

China's automotive industry

Executive Briefing



Supporting the growing maturity of China's automotive industry: the role of simulation software

Enabling efficient and sustainable manufacturing processes in the Chinese economy

Abstract

China, the country that is increasingly known as the factory of the world, is now supplying leading Western automotive manufacturers with high quality parts, while local automotive companies are working more and more as part of joint ventures with leading brands such as GM, Ford and Fiat.

But manufacturers now recognise that to take full advantage of opportunities presented by the indigenous market - as well as exports - they need to adopt best practice processes underpinned by manufacturing simulation techniques.

Just having lower cost, more plentiful resources to throw at the manufacturing process is not enough: global brands will increasingly demand that third party suppliers use the same simulation software as they do when building manufacturing and supply chain processes.

This is not just important from a cost point of view - China is increasingly aware of the green agenda and needs to demonstrate its ability to reduce carbon emissions in line with global targets.

This paper looks at how the Chinese automotive sector is meeting the challenges of the automotive industry and the role that simulation software will play in developing best practice. In our view, the sector is not just growing in terms of volume - it is also growing up fast. This is no longer a young market, but is rapidly growing in maturity and global influence.

The paper also outlines Lanner's experience and expertise in developing simulation software for the automotive sector, and includes a case study about how GM Shanghai is already using Lanner's WITNESS software to reduce costs and improve productivity.

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Background

The Chinese economic miracle has fascinated business commentators for the past decade. Overall, China's GDP grew by only 6.8 per cent in Q4 2008, the lowest rate of growth for 10 years. Since then, the market has recovered, with the Chinese Government predicting a further 8 per cent growth for 2009. In September 2009, both the China Federation of Logistics and Purchasing and the HSBC China Manufacturing Index reported manufacturing growth – the latter for the fifth month in a row.

One of the drivers for recovery is the automotive sector. China is now the world's largest automotive market, drawing from two main sources for its success: foreign exports and domestic sales. The market dipped at the end of 2008 in line with the global recession: its reliance on the US marketplace in particular meant it was vulnerable to the downturn in demand for imports and for investment. In response, the Chinese Government has introduced effective fiscal stimuli to encourage growth.

The local Chinese market is addressed by indigenous vendors such as Great Wall, Foden, Chery, Wuling and Xiali, many of whom manufacture small, light vehicles that are suitable for Chinese consumers and businesses. The Government also changed tax

arrangements to encourage the purchase of vehicles with engines below 1.6 litres.

More recently, those vendors have also been joined by the big brand names of the global industry, such as Buick, Toyota, Ford and GM.

The approach taken by the big global brands has been to establish joint ventures with local vendors. The Chinese Government is keen to promote low-emission vehicles and stimulate automotive manufacturing in its central region, and has provided funding for foreign companies to establish JVs with indigenous vendors.

The stakes are high. In July 2009, for example, Fiat entered into a JV with Guangzhou Automobile Group to make new cars and engines from 2011. Together, Fiat and GAC will invest more than \$557 million in a new production plant.

Sales of locally produced vehicles have also been driven by legislation introduced to stimulate the economy in January 2009. The Government now provides subsidies to buyers of light commercial vehicles in rural areas, and this has had an impact on the industry already, with dealers ordering inventory in anticipation of greater demand through the rest of 2009 and beyond.

The Challenge

Despite the success of the Chinese automotive sector, it is not without its challenges. According to a study¹ by Mercer Management Consulting published in 2005, production costs were 10 to 20 per cent higher in China than in other regions. The main reasons for these high production costs, said Mercer, were high costs for raw materials and subcontracted parts and components, and low productivity.

This is not wholly surprising. As an emerging economy, China did not have the same long legacy of industrial and engineering know-how as the West, nor the same levels of understanding about how information systems can add value to organisations and processes. Until recently, manufacturers have been more likely to address productivity issues by adding more human resources to the problem than to apply new technologies such as simulation software to planning and optimising business processes.

The enormous growth of the Chinese automotive market is exacerbating the problem. Demand from the indigenous population and from partners in JVs requires a much faster speed of build than most companies are capable of using sub-optimal processes.

The availability of investment from the West or from the Government means companies were more likely to build a new factory than improve internal processes.

