We use applied knowledge in science and engineering combined with state-of-the-art facilities to enable our clients to develop, prove, prototype and scale up the next generation of products and processes.

Our open innovation model enables clients to develop products and prove processes with minimal risk. We provide assets and expertise so our customers can demonstrate the process and prove it is feasible before investing substantial amounts of money in capital equipment and training. New products and processes can be proven; on paper, in the lab and in the plant before being manufactured at an industrial scale.

By utilising our proven assets and expertise companies can take their products and processes to market faster. There is no down time in production as all of the process development is completed off-line and our technology transfer teams can help to transfer the product or process into full scale production.

We are home to the UK's National Centres for Printable Electronics, Industrial Biotechnology and Anaerobic Digestion. We work in seven core technology areas. These are:

- Industrial biotechnology
- Printable electronics
- Smart chemistry
- Sustainable engineering
- Anaerobic digestion
- Thermal processes
- Biopharmaceuticals

# About CPI

## Better products faster

We help our clients to produce better products with increased quality and performance. We can create processes with higher yields and reduced manufacturing time with faster conversion of raw materials or feedstock to the finished product.

## Low cost, low carbon manufacturing

We enable companies to decrease capital and manufacturing costs by facilitating batch to continuous processes, increased automation and reduced manufacturing time. We help reduce and reuse wastes, utilise natural materials and decrease reliance on fossil fuels.

## What can we offer?

- Product and process development
- Prototyping, demonstration and scale up
- Fabrication and pilot production
- Fuel, feedstock and materials investigation
- Manufacturability and process assessment
- Process modelling and consultancy
- Business and funding support
- Incubator space



# CPI market focus and value to UK

We develop solutions to match market needs, we are able to work in areas to reduce costs, reduce size and weight, increase efficiency, produce energy, integrate design and functionality and deliver intelligent systems in the application of the latest technologies.

We work in the following markets:



