INNOVATIVE PRODUCT
iPSS
SUPPORT SERVICE

Mechanical Engineering and Design Services

Supporting Businesses in the development of new products and processes

UNIVERSITY OF WOLVERHAMPTON

European Union
European Regional Development Fund

What we offer

We offer a comprehensive range of mechanical engineering and design services that supports businesses undertaking new product development.

Our services are targeted at qualifying SMEs* that are registered within the following areas:

- The Black Country
- Greater Birmingham and Solihull
- Stoke-on-Trent & Staffordshire
- The Marches

There are two-levels of support available:

- Qualifying SMEs will receive fully funded support for up to 6-days - no cost to the business.
- For businesses with a product innovation of high potential, there is scope for a formal research collaboration with the University that requires match-funding by the business.

*IPSS is part-funded by the European Regional Development Fund, so to be eligible for support your business must be based in one of the four sponsoring LEP areas and qualify as an SME (Detailed conditions apply, but in summary the company must have independent ownership, have fewer than 250 employees and turnover of less than €50 million per annum).

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Our Services

Product Design

Our product design offer encompasses the following:

- Hand sketching and concept visualisation
- Product styling
- Ergonomics
- Design for manufacture
- Patent drawings
- Rendering:
    - Product visualisation
    - Product animation
- Form, fit and function prototypes:
    - 3D printing
    - Laser cutting
    - Machining

Mechanical Engineering

We offer the following mechanical engineering services:

- Hand sketching and concept visualisation
- Structural design
- Topology optimisation
- Engineering drawings
- Material selection
- Engineering calculations
- Engineering prototypes
- Metal-working fabrication:
    - Welding
    - Milling
    - Grinding
    - Honing
    - Laser cutting

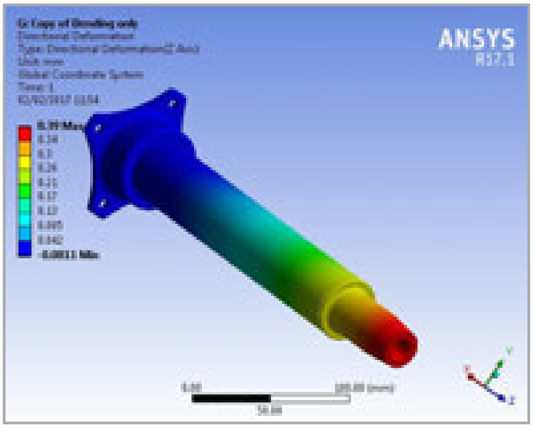
Our Services

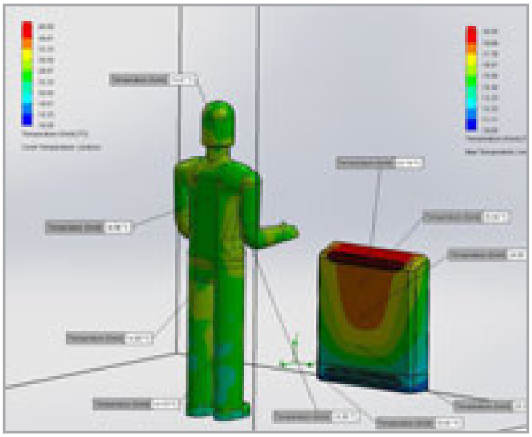
Simulation

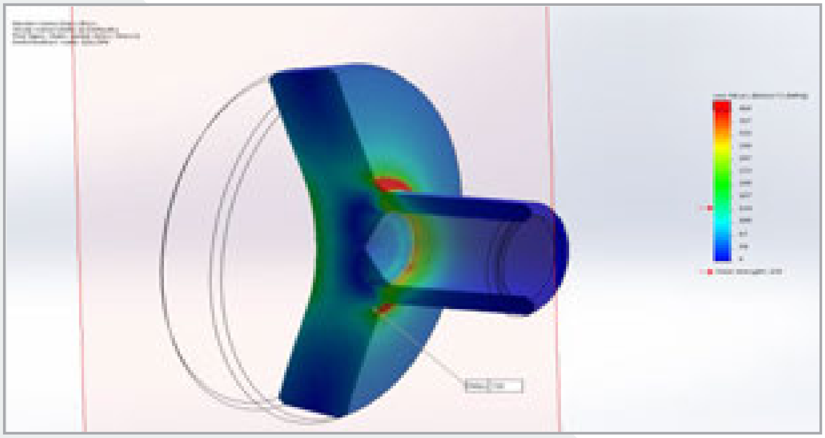
Our simulation offer encompasses the following:

