Presentations will be available for download on SMDI’s website on Wednesday, May 22
THE EVOLUTION AND OUTLOOK FOR STEEL IN NORTH AMERICAN LIGHT VEHICLES

Abey Abraham – Managing Director
May 15th 2019
DUCKER WORLDWIDE JOINS FRONTIER STRATEGY GROUP


The combined company provides unrivalled market research and executive advisory services based on decades of experience supporting the strategic decisions of more than 700 companies. Client executives will benefit from the firm’s broader expertise and geographic reach, robust cloud-based technology platforms, expanded insight into customer behavior, and award-winning data and analyst insights spanning the B2B, healthcare, consumer, and private equity industries.

"This acquisition is designed to maximize the potential of our combined company to better serve our clients and accelerate growth. The demands of growth and forces of change facing multinational company executives and investment professionals get tougher every year, and by bringing together FSG and Ducker’s highly complementary offerings, areas of expertise and global footprint, we can immediately provide a comprehensive set of solutions that address our clients’ global strategic priorities and growth mandates."

- Richard Leggett, CEO
COMPREHENSIVE INSIGHTS FOR HIGH-STAKES MARKETS

Our combined business has the unique ability to deliver superior outcomes throughout all stages and aspects of our clients' growth ambitions.

THE COMBINED BUSINESS MODEL ADDRESSES ALL STAGES OF A CLIENT’S GROWTH MANDATE

- Define Optimal Segments For Growth
- Examine Customer Requirements
- Outline Go-to-market Alternatives
- Support Inorganic Opportunities
- Provide Continuous Monitoring and Decision Support

END-TO-END RESEARCH AND CONSULTING SOLUTIONS

- Economic Forecasts
- Market Insights
- Market Monitoring
- Thought Leadership
- Consulting Solutions
- Cloud-based Technology And Data

EXPANDED GLOBAL FOOTPRINT

Together Ducker Worldwide and Frontier Strategy Group serve multinational and investment professionals around the world via our nearly 200+ professionals across 9 global offices.

<table>
<thead>
<tr>
<th>AMERICAS</th>
<th>EU EUROPE</th>
<th>ASIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detroit</td>
<td>London</td>
<td>Bangalore</td>
</tr>
<tr>
<td>New York</td>
<td>Paris</td>
<td>Singapore</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>Berlin</td>
<td>Shanghai</td>
</tr>
</tbody>
</table>
SETTING THE STAGE

Several different yet related factors impact OEM decisions to go forward with the significant lightweighting of vehicle components. Regulations, competition, cost, capital, timing and other alternatives for achieving the OEM’s business goals all come into play.
The steel industry has demonstrated its ability to work in a coordinated and highly responsive manner with customers to innovate, design, test, and support evolving needs.
CO2 & MPG REGULATIONS ARE DEMONSTRATING SIGNIFICANT PROGRESS

Source: 2018 EPA
GLOBAL REGULATIONS DRIVE THE DEMAND FOR LIGHTWEIGHTING

Passenger car miles per gallon, normalized to CAFE

- historical performance
- enacted target
- proposed target

* Note that Japan has already met its 2020 statutory target as of 2013

Updated April 2019
Details at www.theicct.org/chart-library-passenger-vehicle-fuel-economy
GLOBAL REGULATIONS DRIVE THE DEMAND FOR LIGHTWEIGHTING

Light truck miles per gallon, normalized to CAFE

- historical performance
- enacted target
- proposed target

Updated April 2018
Details at www.theicct.org/chart-library-passenger-vehicle-fuel-economy
THE ROAD TO COMPLIANCE IS A BALANCING ACT

Compliance - Gap
Cost Targets
Performance
Customer Needs
Global Goals
Plant Issues/Union

Powertrain & Electrification
Materials (Body structures/chassis)
Design/Aerodynamic

UP TO 7% Mass Reduction Is Needed

Source: DuckerFrontier Analysis
CLOSING THE REGULATORY COMPLIANCE GAP IS A MULTISTEP PROCESS

Where is the Weight: Light Vehicle Mass Distribution

Body & Closure: 25%
- Chassis Suspension & Steering: 13%
- Engine: 15%
- Transmission & Driveline: 12%
- Fuel & Exhaust: 6%
- Interior: 5%
- Glass, Paint, Trim: 5%
- Wheels & Tires: 5%
- All Others: 4%
- Electronical & Electronics: 4%
- Braking: 4%
- HVAC: 1%
- Bumpers: 1%

Body parts, closures, bumpers, chassis and suspension parts are the prime candidates for further weight reduction.

