Metallic Material Trends For North American Light Vehicles

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North American Light Vehicle Metallic Material Trends

- Ducker Worldwide has been a leader in the examination of worldwide material trends in vehicles for nearly 20 years
- In this presentation we will discuss past, present and future material trends for only North American light vehicles
- We will concentrate on mild steel, high strength steel, ultra high strength steel, iron and aluminum and the outside influences that we believe will effect the mix of these metals in North American light vehicles over the next ten years

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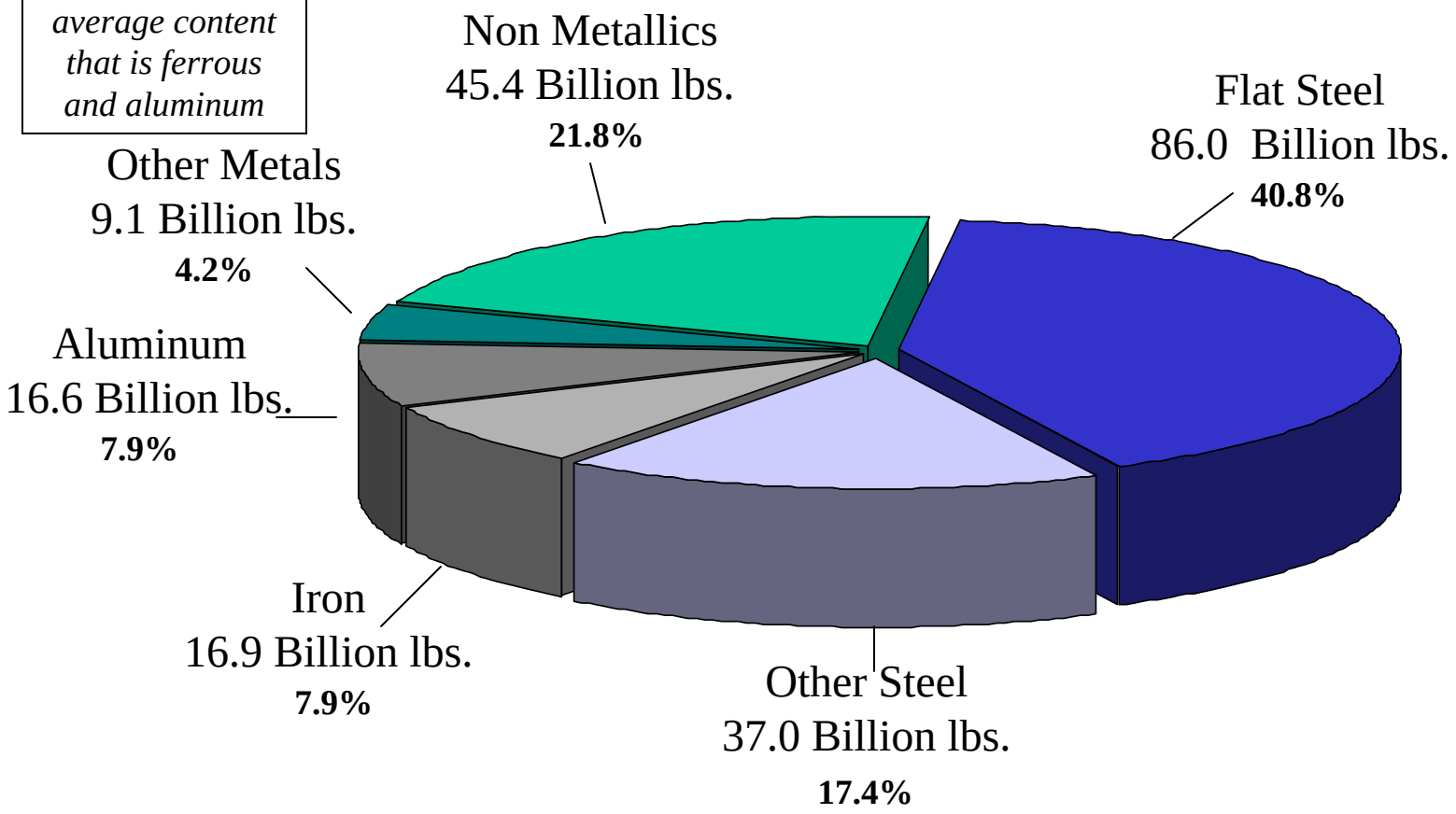
This presentation concentrates on the 75% of the average content that is ferrous and aluminum

2008 Worldwide Material Content for Light Vehicles



211 Billion Pounds for 66.3 Million vehicles in 2008

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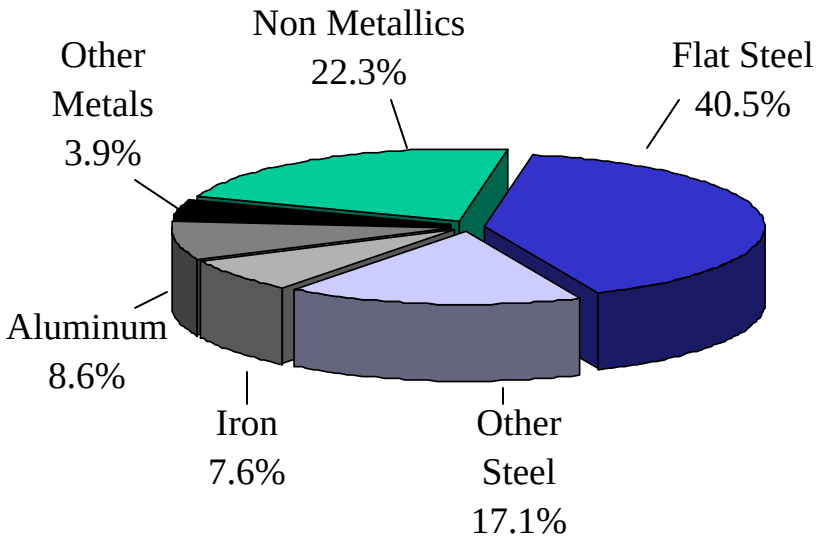
North American Light Vehicle Metallic Material Trends

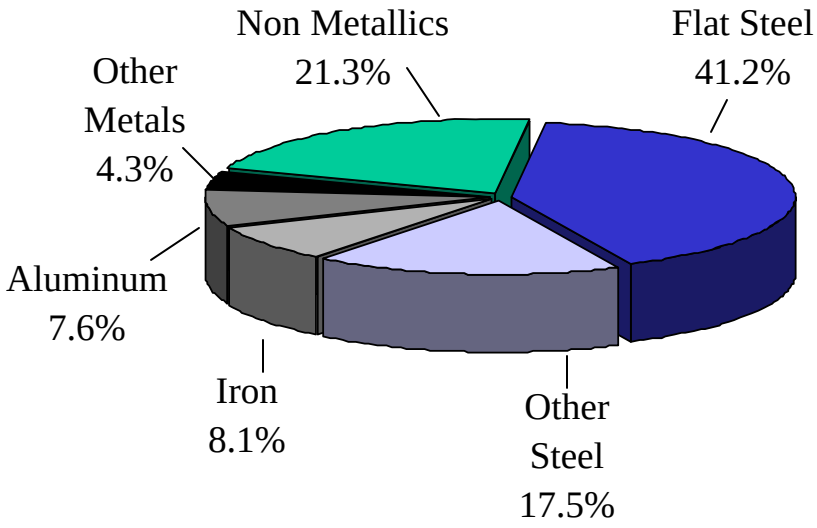
Light Vehicle Curb Weight Segmented by Material

2009 North America



3,755 Pounds

2009 Rest of the World



3,059 Pounds

- **Even after a great deal of hard work, our vehicles still weigh 700 lbs. more than vehicles in the rest of the world!**