Electronics / £16b +

IT / £58b



**ELECTRONICS & IT / £74b +**



**FOOD & DRINK / £76b**



**BUILT ENVIRONMENT / £90b**

**ENERGY / £45b**



**HEALTHCARE & LIFESCIENCES / £20b**



AUTOMOTIVE & TRANSPORT / £50b +



MATERIALS & CHEMICALS / £85b +

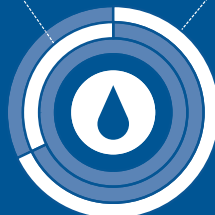


RETAIL & CONSUMER GOODS / £150b +



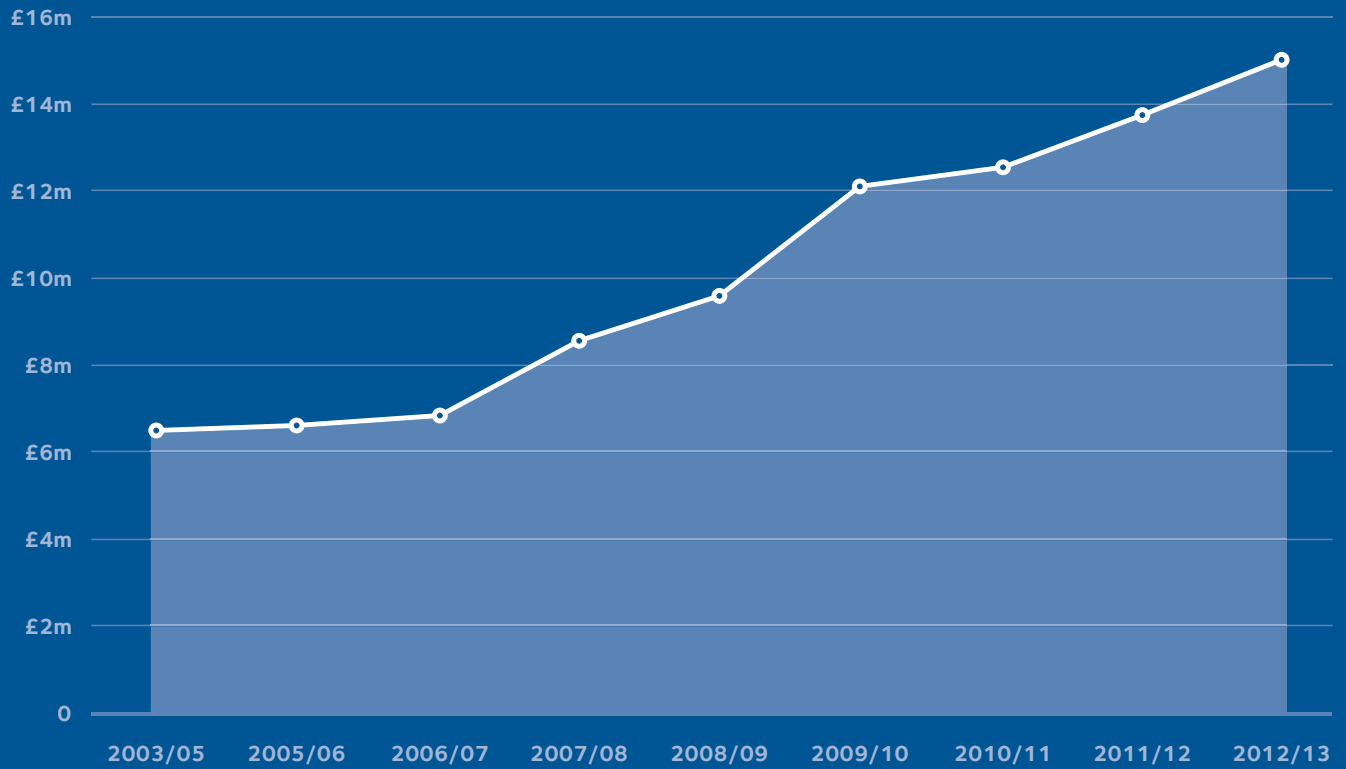
Water & waste water / £6.7b

Waste / £15b

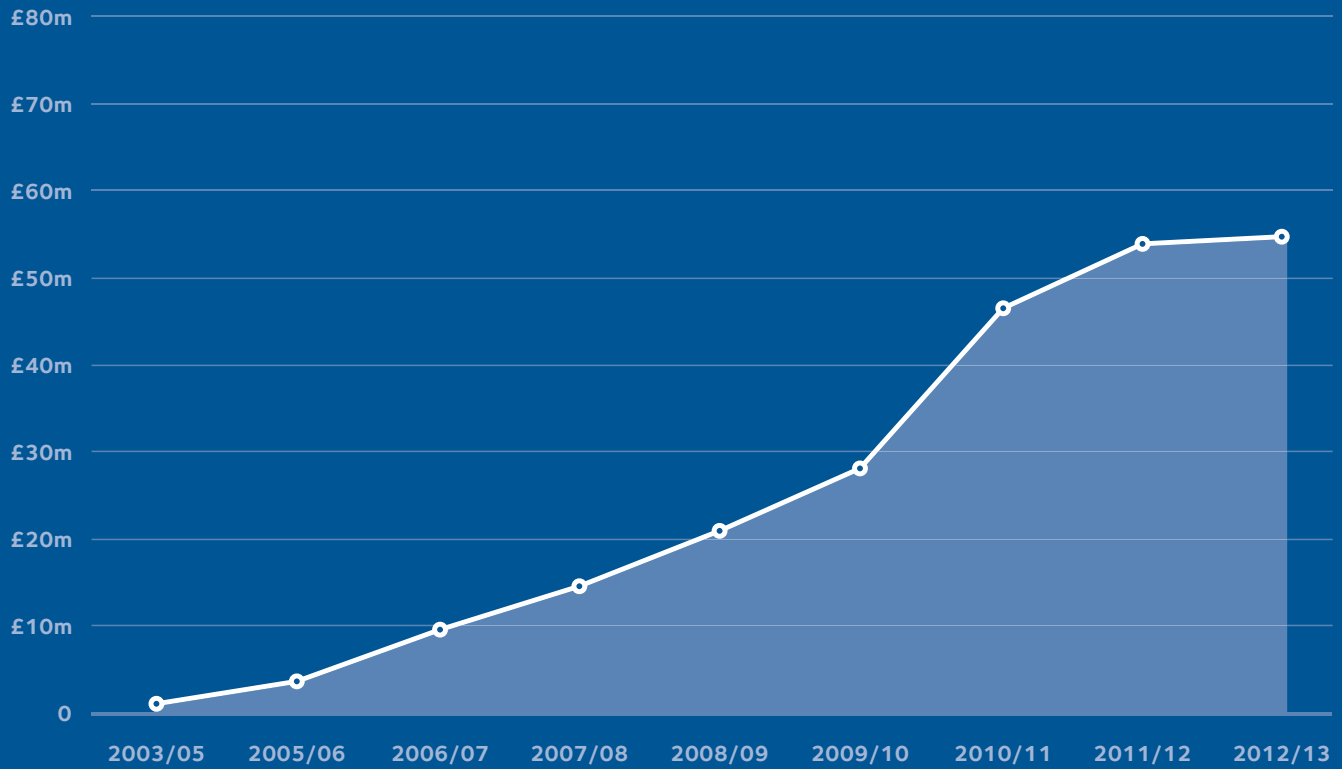


ENVIRONMENT & WATER / £23.7b

# Revenue



# Asset growth



## Customers in 2012/13



## Turnover





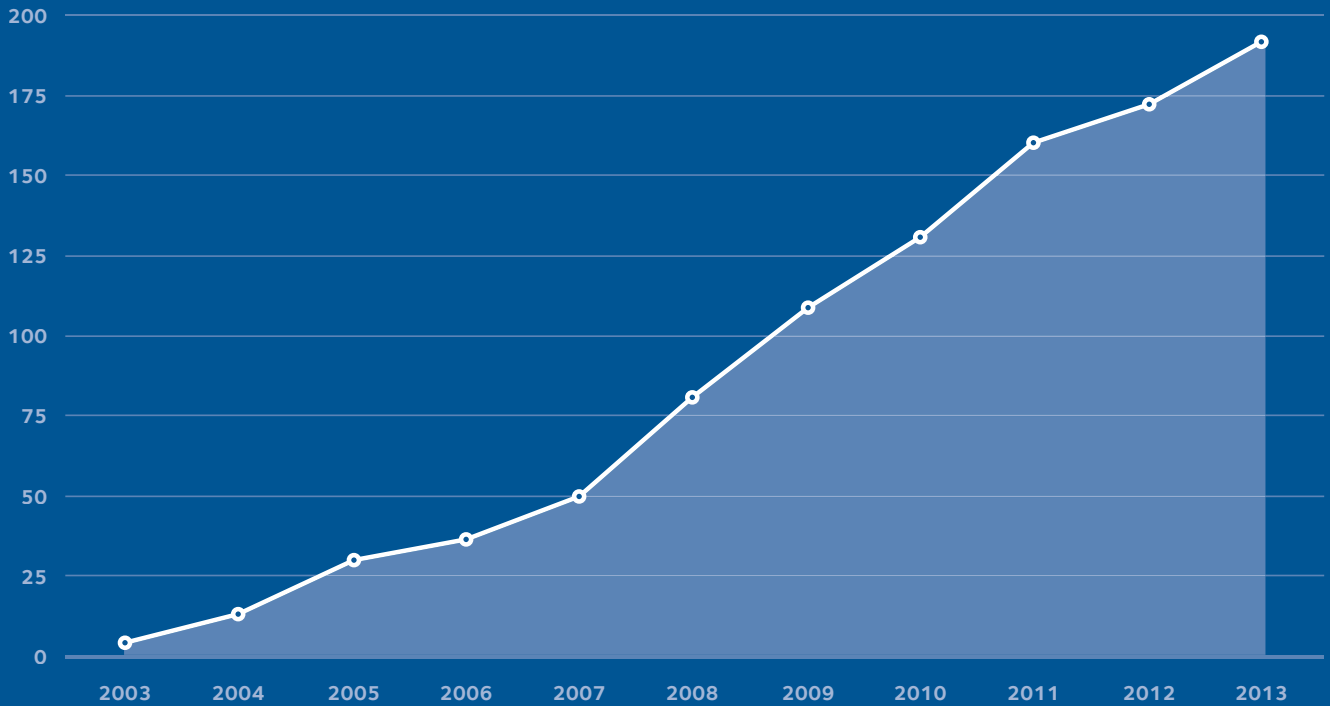
## Commercial turnover



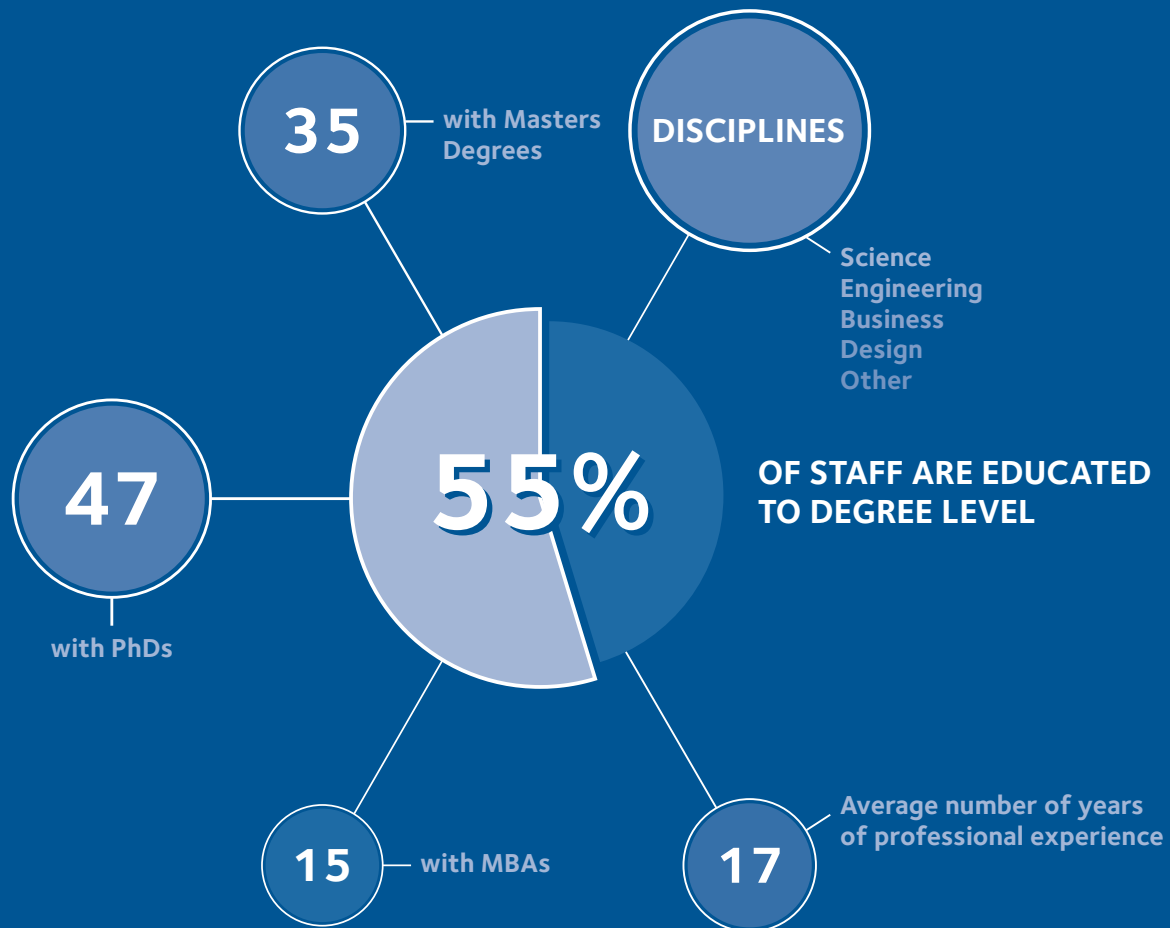
## Asset value



# Employee growth 2003-2013



# Staff profiles



# Innovative products

## The Innovation Landscape

Innovation is at the heart of every business and an essential driver for market growth.

In the simplest of terms, innovation within the process industry involves the application of technology to develop and manufacture products that are useful to the consumer. In turn, the most basic driving force of demand for innovation are the consumers who want new products that are multi-purpose, faster, lighter or smaller, and businesses who want to make the production process more sustainable, more cost effective or create a new product which consumers aren't aware they actually need.

The process of innovation follows a simple yet effective roadmap, which begins with a period of discovery and research before the phase of innovation. From here the novel idea is taken and its concept proven, before scaling up the manufacture and testing its efficacy in operation and then creating a demonstrator. Commercial delivery is the final stage of the journey.

## Research & Discovery

- Research & Discovery is often limited by budget and faces financial barriers
- Manufacture is often time and cost prohibitive due to fractured supply chains

Consequentially, the research fails to commercialise and does not penetrate the commercial market

