

Where British is best

The UK is an epicentre for innovation and creativity. Tom Shelley reports on why this is key for long term prosperity

Despite what one might read in less well informed elements of the press, British engineering expertise has never been rated so high because of its inventiveness and because of its impartiality, meticulous attention to detail and integrity.

There are products that it would appear that only British minds would think of, many of which start out in the UK defence community, and there are research organisations and small companies that are either owned or carefully cultivated by foreign companies.

Many regret that Britain is no longer 'the workshop of the world', with its smoking factories in the Midlands and the North of England that turned out much of the world's industrial goods. But do we really want to try to compete with sweatshops in the Far East or would we rather solve the world's design problems and earn a somewhat greater income by doing so?

Typical of the UK's approach to using ingenuity to solve customer problems are machines for the food and packaging

DESIGN POINTERS

- British design and inventiveness remains second to none
- Foreign companies consult British design and R&D teams not only because of their inventiveness, but also their impartiality, meticulous attention to detail and integrity
- UK engineers are also particularly good at finding better solutions to problems and finding new applications for existing technology.
- The transfer of technology out of the defence and oil and gas sector is prolific in the UK and it is exploited globally

industries. Machine builder Jenton International has devised equipment to test the integrity of food packaging trays. The system pushing heads down onto thermoformed trays with sealed covers and measures the resistance of the nitrogen gas sealed inside.

Jenton technical director, Ross Sion, says: "Our machine is very different to most others, which usually works by pushing down a head to a known height and assumes the same amount of gas and food is in each tray. But not all packets are going to be perfectly uniform and, historically, seal testers haven't been much use because machines reject good packs.

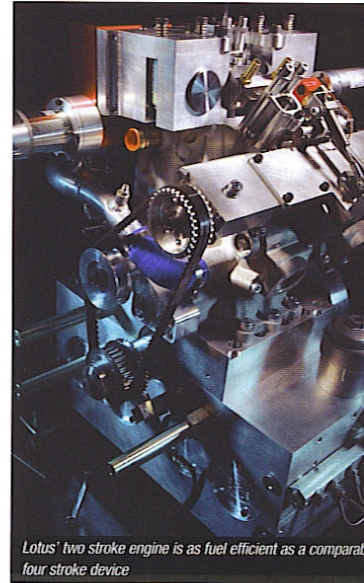
"Our machines use heads which come down and test the dynamics of a food packet by measuring the settling time. This approach is not only more accurate but also it can cope with a much greater range of packs and seals."

In the defence sector, design engineer Mike Tarbard of e2v technologies says the company's ruggedised Argus infrared camera allows what is being detected to be remotely seen by others via a wireless transmitter.

As it was originally developed for a military application, the connection is very secure and robust, and as such it is increasingly finding non military applications. Fire brigades are using it to better co ordinate the fighting of large fires. It is also useful for those concerned with security problems to remotely assess a threat. The most recent application is detecting attacks by pirates on large container ships.

Automotive engineering expertise generally is also alive and well in the UK and, apart from the work at Ford's Dunton Engineering Centre, quite a number of major world class automotive organisations take problematic design issues to Lotus Engineering in Norfolk and Ricardo in Sussex.

The two stroke Lotus Omnivore engine serves as a good example of this unique and distinguished capability. Two strokes are



Lotus' two stroke engine is as fuel efficient as a compar four stroke device

traditionally very polluting, but at 2000rpm the 499.6cc Omnivore produces only 20ppm NOx emissions. The hydrocarbon and carbon emissions produced are roughly equivalent to four stroke engines. Yet, two stroke engines are inherently smaller and lighter and the Omnivore is designed so it can run on alternative fuels such as ethanol and methanol, hence its name.

The engine is a monoblock, with no removable cylinder head or gasket. This reduces the possibility of cylinder distortion by head bolts, and achieves a variable compression ratio by using a 'puck' – a moveable piston in the cylinder head which is driven in and out by a double eccentric mechanism. Although it is a research and development engine, initial results look very promising with the test engine achieving a 10% improvement in fuel consumption compared to stratified direct injection engines.