Finite Element Analysis (FEA)

- Stress analysis
- Buckling analysis
- Fatigue analysis
- Frequency analysis
- Linear and non-linear analysis
- Structural analysis
- Thermal analysis







Our Team

Our product design and mechanical engineering services are delivered by our team of specialist consultants:

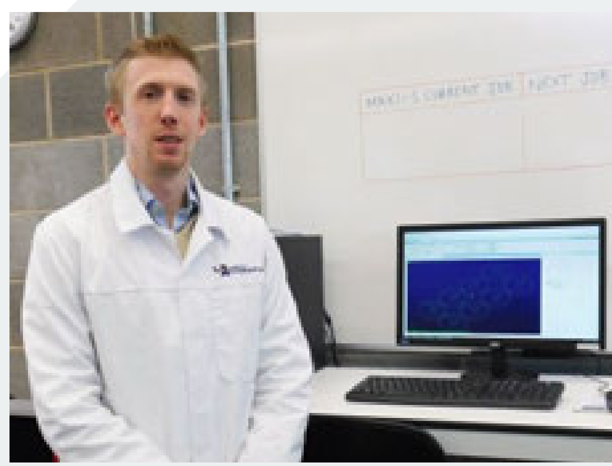
Mechanical Engineering and Simulation

Andrew Pollard BSc, PhD, MIMechE

James Jones BEng, CEng, MIET

Product Design

Jon Lester BSc, MSc, MBA



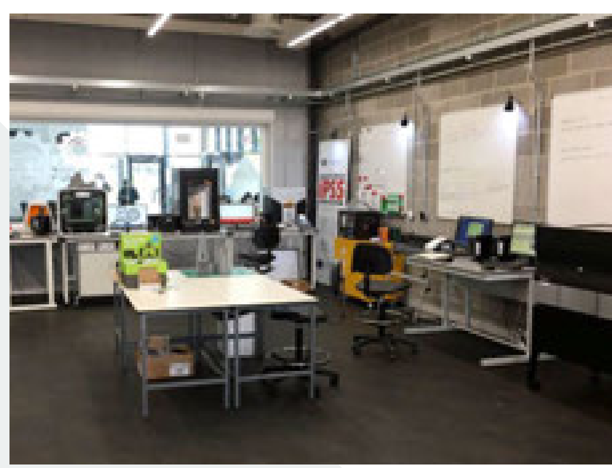
Aaron Vance BSc, MIET

Initial enquiries to: Telephone: 01902 321 105 | Email: ipss@wlv.ac.uk

Our Facilities

We have our own dedicated FabLab, based in the **Prototyping Centre** at **Wolverhampton Science Park**, that houses an extensive range of equipment, including:

- 3D printing:
  - SLS (Selective Laser Sintering)
  - FDM (Fused Deposition Modelling)
  - SLA (Stereolithography)
- CNC Milling Machine
- CNC Lathe
- Laser scanner - reverse engineering
- Laser cutter - plastic, vinyl, wood, aluminium
- CNC table router - wood and polymer sheet
- Precision PCB Milling machine
- Computerised routers
- Conventional equipment and tools
- MIG and TIG welding equipment:
  - Plasma cutting
  - Spot welding



Industries Served

Our services are targeted towards businesses that operate in the following sectors:

