AluMag®

Asia 2015 6th - 8th of Jul

AUTOMOTIVE LIGHTWEIGHT

PROCUREMENT SYMPOSIUM

Jumeirah Himalayas Hotel in Shanghai, China

SYMPOSIUM FOCUS

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

HIGHLIGHTS

- **INTERNATIONAL SPEAKERS**

  AUDI - MAGNA - DGS - GEELY - NOVELIS - JSC - VOESTALPINE, …

- **LIGHTWEIGHT TECHNOLOGY EXHIBITION**

  DGS - StrikoWestofen - Kurtz - Novelis – Idra

- **SIMULTANEOUS INTERPRETING**

  Chinese - English / English - Chinese

ATTENDING COMPANIES

GM, Geely, Audi, FUSO, KOBELCO, brose Technik für Automobile, Webasto Feel the Drive, BOCAR GROUP, BHARAT FORGE KALYANI, SankyoTateyama, Inc., 广东鸿图科技股份有限公司 GUANGDONG HONGTU TECHNOLOGY(HOLDINGS)CO.,LTD., IDRA, MAGNETI MARELLI, DGS Druckguss-Systeme, StrikoWestofen Group, +GF+, ALCOA, TOYOTA, voestalpine, MAGNA, BÜHLER, BME, BENTELER, JSC AUTOMOTIVE, kurtz ersa, CDP BHARAT FORGE, KALYANI, DA 大桥铝业, SHILOH, Mercedes-Benz, DUCKER WORLDWIDE, ADITYA BIRLA NOVELIS, RAFFMETAL THE ALUMINIUM EVOLUTION, UACJ, Sumitomo Corporation, sapa:, Gasgoo, AluMag® THE MARKET DEVELOPER

MEDIA & ORGANIZATION PARTNERS

Reed Exhibitions, FOUNDRY-PLANET.COM, NÜRNBERG MESSE, Al Circle, Automotive -Technology.com®, Automotive News China, ALUMINIUM INTERNATIONAL TODAY, ALU.com.cn China Aluminium Network, ALUMINIUM CHINA

Brings together the procurement and supply side of lightweight materials and their advanced processes in accompany with cost balance or reduction….

AluMag®

Europe ■ India ■ Americas ■ Asia
THE MARKET DEVELOPER

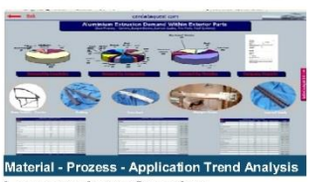
AluMag is "The Market Developer" that successfully penetrates new markets, creates business and localize leading supplier for your company. AluMag access any promising markets and open doors for your business – regardless of region, market, application, material, process or product. AluMag makes you successful – worldwide!

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

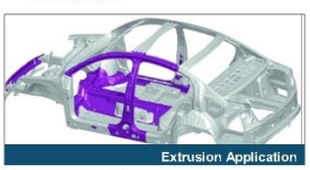
AluMag as your provider of automotive research and forecasting studies, offers you and your business, the market intelligence you need to realize the best strategic decisions



Material - Prozess - Application Trend Analysis

Large variety of market accesss, 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-search 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, con-trolling, executing and closing out a new project. AluMag offers liaison mana-gement 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

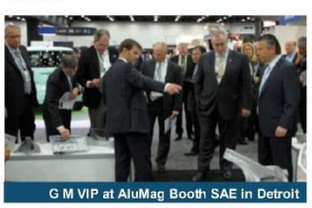
Roadshows / Events

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

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

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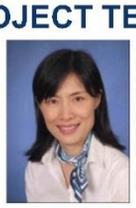

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Asia Automotive Lightweight Procurement Symposium

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AluMag®

Europe ■ India ■ Americas ■ Asia

THE MARKET DEVELOPER

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Company Speechs by:

Agenda

Agenda: (Is Continuously Being Updated)

Monday The 6th Of July – Jumeirah Himalayas Hotel, Shanghai – 6th Floor

06:00pm - 10:00pm

Pre-registration and Welcome Reception

Tuesday The 7th Of July – Jumeirah Himalayas Hotel, Shanghai – 6th Floor

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. Frank VENIER, Strategy and Innovation; Lightweight Design Centre at AUDI AG

Lightweighting SUV - The New Audi Q7 In Multimaterial Car Body Design

10:25am – 11:00am

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

11:00am – 12:00am

Paper 1 – Part 1:

Mr. Gerhard KRACHLER, Director Advanced Development & Product Strategy at MAGNA STEYR Engineering AG & Co.KG

Paper 1 – Part 2:

Mr. Christian JURICEK, Manager R&D Europe at COSMA MAGNA International

Magna's Global Advanced Lightweight Competences

12:00pm – 01:45pm

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

01:45pm – 02:25pm

Paper 2:

Mr. Andreas MUELLER, CEO at DGS Druckguss Systeme AG

Localization And Industrialization Of Cast Aluminium Structural Applications

02:30pm – 03:10pm

Paper 3:

Mr. Li WAN, Vice President at Guangdong Hongtu Technology (Holdings) Co Ltd

Aluminum Alloy High Vacuum Die Casting Technology And It's Application On Automotive Structural Parts

03:15pm – 03:45pm

Paper 4:

Mr. Lothar HARTMANN – Managing Director Foundry Machines & Trimming Presses at Kurtz GmbH

Mr. Michael BARTEL – Asia Sales Manager Foundry Machines & Trimming Presses – Kurtz GmbH

Low Pressure Casting

A traditional casting technology helping to step ahead for light weight solutions in engine block manufacturing

03:45pm – 04:15pm

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

04:15pm – 04:55pm

Paper 5:

Mr. Peter BERNSCHER, Member Of The Board & Director Automotive Body Parts at Voestalpine Metal Forming GmbH

Lightweight Solutions In The Automotive Industry By Voestalpine

05:00pm – 05:55pm

Closing Keynote:

Mr. Jochen SIEBERT, Managing Partner at JSC Automotive Consulting Co. Ltd.

Outlook And Hurdles Of The Chinese Economy And Automotive Industry

05:55pm – 06:00pm

Summary:

Ms. Ying ZHOU, Project Coordinator China – Japan at ALUMAG Automotive GmbH

06:00pm - 10:00pm

Reception Sponsored By StrikoWestofen

Dinner Speech – Part 1:

Mr. Rudolf RIEDEL – Group Managing Director at StrikoWestofen GmbH

Dinner Speech – Part 2:

Mr. Rainer ERDMANN – Managing Director Asia Operations at StrikoWestofen Thermal Equipment Co.Ltd

Profits With Light Metal Castings Start In The Melt Shop

Agenda

Agenda: (Is Continuously Being Updated)

Wednesday The 8th Of July

08:15am – 08:55am

Opening Keynote:

Prof. Fei XIONG Chief Engineer & Director of Auto Lightweight Department at GEELY

Automotive Lightweight Promoting The Application Of Aluminium

09:00am – 09:40am

Paper 1:

Mr. James LIU, Managing Director and Vice President of Asia Auto at NOVELIS China

High Volume Aluminum Solutions For Lightweighting

09:45am – 10:25am

Paper 2:

Dr. Jin HOU – General Manager – Sapa Technology Asia

High Performance Aluminium Alloys For Automotive Light-Weighting

10:25am – 11:00am

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

11:00am – 11:40am

Paper 3:

Mr.Yoshikazu MUKAI, Executive Vice President & Technical Specialist at Kobelco Automotive Aluminium Rolled Products (China) Co,.Ltd – Shanghai Branch

Kobe's R&D Activities For Automobile Lightweighting

11:45am – 12:25pm

Closing Keynote:

Mr. Martin SHI, Chief Editor at GASGOO International And Senior Analyst at GASGOO Research Institute

The Status And Development Trends Of China Automobile Lightweight

12:30pm – 12:35pm

Summary:

Mr. Jost GAERTNER, Managing Partner at ALUMAG Automotive GmbH

12:45pm – 01:00pm

Walk To The SNIEC
Shanghai New International Expo Centre

01:00pm – 01:40pm

Reception With
Snacks & Finger Food at the SNIEC

01:40pm – 05:30pm

Individual Or Guided Visit At The 2015 "Aluminium China " And "China Diecasting" Exhibitions

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Backup Speech

Mr. Jost GAERTNER, Managing Parter at AluMag Automotive GmbH

Top 16 Global Ranking Of Aluminium And Magnesium Foundries By Revenue

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TITLE

Magna's Global Advanced Lightweight Competences

ABSTRACT

1) Introduction
With all the statutory requirements to reduce CO2 emissions, the lightweight approach becomes more important than ever. Besides downsizing, lightweight design is one of the key factors to improve vehicle emissions.

2) Lightweight with major impact on new vehicle requirements
Intelligent lightweight design comprises the integration of functions, downsizing and innovative multi-material-mix.
The cost reduction as a result of 'functional integration' and 'downsizing' leads to a partial compensation of the additional cost resulting from the substitution of materials. Integration of functions means that every part has to fulfill as many functions as possible in order to reduce the number of parts.
Downsizing and exploitation of secondary effects express the idea that a vehicle that is significantly lighter will need smaller, lighter and cheaper components which satisfy the same functional requirements. For example, such a lightweight car needs smaller brakes for the same braking distance, or the powertrain delivers the same performance even if the cubic capacity and the number of cylinders are reduced.

3) Virtual development
Innovative lightweight vehicle concepts have to be designed in such a way to meet the requirements in terms of crash, acoustics, structural durability and stiffness.

