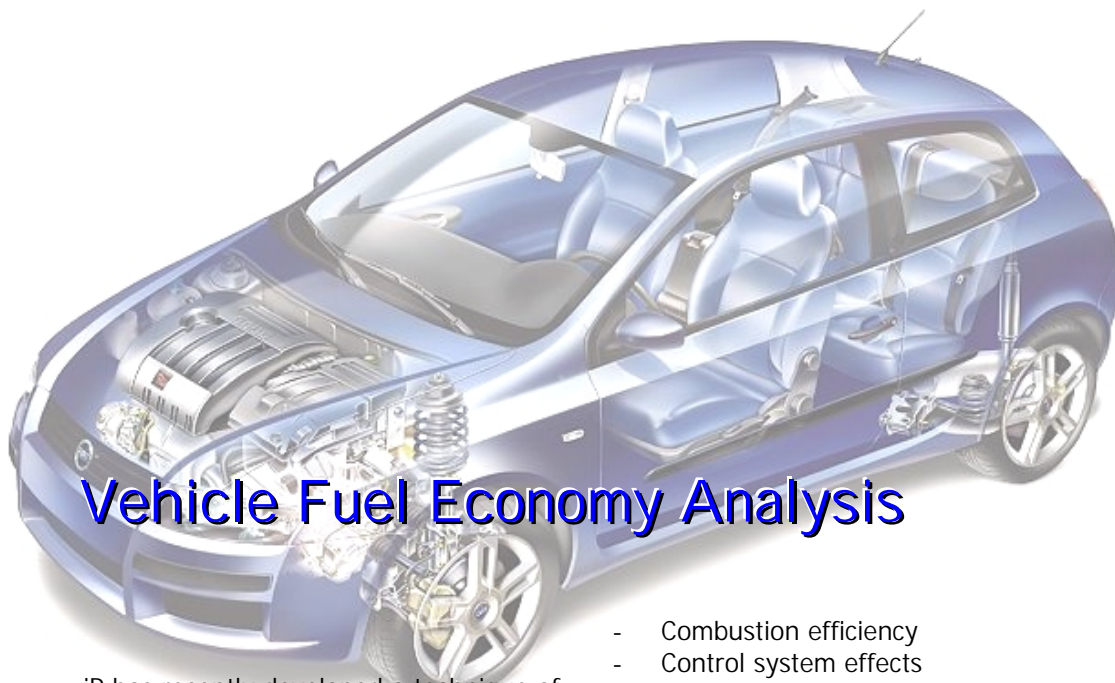


Produced in response to customer requests:

- New techniques & tools
- IP's thoughts on CO₂
- Intrinsic

"IP's approach enables the engineers and managers to really understand where the biggest gains in Fuel Economy can be realised"



Vehicle Fuel Economy Analysis

iP has recently developed a technique of detailed measurement and powertrain modelling that enables the engineer to characterise the complete S/I powertrain in a real vehicle and then run sensitivity studies to determine areas where maximum benefit can be gained.

This technique is one product of iP's **CO₂ Centre of Excellence**.

The technique determines the sensitivities of the following key contributors, including;

- Combustion efficiency
- Control system effects
- Pumping losses
- Transmission efficiency
- Ancillary losses
- Friction and warm-up

These effects are characterised for both the EU Cycle and for "Real World" driving.

The models can be used to perform sensitivity studies on a large range of characteristics to determine which areas will yield the biggest gains from further development.

Fully Parametric Cylinder Head in CATIA V5

iP has used the latest Parametric Modelling and Knowledge Management capabilities of CATIA V5, the new NT based software from IBM / Dassault, to create a fully parametric cylinder head.

The model is built-up from a number of parametrically driven sub-models that interface directly with design tools such as;

