Research Report
ABOUT Automotive

AUTOMOTIVE

Vehicle occupant restraint systems: trends, companies, market forecasts to 2020

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Chapter 1: Introduction

1.1: Overview

Vehicle manufacturers are rushing to develop new and innovative safety systems

A 2011 study by Forbes Consumer Reports indicated that up to 65% of U.S. consumers surveyed rated 'safety' as their top priority when planning a new car purchase, with 'quality' coming in second. With an ever greater value placed on safety by consumers, vehicle manufacturers around the world are rushing to develop new and innovative safety systems. In large part this is driven not by government mandate but by what the consumer market dictates, fuelled by heightened awareness of vehicle safety performance resulting from NCAP crash testing programmes. NCAP testing programmes in the U.S. and Europe continue to raise the bar, and China's own NCAP programme, introduced in 2006, and Latin America's new NCAP programme will provide further upward momentum for safety standards and crucially for the market, safety content per vehicle.

Side curtain airbags are fast becoming standard equipment

A seatbelt for every seat, and airbags for front seat occupants have long been the norm in the traditional developed markets, and side curtain airbags are fast becoming standard equipment too; from September 2013 all vehicles sold in the U.S. market will have to feature them as standard, and penetration rates in Europe had already reached over 65% by 2011. While frontal and side airbags have captured much of the attention over the last decade and made up the lion's share of airbag production, manufacturers have also been turning their attention to different areas to protect all parts of the occupant's body. Knee airbags, first seen in 1996, have become common from the mid 2000s onwards; a rear curtain airbag appeared in a production vehicle for the first time in 2008, the rear centre airbag in 2009, and the seatbelt airbag in 2011. In 2012, Volvo's V40 model became the first production vehicle to feature a pedestrian airbag, which deploys outside of the vehicle.

Active safety systems cover all vehicle systems that are designed to prevent accidents, from road holding to comfort and vision, visibility, braking, or information about the outside environment. Active safety technologies that provide driver assistance include night driving assist, adaptive cruise control, queue assist, cross-traffic assist, and traction control. Active technologies that provide warning to the driver include pedestrian warning, lane departure warning, collision warning, and blind spot warning. In a crash situation, active safety technologies can include crash mitigation by automatic braking, crash avoidance, active bumpers and stability control.

Passive safety systems are designed to limit the consequences of an accident for vehicle occupants

Passive safety systems are designed to limit the consequences of an accident for vehicle occupants. In the moments before a crash these can include early sensing, active seatbelts, active structures, active and knee bolster, and

The Chinese are relatively strong consumers of safety equipment

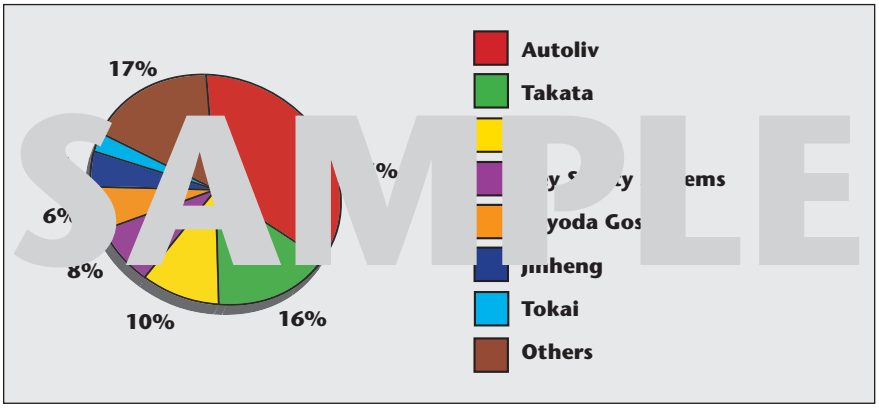
Demand for airbags has been growing rapidly, driven by the growth in vehicle production and increasing demand from consumers for greater levels of safety equipment. The Chinese are relatively strong consumers of safety equipment and the average safety content per vehicle for seatbelts and airbags has steadily risen from $120 in 2003 to around $180 in 2011.

Autoliv currently employs almost 7,000 people in China and is upgrading the capacity of its Chinese plants dramatically; the Changchun facility for example (seatbelts and airbags) will see a doubling of capacity, and the Nanjing (seatbelts), Shanghai (ECUs and crash sensors), and Guangzhou (seatbelts and airbags) plants will all see an increase in capacity of 50%.

In 2011 Asia (excluding Japan) accounted for 17% of Takata's global sales; Takata has major manufacturing facilities in China, notably in Shanghai, and has a new seatbelt and airbag plant in Tianjin that starts production in 2012.

Although historically strongest in North America and Europe (2011 sales in Asia made up just 14.4% of TRW's global sales across all product lines), TRW has also invested in Chinese production through a 50% owned joint venture with Shanghai TRW Automotive Safety Systems Company to produce seatbelt systems, airbags and steering wheels. 2011 sales were $208 million and are expected to rise. However as of 2011, 39 out of TRW's 40 primary vehicle occupant safety systems facilities (manufacturing, R&D, warehouses, offices) were still located in North America (10 facilities) and Europe (29 facilities).