Lightweight materials in general have a lower ductility compared to steel. This in turn requires new strategies in terms of passive safety – in particular the conversion of kinetic crash energy into deformation energy. The basic approach implies the definition of deformation zones, allowing energy absorption trough fragmentation of material, as well as zones with guaranteed structural integrity.

4) Eco Design – Life Cycle Analysis and Total Costs of Ownership
"Eco-design", "design for the environment", "life cycle design" or "design for sustainability" is defined as: "systematic consideration, during new product and process development, of design issues associated with environmental and human health and safety over the full product life-cycle".
This is especially important for innovative lightweight concepts since they require the application of new materials and the development of new processes.

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Manager R&D Europe

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Our Global Presence

MAGNA

~133,000 People	29 Countries	316	87	$36.6 Billion (2014 Sales)	Manufacturing / Assembly; Engineering / Product Development / Sales; Number of Employees

Q1 2015

Magna Steyr Engineering AG & Co KG

Our Global Capabilities

Our Product Systems


SEATING


EXTERIORS


INTERIORS

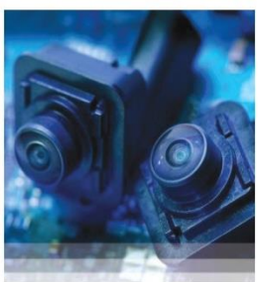

CLOSURES


VISION SYSTEMS


ROOF SYSTEMS


BODY & CHASSIS


POWERTRAIN


ELECTRONICS


VEHICLE ENG & CONTRACT MFG FUEL SYSTEMS

Structure of MAGNA International

Don Walker	Chief Executive Officer
Vince Galifi	Chief Financial Officer
Jim Tobin	Chief Marketing Officer, President Magna Asia
Jeff Palmer	Chief Legal Officer
Tom Skudutis	COO Magna Interiors, Exteriors, Seating, Mirrors, Closures and Cosma
Swamy Kotagiri	Chief Technology Officer
Marc Neeb	Chief Human Resources Officer
Guenther Apfalter	President Magna Europe
Mike Sinnaeve	VP Operational Improvement & Quality

Mike Bisson President	Grahame Burrow President	Albert Lidauer President	Frank Seguin President	John Farrell President	Jake Hirsch President	Guenther Apfalter President
MAGNA SEATING	MAGNA EXTERIORS	MAGNA INTERIORS	MAGNA MIRRORS & MAGNA CLOSURES	COSMA INTERNATIONAL	MAGNA POWERTRAIN & MAGNA ELECTRONICS	MAGNA STEYR
						
Seating	Exteriors	Interiors	Vision, Closures, Lighting, Sealing & Roof Systems	Body & Chassis	Powertrain & Electronics	Vehicle Eng & Contract Mfg; Fuel Systems

Magna Steyr Range of Services

Flexible and global solutions customized for the OEM

Engineering

From systems and modules to complete vehicle engineering

Contract Manufacturing

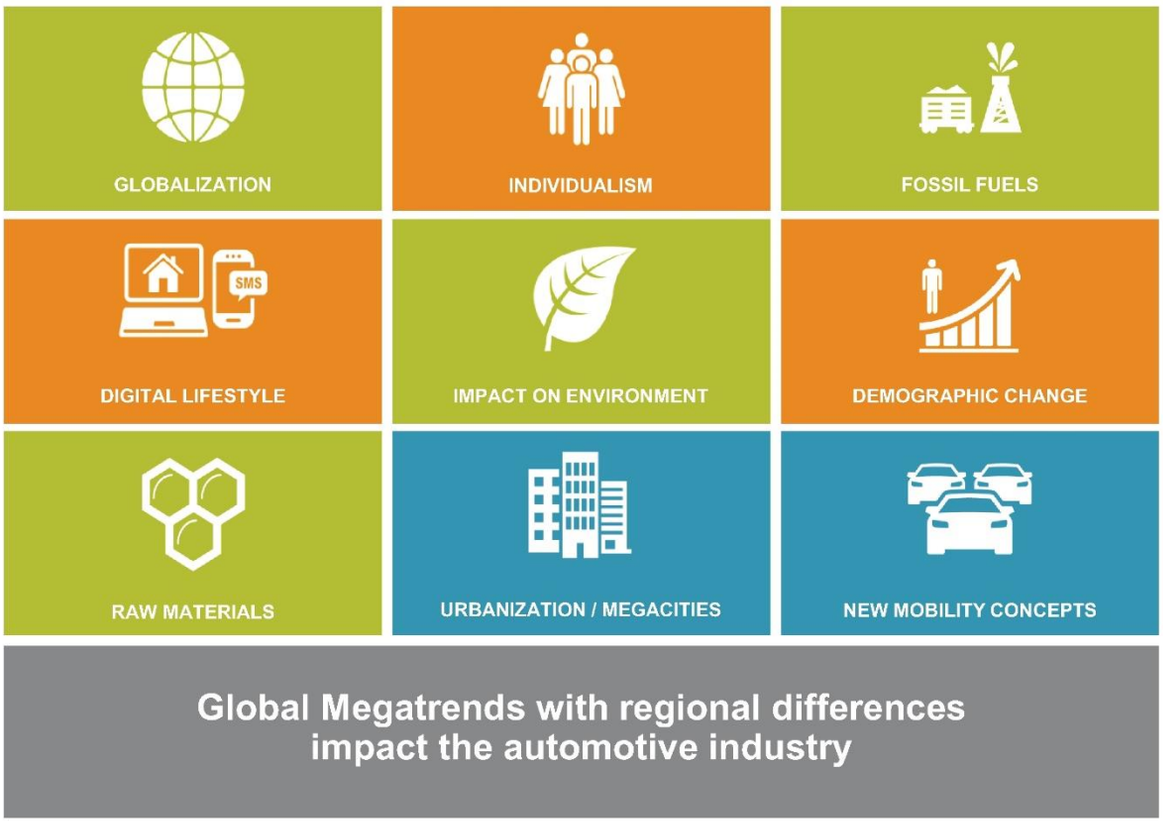
World Class flexible solutions from niche to volume production

Fuel Systems

Energy storage systems made of steel, plastic and aluminum

Global Megatrends
Drivers of New Technologies

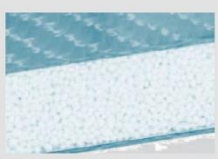
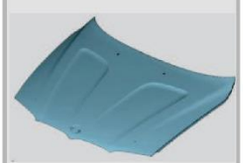
MAGNA



Magna Innovation Pillars

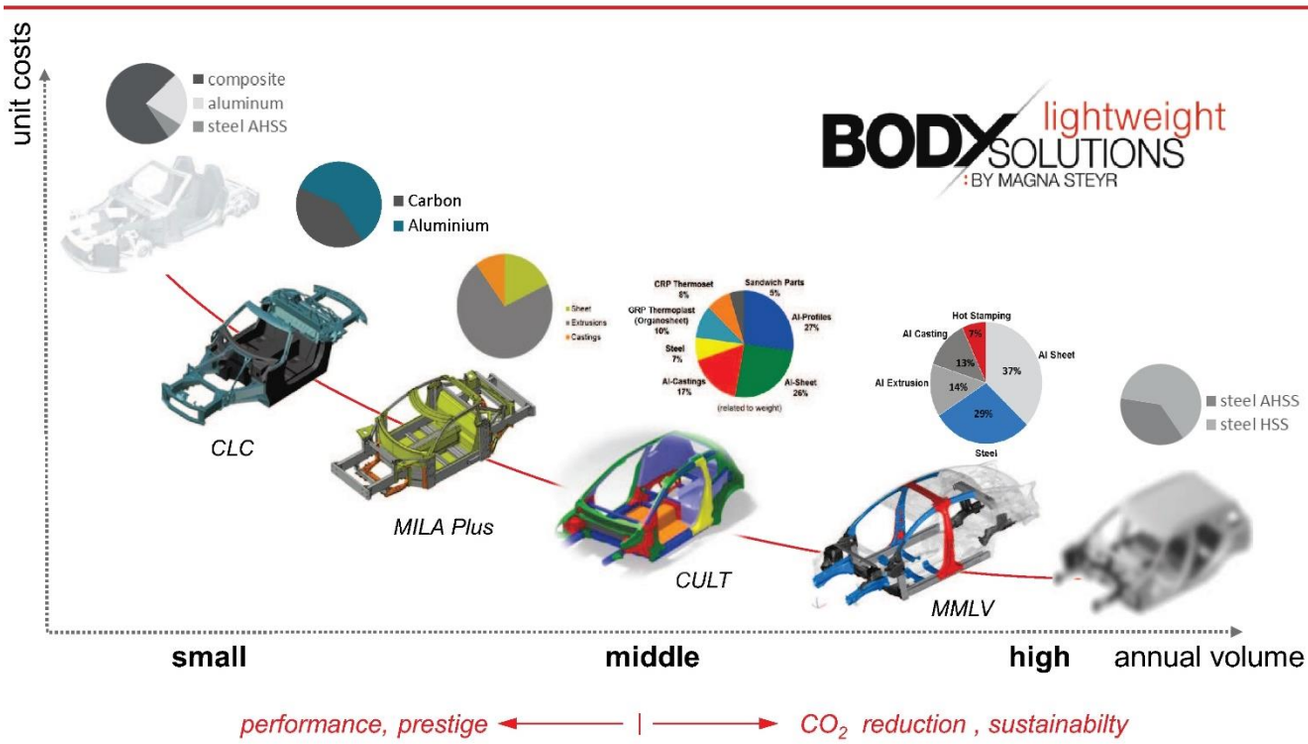
MAGNA

Different approaches driving weight reduction

Lightweight Material	Increase In Performance Density	Integrated Lightweight Functional System	Function Integration from external sources	New Vehicle Architecture
				
