

## North America 2015 9<sup>th</sup> - 11<sup>th</sup> of Nov

### AUTOMOTIVE LIGHTWEIGHT

# PROCUREMENT SYMPOSIUM

## Cobo Center, Detroit, USA



### SYMPOSIUM FOCUS

- Aluminum
- Carbon Fibre
- Composites
- High Strength Steel
- Magnesium

The 3<sup>rd</sup> Automotive Lightweight Procurement Symposium to be focused on automotive lightweighting, supply / process chain and procurement management, will take place in Detroit from the 9<sup>th</sup> – 11<sup>th</sup> of Nov 2015. The symposium is held in the days leading up to the "ALUMINUM USA" exhibition taking place at the Cobo Center, Detroit, Michigan (Walking distance to symposium venue)

### ATTENDING COMPANIES:



### ORGANIZING PARTNERS & SPONSORS



AluMag®  
**Europe 2016** 27<sup>th</sup> - 29<sup>th</sup> of Nov  
 AUTOMOTIVE LIGHTWEIGHT  
**PROCUREMENT SYMPOSIUM**  
 Hilton Hotel in Duesseldorf, Germany

AluMag®  
**Asia 2016** 6<sup>th</sup> - 8<sup>th</sup> of July  
 AUTOMOTIVE LIGHTWEIGHT  
**PROCUREMENT SYMPOSIUM**  
 Jumeirah Himalayas Hotel in Shanghai, China



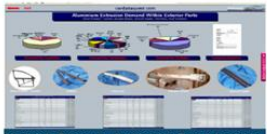
## AluMag® offers the four following services - worldwide:



Market Research

- Aluminium Extrusion Customer Database
- Foundry & Tool Maker Database
- Automotive Application, Material & Process Analyses
- Various Industrial Application Research & Analyses

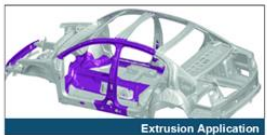
AluMag as your provider of automotive research and forecasting studies, offers you and your business, the market intelligence you need to realize the best strategic decisions



Material - Process - Application Trend Analysis

### Large variety of market access, local & global:

- business database with 6,970+ companies and 18.700+ contacts
- 150+ satisfied customers worldwide
- Arranged 20+ roadshows/events since 2008



Extrusion Application

### Your Benefits:

- Learn about your [potential] clients and competitors
- Obtain an inside view of the market
- Identify opportunities and threats
- Minimize risk and optimize profits
- Position your company successfully
- Based on data off the shelf, secondary re-research and interviews, AluMag generates validated researches



Market Development

- Analysis & Development of Market Opportunities
- Accelerate Market Penetration
- Manage New Product Launches
- Establish a Sales Force Sales on Demand

AluMag guides and supports your organization globally through the different market development phases until we have successfully launched, implemented or executed your project.



Map of activity - SAMPLES

Manage and integrate each aspect of your organization by initiating, planning, controlling, executing and closing out a new project. AluMag offers liaison management services as an addition to our customer's staff by bringing in the resources that define us.



JATCO Head Quarters Meeting in Japan

### Your Benefits

- Analysis and development of Markets
- Realize opportunities
- Accelerate market penetration
- Establish a sales force
- Provide warehousing and distribution services
- Manage new product launches
- Sales on demand



Roadshows / Events

- Organization of Technical & Commercial Roadshows
- Oversea Commercial & Technical Events
- Host In-House Events & Presentation
- Common Technology Booth at Leading Exhibitions

AluMag roadshows, tech-meetings and symposia are the first class events used by exhibitors and guest as a unique benchmark platform.



Daimler Sindelfingen as Roadshow Location

The AluMag think tank events are bringing in decision makers and executives in EUROPE, ASIA and NAFTA.



G M VIP at AluMag Booth SAE in Detroit

### Upcoming Events:

- 2015 Nov: Automotive Light-weight Procurement Symposium in Detroit, USA
- 2016 April Common tech- booth at the SAE World Congress in Detroit, USA
- 2016 Jul: Automotive Light-weight Procurement Symposium in Shanghai, China
- 2016 Nov: Automotive Light-weight Procurement Symposium in Duesseldorf, Germany.



Strategic Localization

- Warehousing & Distribution Service
- Supplier & Tie-up Localization
- Identification & Trade-off of new Technology
- Foreign Market Business Cases and whose Realization

AluMag has the global expertise to search, identify, evaluate and validate potential strategic business opportunities for expansions and partnerships that will assist your business growth plans regionally and globally



On-Site Greenfield Planning Meeting

### Services for:

- Search, develop and present potential acquisition candidates for regional and global business expansions
- Localization of new manufacturing / service sites for business expansions
- Identification of new technology supplier development related to products, processes and materials
- Search, develop and present potential business partners / suppliers to support regional and/or global supply programs
- Evaluate potential competitor profiles for new or existing business in non-presence geographies
- Evaluate new emerging technologies and processes for business expansions

### Are you:

- looking for specific data, information and outlook about product, material, customer, supplier, technologies, ...
- want to discuss your project, increase sales, access new markets, ...
- interested to participate in one of our roadshows / events or organize your customized showcase ...
- looking to localize, expand into new markets, countries, tie-up targets, ...

please contact your AluMag Team to receive a quote or proposal

## CONTACTS & PROJECT TEAM



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## **N. America Automotive Lightweight Procurement Symposium 2015 9<sup>th</sup> – 11<sup>th</sup> Nov**

Cobo Center One Washington Blvd. Detroit, Michigan, 48226 USA



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# **AluMag<sup>®</sup>**

Europe ■ India ■ Americas ■ Asia  
**THE MARKET DEVELOPER**

## Company Speechs by:

Ford Research and Innovation Center

Carbon War Room and Meritor Headquarters

Striko Westofen America

Kurtz

Bharat Forge Aluminiumtechnik

C.P.C. USA

BOCAR Group

Ford Motor Company

Automotive Insight

EJOT Fastening Systems LP USA

UACJ Corp.

