



# *pro* **Active**

*The official industry newsletter of Lotus Engineering*

*Issue 11*

*November/December 2005*

*Lotus' motorsport  
services*



*Lotus races in  
Europe*



# Welcome

Now on our 11th issue, proActive continues in its endeavours to bring you the most interesting news and articles from the world of automotive engineering.

In this issue we look at Lotus Engineering's work within the motorsport sector, reviewing the heritage and pedigree of a company which when coupled with the latest industry technology can only mean winning solutions on the circuit. Famed for the extensive achievements in powertrain and ride and handling, Lotus Engineering are best placed to take on a wide variety of projects for motorsport teams not just in the UK but across the globe.

We also take a look at the latest technological advancements within the field of touring cars and GT racing. Advanced powertrain concepts such as Lotus' Active Valve Train (AVT) system, which you can find out more about in the feature.

We hope you enjoy this edition of proActive and we wish you a prosperous New Year.

*Ingemar Johansson,*

*Executive Engineer for Motorsport Services*



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## **INDIA: Indian and Thai auto companies' quality focus could surpass Japan**

In comments some industry observers may find incredible, Toyota Motor chairman Okuda Hiroshi on Monday said that car companies in India and Thailand may soon overtake those in Japan because of their increasing focus on quality.

*"Thai and Indian companies are fast catching up. My fear is that Japan will soon be overcome by Thai and Indian companies,"* Hiroshi, who also chairs Japan's corporate lobby, Nippon Keidanren, was quoted as saying by The Associated Press (AP).

He reportedly said Japanese companies are not focusing on quality even as the Indian firms are improving their quality standards.

*"I am aware of the excellent quality levels of Indian IT (information technology) and manufacturing companies but, in the field of quality, Japan is standing still,"* Hiroshi reportedly told a gathering of business leaders in New Delhi.

According to The Associated Press, he said no Japanese firm has won the Deming prize in recent years as they are not showing interest in winning this coveted prize, whereas Indian companies such as motorcycle and scooter maker, TVS Motor and Rane TRW Steering Systems have won the award given by the Deming Committee of Union of Japanese Scientists and Engineers.

Hiroshi said Toyota was able to become the most-profitable car company in the world due to its ability to make cars at low costs, the report added.

The Associated Press noted that India has lately emerged as a hub for low-cost manufacturing of cars and their components.

The country is already an 'export hub' for Hyundai Motor and Suzuki small cars.

AP added that Toyota has a manufacturing facility in India near the southern city of Bangalore where it produces the Corolla, Camry and the multi-purpose-vehicle Innova.

Toyota also sources manual transmissions from Toyota Kirloskar Auto Parts, a joint venture with India's Kirloskar group, that has a manufacturing unit near Bangalore with capacity of 160,000 units a year, The Associated Press said.

*Source: just-auto.com editorial team*

## **USA: Chrysler to build Dodge Nitro at Jeep plant**

Chrysler Group has announced that the 2007 Dodge Nitro will be built at the Toledo North Assembly Plant (TNAP) alongside the Jeep Liberty/Cherokee. This will be the first non-Jeep product to be built at the Toledo complex, long the home of the Wrangler, in over 10 years.

The Nitro is scheduled to come to Europe as part of the new Dodge line destined for launch from mid-2006.

*"The employees and management of the Toledo North Assembly Plant have made it one of the most progressive manufacturing facilities in our system,"* said Chrysler truck and activity vehicle assembly chief Byron Green. *"By implementing a process whereby employees work together in small teams and take more control over their daily work, this team has positioned itself to become the home of Chrysler Group's newest model."*

The Toledo Complex is made up of the Toledo North Assembly and Toledo South Assembly, which has been building Jeep brand vehicles since the 1940s.

Part of the total Nitro programme investment of US\$600m is being allocated directly to the plant for many upgrades that will make it ready to manage the complexity of building two different models on one production line. The plant is getting several expansions totalling over 160,000 square feet. Other changes in the plant include new equipment such as over 150 new robots, new conveyors, and important new processes that will contribute to the plant's productivity and quality.