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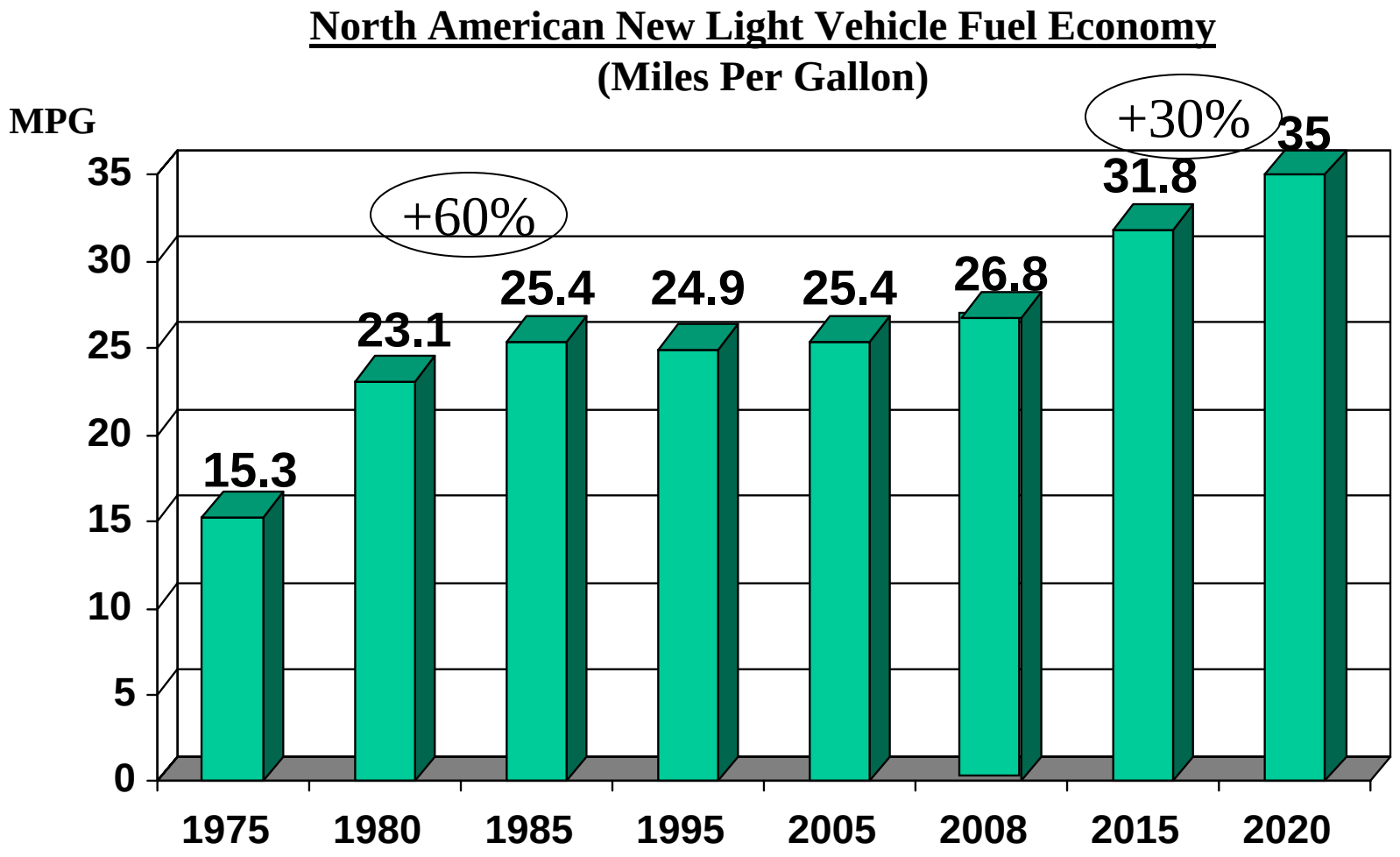
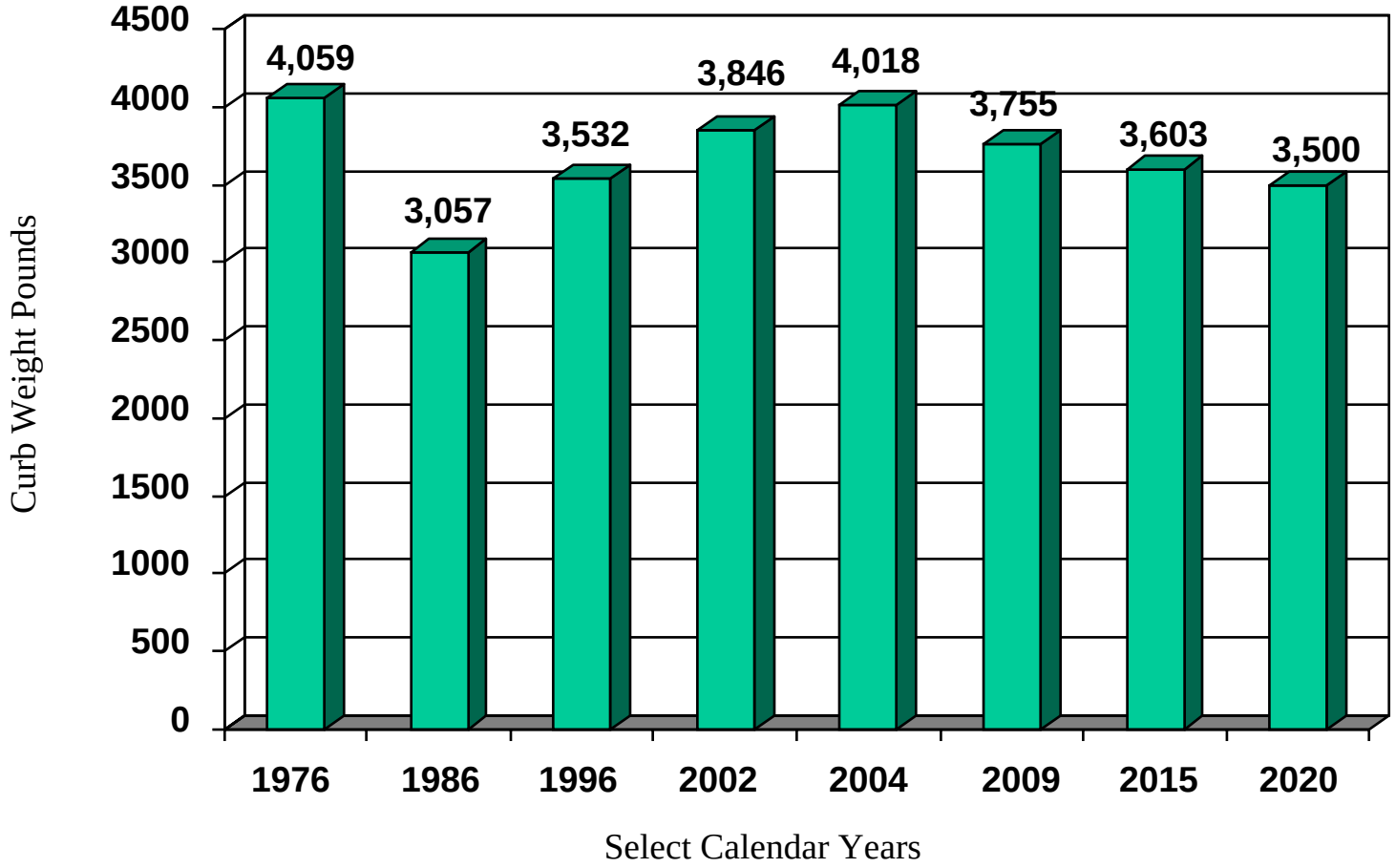
North American Light Vehicle Metallic Material Trends