## Universities



Basic  
Idea

Concept  
Developed

Proof of  
Concept

## Manufacture

### Product Challenges

- Better products
- Innovative effects
- Higher yields

### Business Challenges

- Lower material, operating and fixed costs
- Faster production rates
- More sustainable products

## The Innovation Phase

## Industry

3

4

5

6

7

8

9

Process  
Validation  
In Lab

Process  
Validation  
Production  
Scale

Process  
Capability  
Validated

Capability  
Validated  
Economic  
Run

Capability  
Validated  
Range Of  
Parts

Production

# Innovative products

## What are the challenges facing innovation today?

While there is a need to create innovative products that integrate new materials, coatings and electronics with more effective and enhanced manufacturing technologies, the true challenge lies in the identification of a new technological trend and understanding how it can be exploited to deliver tangible product innovations.

Technology by its very nature is dynamic and constantly evolving so this can cause issues when attempting to harness it in a new way. At CPI we look at the situation from a different perspective, questioning the market need and then integrating a technology with new materials to create a new process and ultimately a new product. It's a case of creating a product that's better by applying smarter technologies or simply applying the technology in a novel way.

While the introduction of advanced materials is a key element in the development of new products, historically there has been a tendency to exploit natural resources to deliver innovation in manufacturing. As a result there is now also genuine need to make the overall process more sustainable using non-fossil feed stocks such as biological materials or recycled waste. It is this collaborative mix of enhanced materials and new technologies that will deliver truly innovative products that have a commercial edge and are sustainable.



