

AluMag®

Europe ■ India ■ Americas ■ Asia
THE MARKET DEVELOPER

● AluMag® Worldwide



AluMag® penetrates new markets - initiate business growth - localize & develop supply chains



Market Research

- Global Al / Mg Foundry, Forging Extrusion Databases for M&A, Supplier / Customer Localization or Competitor Analysis, ...
- Automotive & Industrial Application Research, Material & Process Trend Analyses
- Lightweight Technology Outlook in Aluminum, Carbon, Steel Composites & Magnesium
- Customized Market Intelligence
- European Automotive Forecast



Market Development

- Access & Build-Up of new Markets in Automotive, Truck [Tractor], Trailer & Bus Industries Mainly
- Analysis, Development & Execution of Market Trade-Offs & Opportunities of New Technologies
- Manage new Product Launches
- Accelerate Market Penetration & Establish a Sales Force
- Interim Sales Management



Roadshows / Events

- Organization of Technical, Commercial Roadshows & Events Globally
- Host In-House Events & Presentation Globally
- Common Technology Booth at Leading Exhibitions
- Supply-Chain Automotive Lightweight Symposium [SCALS] In EUROPE, ASIA & N.AMERICA



Strategic Localization

- Green & Brown Field Localization, from Site Selection to Foundation & Ramp-Up
- Warehousing, Distribution, Supplier & Tie-Up Localization
- Foreign Market Business Cases & their Realization
- M&A Target Research
- Interim CTO / COO & Plant Manager

AluMag® is “The Market Developer” that successfully penetrates new markets, creates business and localize leading suppliers for your company. AluMag® access any promising markets, open doors for your business in emerging and booming regions, markets, applications, materials, processes or products. AluMag® makes you successful - worldwide!

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MARKET RESEARCH MARKET DEVELOPMENT ROADSHOWS / EVENTS STRATEGIC LOCALIZATION

ABOUT ALUMAG®

AluMag® - established year 1994 - is "The Market Developer" with nine team members, that successfully penetrates new markets, creates business, localize leading supplier for your company. AluMag® access any promising markets and open doors for your business - in emerging and booming region, market, application, material, process or product. AluMag® is mainly active around the automotive world offering the following services:

- Market Research
- Roadshows & Tech-Events
- Market Development
- Strategic Localization

With the four business activities, AluMag® is capable of supporting any company in its quest to enter new markets or segments, no matter its current position.

AluMag® provide market analyses to test market potential, arranges roadshows and events to showcase client`s products, offer sales and supply chain support. Finally, AluMag® supports in the buildup of a supply chain abroad.

With AluMag® you are in good hands. AluMag® has extensive knowledge and contacts as well as excellent references! **AluMag® makes you successful - worldwide!**

Pic: AluMag®

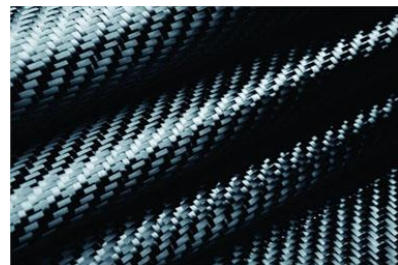


AluMag® In Shanghai, China

ALUMAG[®] AUTOMOTIVE APPLICATION DATABASE

Detailed automotive application information by car body variants [Supplier – Material – Process - Weight]

Material Focus:



Carbon / Composites



Aluminum



Magnesium



Steel

Application Focus Areas:

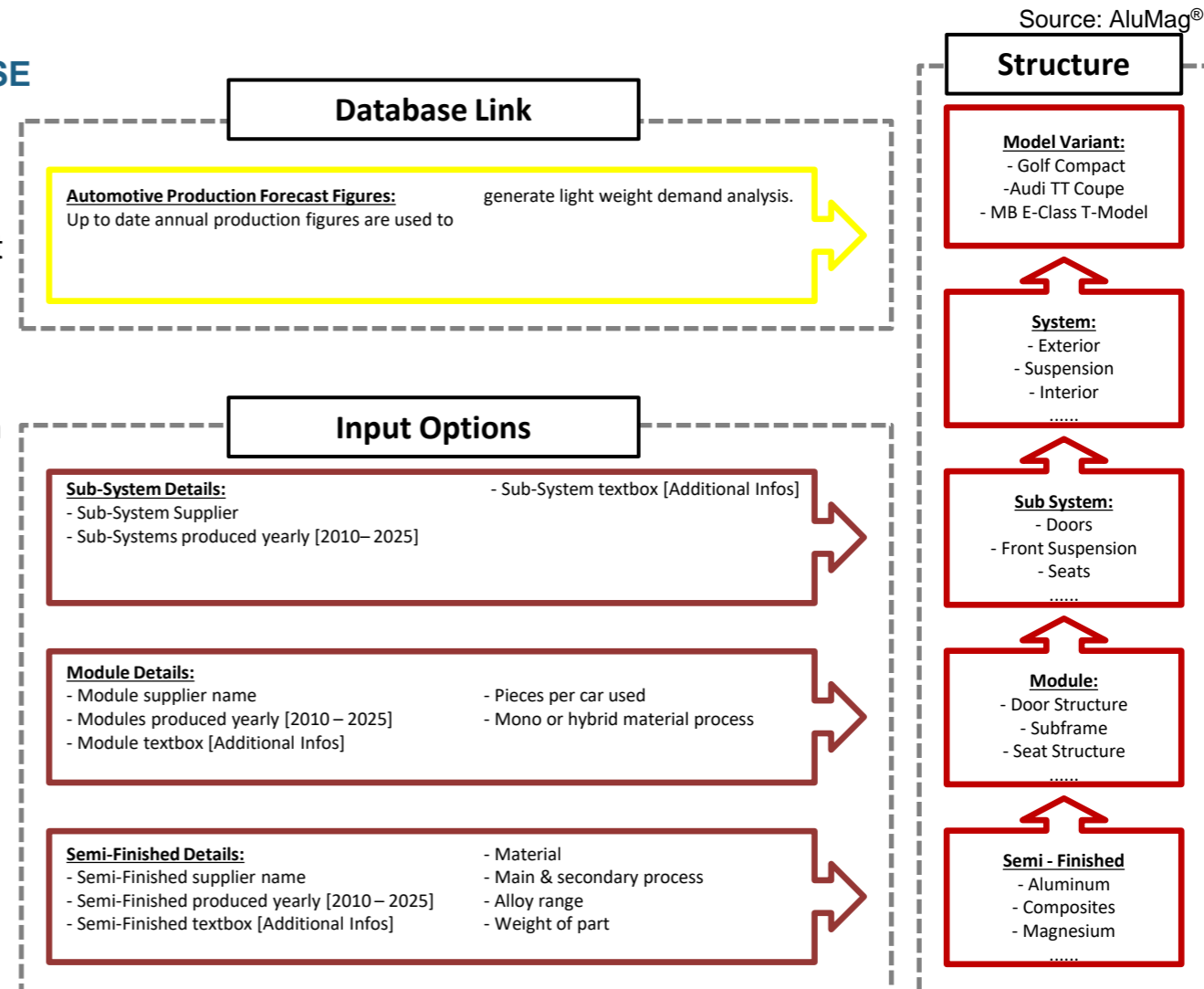
- **Exterior:** hoods & bonnets, lids & tailgates, roof railings, door inner & outer structures, bumper beams, sunroofs ...
- **Suspension / Steering / Braking:** suspension link-arms, knuckles/wheel carrier, sub frames/cradles/cross members, calipers,
- **BIW:** front & rear longitudinal carriers, suspension domes, A- / B- / C- pillars, cross members, side rocker battery housings, ...
- **Interior:** IP / cross car beams, passenger airbag housings, cargo management systems, seat structures, ...
- **Automatic driving:** housings & brackets for LiDAR, laser, radar; camera, ultrasonic, CUs and domain server [computing]
- **Drive train electrification:** battery trays & covers, housings & brackets for inverters, converters, e-motors, transmissions, ...

ALUMAG® AUTOMOTIVE APPLICATION DATABASE

The Automotive Application Database is connected with AluMag® in-house automotive production forecast [could be integrated in LMC, IHS or others too]. Accurate material demand analyses by model variant are generated by multiplying an application weight with yearly model variant production.