The improvements at the plant help give it the capability to build pilot vehicles on the assembly line, which reduces waste and speeds time of development. Further improvements will also be made to body, trim and paint operations. Process improvements such as new material handling operations and increased use of pre-assembled components will also contribute to improved productivity.

The 2.10 million square foot Toledo North Assembly Plant occupies 200 acres and has more than 2,500 employees. Ground breaking of the new plant was in autumn 1997. Production of the Liberty/Cherokee launched in April 2001.

An all-new South plant, which will begin building the replacement for the current Wrangler in the summer of 2006, replaces the current assembly site and will be operated by the Chrysler Group and three supplier/partners who will manage unprecedented levels of the manufacturing operation. This "supplier park" frees capital to be invested in new product development.

*Source: just-auto.com editorial team*

## **GOLDINGS TAKE: Citroen and Peugeot: once more into the luxury end**

Over in the wide open spaces of agricultural Brittany, PSA Peugeot Citroen has just embarked on its latest attempt to be taken seriously as the maker of luxury cars.

On the 24th November automotive journalists were let into the 40-year-old Citroen factory for the first time. They were able to see the first cars coming off the line and to inspect the massive overhaul of facilities which will allow the French company to claim quality standards the equal of countries more routinely associated with quality car production.

The plant at Rennes was first built in the sixties to provide some industrial employment alongside the rural economy. At first it was a Citroen plant but now PSA Peugeot Citroen has made a conscious decision to make this unlikely location the headquarters of its upmarket challenge.

It is to be THE production centre for the group's Platform 3 which is to say that it will be responsible for the Peugeot 407 and the Citroen C6 families. Also there is the older Citroen C5. The only vehicle missing is the Peugeot 607 but this is expected to be moved in to Rennes when it is ready for its model update.

Citroen has been missing from the ranks of luxury cars since the fine run of DS, CX and SM came to an end, and its re-entry into the market will be a challenge for the marketing people. That challenge will be most fierce in the UK where Citroen has positioned itself as a value brand over the last six years. However, the UK marketing gurus have set realistic sales targets of well under 1,000 in the first year and believe that there is sufficient interest and goodwill for the brands to secure sales – particularly from the UK's user-chooser market.

On show also was the Peugeot 407 coupe, much admired for its styling by the motoring Press and even described by Autocar as reminiscent of Ferrari from some angles.

Though the attempt to get back on terms with the German car makers may look ambitious for a company best known for its small car success, the group believes that they have little alternative in these days of increasing brand influence. Good brand reputation trickles down from the top, they believe, and to have no top is to invite slow death.

The principal market for these two cars will of course be France, which is the most patriotic market in Europe when it comes to car purchase. The strange and interesting decision by Citroen is to make the C6 what they describe in their own terms as "presidential." The rear contains only two (adjustable) seats. If you want to sit a fifth passenger in the middle of the back he sits on the fixed belt buckles of the two presidents either side of him.



### *Luxury for PSA Peugeot Citroen*

Citroen is not fazed by the loss of the market for families of five, and claims to not even had to think about it very hard. They believe that too few cars offer armchair comfort for four passengers. The C6's front drive layout with unusually large overall width and length plus the electric sliding rear seats give unrivalled leg and elbow room for the money (around £30,000). There is no doubt that the chauffeur-driven French bureaucrats are going to like this one.

State-of-the-art technology will play a role in the C6's appeal, with features such as active suspension with variable damping, a lane departure warning system, laminated glass in all the windows, directional xenon headlamps, front and rear parking sensors.

Citroen also claims to be the first manufacturer to offer a 'head-up' display, projecting information onto the windscreen, as standard. The car will feature Citroen's first electronic parking brake, and the company says it has also worked hard on driver comfort: a new front/back and left/right 'soft diffusion' air conditioning system.

That diesel engine option is already used in the Jaguar S-type.

PSA's ability to fund the full range of quality cars for both brands will derive partly from the shared platform which can be stretched over three different lengths and set at three different ride heights with minimal alteration. It means that all models have common components worth just over 50% of the cost of the car which is a far cry from the 15% achieved on the so-called common platform of the Peugeot 106 and Citroen Saxo.

The group defines its platform as covering the electrical multiplex, the HVAC and the running gear as well as the underbody.