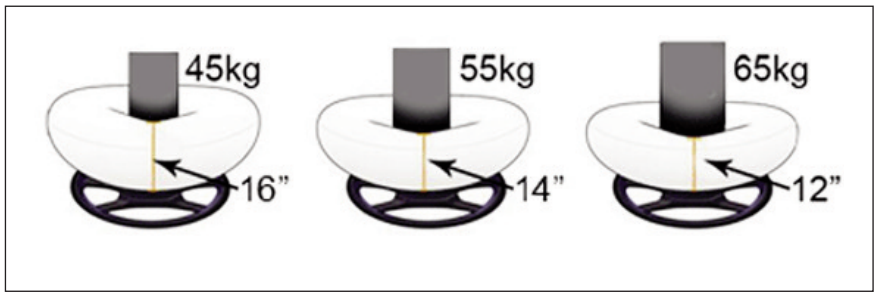
Figure 6: Market shares and values in the Chinese vehicle occupant restraint systems market, 2011 (% share and value in US$ billion)



	%	$
Autoliv		
Takata	16%	
TRW		
Key Safety Systems		
Toyoda Gosei		
Jinheng		
Tokai		
Others		0.6
TOTAL		

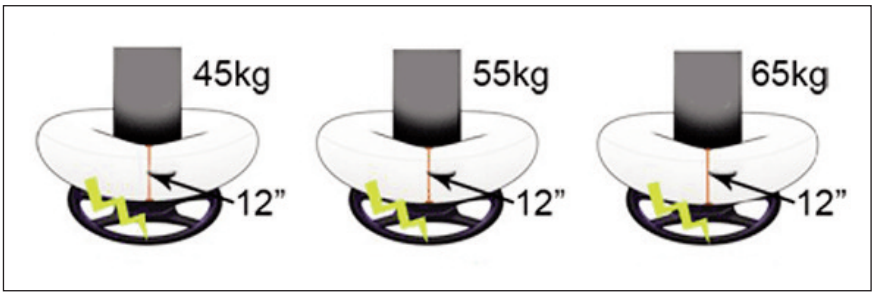
Source: ABOUT Automotive

Figure 8: Effect of impact on airbags without adaptation (standard airbags)



The different weights of the objects cause the airbags to vary in size and pressure.

Effect of impact on airbags with adaptation (smart airbags)



The airbags detect the weight of the object and adjust the pressure accordingly, providing improved protection.

Source: TRW

3.2.2: Side Impacts

Side-impact collisions account for a quarter of all injuries to vehicle occupants, but they account for more than a third of the serious and fatal injuries. One major reason is that the side of the vehicle is a thin crumple zone and the space between the side of the vehicle and the occupant's head is small. Many of the fatalities or serious injuries resulting from side impacts are caused by head injuries, and side airbags have been developed to combat this. Although slow to catch on initially when first introduced in the late 1990s, side airbags have now reached very high penetration levels in the U.S., and from 2013 will be compulsory in all new vehicles. On 2012 model year U.S. vehicles head & torso airbags were fitted as standard on 84%; head only were fitted as standard on a further 8%, and torso only on a further 1%. Side airbags were unavailable on only 1.5% of all vehicles on sale. In Europe penetration has reached around 65% and is likely to continue growing after the EuroNCAP's revised tests including side impact were improved in 2009.

Most vehicles fitted with side torso airbags are also fitted with side curtain sirbags

Side airbags are available in two basic types, one mounted in the seatbacks or doors, designed to protect the chest and midsection (side torso), and the other that emerges from the ceiling for head protection, also known as side curtain airbags. Most vehicles fitted with side torso airbags are also fitted with side curtain airbags (both fitted as standard on 84% of 2012 model year cars in the U.S.).

Chapter 4

Manufacturers

4.1: Autoliv

Autoliv is one of the most vertically integrated automotive safety system suppliers

Following its takeover of almost all of Delphi Automotive's Occupancy Protection Safety (OPS) business in 2009-10, Autoliv has continued to grow from an already strong position as a leading global supplier of vehicle occupant restraint systems. During the past eight years Autoliv increased its share of the global vehicle occupant restraint systems market to around 40% in North America and Europe, 20% in Japan, and around 35% overall globally.

Headquartered in Stockholm, Sweden, Autoliv employs more than 48,000 people globally in 29 different countries. The company is one of the most vertically integrated automotive safety system suppliers, with in-house divisions for all key components. In line with its manufacturing strategy, component production is concentrated in relatively few locations, while assembly plants are located close to customers. Autoliv delivers its products on a just-in-time basis, sometimes several times a day. For some of its customers Autoliv has set up 'sequence centres' inside or in the direct vicinity of a customer's factory. These facilities make final assembly and feed Autoliv's products into the vehicle assembly line in the right order. Depending on the product, products are dispatched within two to five hours of receipt of order.

Autoliv has manufacturing facilities located worldwide including Brazil, Canada, China, Estonia, France, Germany, Hungary, India, Indonesia, Japan, South Korea, Malaysia, Mexico, Philippines, Poland, Romania, Russia, South Africa, Spain, Sweden, Taiwan, Thailand, Turkey and the USA.

In addition, Autoliv operates technical centres and crash laboratories in China, France, Germany, India, Japan, South Korea, Sweden and the USA.

Autoliv's workforce in low-cost countries has grown from 24% in 2006 to 50% by the end of 2011

The past eight years have seen a large shift in the location of Autoliv's workforce; as it has grown, resources have been moved to low-cost countries (LCC). The proportion of Autoliv's workforce in low-cost countries has grown from 24% in 2006 to 50% by the end of 2011. Plants have been closed in Europe and North America as new ones have been opened in Asia and other parts of the world; Autoliv is currently expanding production at its facilities in China, India, and Brazil. This shift in the workforce coupled with productivity improvements has seen Autoliv's cost of labour as a percentage of sales fall from 25.4% in 2007 to just 21.8% in 2011.

Autoliv offers a broad range of product offerings including airbags (driver, passenger, side, curtain, knee), seatbelts (for front and rear seat occupants, buckles and height adjustments), safety electronics, steering wheels, anti-whiplash systems, seat components and integrated child seats as well as active safety systems such as night vision, vision and radar systems.
In 2011 Autoliv had made sales of over $8.2bn with customers from the

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