## Barriers to innovation:

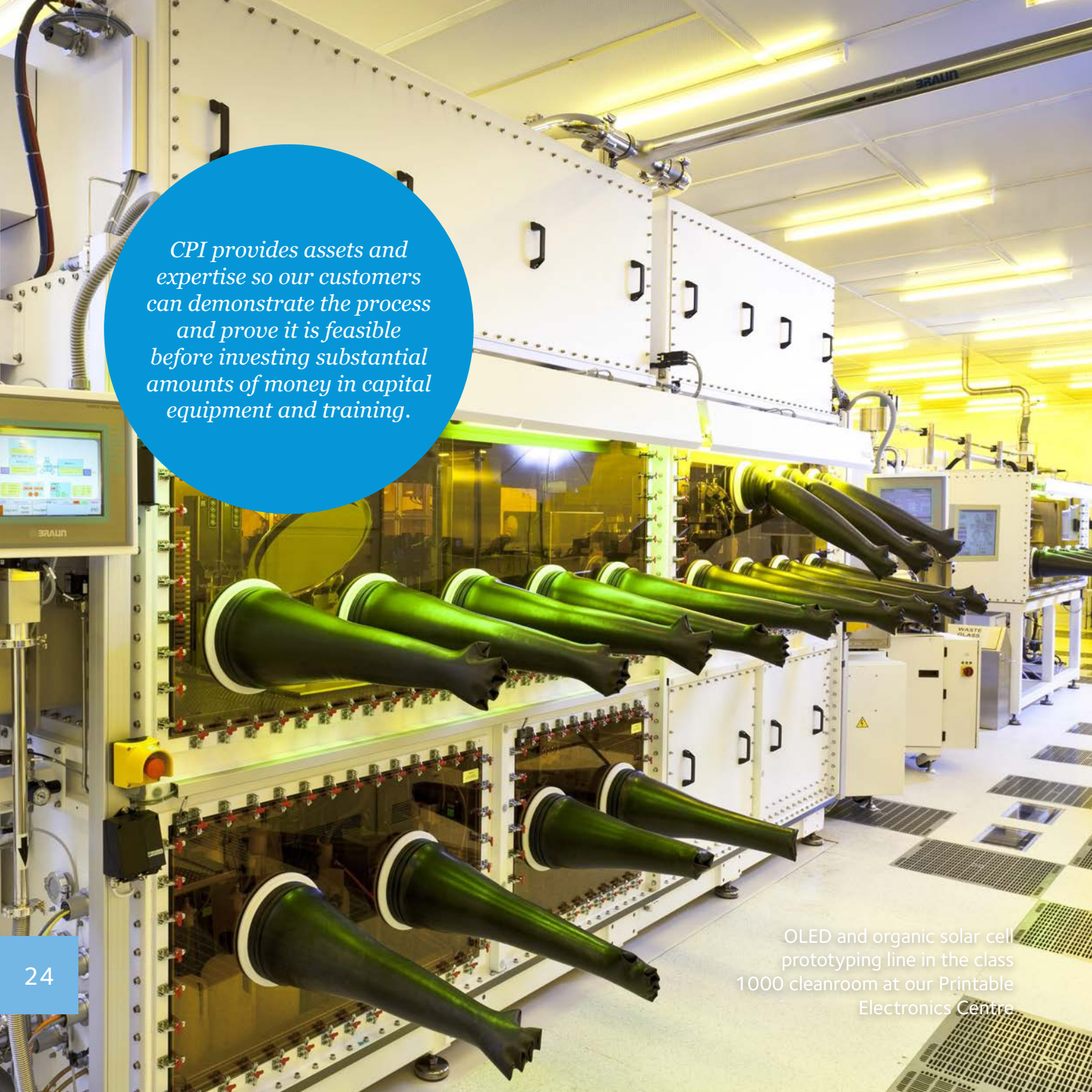
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- **Risk** – capital investment in new technology and processes is often prohibitive
- **Fragmented supply chains** – there are gaps as a result of the above and also due to the competitive edge of emerging markets
- **Knowledge and expertise** – such skills and experience are rare

## CPI breaks these barriers down by:

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- **De-risking** the proof of concept, prototype and scale-up phases of the manufacturing process
- **Accessing funding** streams to support investment into UK manufacturing
- **Working to develop new business** models the infrastructure to create effective supply chains
- **A proven track record** in developing and delivering innovation



*CPI provides assets and expertise so our customers can demonstrate the process and prove it is feasible before investing substantial amounts of money in capital equipment and training.*

OLED and organic solar cell prototyping line in the class 1000 cleanroom at our Printable Electronics Centre



# Innovative products in action



PragmatIC Printing Ltd is a pioneering company in imprinted logic circuits. The technology developed by PragmatIC is able to print electronic logic at very high speeds while dramatically reducing circuit size and simplifying manufacture, thereby opening up prospects for low-cost, high-performance printed electronics across a range of applications.

After successfully trialing a number of innovative developments on a smaller scale, PragmatIC was keen to utilise the expertise and equipment at CPI to help take the project onto the next stage, with a view to moving its technology to pilot-scale production.

Within a short space of time PragmatIC has been able to transfer its process onto the CPI pilot-lines.

PragmatIC were assisted by the experienced process engineering expertise at CPI to adapt the PragmatIC lab-scale product into a yielding baseline process onto standardised industry production equipment.

Having access to specialised facilities has enabled companies like PragmatIC to de-risk their product development and commercialisation processes. PragmatIC have utilised our facilities to scale up their manufacturing methods and provide them with a good indication of the performance of its materials and processes at commercial manufacture scale.

Scott White, CEO of PragmatIC Printing Ltd said:

“We are hugely excited at taking the next steps towards full commercial deployment of our unique technology for imprinted logic. In addition to production, the pilot line serves as a reference platform for our licensees, and as a test-bed for on-going improvements in device design, process optimisation and circuit functionality.”

# Innovative products in action

## PERATECH

Peratech Limited was established in 1996 to exploit Quantum Tunnelling Composite (QTC™ Material), which is a new class of electrically conductive material developed to advance the capability of switching and sensing systems.

QTC materials give enormous flexibility in the design, shape, thickness and style of a switch or touch sensor and can be made in a range of forms from traditional switch replacements, through textile and screen printed switches to innovative, pressure-sensitive QTC Touchscreens that allow for three dimensions of input.

Potential uses for QTC are numerous, ranging from textiles to touch screens. The technology has already been applied in clothing, where controls for iPods and similar devices have been successfully integrated into jackets, which can be washed or dry cleaned, crumpled and stretched.

Peratech approached CPI with a view to broadening its ink technology into a more widely used set of printing processes. CPI brought its experience of ink formulation, print processing and testing expertise to help Peratech develop these new products.

David Lussey, CEO of Peratech said:

“The next innovation in electronics is being able to print complete circuit assemblies as this dramatically reduces unit costs. Both active and passive components are being printed onto paper, textiles and plastics using flexographic printing processes. The development project with CPI is designed to create QTC ink formulations that can be used in this and similar printing processes so that QTC pressure sensors and switches can be incorporated into these next generation printed electronic circuits.”



*The global market for  
printed and flexible  
electronics will reach  
£50 billion by 2022.*

 **cpi** ...the future inspired

Integrated Smart Systems line at  
our Printable Electronics Centre

# Making our resources work harder



**Graham Hillier**

Director of Strategy,  
CPI

The process industry is the unsung hero of the majority of manufacturing supply chains. It supplies the often complex and specialist raw materials that are used to create all of our manufactured goods. As such it is closely linked to all manufacturing sectors.