The investment in the plant will be EUR800m over the years 2002 to 2007 and output is only just over 300,000 currently so getting a decent return without good take-up for the cars will be tight.

Conversion of the factory for the new cars has been extensive and detailed. For example the fork-lift trucks get 100% rubber wheels to stop the spread of carbon dust onto newly painted surfaces, and the assembly line has been given a French oak floor to remind operatives that they need to be as caring with the new cars as they would be with their own stuff at home.

*Source: Rob Golding, just-auto.com*



## *USA: Battle looms as some states sign up to stricter emissions laws*

New York state's adoption of California's ambitious new regulations aimed at cutting automotive emissions of global warming gases is touching off a battle over rules that would sharply reduce carbon dioxide emissions while forcing the motor industry to make vehicles more energy efficient over the next decade, according to the New York Times.

The paper noted that the rules, passed this month by unanimous vote of the State Environmental Board, are expected to be adopted across the north-eastern United States and the west coast and that the motor industry has already moved to block the rules in New York state and plans to battle them in every other state that follows suit.

Environmentalists reportedly say the regulations will not lead to the extinction of any class of vehicle, but simply pressure the industry to sell more of the fuel-saving technologies they have already developed, including hybrid systems - that, they say, will curtail one of the main contributors to global warming.

According to the New York Times, US vehicle makers contend that the regulations will limit the availability of many sport utility vehicles, pickup trucks, vans and larger sedans, since they will effectively require huge leaps in fuel economy to rein in emissions. The industry also says the rules will force them to curb sales of more-powerful engines in the state, and ultimately harm consumers by increasing the cost of vehicles, the report added.



*Strict emission laws could lead to more costly vehicles*

The paper said the standards are actually the most ambitious environmental regulations for vehicles since federal fuel economy regulations were enacted in the 1970s - they will be phased in starting with 2009 models and require a roughly 30% reduction in automotive emissions of carbon dioxide and other greenhouse gases by the 2016 models.

The new rules will also effectively require an improvement in fuel economy on the order of 40% for vehicles sold in the state, the New York Times said.

This latest report said 10 states - New York, Maine, New Jersey, Vermont, Massachusetts, Oregon, Washington, Rhode Island, Connecticut and Pennsylvania - already follow or plan to follow California's air quality rules, which have previously focused on vehicle emissions that cause smog, and the latest set of rules would for the first time limit carbon dioxide emissions. And as the largest of the 10, New York is being closely watched as it institutes the new rules.

The New York Times said that, if all 10 states and California succeed in enacting the rules, they will form a powerful alternative regulatory bloc accounting for about a third of the nation's vehicle sales. Environmentalists reportedly reckon that is so much of the market it should reach a tipping point because it won't make sense for the automakers to build two fleets, one clean and one dirty.

The paper said vehicle buyers will certainly notice the regulations should they survive the court challenges - New York state estimates that the rules will increase the cost of a new car or truck by more than US\$1,000 when fully phased in, an amount it expects car owners to recoup over time through savings on fuel. Vehicles will need to comply with the new standards to be registered in the states.

In early August, more than three months before the regulations were even adopted, automakers from Detroit to Tokyo joined in a suit to block them, making New York the latest legal front in the industry's fight against the measures, the New York Times said, adding that, after California adopted the regulations in their final form in September 2004, vehicle makers sued in state and federal courts, where the battle is still playing out.

The paper noted that California, unlike other states, has special authority to set its own air quality rules because it did so before passage of the federal Clean Air Act. Other states can pick California's tougher regulations over Washington's.

*"If the California regulation actually were in effect today, only a handful of models would meet it,"* Gloria Bergquist, a spokeswoman for the Alliance of Automobile Manufacturers, told the paper.

*Source: just-auto.com editorial team*

## Improving the breed with race engineering

Touring Car and GT racing have captured the imaginations of millions of motorsport fans with the roar of finely tuned engines and thrilling chequered-flag finishes for almost 50 years.

These race series owe their popularity to the strong visual resemblance between the race cars and standard consumer cars – particularly the touring cars, while even the GT racers are more akin to their road-going cousins than a F1 car.

Unlike their consumer counterparts, however, these cars are highly tuned for top performance.