NEW MATERIALS Material	**NEW COMPONENTS** Material + Geometry + Optimized Function	**NEW SYSTEMS** Material + Geometry + Function + Functional Integration	**REDUCED HARDWARE** Connectivity I2C+ Bring your own device	**NEW ARCHITECTURE** Multi-Disciplinary Lightweight Concept

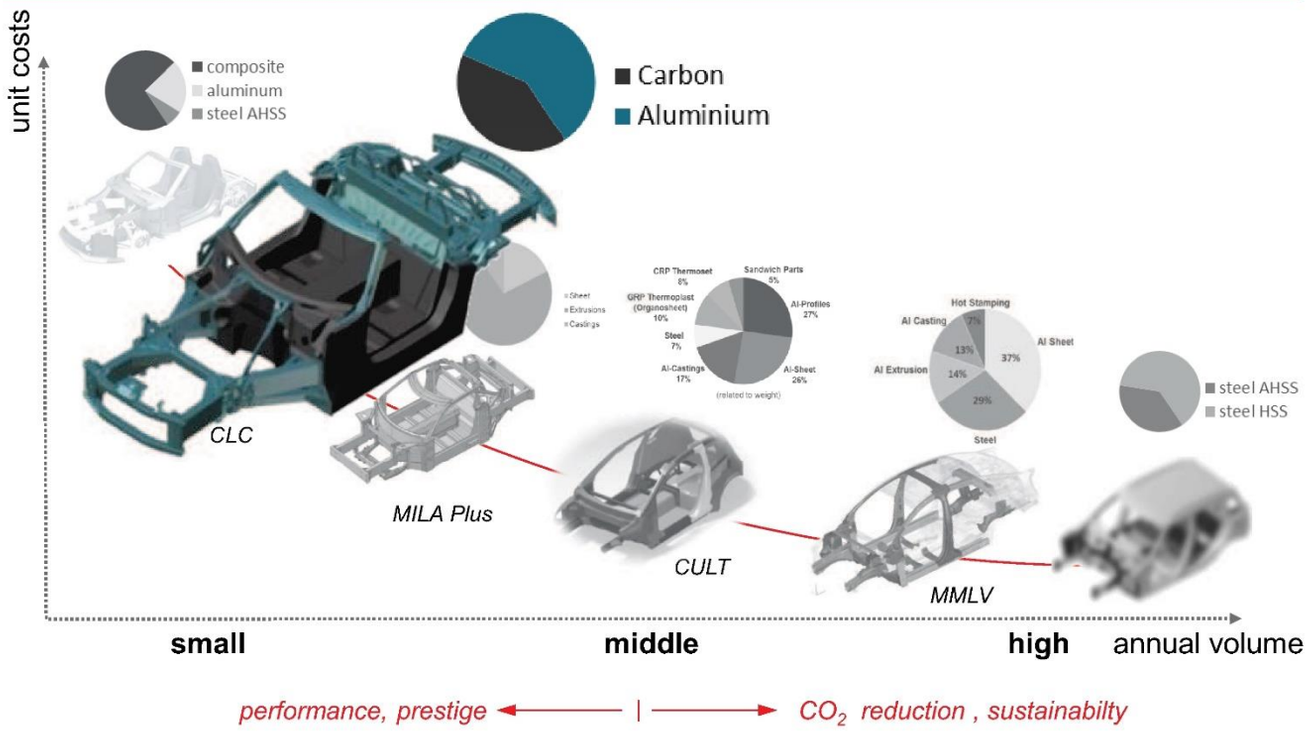
Only a unified approach will drive towards a significant weight reduction

Lightweight concepts overview



Innovative lightweight body design from performance to sustainability driven segments

CLC (Composite Life Cell)

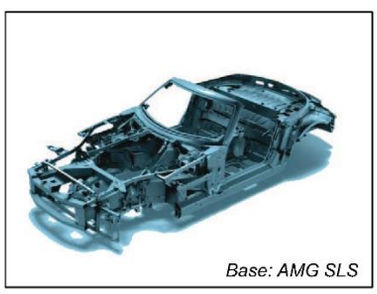


Carbon fibre composite solution for better cost efficiency

CLC Motivation

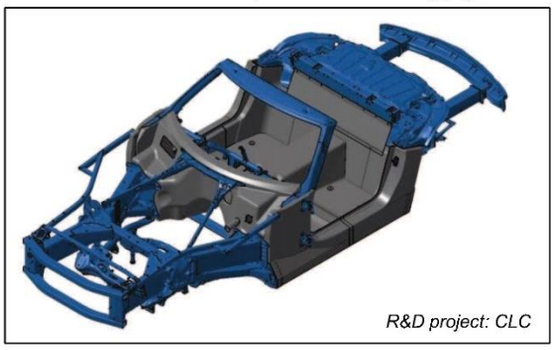
aluminum solution
reference structure

Super Sport Car



composite solution
advanced performance

Volumes up to 5.000 jpy

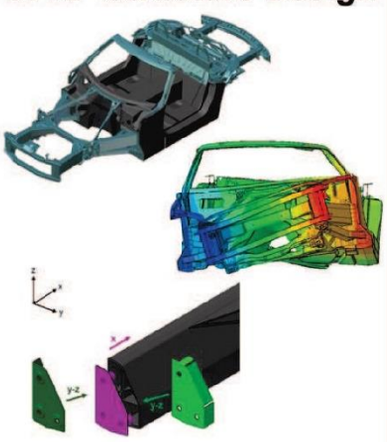


Targets in comparison to reference structure:
- increase torsional stiffness about 10 %
- reduce weight of passenger cell about 20 %
- comparable crash performance
- reference cost + 80 €/-kg

Qualified virtual development and production integration of composite structures.

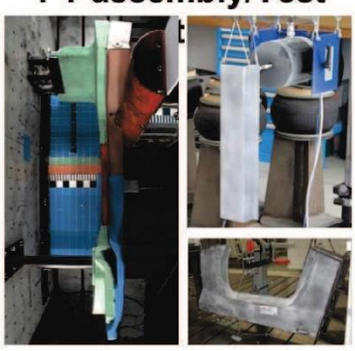
CLC Details

CFRP Structure Design



- Composite specific design
- Design for manufacturing
- Strength and stiffness calc.
- Insert design

PT assembly/Test

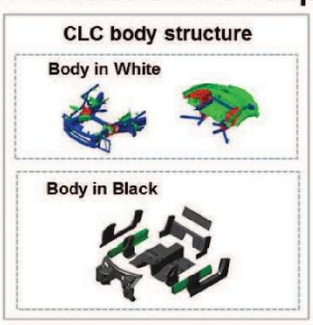


- Clearance of layup, reference point for prototype assembly
- Prototype assembly
- NVH tests

Bending tests with sidewall/rocker:

- pole crash test
- test validation

Production Concept

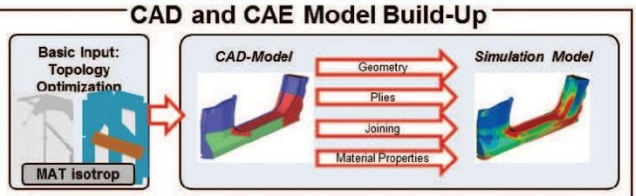


- CFRP cell production
- Al front/rear structure production (analog SLS)
- BIW framing (e-coated and sealed AL front/rear structure)
- Calculation of production and part costs (outer panel: e.g. low temperature 80° paint process)

From CFRP optimized part design up to suitable production concept

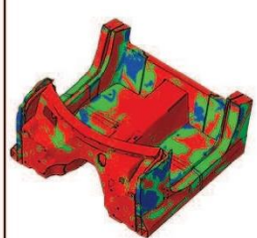
CLC Virtual Development

CAD and CAE Model Build-Up

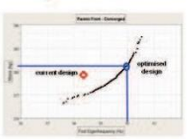


Implemented
- Draping characterization/ simulation
- CAD-CAE exchange process
- Fiber direction mapping
- Model guide line CAD-CAE
- FRP design process

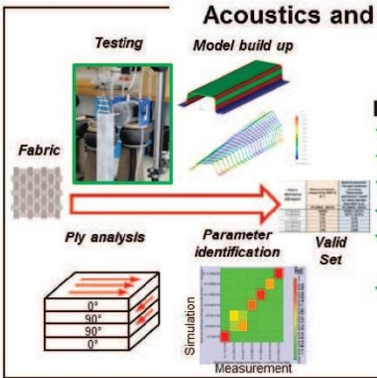
Structural Durability



Implemented
- Ply modeling
- Failure criteria
- Stiffness prediction
- Joint optimization
- Optimization methods

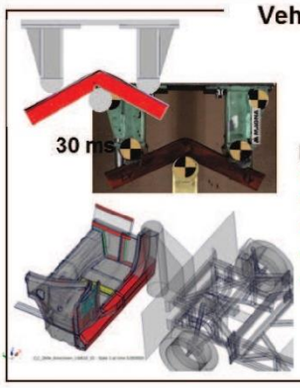


Acoustics and Vibration



Implemented
- Mat. Characterization
- Sim. Model setup
- Sound transmission test
- Sound transfer test
- Influence analysis of production analysis
- Validation of simulation