North American Light Vehicle Metallic Material Trends

North American Light Vehicle Curb Weight
- History and Forecast -



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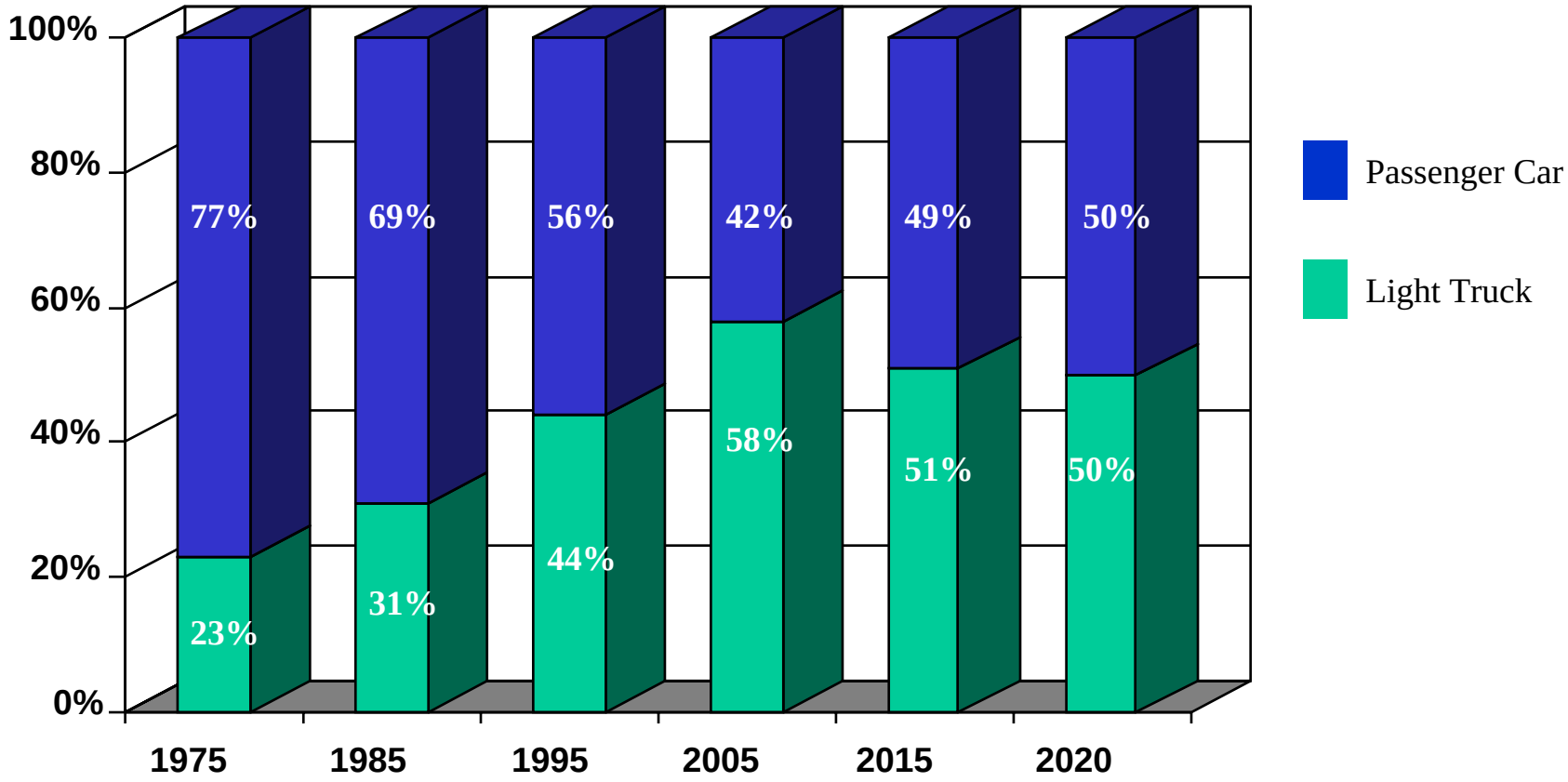
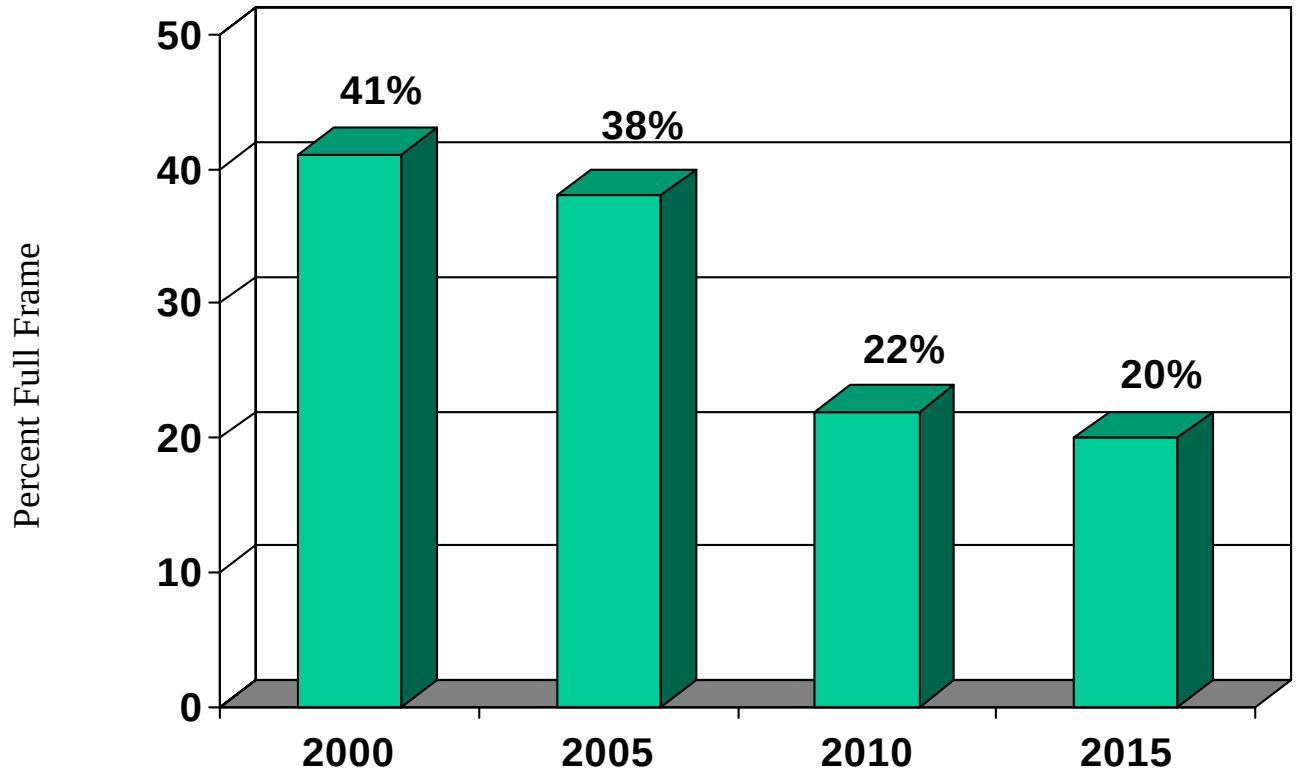
North American Light Vehicle Metallic Material Trends