In the British Touring Car Championship (BTCC), the cars weigh between 1,150 and 1,216kg (2,530-2,675 lbs.) and generate loads in excess of 2g in deceleration and 1.5g when cornering. Engines have some 300 bhp and the fastest circuit allows a top speed of 150 mph with the quickest corner taken at around 130 mph.

As with any racing competition, design optimization to reduce weight and increase strength is critical. British circuits are notoriously harsh and there is often contact during the races. Regulations dictate that the eternal motorsport battle between weight and strength of components is more important than ever.

Achieving this and making many other modifications, while staying within the rules, requires high-tech equipment and knowledge – and that means money. Touring cars are now backed by manufacturers and the formula has increasingly become too expensive for the privateers to compete.

Teams now use state-of-the-art equipment such as 3-D modelling and CAD/CAE systems to design suspensions and perform stress analysis. For example, stress analysis is required to analyze many different iterations of the same part very rapidly to meet tight deadlines, the more quickly these iterations can be performed, the more optimized the part will be.



*British Circuits are notoriously harsh on cars*

Loads induced by lateral acceleration and in-line deceleration can be up to 2g for a vehicle weighing up to 1,216kg. The main criteria for analysis are strength and stiffness. The front suspension upright is arguably the most important component of the car, as it defines the front suspension geometry and the dynamic behaviour of the wheel - no failure due to stress can be accepted.

The same is applied to components such as the damper top mount which absorbs all of the vertical loads created by the front suspension. It is vital this part is as stiff as possible as it is loaded directly by the damper - any undamped deflection will have an adverse effect on traction.

Engine and gearbox mounts are also scrutinized having to support engine and gearbox assemblies that weigh close to 200 kg and are subject to harsh conditions induced by acceleration.

As well as analysing the effect on components, the latest 2D/3D CAD/CAM computer software is used to manufacture very complex components, prototype or batch in touring car and GT racing.

Specialist companies servicing the teams have to invest in high tech equipment to be able to provide a fast and reliable turnaround while keeping costs low, a microcosm of the motor industry in general.

As an example, Ferrari's 360 Modena in GT racing around the world appears to have a highly suitable layout for racing purposes with a new V8 engine 'for the 21st century', and a classic mid-engine layout with a rear transaxle offering a 43 per cent front, 57 per cent rear weight distribution. A further innovation that initially seemed to have some potential was the option of a Formula 1-type electro-hydraulic gearshift system on the road car.

Based on the technical excellence of Ferrari's Formula 1 and road car technology, everything was in place for a GT programme when the car was introduced.

The 360 GT was actually a development of the car built for the one-make Ferrari Challenge Pirelli Trophy, for which the 360 became the only eligible model in 2002 having run alongside the F355 since 2000.

The success of the JMB Competition squad in taking the 2001 FIA N-GT championship persuaded Ferrari to build a limited run of 360 GTs to enable private teams to contest not just the FIA GT series, but also Le Mans and the similarly regulated ALMS - principal differences between FIA and Le Mans/ALMS spec cars are in the underbody and gear change mechanism.

Enzo Ferrari once said that the engine was the heart of his cars, although the level of competition in any current racing arena means that all areas of a race car have to be optimised nowadays. He may not have approved, however, of mandatory restrictors to limit horsepower. This is what GT runners have to contend with in some race series.

# Feature

In spite of system restrictors, development of the race engines has seen an increase in peak power over standard of around 30bhp and a more modest increase in peak torque of 5Nm (3.6lb. ft).

These gains have been achieved with a number of modifications, including modified combustion chamber design enabling a raised compression ratio; higher lift camshafts; a straight through exhaust system unencumbered by silencers; modifications to the dry sump oil system to reduce frictional losses and power drain from the oil pump itself; and the lightening and balancing work to the major reciprocating masses.

Engine cooling can be uprated from standard, with a pair of larger connected water radiator matrices at the front supplemented by an oil/water heat exchanger instead of the production car's rear mounted air cooled oil radiator.

Engine management systems can also be tweaked to enable different fuel maps to be run with, for example, a driver-selectable switch in the cockpit. This can lead to reduced fuel consumption and shorter pit stops.