Lightweight Innovations for Tomorrow

Aluminum Blanking Company



# Agenda

## Agenda: (Is Continuously Being Updated)

### Monday The 9th Of November – Cobo Center, Detroit

05:30pm - 07:30pm



Pre-registration and Welcome

Reception

### Tuesday The 10th Of November – Cobo Center, Detroit

08:30am – 09:15am



Registration

Morning Coffee / Tea

09:15am – 09:30am



Welcome:

Mr. Jost GAERTNER - Managing Partner At AluMag Automotive GmbH

09:30am – 10:25am



Opening Keynote: Mr. Craig RENNEKER - Chief Engineer, New A/T Programs & Component – Transmission & Driveline Engineering At Ford Research & Innovation Center

**Lightweight Transmission & Driveline Components: Practical Challenges**

10:25am – 11:00am

Break for Refreshments/Coffee/Tea, Snacks, Networking, Tech Exhibition

11:00am – 11:45am



Paper 1: Mr Mike ROETH – Executive Director At North American Council for Freight Efficiency (NACFE) & Operations Leader – Carbon War Room



Paper 1: Mr. Karl MAYER – Director Product Line Management At Meritor

**Lightweighting Heavy Duty Class 8 Tractors and Trailers**

11:45am – 01:45pm

Break for Lunch, Refreshments, Networking, Tech Exhibition

01:45pm – 02:25pm



Paper 2: Mr Ryan BROWN – Director Of Sales At StrikoWestofen America

**Analysis Of Cost Drivers When Buying Lightweight Solutions / Materials & The Elimination Of These**

02:30pm – 03:10pm



Paper 3: Mr. Lothar HARTMANN – Managing Director Foundry Machines & Trimming Presses At Kurtz GmbH

**Chassis & Suspension Weight Reduction By LPDC Aluminum With Hollow Cross Sections**



Mr. Kevin CROY - NAFTA Sales Manager Foundry Machines & Trimming Presses At Kurtz GmbH

03:15pm – 03:45pm



Paper 4: Mr. Jörg MANTWILL – Director Sales At Bharat Forge Aluminiumtechnik GmbH & Co. KG

**HCM And Aluminum Forging – Partnership To Birth Chassis Parts' Safety**

03:45pm – 04:15pm

Break for Refreshments/Coffee/Tea, Snacks, Networking, Tech Exhibition

04:15pm – 04:55pm



Paper 5: Mr. Gary F. RUFF - President and Chief Executive Officer, Ruff and Associates, LLC 8/12 - Present

**Advanced Counter Pressure Casting Process for Light-Weighting of Auto and Truck Chassis and Suspension Components**

05:00pm – 05:55pm



Closing Keynote: Mr. Gilberto SALDIVAR – New Projects Group Manager At Bocar Group

**Key Factors To Achieve Mechanical Properties In Lightweight Structural Parts**

05:55pm – 06:00pm



Summary:

Mr. Roberto BOEKER – Managing Partner At AluMag Automotive LLC

# Agenda

06:00pm - 08:00pm



Dinner Speech:  
Mr. Richard KLEIN -  
Responsibility Strategic Planning -  
Business Development & German  
Business At BOCAR

**Wednesday The 11th Of Nov – Cobo Center, Detroit**

08:15am – 08:55am



Mr. Ali JAMMOUL – Global Director  
Body Exterior And Safety Engineering  
At Ford

**Body Lightweighting**

09:00am – 09:40am



Paper 1: Dr. Gerald COLE – President  
At Light Weight Strategies LLC

**Light Weighting the Automotive  
Industry - The Road to 2025 CAFÉ**

09:45am – 10:25am



Paper 2: Mr. Laurence CLAUS -  
President At NMI Training & Consulting  
Inc. & Technical Consultant To EJOT  
Fastening Systems LP USA

**EJOT Fastening Solutions Enable  
Lightweight Body-in-white Assembly**

10:25am – 11:00am

Break for Refreshments/Coffee/  
Tea, Snacks, Networking, Tech  
Exhibition

11:00am – 11:40am



Paper 3: Dr. Akio NIIKURA - General  
Manager R&D Division At UACJ Corp.

**UACJ's Global Strategy And  
Approach To The Automotive  
Aluminum Market**

11:45am – 12:05pm



Paper 4:  
Mr. Lawrence E. BROWN – Executive  
Director At Lightweight Innovations For  
Tomorrow

**Lightweight Innovations For  
Tomorrow!!!!**

12:10pm – 12:40pm



Closing Keynote:  
Ms. Laura ANDERSON – CEO At  
Aluminum Blanking Company

**The Story Behind Aluminum's  
Sourcing Evolution: A North  
America Perspective**

12:40pm – 12:45pm



Summary:

Mr. Jost GAERTNER, Managing  
Partner At AluMag Automotive  
GmbH

12:45 pm – 01:30pm



Reception Speech With Snacks &  
Finger Food

Mr. Michael KOEHLER - Industry Vice  
President At Reed Exhibitions USA

01:30pm – 05:30pm



Individual Or Guided Visit At The  
2015 "Aluminum USA" Exhibition

# EXHIBITOR

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## **TITLE**

**Body Lightweighting**

## **ABSTRACT**

OEM's are faced with enormous challenges driven by today's global emissions and fuel economy legislation. Nine governments worldwide, representing 80% of global vehicle market, have established or proposed emissions and fuel economy standards. Lightweight BIW design and manufacturing will play an increasing role in meeting these requirements. Ford will seek to introduce substantial weight savings of up to 340 kg. The recent introduction of the F150 Truck, a high volume, aluminum intensive BIW, achieves 320 kg. vehicle weight savings. Ford will continue to pursue BIW weight reduction actions through the use of advanced materials such as ultra-high strength steels, lightweight metals such as aluminum and magnesium and composites, proliferating them to global platforms.