North American Light Vehicle Mix Passenger Car Versus Light Truck



North American Light Vehicle Metallic Material Trends

North American Light Vehicle Architecture
- Percent Full Frame -



The average full frame (body on frame) vehicle weighs over 1,000 pounds more than the average unibody vehicle (4,584 pounds versus 3,471 pounds in 2009)

Summary of Influencing Trends

- North American light vehicles will continue to be larger and weigh more than competing light vehicles in the rest of the world
- We will continue to increase occupant safety which can add weight
- We will improve fuel economy over the all time high of 27 mpg in 2008 by 30% to 35 mpg in 2020
- Weight reduction must contribute at least 25% of this improvement in fuel economy resulting in an average curb weight of less than 3,500 pounds by 2020
- The remaining improvement in fuel economy will come from improvements in the powertrain and other technologies such as aerodynamic drag reduction, low roll resistance tires and a 42 volt electrical system
- Vehicle mix will have to be at least 80% unibody and close to 50% light truck and 50% passenger car
- The rate of development and adoption for new steels and aluminum for automotive components will not be significantly compromised by the current economic problems

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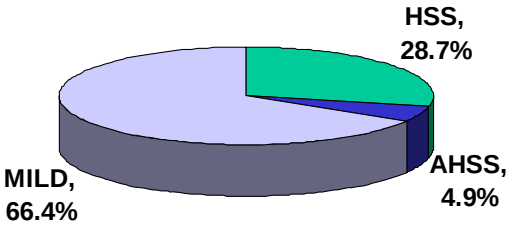
North American Light Vehicle Metallic Material Trends

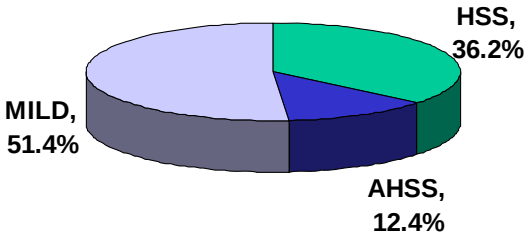
2009 North American Light Vehicle Body and Closure Steel Trends

