

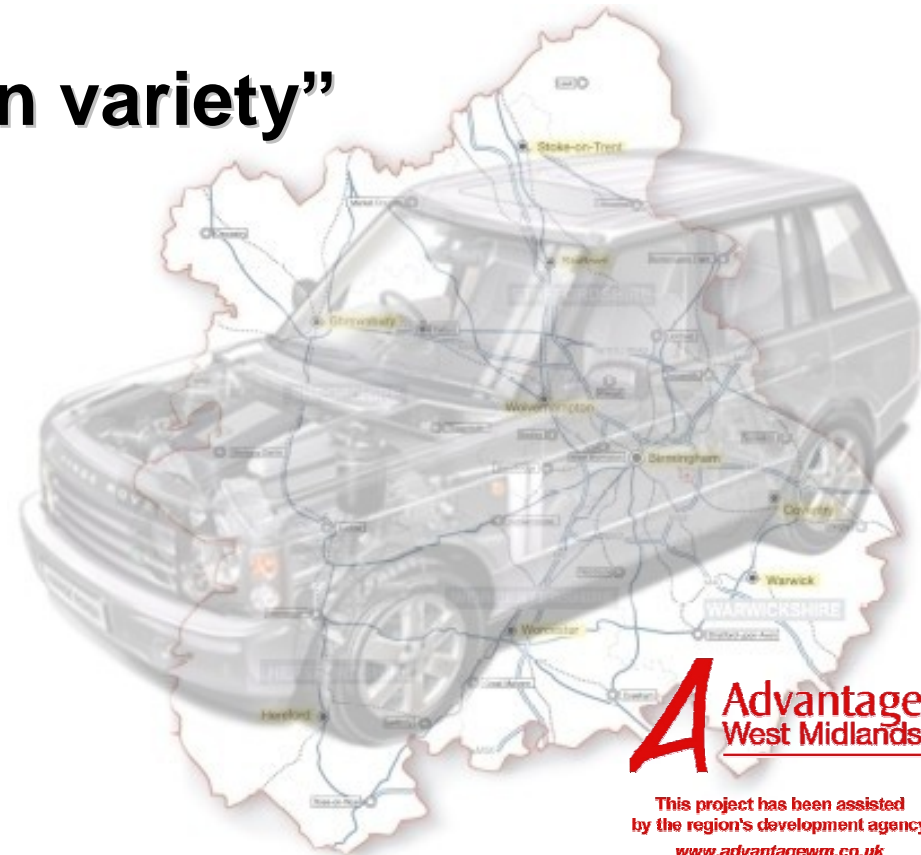


THE UNIVERSITY OF
WARWICK

“putting the brakes on variety”

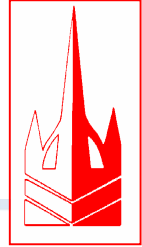
**Mike Gillett – Managing Director,
Covpress Ltd**

**Rob Evans – Lead Engineer,
University of Warwick**

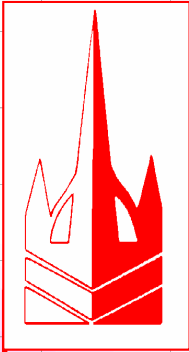


**Advantage
West Midlands**

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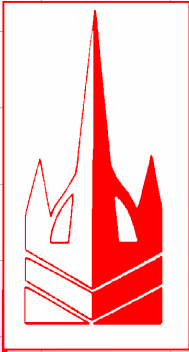
- **Overview of Covpress Ltd**
- **Overview of PARD Programme**
- **Complexity and Variety**
- **Benefits at Covpress**
- **Q&A**



COVPRESS Ltd.



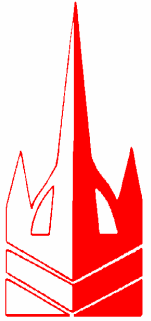
STRENGTH THROUGH TECHNOLOGY AND PEOPLE







INTRODUCTION OUTLINE

- **History of the company**
- **Customers**
- **Equipment and facilities**
- **Production System**

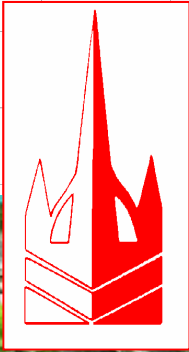
STRENGTH THROUGH TECHNOLOGY AND PEOPLE



COMPANY HISTORY

- 1890: Coventry Radiator Founded
- 1930: Canley Site
- 1987: Coventry Presswork (MBO)
- 1991: Coventry Presswork (subsidiary of Lebranchu)
- 1994: Coventry Presswork (subsidiary of Sofedit SA)
-  2001: Sofedit UK Ltd - (subsidiary of Sofedit SA)
-  2003: Covpress Ltd (subsidiary of Sofedit SA)
-  2004: Covpress Ltd (Acquired by GIL Investments)
-  2005: Covpress Ltd (subsidiary of Covpress Holdings Ltd)

STRENGTH THROUGH TECHNOLOGY AND PEOPLE



LOCATION:
Coventry, UK

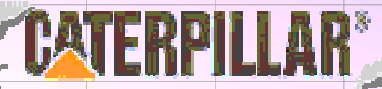
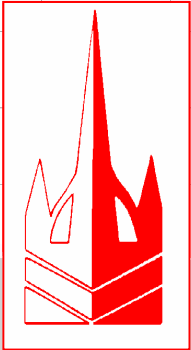
SITE AREA:
8 acres
33,000 sq m covered

TURNOVER:
1997 £35 million
1998 £42 million
1999 £31million
2000 £31 million
2001 £38 million
2002 £40 million
2003 £37 million
2004 £40 million
2005 £43 million



INVESTORS IN PEOPLE

STRENGTH THROUGH TECHNOLOGY AND PEOPLE



CUSTOMERS

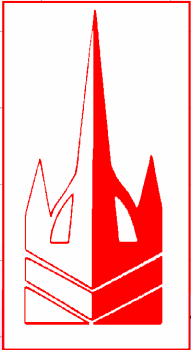


RENAULT

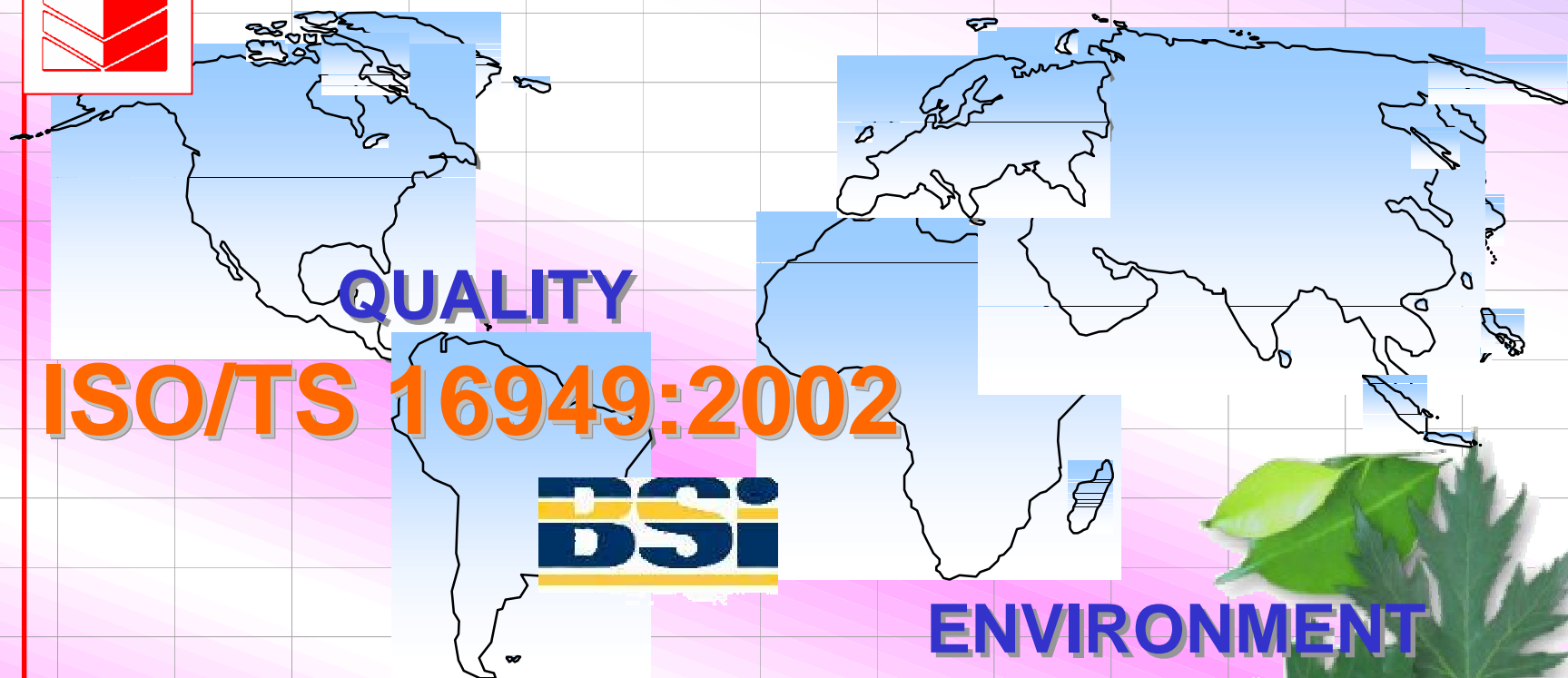


Toyota, General Motors, Peugeot, Rover, Perkins, Rolls-Royce, IBC, Nissan, Renault, Inalfa, Faurecia, Gestamp, Unipres and Thyssen Krupp Sofedit.