**Go Further**

1

## **BODY LIGHT WEIGHTING**

Delivering Smarter, Greener, Safer, Quality  
& Innovative Body Structures

**ALI JAMMOUL**

Director, Body Exterior  
Ford Motor Company



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# Ford Motor Company

## OUTLINE



- Sustainability at Ford Motor Company
- CAFÉ, CO2 & NHTSA Drivers
- Body Weight Reduction Trends
  - Advanced High Strength Steel
  - Aluminum & Magnesium
  - Mixed Materials
  - Composites



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## FORD BRAND PILLARS



Smart



Green



Innovative



Safe



Quality



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# Ford Motor Company

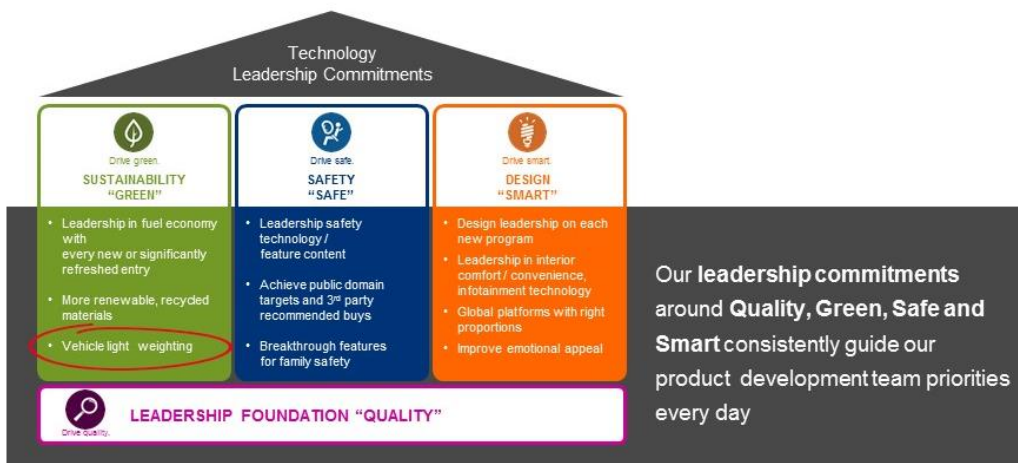
## GLOBAL PRODUCT STRATEGY

- Bold, emotive exterior designs
- Great to drive
- Great to sit in
- Comfort & convenience of a 2nd home on wheels
- Remarkably quiet
- **Fuel Economy as a reason to buy**
- Unmistakably a Ford or Lincoln in look, sound, feel
- All with exceptional value
- Vehicles that serve the needs of all customers



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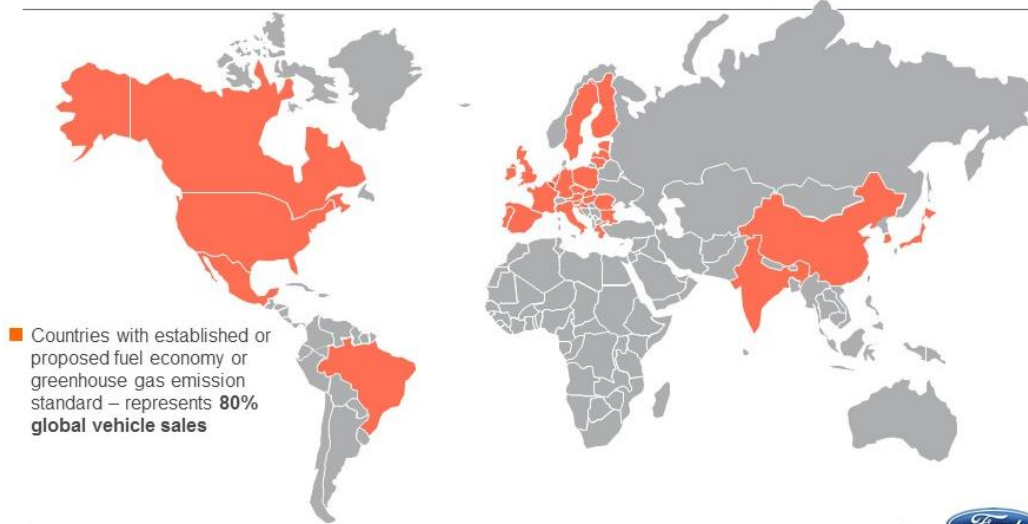
## SUSTAINABILITY – CLEAR TECHNOLOGY PRIORITIES



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## GLOBAL CHALLENGES: Worldwide CO2 & Fuel Economy Standards

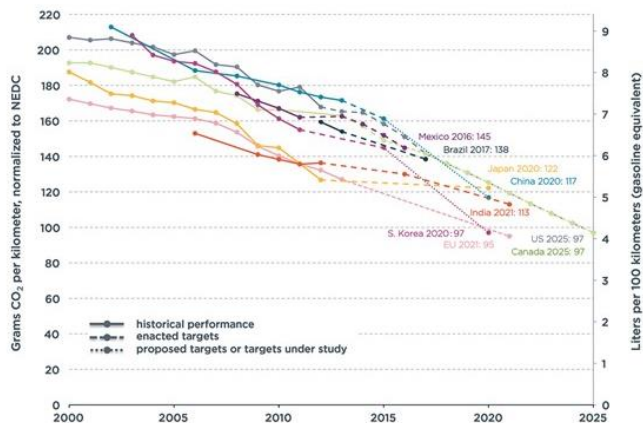


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## GLOBAL EMISSIONS LIMITS

CO<sub>2</sub> emissions must be cut in half over the next 10 years.

This change demands drastic changes to vehicle structures.

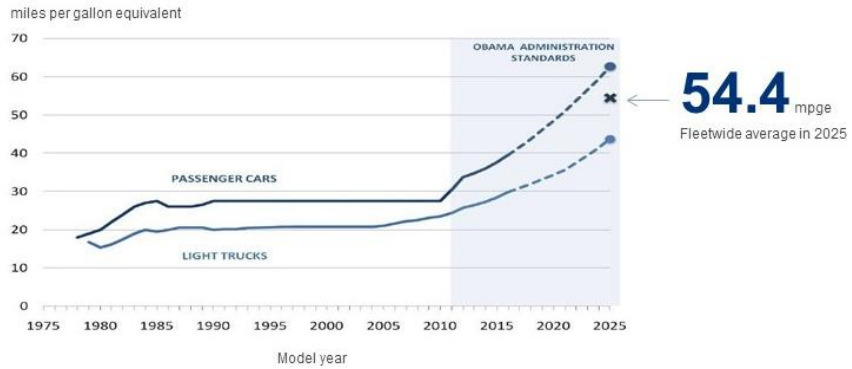


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# Ford Motor Company

## NHTSA FUEL EFFICIENCY TARGETS

Light-Duty Vehicle Fuel Economy Standards, 1978 - 2025



Source: Green Technology, 2011.