2007 Full Frame



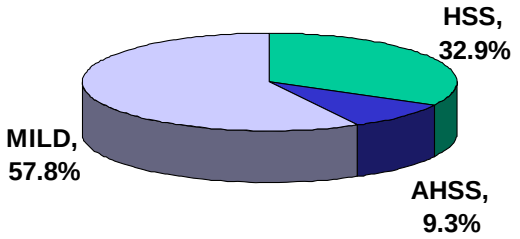
994 Pounds

2007 Unibody



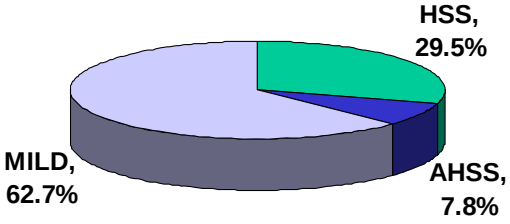
765 Pounds

2007 Total



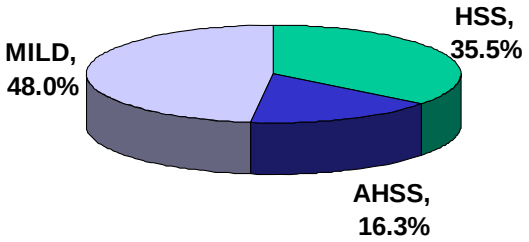
851 Pounds

2009 Full Frame



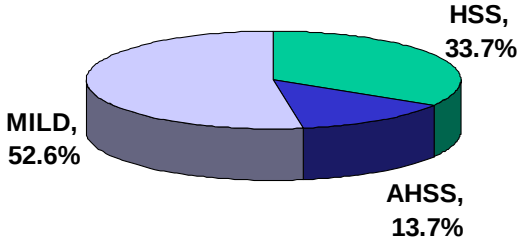
946 Pounds

2009 Unibody



773 Pounds

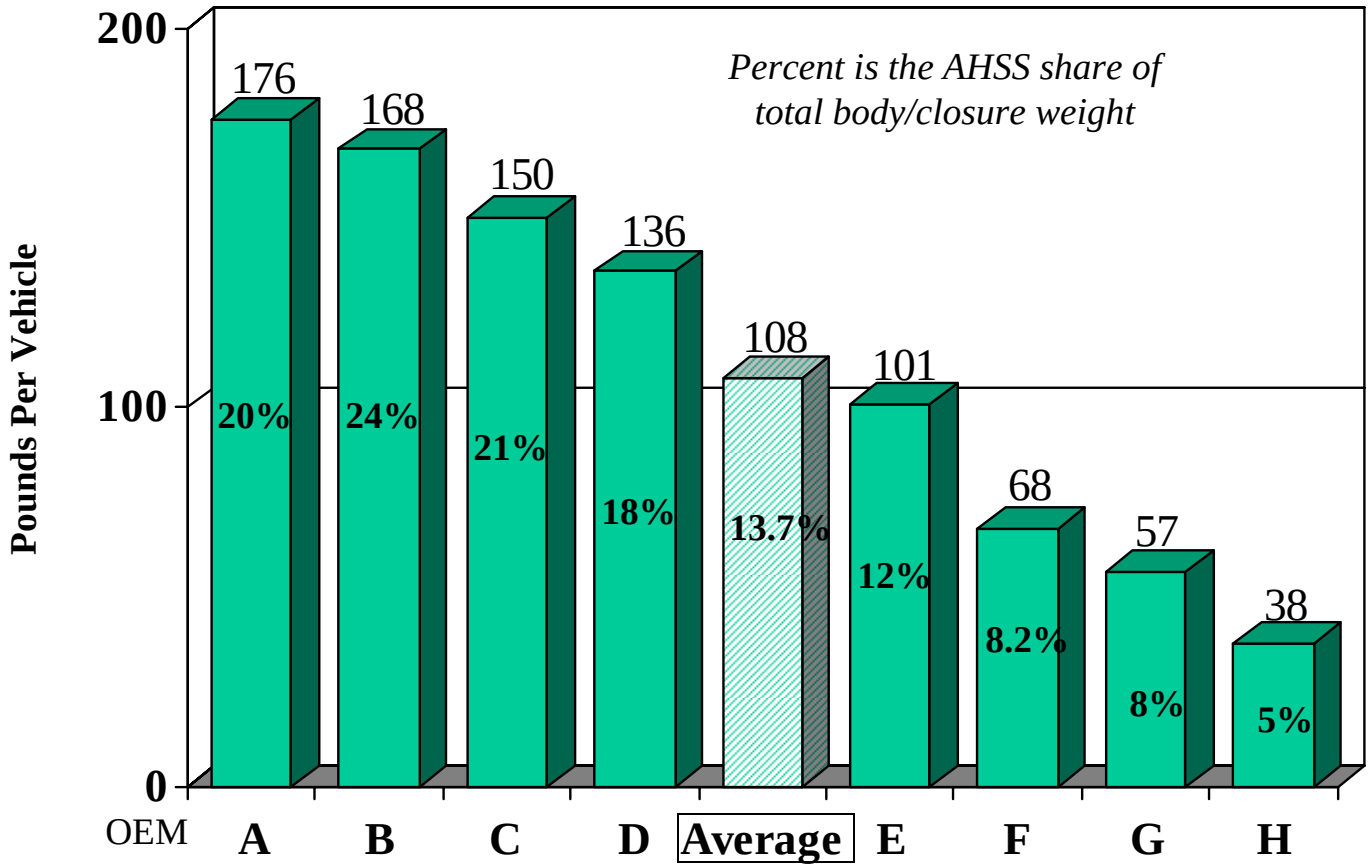
2009 Total



790 Pounds

North American Light Vehicle Metallic Material Trends

2009 AHSS for North American Light Vehicle for Body and Closures

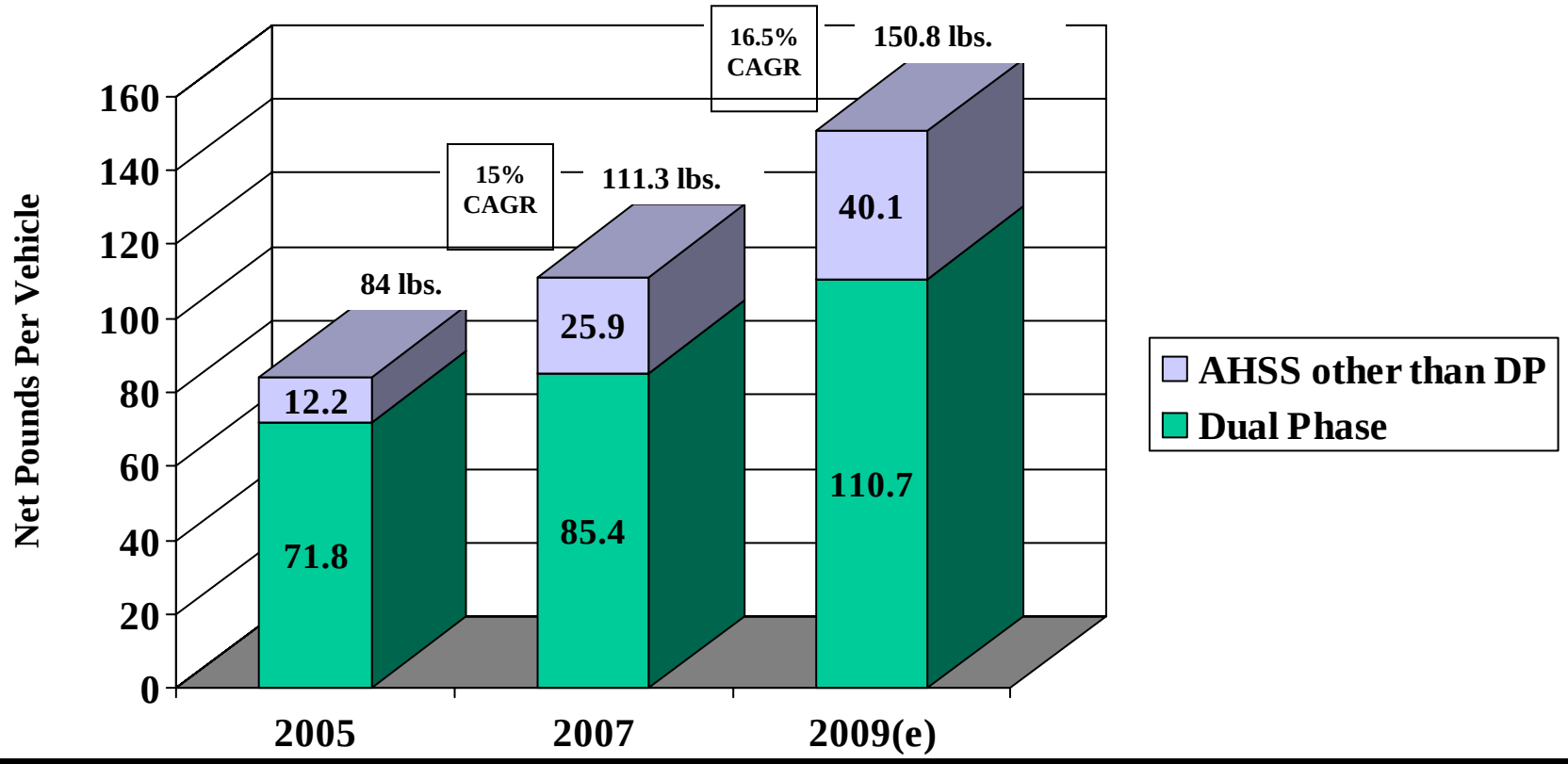


There are large differences by OEM in the amount of Dual Phase, Martinsitic and Boron steels used for body structures

North American Light Vehicle Metallic Material Trends

North American Light Vehicle Trend for Flat Rolled UHSS and AHSS

(Net Pounds per Vehicle)



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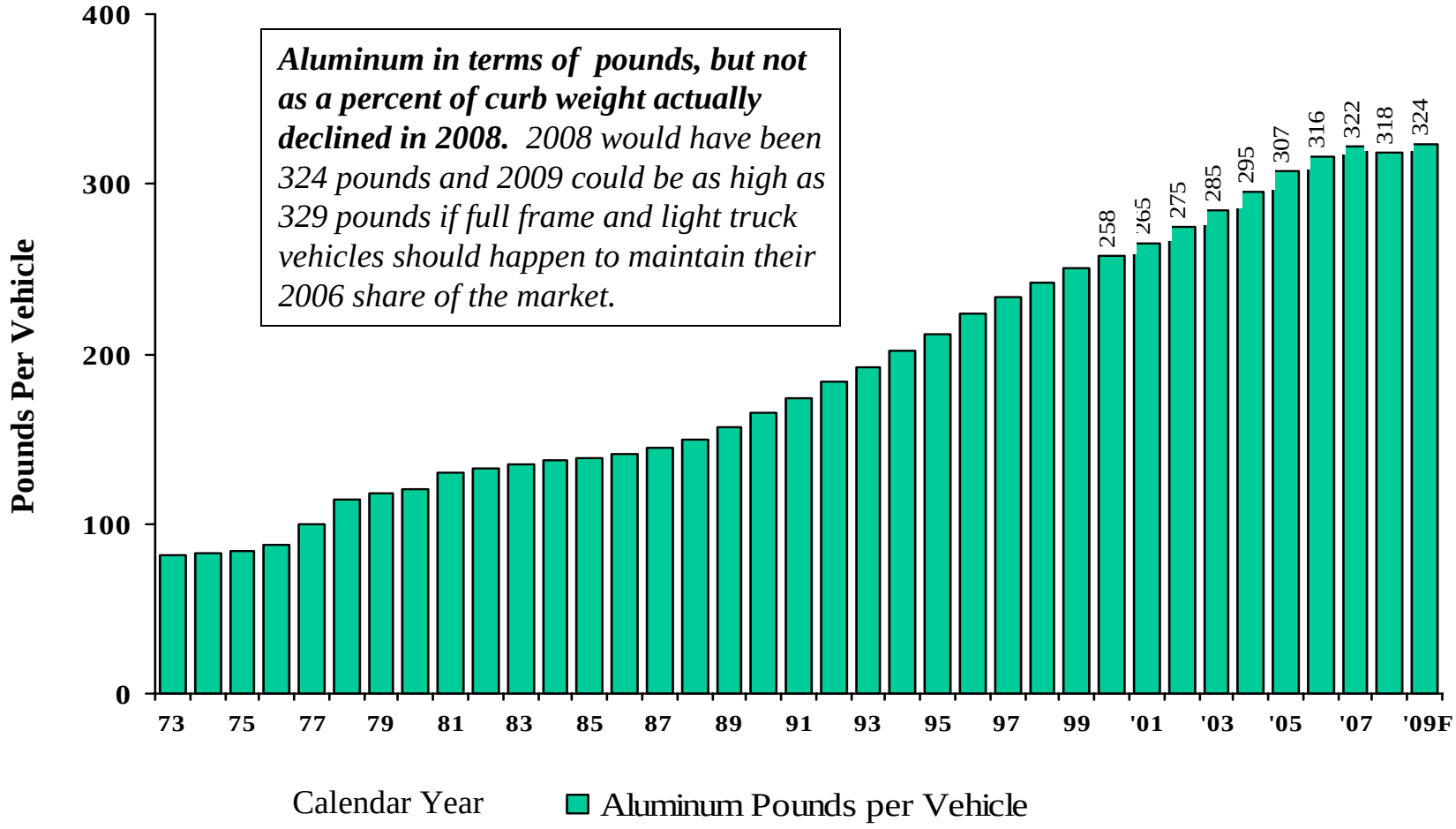
North American Light Vehicle Aluminum Content
- History and Forecast -