GT regulations have allowed the use of the F1-style paddle operated gearshifts from road cars along with standard suspension components fitted in more or less the original locations. Teams also work with brake and tyre specialists to optimize the cars.

In terms of looks, most GT regulations permit the replacement of original removable panels with alternative materials such as carbon and Kevlar though regulations for Le Mans and the ALMS require a flat area between the front and rear axles.

Much of the work on these modifications is fed back eventually in some form into road vehicles. All forms of motorsport are a test bed for the cars we drive away from the showroom. So what are the engineers looking at now for the future?

Could GT Racing be the proving ground for the camless engine - one of the major talking points of 2005?

If racing improves the breed, then it is certainly an attractive proposition. While Variable Valve Timing has become commonplace in recent years, the next big challenge is the camless engine using what is known by Lotus Engineering as Active Valve Train (AVT) technology .

The AVT system is an electronically controlled, hydraulically operated system that allows the control of individual valve lift profiles by a digital signal processor (DSP) based controller. As the names suggest, the valves are opened and closed electronically. This allows valves to be lifted independently to any position and for any length of time.

Benefits are increased fuel economy and engine torque with a reduction in emissions – Lotus say the improved operational efficiency increases torque by up to 10%.



*A proving ground for camless engines*

The big attraction for the racing fraternity will be the ability to use ultra-lightweight valves since the valves will not have to absorb the impact of rolling camshafts.

*Additionally, AVT offers:*

- Elimination of camshaft, valve train drive componentry and engine oil in the head
- Improved engine volumetric efficiency and minimised pumping losses due to throttleless operation
- Potential for differential cylinder loading - optimization where several cylinders operate under standard combustion full load conditions and the remaining cylinders operate in part load HCCI or CAI mode
- Potential for cylinder deactivation
- Elimination of particulate traps in diesel engines
- Potential for specialised engine operation in combined 2 stroke/ 4 stroke modes
- Elimination of heavy duty diesel exhaust braking components through the achievement of compression release braking within the cylinder
- Flexible engine - develop sport variant of base engine through S/W parameter changes
- More efficient, cleaner engine starting strategies, potentially allowing the starter motor and battery to be downsized

Camless engines are expected to go into production with several leading automakers from 2008/2009 and prototype camless engines were shown at the SAE Congress in Detroit earlier this year.

*Chris Wright (Interchange)*

# Feature

## Lotus races in Europe

At the 2004 Geneva Show, Lotus presented the new Lotus Exige on the world stage. At the same event Lotus also launched a track version, the Lotus Exige Cup car. Developed by Lotus Sport, the Exige Cup is produced in limited numbers specifically for the Lotus Cup Europe series that visits several circuits around the continent as part of the European GTP weekends.

Now in its second year, the Lotus Cup Europe series continues to grow with the introduction of two types of competition in 2005, Race and Regularity. Regularity events are open to all types of Lotus Elise and Exige based cars with competitors being assessed on the consistency of their lap times as opposed to pure speed. Race events take place on the same weekends as Regularity events, but they are conducted with a traditional race format and are only open to those with a Lotus Exige Cup.



### Lotus Elise Cup cars in action

The Lotus Cup Europe series is one of the few that follows the genuine Cup principle whereby you can drive the car on public roads to the event and then take part in a race on track.

Lotus Dealers play a central function in the Race and Regularity series and are the direct point of contact for the customer. The Exige Cup is only available through official Lotus Cup dealerships. Registrations for the events can only be completed at participating dealerships and are co-ordinated by an external Cup organisation with the official support of Lotus Cars Ltd.

What makes the Exige Cup different to the standard Exige\*\*:

- 6-point FIA safety cage
- Sport seats
- 4-point seat belt
- Electric operated fire-extinguishing system
- Switch for interruption of circuit inside and outside
- Oil sump monitoring system
- Adjustable front stabilizer
- Two-way adjustable shock absorbers
- Limited slip differential
- Strengthened clutch plate and cover
- Aluminium rims in silver
- Lotus Sport Division production plate

\*\* varies by country of sale



*The cars battle it out on the track*

*Source: Lotus Engineering*





## Lotus' motorsport services

The name Lotus has been synonymous with motorsport from pretty much the day that Colin Chapman built the first Lotus back in 1948.