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## PRODUCT DEVELOPMENT STRATEGY



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# Ford Motor Company

## NEAR-TERM



### Downsize & Boost

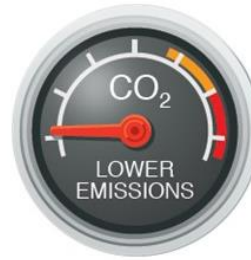
FUEL ECONOMY  
IMPROVEMENT



EMISSIONS REDUCTION



UP TO  
**20%**



UP TO  
**15%**



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## ECOBOOST TECHNOLOGY



**I3 1.0 Liter**



**I4 Family**



**V6 Family**



EcoBoost Technology at High Volume Across Global Platforms is the Near-Term Solution to Reduce CO<sub>2</sub> and Provide an Uncompromised Driving Experience for Customers



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# Ford Motor Company

## ELECTRIFIED VEHICLES

NEAR-TERM MID-TERM LONG-TERM



**C-MAX HYBRID** **47/47 MPG City/Hwy**  
(Prius V44/40)



**C-MAX ENERGI** **100 MPGe**  
(Prius PHEV 95)



**Focus ELECTRIC** **110 MPGe City**  
(Leaf 99)



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## WEIGHT REDUCTION – MID-TERM

NEAR-TERM MID-TERM LONG-TERM

**WEIGHT REDUCTION**  
of 250-750 lbs. (113-340) kg




Smaller displacement engines  
Smaller components  
Lightweight materials



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## LONG-TERM

NEAR-TERM

MID-TERM

LONG-TERM

### Advances In Powertrain Technology Alone Are Not Sufficient To Meet Long Term Needs

- Mass reduction will play a key role in gaining further fuel efficiencies and extending the range of hybrid and electric vehicles.
- Gasoline based cars and trucks will be a feature for many years to come.



**FIESTA ECONETIC**

73.5 MPG  
3.2 L/100 km  
87 g CO<sub>2</sub> / km



**FOCUS ELECTRIC**

110 MPG equivalent



**FUSION / MONDEO**

Hybrid : 42 MPG  
Energi Plug In : 88 MPG



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## What adds weight ?

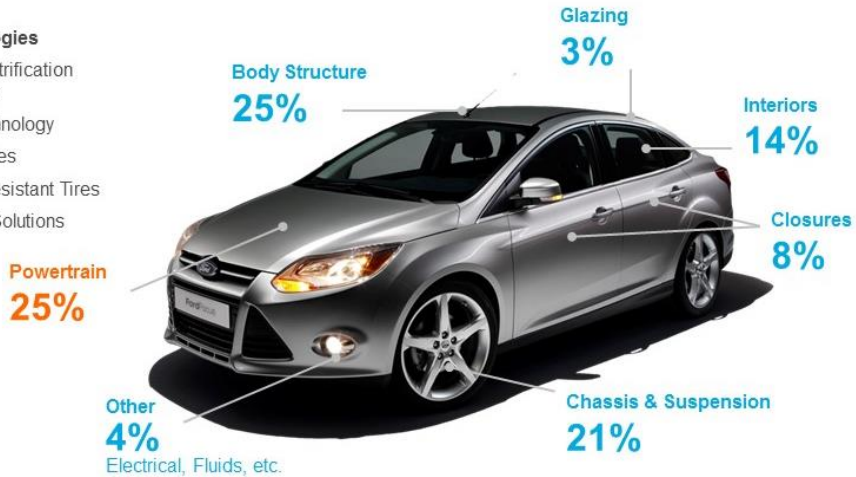


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## WEIGHT DISTRIBUTION – TYPICAL SEDAN

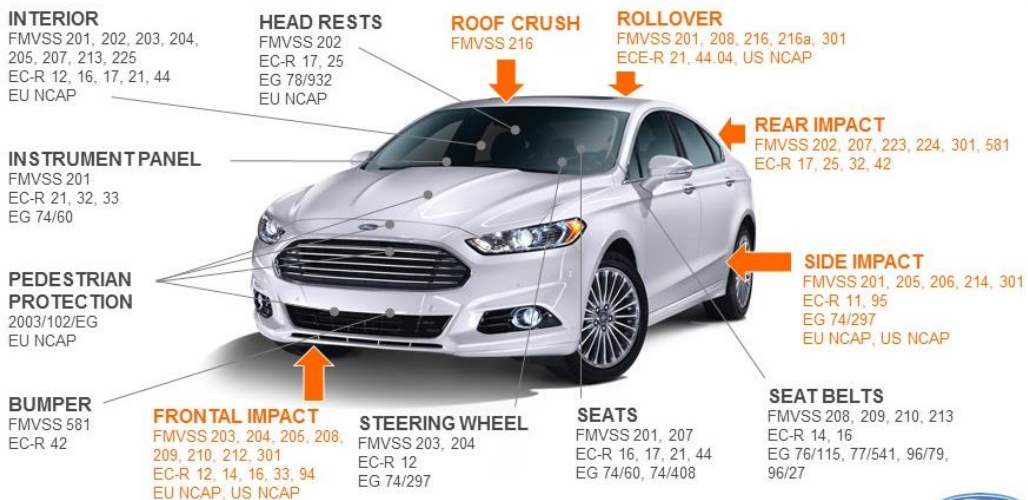
### Future Technologies

- Degree of Electrification & Hybridization
- Start Stop Technology
- Boosted Engines
- Low Rolling Resistant Tires
- Aerodynamic Solutions



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## REQUIREMENTS ADDING WEIGHT TO VEHICLES



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## DESIGN & CUSTOMER FEATURES



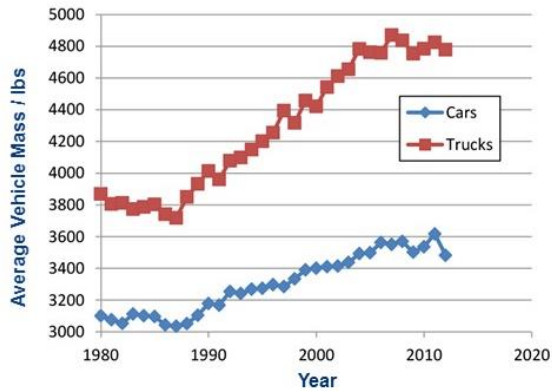
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## AVERAGE VEHICLE WEIGHT 1980-2012 (NA)

Since 1998,  
the average vehicle mass has  
increased by...

