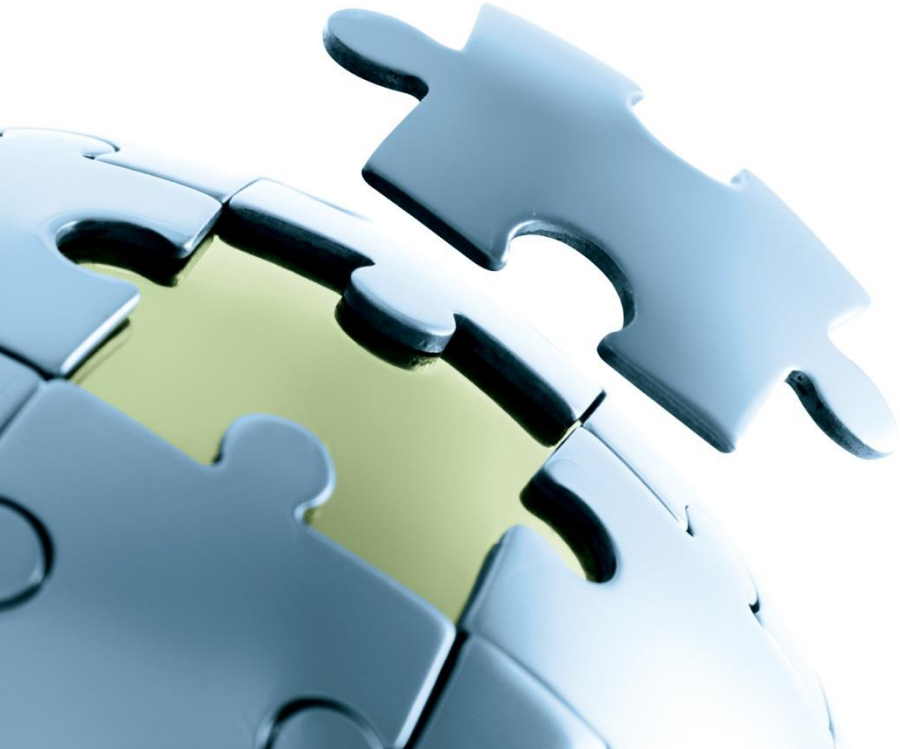
DUCKER WORLDWIDE
Advancing Growth



Metallic Material Trends in the North American Light Vehicle

Automotive *Right*-Weighting

March 2015

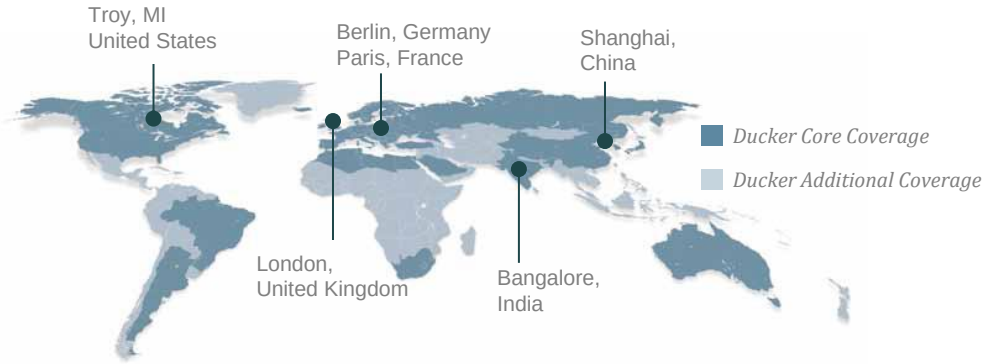
Ducker Worldwide

Ducker Worldwide is a market intelligence, transaction advisory and strategic consulting firm driven to help you achieve your most ambitious growth goals

What We Do

- Market Intelligence and Research
- Strategic Consulting
- Transaction Advisory and Diligence

Access to a Global Footprint



Ducker Facts

53	Year history
150	Team members worldwide
275	End-use markets served
32	Languages spoken
88	Countries were we have experience

Industry and Sector Experts

Transportation (Automotive and CV)	Building Products & Materials	Heavy Equipment & Capital Goods
Industrials & Raw Materials	Aerospace	Healthcare Device & Services

Aluminum in the News

Aluminum is on everyone's radar, investment in the sector is dramatically up

"Ford's new F-150 pickup, the first high-volume vehicle to be built with an all-aluminum body…"
- Light-weighting Summit – Detroit - May 2014

"Will All-Aluminum Cars Drive Metals Industry?"
- Wall Street Journal – London - February 2014

"By 2025, the Ducker report predicts full-sized body-on-frame pickups will average 975 pounds of aluminum, up from 354 pounds in 2012…"
- Automotive News – 2014

"Over the next two decades automakers will use more aluminum for closures - such as hoods, deck-lids and door panels - and also body structures and bumpers"
- Wall Street Journal – February 2014

Steel in the News

The steel industry is not sitting idle, rolling up its sleeves and defending its market share

"Tesla's Gen 3 Sedan To Be Steel-Bodied, Have 'Realistic' Pricing"

