

SME SUCCESS STORIES

A SHOWCASE OF OUR WORK WITH SMALL AND MEDIUM SIZED ENTERPRISES



SUPPORTING THE MANUFACTURING SECTOR IN ITS DIGITAL AND NET ZERO TRANSFORMATION



Foreword – Dr Mark Swift, Head of SME Programmes WMG

MAKING MORE IN THE UK

Smaller manufacturers' appetite for innovation and ability to re-invent themselves is a constant. At WMG, we believe in creating an environment where this important sector can thrive.

Our approach is to cut through the tech jargon and get things done. We operate a "technology plus" model. We introduce SMEs to new technology, new market opportunities, new operating or business models, and new supply chains. We focus on ensuring the new approaches stick by making a tangible difference to the companies we work with. That's why we spend time understanding their individual processes, current markets, and customers, creating solutions that are tailored to them and will have a positive return on investment.

Through our programmes SMEs benefit from cutting edge research and new thinking to embark on that triple transition¹ of implementing digital technology, Net Zero solutions while boosting productivity.

Over the last 40 years, WMG has built strong relationships and networks with businesses to deliver shared prosperity and productivity. We have delivered largescale SME support programmes, from online marketplaces to impressive facilities such as the International Institute for Product and Service Innovation, and more recently the Digital Innovation for Manufacturing scheme (which features in this brochure).

We build our programmes by listening to companies on the ground. Our role as a High Value Manufacturing Catapult centre gives us the knowledge and scale to design programmes that meet business needs.

Our missions (see pages 6-13) include:

- ▶ Digitalisation for increased productivity
- ▶ Net Zero manufacturing
- ▶ Zero Emission supply chains
- ▶ Business growth and transformation
- ▶ Developing the future skills and leadership mindset for a dynamic business environment.

The proof of the value of a programme is in the difference it makes to real businesses. On the next few pages, you will see that impact, from quick wins to major long-term transformation.

Today we are working on over 90 company projects with a range of dynamic and talented businesses in our Midlands region. Our mission is to support business growth through innovation, increased productivity, and sustainability, backing businesses in the Midlands to level up our region and transform communities.



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¹ERC, Jan 2022, 'The State of Small Business Britain'
www.enterpriseresearch.ac.uk/publications/the-state-of-small-business-britain-2021/

The Digital Innovation for Manufacturing Project

The 'Digital Innovation for Manufacturing' (DI4M) project aims to help businesses benefit from the latest in manufacturing technologies and thinking, to become more productive and competitive. It commenced in September 2018 and will have supported over **360 businesses** across Coventry and Warwickshire, Greater Birmingham and Solihull, Black Country, Worcestershire, Leicester, Leicestershire and the South East Midlands by March 2023.

The notion of act now and be first to market with new ideas is at the heart of the project.

Through a range of mechanisms including awareness raising, events, short feasibility projects, and collaborative research and development, SMEs can access a whole range of WMG expertise. From automation and robotics to product design and sustainable materials, we can help businesses to thrive via a straightforward, no nonsense approach:

- a) Identify a business challenge
- b) Engage project stakeholders
- c) Conduct analysis
- d) Propose and deliver technical solutions
- e) Create impact and measurable improvements

Delivered by the WMG SME Group, we are focused on the benefits to the business, collaborative in their approach and future oriented. Here are some of the outcomes and impact of the project to date.

Part funded by the High Value Manufacturing Catapult and ERDF, its mission is to increase the levels of innovation in manufacturing SMEs through introducing businesses to new technologies and techniques

that can lead to productivity and profitability improvements, new supply chain opportunities and new products and services being brought to the market.

54% companies that have participated have seen an increase in turnover



46% have become more profitable

100% have changed organisational behaviour because of the project and want to work with WMG again

New products to market



New products to company



OUTCOMES AND IMPACT

INCREASED NET ADDITIONAL EMPLOYMENT BY:



464



ACHIEVED NET SAFEGUARDED EMPLOYMENT OF:

1629



2093

JOBS IN THE ECONOMY THAT WOULDN'T HAVE EXISTED WITHOUT DI4M SUPPORT

£143,300,000

OF VALUE GENERATED IN THE WEST MIDLANDS ECONOMY FROM SEPT 2018 - SEPT 2021

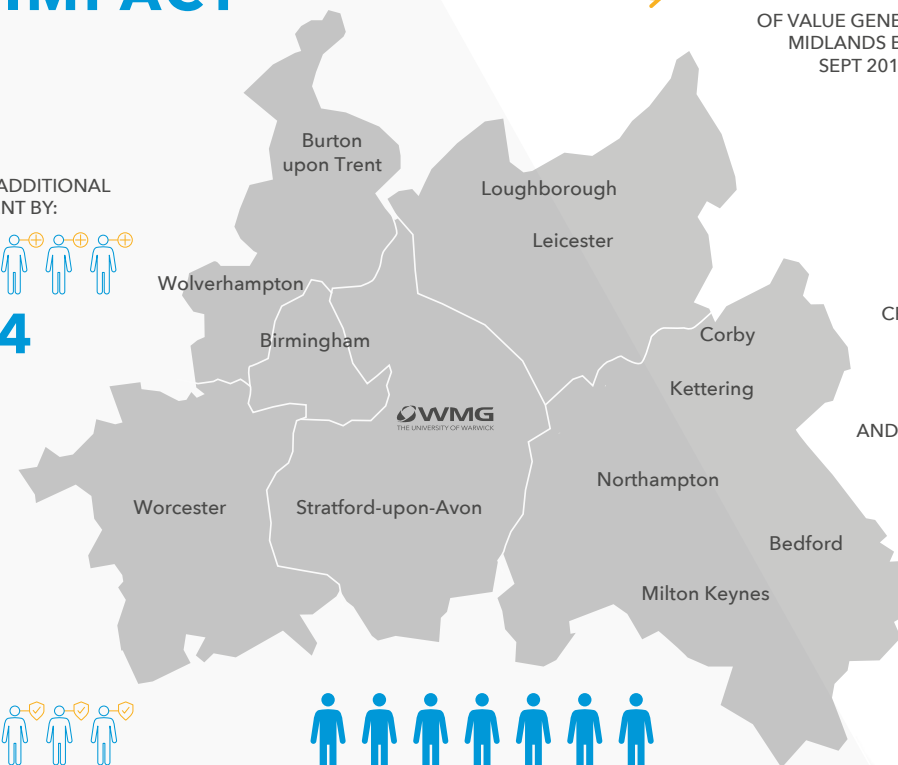


CREATED NET ADDITIONAL GVA OF:

£31.3m

AND SAFEGUARDED A FURTHER:

£112m



Mission Spotlight

Driving Productivity through Digitalisation

The adoption of digital technology to transform business operations is a big theme in manufacturing discussions. Recent economic challenges have highlighted the need for manufacturers to become more agile as digital access becomes more of a necessity to effectively manage production, remote workers, and supply chain disruption.

The UK Government's Made Smarter review¹ suggested that within a decade industrial digitalisation could boost UK manufacturing by £455bn and create a net gain of 175,000 jobs. However, many of the benefits are not being realised due to lack of awareness, not knowing where to start, a confusing array of technology and understanding how to measure the return on investment.

¹Department for Business, Energy & Industrial Strategy, Nov 2017, 'Made Smarter Review' <https://www.gov.uk/government/publications/made-smarter-review>

Traditionally it is the big player manufacturers that have been at the forefront with the adoption of digital capabilities. However, more and more SMEs are now getting onboard with digital technology as they realise that solutions do not have to cost the earth and can be practical to implement. Automation and robotics, sensors and simulation offer major opportunities for business to speed up production, identify bottlenecks and increase efficiencies. SMEs are often more successful in implementing these changes due to their ability to be flexible. They are less burdened by huge workforces, multinational presence and complex workplace cultures and can get up and running with digital quickly.

Our Approach - De-risking Investment through Digital Roadmapping

1

Define

Digital technology does not exist in isolation from people. We talk to key personnel in the business to understand what the challenges and priorities are.

2

Measure & Analyse

What is the current state of a factory and what does the future state look like? How is data currently used? Through observing the production process in depth, cycle times, equipment use and downtime, levels of work in progress and inventory, we identify opportunities for growth and increased profitability.

3

Project Proposal

We propose 3-5 solutions, weighting suggestions for added value, effort level and cost and align with a suggested plan of implementation. We place customers at the centre of these proposals.

4

Implement and Control

The solutions are scoped into short term and longer terms strategic projects with measurable returns and the vehicle for delivery e.g. a DI4M project, internship or knowledge transfer partnership.

