proActive

The official industry newsletter of Lotus Engineering

Issue 9
July/August 2005

Performance partnerships

How China could drive new wave of consolidation

Welcome

Standing back with a global view it is clear that our future calls for strengthening of ties, at home and abroad, by expanding our circles of influence and building partnerships.

We operate in an information age where knowledge and expertise are valued. This has fuelled the growth of partnerships and the move away from giant corporations.

This transformation and the ability of knowledge management can result in jobs moving to people, not people to jobs, an example being the move of software activities to the many small firms in India where work continues whilst the West sleeps.

Issue 9 of ProActive brings an insight into the complexity of Industrial Partnerships, *"Automotive partnerships – Fact or fiction?",* a look into the relationship Lotus has with GM and the Opel Speedster project, and an overview of the collaboration with the paint supplier, Dupont to develop a unique paint system that is used on Lotus products.

If you have any views or comments on any of the articles please email proactive@lotuscars.co.uk.

Simon Wood – Director of Engineering, Group Lotus

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FRANCE: Mitsubishi Motors and PSA Peugeot Citroën sign agreement for SUV joint venture

Takashi Nishioka, chairman of Mitsubishi Motors Corporation and Jean-Martin Folz, CEO of PSA Peugeot Citroën, have signed the final cooperation agreement between their two companies for the development and production of three new SUV model lines – one for each brand.

The agreement plans the annual production in Japan of 30,000 units for PSA Peugeot Citroën, based on a Mitsubishi Motors platform currently under development.

In a statement, PSA said the new SUVs, to be launched in Europe in 2007, would be *"well equipped with top-of-the-line comfort, handling and safety features".*

The Peugeot and Citroën models will be powered by Mitsubishi's newly developed petrol engines with aluminium cylinder block and PSA's own HDi diesel engines equipped with particulate filters.

the new SUVs would be... "well equipped with top-of-the-line comfort, handling, and safety features"

"These fuel-efficient, low emissions diesels will deliver remarkable environmental performance," the statement claimed.

In Japan, the Mitsubishi-branded models will be launched in autumn this year. In Europe, models for the three brands (Peugeot, Citroën and European derivatives for Mitsubishi) will be unveiled at the 2007 Geneva motor show.

Specifically styled for both Peugeot and Citroën, the new SUVs will broaden the French automakers' product ranges and will enable the two brands to reach new customers by entering an expanding market segment. This project will target customers in European markets where European-style vehicles are popular.

just-auto expects the three automakers' models will be about as different from each other as the jointly developed Toyota Aygo, Peugeot 107 and Citroën C1 city cars now being produced at a new plant in the Czech Republic.

Mitsubishi Motors expects that the additional SUV volume built for PSA Peugeot Citroën will enable it to raise capacity utilisation and improve productivity. MMC also expects the agreement will help its efforts to reach targets set out in the current 'Mitsubishi Motors Revitalization Plan'.

Source: just-auto.com editorial team

GERMANY: Knorr-Bremse launches joint venture with Tata Autocomp Systems

The Frankfurter Allgemeine Zeitung reports that Knorr-Bremse, the German braking systems company, and Tata Autocomp Systems, the Indian automotive component group, have formed a joint venture.

The German group is reported to hold a 70% stake in the new company.

Production of air brakes and electronic brake controls is reported to have begun at the new site of the joint venture, located near Puna, India.

A source from Knorr-Bremse commented that the Indian production site would add capacity on a growing market.

Source: just-auto.com editorial team

INDIA: Bosch forms filter joint venture with Mann + Hummel

The Bosch Group and Mann + Hummel GmbH have formed a joint venture to set up a local manufacturing facility to produce fuel filter systems plus oil, fuel, air and cabin filters for the Indian and export markets.

The two companies have a 50/50 share in the joint venture, which will invest INR350m in a factory in Tumkur, south India.

Production is expected to start by the middle of 2006.

