

Press Release

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A Volvo Plug-in Hybrid includes a systematic approach to all safety aspects related to battery power.

The basic perspective is that a plug-in version must be as safe as any other new Volvo car - when it comes to owning and driving and also in the event of an accident.

"We apply the same high safety standards to all our products but the safety-related challenges may differ depending on the driveline and fuel being used. To us, electrification technology is another exciting challenge in our quest to build the safest cars on the market," says Jan Ivarsson, Senior Manager Safety Strategy & Requirements at Volvo Car Corporation. He adds:

"It is understandable that a lot of questions about electrification safety are related to what will happen in an accident but it is important to have a holistic approach including all the aspects of day-to-day usage of the car."

Monitoring and encapsulation

Volvo Car Corporation is conducting wide-ranging and thorough analysis of a variety of safety scenarios for cars with electric power. Through advanced automatic monitoring of battery status and by encapsulating the battery and protecting it effectively in a collision, the result is a world-class safety level.

"A holistic, human centric approach and real-life traffic conditions are always the starting-point for our safety work. Based on our massive database with input from actual road incidents and accidents, we know where the focus must lie in everyday traffic conditions. The solutions we have developed for a Plug-in Hybrid take into account the situations that are unique to this type of car," says Jan Ivarsson. He adds:

"We will introduce the V60 Plug-in Hybrid in Europe during 2012. The rigorous test procedure developed for this diesel-electric car will of course also apply when we take the next step with a gasoline plug-in version."

Know-how from actual traffic

Volvo Car Corporation is using its unique know-how from actual traffic conditions to carry out detailed testing and verification. This test procedure also includes the general requirements and protocols of the industry's safety institutes.

When analysing traffic situations from a safety perspective, the engineers use a model that illustrates the sequence of events during the whole driving phase. The process is divided into five phases: from the normal driving situation to after the accident has occurred.

Unique solutions for electric cars

All established safety systems will also be available in a plug-in hybrid version. However, electric power also adds new possible safety scenarios to the overall picture and these too must be dealt with. Volvo's safety experts have meticulously analysed the five accident sequence phases and developed unique solutions for the battery and for protection of the occupants as necessary.

1. Normal driving: An advanced monitoring system keeps watch and ensures that each cell maintains the correct voltage level and optimal operating temperature by regulating the cooling

system. This is of significance to safety as well as for battery capacity. In the event of any deviation, the battery is automatically shut down as a preventive measure.

2. Conflict: The battery pack adds weight that can create new conditions for the vehicle's dynamics and alter the car's behavior, for instance in fast avoidance maneuvers. The braking system can handle the increased mass, and DSTC (Dynamic Stability and Traction Control) helps the driver contain the situation.

3. Avoidance: If a frontal collision is imminent and the driver is acting too late to brake the car, automatic systems such as Collision Warning with Full Auto Brake and City Safety are activated to help avoid or reduce the effects of a collision.

4. Collision: In order to reduce the effects of a collision, the safety experts have focused on protecting all electrical components.

The rear structure has been modified to ensure a controlled deformation that helps protect the battery pack, which is located under the load floor. Steel beams and other parts of the structure are reinforced. The battery pack is also sturdily encapsulated.

The electric system is monitored by two systems:

- Crash sensors linked to the battery measure the physical collision forces. At the very moment of collision, they send information about the collision to the car's computer, which automatically shuts off the power supply.
- Insulation measurement reacts on deviations in the electrical system. The contactors are opened immediately to brake the power if an earth fault is detected

If the battery is damaged, resulting in gas leakage, there are special evacuation ducts that lead the gas out under the car. In the event of extreme heat, the occupants are shielded by the battery's encapsulation.

5. After the collision: Volvo Car Corporation will work together with the emergency rescue services, providing them with detailed instructions on how to safely make sure that the power supply is disconnected before the rescue work begins.

The high voltage in the battery is separated from the car. All high voltage cables are orange to make them easy to identify.

Stringent test regime

Volvo's safety tests take place in Volvo's technically advanced crash test facility in several different stages: at component level, for whole systems and the complete car is safety-tested virtually in the computer, and physically in Volvo Car Corporation's technically advanced crash-test centre.

"Before introduction, a Plug-in Hybrid will go through the same test program as all our new car models. This includes full-scale crash tests with different load cases, such as frontal collision, rear and side collisions to confirm that the battery technology fulfils our stringent safety requirements," explains Jan Ivarsson.

Volvo Car Corporation has defined a new, severe load case to ensure that the reinforced side structure works as intended.

The test program also includes component tests of the battery pack. The results are used to determine how the collision forces affect the battery - and how much damage it can withstand before power has to be cut in an accident.

"We have decades of experience in how to protect a fuel tank in a collision. Now, we are building up the same knowledge when it comes to protecting batteries. The tests provide both ourselves and the battery supplier valuable input in the continuous product development," says Jan Ivarsson.

Safety when servicing and recycling

A Plug-in Hybrid is equipped with a service cut out to quickly and safely disconnect the vehicle's power supply in the workshop.

Volvo Car Corporation and the battery manufacturers have far-reaching product responsibility as regards both production and recycling. This ensures proper handling of the battery when it comes to the end of its life in the car.

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Descriptions and facts in this press material relate to Volvo Cars' international car range. Described features might be optional. Vehicle specifications may vary from one country to another and may be altered without prior notification.

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