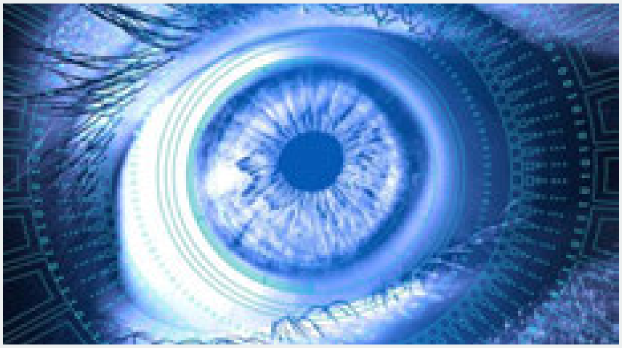
Environmental Technologies & Low Carbon

Advanced Engineering

Advanced Manufacturing

Medical & Healthcare

Automotive



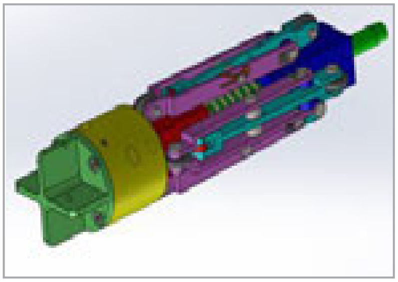
Defence & Security

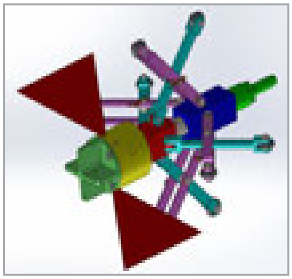
Case Study

Coatsol

Overview

Coatsol Ltd is a company based in Telford that repairs and rehabilitate live mains gas pipelines. Many of their approaches and technologies are highly novel and unusual. Their management is committed to finding new and innovative methods to put themselves ahead of their competition.





Challenge

In response to one of their competitor's services, Coatsol approached iPPS to develop a concept of a device that would enable Coatsol to leapfrog their competitors. They required a device that could be inserted into a live gas main through a small drilled hole, position itself centrally within the gas pipeline and then to spray a thick even coating around the inside of the pipe as the device is drawn back via its umbilical attachment. Conditions imposed included that no compressed air or electricity could be used as it represented an explosion hazard and that spark proof materials were needed to protect against sparks to clashes.

Solution

Consultant James Jones along with intern Charles Gouspy developed a concept that could fit into a 2" hole but then could automatically extend legs so that the spray head can take up a central position within the pipe. This is a highly novel mechanism. Airless spraying technology is used via a rotary spray head. The spray head rotates under the pressure of the supplied coating fluid and two jets of the fluid coat the inside of the pipe as it is drawn back.

Results

As the engineering challenge was so great, it was agreed that the output from the iPSS would be a 3D modelled concept and design calculations that could prove the feasibility and viability of the technology used. This was completed to the delight of Coatsol who then commissioned a 6 week BiG project with an engineering graduate in order to complete the design of an experimental prototype based on the iPSS concept design.

Case Study

Multi Stop

Overview

Multi Stop Ltd is a new venture based in Uttoxeter set up to market their patented invention of a roof edging system to prevent sudden snow avalanches from solar panels and to protect people from tile falls.

Challenge

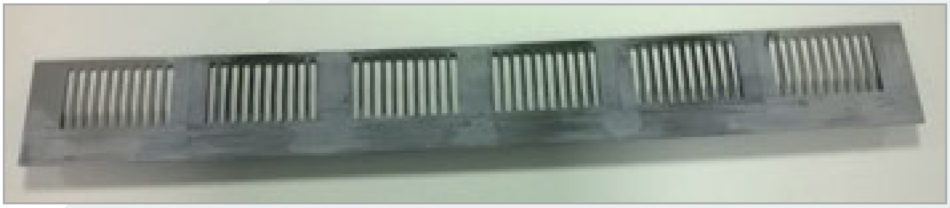
Multi Stop approached iPSS in order to see if we could create a full scale prototype for them to use in marketing activities. The immediate problem was that their prototype design was over a metre long. iPSS 3D printing technology can only create objects that are approximately 20cm long. iPSS also did not possess any 3D CAD of their design at the time.

Solution

Fortunately the width and breadth of the prototype could be accommodated by the 3D printer. It was decided to have a go at making the prototype in 6 sections and then glue them together. Although the building of prototypes in sections had been attempted before, this would be the biggest model attempted by far.