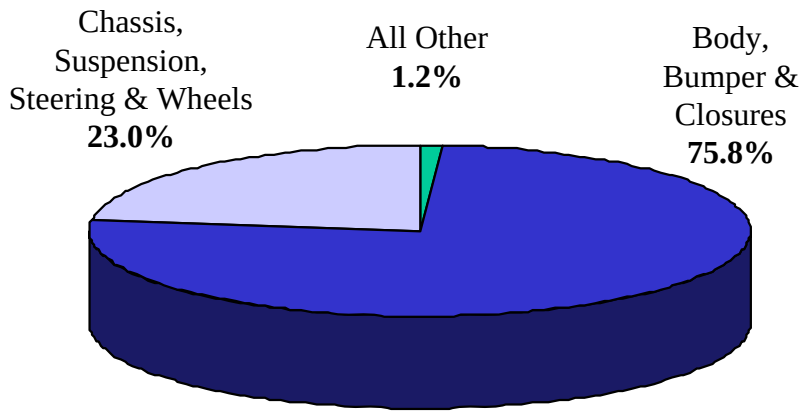


Aluminum in terms of pounds, but not as a percent of curb weight actually declined in 2008. *2008 would have been 324 pounds and 2009 could be as high as 329 pounds if full frame and light truck vehicles should happen to maintain their 2006 share of the market.*

North American Light Vehicle Metallic Material Trends

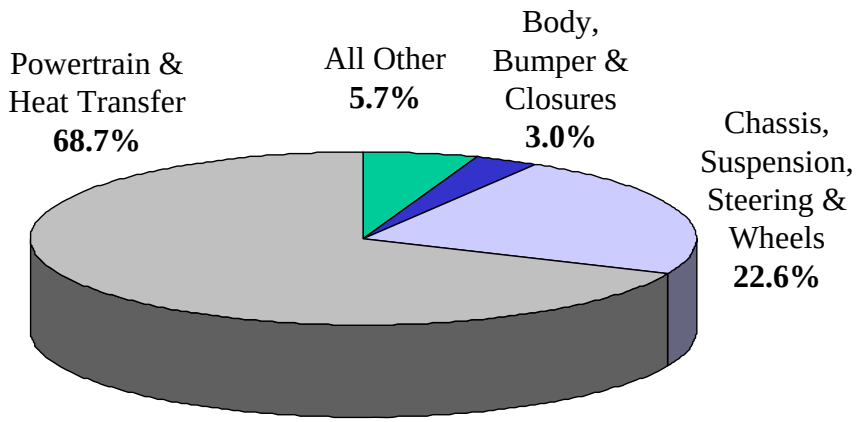
2009 Light Vehicle Material Comparison by Application

High Strength and Advanced High Strength Steel



548 Pounds Per Vehicle
92% Flat Rolled

Aluminum



324 Pounds Per Vehicle
80% Castings

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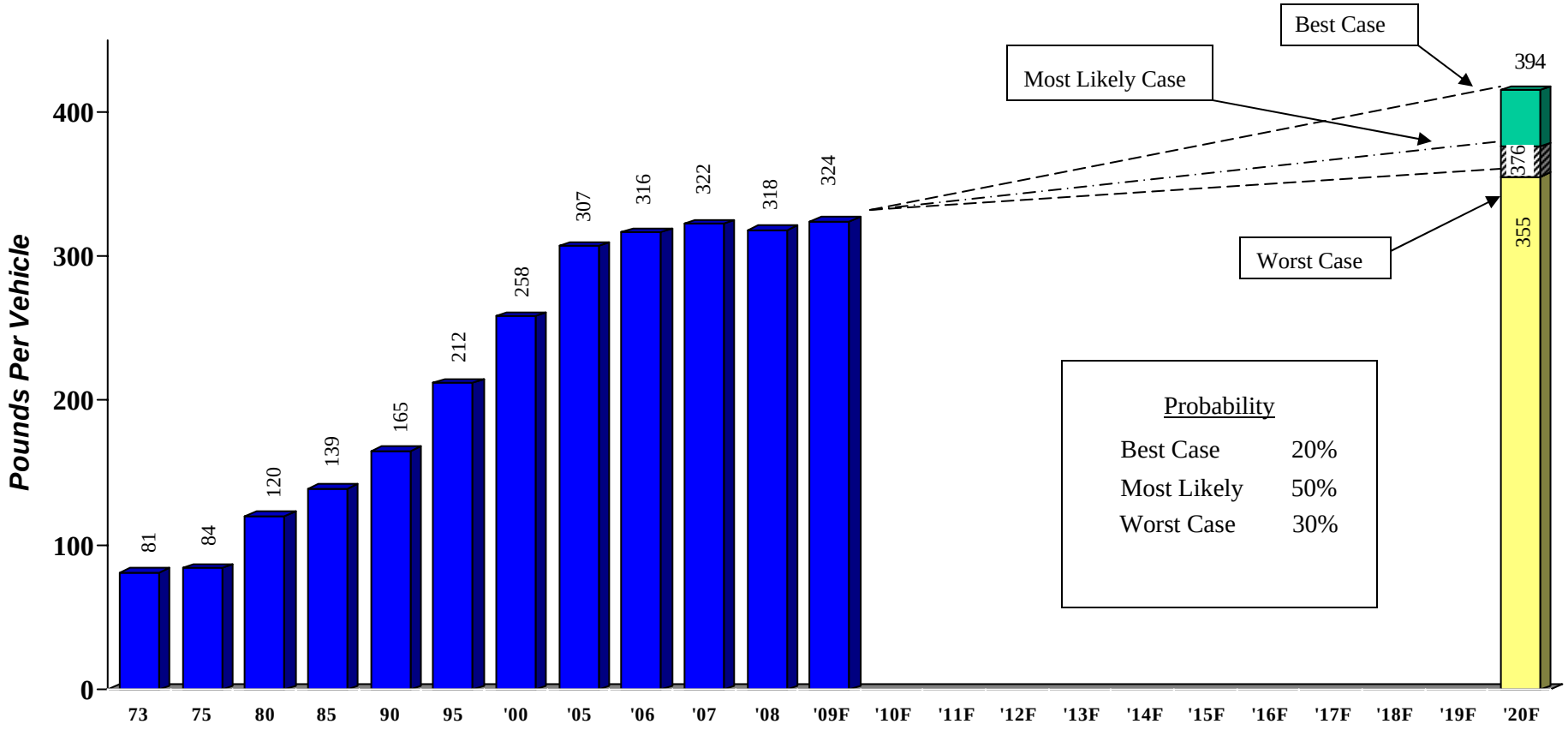
North American Light Vehicle Aluminum Content
- History and Forecast -