The direct connection with our automotive production forecast makes it possible to generate several data enquires:

- Demand by material [aluminum, magnesium, steel, composite, carbon]
- Demand by core processes [cast, extruded, rolled, forged, ...]
- Demand by OEM
- Supplier market shares
- Demand by application
-



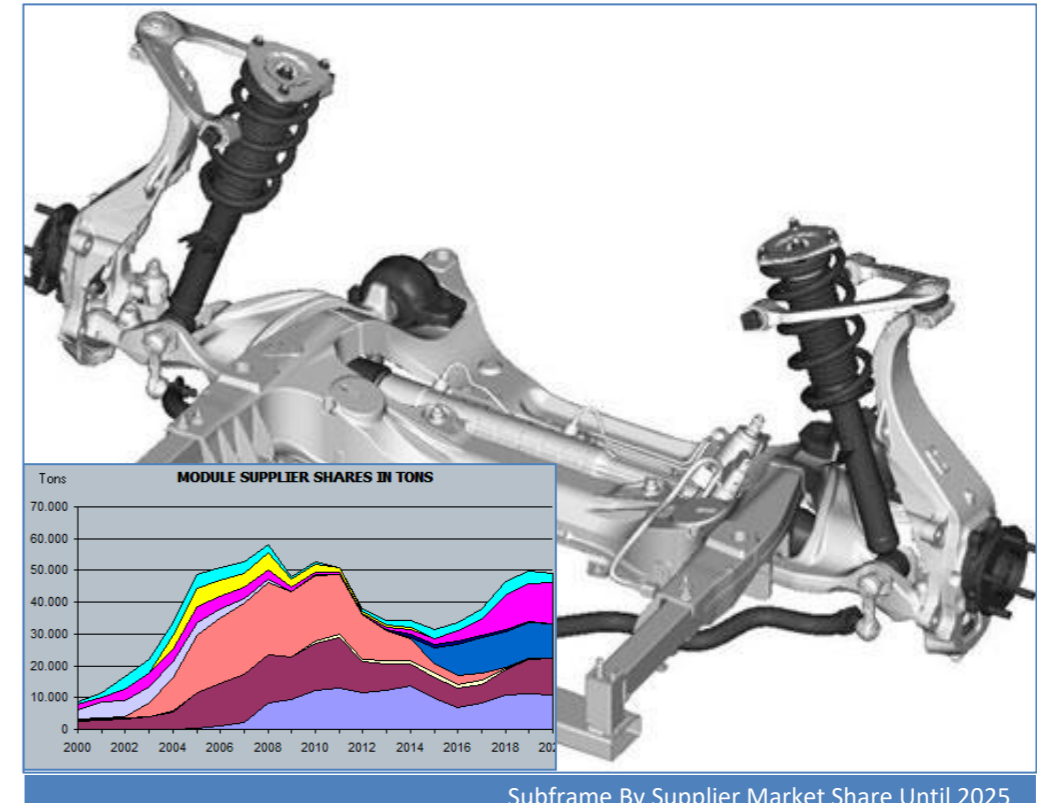
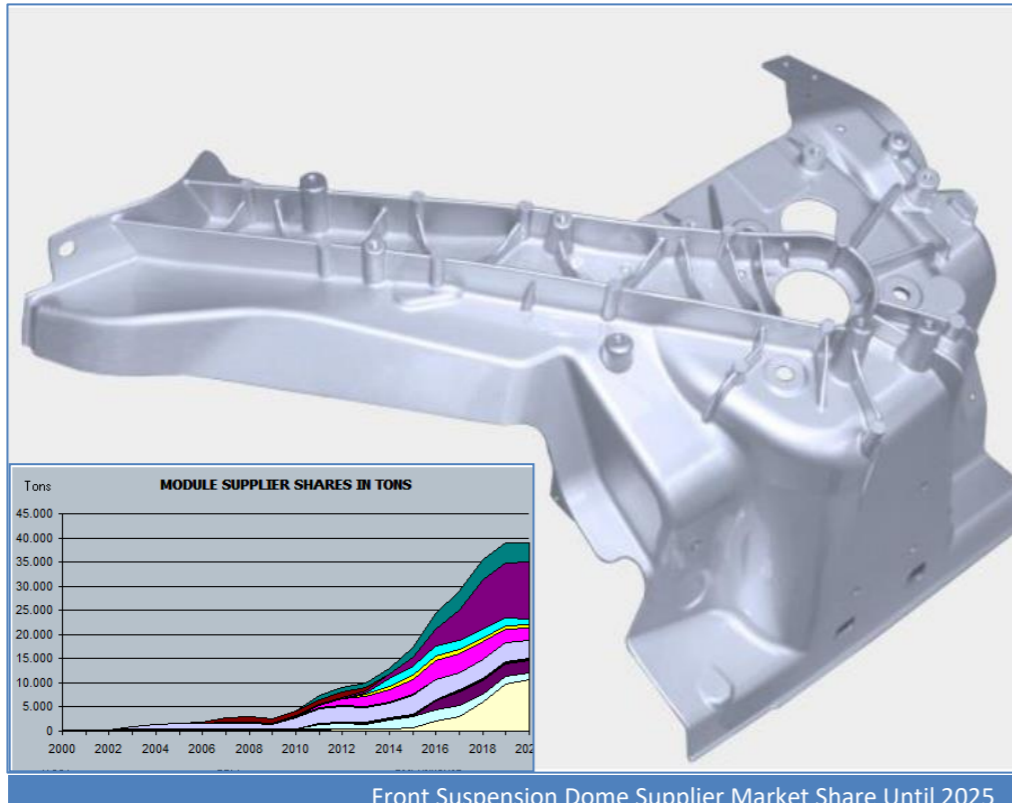
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Source: AluMag[®]

Source: AluMag[®]

ALUMAG[®] AUTOMOTIVE APPLICATION DATABASE - SUPPLIER, PROCESS AND VOLUME FROM YEAR 2010 TO 2025



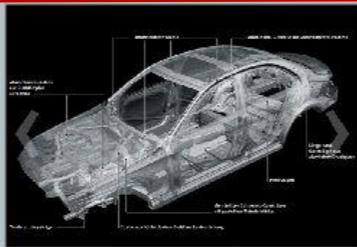
AluMag[®] supplies detailed material and process focused demand analyses from 2010 to 2025 [partly 2030] for any region, globally.

Source: AluMag®

ALUMAG® AUTOMOTIVE APPLICATION DATABASE - MB C-CLASS W205 SEDAN SUB-SYSTEM ANALYSIS

OPEN MENU PICK A BODYVARIANT: MB C-CLASS / W205 - W205 / MRA - SEDAN / LIMOUSINE - LIMOUSINE

SUB-SYSTEM INFORMATION

SYSTEM:	ALREADY EXISTING SYSTEMS FOR THIS BODYVARIANT:			SUBSYSTEM PENETRATION:			
SUBSYSTEM:	SYSTEM	SUBSYSTEM	MODULE	YEAR	PEN	TOTAL	UNITS
Body In White	Axes	Rear Axle	Rear Axle / Wheel- Hubs / -	2010	100,00%		
Body in white - Main Frame / Space Frame	Axes	Rear Axle	Rear Axle / Wheel- Hubs / -	2011	100,00%		
SUBSYSTEM TYPE:	Axes	Rear Axle	Rear Axle / Wishbones/ Link	2012	100,00%		
No Select - No Select	Body In White	Main Frame / Space Frame	Cross Member	2013	100,00%		
SUBSYSTEM SUPPLIER:	Body In White	Main Frame / Space Frame	Cross Member	2014	100,00%	261.284	261.284
MB INHOUSE	Body In White	Main Frame / Space Frame	Frame / Other Parts	2015	100,00%	354.510	354.510
SUBSYSTEM PICTURE:	Body In White	Main Frame / Space Frame	Front Suspension Domes	2016	100,00%	377.784	377.784
	Body In White	Main Frame / Space Frame	Front Suspension Domes	2017	100,00%	385.339	385.339
SUBSYSTEM MEMO:	Body In White	Main Frame / Space Frame	Front Suspension Domes	2018	100,00%	377.632	377.632
Dec 2015: The GLC also has aluminium suspension domes in the front. Source: mercedes.	SELECT BODY VARIANTS			2019	100,00%	370.080	370.080
Nov 2013: The MB C-Class W205 consist of 48 percent aluminium (Cast and Sheet). 9 parts are made out of aluminium cast. Spring strut domes, longitudinal and crossmebers are some of the parts in cast.	MB C-CLASS - W205 - CABRIOLET - W205 / MRA - C-CLASS CABRIOLET			2020	100,00%	362.679	362.679
Nov 2011: All Daimler cast Aluminium Structure parts will	MB C-CLASS - W205 - COUPE - W205 / MRA - C-CLASS COUPE			2021	100,00%	156.271	156.271
	MB C-CLASS - W205 - VAN - W205 / MRA - CLR			2022	100,00%		
	MB C-CLASS - W205 - SEDAN / LIMOUSINE - W205 / MRA - LIMOUSINE			2023	100,00%		
	MB C-CLASS - W205 - SUV - W205 / MRA - GLC COUPE			2024	100,00%		
	MB C-CLASS - W205 - STATION - W205 / MRA - T-MODEL			2025	100,00%		
	MB C-CLASS - W205 - SUV - W205 / MRA - GLC						

MB C-Class W205 sedan front suspension domes analysis on next page

Light weight applications [modules] inserted for the MB C-Class W205 sedan.