The sustainability of the earth and its resources is one of the biggest challenges we face. As demand inexorably rises with increasing population and affluence we must address the fact that our resources are not endless. If we continue to consume them wastefully at an ever-increasing rate, our natural resources will eventually start to run out leading to scarcity of the products that sustain our lifestyle. The major challenge that comes from this issue is the need to reduce the pressure on the earth by making better use of resources, creating more efficient and lower cost processes that use less irreplaceable natural assets. At CPI our key priority is to assist our partners address this very issue

from a market-led commercial perspective. We help companies to develop lower cost, higher efficiency processes that make better use of the world's resources. For example by replacing fossil fuel feedstocks with bio or waste derived materials; by redesigning processes to increase their yield by up to 60 per cent by helping them produce materials and products that can replace expensive and scarce alternatives; by recovering and reusing resources with innovative processes and by linking processes together into networks or closed loops that minimise wastes and emissions. All of these innovative process developments present very real market opportunities and CPI's



role is to collaborate with public and private organisations to realise those opportunities.

The issue is big, it is important and the potential benefits both financially and environmentally are huge. Fortunately, CPI has the expertise and experience to provide effective solutions and there are three core strands at the heart of our offering. Firstly, our proven capability in process and product development demonstrates the UK's technical competence to the wider industrial market, making it an attractive place to invest. Secondly, we work with companies - both SMEs and larger established businesses - to improve their processes and products in

order to increase the value they create. Thirdly, by collaborating with existing research and development facilities, CPI supplies the innovation necessary to enable our partners to get products to market faster and more efficiently. Our approach helps our partners prove their processes and to create a supporting case for long-term investment.

What progress are we making? Over the course of the last decade CPI has grown steadily year on year and the companies we work with are delivering processes and products to the market that contribute to the overarching solution. However, we at CPI are acutely aware of how much

further we need to go and we look forward to continuing to collaborate with the manufacturing sector to transform our industries to address the needs of the 21<sup>st</sup> century.

*We enable our clients to develop, prove, prototype and scale up the next generation of products and processes.*

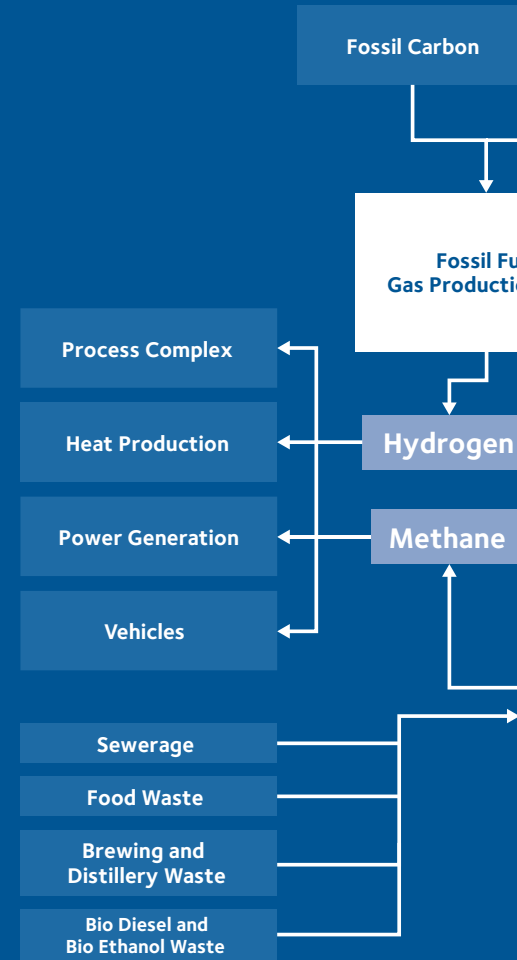
# Resource efficiency

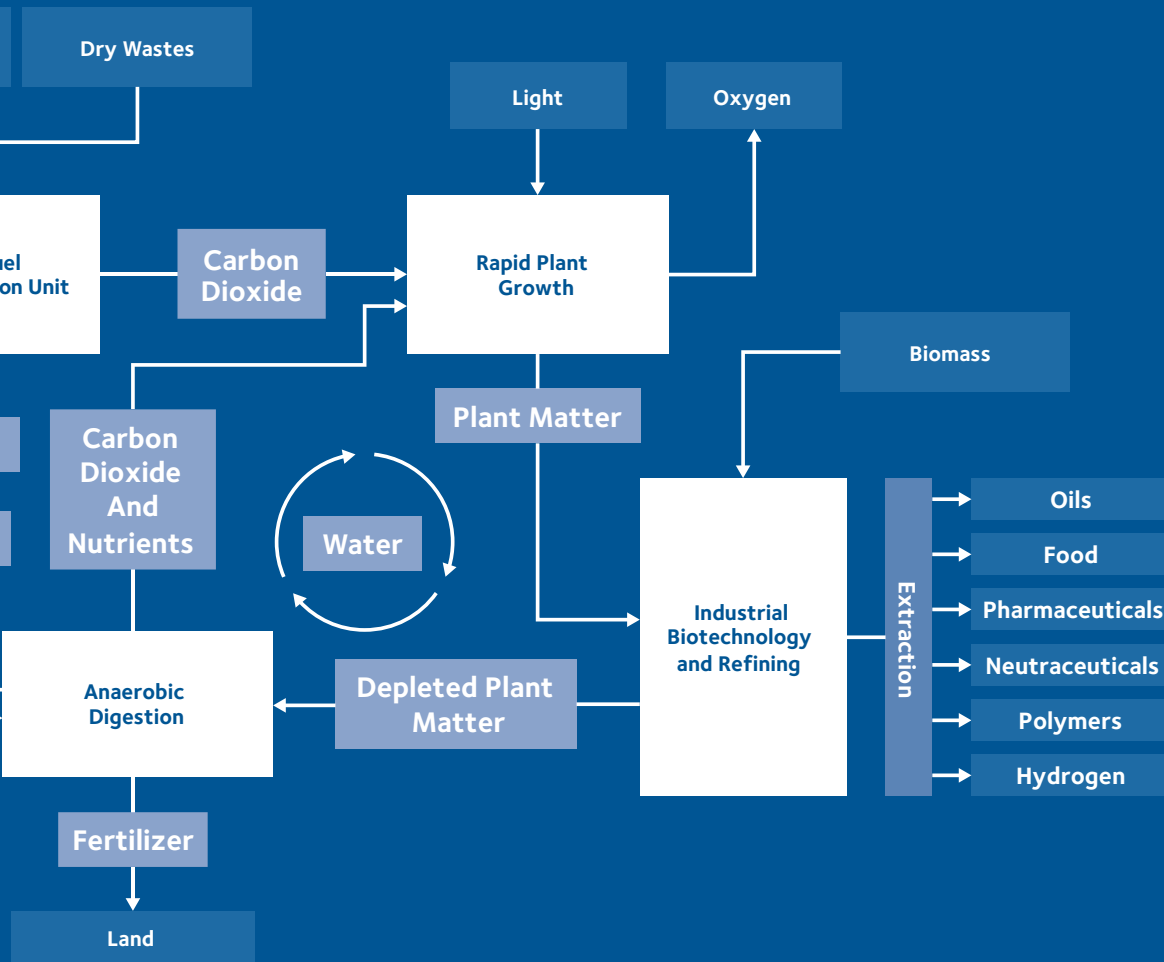
## What is resource efficiency?

