

MODERN TECHNOLOGY IN AIRBAGS AND SEAT BELTS MANUFACTURING

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An airbag is a vehicle safety device. It is an occupant restraint consisting of a flexible envelope designed to inflate rapidly in an automobile collision, to prevent vehicle occupants from striking window and interior. An American inventor, John W. Hetrick, a retired industrial engineer, designed the original safety cushion for automotive use in 1952 at his kitchen table. His patent lasted only 17 years – long before mainstream automotive usage. Dr. David S. Breed, invented and developed a key component for automotive use: the ball-in-tube inertial sensor for crash detection. Breed Corporation then marketed this innovation first in 1967 to Chrysler. A similar “Auto-Ceptor” crash-restraint, developed by Eaton, Yale & Towne Inc. for Ford was soon offered as an automatic safety system in the USA, while the Italian Eaton-Livia company offered a variant with localized air cushions.

Airbags for passenger cars were introduced in the United States in the mid-1970s, when seat belt usage rates in the country were quite low. Ford built an experimental fleet of cars with airbags in 1971, followed by General Motors in 1973 on Chevrolet vehicles. The early fleet of experimental GM vehicles equipped with airbags experienced seven fatalities, one of which was later suspected to have been caused by the airbag.

The GM cars from the 1970s equipped with ACSRS have a driver side airbag, a driver side knee restraint and a passenger side airbag. The passenger side airbag, protects both front passengers and unlike most newer ones, it integrates a knee cushion, a torso cushion and it also has dual stage deployment which varies depending on the force of the impact. The cars equipped with ACSRS have lap belts for all seating positions but they do not have shoulder belts. In 1987, the Porsche 944 turbo became the first car in the world to have driver and passenger airbags as standard equipment. The Porsche 944 and 944S had this as an available option. The same year also saw the first airbag in a Japanese car, the Honda Legend. Airbags became common in the 1980s, with Chrysler and Ford introducing them in the mid-1980s; it was Chrysler that made them standard equipment across its entire line in 1990 (except for trucks until 1995). Audi was relatively late to offer airbag systems on a broader scale; until the 1994 model year, for example, the 80/90, by far Audi's ‘bread-and-butter’ model, as well as the 100/200, did not have airbags in their standard versions. Instead, the German automaker until then relied solely on its proprietary procon-ten restraint system. In Europe, airbags were almost entirely absent from family cars until the early 1990s, except for Saab, who made them standard on the 990 Turbo in 1989 and on all models in 1990. The first European Ford to feature an airbag was the facelifted Escort MK5b in 1992; within a year, the entire Ford range had at least one airbag as standard. By the mid 1990s, European market leaders such as Vauxhall/Opel, Rover, Peugeot, Renault and Fiat had included airbags as at least optional equipment across their model ranges. By the end of the decade, it was very rare to find a mass market car without an airbag, and some late 1990s products, such as the Volkswagen Golf Mk4 also featured side airbags. The Peugeot 306 was a classical example of how commonplace airbags became on mass market cars during the 1990s. On its launch in early 1993 most of the range did not even have driver airbags as an option. By 1999 however, side airbags were available on several variants. During the 2000s side airbags were commonplace on even budget cars, such as the smaller-engined versions of the Ford Fiesta

and Peugeot 206, and curtain airbags were also becoming regular features on mass market cars. The Toyota Avensis, launched in 1998. Was the first mass market car to be sold in Europe with a total of nine airbags. Although in some countries, such as Russia, airbags are still not standard equipment on all cars, such as those from Lada. Some safety experts advocated a performance-based occupant protection standard rather than a standard mandating a particular technical solution, which could rapidly become outdated and might not be a cost-effective approach. As countries successively mandated seat belt restraints, there was less emphasis placed on other designs for several decades. Manufactures emphasize that an airbag is not, and cannot be an alternative to seatbelts. They emphasize that they are only supplemental to a seatbelt. Hence the commonly used term “Supplemental Restraint System” or SRS.

The auto industry and research and regulatory communities have moved away from their initial view of the airbag as a seat belt replacement, and the bags are now nominally designated as Supplemental Restraint System (SRS) or Supplemental Inflatable Restraints.

In 1980, Mercedes-Benz introduced the airbag in Germany as an option on its high-end S-Class (W126). There are essentially two types of side airbags commonly used today, the side torso airbag and the side curtain airbag.

Side-impact airbags or side torso airbags are a category of airbag usually located in the seat, and inflate between the seat occupant and door. These airbags are designed to reduce the risk of injury to the pelvic and lower abdomen regions. Some vehicles are now being equipped with different types of designs, to help reduce injury and ejection from the vehicle in rollover crashes. In late 1997 the 1998 model year BMW 7-series were fitted with a tubular shaped head side airbags, the “Head Protection System (HPS)” as standard equipment. This is an industry’s first in offering head protection in side impact collisions. This airbag maintained inflation for up to seven seconds for rollover by an inflatable ‘curtain’ airbag for superior protection. Roll-sensing side curtain airbags found on vehicles more prone to rollovers such as SUV’s and pickups will deploy when a rollover is detected instead of just when an actual collision takes place. Often there is a switch to disable the feature in case the driver wants to take the vehicle offroad. Curtain airbags have been said to reduce brain injury or fatalities by up to 45% in a side impact with an SUV. These airbags come in various forms (e.g., tubular, curtain, door-mounted) depending on the needs of the application. Many recent SUVs and MPVs have a long inflatable curtain airbag that protects all 3 rows of seats.

The first driver’s side and separate knee airbag was used in the 1996 model Kia Sportage vehicle and has been standard equipment since then. The airbag is located beneath the steering. The Toyota Avensis became the first vehicle sold in Europe equipped with a driver’s knee airbag. The EuroNCAP reported on the 2003 Avensis, “There Has been much effort to protect the driver’s knees and legs and a knee airbag worked well.” Since then certain models have also included front passenger knee airbags.

In 2008, the Toyota IQ launched featuring the first production rear curtain shield airbag to protect the rear occupant’s heads in the event of a rear end impact.

In 1912, Toyota developed the first production rear-seat airbag designed to reduce the severity of secondary injuries to rear passengers in a side collision. This system deploys from the rear center console first appearing in on the redesigned Crown Majesta. In 2009, the S-class ESF safety concept car showcased seatbelt airbags. They will be included standard on the production Lexus LFA in late 2010 and the 2011 Ford Explorer will offer rear seatbelt airbags as an option.

The development of airbags coincided with an international interest in automobile safety legislation.