New Airbag Protects Pedestrians

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Car safety has come a long way since the very first Ford Model-T took to the streets back in 1908. From air bags to digital rear-view mirrors, drivers can now feel more comfortable when they get behind the wheel — and safer. Now that the driver is more secure, the automotive industry has shifted its sights to increased safety features for pedestrians.

According to a recent press release from Volvo Car, 25 percent of traffic fatalities in China were pedestrians. In Europe, the number of pedestrian fatalities is 14 percent, and in the U.S. it is 12 percent, with the most serious head injuries caused by the hard structure under the bonnet panel — basically the hood of the car.

When Volvo began development on its new pedestrian airbag technology, the company embedded seven sensors in the front of the car to transmit signals to a control unit.
"The basic principle is to help improve the safety for unprotected pedestrians in frontal collisions with a car," says Malin Persson, Public Affairs, Volvo Car. "Volvo’s main goal with its Pedestrian Airbag Technology is to save lives and help reduce the risk of injury."

The new tech can determine if an object that comes in contact with the vehicle is human or inanimate. If it registers the signals as a human, then the pedestrian airbag is deployed.

"The pulse given by the accelerometers is different depending on what the object

is," explains Persson. "This is how the system knows [the object] is a pedestrian."

Inflation Sequence

If a pedestrian is struck by Volvo's new V40 while traveling from 20 to 50 km/h, an inflation sequence is activated. The bonnet hinges are equipped with pyrotechnical release mechanisms which, when the system is activated, pull a pin that helps release the rear of the bonnet panel. At the same time, the airbag starts to fill with gas. "The airbag itself consists of a sack and a gas hybrid generator," explains Persson. "During the inflation sequence, the airbag raises the bonnet 10 cm and stays in the raised position to create distance between the hard engine components and the hood."

The airbag serves two functions: it raises the bonnet to create distance; and it cushions the impact around the hard parts of the area near the windscreen (the area on the windshield where the wipers are located). The action creates a dampening effect in the event of a pedestrian strike.

The inflated airbag covers the area under the raised bonnet plus approximately one third of the windscreen area and the lower part of the A-pillar.How it Works

If a pedestrian is struck by the car's front bumper, the airbag is designed to deploy. "Sensors along the bumper are designed to trigger the inflation process when the impact occurs, says Persson.

Within a few hundredths of a second, sensors trigger the pyrotechnical joints at the bonnet hinges to promote the rear end of the hood to be elevated by the airbag, which is deployed at the same time as the hinge mechanism.

"In this inflated position, the airbag covers the entire windscreen wiper recess [photo left], one third of the windscreen, and the lower part of the A-pillars, which is the pillar in front of the driver/passenger doors," explains Persson.

Simulation Testing

Volvo developed the new airbag technology using various types of simulation tests that involved human-like leg and head forms, such as balls, shopping carts from different angles, garbage bins of different weights and from different angles, and various road-side markers. The tests were carried out in a variety of configurations, both in physical and virtual simulations.

The main challenge that Volvo faced during the design process was the simple fact that this concept was a completely new technology that involved various sensors and protection systems.

According to Persson, another challenge was trying to figure out how to package the airbag into the plenum area, located between the intake runners and carburetor or throttle body, which is already quite narrow. Volvo engineers were able to create

a smart packaging system that activates towards the pedestrians once they make contact with the vehicle.

In conjunction with new technology that helps drivers detect and autobrake for pedestrians, Volvo's revolutionary airbag technology has raised the bar in automobile safety, ensuring the safety of those operating the vehicle, and the innocent pedestrians who sometimes find themselves in the wrong place at the wrong time.