Level 1 - Material Substitution
One to One Part/Material Substitution: Closures, Bumpers, Knuckles, Control Arms etc.

Level 2 - Holistic Weight Saving Designs
Parts Consolidation, Multi-Form & Multi Material: sub-frames, front end modules, shock towers, door rings etc.

Level 3 – Glazing/glass, coatings, interiors, etc.

Source: DuckerFrontier Analysis
Objective

• 2017/2018 Flat Rolled Steel Content with a core focus on AHSS and emerging Ultra-high strength steel for the North American Light Vehicle
• Continue in-depth research and insights since the first iteration of this study completed in 2005 for the SMDI

Scope

• Flat Rolled Steel content to encompass the vehicle Body-in-White, closures, bumpers, sub-frames/cradles, suspension, and wheels
• The results are inclusive of over 90% of NA vehicles produced in 2017/2018
• The Ducker study utilized a top down and bottom up approach with OEM, supplier and steel mill inputs
RESULTS

The average North American light vehicle in 2018 is estimated to have 1,480 pounds of flat rolled steel – with nearly 90 pounds of AHSS/UHSS content growth from 2013.

- AHSS continues its growth trajectory with approximately 258 pounds per vehicle in 2018, surpassing our estimates in 2013 by ~4 pounds per vehicle

- The 2018 average light vehicle content of flat rolled steel versus the 2013 flat rolled content per vehicle for body-in-white, structures, closures, door beams, bumper beams, suspensions, subframes, fuel tanks and wheels in pounds per vehicle has changed as follows:

<table>
<thead>
<tr>
<th>Mild Steel</th>
<th>BH</th>
<th>AHSS (DP)</th>
<th>UHSS/3rd Gen. AHSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼ Decline</td>
<td>▼ Decline</td>
<td>▲ 70.0</td>
<td>▲ 19.9</td>
</tr>
</tbody>
</table>

Source: DuckerFrontier
STEEL COMPONENT PENETRATION - CLOSURES

Besides hoods, the remaining closure components remain primarily in steel.

Source: DuckerFrontier Analysis
STEEL GRADE MIX

Net steel content for body in white and closures will see declines; however, AHSS, UHSS and 3rd Gen AHSS materials will grow at a tremendous pace.

---

**BIW & Closure Steel Content Pounds Per Vehicle By Grade**

*Grade Percentage & Total Pounds*

<table>
<thead>
<tr>
<th>Year</th>
<th>HSS 39%</th>
<th>HSS 36%</th>
<th>HSS 30%</th>
<th>HSS 16%</th>
<th>AHSS 18%</th>
<th>AHSS 17%</th>
<th>UHSS 5%</th>
<th>UHSS 12%</th>
<th>UHSS 26%</th>
<th>UHSS 28%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Mild 47%</td>
<td>Mild 44%</td>
<td>Mild 42%</td>
<td>Mild 40%</td>
<td>AHSS 20%</td>
<td>AHSS 16%</td>
<td>UHSS 3%</td>
<td>AHSS 11%</td>
<td>AHSS 14%</td>
<td>AHSS 17%</td>
</tr>
<tr>
<td>2015</td>
<td>Mild 44%</td>
<td>Mild 42%</td>
<td>Mild 40%</td>
<td>Mild 39%</td>
<td>AHSS 20%</td>
<td>AHSS 16%</td>
<td>UHSS 3%</td>
<td>AHSS 11%</td>
<td>AHSS 14%</td>
<td>AHSS 17%</td>
</tr>
<tr>
<td>2018</td>
<td>Mild 42%</td>
<td>Mild 40%</td>
<td>Mild 39%</td>
<td>Mild 37%</td>
<td>AHSS 20%</td>
<td>AHSS 16%</td>
<td>UHSS 3%</td>
<td>AHSS 11%</td>
<td>AHSS 14%</td>
<td>AHSS 17%</td>
</tr>
<tr>
<td>2020</td>
<td>Mild 40%</td>
<td>Mild 39%</td>
<td>Mild 37%</td>
<td>Mild 35%</td>
<td>AHSS 20%</td>
<td>AHSS 16%</td>
<td>UHSS 3%</td>
<td>AHSS 11%</td>
<td>AHSS 14%</td>
<td>AHSS 17%</td>
</tr>
<tr>
<td>2025 4.5%</td>
<td>Mild 37%</td>
<td>Mild 35%</td>
<td>Mild 33%</td>
<td>Mild 31%</td>
<td>AHSS 20%</td>
<td>AHSS 16%</td>
<td>UHSS 3%</td>
<td>AHSS 11%</td>
<td>AHSS 14%</td>
<td>AHSS 17%</td>
</tr>
<tr>
<td>2025 7%</td>
<td>Mild 35%</td>
<td>Mild 33%</td>
<td>Mild 31%</td>
<td>Mild 29%</td>
<td>AHSS 20%</td>
<td>AHSS 16%</td>
<td>UHSS 3%</td>
<td>AHSS 11%</td>
<td>AHSS 14%</td>
<td>AHSS 17%</td>
</tr>
</tbody>
</table>