Visit page 44 to read about digital road mapping in practice with Samuel Heath & Sons Plc.



"The main risk for SMEs is that money allocated for digitalisation is invested without properly identifying the real drivers for the change and what the specific benefits could be. When we work with SMEs to support digital transformation, we like to get a thorough understanding of the business and create a roadmap of achievable digital goals."

Onur Eren, WMG

Getting Started - Affordable Digitalisation

Here are some technology suggestions to take a traditional factory into a new age Smart Factory. Our recommendations require minimal capital outlay, so reduce risk.



Digitisation of paper-based data

An easy way to start, transfer your paper-based documents and data into digital versions that could allow you to better predict future events, assist in compliance with statutory requirements, and allow for easier access across the business.



Digital representation of assets

It is estimated that around 75% of global industrial data is still in written or 2D formats. Simple laser scanning technology to scan your factory and products will allow you to create 3D models to simulate new product development, layout optimisation, and other improvement activities.



On demand cloud storage

Moving away from a traditional expensive onsite server model, cloud storage offers a much more flexible and cost-effective way to manage your data. It can be scaled up or down easily dependent on your growth plans.



Track and trace products and services

From tracking work in progress through to products in a supply chain, there are a number of accessible technology applications to help SMEs gain real-time information of their business activity. Sharing this data with customers and suppliers could offer a real competitive advantage.



Real time machine monitoring

Using a mobile device to monitor and manage your factory remotely is a game changer to maximise output. The WMG Manufacturing Information Platform (MIP) is a complete hardware and software solution that can be retrofitted onto existing machinery eliminating the need to invest in new more costly systems. Evidence strongly supports that data driven operational practices will improve productivity.²

(See Pressmark Pressings Ltd case study, page 40 for more information)



Augment your human workforce with cobots

With a shortage of highly skilled labour in the sector, rising complexity of processes, and a quest for higher productivity - automation is on the wish-list for many manufacturing SMEs. Traditionally robots have been expensive and time consuming to implement. Collaborative Robots (Cobots), however, can assist with machine tending, inspection, part changeover and assembly. Starting at around £8k to buy, these are much more accessible for SMEs.



Scenario planning with simulation

Taking the guesswork out of your planning can be a reality with the powerful ability of Digital Twin Predictive Simulation which can be conducted at a product, process, line, factory or supply chain level. With licences starting under £10k these technologies allow for the validation of different product, process, and manufacturing configurations in the virtual world without disrupting actual production.

² ERC, Jan 2022, 'The State of Small Business Britain' <https://www.enterpriseresearch.ac.uk/publications/the-state-of-small-business-britain-2021/>

Mission Spotlight

Our approach to the Net Zero mission

Collaboration is key as SMEs come together to solve emissions challenges and respond to business opportunities.

The starting point

SMEs contribute 48% of the UK's private sector greenhouse gas (GHG) emissions¹ yet to date only one in ten currently measure their carbon footprint².

Part of solving this issue is helping SMEs understand the benefits of decarbonising the workplace. Sustainability and decarbonisation are important to businesses but the ultimate drivers for this kind of change are reducing costs, boosting reputation and meeting customer requirements. SMEs need help to realise these opportunities.

SME drivers for decarbonising workplaces



Many of WMG's research teams are collaborating with industry to solve weighty sustainability challenges such as how to productionise battery technology to meet future electric vehicle demand as well as how to scale up novel sustainable materials. Some exciting products are also being developed with our help including Pashley's e-trike (see page 38) and technology developed by innovative start-up Concrete4Change that can make concrete a carbon sink rather than carbon producer. The technology which is being tested and trialled using WMG facilities could revolutionise the concrete industry on a global scale. It has been showcased and won an award at COP26.

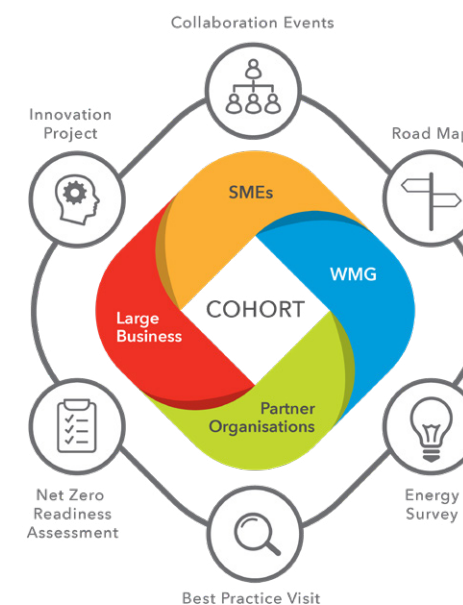
¹ Policy Advisory Group, Dec 2020, 'Sensitive intervention points to achieve net-zero emissions', *Committee on Climate Change*
² British Chambers of Commerce, Aug 2021, 'Net Zero Survey', www.britishchambers.org.uk

The Net Zero Innovation Network

To facilitate an increase in productivity and sustainability for SME manufacturers, we have created a Net Zero Innovation Network with a mission to help businesses understand how careful management of products, processes and energy consumption can lead to reduced emissions whilst increasing profitability. The Network has three strands of support, regular Net Zero events to encourage networking and to highlight new opportunities in the Net Zero space, Net Zero cohorts and special projects.

The Net Zero cohorts bring together 4-5 SMEs with a larger manufacturing organisation and a member of the WMG SME group to work together on Net Zero challenges. The businesses start their involvement with a WMG Net Zero Readiness Assessment tool mapping out their current Net Zero position, buildings and facilities, organisation and culture, supply chain and logistics, manufacturing processes, and materials and services. WMG then facilitate a series of meetings and workshops as well as tailored support for each business to get a Net Zero project off the ground.

By collaborating with others, participants learn from each other and it enhances product ideas. Swedish electric vehicle company Polestar helped to initiate one of our cohorts. It brought together their supply chain including Sarginsons, Impression Technologies, Summit Patternmaking Co, and KS Composites to work together to become sustainability champions and share best practice.



"At Polestar we realise that the journey towards Net Zero and improved sustainability can't be done alone. We wanted to work with the wider automotive industry and engage our supply chain to help improve the overall impact of the UK automotive industry on the environment, so that these benefits are not just realised by Polestar but by any other company who works with our suppliers."

Victoria Rothwell,
Principal Engineer, Polestar

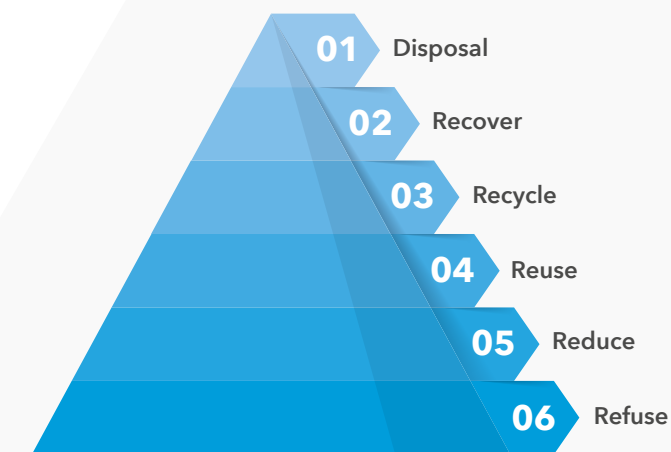
Our first ever cohort is now seeing the impact of collaboration. Cohort member Expert Tooling & Automation has set up automated and modular production lines which will lead to a significant reduction in design time, as well as energy savings and increased productivity. A KTP associate will join the company part funded by Innovate UK for two years to implement the changes. It will also be their first step to creating circular products.

Armac Martin, a luxury brass cabinet hardware manufacturer collaborated with WMG to implement sustainable packaging for key product lines in their business. WMG explored recyclable, compostable, and returnable options and the product chosen was a mushroom-based material that is extremely cost effective and biodegradable. It has reduced packing time significantly, leading to productivity gains in the business.

"The NZIN cohort was really insightful; it enabled us to gain support with a practical project, whilst collaborating with other organisations. It's given us direction in our journey to net zero."

Stephen West,
Head of Operations, Armac Martin

When analysing opportunities for reducing an SME's carbon footprint we regularly apply the waste hierarchy approach which looks for alternatives to landfill. Our project with JCM Contracts on page 32 involved working through the various stages to identify business opportunities.



Our Advice - a pathway to Net Zero

- ▶ **START NOW** the sooner the better
- ▶ **MEASURE** where are you starting from?
- ▶ **GAP ANALYSIS** where are your hot spots?
Any easy wins?
- ▶ **IMPROVE** step by step, collaborate to compete
- ▶ **CELEBRATE** be proud of your progress.
Share the story with customers, employees, suppliers.