Sustainability remains prominent on both the national and international manufacturing agenda. The dawning realisation that the earth's natural resources are not in infinite supply is impacting upon the global economy and is a key driver for change in the industrial sector.

In fact, resource efficiency affects every business and its associated supply chains in some way, shape or form, but particularly impacts upon those involved in the manufacture of goods, chemicals, pharmaceuticals, plastics, electronics, metals and mining, paper and printing, food processing and packaging. The rapid depletion of resources and scarcity of materials, coupled with an ever present agenda to minimise industrial impacts upon the environment and to develop a sustainable low carbon economy are challenges at the very core of the manufacturing arena. However, resource efficiency in the very simplest of terms is delivering a benefit to the end user that has optimised the materials and resources throughout the lifecycle of the product.

CPI works on all aspects of closed loop resource efficient systems.





# Resource efficiency

## What are the challenges facing our resources?

The demands of humanity upon the earth's ecosystems, which have supplied industry with resources and simultaneously absorbed the waste from the manufacturing process, have increased at an alarming rate. As the world's population grows alongside consumer aspirations for a high standard of living, the consumption of goods will similarly increase and put further pressure on the resources readily available to the manufacturing industry. A radical change in our approach to production, consumption, processing, storage, recycling and disposal of biological resource is crucial. Yet while a bio-based economy is vital and perfectly feasible, significant investments are required to support a sustainable alternative economy.

It is a huge undertaking to achieve sustainable production and resource efficiency, through the creation of goods and services which use processes and systems that conserve resources, maximise recovery, reuse, and recycling of materials and minimise waste. However, it must be focused upon now and addressed in order to protect our existing resources and to reap the potentially huge economic

benefits a bio economy based manufacturing industry would offer.

How can such a large issue be tackled? The key is accepting that solving these problems requires a more lateral thought process, encompassing the bigger picture. Often there are no preconceived ideas or a solution would already have presented itself. It is in fact the smallest of changes that regularly yield the biggest results. From reducing energy intensity and substituting existing materials with those that are more secure or have a lower environmental impact, to using less of the material and then the same material over multiple product lives, changes can be made.

Our Sustainable Processing and Printable Electronics centres are working in tandem to address the issues and we are making great progress. Deriving energy from waste; fully utilising feedstocks; developing lightweight materials and new composites we are designing and manufacturing with sustainability in the forefront of our mind.





## Barriers to resource efficiency:

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- **Investment and outlay** – the technology and its outputs are not always more cost-effective
- **Infrastructure** – a closed loop approach is dependent upon the buy-in of the wider industry at all levels in the value chain

## CPI breaks these barriers down by:

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- **Exploiting the low carbon market** through its proven low carbon technologies
- **Harnessing flexible and adaptive manufacturing** processes and systems to run multiple inputs through one system to generate different outputs
- **Maximising efficiency** through continuous processing designed to optimise scalability and outputs



*Our open innovation model enables clients to develop products and prove processes with minimal risk.*

**sartorius**

Engineering by Sartorius BBI Systems

750 litre fermentation vessel within the National Industrial Biotechnology Facility

# Resource efficiency in action



Plaxica is a spin-off company from Imperial College London and specialises in the production of bioplastics made from natural feedstocks such as sugar and cellulosic based materials, including corn starch, which are a greener, cleaner and stronger form of plastic. Plaxica's aim is to reduce the reliance upon oil-based products by using processes that are more sustainable and environmentally friendly.

Plaxica approached our multi-disciplinary team of chemists, scientists, technicians and engineers to help develop and scale up the production process for the product. It also wanted to utilise our laboratory facilities and extensive technical and analytical support. After early stage trials were successful, the company approached CPI with a view to expanding and taking the work to the next level. Larger scale trials have also been successfully conducted at our site in Wilton

and as a result Plaxica is now building a pilot plant with a view to providing their technology to the wider market.

Phil Goodier, CEO of Plaxica said:

"We are extremely grateful for the high quality, professional service provided by CPI. CPI's presence at Wilton was fundamental to our decision to locate our scale up facilities in the North East. The use of the open-access CPI equipment has accelerated our scale up plans significantly."

# Manufacturing processes

## Where are we now?

The UK is a key driver in the manufacturing industry, which accounts for over £6.7tr of the global economy. The UK is ranked in the world's top 10 manufacturing nations and the sector employs over 2.5 million people, accounting for over 50 per cent of the UK export market and over 75 per cent of all research and development programmes.

Yet despite strengths in industries such as aerospace and pharmaceuticals, the UK continues to face the challenge of competing with countries where production and labour costs are significantly lower and the markets, although emerging, are often larger.

Critical to the success of UK manufacturing industry and its processes are the many thousands of Small and Medium Sized Businesses (SMEs) who form part of the critical value chain and who work with the larger manufacturers to design and manufacture today's products.

