

# Scania Trucks Just Keep Going

Scania Extends its Development Proficiency with LMS Virtual.Lab and LMS Test.Lab



Over the last century, Scania has become a leading global manufacturer of heavy trucks. To further extend its own profitability and to successfully conquer new emerging markets, Scania is optimizing its vehicle development activities towards higher degrees of innovation and efficiency. To increase the emphasis on CAE-driven development and the level of process integration, Scania is building its future success on industry-standard CAE and Test solutions, such as LMS Virtual.Lab and LMS Test.Lab.

Scania, the Swedish manufacturer of heavy trucks, buses and engines, offers high-quality vehicles and services that enable its customers to efficiently transport goods and passengers by road. Its truck operations concentrate exclusively on the most profitable segments, namely heavy trucks intended for long-distance haulage, construction haulage and goods distribution. In times of shrinking truck demand, Scania has succeeded in gradually strengthening its global Number 1 position in terms of profitability. According to Per Holst, Scania's Head of Laboratory Technology, "The key for success is to deliver top-quality products through cost-efficient product development, manufacturing and distribution processes. Achieving this requires innovative technological breakthroughs that steer vehicle characteristics towards lower purchasing and operational costs, higher engine output and load capacity, and improved road safety and environmental care." Ever since Scania introduced its famous "low-rev" engine philosophy, its turbo-charged trucks can be driven at low engine speed, while simultaneously providing high traction power and excellent fuel economy – and a long service life. Scania trucks are not only engineered for higher economic value, but also for increased driver comfort, ergonomics and safety, under all types of driving conditions.



**“LMS solutions help Scania tune its testing processes towards optimal CAE support.”**



## **Introducing an all-digital virtual prototyping environment**

Scania considers IT as part of its core business, and manages and executes all IT-related activities internally. The rationale behind this strategy is the increasing importance of IT expertise in developing, building and maintaining Scania trucks. The vision for the next ten years stipulates that Scania will develop its trucks by using an all-digital, virtual prototyping environment. This goal includes the execution of virtual analyses and numerical simulations, to the extent that physical prototypes are only used for truck design verification. This approach requires the strengthening and common use of CAE methodologies and data formats across the entire Scania organization, avoiding parallel use of files and execution of measurements. To realize this goal, Scania will select and partner with a dedicated but limited number of CAE solution providers. Key in this regard is Scania's decision to align its development platform to the CATIA V5 CAD environment from Dassault Systèmes.

For many years, Scania has used multiple CAE solutions from LMS. During the chassis/cab development process, engineers optimize the acoustic comfort within the truck's cab by applying coupled Finite-Element (FE) boundary calculations predicting the effects of engine and driveline noise on the cab's interior. Before constructing the first prototype, simulations in LMS SYSNOISE enable Scania engineers to simulate different configurations of steel plate and absorbent designs for the steel cab. LMS SYSNOISE is also used for the acoustic optimization of gearboxes. In combination with mathematically determined gear

tooth forces, Scania reduces gearbox noise that occurs under specific operating conditions, such as gearbox whining.

For engine development, Scania makes extensive use of LMS Virtual.Lab. First, the Pre-Acoustics module is systematically utilized to create dedicated, reduced acoustic meshes, starting from the FE meshes that represent the truck engine and gearbox assemblies. The mesh shape adaptations that previously would have required over thirty days to create and that would result in the Boundary Element Model (BEM) – are now completed in less than two days! Next, Scania engineers apply the innovative Acoustic Transfer Vector (ATV) method of the Engine Acoustics module to predict the emanated sound-pressure levels, over multiple engine rpm values and under free-field conditions. The sound-power characteristics of Scania engines are evaluated by means of the dedicated ISO 3744 simulation procedure. Ola Jönsson, Senior Engineer, summarizes, “This proven acoustic simulation process yields detailed results, giving us the confidence and assurance that we can accurately trace and subsequently fix potential problems.”

Another major advantage of LMS Virtual.Lab is that it establishes a tight integration with CATIA V5. A transparent and seamless interaction between a centrally managed CAD infrastructure and LMS Virtual.Lab simulations allows Scania to accelerate its development activities. This not only allows Scania to gain critical insights earlier in the development process, but it also makes it easier to control the development of ever-more complicated product configurations.

## Tuning testing activities towards optimal CAE support

Today, physical prototype testing continues to represent an inherent part of Scania's widely recognized vehicle quality label. On a daily basis, Scania engineers perform standard modal tests to assess the performance of smaller components that are mounted onto the engine or chassis. On a much larger scale, structural tests are performed when assessing a newly developed truck frame prototype. These extensive modal test campaigns typically consist of more than 500 measurement locations and yield very detailed information on the frame's modal performance. Lars-Åke Dahlqvist, Senior System Design Engineer, explains how LMS test solutions drive Scania's current testing activities: "We clearly see a shift towards more different test types, and tests with higher channel counts. Test and analysis systems from LMS prove that a single solution can easily be deployed in a wide range of NVH-related tests, as well as in support of durability measurements. This makes it possible for Scania to efficiently organize the usage, maintenance and training of LMS test systems, since the same systems are used to participate in different test configurations with varying acquisition and processing requirements." Dahlqvist also comments on the increasing interrelation between testing and CAE: "Today, we run a lot of

tests and feed high amounts of data to, for example, LMS Gateway, to validate FE models that are used for multiple simulation purposes. Scania will continue to tune its testing processes and activities towards optimal CAE support."

When it comes to NVH testing, Scania increases truck comfort by performing running-modes analyses of a complete truck, both on the test rig and on the test track. When the truck is placed on the test rig, the applied excitation forces to the wheels correspond to the worst possible driving conditions, as retrieved from real-life spindle measurements. A 32-channel LMS mobile system acquires the road measurements, and engineers use LMS CADA-X to reduce the data and analyze the overall behavior of the truck on the test track. Other NVH-oriented tests include interior and exterior pass-by noise, combining in-vehicle measurements with dedicated pass-by noise acquisition and analysis software. To increase the efficiency of engine sound-power measurements completed in the engine acoustics lab, Scania is currently upgrading to LMS Test.Lab. LMS Test.Lab not only acquires and analyzes the test data, it also controls the microphone robot and the communication with the test bench computer in order to automate the complete test. Dahlqvist explains, "By building this highly automated

engine test setup around LMS Test.Lab, Scania will increase its acoustic-cell throughput. This is a perfect example of our automation philosophy, allowing our test engineers to focus more on their core tasks while test cell technicians are running the actual tests."

## Designing successful next-generation Scania trucks

Scania's resolute choice for CAE and the new, complementary role for testing will have a positive impact on the entire organization and its customers. Per Holst clarifies, "Developing trucks on the basis of virtual prototyping and accurate physical testing not only increases the efficiency of our development process, it also leaves more room for innovation. Early engineering insights retrieved through top-market CAE solutions enable Scania to evaluate more innovative concepts and to explore them to a larger extent. A highly integrated and CAE-driven development process will empower Scania to further extend its legacy by designing successful next-generation Scania trucks. In this regard, CAE solutions and Test solutions from LMS offer important and well-appreciated contributions."

## A modular product offering: A way of thinking

Scania's customers are found in more than 100 countries. A modular, global product range enables Scania to respond to a great diversity of customer needs and to bring trucks to market at a lower price. Standard connection points and interfaces between different component series are the foundation of Scania's modular system. In Scania's worldwide range of truck parts, there are only two different types of windshield glass frames! This way of thinking simplifies the task of making continuous improvements and achieving targeted quality levels.





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