"The path to Net Zero can seem intimidating but it shouldn't be seen as a burden or a form filling exercise. There are a whole host of ways to kick start and nine times out of ten there are things you may already be doing that are supporting the mission"

Helena Simmonds, WMG

Case Study Directory



Type of Project	Digital Manufacturing	Sustainability (Net Zero)	New Product	Internship	Productivity	Supply Chain	Page No.
AeroCoach Ltd	x		x			x	16
Barkley Plastics Ltd	x				x		18
Billingham Bags Ltd	x			x	x		20
Genius Facades Ltd	x				x		22
Gordon Ellis & Co	x			x	x		24
HausBots Ltd			x				26
Hobsons Brewery	x		x		x	x	28
Jaltek Systems Ltd	x				x		30
JCM Contracts Ltd		x					32
Lanemark Combustion Engineering Ltd	x	x			x		34
Loqski International Ltd	x		x			x	36
Pashley Cycles	x	x	x			x	38
Pressmark Pressings Ltd	x			x	x		40
Ramfoam Ltd	x		x	x	x	x	42
Samuel Heath & Sons Plc	x			x	x		44
Sarginsons Industries Ltd	x	x		x	x		46
The Alternative Pallet Company Ltd		x	x				48
Total Precision Ltd	x		x				50
Warden Plastics Ltd		x	x				52
3D Heritage	x						54



3D Printing and Simulation project transforms product development process

"It was the stepping stone towards the many other products we currently design, including our range of deep section front wheels. Plus the sales we generated from the AEOX enabled us to invest in other aspects of our business."

Andy Robbins, Head of Engineering, AeroCoach Ltd

Challenge

Cycling experts AeroCoach provide a range of cycling products specially designed and manufactured to optimise and streamline their cycling performance. These include skin suits, handlebars, saddles, wheels and other cycling accessories. They wanted to build their own product design and manufacturing capabilities in house and had a particular product idea that needed development. The product was a specialist rear disc wheel with a fairing (a cover which goes over the spokes to increase aerodynamic performance). The brief was simple enough: the finished product had to outperform similar wheels offered by existing competitors.

Solution

WMG worked with AeroCoach to help develop the fairing part of the disc wheel. Firstly, WMG helped make 3D models of the design for optimal aerodynamic performance and then tested the design using computer simulation. The process of developing tooling to manufacture the product when they were just in the testing phase was costly. WMG therefore proposed to use 3D printing to make test moulds that could be trialled with a manufacturing company Rudd Macnamara. As a plastic processing specialist, Rudd Macnamara were able to produce a trial run of fairings made from different grades and properties of plastic using WMG's moulds which were then tested in the velodrome by AeroCoach.

Impact

- ▶ Following the testing work, AeroCoach put the new "AEOX tubeless disc wheel" into production, which Hamish Bond – the New Zealand gold-winning rower and a keen cyclist – debuted at the World Championship Time Trial
- ▶ As a result of the project, AeroCoach decided to invest in its own 3D printing capability and created a new business line
- ▶ 3D printed moulds saved the company tens of thousands of pounds; and the WMG supply chain contacts saved significant company time



"Customers frequently tell us that they've set new personal best times using the wheel..."

It was good to work with WMG who were very professional and quick to respond to any comments we had....

Everything we asked for, they delivered."

Andy Robbins,
Head of Engineering, AeroCoach Ltd

Automation leads to cost saving and transformative change on automotive lines

"It has been insightful to see how straightforward the upgrade to new automation techniques can be for a business like ours and we are already noting the benefits. This is only the start of the journey as we look to implement collaborative automation across the facility which will have a truly transformational impact on the business."

Matt Harwood, Managing Director, Barkley Plastics Ltd

Challenge

Barkley Plastics is a leading injection moulder, with one of the largest on-site toolrooms in the UK. Although working across a range of sectors, automotive is a huge area of focus for the company. The company has continued to deliver on major automotive client projects, but they were looking for ways to drive cost efficiencies through speeding up production time and improving quality.

They wanted to focus on a particular automotive OEM line which manufactures clear lenses for exterior lighting, worth around 7% of Barkleys' annual turnover. They were interested in how automation could help them reduce scrap rates and save on operator costs. They were currently experiencing a 20% scrap rate on the 300,000 pairs of lenses per year and wanted to reduce it to around 2-3%. Having worked with WMG in the past on a factory layout project for a JLR and BMW line, they approached the WMG SME group to see if there was scope for further support.

Solution

WMG worked with Barkleys to conduct a detailed study mapping out each process, looking at how to improve quality. After analysis of Barkleys' specific needs, WMG suggested a Cognex vision system and RAR cobot (collaborative robot) to implement automation on this line that would align with an existing pick and place beam robot that Barkleys already had in situ. The vision system would scan and recognise parts on the line and would then guide the cobot to detect, pick and place parts in the manufacturing process. The factory simulation of the future state process enabled the production team at Barkleys to see the positive impact automation would have on cycle time, operator usage, reducing waste and a clear view of the benefits they could achieve through investing in the technology. They were then able to decide on the specific models to invest in with continued support from the WMG team and the cobot manufacturer during the implementation of the new processes.

Impact

- ▶ This scoping project led to a grant contributing to 50% of the cost of the cobot
- ▶ Investing in automation could save over £100,000 in operator utilisation each year. Previously the line had 3 operators working on it per shift over 3 shifts per day, and now it will require just one operator per shift to conduct final checks
- ▶ The vision system implementation is foreseen to further reduce scrappage on the lens production by 5%
- ▶ The implementation of the cobot has reduced the level of customer returns by half on the line due to more efficient packing
- ▶ The project has led to further work including placing a final automated spot check on this line as well as automation on other lines which will result in further savings

"Working with Barkley Plastics on this project has provided us with further evidence to show how useful our support around automation in SMEs is. We have enjoyed applying our expertise on this project and seeing the cobot up and running and delivering quality improvements for the business. We look forward to further collaboration in the future."

Ioan Lutas, WMG

Collaborative Robot provides productivity push for Black Country bag manufacturer

“WMG’s help in implementing the new cobot has been amazing. We can’t wait to expand our company because of this new step towards efficiency.”

Martin Billingham, Chairman, Billingham Bags Ltd

Challenge

Billingham Bags have been manufacturing camera, leisure, binocular, and laptop bags for almost 40 years. They wanted to automate the manual task of applying silicon adhesive to help keep up with demand as well as increasing productivity. The existing process was time consuming, involved two operators, and there were often accuracy issues. It was also a process that caused bottlenecks in the overall flow of work. They had recently purchased a collaborative robot to run the gluing applications automatically. However, buying a machine was one thing, getting it up and running and working efficiently for the business was another.

Solution

To solve the challenge, Billingham Bags accessed a six-week part funded WMG Internship programme, taking on Pablo Asensi Garcia (Mechatronics, Robotics, and Automation Engineering Graduate) supervised by WMG’s Asad Ullah. Pablo worked to explore the cobot’s advanced capabilities and limitations, generated a control code for the specific task of dispensing and applying superglue-adhesive, and made use of the robot’s built-in vision system to locate workpieces and detect stitched patterns automatically. He was also able to modify the robot’s behaviour to improve performance for complex stitching patterns and workpieces.

Impact

- ▶ The new automated adhesive application process led to a 50% timesaving, and increased throughput
- ▶ The estimated labour workforce has reduced from three operators to one on this specific line



Cladding company opens up new channels of communication with genius touchscreen tech

“Essentially it makes the lives of our workforce easier and allows managers to track a job on the system and immediately see where it is in the manufacturing process. The result has been more control and better productivity. We used to turnover between £400,000 and £500,000 per month. We’re now hitting the £1.5 million mark per month.”

Gavin Dodds, General Manager, Genius Facades Ltd

Challenge

Genius Facades’ innovative fire-proof cladding systems are in high demand due to increased regulations around cladding safety and can be both retrofitted into old builds and used in new build projects. Greater demand highlighted to the company that big change was needed to transform their production process which was largely paper-based and inefficient. Workers had to manually hand over paperwork to each other as an order moved through the factory, the office was not connected to the shop floor activity, and there was no way of identifying issues with machinery unless someone was physically walking around the shop floor.

Solution

WMG initially worked with Genius by conducting a Digital Manufacturing health check at the business which involved assessing the current systems in place on the shop floor, which included monitoring machine data and information gathered from operational staff. A Roadmap to Industry 4.0 (a more connected and intelligent factory), was then produced. WMG then went on to develop a customised networked system for Genius, featuring touchscreen pods and barcode technology. It enabled staff to log job information in real time that could be viewed by the office staff. The system was web based which meant it could also be used across tablets and phones.

