



Subaru

An NI Premier Case Study

Fuji Heavy Industries, the parent company of Subaru, developed its first hybrid vehicle—the XV Crosstrek Hybrid—to target both Japanese and North American markets. Aiming for a short time to market at the lowest possible price point, Subaru wanted to ensure the vehicle upheld its industry-recognized safety standards. This meant testing driver and passenger safety under various conditions, including scenarios nearly impossible to create in real-world testing.



Simulated tests reduce development costs and increase end product quality.

Automakers are constantly competing for customers who expect innovation as well as a low cost of ownership. As consumers demand higher safety ratings alongside lower emissions, cars have evolved into smarter, more complex systems with advanced controls. As cars include more complex technology, a larger number of correspondingly more complicated components need to be tested.

Challenge

When searching for a new vehicle, fuel economy and price are two top concerns for buyers. To meet market expectations, manufacturers must perform extensive testing on new vehicles under the most strenuous conditions imaginable, all while keeping test times and costs low. This is especially challenging with hybrid vehicles, which use a combination of electric and gasoline powertrains.

Solution

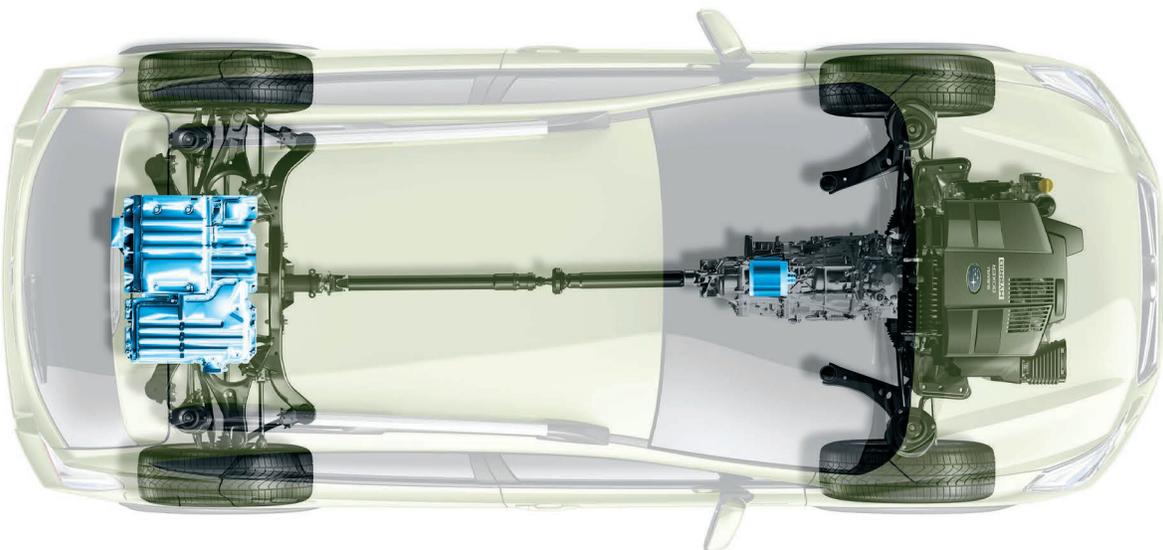
To test the highly complex components of its first hybrid vehicle, the XV Crosstrek Hybrid, Subaru used an advanced technique called hardware-in-the-loop (HIL) simulation. With this technique, Subaru engineers can test in a virtual environment before proceeding to real-world tests. This approach ultimately produces a safer, more economical vehicle for the end user while allowing Subaru to maintain a competitive price and meet strict time-to-market requirements.

Innovation

Subaru chose the innovative NI HIL platform to perform stringent tests in significantly less time and add new tests that were previously impossible. For example, in icy driving conditions, wheels can experience a sudden loss of traction during acceleration. This behavior is extremely difficult and expensive to reproduce, but it can be easily simulated. This approach allowed Subaru engineers to focus on optimizing test times instead of the application's complexity.

“We significantly reduced overall test time and optimized time to market, with all the test patterns running automatically in only 118 hours; that’s a 94 percent reduction in test time compared to manual testing.”

–Mr. Tomohiro Morita,
FUJI Heavy Industries, Ltd.



This transparent overhead view shows the Subaru XV Crosstrek Hybrid's powertrain.



Technology

Using open hardware with reconfigurable I/O, Subaru engineers can simply change parameters during testing to make the HIL system simulate various complex test scenarios that would destroy an expensive prototype motor. This approach reduces the number of setup procedures and creates a safer testing environment because it requires less high-risk equipment. By enabling tests to be performed earlier in the development cycle and removing the limitations of physical test, HIL simulation reduces development costs and increases end product quality.

NI Products

- NI FlexRIO
- LabVIEW
- Electric Motor Simulation Toolkit

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