Deepesh Rathore/Tilak Swarup

UK: Ford soon to introduce bioethanol cars to UK

Ford UK says the European launch of the new Focus Flexi-Fuel Vehicle (FFV) heralds an important landmark in Ford of Britain's plan to introduce cars capable of running on bioethanol into this country. Somerset County Council is leading the scheme, which, subject to European Union approval, would initially bring around 40 all-new Focus FFVs to the county early next year.

> "Ford has moved fast to launch a bioethanol version of the all-new Focus"

Ford Focus FFV

Andy Taylor, Ford's corporate citizenship director, said: *"Ford has moved fast to launch a bioethanol version of the all-new Focus which went on sale this year. All this would be for nothing without the simultaneous installation of a fuel supply infrastructure alongside the availability of bioethanol vehicles. The Somerset Biofuel Project is proving what can be accomplished when major players work towards a common goal."*

In Sweden 80% of Focus models sold since 2001 have been FFVs. The Somerset project draws on the Swedes' experience of establishing regional bioethanol distribution networks and the introduction of bioethanol cars.

Ethanol production from wheat

In Somerset, Wessex Grain is planning a bioethanol production plant on an existing grain storage site in Henstridge. The new facility would be able to convert 340,000 tonnes of wheat into 131,000,000 litres of ethanol a year at full capacity. Bioethanol for the first FFVs on the road in Somerset next year will be supplied by Wessex Grain from crops grown locally and processed elsewhere.

The 1.8-litre Focus FFV offers an overall 70% reduction in carbon dioxide emissions compared to the same petrol-only model. This is achieved by factoring in the CO_2 absorbed by the crop when grown prior to harvest for bioethanol production. The South West region, including Somerset, has a target to cut CO_2 emissions by 20% in the area by 2010.

> "Ford is a welcome and vital member of the Somerset Biofuel Project"

Ian Bright, sustainable development officer for Somerset County Council, said: *"In addition to reducing greenhouse gases, the bioethanol project presents significant opportunities for the county's rural economy. Ford is a welcome and vital member of the Somerset Biofuel Project, which is working to realise important environmental and economic benefits."*

In June this year Ford and 13 other major organisations signed a bioethanol declaration calling on the UK Government to support investment in renewable fuels, ensuring that at least 5.75% of transport fuels sold in this country are renewable by 2010.

Source: just-auto.com editorial team

Automotive partnerships – Fact or fiction?

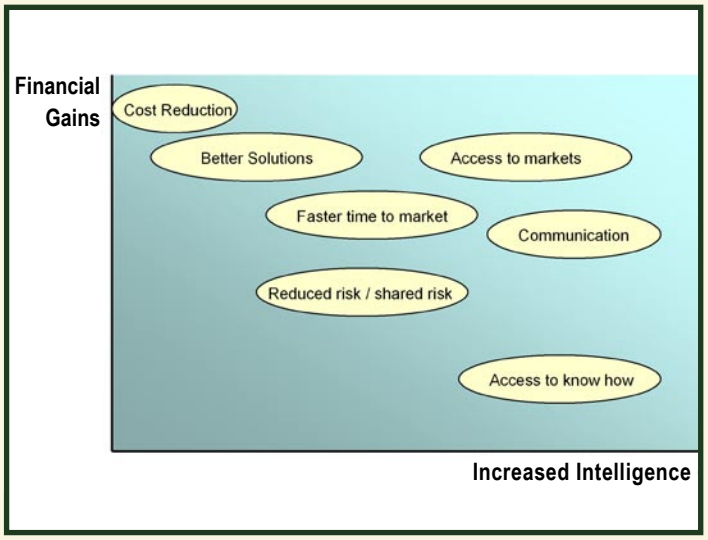
In the last 24-month period there is evidence of increasing editorial content and indeed some practical results of the syndrome generally given the name ‘partnerships’.

To be honest only very few of these would comply with the definition of an industrial partnership; two or more organisations working together for their mutual benefit, each supporting their own costs and without a stake in either’s ownership. Surely anything else can be classified as a variety of commercial relationships when a supplier and customer relationship can be defined?