Yearly production in units of the MB C-Class W205 sedan

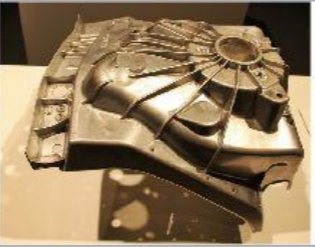
Body variants allocated to the inserted application

Source: AluMag®

ALUMAG® AUTOMOTIVE APPLICATION DATABASE - MB C-CLASS W205 SEDAN MODULE ANALYSIS

MB C-Class W205
 sedan front
 suspension domes

MODULE INFORMATION

MODULE: Main Frame / Space Frame - Front Suspension Domes	MODULE PICTURE: 	MODULE MEMO: Oct 2014: NEMAK is going to be the 3rd MB C-Class Suspension dome supplier in Germany, beside DGS and MB inhouse. NEMAK is waitig for their MB approval Source: NEMAK April 2012. Brabant will supply the NG of the C, E & S-class with suspension domes. Source: Supplier sources. June 2010: The front suspension domes for the MB C-Class B205 will be supplied by Brabant in alu cast.
Module TYPE: No Select - No Select	STATUS: Series	
PARTS: 2	MATERIAL HYBRID:	PROCESS HYBRID:
MODULE SUPPLIER: NEMAK	SUB MODULE SUPPLIER: INPUT SUB MODULE SUPPLIER	

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
PENETRATION - %	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%	40,00%

SEMI-FINISHED PART INFORMATION

MATERIAL: Aluminium	ALLOY RANGE: Al-Casting	Confirmed weight!															
MAIN PROCESS: Aluminium / AL Casting	WEIGHT: 3,16	2010	2011	2012	2013	2014	2015	2016	2017	2018							
SECOND PROCESS: AL Casting / HPDC	SUPPLIER: NEMAK	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%							
MATERIAL:	ALLOY RANGE:																
MAIN PROCESS:	WEIGHT: 0,00	2010	2011	2012	2013	2014	2015	2016	2017	2018							
SECOND PROCESS:	SUPPLIER: OTHERS OR N/K	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%							

Supplier [Nemak] share of total C-Class Production

Material and process information about MB C-Class W205 sedan front suspension domes

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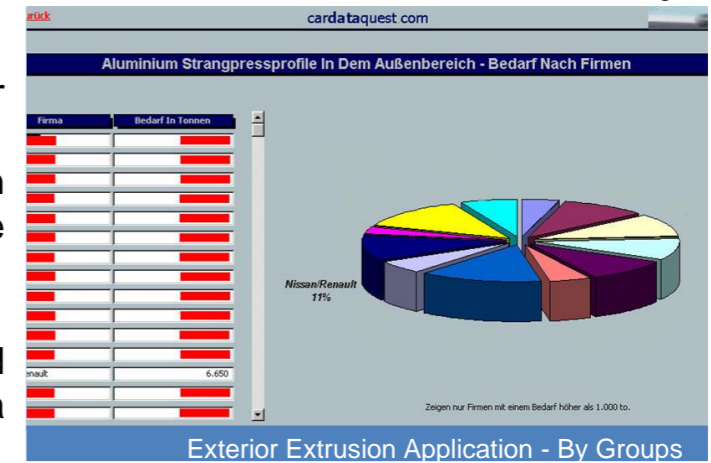
COMPREHENSIVE - GLOBAL - IN DEPTH - CUSTOMIZED

Since 1994, AluMag® maintains and executes single [exclusive] and multi client studies for component and system suppliers.

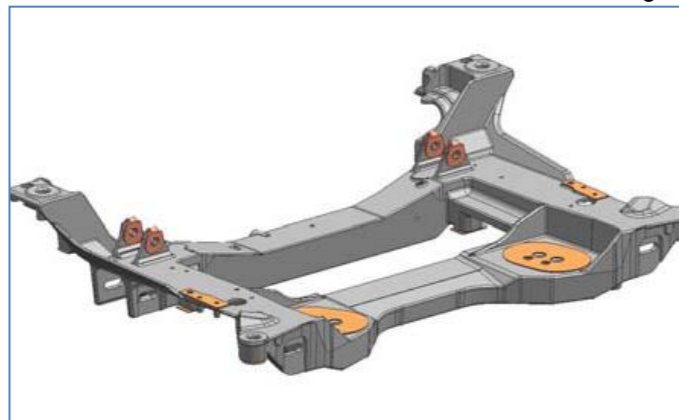
We have more than 160 automotive suppliers as references. AluMag® operates mainly in Europe, North and South America, India, South Korea, China and Japan - giving us the ability to perform worldwide analyses of high quality for our customers.

In the course of our daily research AluMag® is in steady contact with OEMs, suppliers and consultants all over the world. A strong research in international online and offline media confirm the convincing quality of the AluMag® market research.

Source: AluMag®



Source: AluMag®



Aluminum Hybrid Processed Subframe

Your Benefits

- Learn about your potential clients
- Obtain and inside view of the market
- Identify opportunities and threats
- Minimize risk and optimize profits
- Position your company successfully

Source: AluMag®



AUDI Arne LAKEIT and Dr. Klaus KOGLIN

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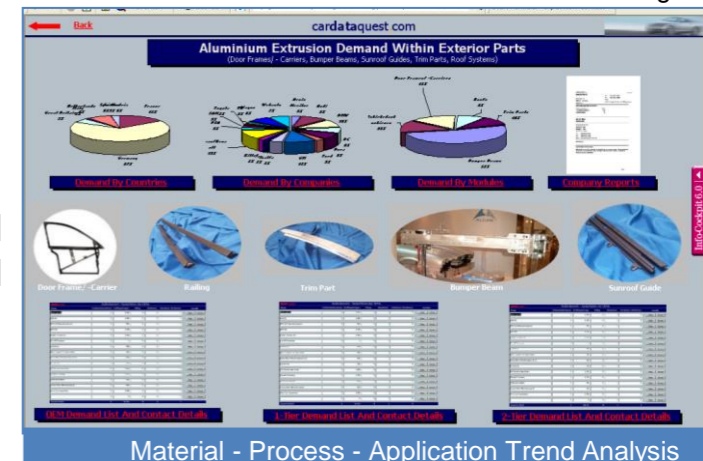
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AUTOMOTIVE AND LIGHT WEIGHTING MARKET INTELLIGENCE

To perform in the business and reach or maintain a leading position over your competition, it is essential to know your market and plan ahead.

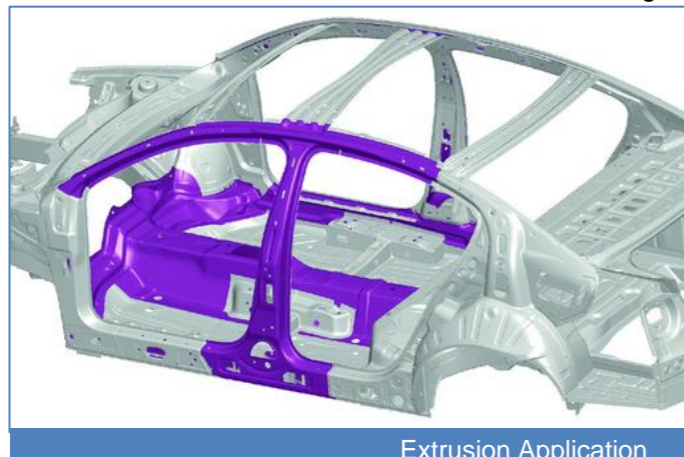
As your provider of automotive research and forecasting studies, AluMag® offer you and your business, the market intelligence you need to realize the best strategic decisions and makes you successful - worldwide!

Source: AluMag®



Material - Process - Application Trend Analysis

Source: AluMag®

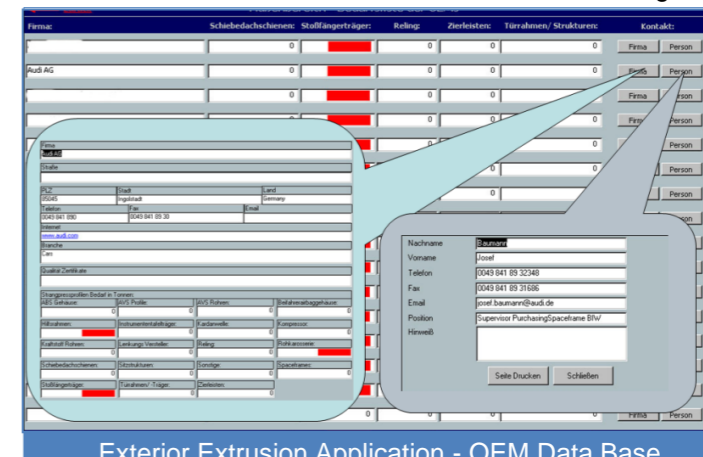


Extrusion Application

Main Activities

- European automotive production forecasting incl. transplant
- Automotive application, materials & process analyses
- Industrial application research
- Supplier and customer databases
- M&A Target Analyses

Source: AluMag®



Exterior Extrusion Application - OEM Data Base

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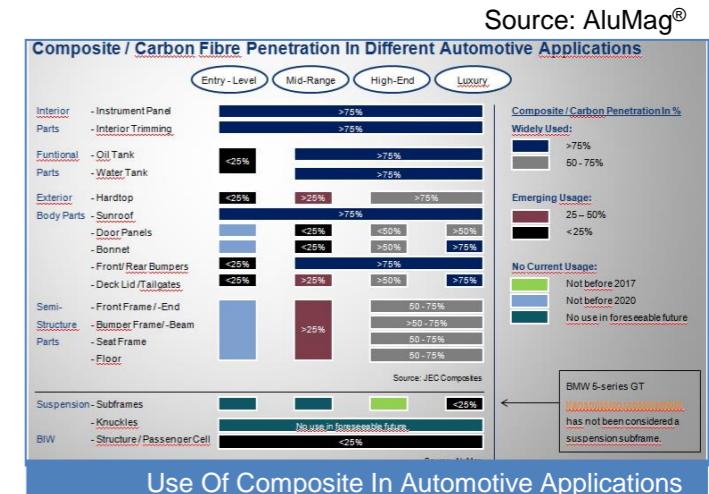
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CASE STUDY: CARBON COMPOSITE ANALYSIS - SAMPLE I

AluMag® has analyzed the composite / carbon fiber threat against cast aluminum within suspension and BIW applications.