Source: DuckerFrontier Analysis
Steel remains the primary share of automotive materials; however, from a content perspective, steel declines by approximately 55 pounds between 2013 and 2018 due to the increased use of thinner gage AHSS and UHSS as opposed to Mild or HSS.
Controlled deformation, high rigidity (limited deformation) and associated weights savings are the fundamental properties driving the growth and proliferation of advanced grades of steel.

**Current Applications**
- A- Pillar
- B- Pillar
- Door Ring
- Door Header
- Door Beam
- Rocker Support / Reinforcement
- Tunnel Rail’s
- Bumper Beams
- Floor Sills
- Hinge post / Cantrails
- Others

**Source:** DuckerFrontier Analysis
APPLICATIONS OF UHSS (PH & 3<sup>rd</sup> GEN AHSS)

Controlled deformation, high rigidity (limited deformation) and associated weights savings are the fundamental properties driving the growth and proliferation of advanced grades of steel.

(UHSS) Generation 3 Steels

- High Tensile Strengths
- Controlled (zoned) Deformation
- High Parts Complexity (advanced geometries)

Projected Applications
- Replacing select or adding adjacent parts to current Press Hardened Steel
- “If 3<sup>rd</sup> Gen. AHSS can deliver the performance characteristics of PH Steels, our strategy would be to replace as much as we can” OEM

Additional Applications
- Applications that would prove significant weight savings opportunity within the Chassis and Body of the vehicle: suspension arms/links, sub-frames and cross members, IP structures etc.
- “The products elongation and formability make further replacement of HSS or DP steels” 3<sup>rd</sup> Gen. AHSS Material Supplier

Source: DuckerFrontier Analysis
3rd Gen AHSS have a dual pathway of automotive utilization, the first and more near term would take advantage of 3rd Gen AHSS’s higher strength and elongation to replace heavier HSS and HSLA applications. Eventually, 3rd Gen AHSS will augment and/or replace PH steel applications.

Source: DuckerFrontier Analysis, Nano-Steel, Arcelor Mittal, SMDI
The 2018 AHSS and UHSS use in North American produced light vehicles is 329 pounds per vehicle, a significant increase from 2013, translating to an additional 90 pounds or a 38% growth from 2013.

- Between 2012 and 2018, there has been a net increase of AHSS/UHSS grades of steel of ~120 pounds per vehicle. This translates to an annual average growth of 20 lbs. per year.
Steel remains the primary share of automotive materials; however, from a content perspective, steel will decline by approximately 65 pounds between 2018 and 2020 due to the increased use of thinner gage AHSS and UHSS as opposed to Mild or HSS.

Source: American Chemistry Council & DuckerFrontier Analysis
The 2015 AHSS use in North American produced light vehicles is 279 pounds and expected to grow significantly to 570 pounds by 2025.

- Adoption rates and estimates vary by OEM; however, beyond 2020, AHSS pounds per vehicle will decline, while UHSS continues to grow.
- Growth of advanced grades of steel has increased since the 2013 report, where 2019 was 351 pounds, and 2025 was 483 pounds.

Source: DuckerFrontier Analysis
THANK YOU

Ducker Frontier
Presentations will be available for download on SMDI’s website on Wednesday, May 22