Standing back and with a global view it is clear that our future calls for strengthening of ties, at home and abroad, by expanding our circles of influence and building partnerships. We operate in an information age where knowledge and expertise are valued – this has fuelled the growth of partnerships and the move away from giant corporations. Think of IBM, at the height of its influence it was a self-contained giant doing everything itself, but in today’s economy business functions differently.

Successful partnerships depend on mutual benefit, not national boundaries

Partnerships facilitate the key factors that drive success – innovation, expertise, speed and cross-fertilisation of ideas. Speed not size counts. This transformation and the ability of knowledge management can result in jobs moving to people, not people to jobs, an example being the move of software activities to the many small firms in India where work continues whilst the West sleeps. Companies are establishing operations where people live, instead of trying to move people to companies. From Lotus’ own experience we know this is needed with the establishment of our offices in Malaysia and China but it is not necessarily an easy change for people to accept. Successful partnerships depend on mutual benefit, not national boundaries. The Koyota Agreement is perhaps a good example but even here where the objective is obviously for the mutual benefit of the entire world, some national agendas remain in opposition.



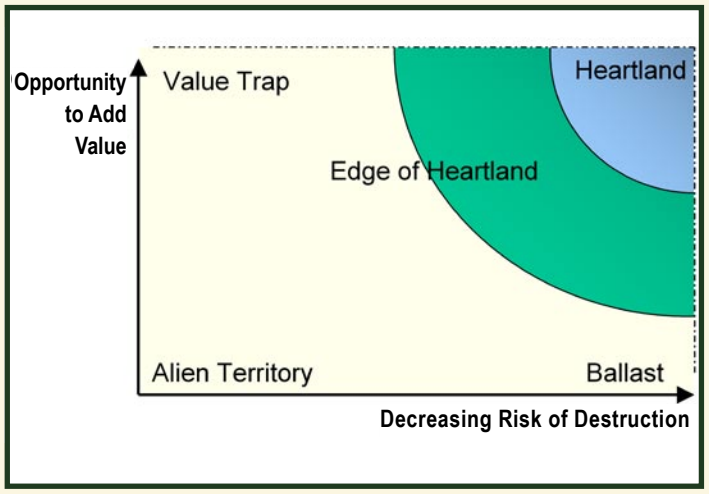
Benefits of partnerships

Generally, however, the concept of partnerships in national, public and academic environments has been shown to be capable of functioning and delivering results, this is partly because of their background of ‘cost centre’ funding rather than being immediately profit-results driven.

In the automotive world this is less clear.

Twenty years ago the OEM was in full control of the value chain in its product, with development to market being a traditional sequential process often taking six years. During the 90s increasing supplier integration became the norm, requiring process coordination and maximising productivity. More recently this has moved to OEMs outsourcing complete design, development and build programmes for whole products, three examples being the Renault Avantime by Matra, the BMW X3 by Magna Steyr and the Opel Speedster by Lotus.

These have moved from the traditional, simple make/buy decision and supplier/customer relationship to a complex set of relationships across many boundaries and departments within the OEM. They are moving towards something like a partnership but are not quite there, and require a substantial change of behaviour if a partnership is to be achieved. This is not the case in Lotus’ commercial experience, although a Newco joint venture arrangement may deliver the same results in a practical and less academic way. This is because a network partnership requires the group to ‘think as a whole’ for the benefit of the partnership and not individual components of it. Since these components (likely companies) actually employ people and therefore influence their personal lives, this will not work. Even if some are magnanimous enough to have the ability to put the partnership first it relies on personal relationships, which can, and do, change; the risk is too high. Indeed a recent pan-European survey amongst automotive companies suggests that the most critical factor in successful working between companies is by soft factors such as trust and respect.