The main goal was to provide the client [European aluminum foundry] with an application overview outlining the composite / carbon fiber threat by means of a timeline “*What to expect when*”.

The timeline was based on existing AluMag® market information as well as on 20 interviews with industry experts representing OEMs, carbon fiber producers and tool makers.



Source: AluMag®



Mercedes SLK R172 Roll Over Protection

Source: Lamborghini



Lamborghini Aventador Passenger Cell

Source: AluMag®



Bentley Mulsanne Spare Wheel Box

CASE STUDY: CARBON COMPOSITE ANALYSIS - SAMPLE II

For a Chinese producer of electronic equipment AluMag® executed a global snapshot study of the automotive CFRP market.

CFRP Demand & Market Shares

AluMag® has analyzed the consumption of CFRP in automotive BIW applications worldwide. Furthermore supplier market shares for each application group were determined.

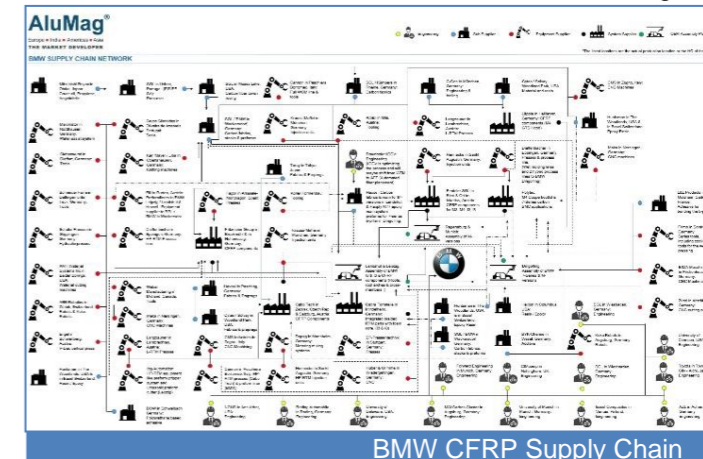
CFRP Supply Chain

A comprehensive carbon fiber supply chain chart were researched for six premium OEMs. In total 110 companies were detected as being part of the six OEMs carbon fiber supply chain. For each company a qualified contact is listed

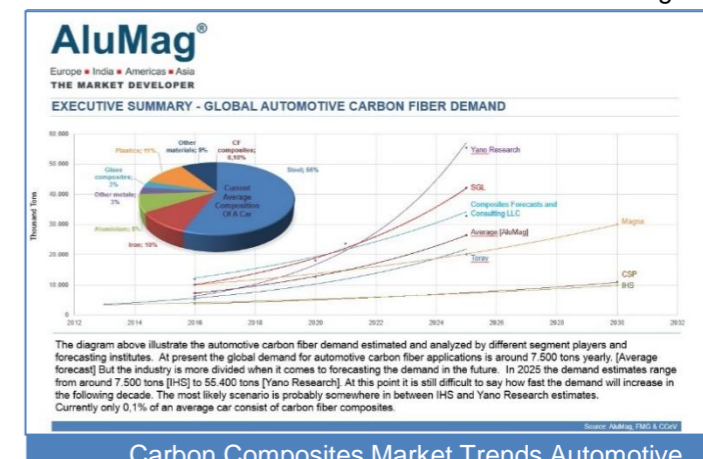
CFRP Application Technology Overview

As part of the analysis several CFRP BIW applications have been thoroughly described in regards to material, process steps, equipment and assembly.

Source: AluMag®



Source: AluMag®



Source: AluMag®

DATABASE - SAMPLE: CUSTOMER ALUMINUM EXTRUSION DEMAND VOLUME AND INDUSTRIES

AluMag® has created a CRM system with several 10,000 of automotive contacts active within the light weight materials industry. AluMag® owns the market knowledge and experience to locate new customers for your business. Regardless of region, market, application, material, process or product.

Aluminum Extrusion Customer Demand Volume Database:

- 1,350 European companies detected within the Automotive / Truck Trailer Segment
- 2,140 European companies detected within industrial segments
- Total yearly aluminum extrusion demand: 800,000 tons

Database Content:

- Full company address
- Purchase contact details incl. direct e-mail & phone
- Demand by company
- Demand allocated by EAA segment

Company:	City:	Country:	Total Demand:	Contact:
A.B.T. GmbH Aluminium Bearbeitung	Nidda-Borsdorf	Germany	200	Company Person
ACM Fahrzeugtechnik GmbH	Rottenburg/ Neckar	Germany	100	Company Person
ACS - Advanced Comfort Systems	Elancourt	France	450	Company Person
ACS - Advanced Comfort Systems	Bressuire Cedex	France	3	Company Person
Adam Opel AG	Rüsselsheim	Germany	6.180	Company Person
AGC Glass Europe - Central Office		France	1	Company Person
Aixam-Mega	Aix-lex-Bains Cedex	France	1.875	Company Person

Source: AluMag®

DATABASE - SAMPLE: CUSTOMER / SUPPLIER / M&A TARGET FOUNDRY & FORGING PLANT FACILITIES

Global Permanent Mould Foundries

- GDC, LPDC, HPDC, Hollow cast
- For HPDC >800 tons clamping force
- 450+ groups with 1050+ casting / foundries / plants

Analyzed criteria for each plant:

[Selected by the client]

- Full plant address
- Contact person
- Clamping force range [for HPDC]
- Number of casting cells / machines
- In-house engineering, tooling, CNC, heat treatment, availability
- Certifications
- Core references and customers
- Automotive applications in production

Kind of Location	Location	State	Aluminium Share [%]	Magnesium Share [%]	Force From [T]	Force To [T]	No. HPDC ≤ 400 [T]	No. HPDC ≤ 1000 [T]	No. HPDC ≤ 1500 [T]	No. HPDC ≤ 2000 [T]	No. HPDC ≤ 2500 [T]	No. HPDC > 3000 [T]	Total No. HPDC	CNC	Tool Shop	Casting Processes
Plant	USA	CA	100	0	125	925							8	Yes	No	HPDC
HQ & Plant	USA	CA	100	0	400	900	1	7	0	0	0	0	8	Yes	No	HPDC, Vacuum
Plant	USA	TN	100	0	600	1.600	0	9	4	1	0	0	14	Yes	No	HPDC
Plant	USA	MN	100	0	400	1.000	0	9	0	0	0	0	9	Yes	No	HPDC, Squeeze Castings
Plant	USA	NC	100	0	1.000	1.000	0	3	0	0	0	0	3	Yes	Yes	HPDC
Plant	USA	MN	100	0	250	1.200	2	11	2	0	0	0	15	Yes	No	HPDC
HQ & Plant	USA	MN	100	0	250	1.600							15	Yes	No	HPDC, SC, LPDC, Squeeze cast, GD
HQ & Plant	USA	IN	100	0	250	1.200	3		15	0	0	0	18	Yes	Yes	HPDC, Vacuum
HQ & Plant	USA	WI	100	0	400	1.600				17	0	0	17	Yes	Yes	HPDC, Squeeze Casting
Plant	USA	WI	100	0	400	1.600				10	0	0	10	Yes	Yes	HPDC, Squeeze Casting
HQ & Plant	USA	IN	100	0	250	1.650	15	3	2	1	0	0	21	Yes	No	HPDC
Plant	MEX	Querétaro	100	0										Yes	No	HPDC
HQ & Plant	USA	WI	100	0	700	2.500	0		25		7	0	32	Yes	Yes	HPDC, Low Pressure
Plant	USA	MI	0	100	800	3.500	0		6			9	15	Yes	No	HPDC
Plant	MEX	Coahuila	100	0	800	1.600	0		1	3	0	0	4	Yes	No	HPDC
HQ & Plant	CAN	ON	0	100	420	4.400	0		23			17	40	Yes	No	HPDC
Plant	USA	OH	100	0	1.250	1.800							15	No	No	HPDC
Plant	USA	WI	100	0	400	3.500							26	Yes	No	HPDC
Plant	USA	WI	100	0	1.600	3.500							21	Yes	No	HPDC
Plant	USA	KY	100	0	400	3.500							21	Yes	No	HPDC
Plant	USA	AL	100	0	1.500	2.500	0	0	0			15	15	Yes	Yes	HPDC