STRENGTH THROUGH TECHNOLOGY AND PEOPLE



ACCREDITATIONS



QUALITY

ISO/TS 16949:2002



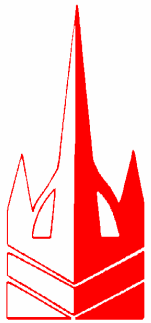
ENVIRONMENT

BS EN ISO 14001



INVESTORS IN PEOPLE

STRENGTH THROUGH TECHNOLOGY AND PEOPLE



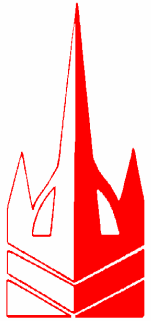
EQUIPMENT AND FACILITIES



Two Purpose Built Press shops.
Encompassing state of the art technology



TH THROUGH TECHNOLOGY AND PEOPLE



EQUIPMENT AND FACILITIES

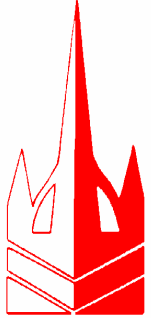


PRESSES

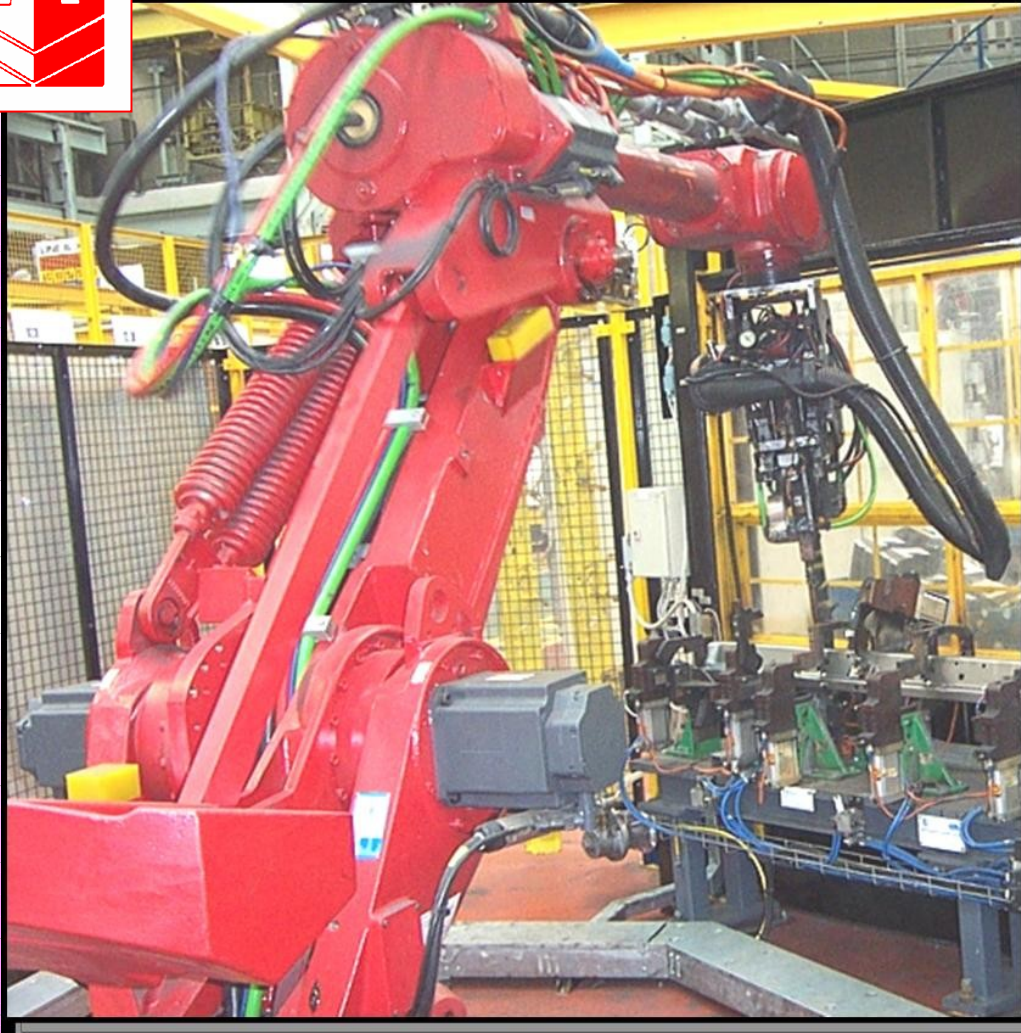
- Single & Double Action
- Hydraulic & Mechanical
- Transfer 800 - 1500T
- Progression 125 – 630T
- Manual Lines 400 -1000T



STRENGTH THROUGH TECHNOLOGY AND PEOPLE



EQUIPMENT AND FACILITIES

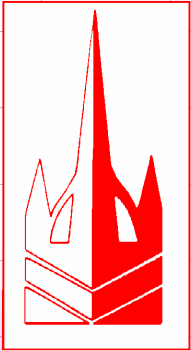


ASSEMBLY CELLS

- Robotic
- Manual
- Flexible Manpower

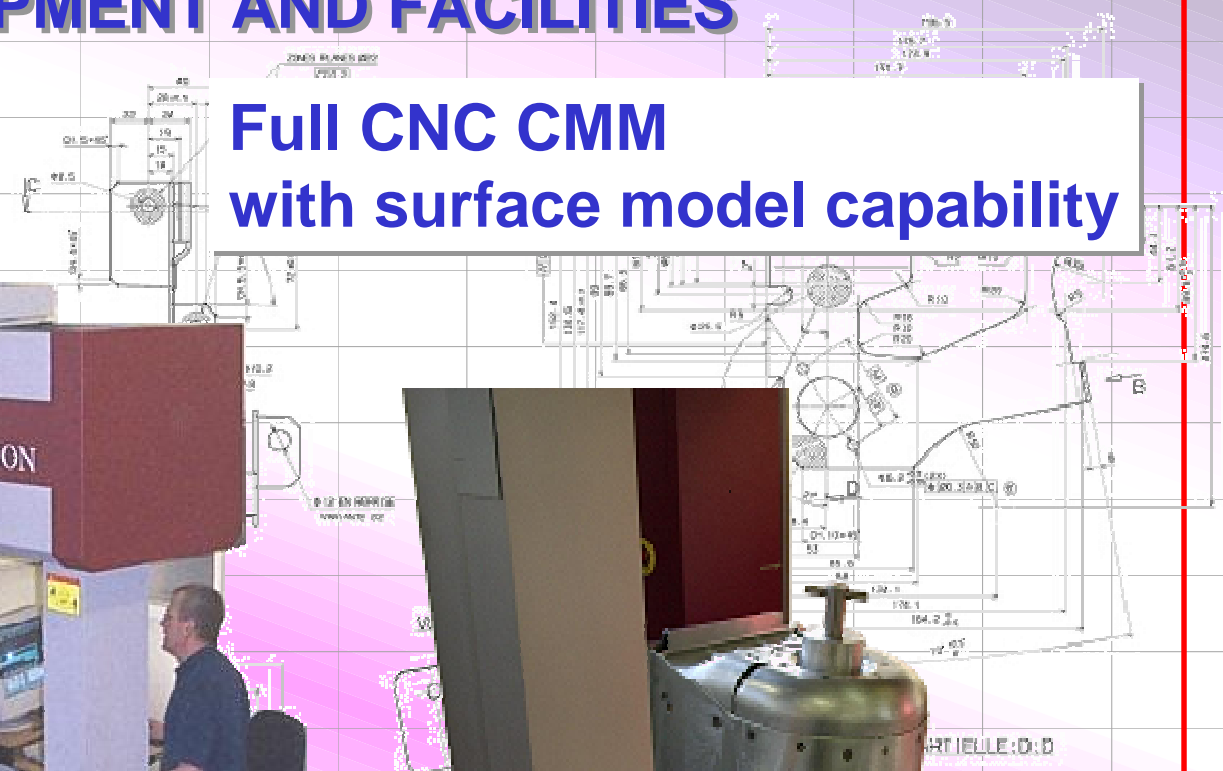
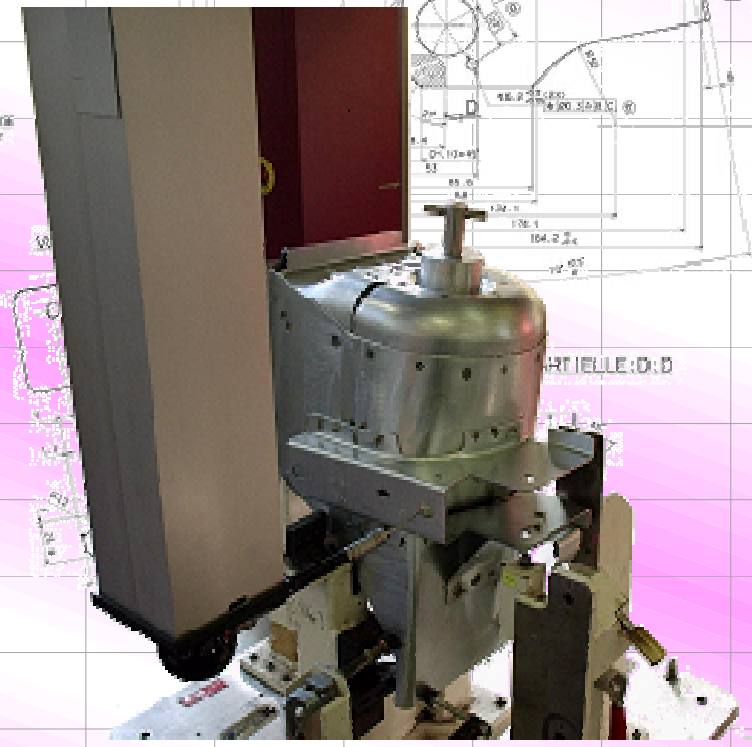