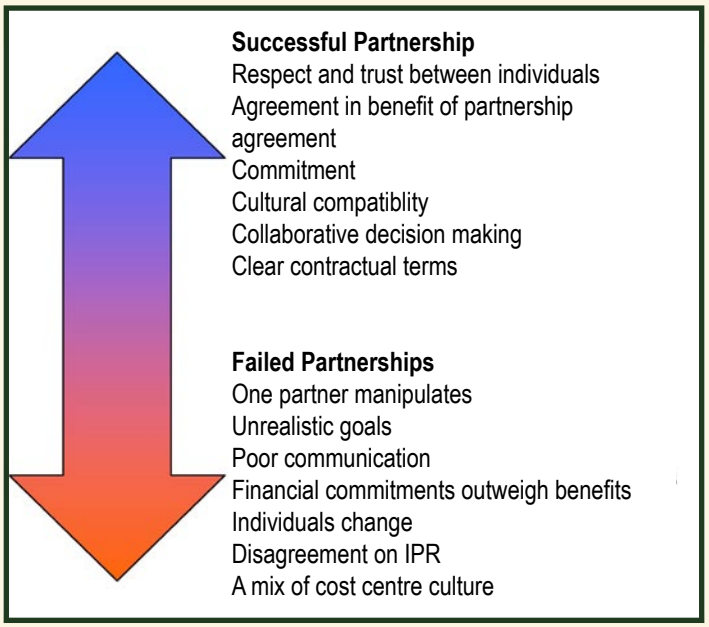
The parenting advantage matrix

Understanding cultural differences in partnerships

The 'Parenting Advantage Matrix' is a good method of determining how successful a partnership in industry will be between a 'Parent' (the larger, more powerful company) and 'Child' (the smaller company). The vertical axis on the matrix represents the ability to add value, ie the attributes the child has which can benefit the parent, for instance unique technology or low cost labour. The horizontal axis represents how well the companies can actually work together. To have a good working partnership between the parent and child, they not only need to both benefit from value adding company attributes, but the companies must also be compatible. How compatible one company is with the other can be dependent on many factors, for instance cultural, political processes and even language barriers. The 'Decreasing Risk of Destruction' horizontal axis is often overlooked when forming partnerships, but should be given as much consideration as the 'Opportunity to Add Value' axis.

The 'Heartland' area indicates a well-balanced partnership; the companies not only understand each other but also both benefit from value adding factors. This leaves three other extremes. The 'Value Trap' is where many partnerships find themselves, here they have identified each other's weakness and understand the benefits of working together. The problem is only identified when they actually try to do so, and are unable to work efficiently. The 'Ballast' area of the matrix is often a result of a once good partnership that has now passed its best. The companies have gained all they can from each other, so the value adding has diminished, but they still have a loyalty to one another that binds them together. There is usually little point in continuing. Finally 'Alien Territory' is a no-go area for a partnership; this is unlikely to happen, as it should be immediately apparent that there is no potential for the companies to work together.

Returning to the earlier example of Matra, Magna Steyr and Lotus highlights valuable learning from niche vehicle manufacturing partnerships.



What makes a partnership succeed or fail

Matra – Renault

Matra had been responsible for design and manufacture of the Espace since 1983, a successful product for both companies. In 1997 Matra and Renault contracted to produce the Avantime. Start of production was delayed over one year, sales returns were reduced from 50,000 to 20,000 p.a. and finally 10,000 p.a. Matra produced just over 5,000 units before closing the business due to poor financial returns.

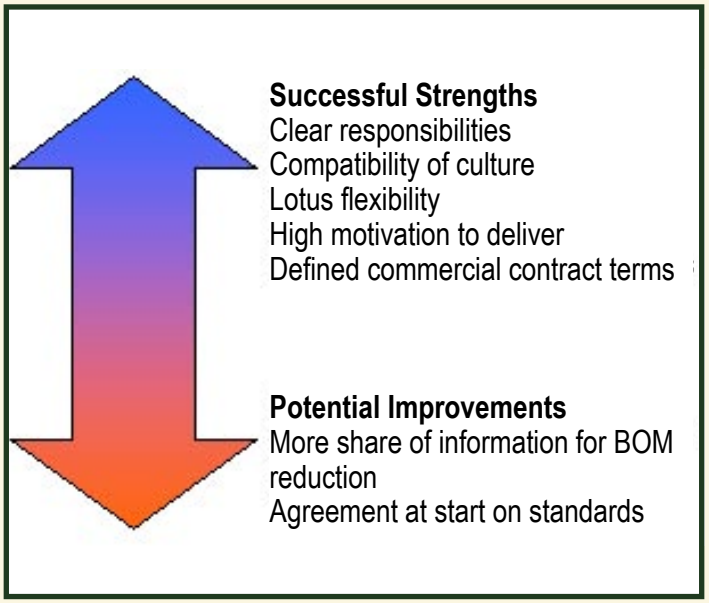
The aspects that could have been improved on include agreement of targets at the start, project monitoring and inclusion of agreement of risk sharing within the contract to manufacture. Maybe the companies had unwittingly moved into the 'Ballast' area of the matrix.

