Steel Use in Chrysler Sebring Sedan/Convertible and Dodge Avenger

James Chapp / Vinay C. Shah
DaimlerChrysler Corporation
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Design/Process Requirements

Goals
• Increase customer satisfaction
  - 5 Star Crash Performance
  - Increase interior volume
  - Increase fuel economy
• Enhance performance in NVH, durability and crashworthiness

Enablers
• Stronger and lighter materials
• Strategic use of AHSS and UHSS
  - Impact zones
  - High stress components
• Improve section, connection and continuity
Body Shell Material

• Aluminum
• Mild Steel including bake hardenable steel
• HSLA
• Dual Phase
• Hot Stamp Boron

2007 Chrysler Sebring Sedan
Body Shell Material

- Aluminum
- Mild Steel including bake hardenable steel
- HSLA
- Dual Phase
- Hot Stamp Boron
- Martensitic 220 KSI

2008 Chrysler Sebring Convertible
Steel Usage – Sebring & Avenger Sedan

2007 Chrysler Sebring & 2008 Dodge Avenger

- 22 less parts overall
- 27 less mild steel parts
- First implementation of DP 590 and Hot Stamp in this segment
2008 Sebring Convertible

- 29 less mild steel parts
- First implementation of DP 590, Hot Stamp Boron and Martensitic 220 steel in this segment
AHSS Steel

2007 Chrysler Sebring Sedan
30 AHSS Components
GA DP 340/590
AHSS Steel – Sebring & Avenger

Galvanneal Coated Dual Phase 340/590 MPa Steel
Front rails/Rear rails/Sills/Kickup/Dash
crossmember/Rear crossmember

• Weight optimization
• Impact energy absorption

2007 Chrysler Sebring
2008 Dodge Avenger
2008 Chrysler Sebring Convertible
UHSS – Sebring & Avenger Sedan

Hot Stamp Boron Steel Usage

Side Structure
Door Impact Beams
B-Pillar

Roof Structure
Windshield Frame
Roof Side Rail
Hot Stamp – Sebring Convertible

Convertible contains 4 hot stamped parts
Windshield frame/Door impact beam
Hot Stamped Parts

Weight Reduction

B-Pillar - previously two 50 ksi parts per side
Reduction of 5.01 lbs/side

Front Door Impact Beam – previously two beams per door
Reduction of 6.24 lbs/side

Overall Effects
Was 26 mild and HSS parts
Now 10 Hot Stamped parts
Total weight reduction of 24.55 lbs from hot stamp material usage
Sedan & Convertible Design Differences

2007 Sebring Sedan-Body Side

Comparison of body side structure

2008 Sebring Convertible-Body Side
Sedan & Convertible Design Differences

2007 Sebring Sedan Underbody

2008 Sebring Convertible Underbody

Front floor cross brace
Convertible Design Differences

- Unique underbody structure required for convertible vehicle
  - 13 HSS Parts = 34.2 % of convertible reinforcement parts
  - 1 Martensitic 220 UHSS part
    - Cross car beam
## Body Parts Comparison

### New Sedans

**HSS/AHSS/UHSS Parts**
- 10 parts with Hot Stamp Boron Steel  
  - B-Pillar/Windshield Frame/Roof Side Rail/Door Beams  
- 30 parts with Dual Phase 340/590 Steel  
  - Sills/Front Rails/Dash  
  - Crossmember/Rear Rails/Tunnel Cap  
- 2 parts with 120 ksi HSLA steel  
- 6 parts with 80 ksi HSLA steel  
- 39 parts with 50 ksi HSLA steel  
- 14 parts with 40 ksi HSLA steel

### New Convertible

**HSS/AHSS/UHSS Parts**
- 1 part with 220 ksi Martensitic Steel  
  - Cross car beam  
- 4 Hot Stamp Boron Steel  
  - Windshield Frame/Door Beam  
- 30 parts with Dual Phase 340/590 Steel  
  - Sills/Front Rails/Dash  
  - Crossmember/Rear Rails/Tunnel Cap  
- 2 parts with 120 ksi HSLA steel  
- 8 parts with 80 ksi HSLA steel  
- 42 parts with 50 ksi HSLA steel  
- 20 parts with 40 ksi HSLA steel

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2007 Sebring Sedan

2008 Sebring Convertible

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[www.autosteel.org](http://www.autosteel.org)
Conclusion

- Optimized interior volume-to-weight ratio
- First Usage of AHSS & UHSS in segment – 40 total parts, 13.9% of parts on sedan
- Achieve weight target for body shell –
  Prior Sedan Body Shell = 789 lbs
  New Sedan Body Shell = 813 lbs
Near Term Goal and Vision
Potential Use of Steels at DCC

**Current Material**
- Door Outer – BH-210
- Door Inner – Mild Steel
- Door Beam – Hot Stamped
- Hood / Deck – Mild Steel
- Fender – Mild Steel

**Development / Needs**
- Current – BH Steels
- Vision – DP Steels

**Closures and Exposed:**
- Structures and Dent Performance

**Vision**
- Door Outer – 490 MPa
- Door Inner – 590 MPa
- Door Beam – 1500+ MPa
- Hood / Deck – 490 MPa
- Fender – 490 MPa
Potential Use of Steels at DCC

**Current Material**
- A-Pillar – Hot Stamped
- B-Pillar – Hot Stamped
- Roof Rail – Hot Stamped
- Roof Header – DP590
- Sill – DP590

**Vision**
- A-Pillar – 980+ MPa
- B-Pillar – 980+ MPa
- Roof Rail – 980+ MPa
- Roof Header – 980+ MPa
- Sill – 780+ MPa

**Development / Needs**
- Current – PM / TRIP
- Vision – TWIP

**Cab:**
- Intrusion Resistance
Potential Use of Steels at DCC

**Current Material**
- Front Rails – DP 590
- Rear Rails – DP 590
- Fender Reinf – Mild Steel
- Tunnel Reinf – HSLA

**Vision**
- Front Rails – 780+ MPa
- Rear Rails – 780+ MPa
- Fender Reinf – 490+ MPa
- Tunnel Reinf – 980+ MPa

**Development / Needs**
- Current – PM / TRIP
- Vision – TWIP

**Crush Zones:**
- Energy absorption
Future Use of Steels at DCC

Hot Stamping vs. Future AHSS
DCC Direction

Hot Forming
Usibor, BTR

Cost
Performance
Availability

Cold Forming
AHSS/TWIP

Future AHSS
Sheet Steel Usage Trend

**Current**

- **HSS**: 25.1%
- **Mild & Medium**: 60.4%
- **AHSS**: 11.8%
- **UHSS**: 2.7%

**Upcoming Products**

- **Mild & Medium**: 35 - 40%
- **AHSS**: 40 - 45%
- **HSS**: 10%
- **UHSS**: 10%

*weight percent

**Vision**

- **AHSS**: 24%
- **Mild & Medium**: 52%
- **HSS**: 18%
- **UHSS**: 6%
AHSS Use in New DCC Vehicles

Jeep Compass

Jeep Wrangler
AHSS Use in New DCC Vehicles

Dodge - Grand Caravan

Jeep Patriot
Thank You