Vehicle Safety



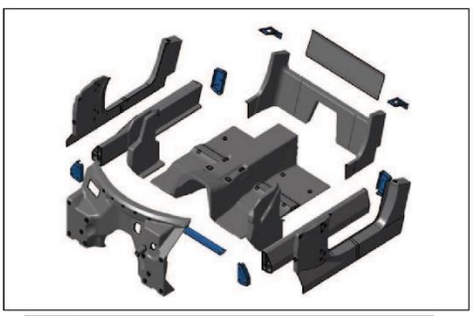
Implemented
- Ply and foam modeling
- Material characterization
- Validation part/system level
- Testing
- Increase numeric stability

Validated virtual methods save development time and prototype costs

CLC development

virtual development
adapted for composite structures

Design Solution

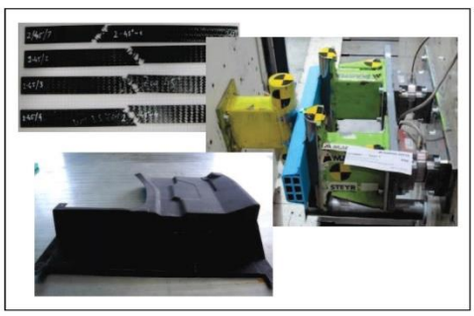


torsional stiffness	110 %	107 %
weight reduction	20 %	38 %
crash performance	compara ble	work in progress
reference cost	+ 80 €/kg	work in progress

Validation

prototyping & testing
prove performance

Hardware

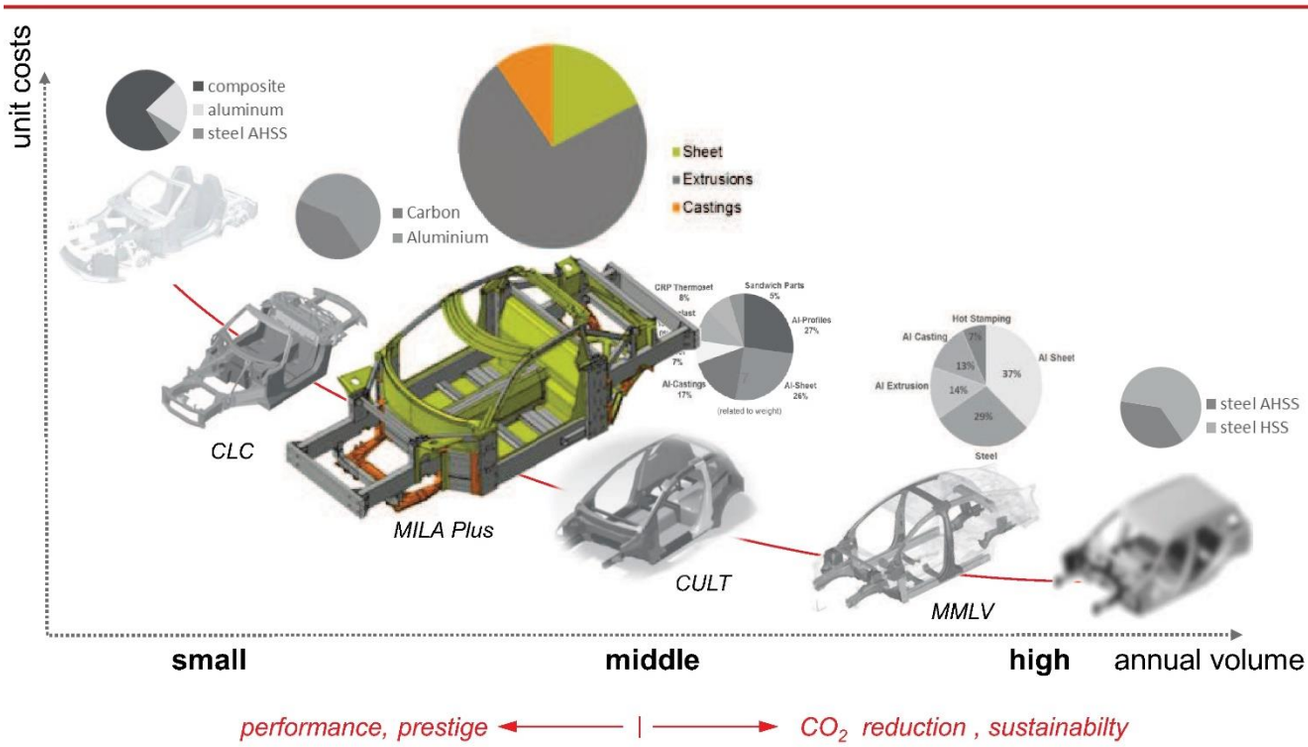


Static and dynamic testing on:
- Coupon level
- Component level
- Module level

Comparison of test and simulation results

Design related hardware for performance testing

MILA Plus



Advanced spcaeframe concept for low volumes

Mila Plus Architecture

- **Affordable lightweight concept for small volumes**
- **One scalable aluminum body structure design for several customers** with full differentiation in upperbody , powertrain and chassis.
- **Scalable body performance** (Weight, Stiffness, Safety) with variably profile inner Cross-section
- **Different upperbody, powertrain and chassis** layouts considered
- **~35% saving costs** compared to stand-alone platform
- **~20% saving costs** compared to stand-alone complete body
- **Minimized invest** for cost efficient production ("economy of scale")
- **Reduced time to market** regarding practical experience and confirmed solutions in lightweight design
- **Virtual development** and simulation of concepts: Structure Stiffness & Durability, Vehicle Safety

BIW Architecture: profil intensive aluminium spaceframe design

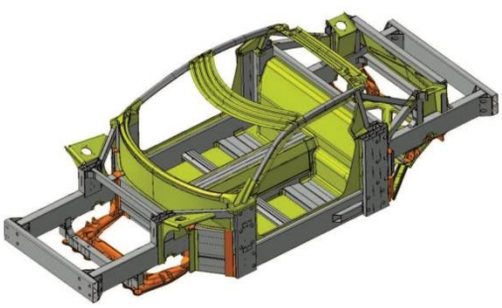
- ✓ Lightweight design
- ✓ Minimal vendor tooling invest

Upperbody concept: multimaterial design

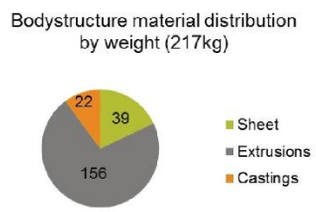
- ✓ Maximal design freedom
- ✓ Minimal vendor tooling invest
- – OPTION: CFRP performance parts

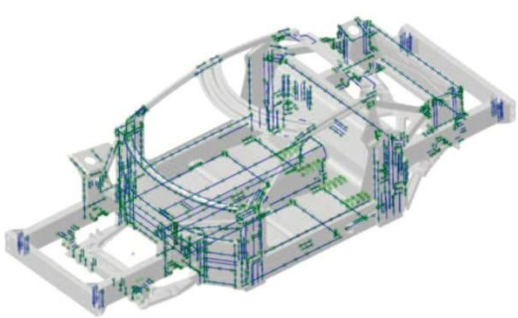
Affordable Hybrid Sports Car Concept for small series

Mila Plus Material & Joining



alluminium bodystructure:





cold joining technologies:

Bonding	96m
FDS	1350Stk.
Punch riveting	102Stk.

For higher volumes → hot joining technique

Mila Plus Vehicle safety

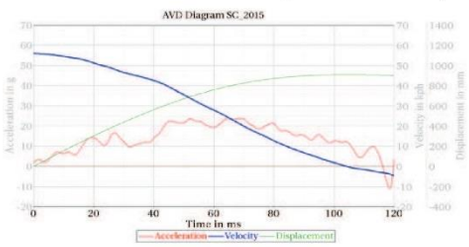
Passive Safety load cases (Feasibility)

Front-crash:
- Deformable barrier ECE-R94 (ODB 56 kph)
- Rigid wall FMVSS 208 (56 kph, 0°)
- Rigid wall FMVSS 301 (48 kph, 30°)

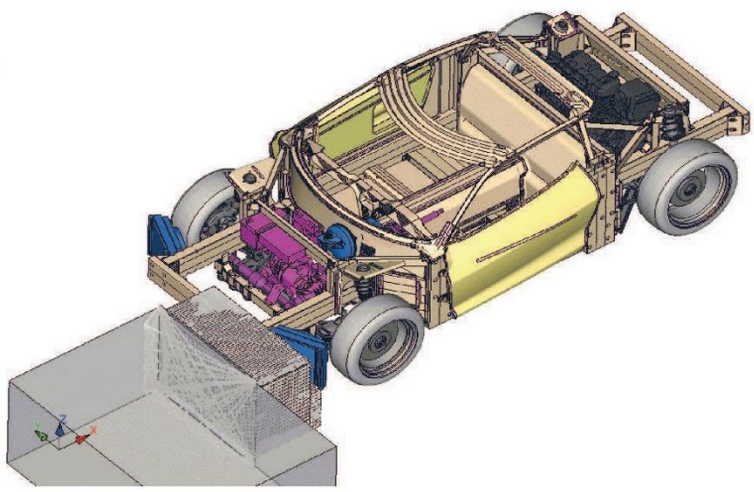
Side-crash:
- Deformable barrier FMVSS 214 (MDB 54 kph, 27°)
- Pole FMVSS 214 (32 kph, 75°)

Rear-crash:
- Deformable barrier FMVSS 301 (MDB 80 kph)

Acceleration Curve (Front crash)