Magna Steyr – BMW

BMW remained responsible for design and concept of the BMW X3 with Magna Steyr responsible for completion of engineering and production. The project had clear targets and responsibility split defined at the outset, a trusting relationship between the individuals and a cultural fit. The result is a successful product and business. This clearly shows a partnership, which is working in the 'Heartland' area of the matrix.

Lotus – Opel/Vauxhall

Opel's desire for a halo product led to discussions in 1998. Opel was responsible for the styling design of the product, and Lotus was responsible for engineering, development and manufacture. The objective was a fast-to-market product with production over three years, starting in 2000. In the event, over 7,000 units were built over five years providing a unique product for Opel/Vauxhall and improved tooling and process flow learning for Lotus. The expectation of each company was detailed at the beginning within contractual terms. This also is a partnership working in the 'Heartland' area of the matrix.



Strengths and improvements

The future

The trends influencing the automotive industry could be summarised in three areas:

- Market, consisting of growth in Asia, value shift from OEM to supplier and commonisation of parts and platform.
- The impact of society; jobs in the West, traffic density, emission and fuel consumption.
- Cost increases of raw materials and price pressure.

All result in changes to technology and massive investment with high risks. This is likely to be an area where partnerships will truly be advantageous. Companies clubbing together, often under the support of national governments, for joint research, development of fuel cell technology or alternative recyclable materials being obvious examples. A partnership? At national levels possibly, at international less likely – competition and strategies will limit arrangements. There is no question that with these future challenges, partnerships or joint development activities will be an integral mechanism in meeting the commercial and technical needs of the next 20 years. However this will remain as a customer/supplier relationship, in its continuously developing form, where both the supplier and user bring increasing levels of knowledge and technology to the end product.

Simon Wood

How China could drive new wave of consolidation

The 1990s was characterised by merger mania as the automotive industry consolidated – suppliers and automakers coming together driven by the need to globalise.

Acquisitions, mergers and takeovers are nothing new in the industry. Over the past century smaller manufacturers have been swallowed by larger ones. What was new in the 1990s was the fact that the really big boys were getting together.

While consolidation has slowed into the 21st century, it still rumbles on, led now by the need of emerging automotive nations to globalise. This is why MG Rover has been of great interest to Chinese manufacturers.

There are well over 100 vehicle manufacturers in China – no doubt the domestic industry will consolidate over the coming years – but there are also a huge number of foreign nameplates, although largely locally-built, on the roads of Beijing, Shanghai and other major cities.

What you do not see is Chinese vehicles on the roads of London, Paris, Tokyo or New York.

Life in China is going to get a lot tougher for European automakers Volkswagen and PSA Peugeot Citroen

This is where MG Rover fits into the great scheme of things for the Chinese, and why Shanghai Automotive Industries Corp and Nanjing Automotive have shown such great interest. The British carmaker would give them a ready-made route into the heart of the European markets.

What they have to ensure, then, is that they can hit the quality and safety standards expected in those markets. This could lead to big opportunities here for European-based engineering specialists, many of which have already set up offices in China to try to win business there.

Chinese companies such as SAIC and Nanjing must not take their eye off the ball at home, however. Much of the consolidation of the 1990s was aimed at taking advantage of the burgeoning market in China and South East Asia.