CASE STUDY: EU28 TOP 15 GDC & LPDC FOUNDRIES INCL. APPLICATIONS 2020

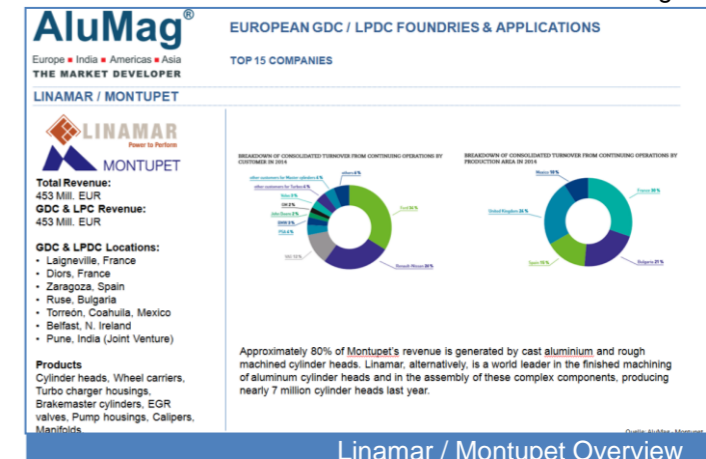
Base and background

- Within an overseeing period of time, client will run-out of orders for exciting process lines in the location XXX with casting cells in line and round tables
- Client will get an entire overview about the market players and applications
- Cylinder heads are not really in the clients focus. But, GDC & LPDC machines which are processing Cylinder heads today, could be used in future for any other products too. Means, this capacity / company will be looked at too
- The research will consider entire Europe
- The machines / area, which will run out of production, could be use with:
 - existing machines for new products
 - refurbished / modified existing machines for new products
 - new machines for new products

Scope:

- GDC and LPDC including hollow cast and counter pressure in Europe 28
- Market player and their products / applications
- Proposed application by AluMag®

Source: AluMag®



Source: AluMag®



CASE STUDY: HPDC AUTOMOTIVE ALUMINUM APPLICATIONS IN NAFTA Short Scope Extraction

The client is a Japan based aluminum processing company and a leader in the industry. The client would like to get a sustainable understanding and benchmark of the global industry leaders like; Nemak which specializes in the production of cast aluminum powertrain components such as cylinder heads, engine blocks and transmission parts for light vehicles. Since the cast structural “body in white” [BIW] will be applied for areas where strong part integration is feasible, Nemak is going to target new components / areas like thin-wall, ductile and weldable castings. This is a target market for the client too. The client has requested support from AluMag® to execute the following services and analyze:

- Leading cast aluminum structures supplier for body and chassis parts
- Selected car manufacturer in NA with their in-house casting, future strategy and make or buy decision as well as decision maker
- Body and chassis segment NA, strategy, locations, expansions, supplier selection process and risks at selected car manufacturers
-

Source: AluMag®

MODEL INFO:
 Platform: F15
 Production Plant: Spartanburg, SC
 Average Yearly Prod: 140,000 units

CAST ALUMINIUM BIW & SUB-FRAME APPLICATIONS:
 According to supplier sources Cosma supplies 5 BIW applications for the BMW X5. So far we have not been able to confirm this information from a second source.

- Front Suspension Domes
- HPDC Aluminum
- Cosma

OTHER APPLICATIONS OF INTEREST:
 • Magnesium Cross Car Beam

BMW X5 & X6 Light Weighting by Material Suppliers

Source: AluMag®

Being inside the OEM's supplier parks is not mandatory but an advantage in terms of transportation costs and logistics.

Cosma with facilities in Indiana and Michigan is supplying the Cadillac ATS with suspension domes. The ATS is being produced in Lansing, MI which is located about 100 KM [60 miles] from Cosma facility in Battle Creek, MI.

Bocar, being the supplier of several HPDC structural parts for the MB C-Class W205, has no foundry in USA but is supplying the Mercedes plant in Alabama from their Mexican facilities.

M. Honsel is supplier of the front and rear suspension subframes for the Cadillac CT6 being produced in Detroit, MI. M. Honsel foundry is located in Mexico.

Localization of Structural HPDC Facilities in NA

CASE STUDY: GLOBAL CAST AND FORGED ALLOY WHEEL MARKET

Summary Extraction

Worldwide the market for OE aluminum wheels is expected to grow with 0,91% in the period 2014-2015 within light weight vehicles. From 44% in 2014 to 45% in 2015. In the period 2014-2029 a growth rate of 7% points is expected which will bring the worldwide penetration of OE aluminum wheels up to 51% in 2029. The Highest growth rates in the period 2014-2029 are expected in China [14% points], Japan [13,5% points] and Central Europe [15% points]. Cast wheels will remain the preferred alloy wheel for light weight vehicles while the penetration of forged wheels is expected to grow moderate over the coming years. Today forged wheels are primarily used on high end vehicles and sports cars, but the booming electric vehicle segment Could boost the penetration of forging wheels in the near future. On the other hand new hybrid wheels to be launched by Maxion / Thyssen could become a threat to forging wheels manufacturers.

The penetration of forged wheels within commercial vehicles [Medium – heavy duty trucks, trailers and buses] is 13% on average in the analyzed regions. Again Nafta is the market with the highest penetration rate of forged wheels with 40%. Trailers and trucks in Nafta has in general more axles compared to other regions,..

Source: AluMag®

AluMag® TRIAD GENERIC RIM MASS MARKET OVERVIEW AND KEY PLAYERS
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SUMMARY - FORGING COMPANIES - KEY PLAYERS

TOP 10 LEADING WHEEL FORGING COMPANIES BY CAPACITY

COMPANY	COUNTRY OF ORIGIN	WHEELS TYPE	MIO CAP.
Alcoa	USA	Forge	9.5
Liaoning Zhongxiang Alu	China	Forge	5.0
Dicastal	China	Forge	2.6
Otto Fuchs	Germany	Forge	2.0
Lian Yunzhang Gemov	China	Forge	2.0
SuperAlloy Industrial Co	China	Forge	1.4
Accuride	USA	Forge	1.1
Shandong Zheneu Forging	China	Forge	0.5
Alu	South Korea	Forge	0.5
AluForce	South Korea	Forge	0.5

The combined capacity of the top 10 forging wheels manufacturers is 24.9 mio units yearly while the OEM demand is only at 15.7 mio units in the analysed region (Triad). A considerable number of wheels (9.2 mio units) are therefore being sold through aftermarket channels, sold outside the triad region or is simply free capacity.

Global Cast Alloy Wheel Market Summary & Outlook

Source: AluMag®

AluMag® TRIAD GENERIC RIM MASS MARKET OVERVIEW AND KEY PLAYERS
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SUMMARY - CAST COMPANIES - KEY PLAYERS

TOP 12 LEADING WHEEL CAST COMPANIES BY CAPACITY

COMPANY	COUNTRY OF ORIGIN	WHEELS TYPE	MIO CAP.
Dicastal	China	Alu Cast	32.4
ENKEI	Japan	Alu Cast	25.0
Borbet	Germany	Alu Cast	20.0
Ronal	Switzerland	Alu Cast	19.2
Wanfeng	China	Alu Cast	18.0
Maxion	USA	Alu Cast	14.8
Lizhong	China	Alu Cast	13.6
Superior	USA	Alu Cast	13.2
ZNA	China	Alu Cast	12.0
Prime	USA	Alu Cast	11.7
Hands	South Korea	Alu Cast	11.0
Sheng Wang	China	Alu Cast	11.0

The combined capacity of the top 12 cast wheel companies far exceed the OEM demand in the analysed Triad region. Even though the total Alu cast wheels capacity in the analysed region is much higher as the list only consider the protagonist. In China alone the total output of aluminium wheels was 148 mio units in 2013 expecting to rise to 238 mio units in 2018. The demand primarily comes from the aftermarket and regions outside the analysed triad.

