Automotive Airbags -
What Now?

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Automotive Airbags – What Now?

Safety Systems in Modern Car

Source: Gerber
Frontal Airbag Effectiveness

Percent Reductions in Driver and Passenger Deaths with Airbags
(Data from Insurance Institute for Highway Safety – IIHS, 2000)

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>Frontal</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P</td>
<td>D</td>
</tr>
<tr>
<td>All</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Belted</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>Unbelted</td>
<td>23</td>
<td>32</td>
</tr>
</tbody>
</table>
Airbag Penetration in Vehicles – 1999-2005

SOURCE: Price Waterhouse Coopers AUTOFACTS 2000 Q3 (the Second AutomotiveCentury- Global Outlook)
Automotive Airbags – What Now?

Market for airbag units

SOURCE: Price Waterhouse Coopers AUTOFACTS 2000 Q3 (the Second AutomotiveCentury- Global Outlook)
Automotive Airbags – What Now?

Airbag Unit Growth by Region – 2000 - 2005

SOURCE: Price Waterhouse Coopers AUTOFACTS 2000 Q3 (the Second Automotive Century- Global Outlook)
AUTOMOTIVE AIRBAGS – WHAT NOW?

GLOBAL AIRBAG MODULE MARKET -- 2001

- **Autoliv**: 29%
- **TRW**: 24%
- **Takata/Petri**: 18%
- **Delphi**: 5%
- **Others (15)**: 24%

Source: Providata; The Global Automotive Airbag market 2001-2010
## GLOBAL AIRBAG MODULE VOLUMES
### 2001 & 2010

<table>
<thead>
<tr>
<th>Module</th>
<th>2001</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver</td>
<td>43.1</td>
<td>57.0</td>
</tr>
<tr>
<td>Passenger</td>
<td>36.6</td>
<td>50.0</td>
</tr>
<tr>
<td>Side-Impact</td>
<td>28.8</td>
<td>80.0</td>
</tr>
<tr>
<td>Head Curtains</td>
<td>6.8</td>
<td>60.0</td>
</tr>
<tr>
<td>Other Modules</td>
<td>2.0</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>117.3</strong></td>
<td><strong>260.0</strong></td>
</tr>
</tbody>
</table>

Source: Providata; The Global Automotive Airbag market 2001-2010
Worldwide Consumption of Air Bag Fabric

Meters of fabric:

- 2000: Approximately 225 million sqm
- 2005: Approximately 325 million sqm

Tons of Yarn:

- 2000: Approximately 57M tons of yarn in 2000
- 2005: Approximately 83M tons by 2005

SOURCE: Acordis Industrial Fibers
What’s Being Used?

- **Coated Fabric**
  
  15% of the market globally at $6.00 per linear yard

- **Widths:**
  
  94-96” + Growing?

- **Uncoated Fabric:**
  
  95% of the market globally at $4.00 per linear yard

Source: Gerber
Fabrics/Yarns Used

While original yarns/fabrics used were variations of 840 denier nylon 6,6, neoprene coated, today’s fabrics are primarily nylon 6,6, lighter denier/dtex, lower dpf yarns, and silicone coated. Typical yarns and constructions being used and evaluated are plain weave:

- 210 denier/235 dtex, 72X72
- 315 denier/350 dtex, 60X60
- 420 denier/470 dtex, 49X49
- 525 denier/580 dtex, 43X44
- 630 denier/700 dtex, 41X41
Coatings

- Neoprene was the original coating –
  - available, cheap, adequate, familiar

- Most new developments involve silicone.
  - Low or no flammability (FMVSS302)
  - Abrasion resistance
  - Good flex
  - Low gas permeability (<0.3 cfm)
  - Thermal aging stability
  - Low stiffness (for packing)

SOURCE: Wacker Silicones
Coatings are used in:

Driver side – essentially 100%
Passenger side – Some
Side Impact – Most
Curtains – Most
Automotive Airbags – What Now?

The Air Bag Process – a textile perspective

Fiber → Yarn → Fabric → Airbag → Module Assembly

Cut/Sew

Coating

Silicone Others

SOURCE: Wacker Silicones
What is driving the growth in airbags:

- Federal regulation – first and foremost
- Public awareness
- General increase in concerns for safety
- Development of rollover and side impact systems
- Increased sophistication of systems
- Competitive dynamics
World Trends to 2005

- Front airbags will
  - Fluctuate with the car production rates in WE, the USA, and Japan
  - Still grow in other area

- Side airbags fueling growth

- Head protection and roll-over protection will be fast growing application

- New systems are under development for such areas as knee, foot, and headrest, even an external pedestrian system
World Trends to 2005

**BUT:**

- Price reductions will be difficult to achieve as system becomes more sophisticated

- Further cost reductions will have to be based on *innovation and new development.*
What’s Ahead?

- Composites? Combinations of materials – nonwovens and film? Use specific?

- Lighter fabrics for packability and for use with “cold inflator” technology and special areas?

- New coating polymers?

- Consolidation/Integration of supply chain?

- New applications for air bags – but selective: side curtains, rollover protection, others?
Automotive Airbags – What Now?

Autoliv Head and Thorax Bag
Automotive Airbags – What Now?

Carpet/Floor Airbags
Automotive Airbags – What Now?

Knee Bags
Inflatable Back Passenger Seat Belt
Pedestrian Protection Bags
GLOBAL AIRBAG GROWTH FACTORS

- Continued growth of side-impact and curtain applications in North America, Europe and Asia-Pacific.

- Developing airbag markets in South America, Eastern Europe, Southeast Asia, India and China.

- Conversion to global platforms by the Big 6 vehicle manufacturers promotes safety product usage -- airbags, pretensioners, occupant sensing systems and anticipatory crash technologies.

- Maturing supply base in developing areas, ready to produce airbags in mass quantities, often licensing technologies or partnering with large airbag suppliers (China is a prime example).

- Technology maturation, growing consumer acceptance and lower prices will push airbag utilization to near 100% in Japan and Western Europe.

- Improved fabric technologies are decreasing cushion weight and increasing “foldability”, new coating applications are a major contributor to this trend.

Source: Providata; The Global Automotive Airbag market 2001-2010
Requirements for Automotive Industry Suppliers

- Price
- Quality
- Competence in production, technology and development
- Long-term strategy
- Innovation
- Financial stability
- Integrated service package
- Logistics
- Flexibility
- Globalization
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