- Motor Authority – July 2014

"Steel to play a key role in meeting 2025 mpg targets"

- Automotive World – July 2014

"Advanced high-strength steels will offer more than sufficient light-weighting opportunities to automotive companies in the next decade, and from 2021-2025"

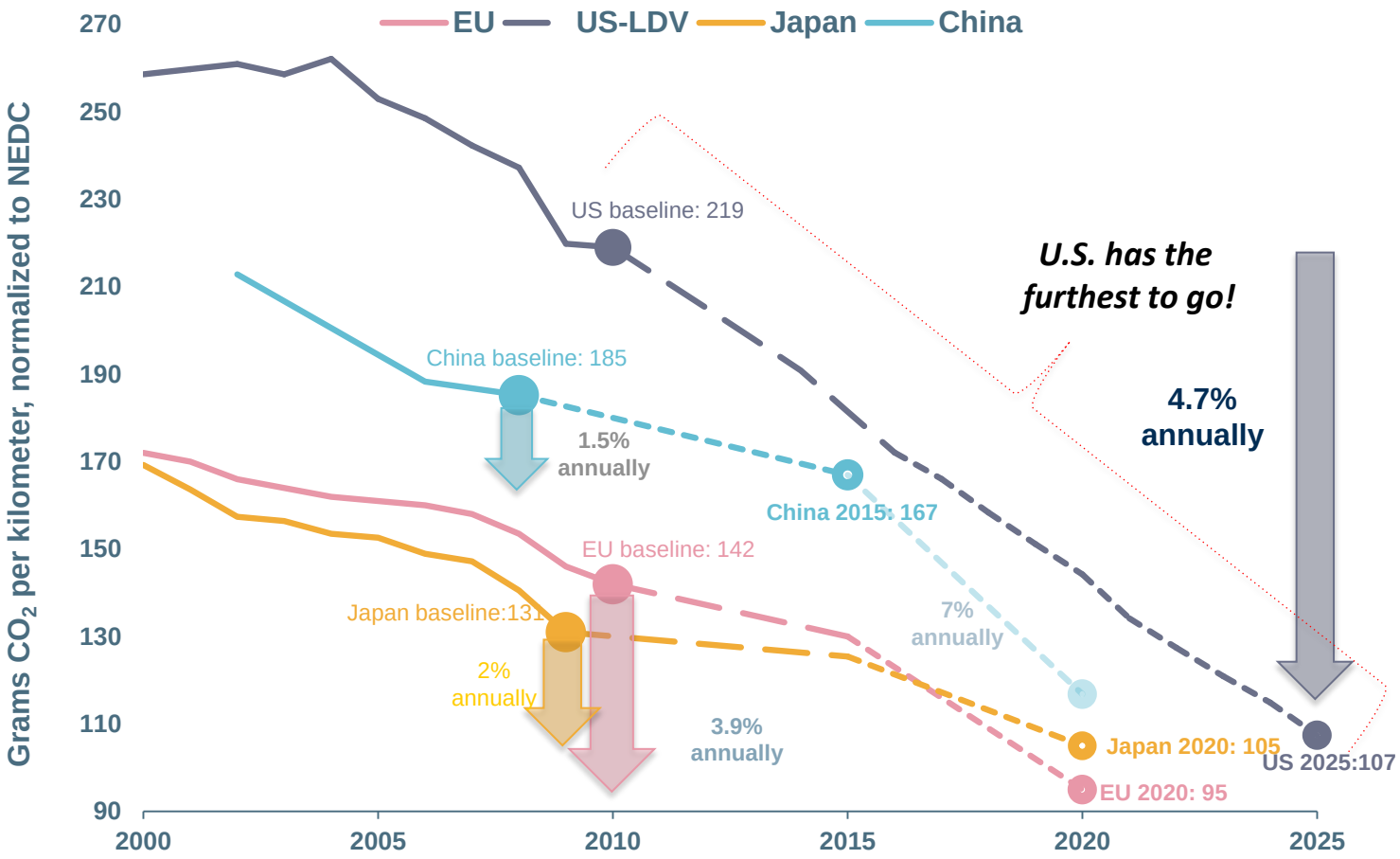
- World Steel Dynamics – October 2014

"The first serially produced vehicles to utilize the new (gen 3) steel will roll off production lines in 2017, …already undergone formability and weld-ability tests with global carmakers…"