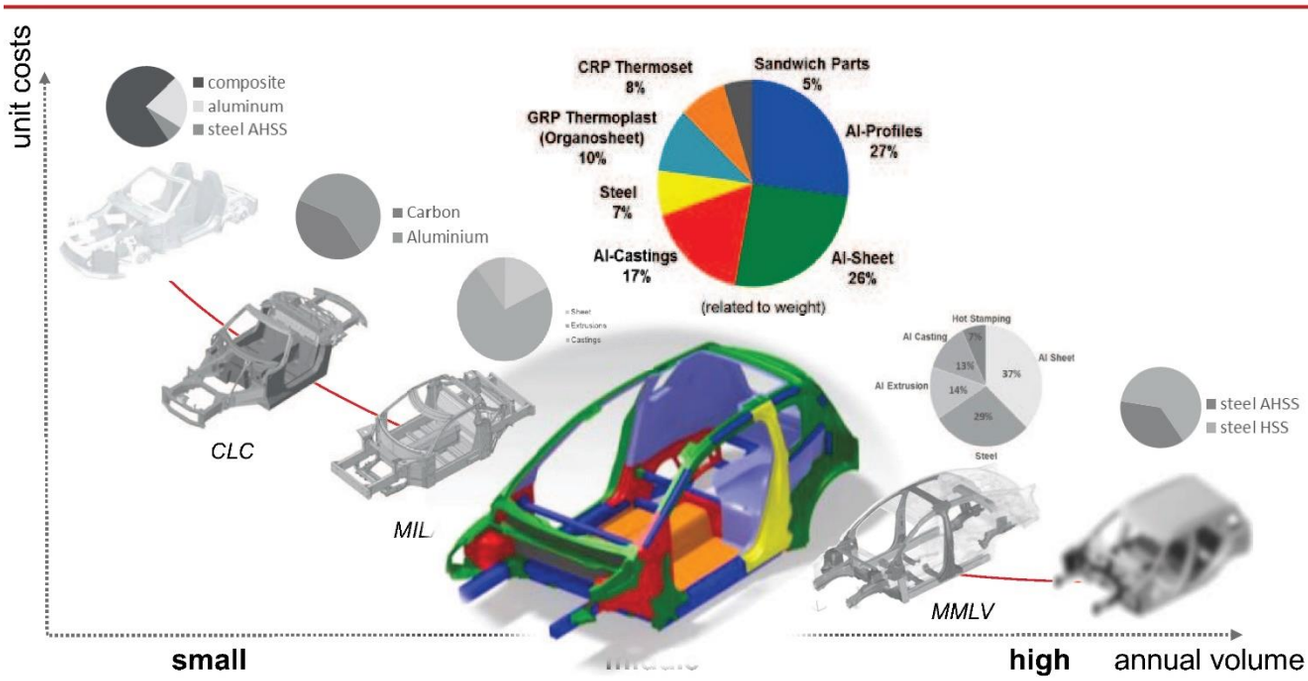


Animation structure performance (front, side and rear crash)



Body structure ready for 5 stars rating according NCAP regulation

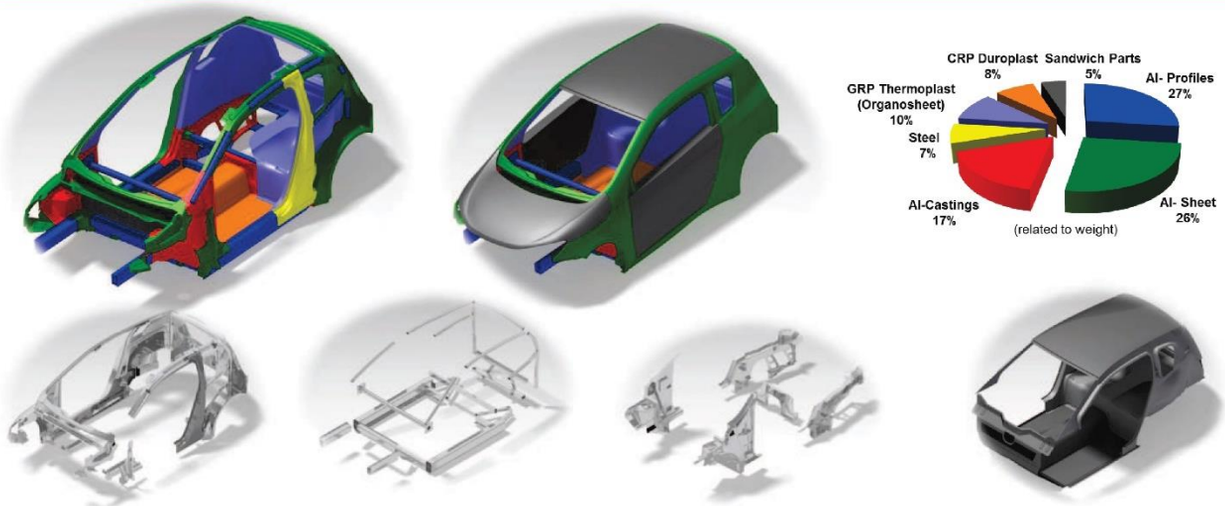
CULT (Cars UltraLight Technologies)



performance, prestige ← | → *CO_2 reduction , sustainabilty*

Award winning multimaterial design for small volumes

CULT Material & Joining



Sheet: 58 Parts

Profiles: 32 Parts

Castings: 5 Parts

GRP Thermoplast: 10 Pcs.
CRP Duroplast: 1 Pc.
GRP- Sandwich: 1 Pc.
Steel – Sandwich: 3 Pcs.

Main targets:
BIW: < 140kg
Series: 30.000 Jpy
CO_2 emission: < 50gr/km
Weight reduction overall: 300kg

Joining technique:
CMT→14m,
Punch Rivets→778 Pcs.,
FDS→465 Pcs.,
Bonding→85m

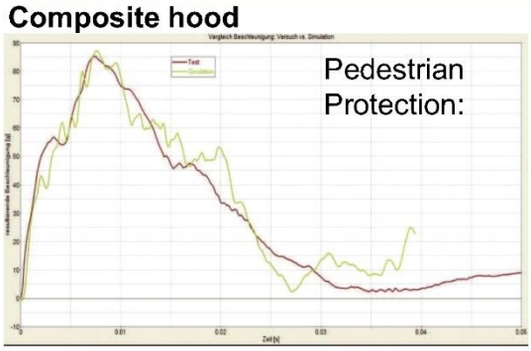
Multimaterial approach to meet the targets

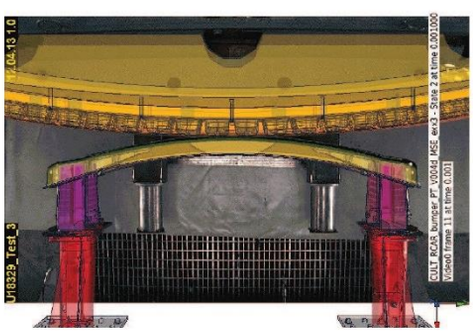
CULT Simulation of Composite Material

Crash management

Force and energy absorption

Composite hood





Simulations done in CULT:

- Static stiffness and torsion; complete front crash simulation
- Crash:
- Composite hood: - pedestrian protection
- Front CMS: 3 different load cases, different temperatures,
  different speed

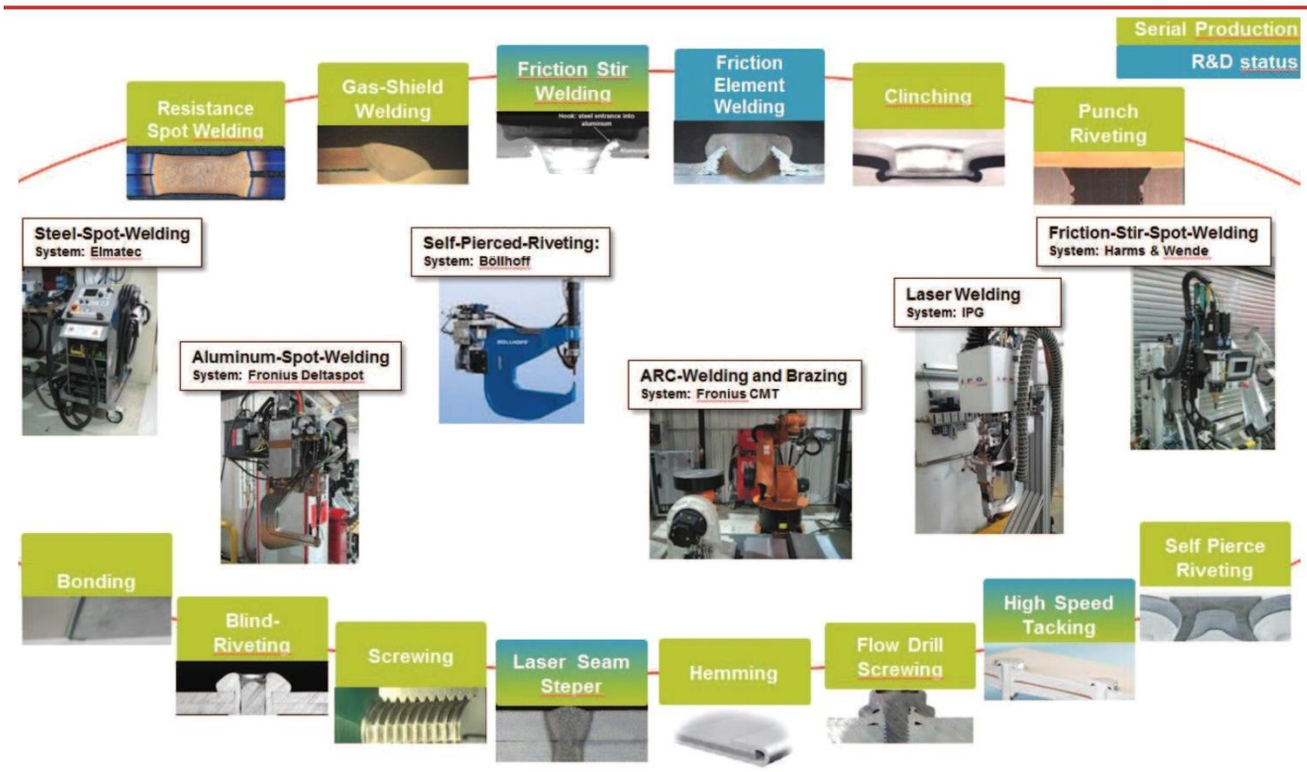
Status/next steps:
redisign of the part for further weight reduction

