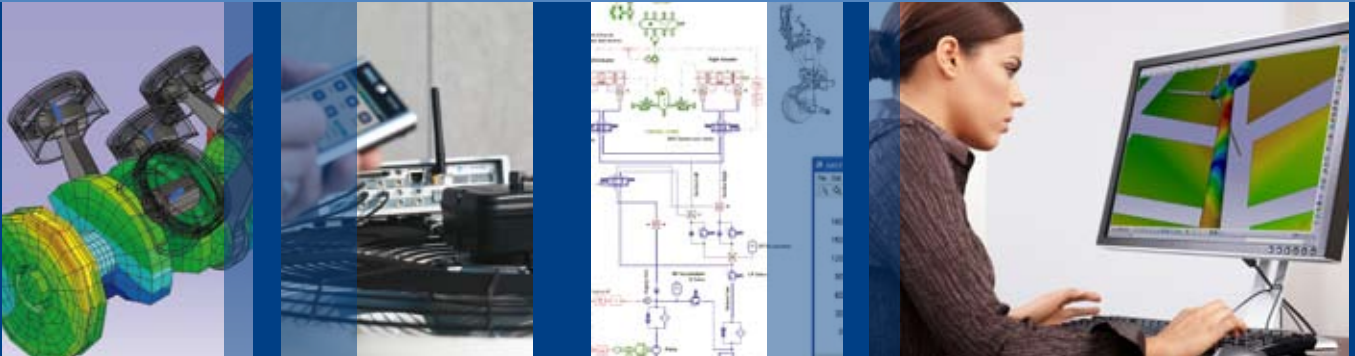


# LMS Engineering innovation



# LMS, the engineering innovation partner for manufacturing companies worldwide

LMS knows how to help customers get better products to market faster and turn superior process efficiency into key competitive advantages. With a unique combination of 1D and 3D simulation software, testing solutions and engineering services, LMS tunes into mission critical engineering attributes, ranging from system dynamics, structural integrity and sound quality to durability, safety and power consumption. With multi-domain solutions for thermal, fluid dynamics, electrical and mechanical system behavior, LMS can address today's complex engineering challenges associated with intelligent system design.

With approximately 30 years of experience, LMS has developed truly unique competences and integrated solutions that can empower an innovative way of engineering – one that supports manufacturers in the race to get products out right-the-first-time. The results are dramatically shortened cycle times, superior products that truly excite customers as well as reduce development costs and risks.

Thanks to our technology and dedicated people, LMS has become the partner of choice of more than 5,000 manufacturing companies worldwide. LMS operates through a network of subsidiaries and representatives in key locations around the world.

## LMS helps manufacturing companies...

### Compete with innovative designs

Innovative design and radical new product concepts represent a solid basis for growth and profitability. Winners of the product innovation race often combine a talent to mobilize knowledge and creativity with product development and go-to-market speed. Manufacturing companies rely on LMS solutions to eliminate non-value-added tasks, frontload key design decisions early in the development phase, and explore new product concepts in the shortest possible time. LMS can also improve active system performance engineering – a key innovation driver in mechanical product design.

### Deliver the expected brand values

Creating innovative and attractive products is not just about producing visually attractive designs. Mission critical attributes need to be refined from the early design stage onwards. Using LMS simulation, engineering teams can quickly analyze a multitude of design options to find the right balance. This approach results in better decisions during the early development stages and helps engineer product performance to reflect the core brand values that create passion.

### Expand and renew the product portfolio

Today's consumer expects choice: products that directly address niche markets and specific customer requirements. With more models and options, the development process needs to be dramatically shortened not just to save costs, but also to cope with the increasing number of product releases. LMS helps manufacturing companies speed up their development process by analyzing "real-life" design performance much faster and much earlier in the process as well as accelerating time-consuming physical prototype testing.

### Optimize overall product quality

LMS offers the right solution mix to successfully set targets, detect and adjust design flaws in the early concept stages, accurately assess and refine product performance using validated virtual models, and efficiently validate the final design using advanced prototype testing techniques. LMS customers not only measure their return on investment in terms of faster time-to-market and reduced development costs, but also in terms of improved product quality and reduced warranty and product recall issues.