Ricardo, on the other hand, has been working with leading defence research contractors Qinetiq to produce lower cost lithium ion batteries for use on electric and hybrid vehicles. It has just completed a two year project to reduce the cost of lithium ion technology and make use of prototype battery cells developed by Qinetiq. These use an iron

sulphide based chemistry which can be cycled more than 1000times without much loss of performance provided the battery is not run completely flat.

This means that the battery cells have to be carefully managed. Ricardo has devised a battery management system, which it says, is fully adaptable to a range of cell chemistries and battery architectures. The pack includes a number of innovations to improve performance and reduce cost.

Ricardo group technology director Neville Jackson says: "By combining lithium ion battery cell chemistry with our innovative battery management system, we have demonstrated that iron sulphide based cell chemistry is a viable energy storage solution for hybrid vehicles."

Mark Roberts, strategic market team director of energy and environment, at Qinetiq says: "Not only could this improve performance in existing hybrid electric vehicles through reduced cell size and weight, but also make all electric vehicles a more credible proposition by



Engineers are good at finding new markets for technology

increasing range. And because iron sulphide battery cells are cheaper to produce than traditional cobalt based battery cells, lower production costs could make hybrid and all electric vehicles much more affordable in the future."

Another area where the UK reigns supreme is doing consulting design work for the oil and gas sector, and to some extent, the nuclear sector. The reason people come to Britain is that the design work is competent and completely impartial. British designers do not favour products from any country; they look for

Ingenious sensor takes inspiration from a fly

A tiny parasitic fly has helped BAE Systems to build a cutting edge optical imaging system with a field of view six times bigger than the cameras it is designed to replace.

'BugEye' – about the size of a sugar cube – was developed by scientists at the company's Advanced Technology Centre (ATC). The project called for smaller, lighter cameras for missile tracking systems and wanted a lightweight device that could view 120° of sky to replace heavy, gimbal mounted equipment which can only cover 20° without being moved.

The ATC team spent six months studying insects' eyes to see if nature could provide a solution. They found one in a microscopic fly – the eye of the male *Xenos peckii* has about 50 separate lenses and can see and process a very wide field of vision.

The individual images in each lens in the fly's eye are upside down, but the fly rearranges this in its brain. The ATC used computer software to perform a similar job. BugEye has nine lenses. The images from them are passed through a faceted, polished fibre optic faceplate, focused down onto one focal plane sensor, similar to that of a video camera, then stitched together and corrected by image processing software so that they are the right way up.

The result is a clear, wide angle panorama that can be viewed on a video screen. Further uses for the technology are being explored, including applying this process to night vision equipment for soldiers. It also has potential for use with CCTV cameras in public places and shops and if reduced in size, could be used for keyhole surgery.

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best value wherever they can find it in the world.

A good example in the nuclear field is by Nuclear Engineering Services headquartered in Wolverhampton. It has undergone growth of 300% since 2003 and is anticipating further growth of 20% year in year. The company uses Pro/Engineer, AutoCAD, Autodesk Inventor, PTC's ProductView and Windchill PDM Link and a range of finite element packages in its design work, but what is particularly is the way all the design decisions are audited and how they ensure that everything is done by suitably qualified and experienced personnel. It is this kind of thoroughness and reputation for integrity that also attracts major oil and gas companies to come to UK institutions.

When expertise is built up in a particular sector, it can be made use of in what may not be immediately obvious ways. An example of a spinoff from the UK's offshore industry that has the potential to grow is a personal, recreational submarine.

The submersible has been designed and developed by former offshore engineer Robert Leeds. He says that his concept began in the 1980s when he was working in the Middle East inspecting offshore and harbour structures, and on returning to England in 1993, he formed

a small company, Subeo, to develop a suitable, reliable, and not too expensive underwater craft.

The production version will seat three, one of whom is expected to be a qualified pilot of the vehicle. The sale price is to be £390,000, which is a lot less than other commercial submarines currently in production. And, Leeds says, he could easily engineer it to go down to 300m and fit it with manipulators if somebody wanted it for serious work purposes.

However, what this really demonstrates is the enormous inventiveness and ingenuity of British engineers and engineering. But, steps have to be taken to protect our intellectual property, since it is evidently the UK's greatest asset, and to ensure that young people have a smooth path into engineering career and are encouraged to follow it. However, overall, if the UK's future is in innovative engineering design - as many believe it is - then the UK has a pretty solid platform from which to launch.

www.jenton.co.uk
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