Global Forged Alloy Wheel Market Summary/Outlook

CASE STUDY: GLOBAL NON FERRO CASTING INDUSTRY ANALYSIS

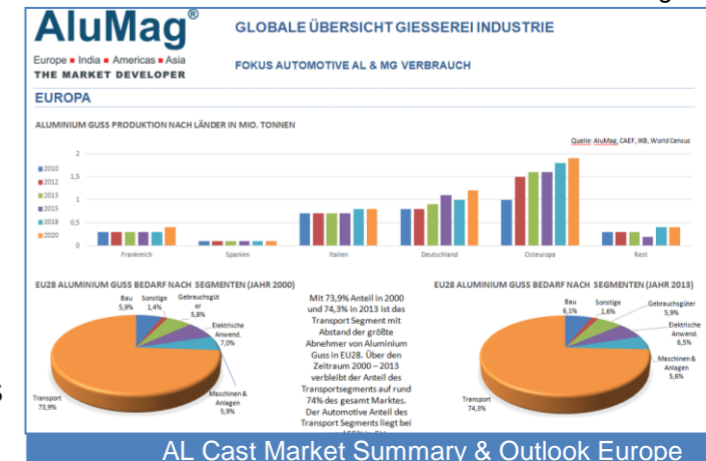
Snap Shot Summary Extraction

Cast aluminum is primarily used in power train applications, such as cylinder heads, engine blocks and transmission housings. In NA about 85% of all vehicles are equipped with an aluminum engine block. In Europe, this figure is 55%, 60% in China and 45% in Brazil [2015]. For 2020, a penetration rate of 89% in NA is expected during can be expected in Europe with 60%, 66% in China and 64% in Brazil.

Another important application is cast aluminum wheels, currently around 45% of all vehicles sold are equipped with original cast aluminum wheels world wide. In NA, the OE incorporation rate is of 77% [2015]. For 2025 OE penetration rate of 50% is expected worldwide.

When it comes to **BIW structures**, especially sports cars are equipped with cast aluminum [vacuum HPDC] since the 90s. Audi initiated the turn with the introduction of an aluminum frame for medium to high Volume vehicles [A8 and A2] beginning of this millennium. The Audi "space frame" Was made of cast-, extruded- and sheet aluminum processed parts. With a very high growth rate of applications in the automotive structure, aluminum is no longer a rarity. New generations of models of high-end car manufacturers such as MB [C, E, and S-Class], BMW [X5, X6, 5 & 7-Series], JLR [Range Rover, Range Rover Sport, XJ, F-Type, XE] Cadillac [ATS, CTS, CT6], Audi [Q7, A4, TT, A8, A6] have ..

Source: AluMag®



Source: AluMag®



Source: AluMag[®]

ALUMAG[®] DATA RESEARCH & VALIDATION

- **AluMag[®] Daily Data Research**

- Off the shelf data pool
- Interviews
- Media research - Internet, automotive & light weight magazines
- Tradeshows
- Business meetings & phone calls

- **AluMag[®] Never Starts From Zero!**

Due to the AluMag[®] our comprehensive application databases we start an analysis with between 20% & 100% market coverage.

- **AluMag[®] Contact Network**

A substantial contact network within the automotive and light weight industry is crucial for the execution of a market analysis. AluMag[®] maintains a CRM system with several thousands up to date contacts. Regardless of application, material & process our analyses are always backed & validated by several industry experts.

- **Customer Satisfaction Guaranteed**

An AluMag[®] analysis is finished when the client is satisfied.



Europe ■ India ■ Americas ■ Asia

THE MARKET DEVELOPER

MARKET RESEARCH MARKET DEVELOPMENT ROADSHOWS / EVENTS STRATEGIC LOCALIZATION

ALUMAG[®] OPEN DOORS & ESTABLISH MUTUAL CUSTOMER-SUPPLIER RELATION

AluMag[®] access new markets and open doors for customer strategic business targets in emerging and booming market, application, material, process or product. Contract wise, AluMag[®] and its services could be booked:

1. closed retainer quotation
2. service frame contract
3. interim assignment

We guide and support your organization globally through the different development phases until we have successfully launched, implemented or executed your project.

Source: AluMag[®]



JATCO Head Quarters Meeting in Japan

Source: AluMag[®]



NISSAN UK Lightweight Meeting

Customer Benefits

- Analysis and Development of Market Opportunities
- Accelerate Market Penetration
- Establish a Sales Force
- Provide Warehousing and Distribution Services
- Manage New Product Launches
- Interim Sales Management

Source: AluMag[®]



AISIN Japan Management Procurement Meeting

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THE MARKET DEVELOPER

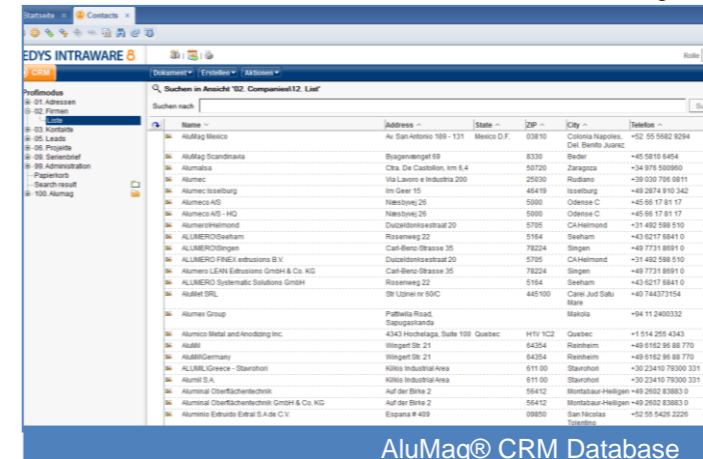
MARKET RESEARCH MARKET DEVELOPMENT ROADSHOWS / EVENTS STRATEGIC LOCALIZATION

INITIATE AND MAINTAIN BUSINESS CONTACTS GLOBAL

Since the foundation of AluMag[®] in 1994, AluMag[®] has created a business contact database with over 25.2K+ contacts in 9.6K+ companies. Each new or existing business contact is recorded from first day and maintained on a daily or demand and worldwide basis. This is just one access to open new doors for your business.

Due to the world-wide network and partnership, AluMag[®] is supporting global companies on cross border Mergers and Acquisitions.

Source: AluMag[®]



Name	Address	State	ZIP	City	Telefon
AluMag Benico	Av San Antonio 189 - 131	Mexico D.F.	03810	Colima Nariño,	+52 55 5662 9294
AluMag Scandinavia	Bjergengenel 89		8330	Bader	+45 9810 8454
Alumina	Cha. De Castillon, km 5.4		50720	Zaragoza	+34 978 909962
Alumec	Val Laine e Industrija 208		26200	Budapest	+36 069 790 9811
Alumec Isseburg	Im Geer 15		45419	Isseburg	+49 2874 910 342
Alumico AG	Niedweg 20		5000	Odense C	+45 66 17 81 17
Alumico AG - HG	Niedweg 25		5000	Odense C	+45 66 17 81 17
Alumico Helmond	Duchikensstraat 20		5705	CA Helmond	+31 462 598 510
ALUMERODueham	Rosenweg 22		5164	Seeham	+43 6217 8841 0
ALUMERODueham	Carl-Berni-Strasse 35		78224	Singen	+49 7731 8891 0
ALUMERO FINECH Extrusions S.V.	Duchikensstraat 20		5705	CA Helmond	+31 462 598 510
Alumero LEAN Extrusions GmbH & Co. KG	Carl-Berni-Strasse 35		78224	Singen	+49 7731 8891 0
ALUMERO Systematic Dotation GmbH	Rosenweg 22		5164	Seeham	+43 6217 8841 0
Haldor OIL	De Uppelre 65/C		445100	Cara Just Sulu	+40 744273754
Alumex Group	Pattalla Road,			Matola	+94 11 2400332
Alumico Metal and Anodizing Inc.	4343 Hochstaple, Suite 100	Quebec	H1V 1C2	Quebec	+1 514 295 4343
ALUMI	Wingert Str 21		84254	Raasdorf	+49 9162 96 88 770
ALUMI Germany	Wingert Str 21		84254	Raasdorf	+49 9162 96 88 770
ALUMI Greece - Stavros	Kilwa Industrial Area		611 00	Stavros	+30 23410 79300 331
Alumi S.A.	Kilwa Industrial Area		611 00	Stavros	+30 23410 79300 331
Aluminaal Oerfischertechnik	Auf der Birke 2		56412	Montabaur Heiligen	+49 2602 83863 0
Aluminaal Oerfischertechnik GmbH & Co. KG	Auf der Birke 2		56412	Montabaur Heiligen	+49 2602 83863 0
Alumina Extrudal S de C.V.	España # 409		08850	San Nicolas	+52 55 5426 2226

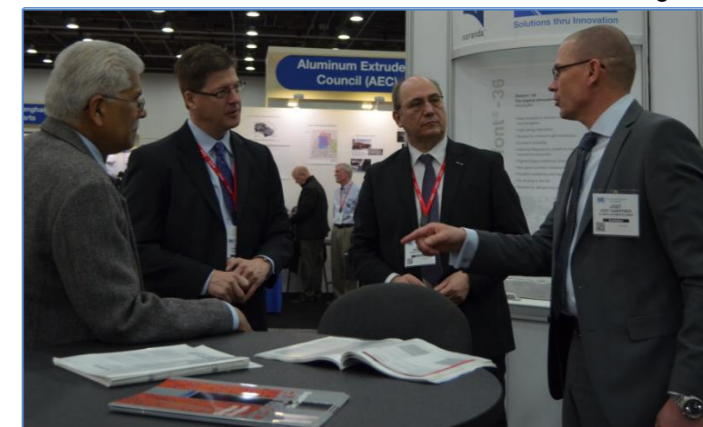
AluMag[®] CRM Database

PROJECT MANAGEMENT

Manage and integrate each aspect of your organization by initiating, planning, controlling, executing and closing out a new project, AluMag[®] provides tailored flexible standard processes which are mapped to the specific objectives of the client's project.