Results

The results were initially encouraging albeit with some warping of the sections taking place. After the first section was created and assessed, it was decided to continue with the remaining five sections. The sections were then glued together, filled and then sanded to create the required finish. Multi Stop then painted the model themselves in order to give it the appropriate appearance as if it had been injection moulded. Multi stop used this prototype to demonstrate the benefits of their concept to clients and suppliers alike.



Case Study

Simco

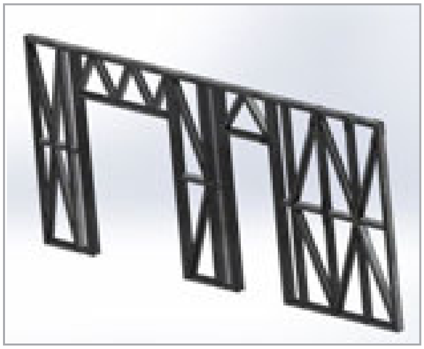
Overview

Simco is a company based in Walsall who produce facades for new buildings. They actively seek new markets and new technologies in order to grow their revenue and their business.

Challenge

Due to Simco's relationship and reputation with various local councils and housing partnerships they wish to enter the housing market offering the revolutionary lightweight steel frame (LSF) construction technique. They originally approached iPSS to commission a BiG project to design a concept LSF building. The project was a success. Manuel Silverio, a PhD student designed a frame with full supporting calculations. The remaining unanswered problem was related to joining the frame members together. As LSF technology is so new, a system of standard joints has not been created as it has for hot rolled sections. A simple jointing system needed to be created. Simco commissioned an iPSS project to look at the problem.

Solution



Consultant James Jones used a concept of splice plates, either spot welded or screwed onto the sides of joint clusters. As there are potentially so many joint types, it was not considered practical to design every conceivable joint type but to provide clear and concise design rules for such joints that could easily be followed by Simco's team of draftsmen.

Results

The concept was developed with use of Eurocode 3 structural steel engineering calculations. The concept is recommended for testing to confirm the joint type's effectiveness.

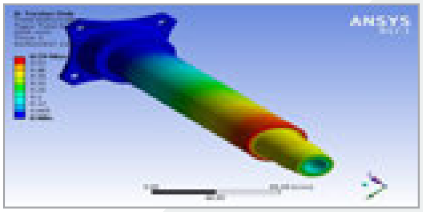
Case Study

INNOVATIVE PRODUCT iPSS SUPPORT SERVICE

Advanced Innovative Engineering Ltd

Overview

Advanced Innovative Engineering Ltd (AIE) is based in Lichfield and designs and manufactures Wankel Rotary Engines. These engines have a wide range of applications within: aviation, marine and automotive sectors.



Challenge

Many of the engines AIE produces are for the aviation UAV market. Mass is a key concern and they are frequently being asked by customers to reduce the mass of their assemblies. Most of AIE's componentry is produced from aluminium, either machined from billet or from castings. AIE considered the next step in their product evolution to be the introduction of carbon composite materials. AIE's knowledge base in this material was low and so they commissioned consultant James Jones to conduct an iPSS project to assess the feasibility of introducing carbon composites into certain components. The prop shaft was the first part to be identified.

Solution

James began by researching the previous use of composite prop shafts and found that the technology has been successfully used for automotive prop shafts. It was clear that not only was the mass saving an advantage, but the increased stiffness could be utilised in order to create longer, one-piece shafts where complex two-piece shafts had been previously used. James continued to research theory and produced detailed design calculations which proved very useful. Designs were produced based on these calculations and confirmatory FEA analysis performed.

Results

A great many factors needed to be considered for a successful design. These included: torsional stiffness and resonance, bending stiffness and whirling resonance, fatigue strain, buckling resistance, methods of assembly and, of course, mass. It was found that a 20% reduction in mass of the shaft is possible for this like for like carbon composite based redesign. It is expected that the iPSS project will proceed into a research collaboration with UOW leading to prototype production and manufacture.

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