- Arcelor Mittal – April 2014

US & Global Perspective on Reducing CO2

Key Region/Country Absolute and Annual CO2 Rate Comparison



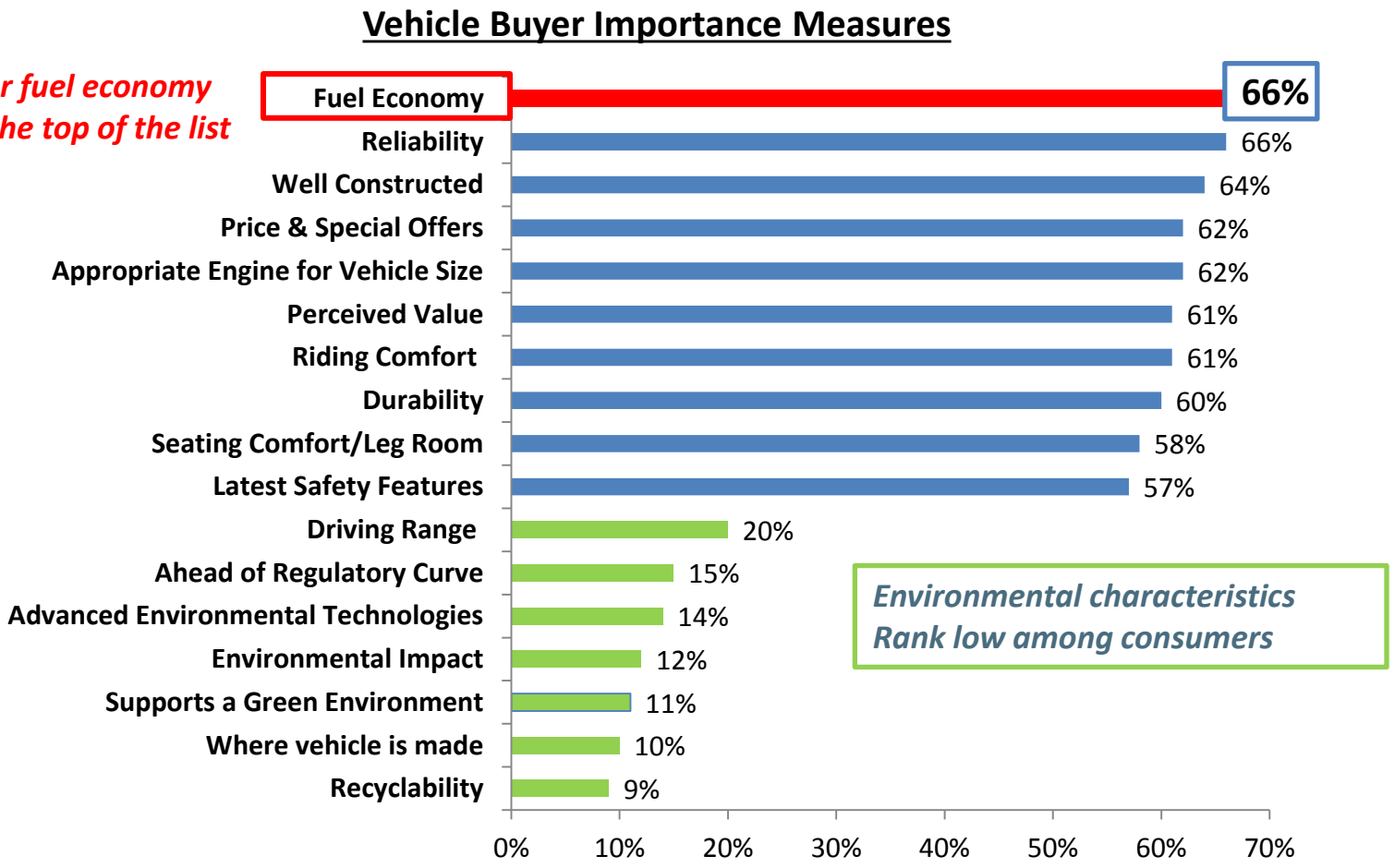
[1] China's target reflects gasoline fleet scenario. If including other fuel types, the target will be lower.
[2] US and Canada light-duty vehicles include light-commercial vehicles.
[3] Annual rate is calculated using baseline actual performance and target values.

Source: European Aluminium Association

Consumers Demand Fuel Economy

What do automotive consumers say they wanted in a new vehicle?