AluMag[®] offers liaison management services as an addition to our customer's staff by bringing in the resources that define us
– our experienced people and sales management tools as well as routines.

Source: AluMag[®]



SAE Meeting with Rheinfelden Alloys in Detroit

BENEFIT FROM EXPERIENCE WITH JAPANESE CLIENTS - GLOBALLY:

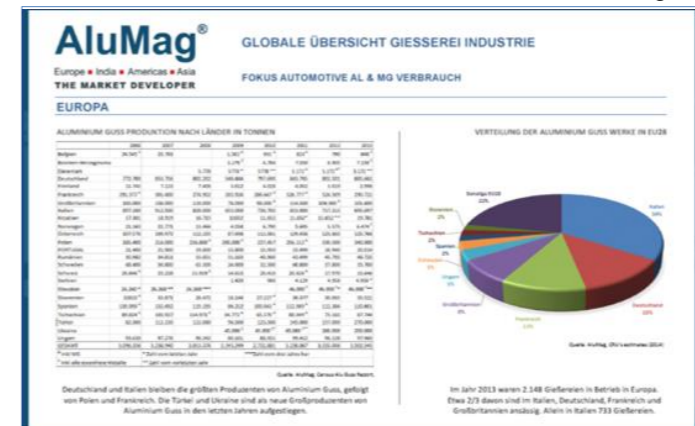
- Existing direct and personal access to almost all Japanese OEMs R&D suspension engineers and purchasing managers [Toyota, Honda, Nissan, Mazda, Subaru, Mitsubishi, Suzuki, Fuso, Hino, Isuzu...]
- Connected to the leading Japanese Tier1 [Aisin, Denso, F.Tech, Futaba, ...]
- Direct access to Japanese OEMs headquarter and also locations globally
- Gathering and analyzing actual potential customers global market demand
- Analyzing OEMs in-housing capacities and Japanese Tier 1 competitors capability
- Reputation to Japanese customers: AluMag® receiving continually requests from Japanese OEMs, Tier 1s on European/NA located supplier recommendation for various applications
- Deep culture and language understanding on each OEMs: Keiretsu, top-to-down, teamwork, company policy...
- On behalf of clients interest: AluMag® could visit Japanese customers with/without clients member/s, organizing technical or commercial meetings for project acquisitions, joining RFQ and quotation discussion...

Source: AluMag®



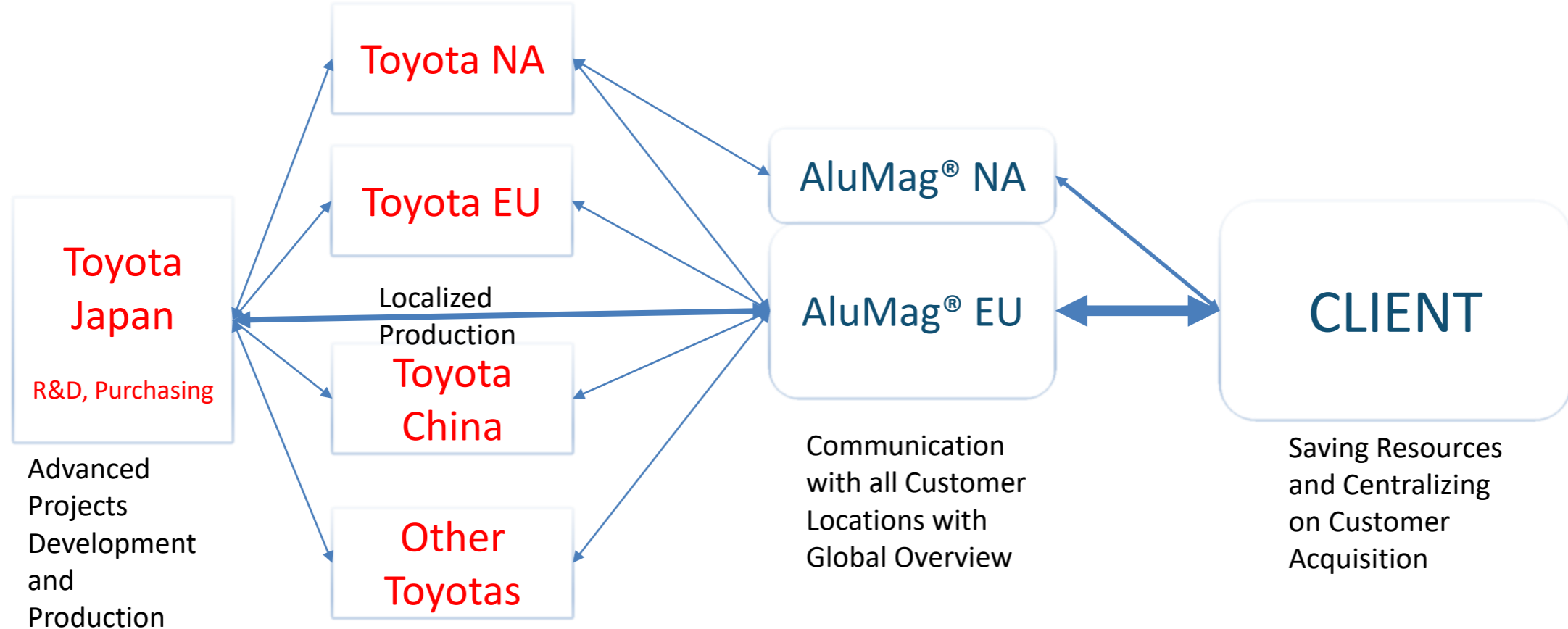
Joint Honda Meeting with Purchasing and R&D

Source: AluMag®



Global Overview of Cast Al & Mg by AluMag®

FLOW OF COMMUNICATION:



BENEFIT FROM ALUMAG® MERITS AND EXPERIENCES GLOBALLY:

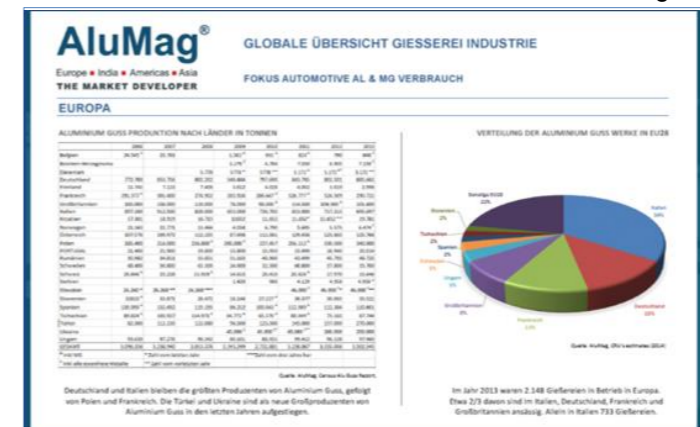
- Detect and realize opportunities, finally accelerate market penetration for clients
- Lotus Notes based CRM Database, with 25.2K+ contacts allocated to 9.6K+ companies, from AISIN and AUDI to ZF and ZHEJIANG GEELY. Each new or existing business contact is recorded from first day and maintained on a daily or demand and worldwide basis. This is just one access to open new doors for your business
- The CRM is mandatory to be used, first class integrated and maintained by each AluMag® member in their daily communication, project work, research, ...
- On-going analyzing / tracking of OEM and Tier 1 needs and in-housing
- Manage and integrate each aspect of the clients organization by initiating, planning, controlling, executing and closing out a new project
- AluMag® offers liaison management services as an addition to clients management / staff by bringing in the resources that define us
- AluMag® guides and supports clients globally through the different market development phases until we have successfully launched, implemented or executed
- Material, process and application skilled, flanked by cultural and language intellect by AluMag® members, which burning for their customers projects [native: American, Chinese/Japanese, Danish, German, Mexican, Turkish]

Source: AluMag®



Gathering further Executive Contacts by Symposia

Source: AluMag®



Global Overview of Cast Al & Mg by AluMag®

Europe ■ India ■ Americas ■ Asia
THE MARKET DEVELOPER

MARKET RESEARCH MARKET DEVELOPMENT **ROADSHOWS / EVENTS** STRATEGIC LOCALIZATION

Source: AluMag[®]



Daimler Sindelfingen as Roadshow Location

The Roadshow is the first class on-site contact event used by exhibitors and guest as a unique benchmark platform.