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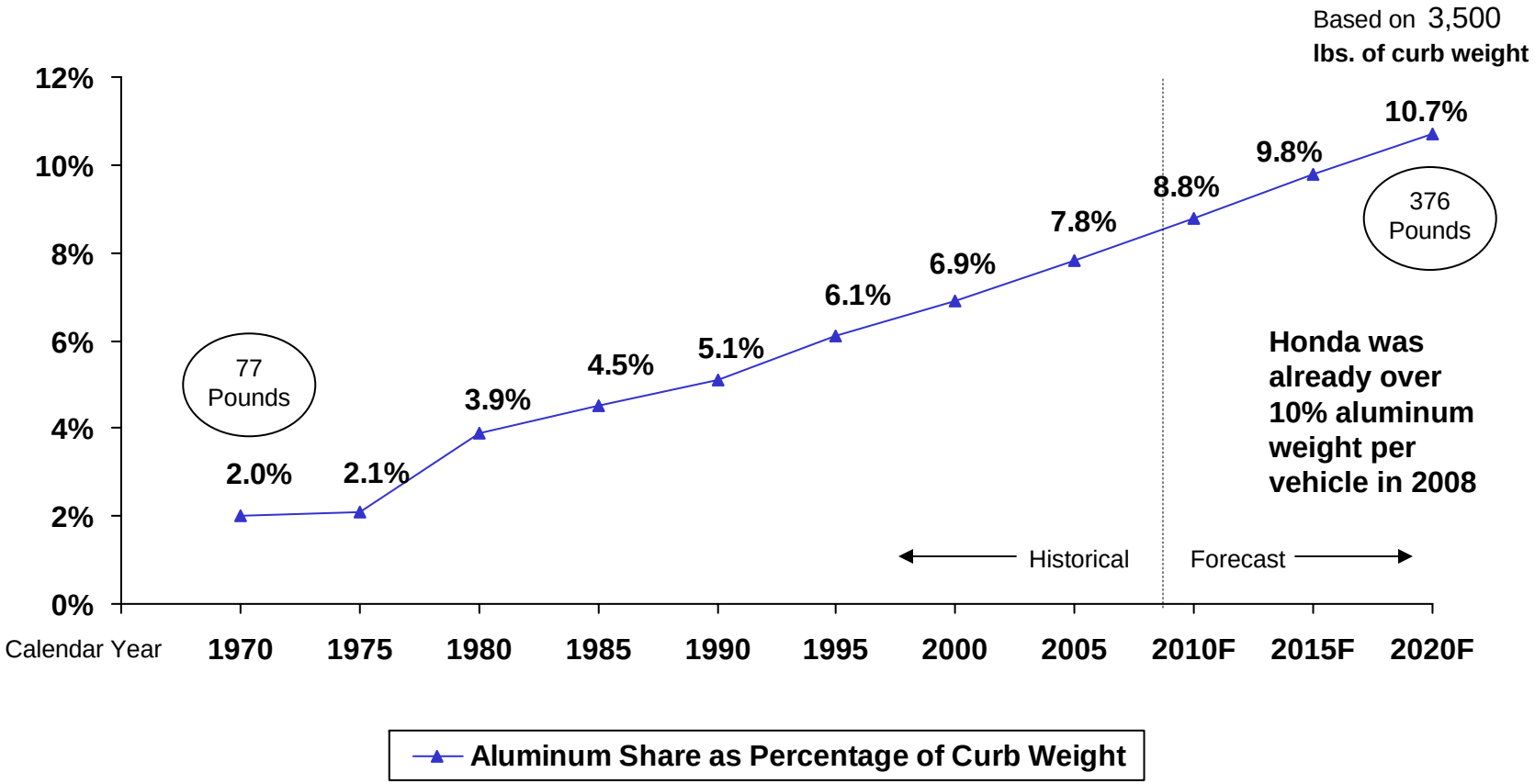
North American Light Vehicle Metallic Material Trends

North American Light Vehicle Aluminum Content as a Percent of Curb Weight
- History and Forecast -



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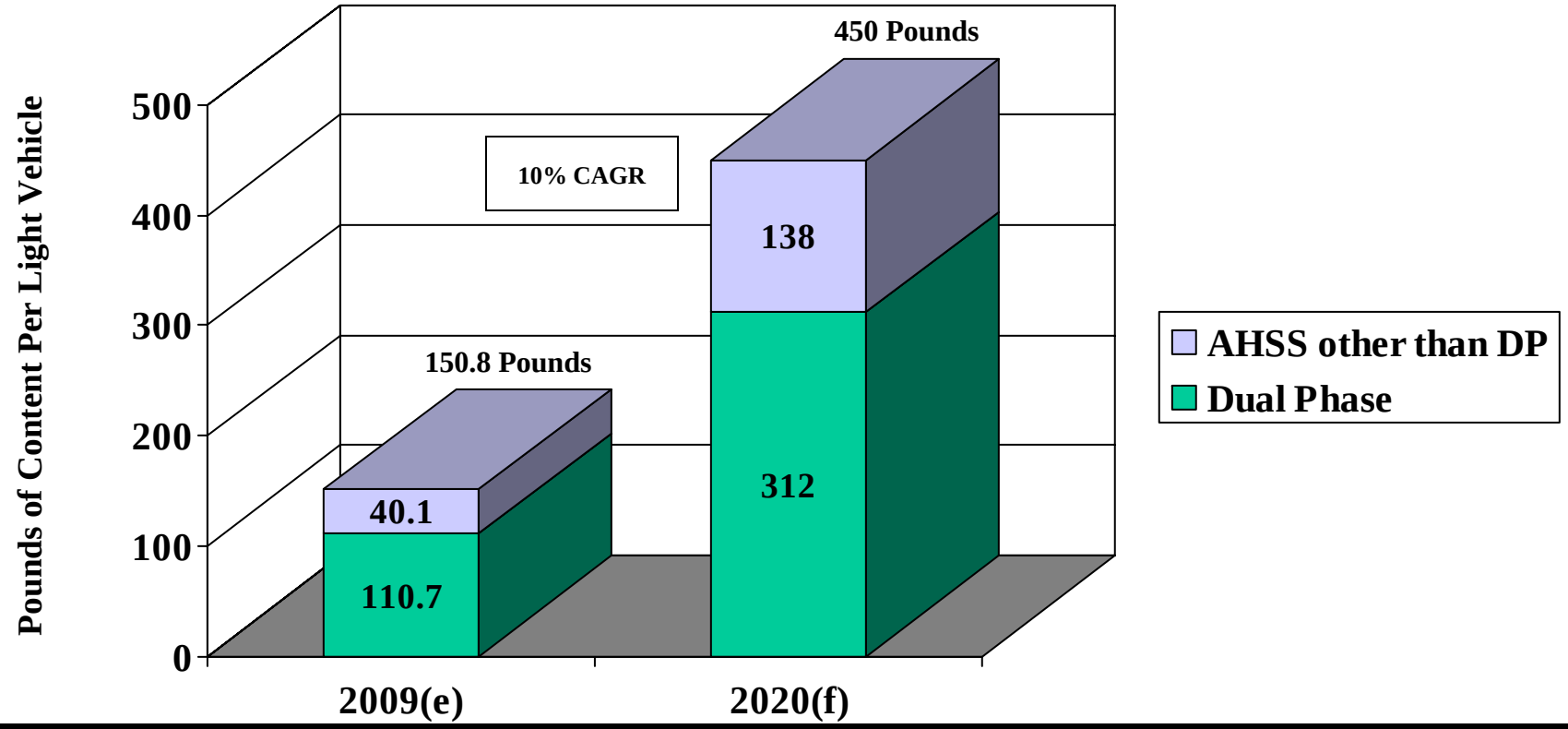
North American Light Vehicle Metallic Material Trends

•**This forecast includes light vehicle flat rolled AHSS and UHSS content for body structures (BIW), closures, bumpers, suspensions, subframes, crossmembers, cradles and wheels**

NA Light Vehicle Growth Forecast for Flat Rolled Advanced and Ultra High Strength Steels