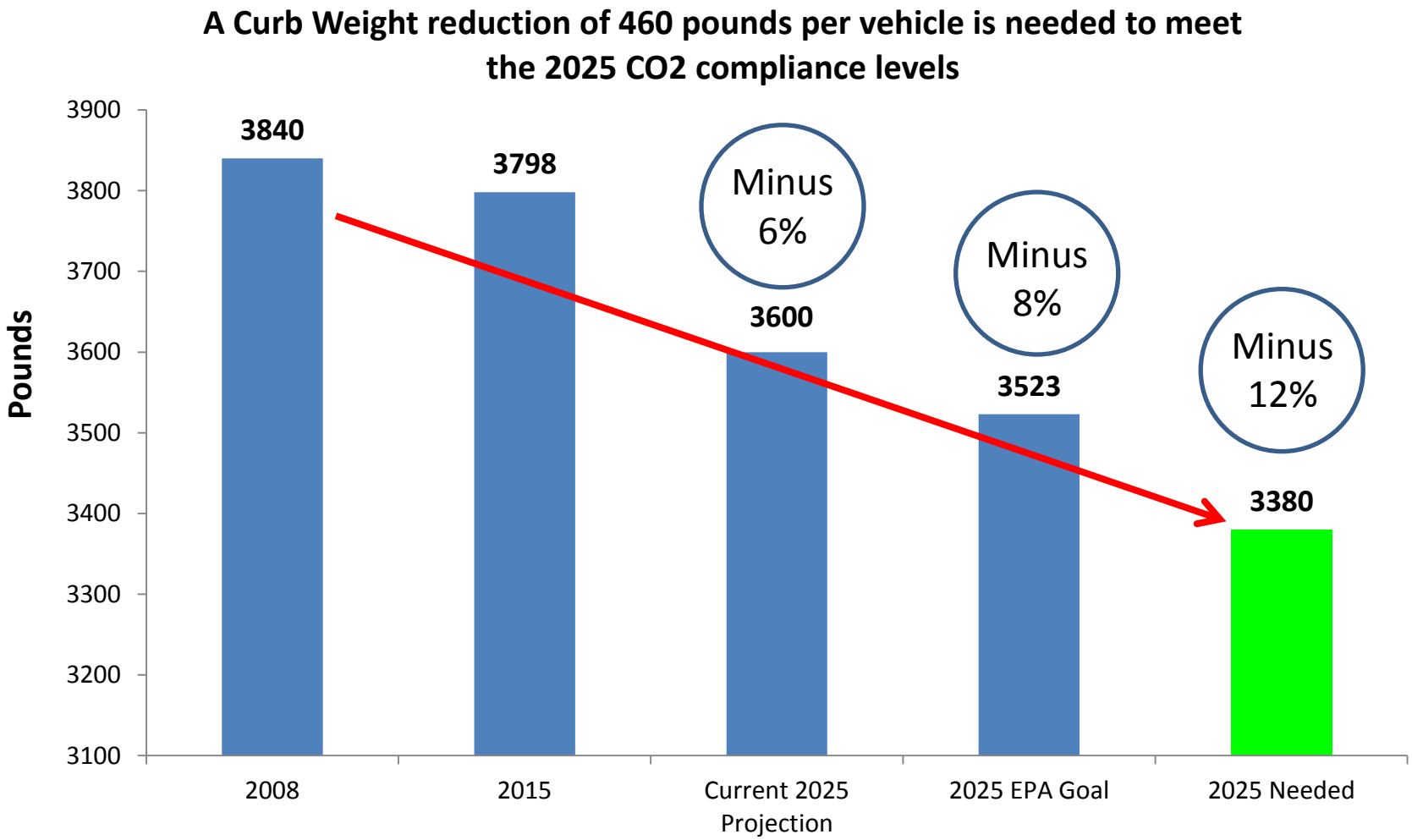
First time ever fuel economy is at or near the top of the list



Source: Synovate Survey & Ducker Analysis

A Plan Forward: Weight Reduction

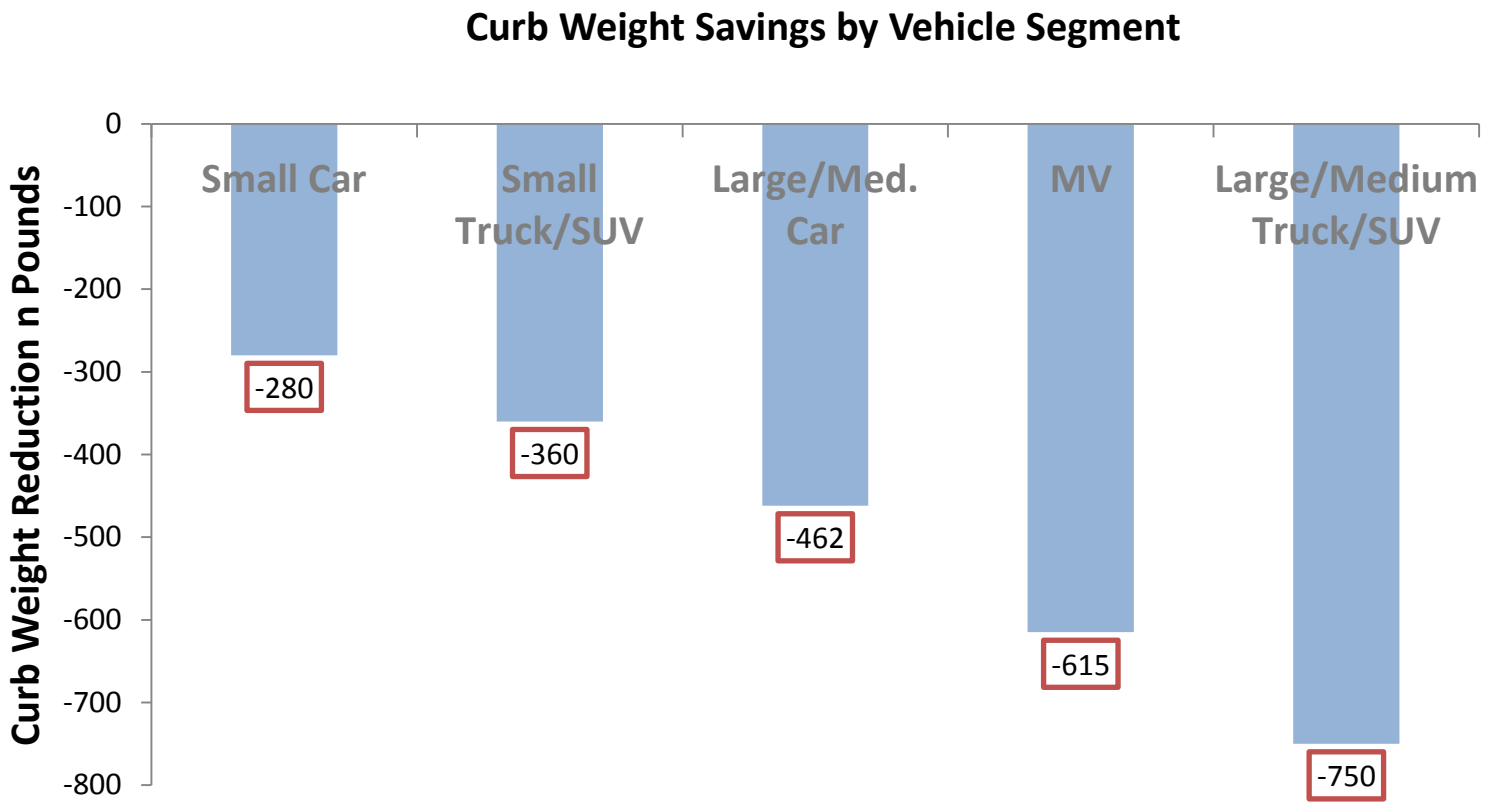
Ducker believes that more weight reduction will be required to meet the compliance levels