Customisation

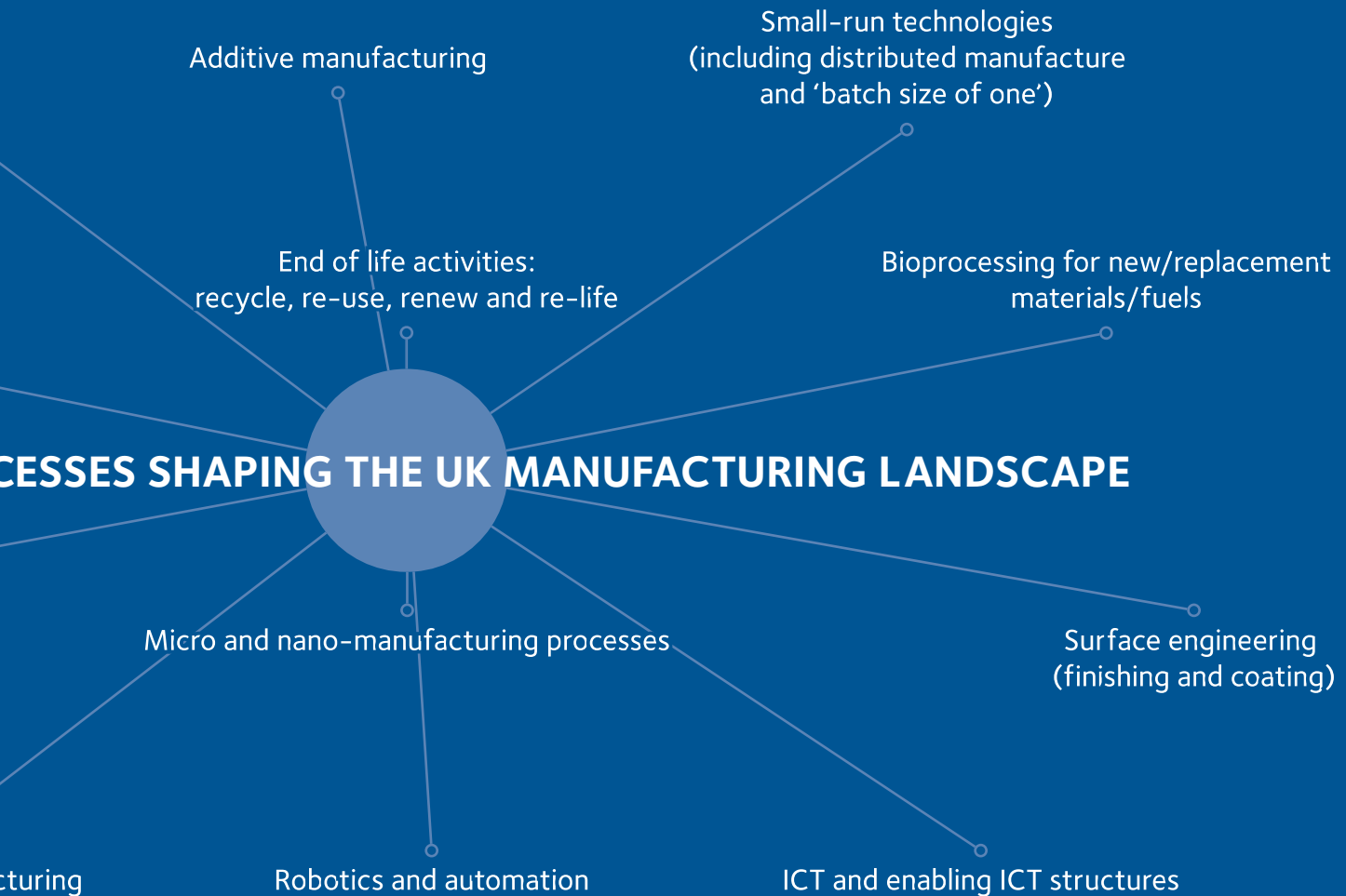
Integrating technologies and processes

**EFFICIENT PROOC**

Linking design and manufacturing more closely

Net shape manufact

# PROCESSES SHAPING THE UK MANUFACTURING LANDSCAPE



# Manufacturing processes

## What are the challenges facing the process sector today?

The growing economic power of Asia; the Government focus upon innovation and research and development; the birth of relatively new industries such as renewable energy and photonics and an increased demand from end users with more disposable income are all shaping the direction of the industry. However, the overarching challenge is clear – in order to compete globally UK-based businesses must create more adaptable and cost efficient processes to advance manufacturing systems and create new business models to support them.

Only by evaluating and in some cases deconstructing the manufacturing process can it truly become more responsive to changing market demands. There has never been a greater need for processes to be bespoke and entirely flexible to reduce costs and make the entire process sector leaner and more efficient. The evolution of process engineering is now focused upon developing techniques concurrently and creating systems that allow for reconfigurable manufacturing.

While the potential for techniques such as additive manufacture may be well documented and publicised, the use of such cost saving, efficient processes are not yet mainstream. However, digital layering processes dispense with exorbitant tooling costs and minimise waste. These processes only use the material needed to make a part whereas traditional subtractive process can waste up to 95 per cent of the raw material used to create a component. Consequently additive processes require far less raw material. Furthermore, the digital layering process removes traditional product design constraints, empowering designers to develop lightweight, complicated geometric products previously unimaginable.

If all industries, especially those in the high value manufacturing sector help connect the designer and developer the gaps in the value chain can be bridged and the manufacturer's position strengthened.

## Barriers to enhanced flexibility and high value manufacturing:

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- **Costs** – significant investment in the economy is needed
- **Materials shortage** – resources are not finite and sustainable alternatives are needed
- **Skills shortage** – a greater feed of new talent in the fields of science, maths, engineering and technology
- **Demonstration** – the inability to showcase new products and processes in a commercial setting often results in products failing at the prototype stage
- **Weakened supply chains** – SMEs continue to compete with the high volume of manufactured imports. New business models are required to harness innovation

## CPI breaks these barriers down by:

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- **Working closely** with manufacturers, designers and developers to integrate skills and to create novel processes
- **Providing open access assets** that are not readily available to allow companies to develop innovative manufacturing solutions
- **Channeling the expertise** of CPI scientists and engineers to develop new, agile manufacturing processes
- **Demonstrating proven capability** in adaptive, flexible, near net shaping and additive manufacturing
- **Utilising its proven batch to continuous** manufacturing assets
- **Reducing the capital outlay** and de-risking the testing and demonstrating of new processes

# Manufacturing processes in action



Sanofi Aventis aims to become a diversified global healthcare leader, and to this end utilised the facilities at CPI to demonstrate the potential of Corning Advanced-Flow reactors for multiphase hydrogenations in high volume manufacturing.

In the pharmaceutical and fine chemicals industries, most multiphase hydrogenation reactions are conducted in large batch or semi-batch reactors, in which the catalyst is suspended in liquid and continuously stirred. Batch reactors are often susceptible to lack of temperature control, which can result in hot spots on the catalyst's surface. These hotspots lead to the formation of several by-products or intermediaries, which can result in decomposition. In recent years there has been increasing interest in the testing of micro reactors at laboratory scale for catalytic hydrogenations as, due to their small transverse dimensions, they have exceptionally high surface to volume ratios and therefore exhibit

enhanced heat and mass transfer rates. Typically, the micro reactors produce 0.1 to 10 grams per hour, so are very well suited for screening or small scale production. A natural progression was to scale up this process for industrial production to several hundred tons per year, which requires production rates of at least one hundred times higher.