Validated simulation for an efficient development process

CULT Corrosion

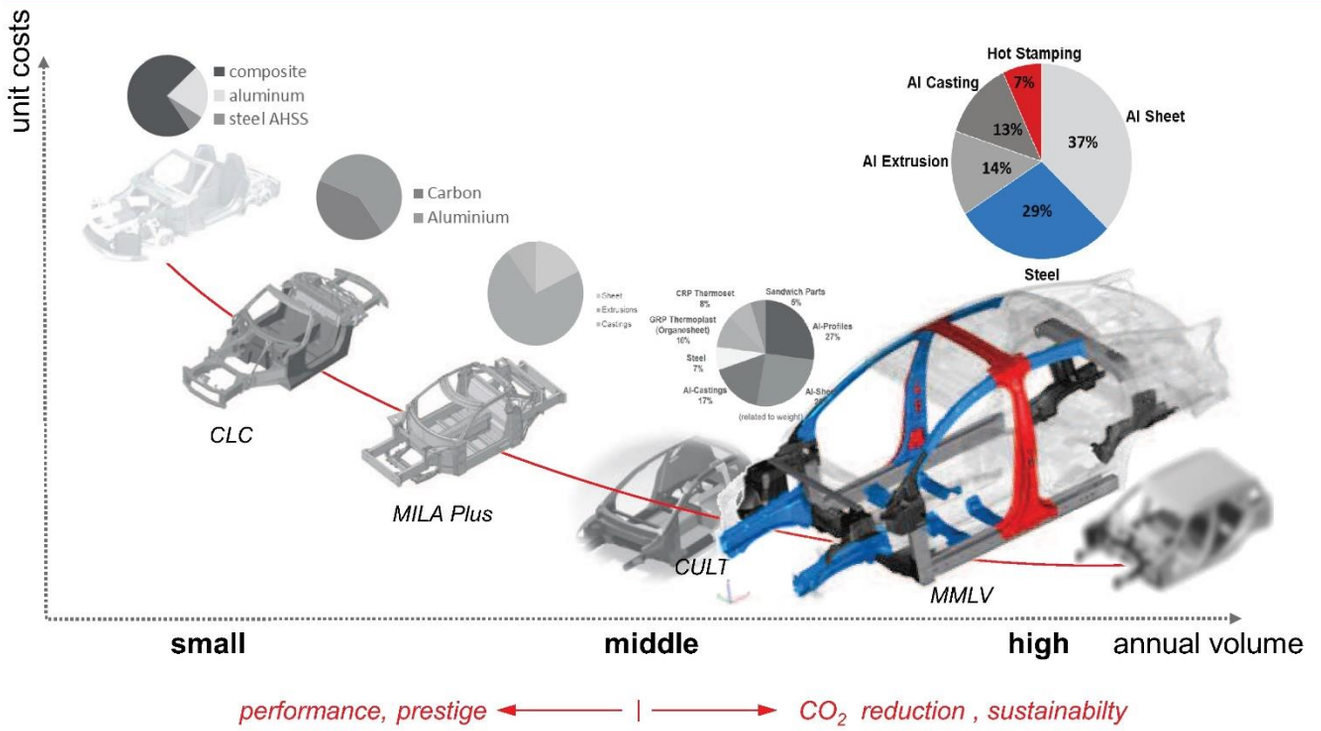
Electrochemical corrosion has to be respected

Joining technology overview

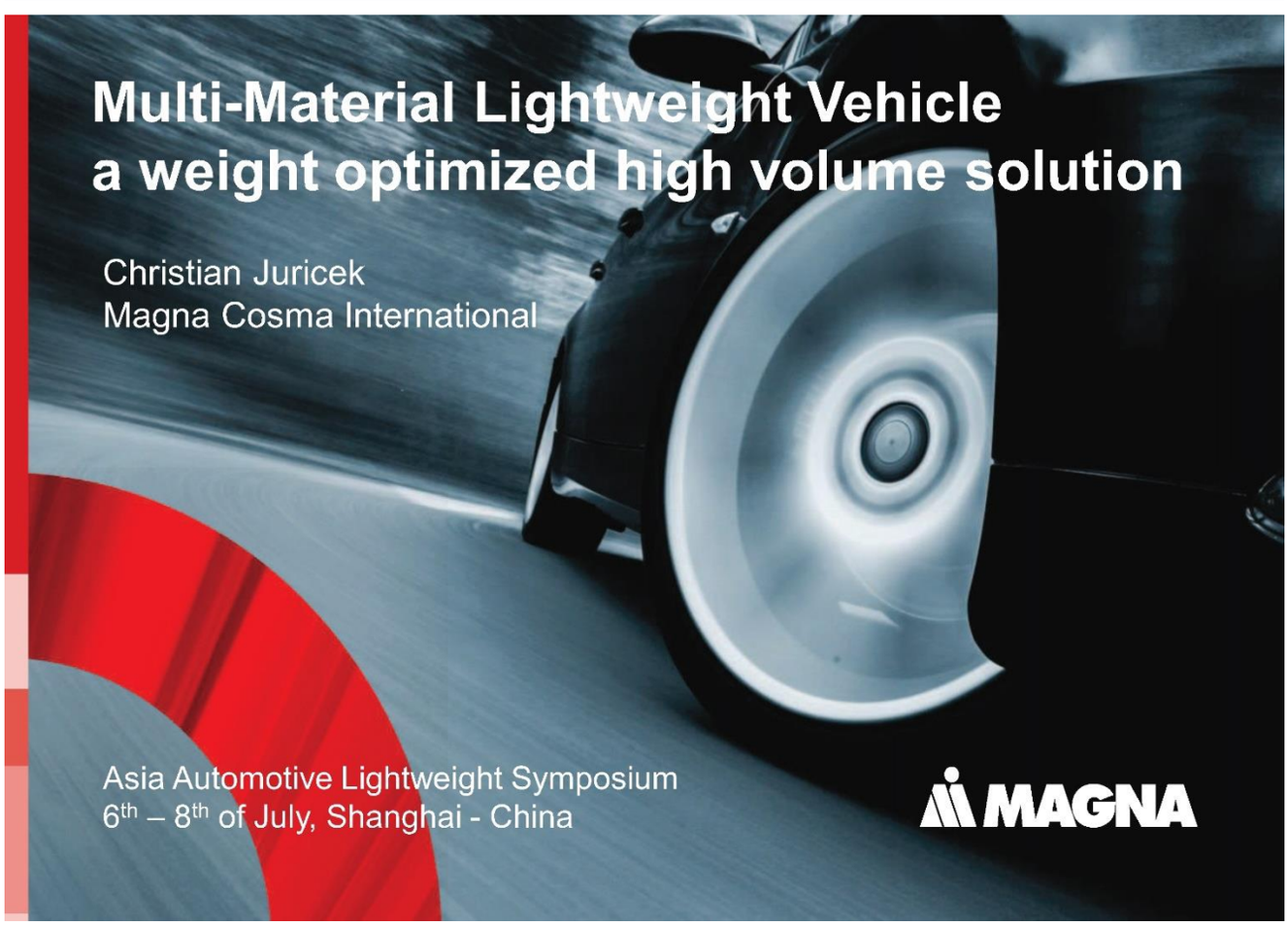


Joining technologies for efficient lightweight design

MMLV (Multi-Material Lightweight Vehicle)



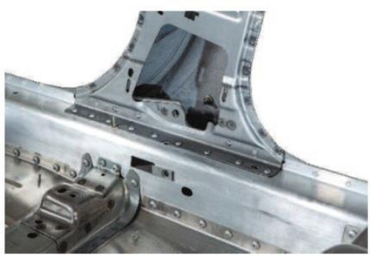
MMLV a weight optimized high volume solution



Agenda

MAGNA

- Project Motivation
- Partners & Collaboration
- Development Review
- Prototype Builds
- Vehicle Testing
- Summary



Project Motivation

MAGNA

Project Motivation

MAGNA

U.S. DEPARTMENT OF ENERGY

- Make light weight design affordable for high volume applications
- Reduced vehicle mass for lower fuel consumption
- Utilize commercially available materials and manufacturing processes

Ford Motor Company

MAGNA

Ford

Statistics Q4 / 2014

187.000
Employees

62
Manufacturing Facilities

6,3M
Global Vehicle Sales

35
Global Products

$ 135,8B
(2014 Sales)

Magna Steyr Engineering AG & Co KG

Cosma's Global Presence

Statistics Q4 / 2014

34,000 Employees

16 Countries

61 Manufacturing Facilities

23 Engineering
Product Development
Sales

8 Tooling Facilities

Product Expertise

Body & Chassis

BODY SYSTEMS

BODYSIDE ASSEMBLIES | UNDERBODY ASSEMBLIES | CLOSURE ASSEMBLIES | I/P BEAM ASSEMBLIES | BUMPERS & DOORBEAMS | COMPLETE BODY-IN-WHITE

Cosma produces a complete range of lightweight steel & aluminum body-in-white solutions from small stampings up to fully assembled body-in-white modules.