Since then Lotus has enjoyed success at all levels, including at Le Mans, Indianapolis and of course Formula 1, where it ended up with 79 wins and 13 world championships. More recently Lotus' involvement has been somewhat reduced, but it is still very relevant and, most importantly, the expertise and passion remains.

Track-focused derivatives of Lotus Cars' product, from circuit driving specials such as the Exige 240R, through to GT3 racecars underscore Lotus' ability to develop hugely competitive vehicles.

All of these products draw upon the expertise of Lotus Engineering.

Lotus Engineering has recently experienced a great demand for its services, particularly as they relate to motorsport activity. These services cover all aspects of vehicle and powertrain engineering, from engine calibration & control in the Time Attack winning Chevrolet Cobalt SS through to chassis set-up and analysis on a Mosler MT900R GT2 which competes in selected rounds of the FIA GT and British GT championships. This team recently won the Tag Heuer GT250 with the Mosler after analysis with Lotus Engineering.



*Type 79 Lotus Formula One car*



*Lotus Elise in action*



*240R Supercharged Engine*

The latter example draws upon Lotus Engineering's world-class SKCMS (Suspension, Kinematics and Compliance Measurement System). The custom-made vehicle measurement rig was designed, developed and made in-house by Lotus Engineering. Clients have used the SKCMS for many years to refine the characteristics of their road going cars, but now more racing teams and privateers are finding out about how the rig can help them win races!

Coupled with Lotus Engineering's world class ride and handling expertise motorsport teams, who have won over 50 awards for Lotus products since 1995, new technologies can be developed, tested and refined to the highest standards.

With a 2.25 mile test track onsite, engineers can carry out development and benchmarking work within a secure and confidential arena – allowing teams to stay one step ahead of the competition.

Powertrain engineering is another aspect of motorsport that Lotus Engineering can assist with. All aspects of powertrain can be handled in-house, from innovative design solutions to engine management systems. Our depth of knowledge is fortified by the fact that 10% of all new cars sold in Europe will be powered by Lotus designed engines.

So what does this mean?

Well, this means that motorsport competitors can come to Lotus Engineering to help them understand more about their vehicles from powertrain calibration through to suspension set-up, refinement and calibration. Activity that would otherwise take many hours of costly track and driver time to identify and tailor.

Lotus Engineering has a proud track record of delivery world-class solutions to global OEMs. Lotus also has an outstanding heritage of motorsport success. These two elements continue to work in harmony to ensure ongoing motorsport success. Isn't it time you took advantage our expertise?

*Source: Lotus Engineering*

## The onward march of diesel

Before we all switch over to the hydrogen-based economy and the fuel cell becomes the green powertrain of choice for the automotive industry, there will be plenty of debate about the best and most environmentally sound powertrain solutions. How does diesel stack up against the gasoline-electric hybrid and where is diesel share heading? Rob Golding takes a look at some of the issues facing the proponents of diesel as well as the arguments put forward by one of the diesel engine's biggest champions, PSA's Jean-Martin Folz.

It's highly probable that diesel cars will represent more than half the market in Western Europe for the first time when the figures come in at the end of the year. It was 49% diesel at the halfway point and might have passed the landmark then had it not been for a shortage of particulate filters in Germany.

The remorseless onward march of diesel is the cause of rejoicing in some quarters. No-one is more pleased than Jean-Martin Folz, the chief executive of PSA Citroen Peugeot who sees every step forward for diesel as a step back for other (more questionable) short-term palliatives for global warming.

Folz is a mild and rational man but he is easily irritated by the ill discipline of researchers and legislators who cannot decide in which way lies salvation. As a consequence there is anarchy within legislation, the carmakers become cost-laden by diversity of national market requirements, and consumers and humanity are sold short.



*The onward march of diesel*

*As a consequence  
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requirements*

That's his view. The strength of his view leads him to passionate advocacy of diesel as the short-term (at least) solution. There are some issues with particulates that render the fuel less attractive, in that regard, to gasoline. But known technology for particulate traps can generate a response to much tighter regulation. Issue solved. Let's ignore hybrids and bio-fuels and get on with it.