Impact

- ▶ The project has led to a dramatic increase in the business’s productivity, **production waste was reduced by 10% and productivity up by 15%**

“Genius Facades is a focused, motivated and business-driven company at the forefront of industry development. They knew they needed to change and were determined to do so by embracing new tech innovations.”

Onur Eren, WMG



Woodwork company nails success with more than 70k savings

"We've spent over 150 years in the industry. We know it well, however, we are looking to the future and need to use digital to continue to be innovative and competitive. WMG have the know-how in smart factories, and we got support that I wouldn't have got anywhere else."

Daniel Robinson, Head of Finance, Operations & I.T, Gordon Ellis & Co

Challenge

Gordon Ellis & Co is a UK manufacturer of precision woodworking and rotational moulding. Specialising in CNC precision woodworking, products include hospital bed frames, trolleys, high end audio equipment casings, and premium engineering grade automotive components. Their rota moulding products have a wide range of durable, weather resistant applications.

Although the company has progressed massively from manual manufacturing practices to industrial machinery, they wanted to step into the digital age. They wanted to identify how 'digital manufacturing' could create improvements on their shop floor to meet increased customer demand.

Solution

WMG's Onur Eren undertook a detailed investigation of the key facilities 'current-state', reviewing existing equipment, productivity, efficiency, and data outputs. Working with Gordon Ellis & Co, he was able to propose a 'future-state', recognising equipment suitable for upgrade, targeting challenge areas, and identifying the business's core capabilities. He proposed how costs could be reduced by eliminating material waste and promoting operational excellence methodologies and suggested methods to gather data from the factory.

During this preliminary project, it was clear that digitalisation would have a major impact on Gordon Ellis & Co's turnover while increasing their competitiveness in luxury markets. WMG and the business then worked on a Knowledge Transfer Partnership (KTP) bid to gain funding to implement sensors and data collection devices around the factory. KTPs are partnership between the company, an employed graduate (the associate), and an academic institution (this time WMG) offering facilities, expertise, and resources to deliver the project aims.

Impact

- ▶ The preliminary project 'quick-wins' saved the company £70k a year. These savings will allow them to invest in the newly defined strategy, targeting industry 4.0 technologies
- ▶ More substantial gains will be realised after the installation of state-of-the-art CNC equipment, yielding an estimated fourfold gain in production capacity, de-risked by the team's involvement
- ▶ The Innovate UK KTP bid funding was successful and the project aims to increase the turnover of Gordon Ellis & Co by £540k over the next five years



"I really enjoy projects like these because the team at Gordon Ellis were passionate about taking on the latest innovations before others in industry. A strategic change project, such as a KTP, helps businesses take a medium-term view and make a real step change in productivity through the adoption of digital technology. We are already seeing significant productivity improvements in the business which will only accelerate over the next two years and beyond."

Onur Eren, WMG

Wall climbing robot developed for market has potential to save hundreds of lives

“WMG helped us from day one, from building the prototype all the way to making sure the robot safely sticks to the wall and carries out its job efficiently. We have worked tirelessly over the last three years to make HausBots a reality. Going forward we hope to continue our work with WMG to make more robots for other uses that can reduce harm to humans.”

Jack Corne, CEO and Co-Founder, HausBots Ltd

Challenge

An innovative small manufacturing company Hausbots had developed a unique remote-controlled robot that can climb vertically and tackle rough surfaces and obstacles such as wires without the need for scaffolding. Using a robot for painting difficult to reach places offers the potential to significantly reduce the number of work-related falls and accidents in the construction industry. In the US alone, 85,000 workers fall from height every year, of which 700 of them will be fatal.

They initially needed help with early prototyping and later some specific testing work to ensure that any radiated emissions from the robot did not affect other machinery on a building site and likewise that radio emissions from other equipment did not affect its performance.

Solution

WMG worked with HausBots on the circuit motor controls and designed the system to help them get from prototype to production ready. They then linked with WMG robotics experts and gained access to WMG specialised electronics testing facilities to undertake the important testing work. The tests identified that there were some radiated emissions from the robot umbilical cable (the cable that carries power, paint and data). WMG supported Hausbots to design out the issue with an invaluable product development service and provided further guidance regarding the certification process.

WMG also implemented extensive electro-magnetic compatibility (EMC) testing to make sure the fans, which essentially attach it to the surface were functioning correctly. An Electromagnetic Compatibility (EMC) certification is a legal requirement to confirm these aspects, but Hausbots did not have the specialised equipment or expertise to thoroughly test their robot.

Impact

- ▶ The project accelerated the development of the product by many months, bringing it to market faster than would have been possible without WMG's support
- ▶ The product is now selling internationally, with plans to increase their global reach

“It has been a pleasure to work with HausBots and help them develop their product, the concept of the robot is incredible. Our facilities and expertise have helped the company develop an innovative product now on the market carrying out many jobs including painting and cleaning the graffiti off the spaghetti junction in Birmingham. We look forward to continue working with them in the future and can't wait to see where they are this time next year.

Dr David Norman, WMG

iSpaniel launches to boost brewery efficiency nationwide

“It’s only with people like Scott from WMG who poke and prod that you get the answers you need”

Nick Davis, Founder of Hobsons and iSpaniel

Challenge

Hobsons Brewery is an award-winning independent brewer based in Shropshire. They identified an opportunity to develop a cask tracking service that would be able to track casks from filling, to delivery, through to collection and return to ensure that the location and content-status of every cask was always known. They approached WMG to explore the feasibility and technology surrounding their business idea which they felt could add a lot of additional value to their business.

Solution

WMG worked with Hobsons to develop a ‘smart’ beer cask track and trace solution. It delivered real-time alerts, status, tracking, traceability, and asset management reports and a smartphone-ready ‘Near-Field Communication’ (NFC) tag robust enough to withstand a brewery environment. They also provided the Hobsons team with a proof-of-concept software application to visualise the location data. Using this proof-of-concept cask-based and staff-held technology, Hobsons were able to run a 4-month trial on 1000 of their own casks to prove the concept.

Impact

- ▶ Following the project, Hobsons were able to monitor their stock much more effectively, **reducing working capital by 20%**. The project also allowed the firm to understand its supply chain better and dynamically reconfigure based on supply and demand
- ▶ Previously **less than 1% of the business was online, now 20% is online** - adding additional business of **£500,000 this year which they want to double next year to £1 million**
- ▶ The growth has resulted in 2 new jobs and helped to secure £600,000 funding investment
- ▶ Hobsons created another business iSpaniel to roll the technology out to other brewers as well as a range of other sectors enabling organisations to easily trace their containers, resulting in reduced waste and increased profit
- ▶ There have been a series of follow on projects including real time digital monitoring of key production processes



“It’s always good to be able to support innovation, especially one that helps other businesses too. The project, and its success, illustrates how businesses can grab digital by the horn and use it to transform themselves and others across industrial sectors”.

Scott Crowther, WMG

New product growth plans de-risked with digital factory optimisation tools

“We had such a positive experience working with Kieran that we have subsequently recommended WMG’s digital factory optimisation tools and will continue to do so.”

Stephen Blythe, Business Manager, Jaltek Systems Ltd

Challenge

Jaltek Systems is a contract electronics manufacturer based in Luton with over 30 years’ experience. With growing demand for their electronic box build capability (where they assemble a full electrical system on behalf of clients), they approached WMG to help with their plans to set up a new facility to help them realise their ambitious growth targets. The “box build” offer involves Jaltek creating a complete electrical assembly service for customers from design through to market launch. It involves coordinating, assembling, and testing a combination of their own components as well as components supplied by the customers.

Before moving to the new facility, they wanted to review their existing facility to ensure that the new set up was efficient and to ensure maximum flexibility to allow them to scale up. The production process for the “box build” product involves a complex product architecture carried out by experienced operators, a convoluted material flow path, as well as some rigorous testing and traceability requirements that can create various bottlenecks.

Solution

WMG’s Kieran Batchelor initially worked with Jaltek to undertake analysis on the “current state” of the production process for this product line. Through process mapping and other Lean Six Sigma tools he was able to identify any specific bottlenecks, non-value add activities or inefficiencies. He then went on to meet operators and had discussions with management to gauge any other potential issues.