Source: Ducker Analysis

A Plan Forward: Weight Reduction

To reduce the 2025 curb weight by 12% or 460 pounds compared to 2008, the required weight reduction by vehicle segment is shown below



Source: Ducker Analysis

Materials Mix: Viewpoint

"Aluminum is sixty percent more costly than steel and if you start using it, or magnesium or plastics, you're increasing the cost of the car. And who is ultimately going to pay that cost? It's going to be the consumer. So we try and demonstrate the uses of these steels to make it easier for auto companies to then adapt these into their own platforms"

Materials Mix: Overall Comparisons

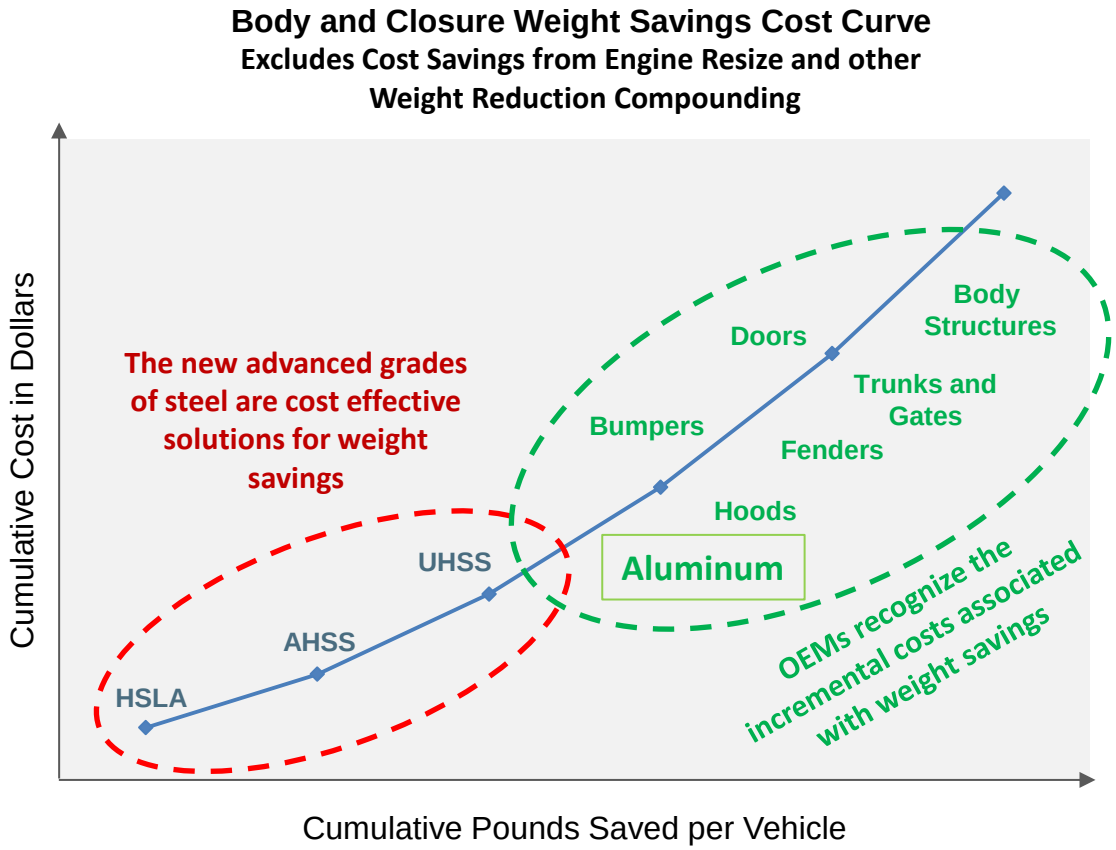
OEMs have a wide variety of materials to chose from, each offering their own cost to weight benefit ratio