STRENGTH THROUGH TECHNOLOGY AND PEOPLE

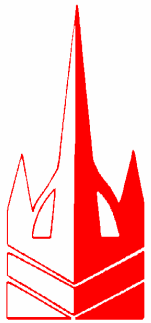


EQUIPMENT AND FACILITIES

**Full CNC CMM
with surface model capability**

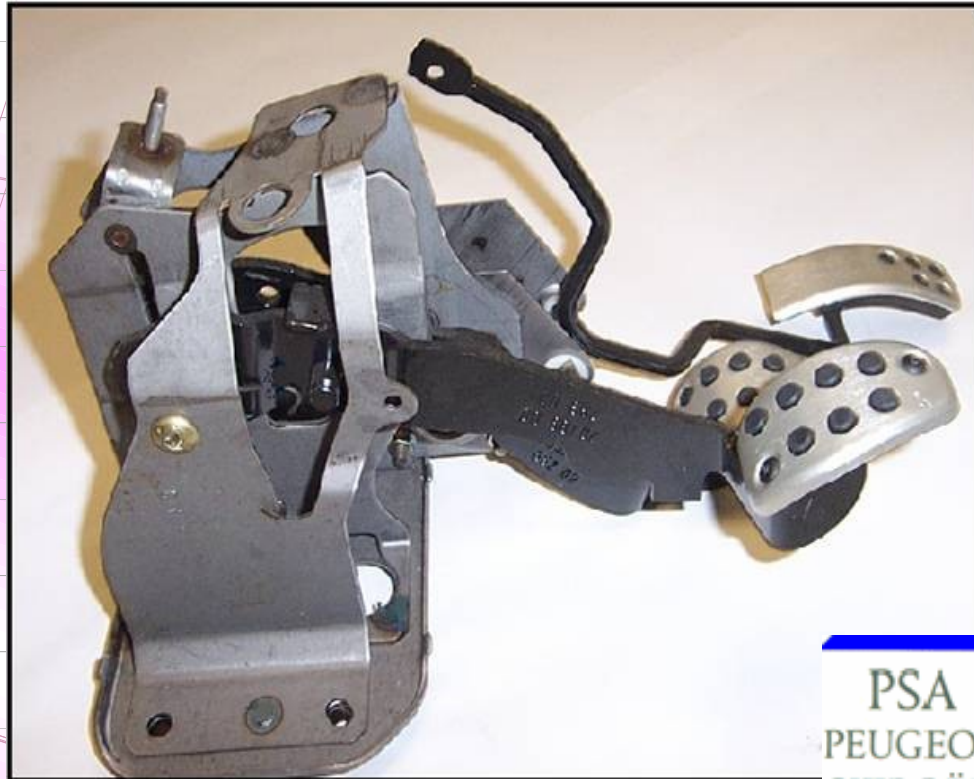
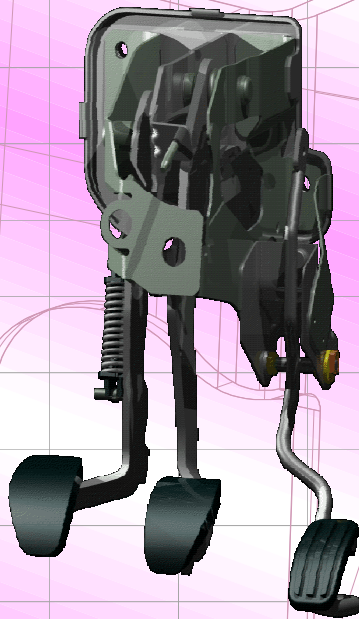