The project also involved collaboration with WMG’s Centre for Imaging, Metrology and Additive Technologies who visited the factory to conduct a laser scan of the current facility production areas and the new facility production area. This enabled Kieran to develop a report of recommendations for improvements and to design an optimal digital 3D version of the “future state” for the new facility that could be customised going forward. This is a powerful example of using digital tools to optimise production and de-risk investment. Recommendations included implementing digital visual management in new areas to track build progress, separating out a test area from assembly, and implementing a more ergonomically friendly workstation design.

Impact

- ▶ Kieran’s report has provided a guide and framework to design and optimise Jaltek’s new production facility. It significantly reduced any risks associated with the move
- ▶ The suggestions helped eliminate waste and improved productivity in the business and will provide best practice for future production line development
- ▶ The new design offers a potential 75% increase in capacity going forward which will allow Jaltek to meet any potential surges in demand and the factory space left behind will now act as a space for PCBA (printed circuit board assembly) production
- ▶ Further work is now being scoped with Jaltek including an internship to analyse the feasibility of using collaborative robots to speed up repeat processes on volume builds as well as a strategic change project to open up new market opportunities and further their growth ambitions



Waste recovery project identifies new opportunities and savings

Challenge

JCM Contracts are a commercial joinery company based in Halesowen. A large part of their business is the manufacture of washroom cubicles which are made from a decorative compact laminate material. They were generating one tonne of offcuts of this material per month, and it was difficult to recycle. The company had become more active in their mission to decarbonise the business and wanted to calculate their CO2 output and identify innovative measures to reduce it.

Solution

JCM were introduced to Helena Simmonds, Net Zero specialist at WMG, and they joined a Net Zero cohort - a group of SMEs all interested in reducing carbon emissions. Helena scoped a project to assess alternatives to landfill for the laminate off-cut to reduce both the environmental and the financial impact. She undertook an environmental and cost assessment and was able to determine that the offcuts generated 366,481kg of CO2 equivalent emissions, costing JCM £7,200 per annum to dispose of them. Using the '5 Rs' sustainability hierarchy (see page 13), she then went on to explore alternatives for the waste offcuts for each level of the waste hierarchy.

This included the identification of a waste management company that can recover energy from the waste to create electricity, recycling the offcuts and using them to develop new products, such as filler for injection moulding plastics as well as garden furniture, flooring or polymer gears.

To significantly reduce the amount of material used when manufacturing the washroom cubicles, it was proposed that JCM use a "nesting" software which takes 2D drawings of the pieces to be cut from the sheet and fits them to maximise utilisation.

Impact

- ▶ New product opportunities are now being explored which could generate a new revenue stream for JCM, further research will prove feasibility
- ▶ The nesting software is to be installed and could reduce usage of the material by 5% and speed up the cutting process by 15%
- ▶ The project led to additional collaborative work and a grant of £20,000 to implement a collaborative robot to carry out the sanding process in the business. It is already exceeding its targets, saving time, and creating efficiencies



Lanemark save £50k a year through factory optimisation and implements value engineering exercise to reduce environmental impact

“We have revised the way we look at product improvement and the design of new products now across the business because of the processes WMG introduced us to. This has the potential to drive real growth and innovation for the future”

Aidan Lewis, Technical Manager, Lanemark Combustion Engineering Ltd

Challenge

In 2020, Lanemark Combustion Engineering Ltd identified the potential for improvements within their factory space. They had an opportunity to move some of their site equipment to another location and increase the capacity and efficiency of the factory floor while optimising flow. Lanemark sought some specialist support in process improvement.

Solution

WMG set out to identify a series of quick wins and timescales for prioritisation. A Value Stream Assessment (VSA) was conducted with the management team, to provide a critical examination of Lanemark's end-to-end processes, identifying opportunities for improvement and innovation. They also conducted production line walks to offer guidance for optimising and developing tooling, documented product and process material flow and engaged company stakeholders to develop a block plan for best flow through the factory space. They were able to establish a new production planning information area, to give better visibility of workload and daily tasks and create ground-level stores using a U-shaped layout for optimal efficiency.

Impact

- ▶ As a result of this work, Lanemark gained over 25% efficiency in labour productivity, saving around £50,000 per year
- ▶ More space on the mezzanine enabled the company to move their equipment out of a storage unit
- ▶ Improved material flow processes from 'Goods in' to 'Goods out' has reduced cycle times and distance travelled, boosting working capital

What happened next?

Following this initial project, Lanemark enrolled onto a Net Zero Cohort (more information found on page 11). They had objectives to improve their sustainability credentials with customer requirements also driving a need to change.

They worked with WMG team members, this time focusing on a specific product line. Colleagues at WMG implemented a value engineering exercise, which involved identifying ways to reduce the size and weight of a particular product as well as identifying cost savings in the supply chain.

They decided to focus on the control panel and bracket design as it was the most complex of the subassemblies involved. After looking at eight different potential designs, and different materials, they created a new standardised bracket design to link the burner assembly and control panel. The project **reduced the production costs and environmental impact on the FD gas burner lines by 20%**. This was 10% more than the initial projections and the mass reduction saves 190kg CO₂ for just the FD burner line every year.

Lanemark are much leaner in the way they work now across the organisation which will improve engagement with staff and the supply chain. The Value Engineering exercise has so far saved £16-17k since the project completed and will save significantly more when it is applied across the other four product lines.

“Lanemark has a great dynamic team and were really open to examining processes and discussing improvements. We can't wait to see what they do next”.

Onur Eren, WMG

Company goes off piste with new skiing device

“One of the things we’d now like to push is getting the new product into the ski rental market, where it can be hired out when skiers rent their skis. This is something we would never have considered with the zinc-based product as it was just too expensive.”

James Pittard, Director, Loqski

Challenge

James Pittard, an avid skier devised an idea of an easy to use, pocketable device that could lock both skis and poles simply together after worrying about his skis going missing when taking advantage of après ski offerings in bars and restaurants. The Loqski lock is an advanced security combination lock with 10,000 different combinations compared to the average maximum of 2000, the durability to survive temperatures of -50°C and ability to be used with ski gloves on. After taking his idea to a design agency, the Loqski ski lock was launched in a zinc-based material. However, as sales were taking off the zinc-based material couldn’t be manufactured quickly enough to keep up with demand and if he wanted to increase volume, he needed to cut manufacturing costs.

“Firstly, the zinc die-cast model is expensive to make because when it comes out of the tool it needs a lot of finishing to make the product look good enough to be able to go to market. And secondly, we needed to strip out parts to improve the assembly because all these were making it difficult to assemble and so pushing the cost of production up,” explains **James Pittard**, Director of Loqski.

Until they discovered GV-5H, an engineered glass fibre reinforced thermoplastic material that is often used in the automotive industry as it’s incredibly tough yet lightweight.

James then approached WMG for help including testing the material, assessing the strength of the redesigned components in the assembly and giving advice on ways in which costs can be reduced during the manufacturing process.

Solution

Whilst it’s not possible to 3D print in Grivory GV-5H, WMG printed the prototype parts in strong engineering plastic with a carbon fibre infill using a Markforged Mark 2 FDM printer that would reflect the strength of this material. These prints proved the suitability of Grivory GV-5H for this product. With Loqski having already made a substantial investment in current tooling for its existing zinc-based product, we assessed whether the redesigned barrel design component would fit into the assembly as changing just this one part would help reduce costs. WMG produced many 3D prints of the barrel component and these barrel parts were then thoroughly tested not only for form and function but also to assess whether they would fit with the other components in this existing assembly.

Impact

- ▶ WMG’s work proved that the re-designed barrel component would fit in the existing assembly. Loqski only had to redevelop tooling for this rather than the whole product, resulting in a saving of over £40,000 in tooling costs and precious product development time
- ▶ The project has led to reduced manufacturing costs and the ability for the product to be manufactured in higher volumes, leading to the potential for wider distribution and increased sales

“Loqski always had an ambition of keeping manufacture in the UK and by reducing manufacturing costs we are pleased that we could assist them in doing that”

Neil Jeffree, WMG



Long term partnership leads to awards and new product success

“Working with WMG has given Pashley the opportunity to take advantage of skills, expertise and facilities which we would never otherwise have had access to. This is really helping us create robust and reliable, yet lightweight products which we’re confident will give us a competitive advantage in the market.”

Adrian Williams, Managing Director, Pashley Cycles



Pashley Cycles is Britain’s longest established bicycle manufacturer, one of just a handful remaining in the UK today. The company’s dedicated team design and hand-build a unique range of traditional bicycles, tricycles and delivery bicycles from its factory in Stratford-upon-Avon.

Challenge

Adrian Williams, managing director of Pashley, has seen other UK bike builders gradually disappearing by pursuing high-volume manufacture, then being undercut by suppliers overseas.