Material	Density in g/cm3	Weight Savings for Equivalent Stiffness	"Current" Weight Savings (Equivalent Weight)	"Current " Cost per Lb Saved
Mild Steel	7.85	Base	Base	Base
AHSS	7.85	0%	15-20%	$0.50
Aluminum	2.7	45-55%	35-40%	$2.00
Magnesium	1.8	55-65%	45-50%	$2.50
Carbon Fiber TP Composites	1.6	75-80%	75-80%	$6.50

Source: Ducker Analysis, Energy and Transportation Science Division Oak Ridge National Laboratory August 2011

OEM and Vehicle Segment Driven Material Choice

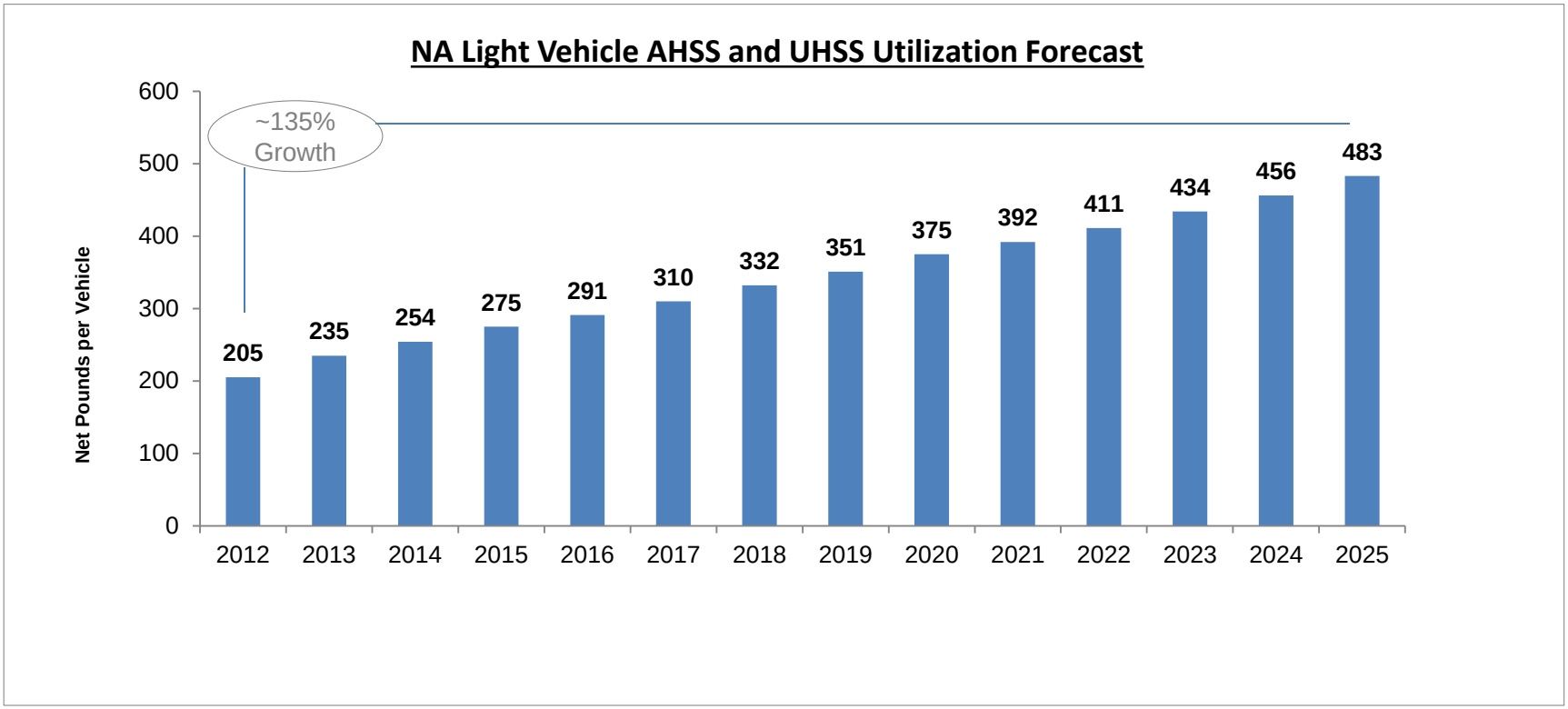
Given an OEMs mix of vehicles offered for sale in the US, the use of AHSS or Aluminum become strategic in nature: use the best materials for the weight savings required



HSLA = High strength, low-alloy steel
AHSS = Advanced high-strength steel
UHSS = Ultra high-strength steel