STRENGTH THROUGH TECHNOLOGY AND PEOPLE



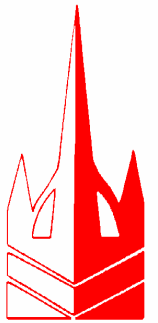
PRODUCT MIX

Pedal box assemblies



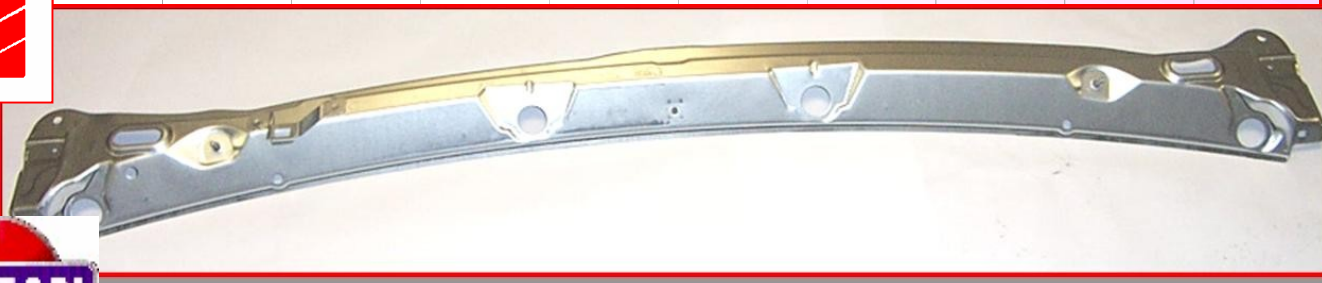
PSA
PEUGEOT
CITROËN

— STRENGTH THROUGH TECHNOLOGY AND PEOPLE —

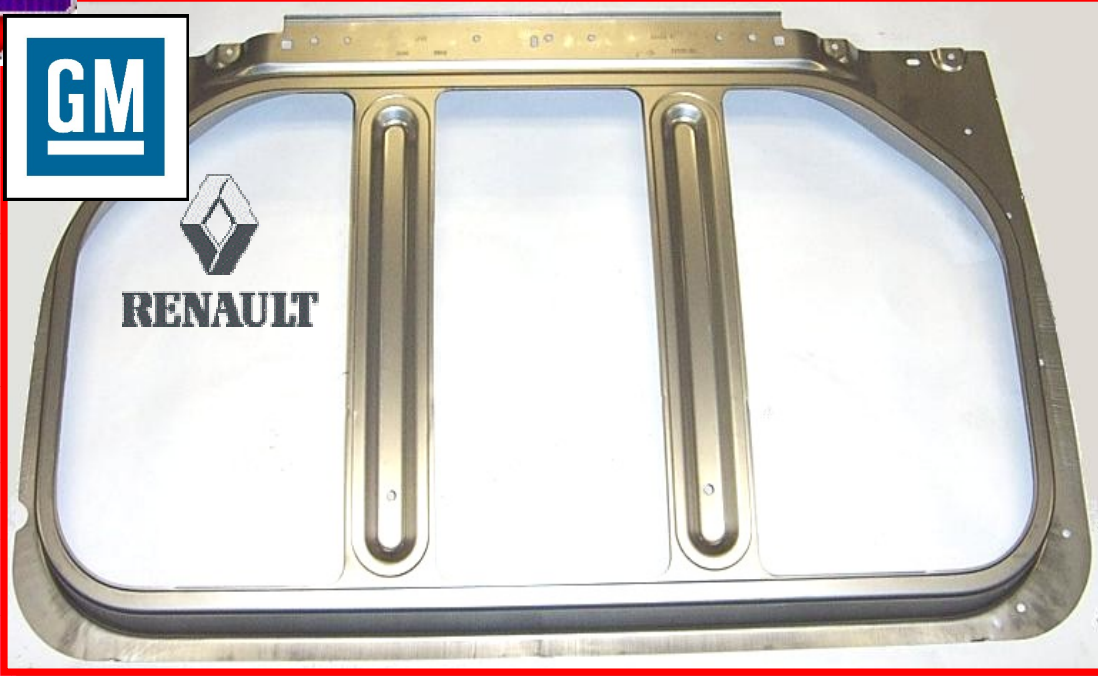


PRODUCT MIX

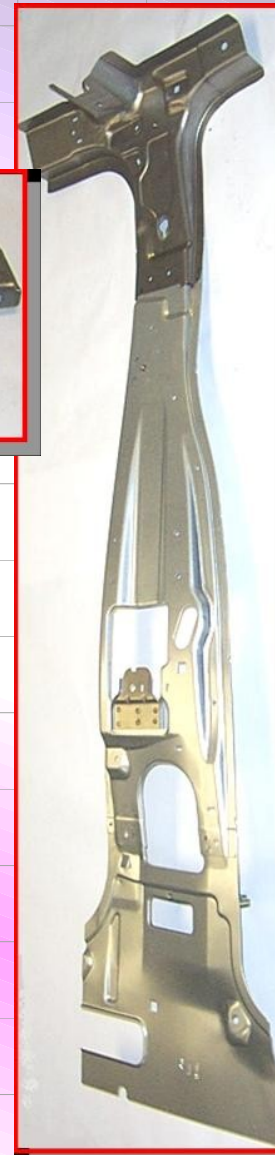
Body in White



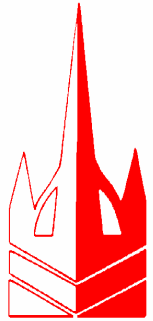
NISSAN



RENAULT



STRENGTH THROUGH TECHNOLOGY AND PEOPLE

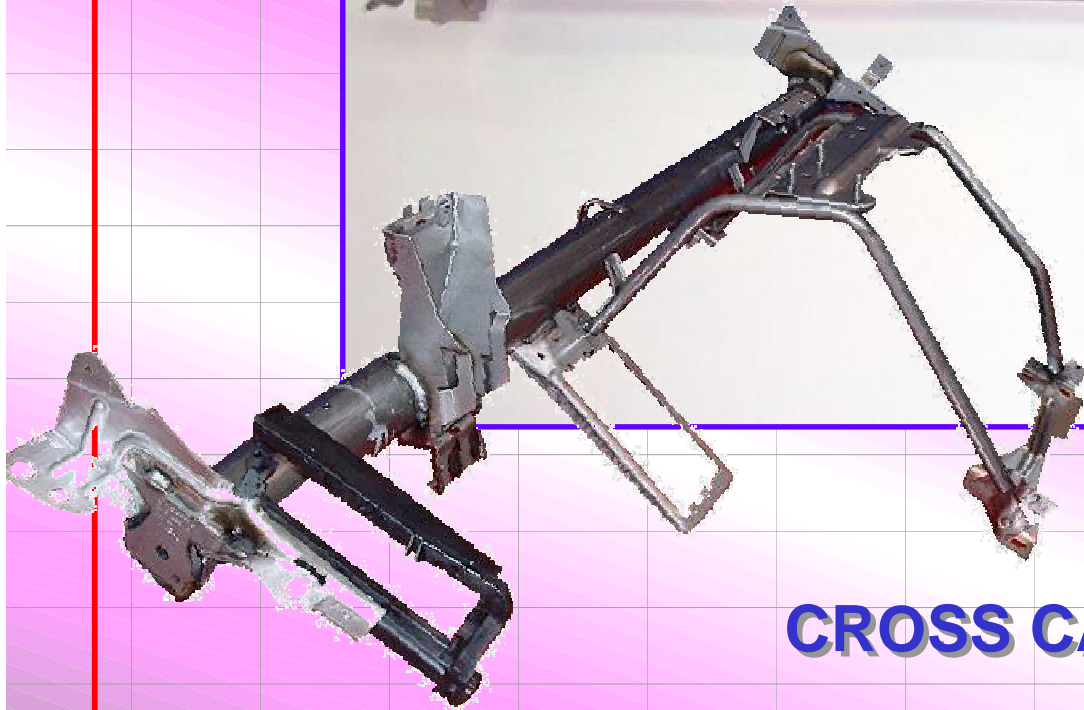


PRODUCT MIX

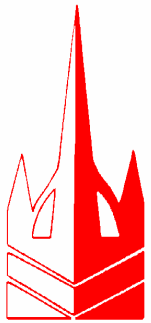
TORSION BARS



CROSS CAR BEAMS



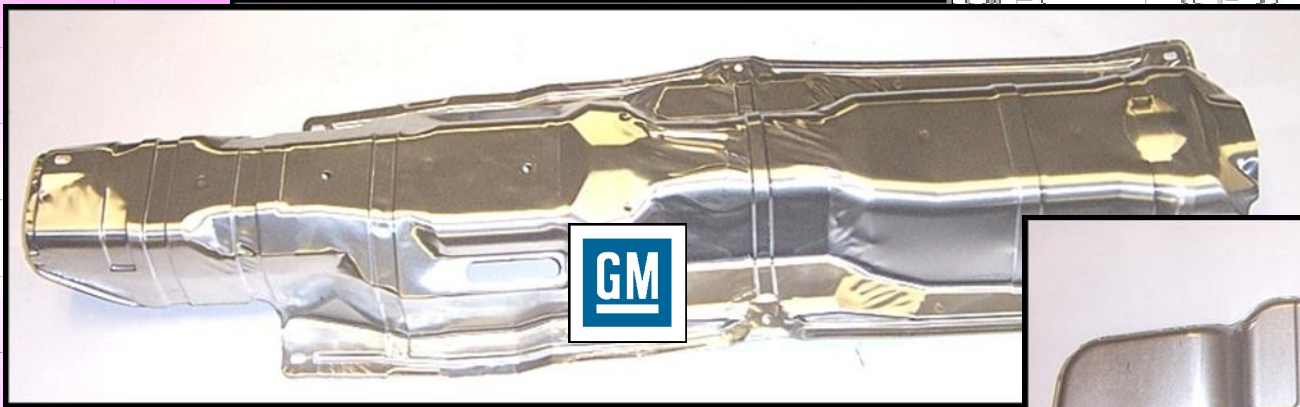
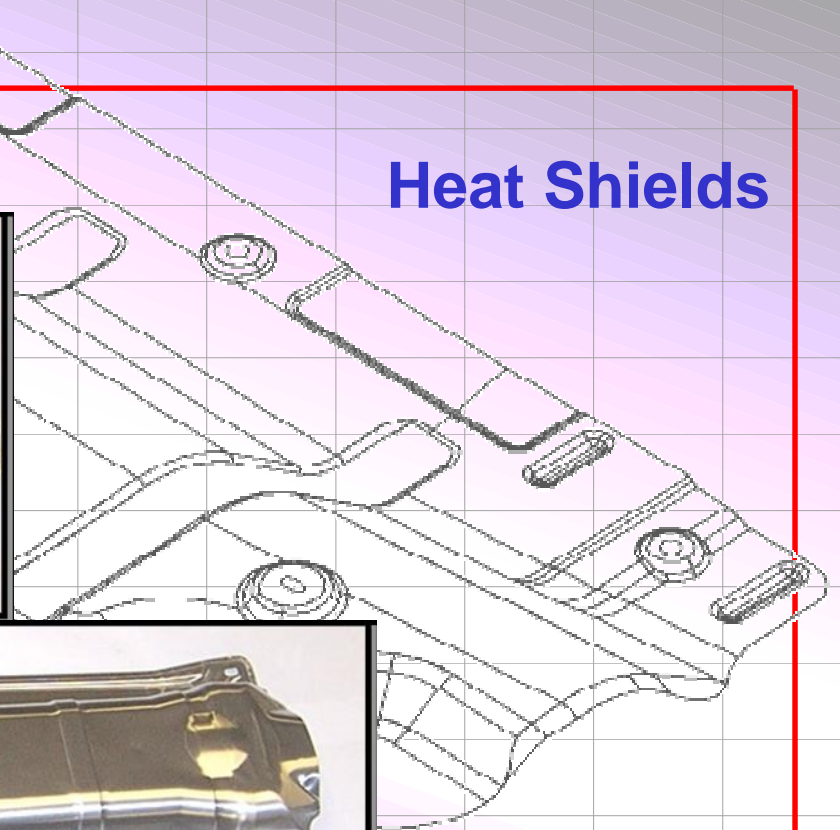
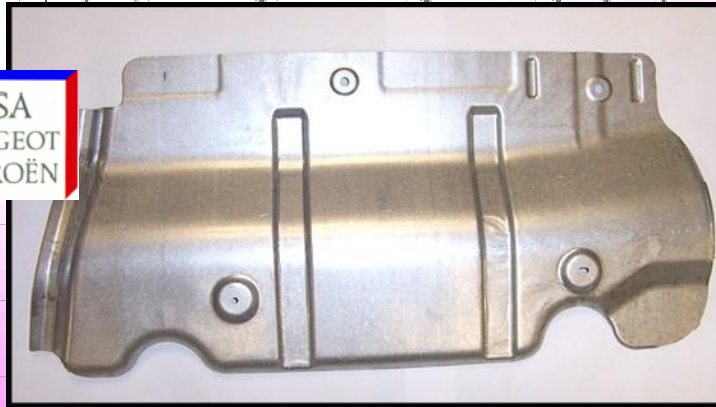
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PRODUCT MIX

Heat Shields

PSA
PEUGEOT
CITROËN

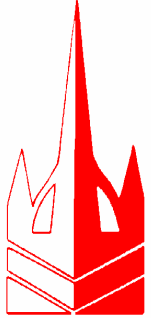


GM

PSA
PEUGEOT
CITROËN



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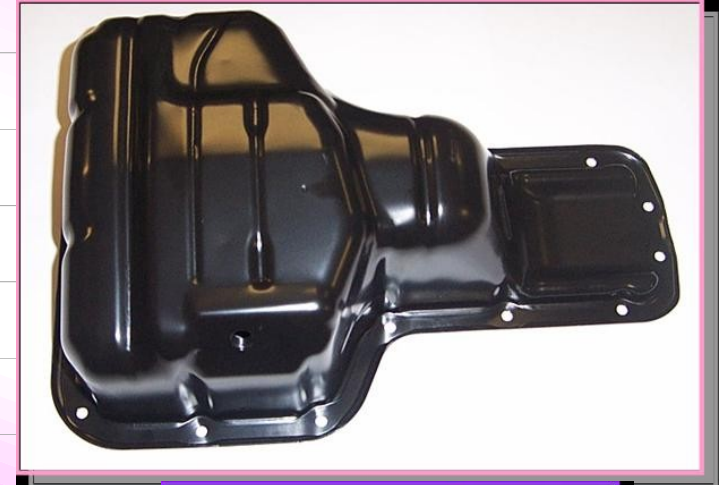
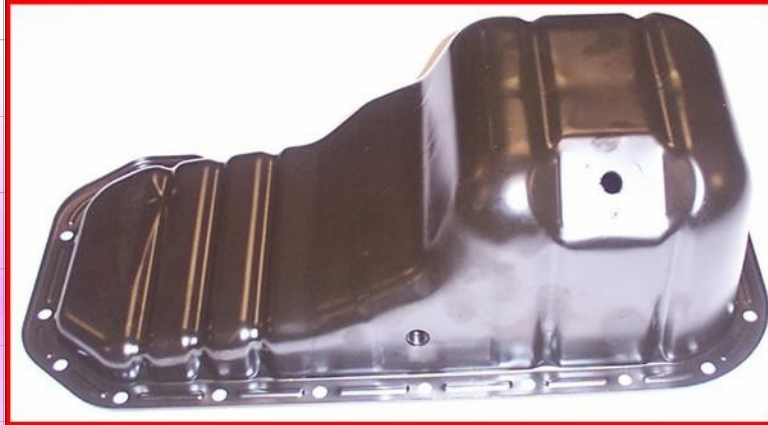
PRODUCT MIX