Pashley has retained their dedication to niche, quality bicycle manufacture and their 90-year heritage is a key part of their brand. However, to continue growing, the company has had to shake off the perception that they only make old-fashioned bikes and two major projects have offered that opportunity. Several years ago, Pashley were approached to bid as a partner for a £79.7m contract to develop a new bike for the Transport for London (TfL) London Cycle Hire (LCH) scheme.

The timeframes were extremely tight, they would have just 18 months to design, develop and launch a brand-new bicycle. They would need to source new materials that were lightweight and robust, a different approach to the traditional materials Pashley used in their classic bikes.

Adrian said: “In order to move forward, we had to prove to Serco, the contract provider, that we had the capability to deliver high-quality bikes in modern materials and that’s where WMG came in.”

Solution

Using 3D printing, WMG experts ‘mocked up’ Pashley’s prototype designs to look like metal and plastic moulded parts, so they could demonstrate to Serco their unique design capabilities and robustness. WMG also helped with the selection of an alloy to make the frame and other components, which was vital in helping Pashley secure the partnership with Serco. Via our extensive networks of UK manufacturers, WMG were also able to introduce Pashley to a supplier for the plastic components, anchoring the supply chain for these British-made, iconic London bikes firmly in the UK.

Impact

- ▶ Pashley was successful in being selected as the sole supplier for the next generation of London Cycle Hire bicycles, a five-year contract that secured the jobs of 50 people at the company
- ▶ This success led to a further contract to supply 1,000 hire bikes (including 100 e-bikes) to the Edinburgh Bike scheme and a contract to supply the West Midlands Cycle Hire scheme with 1500 hire bikes (including 150 e-bikes)

What happened next?

Following this project, Pashley went on to collaborate with WMG and a wider consortium including Simpect Engineering, Reynolds Technologies, and Foresight Innovations to develop an award-winning novel, e-assisted cargo trike¹. Featuring an innovative tilting suspension, it provides greater cornering stability, speed, and manoeuvrability than a conventional tricycle configuration of the same size. Supported and part-funded by the Niche Vehicle Network, it launched in April 2021.

The e-trike is suited to parcel and package deliveries in an urban environment where fast and efficient multiple deliveries are required. Specific support provided by WMG included the development of photorealistic visualisations of the concept, modelling and optimisation of the production facilities and the instrumentation of prototype and pre-production vehicles as part of the physical testing stage.

Additional partnership work is now underway to develop a novel locking device for the trike which will ensure it can be secured easily when making deliveries.

“This project provides a fantastic opportunity for WMG to apply its knowledge and expertise in vehicle electrification, and in product testing and evaluation, to a real-world product development process, helping a consortium of UK SMEs bring a new, zero-emission delivery vehicle to a rapidly growing market”

Dr Alex Attridge, WMG

¹ <https://www.pashley.co.uk/news/products/new-tilting-e-cargo-trike.php>

Metal pressings company launches its own digital revolution using sensors on the shopfloor

“This dashboard is exactly what we needed. Through this project with WMG it feels like we’ve moved into the digital world, and it’s amazing how useful it can be having the data at your fingertips.”

John Nollett, CEO, Pressmark Pressings Ltd

Challenge

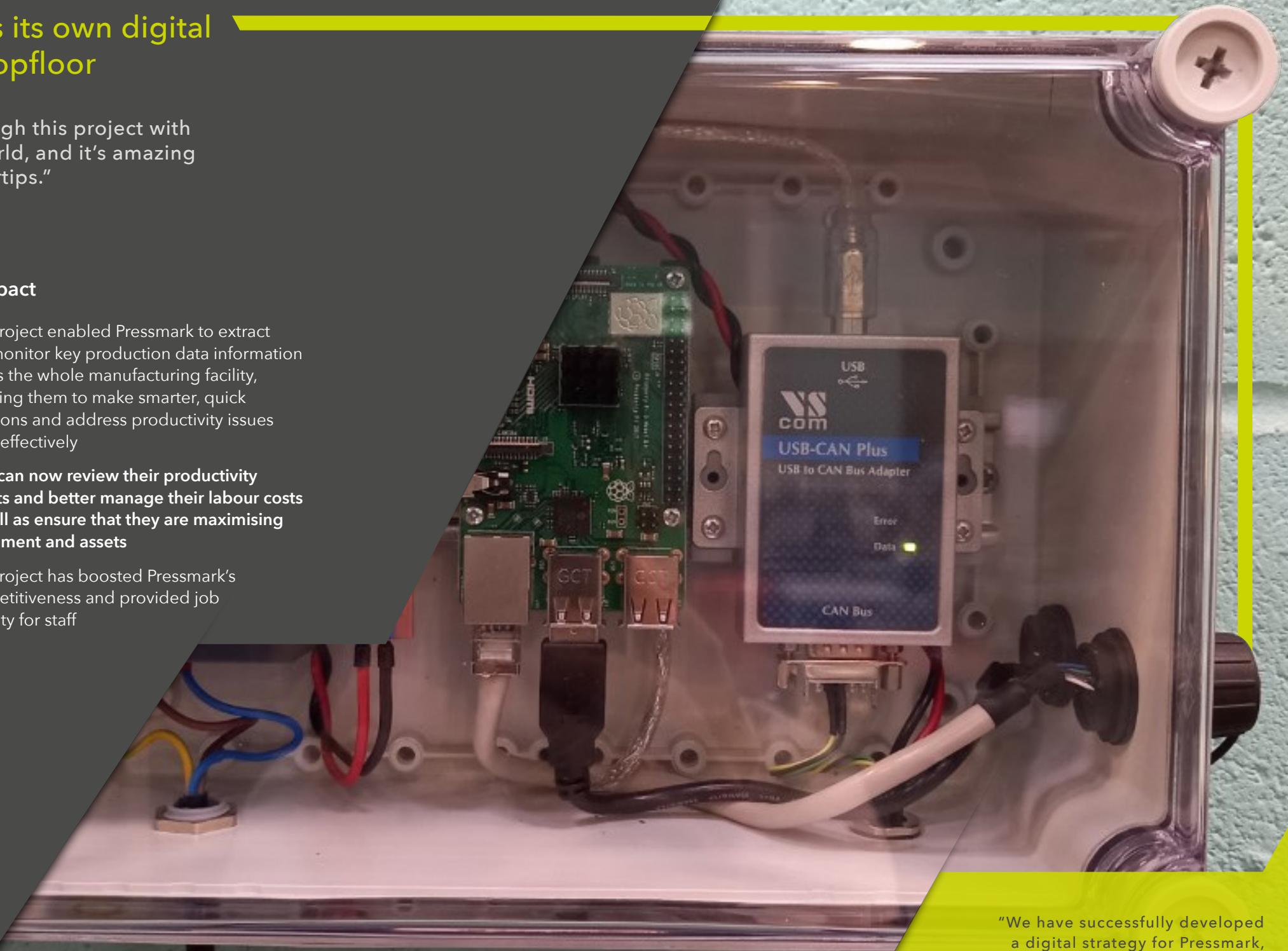
Atherstone based Pressmark Pressings had over 20 manual processes and they wanted to investigate if they could eliminate any inefficiencies in production and increase overall throughput in the business, unlocking productivity. There was a lack of real time visibility of process productivity in manufacturing operations which meant that it was difficult to identify any potential problems and therefore resolve them. They were keen to set up systems that would enable them to develop their sustainability for long term success.

Solution

WMG developed the innovative Manufacturing Information Platform (MIP) comprising multiple sensors that can be fitted to a variety of machines to feedback live data to a dashboard. The system can be retrofitted to existing legacy production lines and equipment, making it easy for businesses to access meaningful data, without the need to invest in new machinery. This was implemented at Pressmark to monitor cycle times of each press, detect tool changes, and diagnose problems. A new sensor was also created by WMG to read the tool ID to record the parts that are being made as they go. A graphical factory dashboard was also made available for Pressmark to see the live data on a phone or tablet. Target rates can be monitored against actual data and alerts are made if cycle times are lower than they should be. All the data was retained in a database for further analysis.

Impact

- ▶ The project enabled Pressmark to extract and monitor key production data information across the whole manufacturing facility, enabling them to make smarter, quick decisions and address productivity issues more effectively
- ▶ **They can now review their productivity targets and better manage their labour costs as well as ensure that they are maximising equipment and assets**
- ▶ The project has boosted Pressmark’s competitiveness and provided job security for staff



“We have successfully developed a digital strategy for Pressmark, enabling them to make real time decisions that they can continue to build on for the future as they grow.”