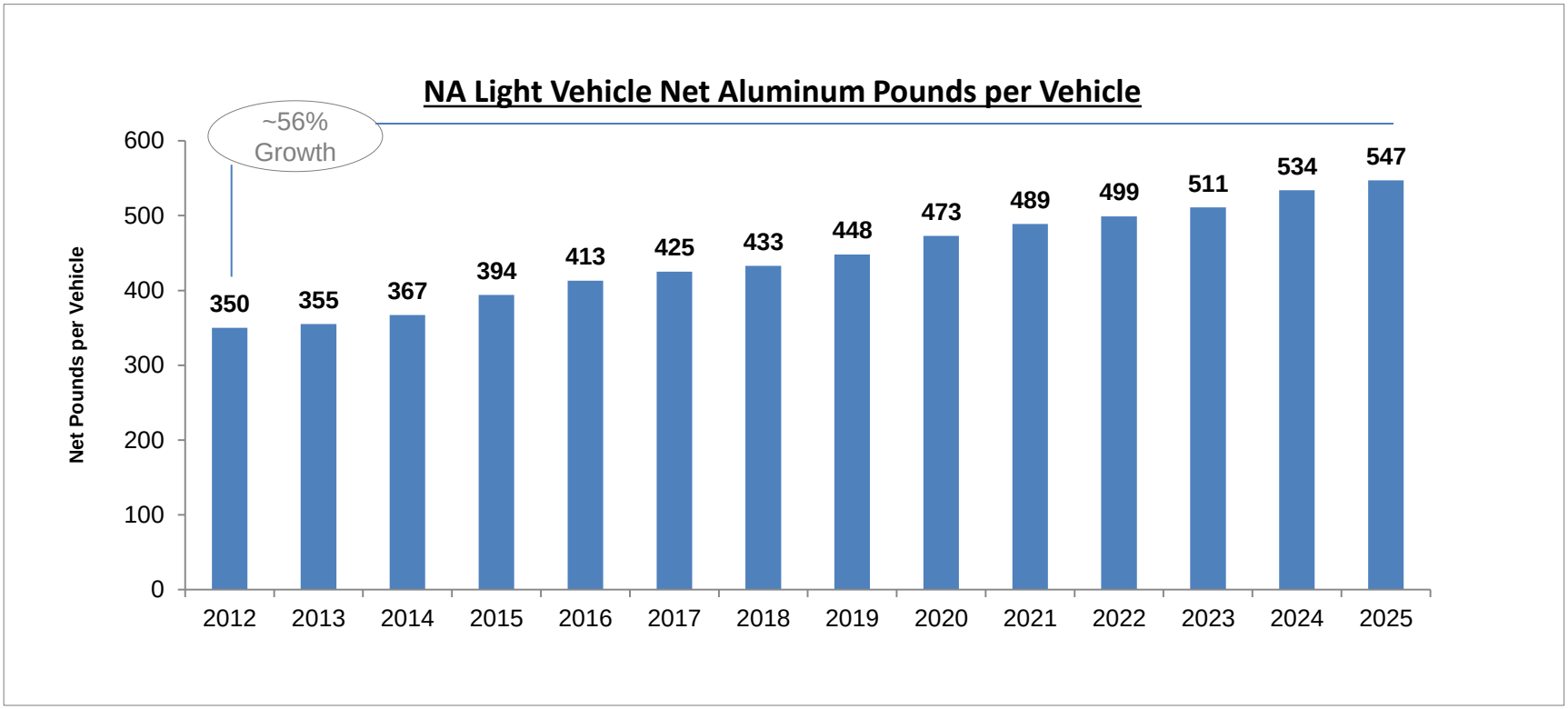
NA Advanced High Strength Steel Content and Forecast

The 2013 AHSS use in North American produced light vehicles is 235 pounds and expected to more than double to 483 pounds by 2025. As demand for light-weighting grows, particularly for OEMs and vehicle platforms that cannot accept the cost association with using aluminum, AHSS will provide relief



NA Aluminum Content and Forecast

Fifty years of uninterrupted aluminum growth for North American manufactured light vehicles is essentially guaranteed. There is nothing on the horizon that would tell us that this burst in aluminum growth can be significantly slowed over the next ten years



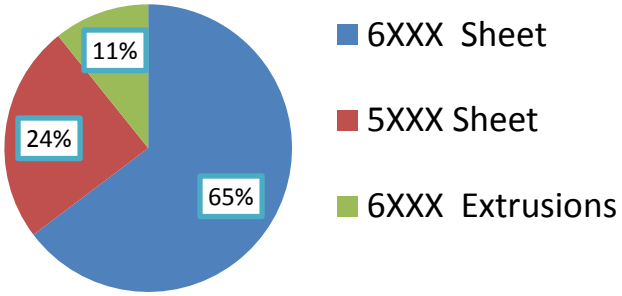
Perspectives on the 2015 Ford F-150

This November 6, 2014 photo shows the first F-150 trucks being built in Dearborn, Mich. It's Ford Motor Co.'s biggest bet in decades: an aluminum-sided F-150 that could set a new industry standard, or cost the company its pickup truck crown. (AP Photo/Carlos Osorio) The Associated Press