Oil pan assemblies

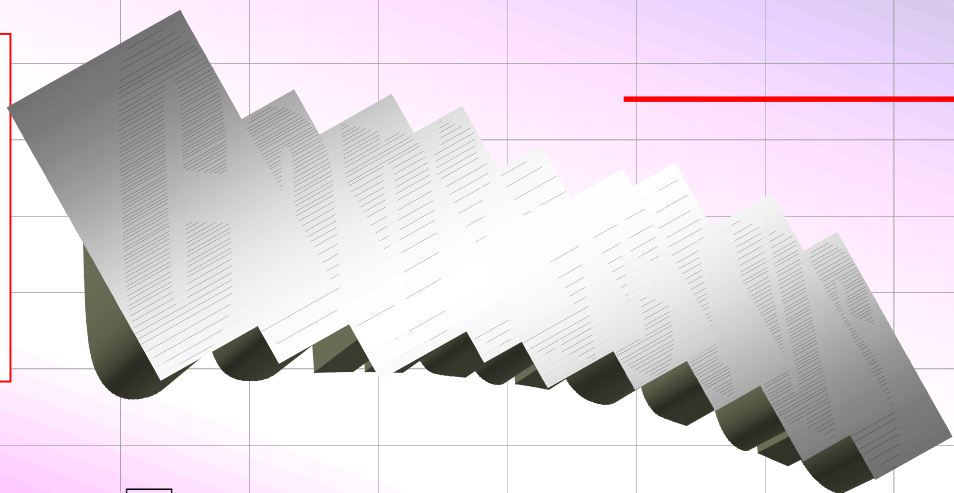
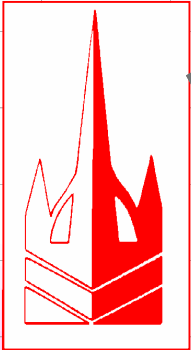
Perkins

Toyota

Rolls
Royce



STRENGTH THROUGH TECHNOLOGY AND PEOPLE

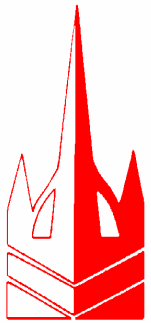


Covpress Ltd.
Burnsall Road,
Canley, Coventry,
West Midlands,
CV5 6RT,
UK.



 **02476 691000**
 **02476 678425 Sales**
www.covpress.com

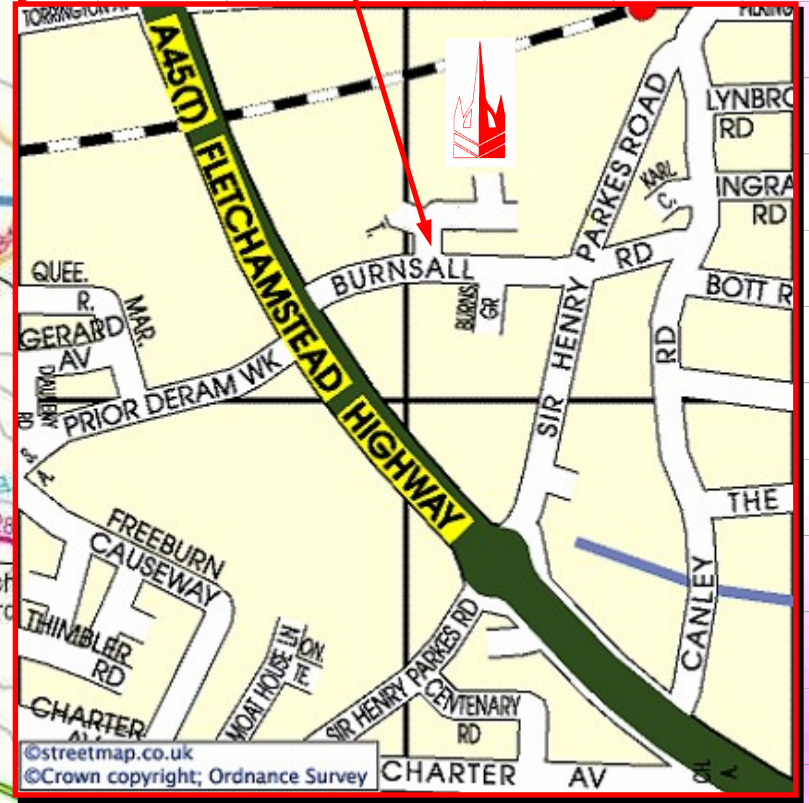
STRENGTH THROUGH TECHNOLOGY AND PEOPLE



HOW TO FIND US



Enter via Fletchworth Gate



STRENGTH THROUGH TECHNOLOGY AND PEOPLE



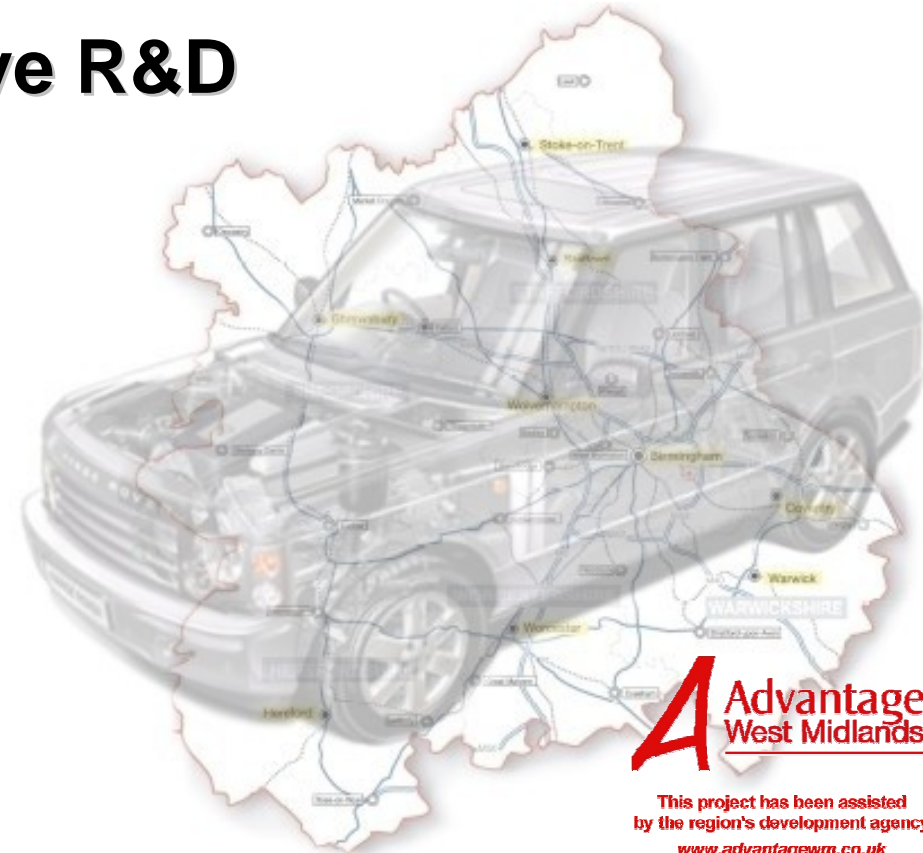
COVPRESS Ltd
Strength Through Technology and People

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WARWICK

Premium Automotive R&D Programme

Overview

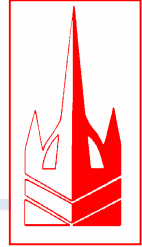
Rob Evans – September 2005



This project has been assisted
by the region's development agency
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Programme overview



■ Collaboration between:

- Jaguar Land Rover
- Suppliers
- Warwick Manufacturing Group
- Advantage West Midlands

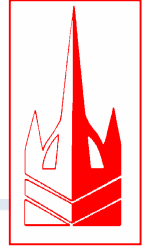
■ Strengthen competitiveness of Premium Automotive Sector

■ Advanced engineering and manufacturing research projects

■ Transfer new technology and skills to supply base



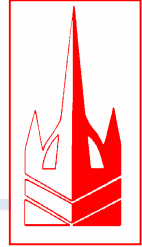
Deliverables



- **Business Assisted**
- **Jobs Safeguarded**
- **Learning Opportunities Created Directly**
- **Accredited Qualifications Obtained**
- **Increase in Value Added**
- **R&D investment. (following project completions)**
- **Intellectual Property**
- **New Products and/or Processes**



Programme overview

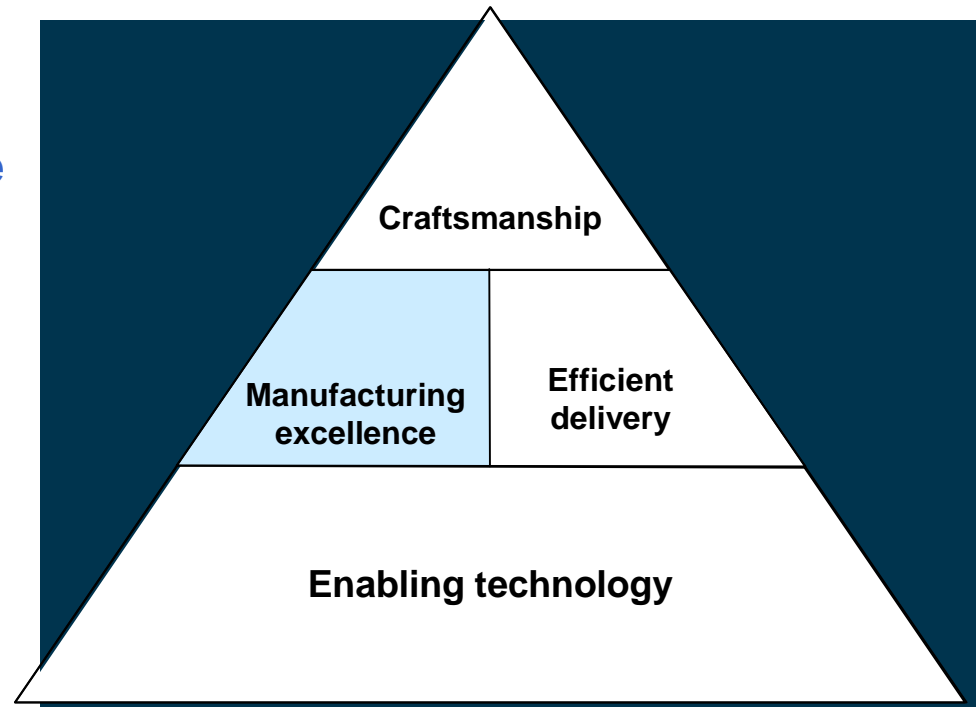


■ Four themes:

- **Craftsmanship**
- **Manufacturing excellence**
- **Efficient delivery**
- **Enabling technology**

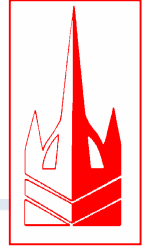
■ Twenty projects

■ Three priority groups





Projects



Priority 1

- Craftsmanship
- Advanced Body Joining Techniques
- Zero Prototype, Virtual Test Vehicle
- Simulation of Assembly/Paint/Ergonomics
- Electrical Test for Advanced Architectures

Priority 2

- Advanced Materials Integration
- Materials Characterisation and Simulation
- Low Volume, High Flexibility Manufacturing
- Web Based Shop Floor Information
- Knowledge Based Tools for Logistics and Wireless Tracking

- E-Business
- Software Integration
- Manufacturing Skills Development
- Management Skills Development

Priority 3

- Environmental Competence
- Safety
- Environmental Condition Recognition
- Intelligent HMI
- Hybrid Vehicle Integration
- Hybrid Vehicle Application



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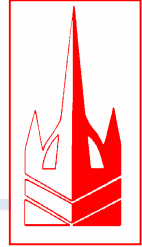
Simulation Project – Complexity Work Stream

‘putting the brakes on variety’

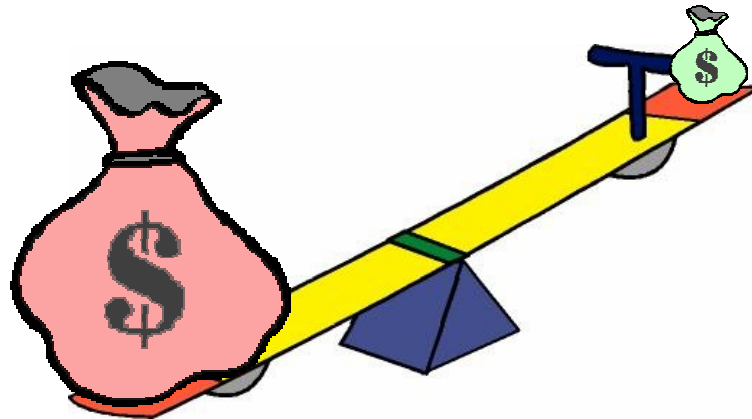


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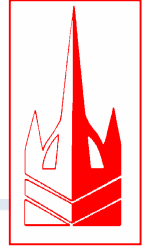
Why is complexity an important issue



- Companies pursuing increased sales revenues offer increasingly higher levels of personal product differentiation
- But what about the consequence of adding higher levels of customer choice?
 - What effect does it have on the organisation?
 - What does it cost?



What is complexity?



- Everything is complex to some greater or lesser degree

Continuous scale from

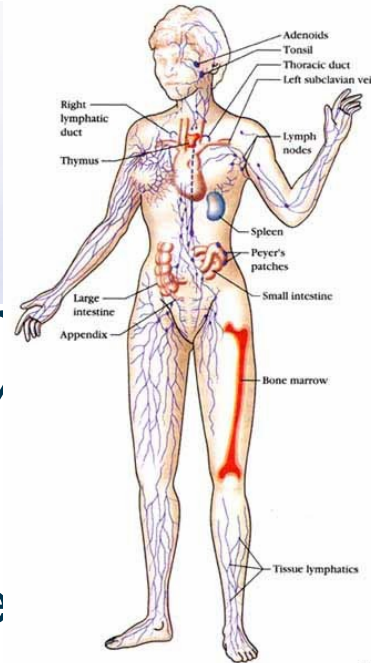
Simple



Complex

- Complexity exists

Product – Process



Product forms

Supply Chain

- This project is complex
- Product Complexity organisation

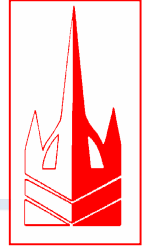
Understanding the effects of complexity of the

- Variety is one dime only one...

Product complexity, but not the



Complexity – an example



Beans on Toast

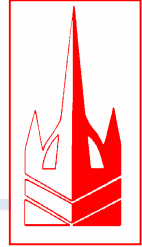
- *Beans - Low fat/
barbecue/Heinz/HP* 4
 - *Toast - Brown/white bread* 2
 - *-Butter/margarine/plain* 3
 - *Cheese on top/not* 2
-
- Total variants 48

Full English Breakfast

- *Bacon - smoked/plain/not* 3
 - *Sausages – pork/beef/
Lincolnshire/Cumberland/not* 5
 - *Beans/Tomatoes/both* 4
 - *Mushrooms /Fried* 4
 - *Potatoes/both/none*
 - *Bread - Brown/white* 10
 - *-Toast/Fried/plain*
 - *-Butter/margarine/plain*
-
- Total variants 2400

Variety is a key driver of complexity

Complexity – an example



Beans on Toast

- Beans - Low fat/
barbecue/Heinz/HP 4
 - Toast - Brown/white bread 2
 - Butter/margarine/plain 3
 - Cheese on top/not 2
-
- Total variants 48

What skills
do you
require to
make each
dish?

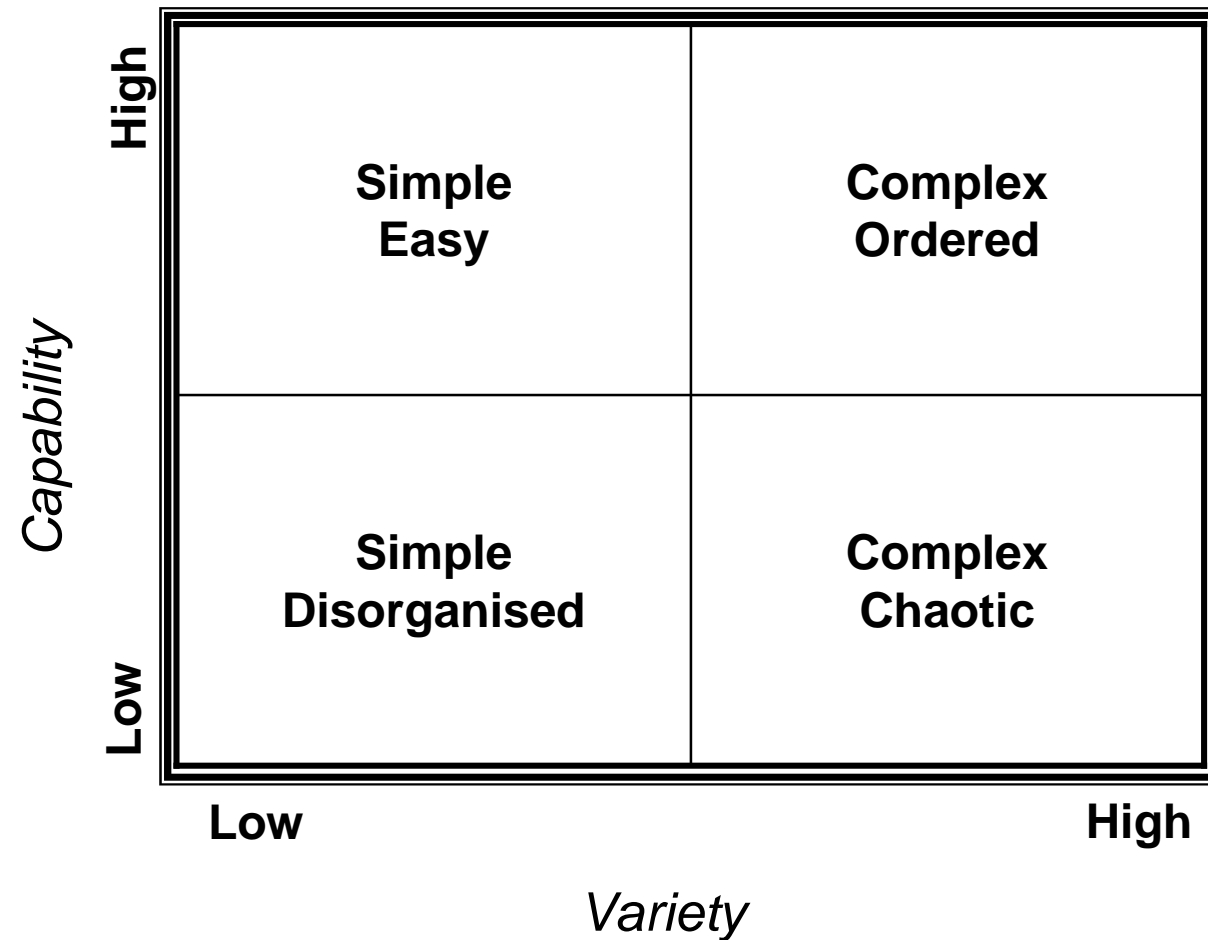
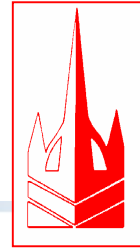
Spaghetti Bolognese

- Mince – lamb/beef/pork 3
 - Tomatoes 1
 - Carrots/not 2
 - Tomato puree 1
 - Onion 1
 - Pasta – dried/fresh 2
 - Garlic Bread – with
cheese/not 2
-
- Total variants 24

Capability is another driver of complexity

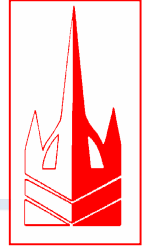


Complexity A Combination of Variety and Capability





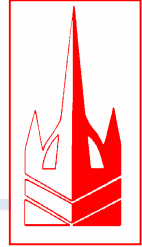
Managing product complexity



- **Product design enhancement**
(e.g. DFA/DFM).
- **Manufacturing process effectiveness**
(e.g. simulation, error proofing).
- **Total cost evaluation**
(e.g. complexity cost).