Dan Peavoy, WMG

Automation comes to the rescue during covid pandemic

🎯 Challenge

Almost a third of UK manufacturers saw orders decline by up to 50% following the onset of the coronavirus pandemic, according to a report by Make UK. This was the case for Ramfoam, a Birmingham-based polyethylene and polyurethane foam convertor, whose main clients are in those sectors that were hardest hit in 2020, including retail and automotive. As a result of this downturn, Ramfoam immediately thought about how it could use its expertise to support the fight against covid. It responded to the Department for Business, Energy & Industrial Strategy's (BEIS) call and created a PPE product for the NHS - RamfoamCare+, a protective face visor and foam headpiece that frontline staff could assemble in seconds. In May 2020, Ramfoam were awarded a contract to produce 3 million RamfoamCare+ kits per week. However, to meet the production requirements, Ramfoam required some support to enable it to scale up capacity from 100k visors a week to 3 million.

🎯 Solution

Ramfoam had already implemented a range of innovative solutions to deal with the largescale manufacture of the new visor but one of the firm's biggest challenges was the lack of automation for the picking and packing of the visors and the inability to pinpoint ways that their shop floor could be optimised to deal with the increased workload.

Through a project with WMG, Ramfoam were able to take a supply chain approach, identify supply chain partners as well as create a plan to rapidly increase their own production capacity. This included accessing a specialised 3D visualisation tool, producing a digital twin model of their existing production facility to assess how they could scale up quickly. It allowed them to try different layouts digitally and simulate the use of robotic cells without having to spend thousands of pounds and valuable time on physically trialling them. WMG also then provided specific guidance to how automation would increase productivity in the packing process as well as providing links with other manufacturers to set up a responsive and resilient supply chain to support the UK's urgent need.

⚙️ Impact

- ▶ Through the creation of a new supply chain, and a new production facility (including virtual digital model), Ramfoam was able to make 54 million visors in 2020 and save significant costs
- ▶ Bottlenecks in the production process were identified and automation will speed processes up
- ▶ This project has led to further engagement with WMG, with two interns placed at the business to create a new product line and costing system. It is expected **the new product lines could generate between £1-2 million in additional revenue next year** and the company are planning to set up a new division to service the oil and gas industry



Digital roadmap gets ideas flowing for high-end bathroom fittings manufacturer

"We were unsure where to start with our digital transformation, but Liz and the WMG team worked with us and brought in fresh ideas without being 'preachy'. We discovered that we had the capability to deliver many of the improvements in house, but needed guidance as to how to plan the transformation. We are now all extremely excited to grow this new area of our business with the assistance of WMG."

Martin Harrison, Manufacturing Director, Samuel Heath & Sons Plc

Samuel Heath & Sons Plc have been designing and manufacturing premium quality taps, showers and bathroom fittings, as well as architectural hardware and door closers at their factory in Birmingham for almost 200 years. Their luxury products are specified by leading architects and interior designers for prestigious residential and hospitality projects around the world.

Many of their processes were manual and data held in paper form on various databases and managed in different ways. The management team at Samuel Heath saw the potential for new digital technologies to help them.

Challenge

Martin Harrison, Manufacturing Director joined the business two years ago at a critical time in the company's growth. The market was changing and the company was seeking to move towards a 'make to order' model with smaller batch volumes which align with customers' individual needs, away from the more traditional 'make to stock' production model.

Martin said: "... Customers have access to far more choice these days and want to create unique interiors. With this comes a much wider assortment of products and finishes in our offer to our customers. This was a definite niche to exploit as we have all of the production processes under one roof, but it was putting strain on our existing production systems."

Solution

Through a series of hands-on workshops, the senior team digitally mapped out their entire process end-to-end. This allowed the flow of materials and information to be displayed, identifying potential areas for improvement and investment in technology.

Liz McArdle, WMG said: "Once we mapped out the process and information flow, we highlighted opportunities for process improvement and the application of digital manufacturing technologies to ensure the products are produced in a competitive manner, while still retaining their highly prized characteristics."

Finally, Liz and the team created a digital roadmap with operational and strategic recommendations to make their data more accessible and able to make decisions more rapidly. They also made suggestions for which approaches would help them make the shift to make-to-order, including the right mix of skills to cope with the changing direction of the business.

Impact

- ▶ Samuel Heath took on two interns from WMG to continue the digital transformation; one looking at machine monitoring using computer vision techniques to record the plating process settings. The second to automatically dose the chemicals in the plating line, reducing chemical usage and ensuring consistent product quality



Partnership is key as castings foundry push the boundaries on a suite of projects

“We have been really happy with the work Dr Paul Lansdell and others at WMG have done for us which led us to explore other areas to collaborate including internships, apprenticeships and some joint activity on Net Zero solutions.”

Anthony Evans, Managing Director, Sarginsons Industries Ltd

Challenge

Based in Coventry, Sarginsons are a metal castings foundry that specialise in high integrity castings as well as CNC machining, metallurgic and heat treatment expertise. They have high-profile clients and work with partners in the automotive, aviation and oil and gas sectors to offer exceptional lightweight components. They have strong working relationships with a number of universities and research centres and their approach to collaborative work led them to contact WMG to discuss some of their ideas.

The company identified a number of key objectives for the next few years and approached WMG for help in prioritising them and linking them up with the right expertise and support. With an ongoing mission to improve and create USPs in the business, for the first project they wanted to discover if creating a cooling channel insert in one of their die casting processes could improve the integrity, quality, and performance of the parts. When creating complex tooling with this process, there can often be issues and parts can end up cracking due to the high temperatures involved.

Solution

Using Computer Aided Design (CAD) and Computational Fluid Dynamics (CFD) modelling, WMG were able to simulate a variety of cooling scenarios to identify what process would be feasible and if the insert could be developed using Additive Manufacturing. Now a series of tests are underway to find out which materials are best suited to 3D print tooling for the business.

“3D printing complex tooling will be a game changer for us, minimising the level of costs we currently outlay on tools for casting. Once we decide on the best materials and ALM process, we expect the results to be transformational.”

Rick Davies, Engineering Director, Sarginsons

“We have already implemented a number of quick wins to decarbonise the business including joining WMG’s Net Zero programme which was initiated by our client Polestar. Our collaborative work is an important aspect of us achieving our Net Zero goals”

Anthony Evans, Managing Director, Sarginsons

Impact

- ▶ This initial work has led to other strategic project opportunities **as well as a collaborative funding bid worth £50k**
- ▶ Having identified that **47% of sand is wasted and never used before it is disposed** of in the diecast process, a subsequent WMG Net Zero roadmap has identified how **Sarginsons can tackle waste reducing it to just 2%**

What happened next?

Sarginsons were keen to keep working with WMG and have now adopted an intern to help support with their processes and production activities. Testing different compositions will ultimately help Sarginsons to develop lighter and stronger products and increase quality in the organisation. Sarginsons and WMG are also joining forces as part of Coventry City’s Climate Change Board where both Anthony Evans and WMG’s chair Margot James have seats. WMG’s Russ Hall and Felix Martin have begun an investigation into how Sarginsons can recover heat from their hugely intensive casting and forging work to power other functions in the business.

“Assisting Sarginsons on their journey of continuous improvement so far has been a real pleasure. Our role is to support companies to increase their OEE (Overall Equipment Effectiveness) and we are excited to see the results of the use of additive manufacturing for tooling as well as how a change in the composition of their raw materials could boost quality. It is great that the company are involved with WMG now on a number of levels which will benefit us both strategically in the long run”

Dr Paul Lansdell, Innovation Manager, WMG

Sustainability project leads to 60% of waste offcuts reused

“It is always a pleasure to work with WMG as they have experienced resource that can quickly absorb information and understand their customers’ needs and challenges. WMG can then collaborate and provide their thoughts with a much wider view than the Customer, which promotes new ideas.”

Richard Darlow, Operations Manager, The Alternative Pallet Company Ltd

Challenge

The Alternative Pallet Company, based in Northamptonshire, provide a range of lightweight, strong paper-based Honeycomb pallets under the trade name PALLITE. They offer an affordable alternative to wooden pallets with the same product performance - but with the added bonus of being 100% recyclable.

The company were committed to streamline their production processes. Although the PALLITE products are more sustainable than timber alternatives, there were still efficiencies to made, with 10 tonnes (15% of total produced) of Paper Honeycomb offcuts per month sent to an external facility to recycle. The company wanted to know if there were any new product opportunities or revenue streams to explore by re-using the offcuts instead.