But the industry is growing not just in volume, but also in maturity. Today companies with global operations who are moving into the Chinese market are bringing their knowledge of simulation software to bear on joint ventures – just as they have done in other emerging economies such as Russia. Indeed, companies such as Ford request that companies who want to supply parts to their vehicles build their models using Lanner's WITNESS simulation software.

As a consequence, indigenous Chinese companies are also learning about the benefits of simulation software to the automotive sector. This is also being driven by the fact that simulation software is now very much on the curriculum of Chinese universities, from which hundreds of thousands of newly trained engineers graduate every year. Over time, simulation software will be seen as a normal element of automotive manufacturing and engineering, rather than a novelty.

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Sustainable supply chains

executive briefing

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The benefits of simulation software include the ability to model processes within the manufacturing and supply chain environment so that they are as cost-effective and efficient as possible – even before companies commit investment to building new facilities. Increasingly, Chinese companies are also considering the environmental impact of their operations, and this can also be modelled using simulation software.

It is not just indigenous automotive companies that need to adopt simulation software when operating in China. The global supply chain for the automotive manufacturing sector is

necessarily complex, and a huge industry has already sprung up in China for automotive parts and spares.

There is also a requirement for automotive manufacturers to understand the financial and ecological balancing act between manufacturing in China and distributing new vehicles in the West. Global brands must understand cultural differences between the West and the Chinese market, which requires smaller, greener vehicles. They must avoid making cars that people don't want, or can't afford. Getting those calculations wrong can mean the difference between market leadership and failure.

A New Approach

“the world's most successful automotive manufacturers and suppliers are using Lanner's WITNESS simulation software”

Simulation software can help organisations in the automotive sector to manage the constant change that they face on a daily basis.

Automotive manufacturers and suppliers alike are under constant pressure to shorten lead times while reducing costs and responding to rapidly changing or globally different consumer demands.

In an industry where success forces companies to implement many complex changes so quickly, the risks of making mistakes are enormous. Lanner's simulation software can help organisations make changes with the certainty that they'll achieve their intended results before they commit to them. Many of the world's most successful automotive manufacturers and suppliers are using Lanner's WITNESS simulation software.

Lanner's heritage in the automotive sector

“Ford, Michelin, Nissan, ArvinMeritor, Cummins, DaimlerChrysler, Delphi, General Motors, Honda, Johnson Controls, TRW and Uniroyal”

Lanner's heritage in the automotive sector stretches back as far as 1978, when the world's first visual interactive simulation tool was developed in the operational research department of British Leyland Motors, which subsequently became AT&T Istel. Lanner Group was formed by an MBO from AT&T Istel in 1996 and is now recognised as the world's leading business process simulation and optimisation organisation.

WITNESS has been used extensively within the automotive industry for over 15 years, by organisations that include Ford, Michelin, Nissan, ArvinMeritor, Cummins, DaimlerChrysler, Delphi, General Motors, Honda, Johnson Controls, TRW and Uniroyal. It is the de facto standard for simulation models in the global automotive marketplace.

One of the strengths of WITNESS is its flexibility. The software is ideally suited for use in the automotive industry, where material delivery, production, and distribution involve such diverse processes.

- Demonstrating capability and compliance to key stakeholders to prove plant performance
- Applicable throughout the retrieval, processing and encapsulation processes as well as supply chain and logistics requirements

- Provides increased performance through better resource utilisation and identification of bottlenecks
- Enables reduced operating costs and lower capital expenditure by engineering a solution to meet the needs of the business

Lanner's automotive customers have used WITNESS to address issues in such areas as:

- trim operations
- paintshop
- body assembly
- powertrain
- stamping operations
- material delivery logistics on application areas such as:
 - production design, planning and scheduling
 - facilities layout
 - supply chain logistics
 - capital equipment justification
 - engineering process improvement

Companies report improved confidence in decision making, better communication of recommendations and team integration, and faster buy-in to proposed changes.

In Practice

GM Shanghai

GM has eight joint ventures and two wholly owned foreign enterprises as well as more than 21,000 employees in China. Products are sold under the Buick, Cadillac, Chevrolet, Opel, Saab and Wuling nameplates. GM and its joint ventures sold 1,094,561 vehicles in China in 2008.

Shanghai GM Dong Yue Motors Co. Ltd. is a joint venture manufacturing facility situated in Yantai, Shandong. Shanghai GM holds a 50 percent stake and oversees the company's management. GM China and SAIC each hold 25 percent stakes in the facility, which manufactures Chevrolet brand vehicles. The plant has an annual capacity of 240,000 vehicles.