Reducing Product Variety Through Product Design



- **How do we accommodate variety whilst decreasing part count?**
 - Increase the number of options provided to the customer whilst using fewer part numbers

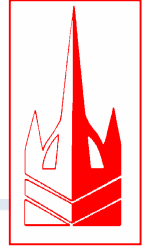
- **How do we apply the principles of DFMA to incorporate variety?**
 - Utilising existing tools in a new way

- **How do we make a car easier to assemble without just pushing complexity down the supply chain?**
 - Purchasing bigger more complicated modules may create more complexity

- **What measures drive the correct behaviour?**
 - How can a designer provide an optimum design before major investment takes place



Containing Product Variety Through Manufacturing and Logistics Control



- **What are the drivers of complexity in any given situation?**
 - **Product Strategy**
 - **Manufacturing Strategy**

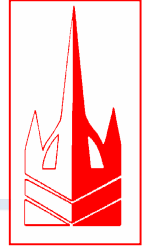
- **How do we ensure that a high part count can be accommodated in a manufacturing system?**
 - **Ensuring business becomes increasingly 'Lean'**
 - **Late configuration and complexity zones**

- **Where is the flexibility of the manufacturing system insufficient?**
 - **Identify facility and system constraints**

- **How do we prevent the wrong parts being assembled?**
 - **Product and process error proofing**



Developing a Cost Model to Support Decision Making

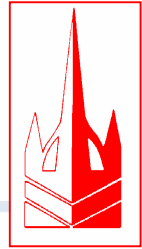


- Provide automotive suppliers with a model which assists in complexity related decision making.
- Evaluate complexity costs by:
 - Providing a systematic process that considers all possible activities.
 - Quantifying the total resources (e.g. money, space, time, and etc.) needed for making improvements.

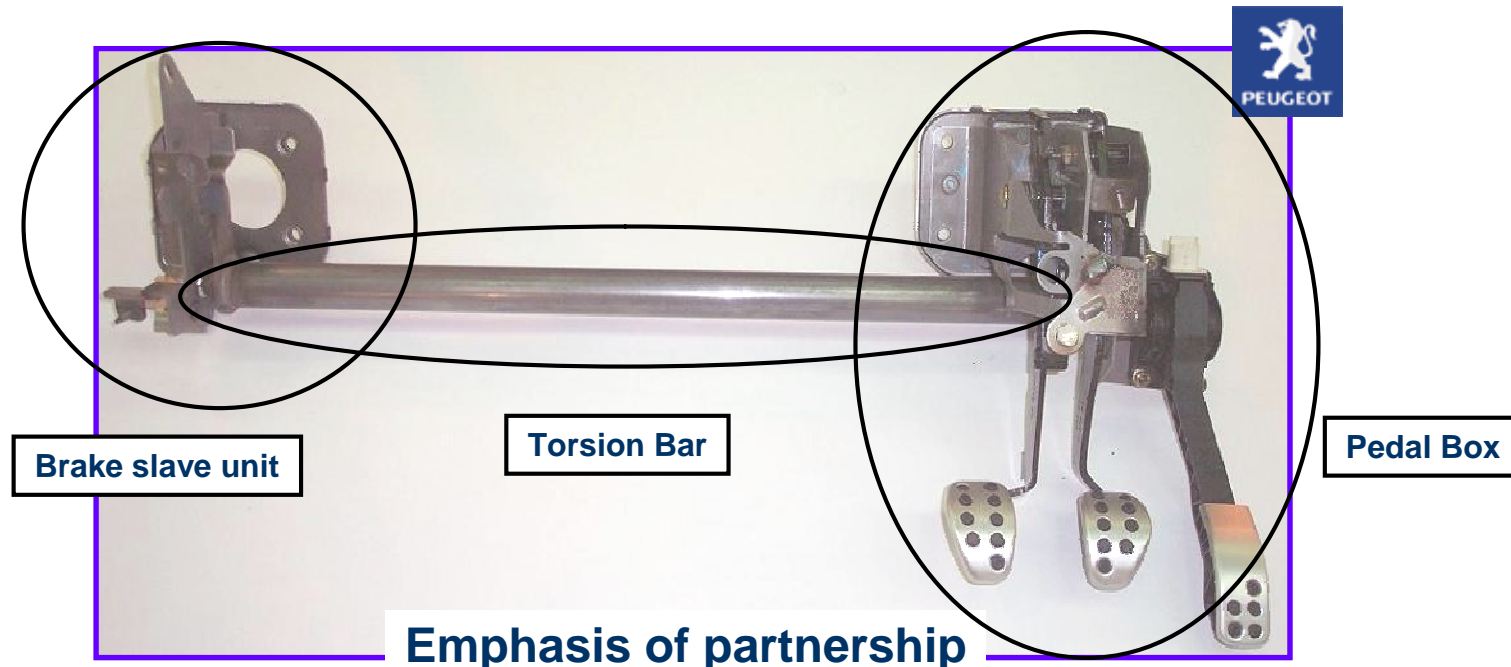
$$\text{Total cost} = \text{£}_{\text{material}} + \text{£}_{\text{logistics}} + \text{£}_{\text{tooling}} + \text{£}_{\text{inventory}} + \text{£}_{\text{design}} + \dots$$



Work at Covpress



Pedal Box Manufacture

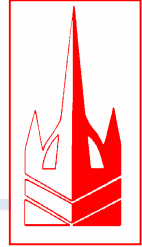


Quality first

Cost second



Pedal Box



- **1300 per week**
 - Supplied in batches
 - Not sequenced to car build

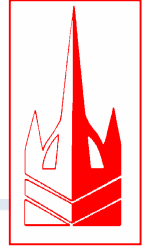
- **Supplied to 2 factories**
 - UK and France

- **12 variants**
 - Sports/Standard
 - Cable/Electronic Accelerator
 - 2x cable clutch/2x hydraulic clutch/Automatic

- **Soon to introduce cruise control!**

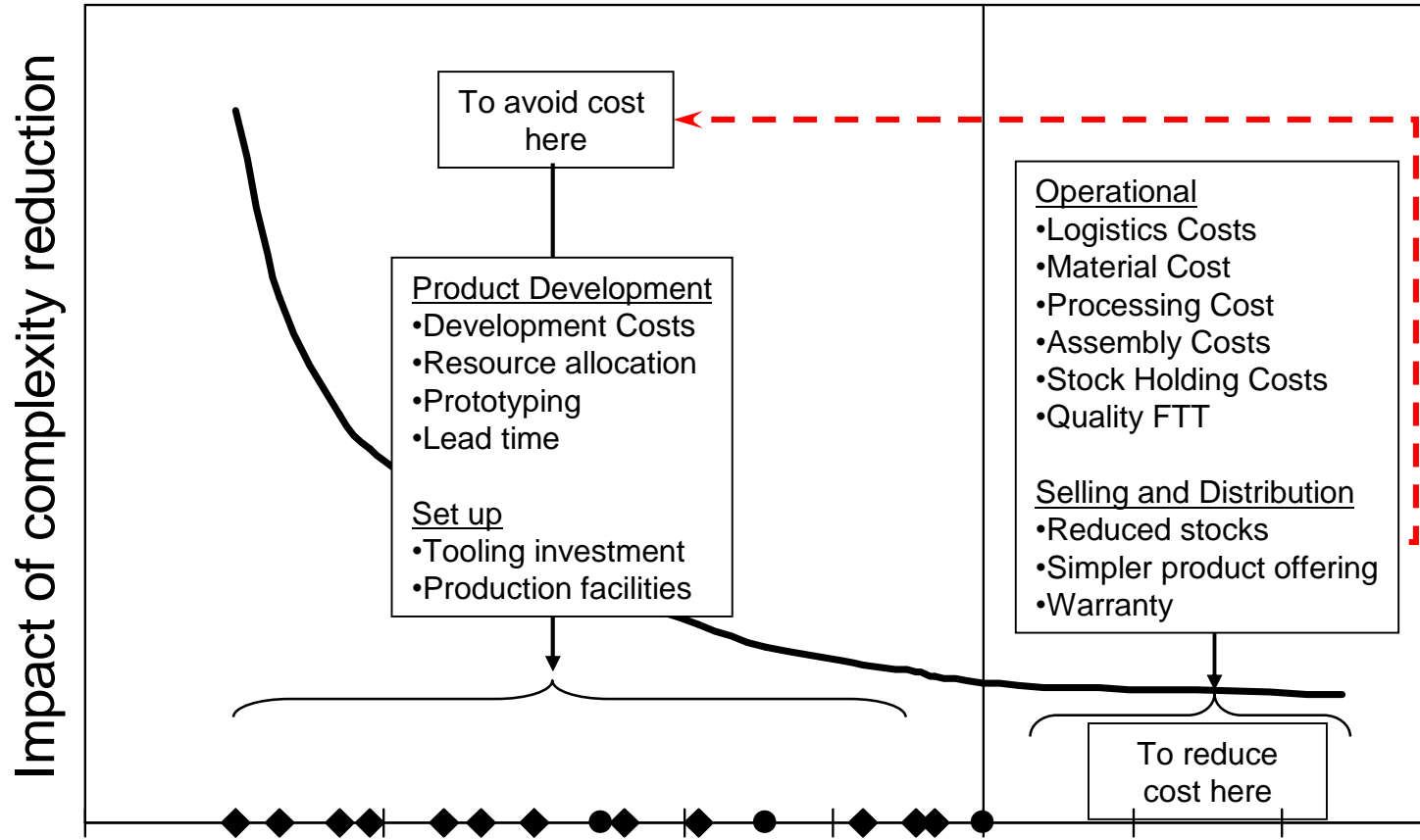


Pedal box assembly



- **3 single piece flow cells**
 - Pedal Box
 - Left hand brake slave
 - Torsion bar and finished assembly