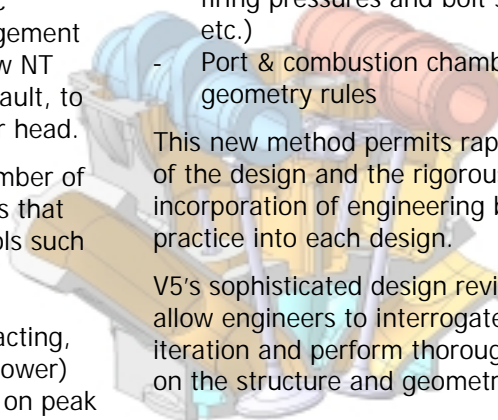
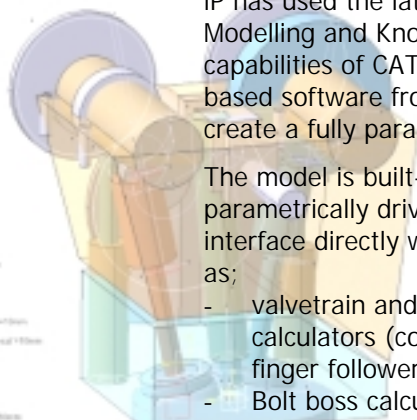
- valvetrain and cam profile calculators (covering direct acting, finger follower and roller follower)
- Bolt boss calculators (based on peak

firing pressures and bolt spacing etc.)

- Port & combustion chamber geometry rules

This new method permits rapid iteration of the design and the rigorous incorporation of engineering best practice into each design.

V5's sophisticated design review features allow engineers to interrogate each iteration and perform thorough analysis on the structure and geometry.





“Fully representative CAD models of complex components allows validation of expensive tooling at an early stage via digital data”

Cylinder Head Models & Tooling

This project really showed-off IP's skills in detailed modelling and knowledge of tooling pack design.

The end product was a full set of 3D models of the parts, tooling and linked 2D casting and machining drawings.

The final tooling pack design included all necessary core clearances and flash shut-off. The tooling was cut directly from IP's models by Grainger and Worrall, 3 months after the delivery of the initial concept models from the customer.

The first castings produced by Graingers were truly “right first time” which remains unusual in the industry.



“Today's calibration engineers need powerful tools that make best use of the engineer's own skills”

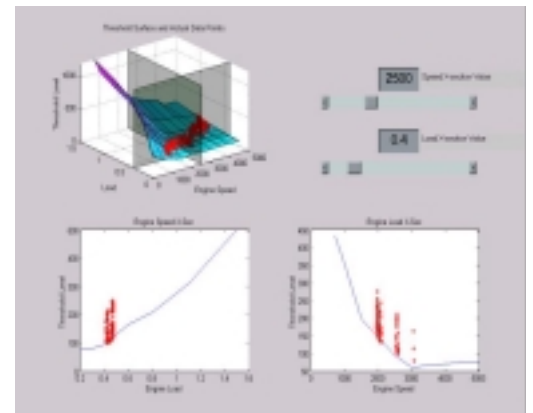
New OBD System Validation Tools

Powertrain control system calibration techniques are becoming highly developed and powerful. IP have been developing a number of engineering tools to make the most of the increasingly capable systems and to improve the quality of the final calibration.

iP's aim is to provide user-friendly tools for the calibration engineer with graphical interfaces throughout the process. This allows the experienced engineer to review the data, influence the optimisation process and generate the final calibration in an interactive way.

One example of a number of such tools

is the Matlab based Misfire Monitor tool seen below.



iP Moves into Diesel Calibration

iP has set itself the goal of being a leading source of diesel powertrain calibration services to the Industry.

The first move towards this ambitious goal has been made with the imminent supply of skilled calibration engineers to support a customers test bed and vehicle

calibration activity for a common rail 4-cylinder engine.

iP's aim is to build-up this skill base in the next 6 months in time to support the forthcoming EU-4 milestone and increased workload from common rail technology.

iP's Thoughts on Down-sizing for CO₂ Reduction

European Vehicle Manufacturers have committed to reducing CO₂ emissions to a fleet average of 140 g/km by 2008.

Great advances in Diesel engine efficiency and performance have been achieved over recent years. The gasoline engine has not made similar advances and Luke Barker, the head of iP's CO₂ Centre of Excellence suggests that in order to bring the total fleet average in line with the target, drastic reductions in Gasoline engine CO₂ emissions will be required.

iP has evaluated most of the technologies available or in development for the gasoline engine and has determined that one route offering excellent value for money and big potential gain is down-sizing and pressure charging.

iP's favoured pressure charging route is turbocharging, but this has a number of issues that have to be addressed to make aggressive down-sizing successful

in a critical market.