Solution

WMG’s Laura Downey set out to find an alternative use for the Paper Honeycomb offcuts and conducted an extensive feasibility study using the ‘5 Rs’ sustainability hierarchy (see page 13 for an overview). As part of the hierarchy ‘reduce’ element, she proposed that nesting optimisation software would be able to pinpoint the most effective way to use more of the material to minimise waste, increase efficiency, reduce labour and raw material costs per part.

The machines would optimise the number of product parts that can be cut from the paper-based honeycomb.

In addition to this, ‘repurpose’ options were investigated, including animal bedding, moulded pulp packaging, and packaging insulation and inners. For each option, Laura investigated the feasibility, economic value, and sustainability. It was concluded that using the offcut materials to create packaging inners and packaging fitments was the most sustainable alternative use. The honeycomb traps air within the hexagonal cells and works very well as a thermal insulator. These packaging inners and fitments would be a brand-new product for the company to market.

Impact

- ▶ As a direct result of the feasibility study, The Alternative Pallet Company purchased a slitting machine, to slice the off cuts into packaging inners and packaging fitments which gave a return on investment in less than a year
- ▶ The impact of implementing alternatives to recycling include reducing waste offcuts by 6 tonnes per month, which is a 60% reduction

- ▶ The additional product is projected to earn them £12,000 per month in profit. ‘Thermalite’ will be made with the material which would have otherwise gone straight to recycling. The Thermalite product is also 100% recyclable after use and so has no impact on original product circular life span
- ▶ The project had a short turnaround time, with the new product on the market from late 2021

“It was great to work with Richard and the team because they were so receptive to new ideas. Lots of these studies require a bit of trial-and-error thinking, and it was interesting to be able to explore a range of alternatives for their offcuts. It’s always refreshing to work with companies with sustainability at the forefront of their innovation.”

Laura Downey, WMG



Opening the door for a new contract win

“We are a small to medium-sized business and securing this contract has helped to protect jobs for our staff. The best thing about working with WMG was the unique and easy access to resources, skilled people, and equipment that we couldn’t have got elsewhere.”

Andy Tomlinson, Director, Total Precision Ltd

Challenge

Total Precision Ltd is a plastic injection moulding and metal stamping company. Based in Ilkeston, Derbyshire, they specialise in insert moulding and over moulding. Their diverse customer base covers a range of sectors from automotive and rail to consumer electronics. The directors were approached by a major automotive manufacturer to design and supply a special ‘door jig’ used to hold a car door in position through the paint shop and into the manufacturing line. The existing component was causing the manufacturer problems. The door, along with the jig, would be sprayed with paint, but when the door was opened and closed the paint from the jig was flaking away leading to a costly rework. The new door jig had to be made from a flexible material that the paint would stick to and not flake, while also being able to withstand the oven temperature for the curing step of the process.

Solution

Aware of WMG’s experience in design and prototyping, Total Precision approached the SME Group for help with understanding the type of plastics needed to withstand temperature and paint adhesion requirements. Initially CAD was used to completely redesign the part and then some testing on the materials which resulted in an optimised design that was 20% lighter, meaning savings in manufacturing and material costs. The new jig was made from plastic with a textured surface that could flex and bend without the paint flaking off. WMG then used 3D printing to develop prototypes of the part, which allowed the team at Total Precision to demonstrate the mechanism on vehicles at the customers’ factory and adjust there and then.

Impact

- ▶ Total Precision secured the contract to supply more than half a million units a year for the next three years to the customers’ UK manufacturing base
- ▶ The customer is now using the door jigs on all of their product lines and so far Total Precision have supplied 570,000 parts to them
- ▶ The work so far has contributed to £52,000 in additional turnover
- ▶ It led to a knowledge transfer partnership enabling the company to access additional skills and university expertise to work on product development with Birmingham based manufacturer Harry Mason Ltd



Reducing material saves £42k per year without compromising effectiveness

"We're always looking to make efficiencies and reduce waste to make our business more sustainable. The simulations Fernando created allowed us to see how we could reduce the quantity of material but keep the product effectiveness, so that we could make decisions prior to investing in new tooling."

Mark Barrett, Managing Director, Warden Plastics Ltd

Established in 1957, Warden Plastics specialises in plastic injection moulding and extrusion, serving a diverse range of industries. Warden's initial area of activity was the chipping and selling of regranulated plastics, but it soon expanded its operations to include the design and production of plastic extrusions. Warden Biomedica is the trading name for Warden Plastics' own product range. Warden Biomedica specialises in the research and development of random filter media for aeration and biological wastewater treatment plants.

Challenge

One of Biomedica's products is an eco-friendly filter called Biomarble. The excellent ventilation and high performance of Biomarble media make them extremely effective in wastewater treatment. Warden's management team were looking to optimise tooling and reduce the product weight. They wanted to reduce the cost of production while maintaining the performance of the part. There is growing demand for Biomedica in biological wastewater treatment processes, and Warden Plastics is becoming a global supplier in the wastewater treatment industry. If successful, Warden was also seeking to make similar cost and material savings for its next product.

Solution

WMG's Fernando Murguia, began by building a simulation of the plastic injection process for the existing product. The simulation was then evaluated and used to optimise the geometry of the product to minimise the volume of material while being just as effective. Further simulations were carried out to show the efficiency of the final design. Fernando was also able to offer advice on tooling solutions and design.

Impact

- ▶ The optimised Biomarble design saved approximately 10% of the overall product weight
- ▶ Reducing the amount of material used translates to a 6% cost reduction, saving over £200k within a five year period

- ▶ WMG is now assisting Warden on the design and manufacturing process to maximise potential profits. The new product must be lightweight and have high machine output "yield". WMG has already helped reduce the raw material content by 18%, which will help ensure its commercial viability



"This is the kind of product that will enable an environmentally conscious future and, from our perspective, it was of the utmost importance to run a number of simulations to optimise the use of materials and ensure we were keeping the product effectiveness. Warden is a really dynamic team, and it was great to be able to help them become more sustainable and efficient."

Dr Fernando Murguia, WMG

Heritage locomotive project picks up steam through project support

“WMG’s support on this project has been invaluable. The advice we have received from Dr Lansdell has enabled us to look at options that we never would have considered before that have the potential to save the project tens of thousands of pounds.”

Martin Shepherd, Director, 3D Heritage

Challenge

SME 3D Heritage has been working with registered charity The A1 Steam Locomotive Trust (A1SLT) on a mission to revive long-lost steam locomotive designs. Their new project is to build a Gresley class P2 steam locomotive No. 2007 Prince of Wales at its Darlington Locomotive Works (DLW). The original class P2s were designed by Sir Nigel Gresley to haul 600 ton trains on the arduous Edinburgh to Aberdeen route, however sadly, the design was never fully developed.

With new technology and expertise, the Trust and 3D Heritage wanted to bring the class P2s back to life. The project has already come a long way with a whole range of parts in development, however there were some specific design and materials challenges with the original Lentz valve gear and cambox (the box that houses the valve gear mechanism) that the consortium needed to resolve.

Solution

With around 120 parts, the cambox is one of the most complicated assemblies within the locomotive. Before committing to spending money on patterns, castings, and machined components, 3D Heritage and the Trust needed to ensure that the overall concept was functionally correct and that they could manufacture and assemble the many parts.

WMG’s Dr Paul Lansdell who has a range of experience in metallurgy and was previously the Chief Mechanical Engineer at the Dean Forest Railway created a CAD model of the designs that could be tested and amended. He recommended the use of 3D printing in ABS plastic to create a one-third scale model of the cambox for the team to see if any changes were required to the parts before committing to manufacture. The box also featured a series of windows that enabled the engineering team to see what was happening with the valve mechanism on the inside. Following the creation of the model, Dr Lansdell explored the material grades, surface coatings and heat treatment which had previously caused issues. He then used 3D printing to create sand moulds to manufacture various parts of the locomotive. Developing patterns for sand casted metal parts can be extremely expensive and if there is an issue with the casting of the part it can be costly to start the process again.

Impact

- ▶ This work has been transformative, giving the project a huge advantage for making reliable and durable valve gear
- ▶ The model of the cambox was used to educate sponsors and donors of the inner workings of the Lentz-Franklin valve gear resulting in additional funding for the project
- ▶ The introduction to modern materials and treatments will optimise the performance of the locomotive, giving the project the sustainability and durability that was vitally missing in the original designs by Sir Nigel Gresley back in the 1930s
- ▶ Using 3D printing to create the cambox model and potentially the castings to create actual final parts will save 3D Heritage and the Trust tens of thousands of pounds

“I have been honoured to work on this prestigious project which has allowed us to apply leading edge research and new techniques on a real-world business case.”

Dr Paul Lansdell, WMG

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