CHASSIS SYSTEMS

FRAMES | CRADLES & SUBFRAMES | TWIST AXLES | CHASSIS MODULES | CONTROL ARMS

Cosma is a market leader in complete chassis structure assemblies and modules. A variety of innovative lightweight steel & aluminum metalforming processes including hydroforming, rollforming, stamping, casting and bending can be applied to meet specifications.

Magna Steyr Engineering AG & Co KG

Responsibilities

MAGNA

Vehicle Structures Development:

- Body-in-White & Closures
- Chassis & Bumpers

Process Development:

- Cost efficient Manufacturing
- Material, Assembly & Paint Concept

Ford

Vehicle Integration Development:

- Powertrain & Suspension
- Interior & Glazing
- Paint
- Physical Testing

Asia Automotive Lightweight Procurement Symposium 2015 Ch. Juricek, Magna 9

Deliverables

MAGNA

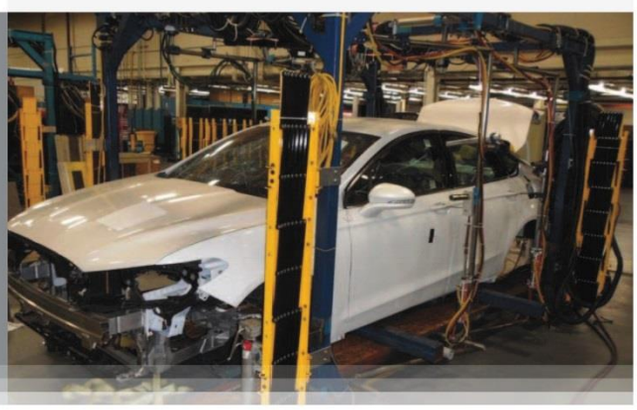
Vehicle Structures Development:

- CAD Design
- CAE Analysis & Validation
- Prototypes (complete vehicle and paint)
- Feasibility High Volume Production
- Manufacturing Footprint

Ford

Vehicle Integration Development:

- Integration of Vehicle Components
- Physical Testing:
  - Safety & Fatigue
  - NVH & Corrosion



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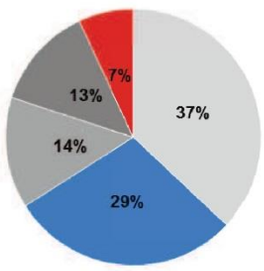
Body-in-White

MAGNA

76,7 kg Mass Reduction from Baseline (23,5%)

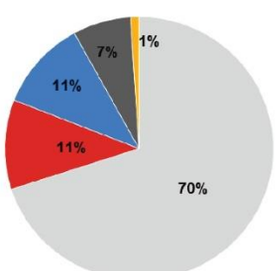


Aluminum Sheet
Aluminum Casting
Steel
Hot Stamping
Aluminum Extrusion

Closures

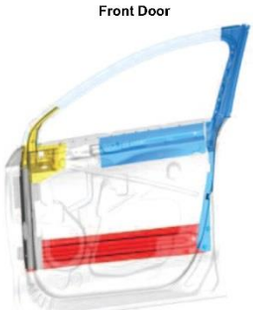
MAGNA

29 kg Mass Reduction from Baseline (29,7%)



Deck Lid

Front Door



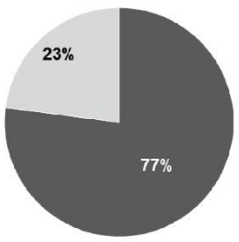
Rear Door

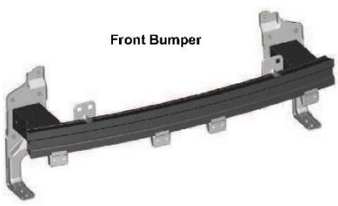
Aluminum Sheet
Aluminum Casting
Steel
Hot Stamping
Aluminum Extrusion
Magnesium Casting

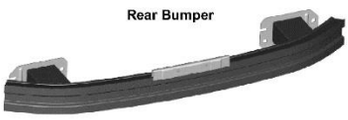
Bumper Structures and Subframes

MAGNA

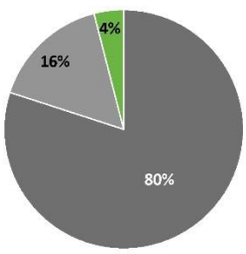
Bumpers - 11,4 kg Mass Reduction from Baseline (30,9%)







Aluminum Casting | Aluminum Extrusion | Aluminum Sheet | Other (bushings … etc.)



Subframes - 27 kg Mass Reduction from Baseline (47,4%)

Powertrain and Suspension

Ford Developments

MAGNA

Powertrain – 73 kg mass reduction

Ford

1.0 liter 3cyl engine

6-speed Automatic Transmission

Suspension – 74 kg mass reduction (37%)

Tall, Narrow Tires 155/70R19

Carbon Fiber Wheels 19"x5"

Thermal Coated Brake Rotors

Coil Springs Hollow Steel & FRP

Stabilizer Bars Hollow Steel

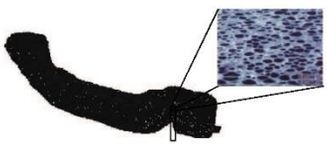
Interior and Glazings

Ford Developments

Interior & Climate Control - 50 kg mass reduction (25%)

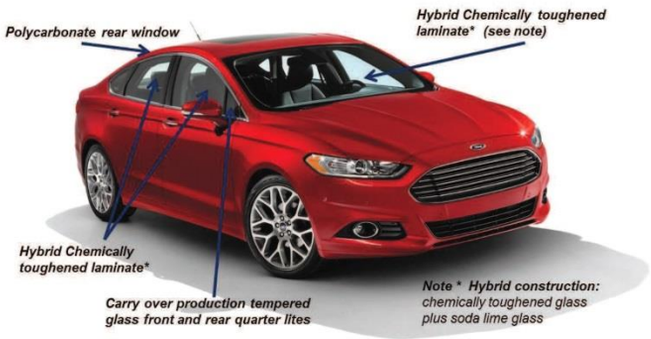
Carbon Fiber
Seat Structures

Carbon Fiber
Instrument Panel Beam



Air Ducts
Foamed Plastics

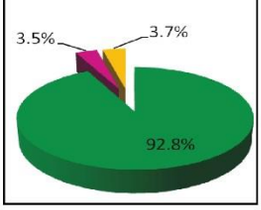
Glazing - 12 kg mass reduction



Weight Review

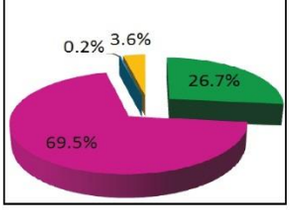
165 kg Mass Reduction (31,9%)
Vehicle Structures

Baseline		
BIW	316.04	kg
Closures	92.17	kg
Chassis	89.07	kg
Bumpers	20.38	kg
Totals	517.66	kg



MMLV Concept		
BIW	231.33	kg
Closures	57.23	kg
Chassis	52.90	kg
Bumpers	11.13	kg
Totals	352.58	kg

31.9% Reduction

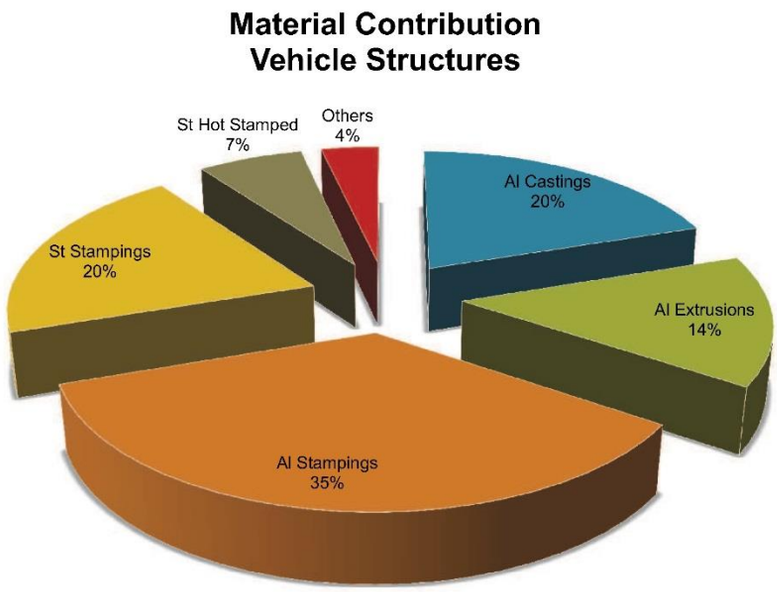


Steel Aluminum Magnesium Other

364 kg Mass Reduction (23,3%)
Complete Vehicle

MMLV	Multi Material Lightweight Vehicles	
Description	2013 Fusion	MMLV Final Design
Body Exterior & Closures [kg]	594	456
Body Interior & Climate Control [kg]	206	161
Chassis [kg]	350	252
Powertrain [kg]	340	267
Electrical [kg]	69	59
Total Vehicle [kg]	1559	1195

