MES
MODEL ENGINEERING SOLUTIONS

Renault Uses MES Software to Boost Efficiency in Model-based Development

Renault is one of the world's largest car manufacturers and a leading player in the emerging technology field of e-mobility. In Renault's LARDY and GUYANCOURT development centers on the outskirts of Paris, a staff of over 14,000 engineers is engaged in creating technology concepts for the next generation of passenger cars. A significant focus of Renault's R&D activities lies on safety-critical vehicle functionalities, including tracking control, motor management, and battery management systems. Ensuring the integrity, robustness, and safety of these kinds of technology is an extremely challenging task. For Renault, safety always comes first and is at the very center of the company's product development chain.

Development of Safety Features at Renault

Renault has a dedicated development unit for safety-related features. This unit follows a strictly defined process that is derived from a cutting-edge safety philosophy. The process is based on a tool chain using Simulink® from MathWorks and TargetLink® by dSPACE. Part of the process involves the development of a functional model, followed by extensive reviews of the model, prior to any actual code generation.

Renault's Model-based Design Workflow

The Renault Embedded Software team's main objective was to speed up its development cycle, while simultaneously improving the level of software quality. To achieve these twin goals, the new design workflow needed to include three major improvements:

- Implementation of an iterative design process
- Model-based design using the model as a reference throughout the entire process
- Automated code generation to prevent errors that can naturally result from manual coding

Renault-specific Guidelines for Software Models

A working group of experts and modeling stakeholders collaborated on developing a set of design rules to support the model-based design workflow and ensure its compliancy with industry guidelines (MAAB, MISRA, AUTOSAR, etc.) as well as Renault's software architecture and specifications.

A particular challenge was implementing this broad range of guidelines in a comprehensive and efficient way. Renault software models can easily attain a high level of complexity with many levels of sub-functions and modules, making them extremely difficult to review manually. As a result, manual reviews of such complex functional models consumed vast personnel resources. This essential process step essentially delayed the entire development process.

Renault began searching for a tool to automate and safeguard the review process and to integrate the review step into its automated tool chain. Furthermore, Renault was looking to establish an automated system of waterproof metrics to

confirm the guideline compliancy of its functional modelling process. Renault required a model checker with the following high-level specifications:

- Support for the guidelines defined by Renault experts
- Enforces model compliance with guidelines
- Delivers information on how to fix rule violations
- Reports and documents rule violations
- Automated model repair capabilities

MES Model Examiner®: The Solution for Renault

In 2012, Renault first introduced MES Model Examiner®. This tool automatically checks software models for guideline compliancy and delivers comprehensive reports and metrics on the quality and compliance of Simulink® models. Today more than 150 functional model designers have access to the system and use it on a regular basis.

MES Model Examiner®: Concrete Benefits and Savings

The new process with integrated tool support has now been in use at Renault for some time. The benefits became clear from the start and investment in the tool paid off fast. According to Renault, the model analysis duration has dropped by 30%, which is an outstanding result. Renault has been using MES Model Examiner® for their model-based development for years now and the tool has proofed to fit fully into the Renault process.

Renault-wide Roll-out of MES Model Examiner®

In the years to come, Renault aims to gradually expand its model-based design process to include other development projects. More and more users will use the tool chain in which MES Model Examiner® is an integral part. Renault also plans to migrate to the next version of MES Model Examiner® DRIVE (3.x). Renault has worked closely together with MES, sharing countless valuable suggestions regarding future product development and improvements of the MES Model Examiner®. Renault regards MES as a reliable and valuable partner thanks to the latter's unique expertise in quality assurance of safety-critical software for the car.

About Model Engineering Solutions: Läuft die Software, fährt das Auto

Model Engineering Solutions (MES) specializes in integrated quality assurance of embedded software in vehicles. MES Quality Commander® is a dynamic management and reporting tool for software development and delivers key data throughout the software life cycle, providing an optimal basis for decision-making. MES Model Examiner® (MXAM) is the market-leading tool for checking quality guideline consistency of Simulink®, TargetLink®, and ASCET models. MES Test Manager® implements the requirements-based approach in model-based development perfectly. MES supports its clients with consulting services and customized training programs for the introduction and improvement of model-based development processes, the deployment of new standards such as AUTOSAR, or the fulfillment of new requirements such as ISO 26262. Amongst MES's clients are major OEMs and suppliers from the automotive industry. MES is a TargetLink Strategic Partner of dSPACE GmbH and a Product Partner of MathWorks and ETAS.