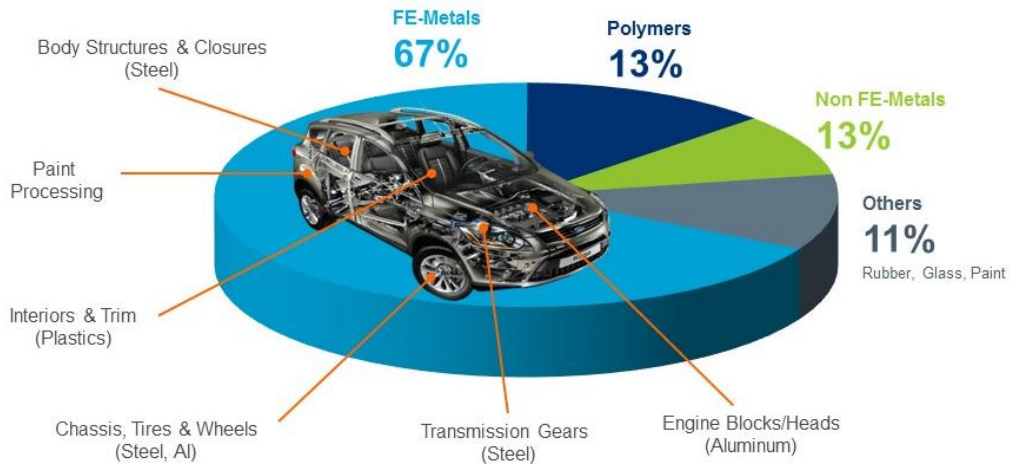
**17 lbs /yr** for cars

**42 lbs /yr** for trucks



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## AUTOMOTIVE MATERIALS USAGE – TODAY



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## MATERIAL DELIVER WEIGHT REDUCTION

### Advanced High Strength Steel – Weight savings potential additional 7 to 10%

- Most mature technology
- Stamping, Joining & Assy Infrastructure Exists
- Lowest cost alternative
- Tooling upgrades required

### Aluminum - Weight savings potential 40 to 50%

- Solid experience with Al Sheet (Closures)
- Material cost is higher than advanced steels
- Slight tooling upgrades required
- Extrusions & Castings offer part consolidation opportunities

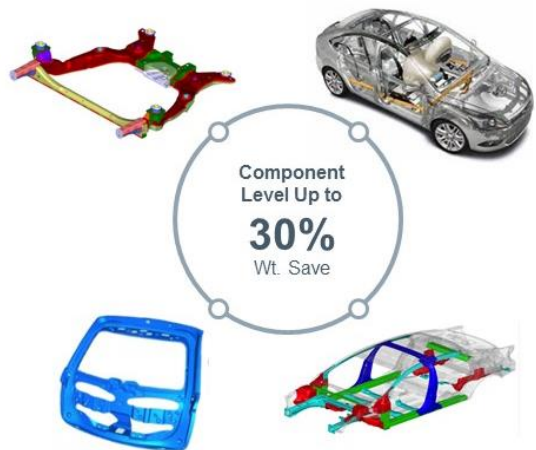
### Magnesium - Weight savings potential 50 to 60%

- Casting is currently the only economically viable manufacturing process
- Corrosion can be an issue in some applications
- Material supply base and converters in a state of flux
- Sheet development in research phase

### Polymer Composites - Weight savings potential 10 to 60+%

- Good supply base for Injection Molding & sheet molded composite (SMC)
- Class B surface and semi-structural applications
- Carbon Fiber only starts to look promising @ \$5-8 / lb
- Infrastructure to Make CF small and needs to grow

### Multi-Materials Lightweight Vehicles – Optimizing all materials systems



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# Ford Motor Company

## FORD GLOBAL DESIGN & MANUFACTURING FOOTPRINT

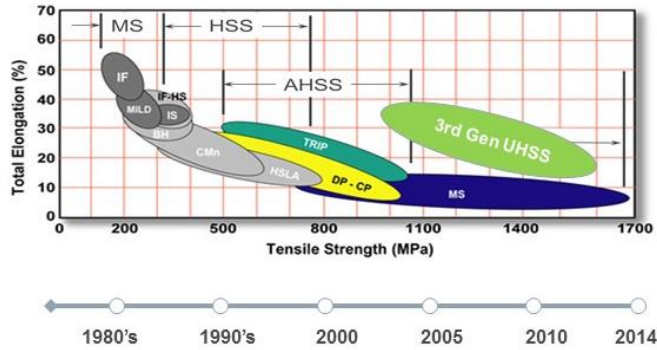


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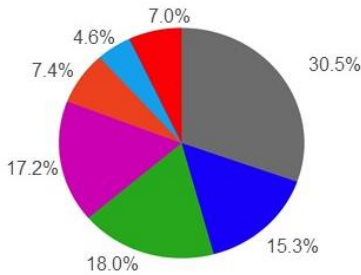
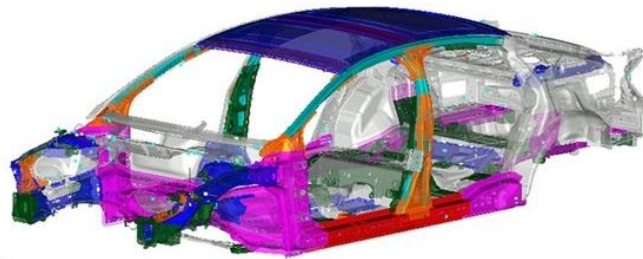
## STEEL GRADES