Compression Ratio and Detonation resistance – IP has developed techniques to allow higher geometric compression ratios and still achieve high specific output

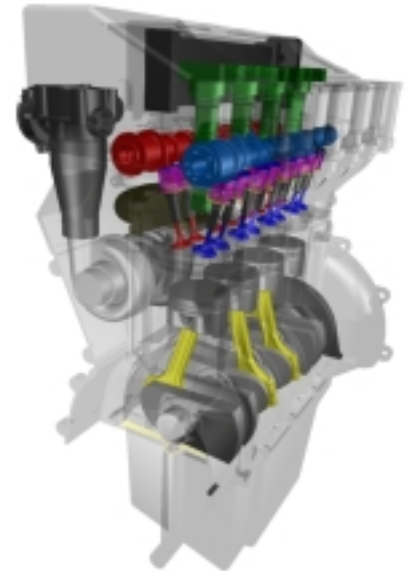
Turbo Lag & Low Speed Driveability – new technologies are now available to eliminate the poor off-the-line performance of highly boosted engines. A number of electrically based systems are now available to address this issue.

Over-fuelling for Catalyst Protection – this has traditionally negated most of the benefits of down-sizing in the past. New control techniques and simple technologies can reduce exhaust gas temperatures without the need to resort to over-fuelling.

The potential gains from this approach are very high and cover a very wide range of engine speeds and loads. For more information, contact us direct.



iP's 1.1 Litre IPA engine concept



Plans for the Future

Integral Powertrain is a rapidly developing company and aims to remain that way. This Newsletter will help to update our customers on interesting recent projects and also show where our company is going in the future.

Office Expansion - iP's current office facility in Bletchley is due to be doubled in size to accommodate the Intrinsic Training area and sales staff and to allow for the continued growth in engineering staff.

Diesel Calibration – we are rapidly moving into this area of engineering. By mid 2002 we aim to have at least 4 skilled and experienced diesel calibrators on-board. This is intended to support the industry growth in high tech diesels.

Facility Development – our test facility partner, Associated Octel is in the process of improvements to their facilities. The upgrade of their vehicle emissions facility to add a SULEV compatible CVS gas analyser is expected in 2002.

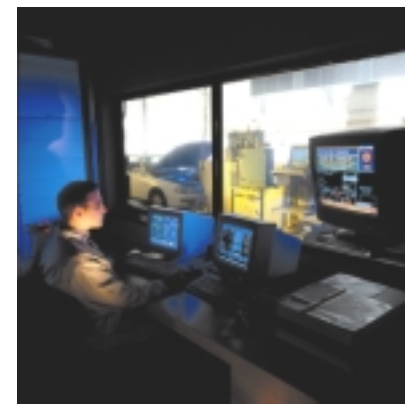
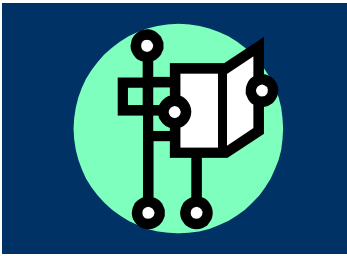


Image and facility courtesy of Associated Octel



Integral Powertrain
Denbigh Road
Bletchley
Milton Keynes MK1 1DB

Phone:
+44 (0)1908 278600

Fax:
+44 (0)1908 278601

E-Mail:
dmeeek@integralp.com

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www.intrinsys.co.uk



Intrinsys - working with Business to realise the potential of CAE

After developing its own CAE systems and carrying out implementation at selected clients (including Ilmor Engineering), iP has launched a new venture, **Intrinsys**. This will provide comprehensive CAE solutions to the wider Engineering industry.

At the hub of Intrinsys' methods is CATIA software. iP has been working closely for a number of years with IBM and Dassault and has incorporated the powerful knowledge-based parametric capability of V5 into its in-house design process.

Intrinsys is licensed to provide this software and will also provide hardware sales, systems installation services, help desk support and application training. The company is based at iP's Milton Keynes office where a new and dedicated fully equipped training facility and a state of the art competency centre are being readied for the New Year. Here people can receive

demonstrations of the product and trial the software for themselves.

Intrinsys believes there are major competitive advantages to be gained as the design process moves towards knowledge-based engineering and CATIA V5 has immense potential to deliver these benefits to companies by reshaping their design process. "We believe businesses now need a new type of support from a partner that is itself a leading edge user of CAE tools," says Darren Cairns, a director of Integral Powertrain. "At Integral Powertrain we are continually pushing for real improvements to quality, efficiency and lead times in the highly competitive automotive engineering sector. We are confident that this experience will enable us to help customers in all industries to achieve optimal solutions themselves".

