Mazda Motor Corporation reduces development lead times on its electronic control technology thanks to PAM-CEM

THE CHALLENGE

Electronic control technology such as remote keyless entry and radar-based side collision warning systems is now necessary for high-end automotive vehicles. These feature approximately 100 microprocessors with a total cost exceeding the price of the steel used to build the car. Mazda Motor Corporation used PAM-CEM to perform large-scale electromagnetic analysis for such increasingly complex vehicles.

THE BENEFITS

- Simulate the electromagnetic field of the entire vehicle,
- Manage a large volume of computation in a short period of time,
- Address and resolve electromagnetic challenges early in the design stage,
- Shorten simulation time with the automatic mesh generation function.

*" **The introduction of PAM-CEM has allowed us to conduct very precise electromagnetic wave simulations.** We believe electronic control systems will be increasingly important in the development of the cars of the future."*

Yasushi Hamada, Manager of the Electronic Testing and Research Group at MAZDA Motor Corporation

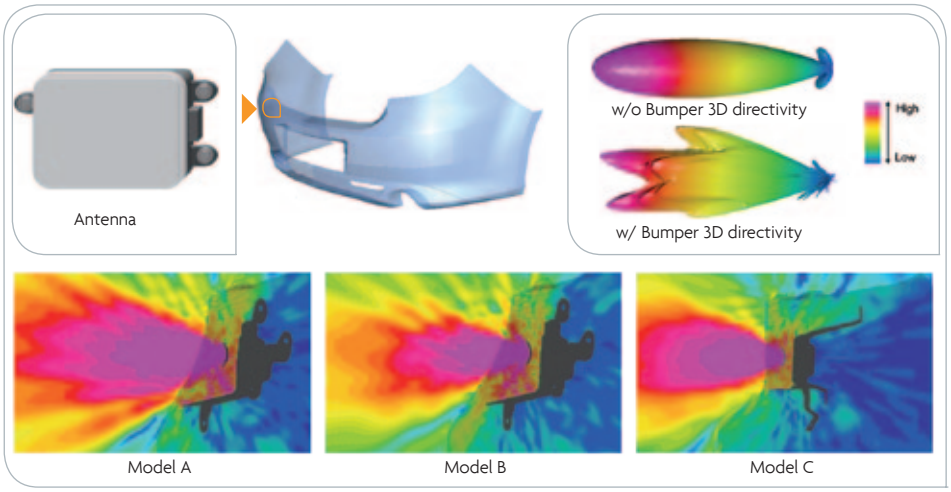
The Electronic Testing and Research Group, part of the Mazda Motor Corporation Electronic Development Division, handles the Research & Development of all electrical components used in Mazda vehicles and is thus responsible for the entire electronic control technology.

In recent years, as the design of passenger cars grew more complex, with electronic control technology such as remote keyless entry and radar-based side collision warning systems, electromagnetic analysis and control became an increasingly important requirement.

The Electronic Testing and Research Group began using electromagnetic simulation on a large scale in 2002, starting with simple tools to analyze the electromagnetic field distribution of single components. Two years later, Mazda Motor Corporation expressed the need to simulate the electromagnetic field of the entire vehicle, and thus introduced a more advanced computational tool: ESI's PAM-CEM Simulation Suite.

Managing large and complex electromagnetic simulations

In the field of Computational ElectroMagnetics, PAM-CEM Simulation Suite addresses realistic models in their early electromagnetic design stage by combining the Finite-Difference Time-Domain (FDTD) method with



Electromagnetic bumper design for optimized RADAR performances

dedicated techniques in Cable Networks management. For Mazda Motor Corporation, using the FDTD method instead of the Method of Moment meant that, even in large-scale simulations involving a high number of different components, they were able to cope with a huge volume of computation in a short period of time. Mazda Motor Corporation found other main benefits to PAM-CEM such as its automatic mesh generation function which allows the company to reduce the number of man hours required for a simulation and the flexibility in the ESI response to detailed requirements.

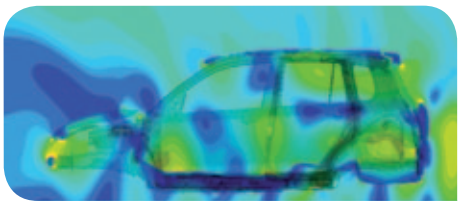
Today, Mazda Motor Corporation makes extensive use of PAM-CEM electromagnetic simulation technology specifically for radar-based side collision warning and keyless entry systems, which are difficult to simulate and measure; the two main reasons for the latter being that the direction the driver will approach the vehicle remains unknown, while the frequency used in keyless entry systems is not perfectly compatible with the car's dimensions.

" The Electronic Testing and Research Group intends to continue to improve Mazda Motor Corporation skills to contribute to the creation of better cars through electromagnetic control and I am convinced that ESI will continue to provide outstanding simulation products and technical support for the initiatives of the Electronic Testing and Research Group"

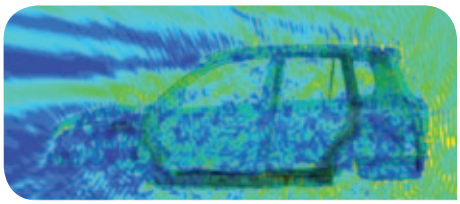
Marie Tsurunaga, from Mazda Engineering & Technology Co. Ltd., Vehicle Testing Division, Electronic Testing and Research Group.

3MHz - 100m

30MHz - 10m



300MHz - 1m



3GHz - 0,1m

Electromagnetic fields getting more complex with the frequency (distribution from 3 MHz up to 3 GHz)

Reducing development lead times with virtual prototyping

The PAM-CEM end value to the Electronic Testing and Research Group is virtual prototyping which helps reduce its development lead times. Indeed, in the past, it was common for car manufacturers to take up to five years to successfully design a car. Today at Mazda, one model is created in a period of eighteen months thanks to the manufacturing of a single prototype, all defects being identified at the design stage prior to the manufacturing process.

To find out more about ESI's solutions for Electromagnetics simulation, please visit : www.esi-group.com/electromagnetics

ABOUT MAZDA MOTOR CORPORATION

Mazda Motor Corporation, headquartered in Japan, is a manufacturer of passenger cars and commercial vehicles. Mazda Engineering & Technology Co. Ltd. is a fully owned subsidiary of Mazda Motor Corporation. www.mazda.com

ABOUT ESI GROUP

ESI is a pioneer and world-leading provider in virtual prototyping that takes into account the physics of materials. ESI has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product's behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment's impact on performance. ESI's solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping, thus eliminating the need for physical prototypes during product development. The company employs over 750 high-level specialists worldwide covering more than 30 countries. ESI Group is listed in compartment C of NYSE Euronext Paris. For further information, visit www.esi-group.com.

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