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## MATERIAL – BIW

- Mild Steel
- BH – HSLA (YS < 300)
- HSLA (YS > 300)
- DP 600
- DP 800
- DP 1000
- Boron - Martensitic



**348** Mpa  
CURRENT BIW  
avg Yield Strength

**410** Mpa  
NEXT GEN BIW avg  
Yield Strength

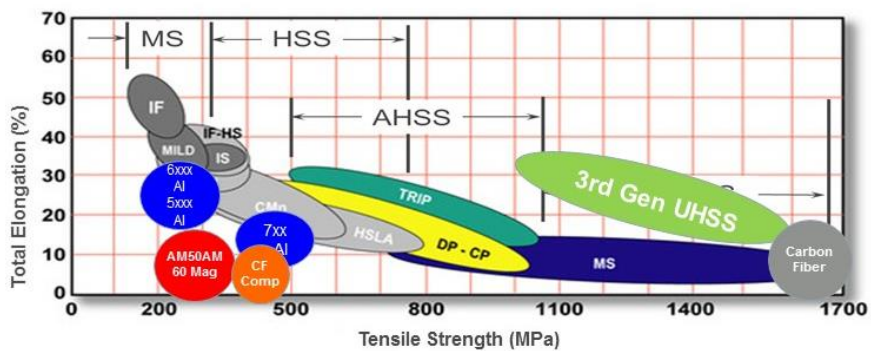


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## MATERIAL SELECTION



CHOOSING THE RIGHT MATERIAL, ON THE RIGHT PRODUCT, AT THE RIGHT TIME !



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## ALUMINUM EXPERIENCE – ALUMINUM MILESTONES AT FORD



1908 FORD MODEL 'T' SEDAN  
Simple Sheet Aluminum Hood



1992 TOWN CAR  
1<sup>st</sup> returning aluminum panel 100,000/yr



1999 LINCOLN LS  
Aluminum Hood, Fenders, Decklid

1900s ... 1980 1990 2000



1979 LINCOLN VERSAILLES  
1<sup>st</sup> Aluminum Hood Assembly



1996 FORD TAURUS  
High volume Aluminum Decklid 300,000/yr

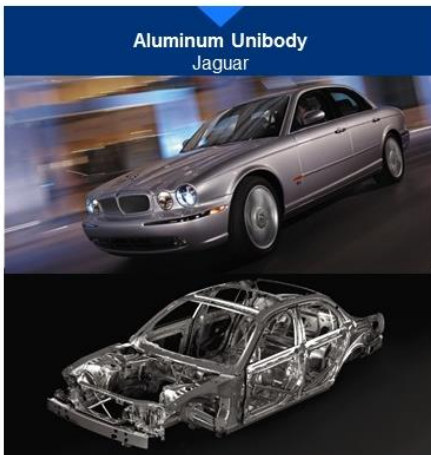


1996 FORD F150  
Very high volume Aluminum Hood 900,000/yr

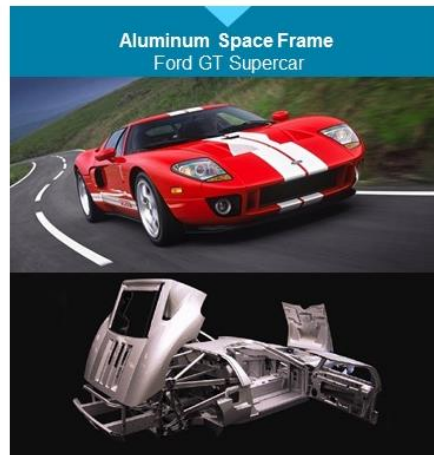


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## ALUMINUM – PRODUCTION APPLICATIONS



Aluminum Unibody  
Jaguar



Aluminum Space Frame  
Ford GT Supercar



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## ALUMINUM F150 – HIGHEST VOLUME PRODUCTION VEHICLE



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## TECHNICAL CHALLENGES

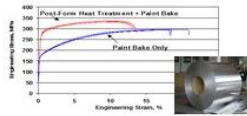
		HIGH VOLUME	TECHNOLOGY DEVELOPMENT	SUPPLY BASE	CHANGE OVER
<b>DIE DESIGN</b>	<ul style="list-style-type: none"> <li>Forming Limits</li> <li>Yield Strength</li> <li>Slivers</li> </ul>	✓	✓	✓	✓
<b>JOINING TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>Laser Welding</li> <li>Riveting</li> <li>Flow Drill Screwing</li> <li>Adhesives</li> </ul>	✓	✓	✓	✓
<b>MATERIAL</b>	<ul style="list-style-type: none"> <li>4 - 6 Different Alloys</li> <li>Material Segregation</li> <li>Collection / Recycling</li> <li>Material Aging</li> <li>Material Properties</li> </ul>	✓	✓	✓	✓
<b>HYDROFORMING</b>	<ul style="list-style-type: none"> <li>Forming Limits</li> <li>Post-forming processes</li> </ul>	✓	✓	✓	✓



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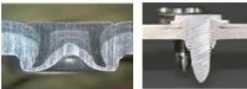
## ALUMINUM TECHNOLOGY LEADERS



Higher Strength Aluminum



Advanced Pretreatments & Adhesives



Advanced Joining (SPR's & Flow Drill Screws)



Hydroformed Aluminum



Resistant Spot Welding

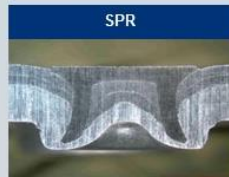


## NEW TECHNOLOGY

### Mechanical Spot Joining

Self-piercing rivets, flow drill screws and clinches used on complex stacks of thicker and higher strength materials.