General Motors bought into companies such as Isuzu, Suzuki and Daewoo, Renault aligned with Nissan while Ford has Mazda. Most of the big car manufacturers have forged joint ventures with the Chinese companies.

From just five manufacturing joint ventures between established Western and Japanese carmakers with Chinese partners ten years ago, there are now 28 arranged marriages in 15 cities.

There are now more brands offered and manufactured in China than in North America and the competition is tough.

The fierce competition means life in China is going to get a lot tougher for European automakers Volkswagen and PSA Peugeot Citroen.

Although they got a head start by setting up manufacturing in China more than 20 years ago, the ‘halcyon era’ has come to an end, according to Michael Dunne, president of Automotive Resources Asia.

From 1985 to 1998 the Chinese auto industry was highly regulated. Opportunities were limited for carmakers looking to set up operations and three of the five early joint ventures were snapped up by VW and PSA.

VW’s domination of the car market, through its early joint venture – producing the Santana – with Shanghai Automotive Industries Corporation has diminished.

From a market share that once stood at 53% it will now drop closer to 20% this year, according to Dunne.

Dunne said: *“People are now looking at the value proposition. There are more brands manufactured in China now, than there are in North America, and the Chinese preference is for Asian designed or influenced vehicles, which are cheap and reliable.*

“Automakers such as Ford and GM have been wise to leverage their Asian affiliates in China in terms of design input and this is something PSA and VW cannot call upon.

“Whereas once the market was dominated by larger saloons which the richer Chinese could afford, the volume is now at the lower end and the demand is for cheap and very modern vehicles.

“VW and PSA need to review and update their model ranges very quickly because life in China is going to get an awful lot tougher for them.”

So much for the future, what has happened to some of the higher-profile mergers of the past few years?

They probably don't come much bigger than DaimlerChrysler, the coming together of Daimler Benz and Chrysler Corp, which stunned the automotive world.

For a long time it has been an uneasy alliance as the Germans, rather than the Americans gradually took control. In business terms DaimlerChrysler had its ups and downs.

While the Mercedes-Benz brand still rides high, Smart remains a problem and Chrysler, like all of what was traditionally known as the US Big Three, continues to struggle in its home market, particularly against the European, Japanese, and now South Korean models being built in their own backyard.

The alliance of Renault and Nissan has been the most surprising success. Back in 1999 many thought this was two hopeless cases trying to hold each other up.

Under the astute management of Carlos Ghosn, however, Nissan has been turned around and economies of scale have been achieved – not that Mr Ghosn is satisfied yet.

Now CEO of Renault and Nissan, he has said he is not happy with Renault's performance outside France, particularly in Brazil where it is using only 35% of installed production capacity and not making a profit.

Carlos Ghosn: Astute management

BMW focused on the UK for its acquisitions and while many deem the purchase of the Rover Group in the early 1990s as a failure, the German automaker has ended up with New Mini, one of the real success stories in vehicle terms of the past decade.

Still in Germany, Volkswagen has, over the years, acquired a varied portfolio of brands, including Audi, Skoda, Seat, Bentley, Lamborghini and Bugatti.

Some alliances have been forced and in the case of the South Koreans it has worked out pretty well. Through the mid-1990s the Korean industry was on a roll, expanding globally and predicting world domination backed by huge loans from the banks at home.

With such massive gearing, the Korean industry was an accident waiting to happen and it crashed, along with the Asian economy in 1998.

Daewoo was bought by GM but Hyundai kept a grip and pulled its rival Kia under its wing. Sensible strategies have since emerged. The 25 platforms the two companies had will eventually be reduced to just seven.

Dominant sales at home, built largely through a sudden lack of domestic competition and huge tariffs on imports were backed by growing sales overseas.

In the United States, Hyundai's increasing market share has led it to build a new factory there while Kia's position as the fastest-growing marque in Europe is being re-enforced by its own new plant in Slovakia due on line at the end of 2006.

Where do the next mergers or acquisitions come from? Well, let's see who's available. There are those who have yet to make a move – Toyota, Honda and PSA – itself the result of an earlier merger between Peugeot and Citroen.