**“LMS helps meet the challenges of every engineering department – tight development schedules, budget restrictions and higher product expectations.”**



### Addressing a complete range of critical engineering attributes

- Structural integrity
- System dynamics
- Vehicle dynamics
- Comfort
- Noise and vibration
- Sound quality
- Durability
- Safety
- Performance
- Power management
- Fuel economy and emissions
- Fluids
- Electromechanical systems
- Thermal management

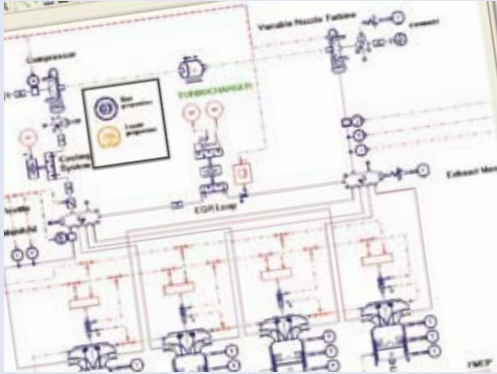
### A unique combination of simulation software, testing systems and engineering services

- 1D simulation software to model and analyze multi-domain system behavior
- 3D simulation software to simulate and optimize functional performance
- Integrated solutions for test-based engineering, refinement and validation
- Engineering services for troubleshooting, design refinement, technology transfer and co-development

### A solid partner with global experience

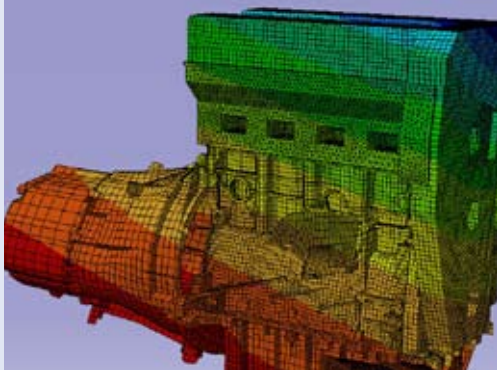
- A global engineering innovation partner for more than 5,000 manufacturing companies
- Approximately 30 years of experience in mission critical engineering disciplines
- An international approach to customers backed by a global network of experts
- Continuous R&D investment backed by a strong financial track record

# LMS, a unique portfolio of engineering innovation solutions



## **LMS Imagine.Lab AMESim** The integrated platform for 1D multi-domain system simulation

LMS Imagine.Lab AMESim offers a complete 1D simulation suite to model and analyze multi-domain intelligent systems and predict multi-disciplinary performance. Model components are described using validated analytical models that represent the system's actual hydraulic, pneumatic, electric or mechanical behavior. All the user has to do is assemble pre-defined components from validated libraries to create a physics-based model of the system. Using this functional system mock-up, LMS Imagine.Lab AMESim accurately simulates intelligent system behavior long before detailed CAD geometry is available.



## **LMS Virtual.Lab** The integrated solution for 3D functional performance simulation

LMS Virtual.Lab offers an integrated software suite to simulate and optimize the performance of mechanical systems for structural integrity, noise and vibration, durability, system dynamics, ride and handling and dynamic motion and other attributes. LMS Virtual.Lab covers all the process steps and required technologies to perform an end-to-end design assessment in each key discipline. Using LMS Virtual.Lab, engineering teams can build accurate simulation models, simulate their real-life performance, quickly assess multiple design alternatives and optimize designs before prototype construction.



## **LMS Test.Lab, LMS Test.Xpress and the LMS SCADAS family** An unrivaled suite of test-based engineering solutions

LMS offers a full range of data acquisition systems and analysis software for noise, vibration, acoustic and durability engineering. The LMS Test.Lab suite for test-based engineering includes solutions for rotating machinery, angle domain, structural and acoustic testing, transfer path analysis, environmental testing and vibration control. LMS Test.Xpress offers dedicated solutions for acoustics and vibration qualification testing. The data acquisition hardware from the LMS SCADAS family ranges from compact mobile units, autonomous smart recorders up to high channel count laboratory systems. For durability engineering, LMS offers dedicated solutions for mobile data acquisition based on LMS SCADAS, and a full suite for durability test data processing and analysis.



### **LMS Engineering Services** **Solving critical engineering challenges**

LMS Engineering Services counts on its globally minded team of over 100 multi-lingual engineers to help customers optimize product designs and address tough engineering challenges. The LMS Engineering Services team has decades of experience solving engineering challenges that manufacturers across various industries must meet head-on.

LMS simulation and testing experts are ready to address critical engineering projects – openly sharing know-how and best practices and troubleshooting to support the development group from concept to final validation. Making the difference between a successful product launch and costly repairs or even failures, the LMS approach to functional performance engineering can truly be a strategic competitive advantage for every company.



### **LMS Customer Services** **A partnership for your success**

LMS supports its customers with engineers who not only understand the hardware and software, but also master the related engineering applications. Extensive training, seminars, and on-site services help our clients' technical staff gain and maintain their software and system know-how. LMS offers a complete portfolio of professional services, including the full installation management, hardware calibration, on-site training and support, and continuous knowledge transfer.

The final result is a win-win situation: an optimal return on hardware and software investment in terms of optimized engineering team productivity and up-to-date systems with the latest technology and application developments.

# Driving engineering innovation in a wide range of industries



Through its technology, software and people, LMS has become the partner of choice for Fortune 500 companies in the automotive, aerospace and other advanced manufacturing industries around the world.