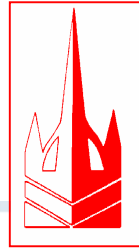
- **Error proofing used to assist build process and right first time philosophy**
 - **plc controls of welding equipment**
 - Will not allow operation if wrong parts are assembled
 - **Very little cannot be detected by the process**



**Resulting in decreased total cost
and enhanced revenues
- increasing profitability**



Design Aspects – Product Variety Matrix



High offtake parts – apply DFMA

Offtake	0.21%	1.60%	1.77%	8.98%	26.19%	7.46%	18.06%	16.04%	1.80%	3.55%	0.04%	4.30%			
Combined Offtake	1.81%		10.75%		43.65%		34.10%		5.35%		4.34%				
Assembly Number	96 581 478 80	96 581 481 77	96 581 482 80	96 581 483 77	96 581 484 80	96 581 485 77	96 581 486 80	96 581 487 77	96 581 488 80	96 581 489 77	96 581 490 80	96 603 977 77			
Assembly Description	DV6 std Bosch	DV6 spt Bosch	ET3 std Bosch	ET3 spt Bosch	MA std Wire	MA Sport	BE std Bosch	BE spt Bosch	BVA std Bosch	BVA spt Bosch	BVA Std Wire	BVA Spt Wire			
Pedal Box Sub Assy →	M31703	M31700	M31696	M31697	M31701	M31704	M31694	M31695	M31698	M31699	M31702	M31705			
Welded Box Assy →	9653796880		9652252280		9652339480		9652339580		9652700780		9652704480				
													Design Ratio	Offtake Ratio	
M11598	Left Hand Brake Sub Assy		1		1		1		1		1		2	45%	98%
M31689	DV6 LH Brake Plate Assy	1											1	9%	2%
M31683	Accelerator Plate Assy	1		1		1		1		1		1	1	55%	100%
M11599	Accelerator Sub Assy					1						1	2	18%	48%
M31681	Support Plate Assembly	1		1				1		1			2	36%	52%
9631096780	T1 Clutch Plate Assy					1						1		18%	48%
9631097080	T1 Clutch Plate Assy							1		1			4	18%	39%
9654901680	ET3 Clutch Plate Assy			1										9%	11%
9653797080	DV6 Clutch plate Assy	1											1	9%	2%
9631702380	Pedal Baseplate Assy			1		1								18%	54%
9632909680	Right Baseplate assy								1			1	3	18%	10%
9631702480	Right Baseplate assy	1							1					18%	36%
7903233042	M6 Flange Nut	2		2		2		2		2		2		55%	100%
9629120080	Clutch Cable Protection Tube			1		1								18%	54%
99XXXXX	ET3 thing on clutch plate			1									4	9%	11%
9652336880	Rose Joint Bearing	1		1		1		1		1		1		55%	100%
		8		10		9		8		8		8		51 x 16	
														PVI	816

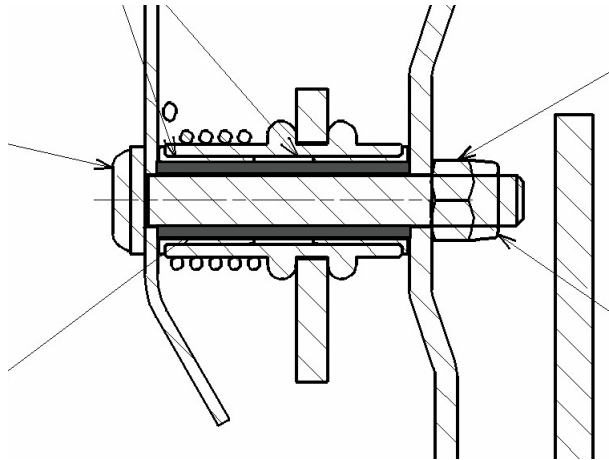
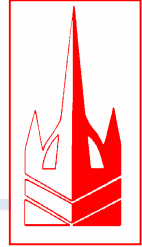
Low offtake assemblies!!!
Made from uncommon parts

'Reasonable' offtake assemblies!!!
Made from some unique parts

Low offtake assemblies!!!
But made from common parts

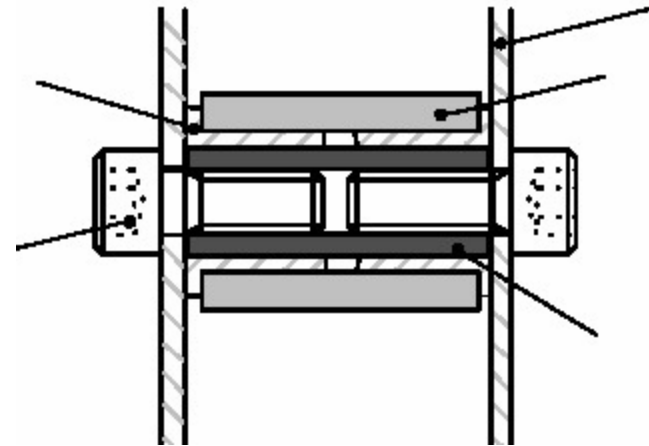


Error proofing by Design



Existing design

Q. How do you guarantee the spacer is in place if you can't see it?

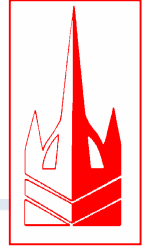


Proposed design

A. Design the assembly so that it cannot go together without it!



Where now



- **Covpress has little design capability**
 - **Make to print business**

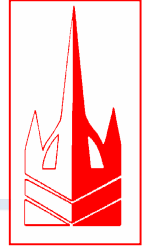
- **Has a very thorough product sign off process**

- **Accepts the customer's design**

- **By early analysis of the design can identify opportunities for the customer**
 - **Skills/knowledge transfer**



Benefits of relationship



■ Covpress

- Value Added increase
- Learning Opportunities
- Access to leading edge technologies and knowledge
 - Project spin offs

■ Warwick

- Access to real life
- Try out our research – get some feedback early

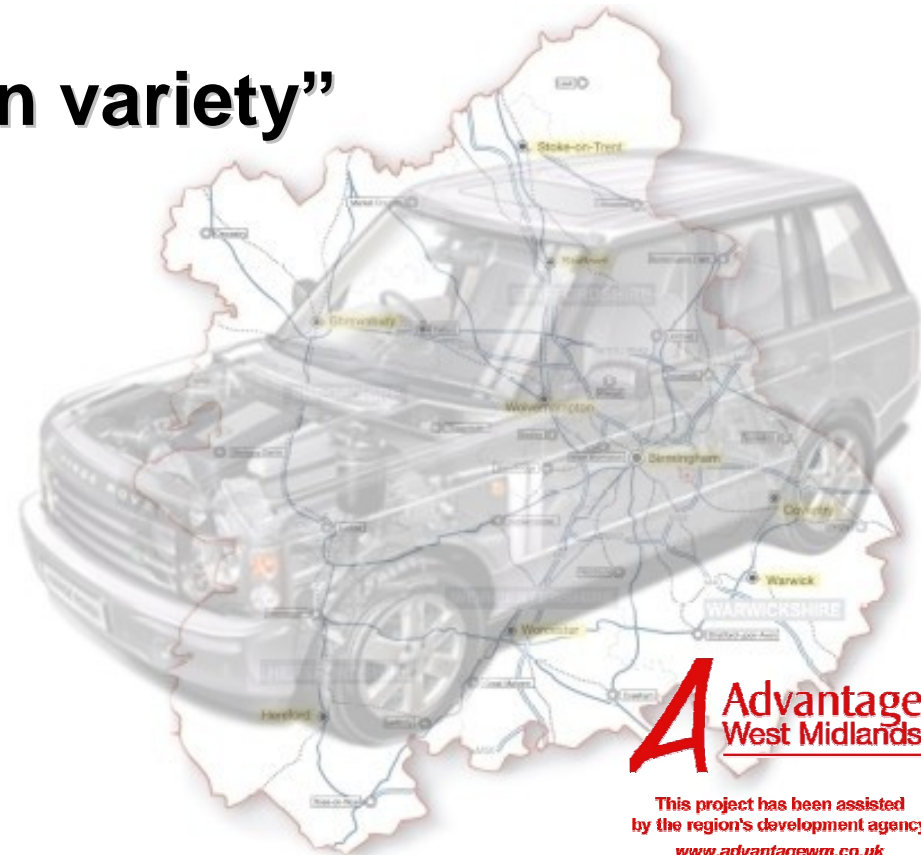


THE UNIVERSITY OF
WARWICK

“putting the brakes on variety”

**Mike Gillett – Managing Director,
Covpress Ltd**

**Rob Evans – Lead Engineer,
University of Warwick**



**Advantage
West Midlands**

This project has been assisted
by the region's development agency
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