Folz is right to try to focus minds on a single, simple measure to reduce emissions of CO<sub>2</sub>. It would be wise to remember that the development of diesel to its present (arguably) superiority to gasoline has been the work of more than half a century. It must be unlikely that a wholly new drive technology is going to deliver the goods in short order.

One legislative intervention that Folz will encourage – because it has worked very well for his company (and for France) in the past – is a programme of payments to owners of old, badly-designed and badly maintained cars which are 90% of the cause of the emissions problem. Encourage these cars to be surrendered and pay incentives to the owners to buy a new one with far greener performance. Even if a ten-year-old car was still in its 'as new' condition", its CO<sub>2</sub> emission would be 12% worse than the equivalent new model according to figures from the European Commission. Of course, it wouldn't be in 'as new' condition, would it?

This has been done before in France and works particularly well for the French vehicle makers because France is the most patriotic of all the major European markets. The principal beneficiaries of the bulge in demand for new cars would be Renault, Peugeot and Citroen.

What would give Folz particular pleasure is if all these artificially generated buyers of new cars were to opt for a PSA diesel-hybrid. He doesn't actually make such a thing at the moment, but says that he is going to – just to end his irritation for the gasoline-electric hybrid which makes no real contribution to anything. He will be showing the technology installed in a car early next year to generate feedback.

*Petrol-hybrids are better suited to countries where petrol engines dominate, such as the US and Japan, and where the culture and infrastructure still limits the potential for the growth of diesel*

*“Only a diesel-hybrid system is attractive because it offers a real fuel consumption reduction,”* said Folz.

London is a particularly good example of legislators distorting demand by muddled thinking. The gasoline/electric Toyota Prius has been exempted from payment of the London central area congestion charge simply because of the nature of its engine technology – not the result of its engine’s operation. With a following wind it can manage sixty miles to the gallon, but so too can the very best, modern diesels in a lightweight car. London is not the only example of anti-diesel discrimination.

To argue that gasoline-electric is better than diesel is to forget the additional weight of such a car and the additional energy consumed in the very expensive, extra-process, manufacturing stage.

Folz said there is no room for petrol-hybrid cars in Europe, where diesel engines are well accepted. Petrol-hybrids are better suited to countries where petrol engines dominate, such as the US and Japan, and where the culture and infrastructure still limits the potential for the growth of diesel.

In Europe, the growth is actually at its maximum. The 4% annual growth, that has taken the percentage diesel penetration from 30% to near 50% in less than six years, is stretching the capacity of the fuel suppliers to ride the trend. They have to build capacity to keep up and there is a very real danger that there will be a shortage, a price rise and a trend reversal.

There has to be some CO<sub>2</sub> reducer that is championed by legislators and carmakers alike, while we wait for fuel cells to ride to the rescue. The first commercial offer of a hydrogen car is ten years away at least. Even then the supply of them will be limited because they will almost certainly still be unprofitable for the producers. At the moment the production costs of a fuel cell is

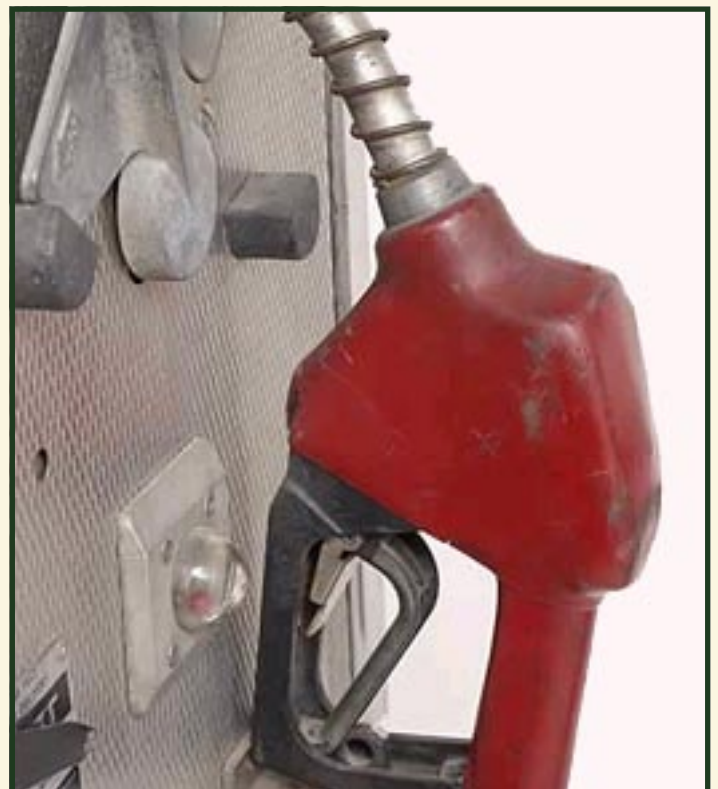
estimated at the same as a Formula 1 engine – around US\$1m. The only reason that they will appear at all is that manufacturers are very keen to build positive PR from the green credentials. Toyota has earned disproportionate benefit from selling its initial Prius cars at below manufacturing cost. They, and others, will do the same to support the first few years of fuel cell.