CPI, Sanofi-Aventis and Corning believed the implementation of slurry hydrogenation in continuous flow reactors would effectively solve this issue. The method was tested at CPI's state-of-the-art flow reaction facility using Corning's Advanced-Flow glass reactor, an assembly of glass fluidic modules connected together through appropriate piping. CPI successfully operated the reactor and the conversion, selectivity, impurity profile and the catalyst content were studied by the highly skilled team. After over 300 hours of operation, results concluded that over 98 percent conversion could be achieved with the continuous flow reactor for starting material concentrations from 30 wt percent to 45 wt percent. The catalyst content proved to have very little impact in a wide range of concentrations, opening the door to potential savings versus the batch reactor processing. These results successfully prove the high potential of Corning Advanced-Flow reactors for slurry-based hydrogenation at an industrially important scale.





*By utilising CPI's  
assets and expertise  
companies can take  
their products and  
processes to market  
faster.*

Corning Advanced Flow  
Reactor within CPI's Smart  
Chemistry Facility

# New business models

## The real value of manufacturing

Value capture is at the core of the manufacturing industry. Or at least it should be. An all encompassing production model is essential if the UK is to up the ante and compete more successfully on the international stage. Not only will enhanced value chains deliver financial rewards, but a holistic chain will also significantly improve nationwide research and development programmes, enabling commercialisation and providing vital infrastructure for other businesses whilst protecting intellectual property. Moreover, an effective value chain will support the retention of our rich engineering and scientific skill base and assist in the evolution and advancement of our process industry.

Today, the world we inhabit is entirely interconnected. The challenge lies in understanding how to combine the assets and capabilities we have in the UK to create and capture value more effectively. Currently, the UK economy does not capture as much value as it should from innovative product development and manufacture. The need to maximise value development throughout the product lifecycle, as well as closer relationships between academics and industry is increasingly prevalent as other global forces benefit from the UK's fragmented value chains. We must question why we are outsourcing production from within the UK and as a result reducing our foothold in the global marketplace. While it may be more cost effective it is our responsibility to find alternative ways of reinventing and innovating our manufacturing supply chains to enable greater inward investment.

**50%** of our EU bids are successful  
against an industry average of 15%

**75%** of our UK bids are successful  
against an industry average of 20-25%

# New business models

What are the challenges facing our current value chains?

As the emerging economies - the BRIC and N11 territories - continue to increase their market share alongside the advances from the Japanese and Germans in the high value manufacturing arena, the development of new supply chain and production networks in the UK has never been more critical as SMEs face huge barriers in accessing global value chains. The challenge is to develop integrated value networks capable of sustaining the economy and realising the superior value systems.

The best approach is to develop and build new business models that bridge gaps and link all stages in the manufacturing process together as one whole. The creation of knowledge intensive services, such as R&D, inventory management, quality control, and other professional and technical services in networks that address systems based solutions centred around cross disciplinary skills to develop and produce new value propositions is the real challenge we are facing but which will significantly impact the manufacturing landscape in the UK.



## Barriers to developing new business models:

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- **Funding gap** – finance including venture capital funding remains difficult to obtain
- **Policy and regulations** – procurement issues and evolving government policies are impacting upon responsiveness
- **Risk** – resilience to investing in new models coupled with challenging policy and regulatory obstructions

## CPI breaks these barriers down by:

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- **Collaborating** with the government through the High Value Manufacturing Catapult to influence and shape economic, taxation and regulatory policies
- **Working with businesses** to create strong and sound business cases for long-term investment
- **Exploiting innovation** and capturing value through proven new business models

*Our approach helps our partners prove their processes and to create a supporting case for long-term investment.*



Evolutionprint



graphic communication  
Est. 1989



Interactive poster being produced at Evolution Print

# New business models in action

## The Northern Way Printed Electronic Supply Chain Programme

The programme is a unique initiative, bringing together the cities and regions of the North of England to work together to improve the sustainable economic development of the North. The Northern Way works with local authorities, universities, the private sector and other partners to secure a strong coalition in support of this goal.

The Northern Way's 'Building the Supply Chain in Printed Electronics' programme is targeted at providing the funding and collaboration infrastructure within which participating organisations can explore and ultimately exploit the opportunity within the printed electronics market.

The competition was broken down into a series of work packages to stimulate the growth of a supply chain and ultimately develop working demonstrators of what the technology could achieve. The competition involved 20 organisations across eight projects and directly resulted in at least eight patents being filed.

Work packages one and two were focused on the scale up of molecules to one kilo and beyond for repeatable batches of Organic Semiconductors (OSCs), and on the development of ink formulation for printing. The aim was to transfer this gained knowledge to the chemical companies, who, in turn, subsequently developed a range of OSCs, increased links and increased the understanding of the technology's potential, workings and benefits.

Packages four and five were focused on the development process, working under the principle that simpler structures give superior performance and reduced costs. Challenges in this area were to gain knowledge of what is required when processing material to develop transistor performance great enough to drive Liquid Crystal Displays (LCDs) and to continually improve the quality and applications for Organic Light-Emitting Diodes (OLED).

The final work packages centred around the Demonstrators competition, in which eight demonstrator projects were developed and working prototypes produced.

# Closing thoughts



**Nigel Perry**

Chief Executive Officer,  
CPI

As a developer of key technologies in the UK, we continue to meet our targets and expand the horizons of innovation.

Our growing and experienced team is currently delivering a number of forward-thinking and economically vital projects to steer the UK's process industries, printable electronics technologies and low carbon transition with partners from the public and private sector. Moreover, we remain excited about the scope for even stronger collaborations as we continue to provide a valuable service that helps drive the UK's progression into a key part of global manufacturing.

Yet the potential role a centre such as ours can play in supporting the evolution of the manufacturing industry and the many diverse sectors it shapes has not been fully explored or exploited. However, our involvement and partnership with the High Value Manufacturing Catapult, and indeed the other six

Catapults in the network, awards the CPI direct involvement to influence the UK and EU research strategy and government investment in innovation, alongside substantial sustained investment to ensure our staff and facilities are at the cutting edge of product and process development.

This is our vision and we are resolutely committed to achieving and surpassing it. The possibilities in the process industry are countless, they simply need to be harnessed and focused to ensure tangible benefits are realised both by the industry and the wider world.





We have partners and customers  
in **35** countries

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POLAND  
NETHERLANDS  
BELGIUM  
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CZECH REPUBLIC  
HUNGARY  
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