- Launched all new Laboratory with SPR, Flow Drill Screw and Clinch capability.
- Implemented Ford-First technology on Flow Drill Screws



### Resistance Spot Welding

MFDC resistance spot welding needs to be developed to enable reduction of transformer sizes and to enable high currents required for Al welding.

- Designed, acquired, installed industry-first 2400A aluminum RSW cells.
- New multi-step weld sequence improves weld effectiveness to 99% (similar to steel).

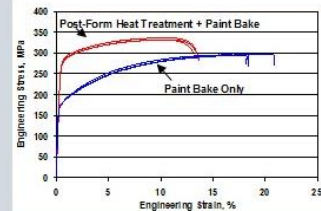


## NEW TECHNOLOGY

### Post-Forming Heat Treatment

Heat Treatment after stamping but prior to body construction results in significantly higher in service panel strength without introducing new and expensive alloys.

- Novel heat treatment process achieves >70 MPa increase without using new alloys.
- Process has been shown to be compatible with downstream processes.



### Lubricants for Improved Formability

New class of stamping lubricant significantly increases formability and enable the forming of traditionally infeasible panels.

- Enhanced formability of aluminum offers breakthrough in craftsmanship.
- Initially demonstrated on the current F-150 door inner panel.



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## NEW TECHNOLOGY

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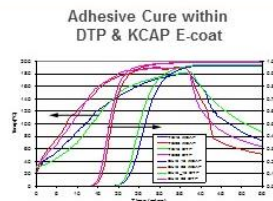
- Enhanced formability of aluminum offers breakthrough in craftsmanship.
- Initially demonstrated on the current F-150 door inner panel.



### Adhesives and Pretreatments

Adhesive to improve stiffness of aluminum structure is governed by adhesive selection and pretreatment.

- Implementation Readiness for Alcoa 951 pretreatment for coil-applied and batch parts.
- Detailed required Paint Shop modifications to ensure adhesive cure.



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# Ford Motor Company

## WEIGHT

**GOAL**  
**40%**



X0 PROTOTYPE  
WEIGHT SAVINGS

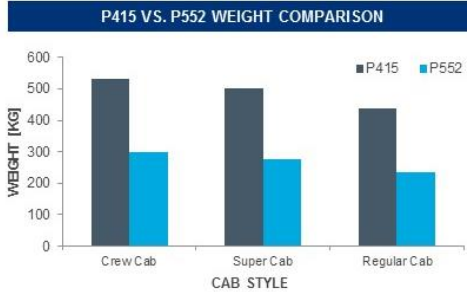
**36%**

X1 PROTOTYPE  
WEIGHT SAVINGS

**40%**

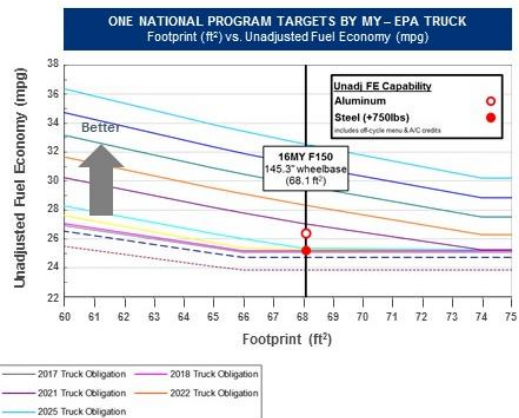
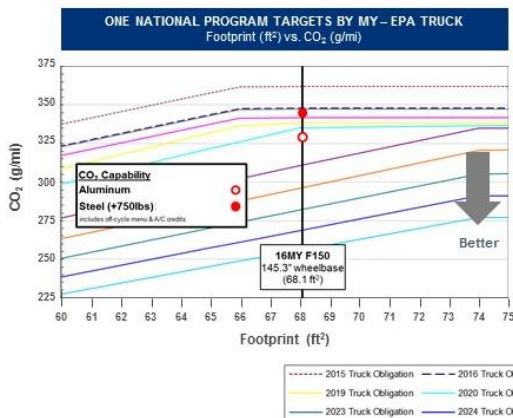
F-150  
WEIGHT SAVINGS

**45%**



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## FUEL ECONOMY AND CO2 EMISSIONS STANDARDS



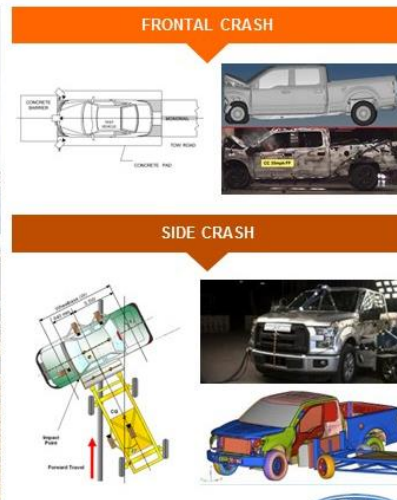
F150 achieves 2020 level Truck Fuel Economy and CO2 Emissions Regulations



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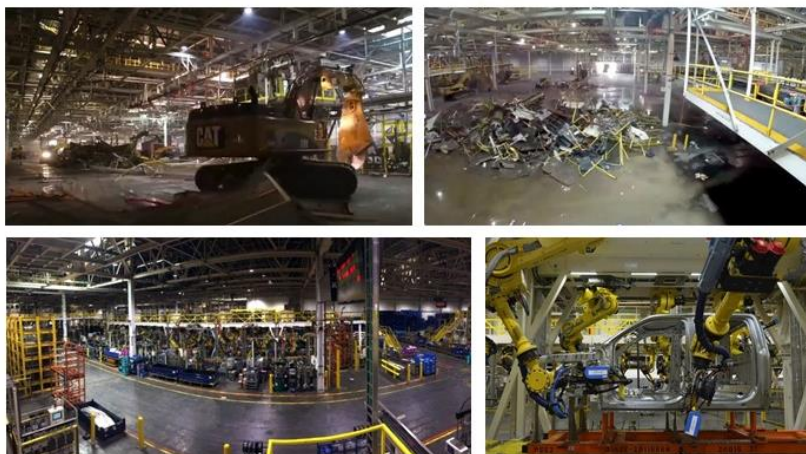
# Ford Motor Company