The most dependable estimate for an on sale date of 2015 is probably Toyota’s given that this is the company that stuck at the Prius development to grind the production price down to the point where the conspicuously-green consumers were prepared to pay the (subsidised) asking price.

Toyota says that it has “hundreds of engineers working away” on fuel cells. DaimlerChrysler meanwhile has sixty or so evaluation fuel cell vehicles already in service and gathering operating statistics.

It does therefore seem that diesel will be driven very hard for the next ten years to assist with bridging the gap to 2015. Consider the ground that has been covered in the last 10 years and the contribution diesel transition can still make in that time is considerable.

Around Europe, the progress has been very varied. Because they have been catching up frantically, the smaller countries such as Norway and Switzerland turned in diesel market share growth performances of 338% and 314% respectively, according to figures published by Auto Industry Data.



*Diesel growth in Europe reached its maximum*

# Feature

Belgium and Spain, which had already reached just over 50% market share for diesel, showed that there is still life after half-and-half, and moved on to 72% and 67% respectively. Of the Big Three markets, the UK was the star performer. Its market share was up 180% over the period, while Germany doubled and France was up 60%.

In the US – where fuel economy was an expression of concern last heard before the Bush administration took office – there are 40,000 diesel-engined cars in total. That's it. Ricardo, a UK engine specialist, estimates from various industry bodies that it will take another three years to break 100,000 and six years to get through a million.

Diesel and gas cost the same in the US, so the roadside billboard prices don't do much to provoke change. All the economic incentive therefore is in the greater fuel economy, and when percentage increases are built from a very low base the benefit is not all that compelling. A 30% improvement in changing from gas to diesel in the UK can be 10mpg or more. In the US it might be three. In the UK, diesel converts actually have to overcome the obstacle of diesel fuel costing up to 7% more before looking at the 30% fuel saving. On average though, diesel fuel prices in Europe are cheaper than petrol.

But there are some movers and shakers in the US. Delphi and Bosch, the two lead players in the diesel component business, are both making huge investment in diesel engineering research centres in the US and are laying down production plant. Amongst the carmakers, Volkswagen and Mercedes are the first to have

diesel cars on sale. Volkswagen is going for the premium models in the mid range. Mercedes has so far fielded an SUV and an S-Class. Because of the vicious price battles at the low-end of the price range in the US, diesel has to try to make an impact higher up the price range where the additional production cost of a diesel engine – still more than \$1,000 – is easier to absorb.

There is no easy way of escaping the cost of providing items not required in the petrol engine. The expensive items are the turbocharged intercooler, high-pressure common rail direct injection, particulate filters and measures to remove noise, vibration and harshness (NVH). Commercial light trucks and minivans are the more obvious first target for diesel, but that market is still minded to look at purchase costs rather than operating costs.

There is yet a tank trap down the road for diesel planners. Draft so-called Euro V rules designed to clean up car exhausts are tough, possibly too tough and therefore counterproductive according to the industry.

The European Commission has been warned that for the diesel industry to meet the new levels, engines would have to cost as much as €1,500 more than they do now according to the European Association of Vehicle Manufacturers. That could form sufficient of a deterrent on purchase price to reverse the diesel movement and the benefits thereof. It sounds like another case for the crusading Jean-Martin Folz.

*Source: Rob Golding, just-auto.com*



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