Perspectives on the 2015 Ford F-150

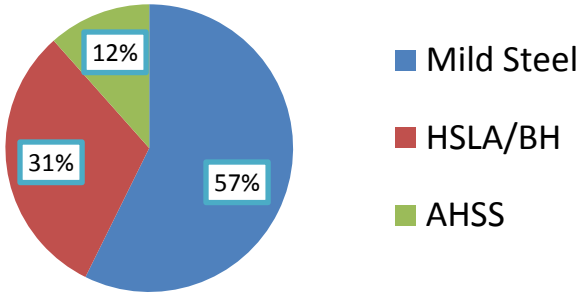
Aluminum additions to the 2015 F-150 body structure and closures saved ~470 pounds or 43% over the corresponding parts on the 2013 F-150. This excludes savings from the aluminum hood that is on both the old and new F150 trucks. Note the mix of steels replaced is typical of today's steel body mix

2015 F150 Crew Cab 632 pounds Excludes Steel Ladder Frame and Aluminum Hood



632 Net Pounds of Additional Aluminum

2013 F150 Crew Cab 1,102 Pounds Excludes Steel Ladder Frame and Aluminum Hood



Replaced 1,102 Net Pounds of Steel Sheet

OEM and Vehicle Segment Driven Material Choice

More than one way to achieve lower MPG: Light-weighting vs. Powertrain

2015 Ford F150 Pickup 2WD

2.7 L, EcoBoost 6 cyl, Automatic (S6), Turbo

22 combined city/highway

MPG 19 city 26 highway

4.5 gal/100mi

2015 Ram 1500 HFE 2WD

3.0 L, 6 cyl, Automatic 8-spd, Diesel Turbo

24 combined city/highway

MPG 21 city 29 highway

4.2 gal/100mi

2015 GMC Sierra C15 2WD

4.3 L, 6 cyl, Automatic 6-spd

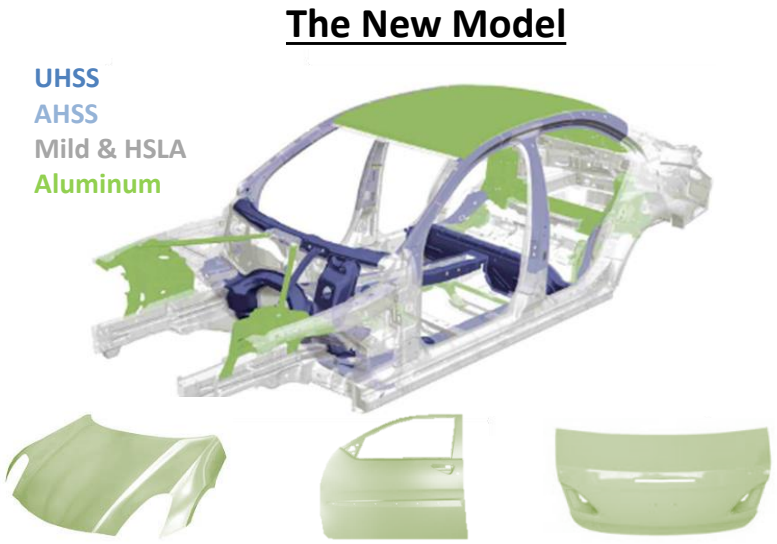
20 combined city/highway

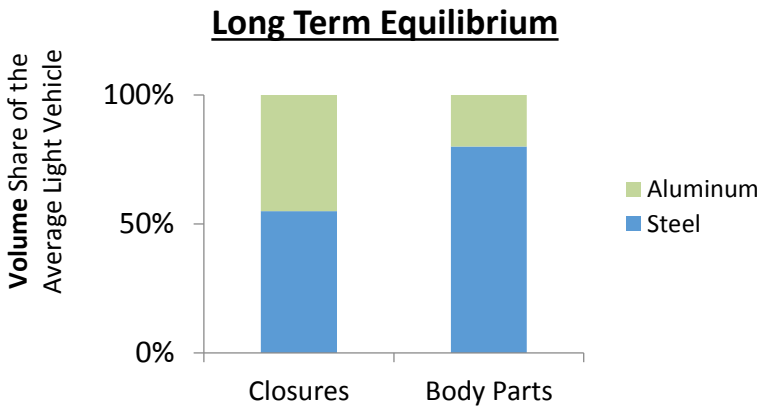
MPG 18 city 24 highway

5.0 gal/100mi

The Right Materials for the Right Applications

Closures, are likely to convert to aluminum, while most body parts will remain in steel with increased share of AHSS





Source: Ducker Worldwide

This concludes our report. Thank you.

50 YEARS
1961 – 2011

For 50 years, Ducker Worldwide has enabled clients to navigate and thrive in a dynamic, global marketplace. Our unique and proven combination of custom market intelligence, critical thinking and strategic consulting create valuable opportunities that deliver critical results.

For more information regarding our strategic services, expertise and to learn how Ducker Worldwide can help you, please contact one of our team members at 248-644-0086 or visit our website at www.ducker.com