## THE TRUTH ABOUT TRUCKS: SAFETY



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## CONVERTING THE BODY SHOP IN 4 WEEKS

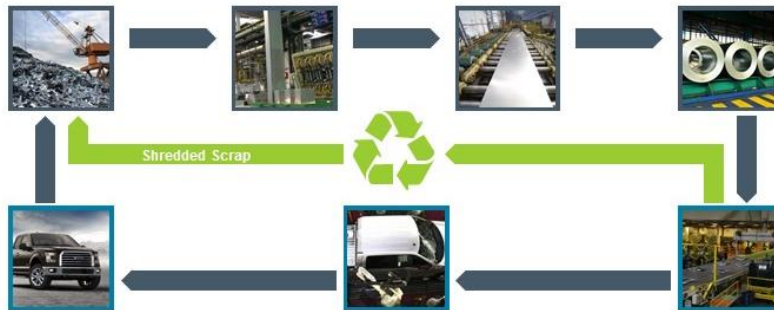


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## ALUMINUM INTENSIVE VEHICLES – RECYCLING ISSUES

- Energy to recycle aluminum is approximately 5% of the energy required to extract, process and fabricate new metal
- In order to have “closed-loop recycling”, alloys must be segregated by composition.
- Dearborn Stamping has new technology that allows for 4-way segregation.
- 87% of the total stamping scrap is tolled back to the aluminum suppliers
- Displaces 1/3 of the primary aluminum



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## MOST CAPABLE



**BEST-IN-CLASS  
TOWING**  
UP TO 12,200 LBS

**BEST-IN-CLASS  
PAYLOAD**  
UP TO 3,300 LBS

**MOST FUEL-EFFICIENT  
F-150 EVER**  
26 MPG



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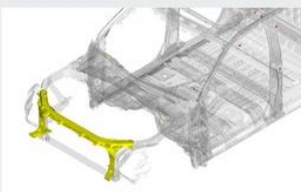


## Magnesium Applications



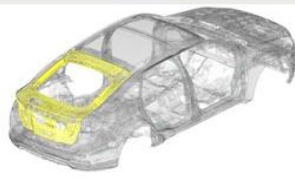
### Cast Magnesium Body Applications

#### F-150 Magnesium Bolster



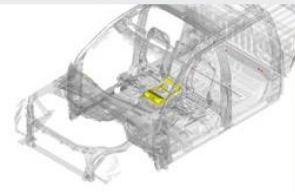
In production since 2004  
Approx. 6.5M units

#### Magnesium Liftgate Fusion/MKT



In production since 2009  
Approx. 100k units

#### Seat Frame F-150 & Explorer



In production since 2009  
Approx. 2.2M units

#### **Magnesium Summary**





- 30% Lower density, plus thinner gage & lower draft angles leads to 40% lighter parts compared to Al castings.
- Less machining and not heat treating enables piece price savings compared to Al castings
- Longer tool life vs Al enables cost reduction.





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## LOW VOLUME CARBON FIBER APPLICATIONS

Aston Martin Vanquish	Current Ford GT	Ford Mustang GT500KR	2016 Ford GT
			
Carbon fiber composite transmission tunnel, braided A-pillar, front end crash structure (400-800 units/year)	Carbon fiber composite rear deck lid and seats (4500 units total)	Carbon fiber hood (<5000 units/yr)	Carbon fiber Supercar



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## ONE PIECE CARBON FIBER REAR DECKLID INNER



Aluminum Inner - 12 Kg  
Random Carbon Fiber - 6.5Kg



LARGEST MONOLITHIC CF DOOR INNER



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## THE ALL NEW FORD GT CARBON FIBER SUPERCAR



*Ford Redefines Innovation in  
Aerodynamics, EcoBoost and Light-Weighting*



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## OPTIONS FOR COMPOSITE INTENSIVE APPLICATIONS?

- New applications need to be transparent to existing downstream assembly processes and capable of tolerating e-coat oven bake temperatures.
- Early adoption will be limited to sub-assembly applications that have minimal impact on existing bill of process and assembly plant tooling.
- Longer term applications will include substantial elements of the primary body structure and require changes to the bill of process and new capital investment.

Roof and Floor Structure Panels



Body Side Structure Components



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## CURRENT ROAD BLOCKS

Current **Road Blocks** to Widespread Implementation of Carbon Fiber:

Material Cost  
& Volatility

Material  
availability

Inadequate  
manufacturing  
methods for  
high volume  
throughput

Legacy  
constraints  
(existing  
infrastructure)



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## SUMMARY

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### Body Lightweighting Conclusions

- Body lightweighting design will play an increasingly central role in new vehicle development
- Innovative and intelligent solutions are needed in material development and manufacturing technology
- These solutions need to be affordable and scalable to meet the OEM's global footprint, global platforms and volume requirements
- Body lightweighting trends toward higher grade and lighter alloy metals and composites will accelerate



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# We Welcome You To Our Next Event

AluMag®

**AluMag SAE 2016** 12<sup>th</sup> – 14<sup>th</sup> April

Light Weighting - Emission Reduction - Car Comfort

Technology Center, Booth # 763 - Detroit - Cobo Center, MI USA

AluMag®

**Asia 2016** 6<sup>th</sup> - 8<sup>th</sup> of July

AUTOMOTIVE LIGHTWEIGHT

**PROCUREMENT SYMPOSIUM**

Jumeirah Himalayas Hotel in Shanghai, China

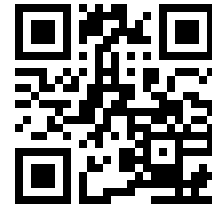
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**Europe 2016** 27<sup>th</sup> - 29<sup>th</sup> of Nov

AUTOMOTIVE LIGHTWEIGHT

**PROCUREMENT SYMPOSIUM**

Hilton Hotel in Duesseldorf, Germany



Organized by AluMag

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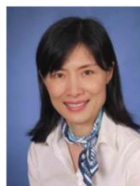
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**THE MARKET DEVELOPER**



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