Shanghai GM Dong Yue Automotive Powertrain Co. Ltd. is a joint venture located in Yantai, Shandong. Shanghai GM owns 50 percent, while GM China and SAIC each own 25 percent. The facility has an annual capacity of 375,000 engines and supplies engines for vehicles manufactured by Shanghai GM.

Shanghai GM Dongyue Powertrain has designed and implemented cost-effective and efficient facilities using Lanner WITNESS simulation software. Speaking at Lanner's recent China user conference, which was held at Tianjin Polytechnic University, Mr. Zhou Baoyuan, IE engineer at Powertrain, said: "Seamless workflow is our goal. Efficient inventory management and work in progress (WIP) have been regarded as important KPIs to keep car engine assembly lines running but at lower costs.

"We used to manage WIP levels within each work cell by experience. However, this could cause problems when we could not foresee random events such as machine breakdowns, schedule changes and re-setting assembly lines for new models. WITNESS simulation provides us with a way to try out and optimise processes by simulating the assembly line running with various conditions in place. As a result, we have successfully cut down the WIP by 20% and reduced the assembly line re-setup time by one hour."

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Nissan

When Nissan Motor Co. Ltd planned to establish a £100 million production plant in St Petersburg, Russia, it sought guidance from the team at Sunderland-based Motor Manufacturing (UK) Ltd in the UK. Using Lanner's WITNESS simulation suite, NMUK produced a model of the St Petersburg paintshop using CAD and performance data to demonstrate to the Russian team and paintshop developers Durr how simulation technology could drive production at the new site.

The WITNESS model enabled users to visualise how to control the flow of vehicle production in the paintshop. By using WITNESS software to design a model of the Russian plant before it began production Nissan's Russian team were able to future gaze events before they have taken place. This is invaluable as it eradicates potential mistakes and inaccuracies

in production methods, which means the paintshop team can be confident that they start on the right footing, enabling them to meet their targets from day one.

Anthony Timmiss, Engineer at NMUK, who designed the WITNESS model for the St Petersburg paintshop, said: "It is exciting times for Nissan with the launch of the new assembly plant at St Petersburg. The Russian automotive market has seen huge growth in the last few years and this is expected to increase significantly in the next three or four years. Having successfully used Lanner's WITNESS at the Sunderland plant to drive production of the Qashqai model, Nissan decided to implement the simulation technology in St Petersburg to help fulfil production of 50,000 cars. WITNESS is ideal as it is easy to implement and use, cost effective and offers highly accurate predictions.

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Volvo

Volvo's Gent plant in Belgium relies upon Lanner's WITNESS simulation software to continually optimise efficiency and productivity in the plant, and maintain its reputation for quality.

In particular, WITNESS helps Volvo to identify the optimum approach for new or revised car manufacture for models including the V50, C30, S60 and the new XC60; prove scenarios in a virtual environment before investment is committed; and identify and remove blockages and bottlenecks in the production process.

Conclusion

In many ways, the Chinese automotive industry is a victim of its own success. As the world's largest steel manufacturer, it has access to the raw materials needed to build huge numbers of vehicles for its own market, as well as for export. It also has the resources to build as many factories as are required, as well as design innovation leadership and engineering skills.

The last piece in the jigsaw is the design and management of factories and manufacturing / supply chain processes. The automotive market can only continue to grow in China: the companies that lead the industry onto a global stage will be those who understand the multiplier effect of good process design using simulation software.

1 'Chinese Automotive Market 2010' by Mercer Management Consulting

About Lanner

Lanner is transforming the way managers and service owners in large, complex organisations improve delivery and process performance. Lanner is organised to add value at each stage of a customer's journey offering consulting that provides guided discovery and expert analysis of the problem, applications that empower process users and increase an organisation's ability to improve and save money, and automated simulation components embedded in leading software suites. Lanner's proven

simulation and planning technology is supplied to simulation professionals through its Witness® brand and as embedded components to software developers under its L-Sim™ brand. Based in the UK with subsidiaries and partners in Europe, The Americas and the Far East, Lanner applications are used by more than 3,500 companies globally and its services group has delivered projects to over 1,000 customers. www.lanner.com