PSA chief Jean-Martin Folz has consistently railed against mergers or acquisitions. His strategy is to form partnerships, which PSA continues to do successfully with the biggest names – Toyota, Ford, BMW, Renault etc.

Such alliances bring economies of scale in terms of development and manufacturing costs while allowing the company to keep its own identity. It's a strategy that appears to be working for PSA although it may want to do more to stay on the pace in China.

Toyota and Honda – as well as Porsche which is arguably the most profitable vehicle manufacturer in Europe – seem happy and secure enough to continue on their own with strategic alliances as and when necessary.

When thinking of future consolidation it looks as though most of it will be seen in China and India as the market grows in those two countries.

By Chris Wright and Anthony Lewis

Body and paint operations

When you walk up to a new car the first thing that should catch your eye is the sun gleaming off of the perfectly polished paintwork. However, no matter how well designed or built it is, a poor finish will create a negative impression before the customer has even sat in the driver's seat.

Here at Lotus not only did we need to source a high quality paint to finish our product, but also one that was water-based with low temperature curing properties. We worked closely with Dupont to validate their new water based paint system here at Lotus during the late 90's, and have continued over the years to innovate and try new ideas within this partnership.

Over the past two years we have made great improvements to staff training, the process, materials, and facilities, which have meant real gains for the full spectrum of the Key Performance Indicators (KPIs). How well we have reached our objectives will primarily be judged by technical testing performed by both Lotus and Dupont, our preferred paint supplier, feedback from any warranty claims, and of course customer satisfaction.

To run our successful manufacturing department here at Lotus we need the *"4 M's":* Man, Machine, Materials and Method. When all the *"4 M's"* come together in harmony to create the perfectly finished car, it is called a *"Gun Finish"* by our Paint and Body department. This means *"a painted car set that has had no paint rectification carried out other than a de-nib of dirt"*, or minor repair area that causes minimal damage to the clear coating. Reaching this level of perfection takes a number of stages.

Stage 1 – Knowing your tools. To maximise the usage of materials we must first fully understand them. The clear acrylic layer that sits on top of the colour coat and acts as a shield (see Figure 1) is the hardest and toughest part. Once applied, the topcoat will take up to two weeks to cure, meaning any polish rework cannot be carried out too early because it could require more work in the future before it leaves the factory. Additional polishing will also be required to remove any marks after build and part cure has occurred.

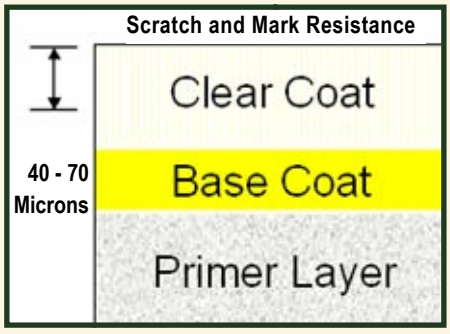


Fig 1: Illustration of the paint system

Stage 2 – Changing habits. We must then address how to change the processes that have always been followed. How can we influence our staff and adapt their behaviour? To accept the need to change we have coached and retrained our team here at Lotus.

Stage 3 – Gaining confidence. By continuously feeding back the advantages of our new systems through quality data within the manufacturing division, paint supplier audits and customer feedback, we have gained confidence. This has in turn led to further enhancements to the evolving concept.

Stage 4 – Making the grade. A *"Gun Finish"* to us now means that all of the inaccessible areas of the unassembled car are polished within the main paint facility. Faults in the paint are then graded to determine whether they can be reworked at a later stage without the need for further paint application, known as a blow in, or investigated further by the operator. One of our operators can then use abrasive materials to investigate the fault before giving the car its final polish.

Should a fault be too severe for a minor rework, the part will be rejected and passed back for reworking before returning to our production line.

A key advance that has assisted the evolution of the process was the introduction of a "High Build Primer". Developed in conjunction with Dupont, this product has enabled vehicles to be primed in a single pass. It also has the ability to hide minor panel defects reducing the amount of rework necessary.