## Engineering the passion

With 30 years of experience in automotive engineering, LMS has built long-standing relationships with most automotive OEMs. Simply stated, LMS lets their engineering teams develop a function-driven product development process. Our automotive solutions and expertise cover all the key vehicle engineering domains, ranging from vehicle dynamics, durability and safety to NVH, comfort and sound quality. With multi-domain simulation solutions for thermal management, internal combustion engines, transmission, electrical and mechanical system behavior and fuel cells, LMS can address the complex engineering challenges associated with today's intelligent vehicle designs.

## Meeting engineering challenges of ground vehicle suppliers...

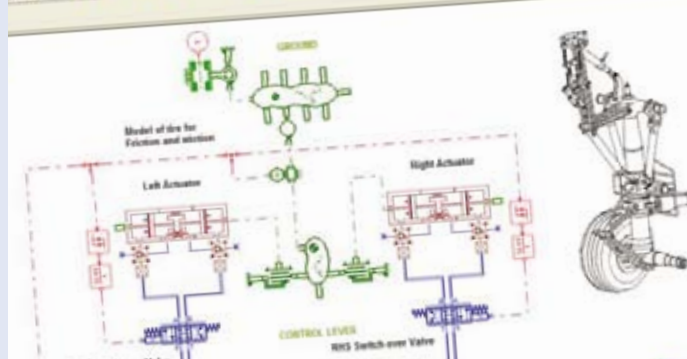
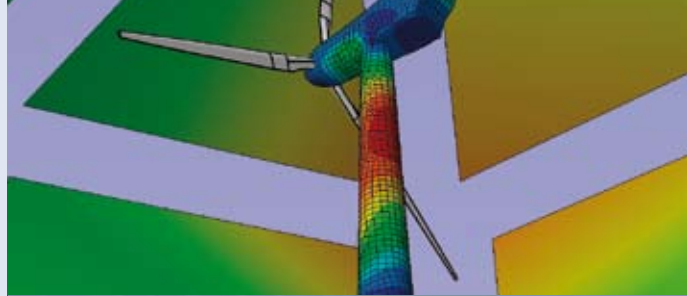
Companies like Aisin Seiki, Bosch, Continental, Delphi, Denso, Michelin, TRW, Valeo, Visteon and ZF rely on LMS solutions to engineer automotive components and subsystems. They apply the most advanced simulation and testing techniques to optimize the NVH and durability performance of suspension systems, chassis components and body parts. They predict the

dynamic performance, durability and acoustic quality of engine, transmission and driveline systems. They optimize the NVH performance of trim, seats, dashboards and complete car interiors. They engineer components and systems for optimal thermal, fluid dynamics, electrical and mechanical system behavior. They all have one thing in common: LMS simulation and testing solutions are at the core of their engineering processes.

## ... and the most diverse ground transportation industries

Manufacturers of trucks, buses, motorcycles, rail vehicles, tractors and other off-highway vehicles face similar challenges as the automotive manufacturers. They need to transform their development processes to accelerate the going-to-market speed, while controlling costs and risks. They experience increasing market requirements in terms of performance, security, comfort, fuel efficiency and durability. Due to extreme operating conditions and low production volumes, successive prototype testing is often not an option for these manufacturers. LMS lets them address critical functional performance aspects using extensive 1D/3D simulation to refine and validate their products with solid test-based engineering processes.





### Engineering tomorrow's aircraft and space systems

Aerospace manufacturers are faced with the challenge of designing systems and components that have to be safer, more reliable, cheaper to operate, deliver better passenger comfort, and have less environmental impact than their competitors. In addition, they have to systematically reduce development times in order to get new products to market earlier. Yet, only a few prototypes are available and, in most cases, only towards the end of the development cycle. LMS helps aerospace companies around the world like Airbus, Boeing, Bombardier, Cessna, Dassault Aviation, EADS, Embraer, ESA/ESTEC, Gulfstream, Hughes, Lockheed Martin, NASA, ONERA, Pratt & Whitney, Rolls-Royce, SNECMA and TRW to face these tremendous engineering challenges.

### Supporting functional performance engineering in a wide range of industries

In the face of unrelenting global market pressures, manufacturers of industrial machinery, consumer and business electronics, power generation plants and even medical equipment must deliver innovative products that outperform the competition and meet or exceed customer expectations. But how do you contend with tight development schedules while satisfying tough quality standards and budgetary constraints? How can you proactively engineer your products to meet safety requirements, comply with regulations, deliver the required user comfort and reinforce brand values? Just ask ABB, Atlas Copco, Bosch, Ericsson, Fujitsu, Heidelberger Druckmaschinen, John Deere, Mercury Marine, Miele, Picanol, Philips, Siemens, Thomson and Westinghouse. LMS helps these manufacturing companies and many others develop products that meet the most stringent engineering and business targets.

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