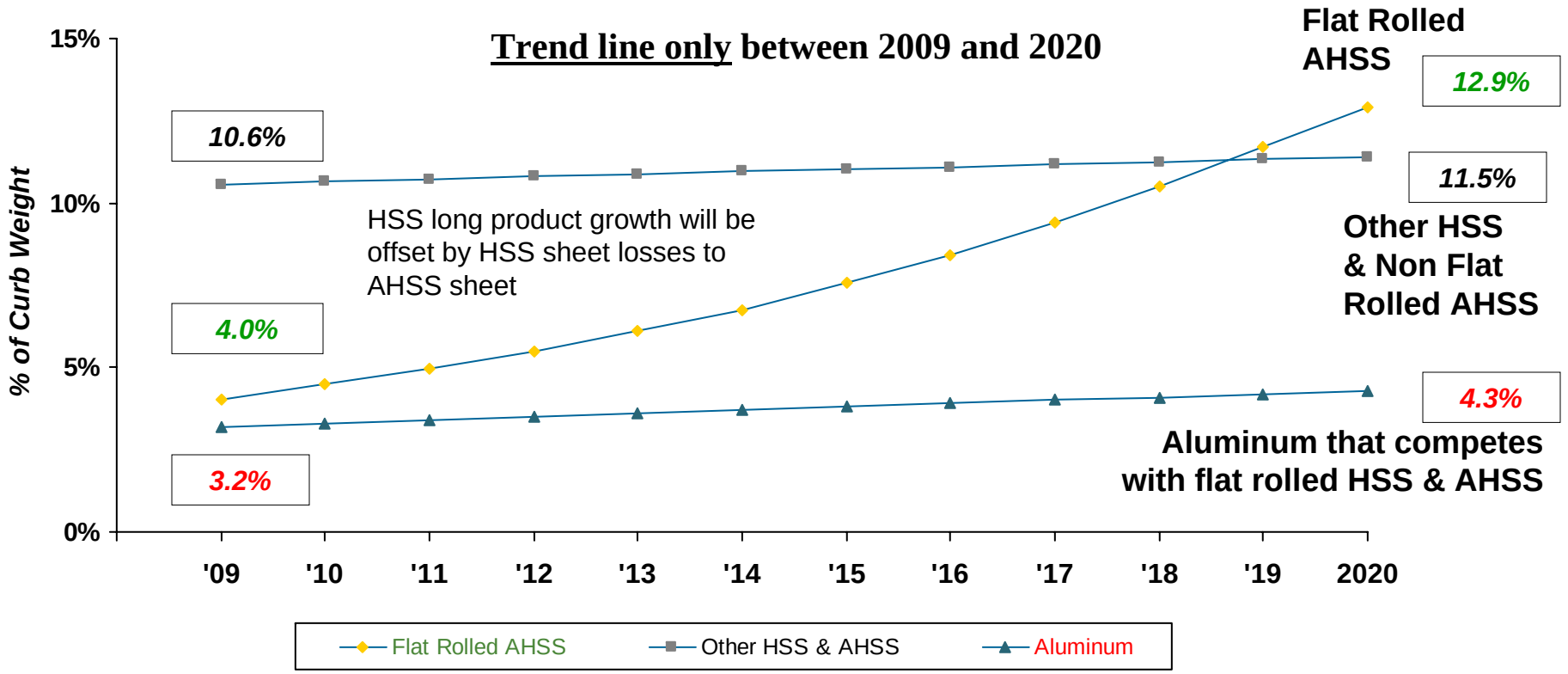
2009 – 2020 (net pounds per vehicle)



North American Light Vehicle Metallic Material Trends

North American Light Vehicle Content Growth for Flat Rolled AHSS, Other AHSS and Aluminum Content for Competing Components

- History and Forecast -



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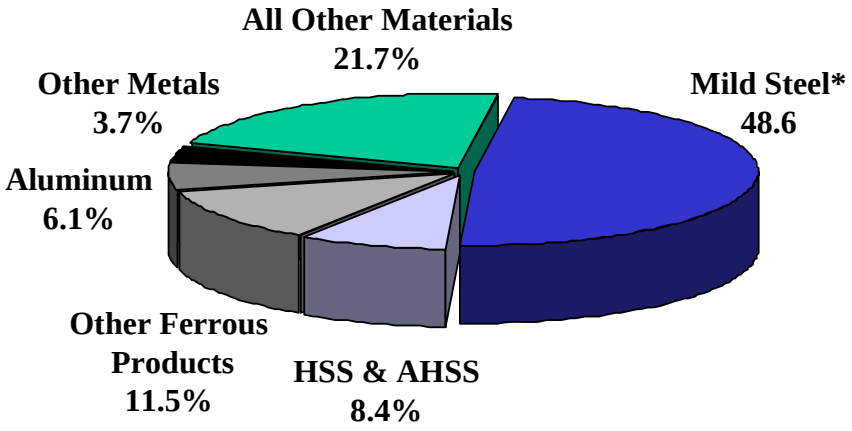
North American Light Vehicle Metallic Material Trends

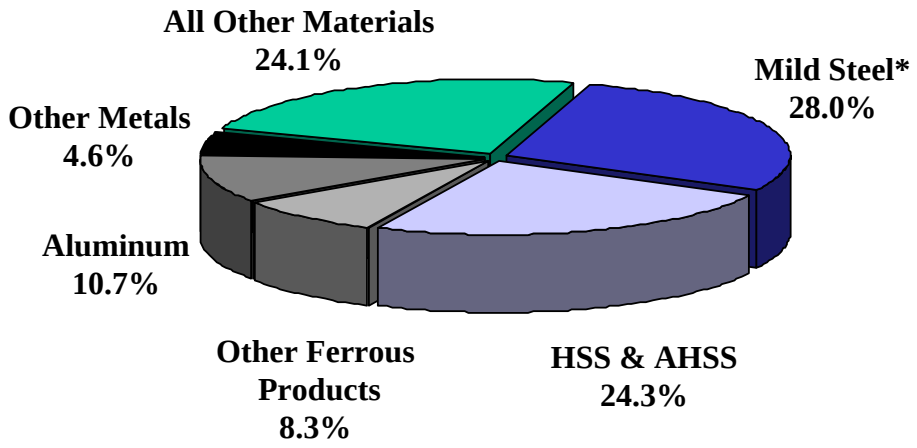
North American Light Vehicle Curb Weight Material Mix

1995



3,503 Average Curb Weight
56% - CAR | 44% - Light Truck
25 MPG Combined Fuel Economy

2020



3,500 Average Curb Weight
50% - CAR | 50% - Light Truck
35 MPG Combined Fuel Economy

** 270 or less MPa tensile strength……*

North American Light Vehicle Metallic Material Trends

Conclusions:

- To help achieve the 2020 fuel economy goal we need to reduce average curb weight by at least 7% with little or no change in vehicle footprint
- Seven percent may not appear to be a significant decline in weight, but it will be a tremendous challenge for the automotive materials community which must also deal with increased safety requirements, the weight implications of hybrid and electric powertrains and continued cost pressures on nearly every front
- To obtain a 7% decrease in curb weight, Ducker estimates that we will need to replace approximately 650 pounds of mild steel, high strength steel and iron with 350 pounds of dual phase, martensitic, boron and other AHSS, 52 pounds of aluminum, 10 pounds of magnesium and 25 pounds of polymers and composites. Rubber, glass and other non metallics will need to decline by at least 40 pounds
- To achieve these goals, the industry must stay on course despite the current state of the economy. If we don't continue to add new and improved compositions, perfect forming technology and develop better joining techniques at acceptable costs the 3,500 pound curb weight goal will not become a reality in the desired timeframe

Thank you for your attention!

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