Stage 5 – The future. The focus for the future will centre on: Investigating methods to cure the paint system in a more efficient manner to reduce stress on both the substrate panel and the system itself.

Working to reduce the amount of dirt within the paint system itself, which can lead to reworking.

Testing new primer systems that will require minimum preparation work prior to colour and clear coating.

Summary

Next time you walk past a new Lotus car take the time to notice the top quality finish that has been created by our hardworking team here at Hethel.

Performance partnerships

OEMs continue to increase the diversity of their vehicle range and shorten product lifecycles to meet an expanding consumer demand for differentiated, focused products. This places huge demands on large organisations to handle the high-speed programmes within their product development teams, while continuing to deliver such vehicles engineered and built to a high quality.

Lotus Engineering has a long history of working closely with such organisations to help them realise such ambitions. More recently this has included the development and manufacture of the Opel Speedster/Vauxhall VX220 for General Motors. The fact that Lotus Engineering and GM worked together on previous projects meant the necessary trust to contemplate such a venture was already in place.

Vauxhall VX220

A central group between GM and Lotus was established to manage the programme to a rapid timescale by the use of a gateway process encompassing all aspects of production readiness, from design through to aftersales. Such a process, combined with regular vehicle reviews, focused the input of key decision makers on both the product and business case status.

A project centre housed all team members, with all essential facilities (including studio, prototyping, vehicle workshops, and production facility) within easy walking distance – true co-location is not always as easy to achieve. Strong support from key suppliers showed them taking design roles within the project team in some instances.

Technical confidence within the parent partner was enhanced through engaging key stakeholders throughout the engineering organisation, from its leaders to individual technical specialists. Tailored validation programmes were jointly agreed, to recognise and match the unique duty cycle for a performance product. Working with a specialised company enabled GM to recognise the benefit of supplementary tests, such as racetrack endurance, while streamlining others to save cost and time.

The benefits for GM of working with Lotus, a ‘whole vehicle’ company, were also seen beyond the engineering environment. Specialist support was available across all aspects of a whole vehicle project, including process engineering, manufacturing, ‘low-volume’ supply base, aftersales parts, service and support networks, vehicle distribution and so on. Reciprocal benefits from GM to Lotus included quality systems development and specialised support.

The success of the partnership led to a major follow-on contract to produce a turbo-charged variant of the Speedster, also incorporating other upgrades to interior, bodywork and suspension. Like its predecessor it collected many industry awards, for its brilliant yet affordable performance, and further grew brand awareness and reputation.

Vauxhall VX220 Turbo

In addition to the main vehicles produced by the partnership, there were the benefits of numerous spin-off programmes; for example, the record breaking Eco Speedster to raise the profile of GM’s diesel engine range, and the race-spec Vauxhall VXR220. Effectively ‘niches within a niche’, such products enabled further cost-effective brand building and set a bold direction for new products.

In the future, there will almost certainly be an increasing demand for niche products, spreading beyond the major OEMs into the emerging automotive players, and constantly driven by more focused market segmentation.

Partnerships will continue to grow in complexity, with a web of relationships spanning sales and marketing, product development, manufacturing and components. Arrangements to share assets, knowledge and risk, can be complicated to set up and companies that are best able to engender the trust essential to the process will be at the fore.

Extremes of all kinds – performance, luxury, mobility, fuel choice, security, will continue to provide a rich seam of niche vehicles. Partnerships between large organisations covering many such niches, and smaller companies specialised in their field, will continue to be the most successful method of delivering those products.

Vauxhall Eco-Speedster

In the future, there will almost certainly be an increasing demand for niche products spreading beyond the major OEMs into the emerging automotive players

Lotus Engineering has a commitment to develop its expertise across a wide spectrum of operations essential for success; seeking out and developing new and competitive suppliers across the globe; vehicle and powertrain engineering teams working in client environments or Lotus project centres worldwide; high quality manufacturing both in the UK and Malaysia; and vehicle distribution, sales and aftersales support in more countries year by year.

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