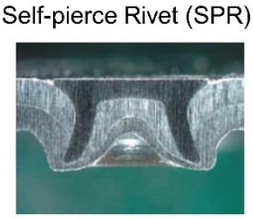
MMLV Material Contribution



165 kg Mass Reduction from Baseline (31,9%)

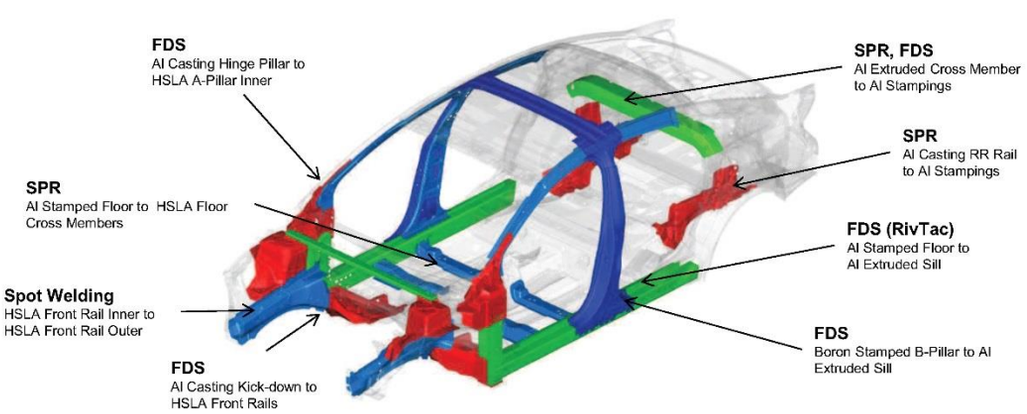
Joining Technologies

Self-pierce Rivet (SPR)



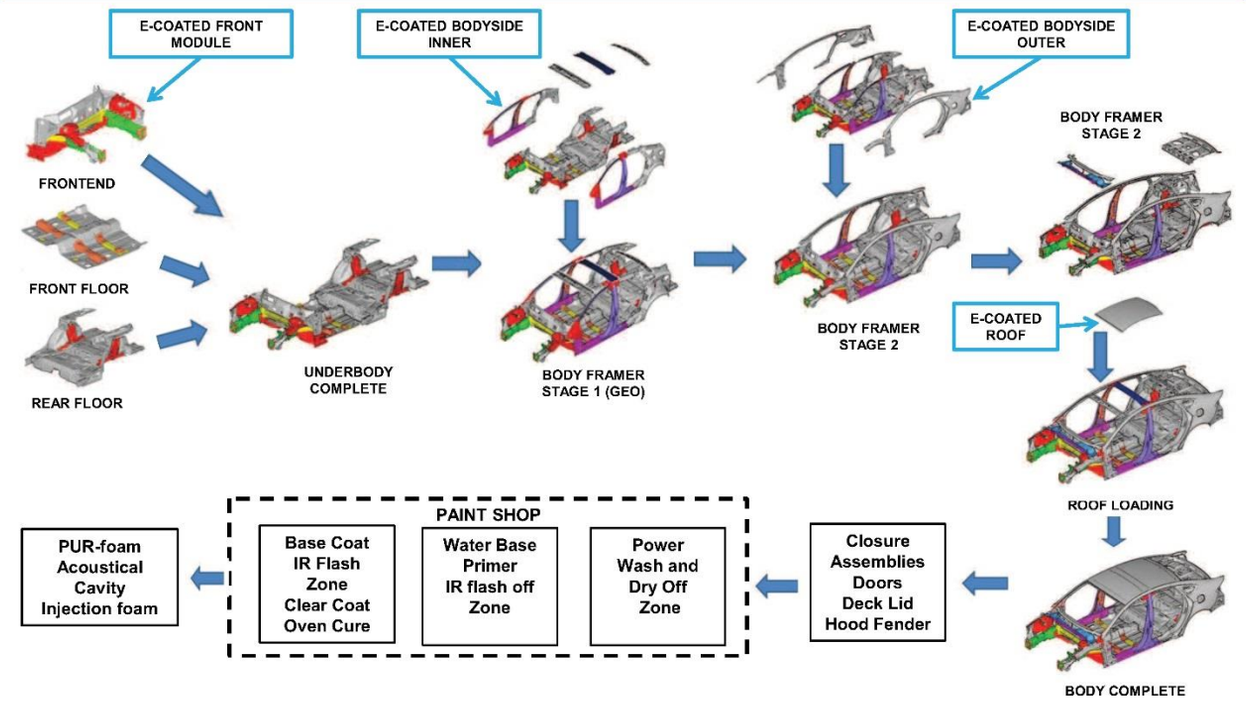
Flow Drill Screw (FDS)

RivTak™ Technology



All BIW joints include a heat (Dow Betamate 73305) adhesive or air cured (Dow Betamate 73326/73327) adhesive for improved durability and to create a barrier to prevent galvanic corrosion.

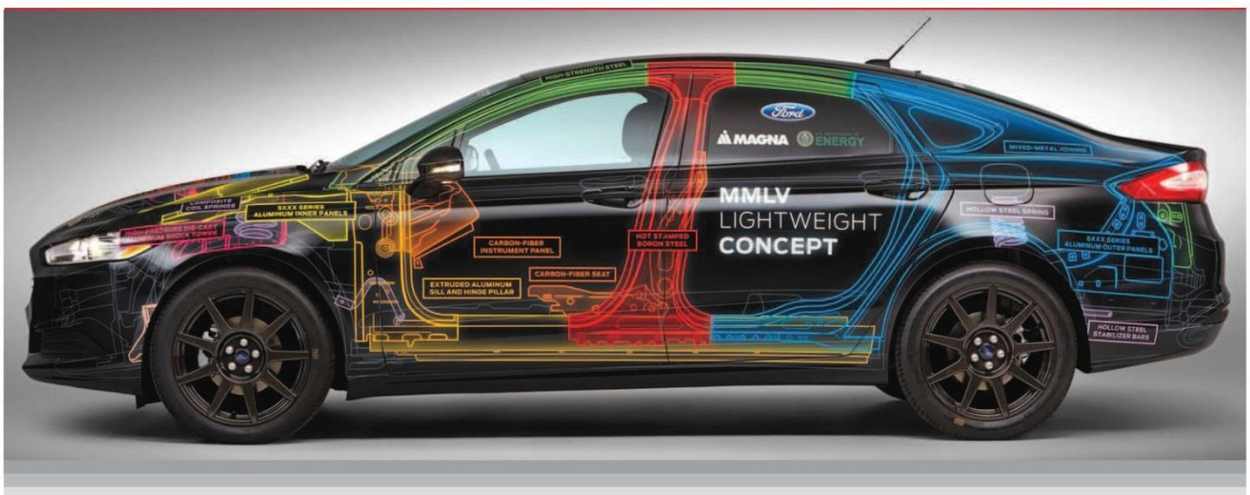
Assembly Process & Corrosion Strategy



The assembly/corrosion strategy allows for a multi-material BIW to be run thru current OEM paint body shops creating the possibility to implement into existing OEM facilities.

Prototypes & Testing

Environmental Benefit



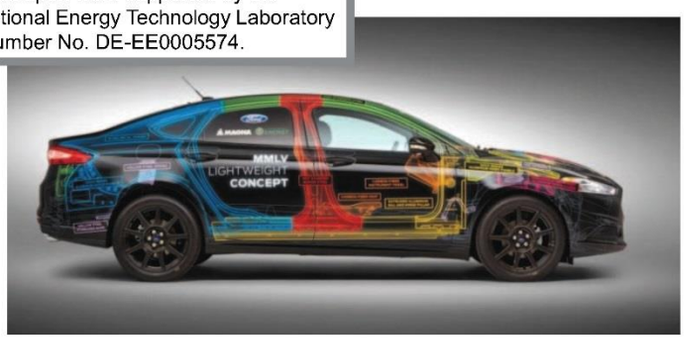
Environmental benefits of the Multi-Material Lightweight Vehicle Concept vs. the 2013 Ford Fusion built and driven for 250.000 km in North America:

- 16% reduction in CO_2 emissions
- 16% reduction in total primary energy (LCA)
  - fuel savings, less burden of production and end of life phases

Acknowledgement

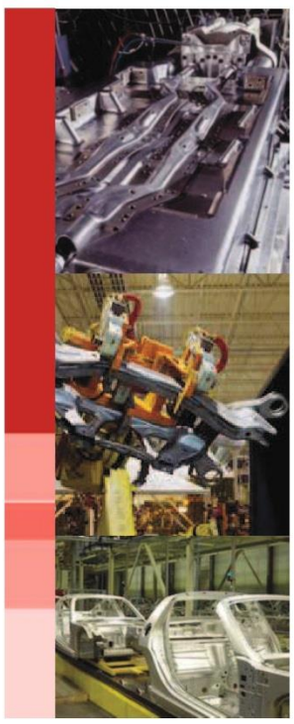
Thanks to the DOE, Ford and our Magna colleagues

This material is based upon work supported by the Department of Energy National Energy Technology Laboratory under Award Number No. DE-EE0005574.



Summary

- Department of Energy has got validated results showing affordable lightweight solutions.
- Based on available material and technologies a concept for high volume applications has been developed.
- Reductions of CO_2 emissions and energy consumption have been validated over vehicle lifetime.
- Early stage development collaboration of legislation, OEM and supplier leads to sustainable solutions.



We Welcome You To Our Next Event

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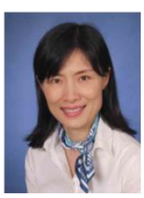

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