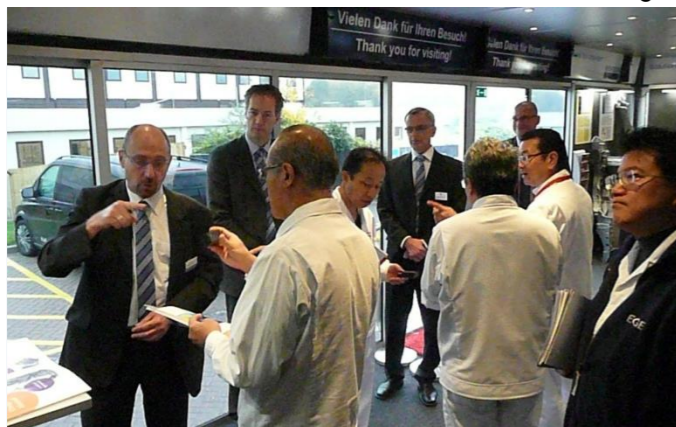
Attendees for the AluMag[®] Roadshows and events will attract contacts from all kind of departments as well as the management and board members.

Source: AluMag[®]



2nd Floor Roadshow Trailer Inside View: Tech-Paper

Source: AluMag[®]



VIP Round Mr Takahiro HACHIGO at HONDA UK

Kind of Events

- Organization of acquisition Roadshows
- Organization of technical Roadshows
- Commercial and technical events
- Host in-house events and presentations

Source: AluMag[®]



1st Floor Roadshow Trailer Inside View: Exhibition

Europe ■ India ■ Americas ■ Asia
THE MARKET DEVELOPER

MARKET RESEARCH MARKET DEVELOPMENT ROADSHOWS / EVENTS STRATEGIC LOCALIZATION

GLOBAL EVENT IMPRESSIONS

AluMag® has leveraged a global community of business executives to create a world-class platform to support executives make the right contacts and decisions for their organization.

Our unique events are bringing in decision maker and executives in EUROPE, ASIA and NAFTA.

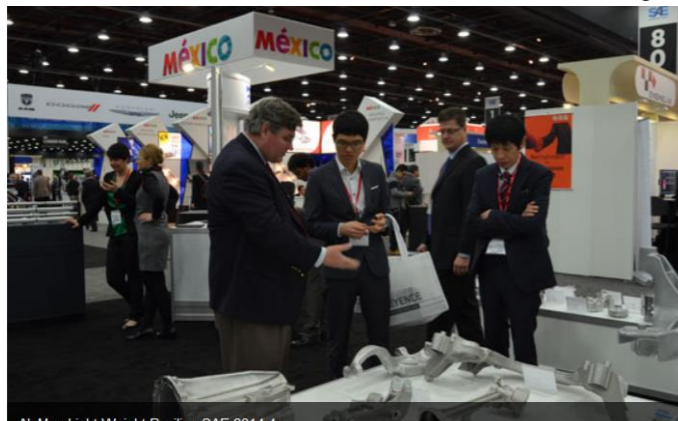
Interchange of information, intensifying your champion network, getting input to create your individual best practice strategy, are just some aspects of attendees and speakers benefit in being part of an AluMag® event.

Source: AluMag®



AUDI Q7 Light Weight Paper Shanghai 2015

Source: AluMag®



AluMag Light Weight Pavilion SAE 2014.4

Organizing Tech & Procurement Shows Globally

Events 2019/2020/2021

- 2019 Jul 18th Keynote speech and moderator at FICMES / China Diecasting Congress in Shanghai, PRC
- 2019 Sep 4th Speech at the AMAP Colloquium in Aachen, Germany
- 2019 Nov 25th Speech at the European Aluminium Congress in Duesseldorf, Germany
- 2020 Feb 11th to 12th Speech at the VDI Congress in Bad Gögging, Germany
- 2021 May 4th to 6th Speech at the Mexican EUROGUSS

Source: AluMag®



General Motors VIP at AluMag® Booth SAE in Detroit

LOCALIZATION IMPRESSION

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. Whether it is metal or plastic or land, sea or air in application, our experience with product, process and materials is global with personnel active in Europe, India, China, Japan, Mexico and the US.

- Search, develop and present potential acquisition candidates for regional and global business expansion
- Localization of new manufacturing / service sites for business expansions
- Identification of new technology supplier development about product, processes and materials
- Search, develop and present potential business partners / suppliers to support regional and/or global supply programs
- Interim assignments as COO
- Identify and present:
 - Existing barriers to current and/or new business participation
 - Potential competitor profiles for new or existing business in non-presence geographies
 - New emerging technologies and processes for business expansion

Source: AluMag[®]



On-Site Audits for Customer Visits & Tie-up validation

Source: AluMag[®]



On-Site Greenfield Planning Meeting

CASE STUDY: ALUMINUM M&A TARGETS REPORT

Snap Shot Scope & Example Extraction

Client intends to make a strategic investment in an on the technological basis leading small or middle sized company with its own melting operation in-house, with the potential to grow and to globalize, regardless which aluminum cast process is used by the company, except sand casting. Nevertheless hollow casting is preferred by the client.

Forging is an alternative, but not extrusions. The client could also great with an acquired technology hub a global acting light weighting group with a minority stake and/or with a second investor. The first M&A target could be localized in any region of the world. The max revenue of app should be 1,000Mill USD.

AluMag® provided the client a report to introduce 14 M&A target companies in compliance with the above listed conditions. For each target the following information will has been be researched:

- Estimated Enterprise Value [calculated based on its EBIT or EBITDA multiple], Ownership & dept structure;
- Capex, Growth, Sustaining,
-

Source: AluMag®

The screenshot displays two 'Facility Factsheet' tables. Each table includes a company profile (name, address, phone, email) and a detailed 'Facility Factsheet' with columns for 'Production/Process', 'LPDC (Equipment/Process)', and 'OTHER CHECK LIST'. The tables are organized into sections for 'Client and Production', 'Production', and 'Facility Factsheet'.

Example Of The Fact Sheet Of A M&A Target

Source: AluMag®

The screenshot shows the 'SUMMARY' section of the report. It contains three paragraphs of text, each describing a target company. The first paragraph is for 'BFBFBFBFBF', the second for 'BFABFABAF', and the third for 'BCGBCGBCG'. Each paragraph provides details about the company's operations, capacity, and market position.

AL Cast Market Summary & Outlook NAFTA

M&A TARGETS REPORT – METHOD & PROCESSES

With our extensive global network and comprehensive industry knowledge and knowhow AluMag® is highly qualified to support global companies on cross border Mergers and Acquisitions.

Step 1 – Target Specifications:

M&A target specifications and requirements are disclosed by the client:

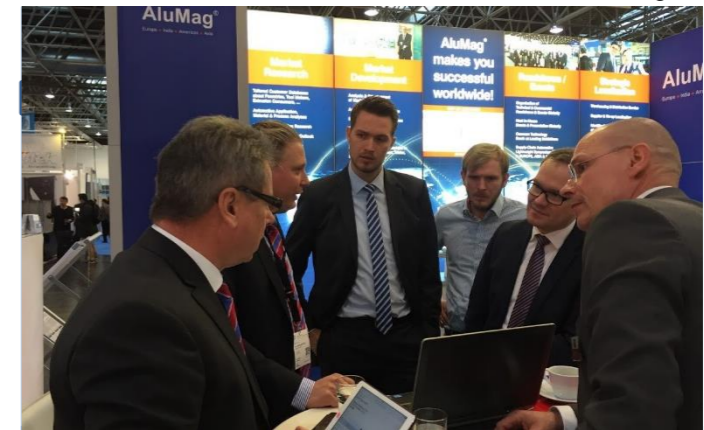
Samples of client M&A specifications / criteria:

- Kind of business
- Region of interest
- Revenue
- Materials
- Products & processes

Step 2 – Generating A Long List

Based on the M&A specifications set in step 1, AluMag® will generate an enquiry to filter its in-house CRM system and extract possible hits to an excel working sheet. AluMag® CRM system contains about 9.6K+ companies within the automotive light weight industry where each company has been allocated by region, business segments, materials, products, processes and much more.

Source: AluMag®



Step 1: M&A Target Specifications

Source: AluMag®

Name	Address	State	ZIP	City	Telefon
AluMag Mexico	Av. San Antonio 189 - 131	Mexico D.F.	03810	Colonia Narvosa	+52 55 5862 8294
AluMag Scandinavia	Byggenävergränd 69		8330	Bieder	+45 58 10 6454
Alumatis	Chra. De Castillon, km 5.4	Zaragoza	50720	Zaragoza	+34 976 500960
Alumec	Val Lavin & Industrija 208	Rudans	26530	Rudans	+38 326 795 0811
Alumec Isosburg	Im Geer 15	Isosburg	46419	Isosburg	+49 2874 910 342
Alumeco AG	Nahdweg 26	Odessa C	5800	Odessa C	+45 66 17 81 17
Alumeco AG - HG	Nahdweg 26	Odessa C	5800	Odessa C	+45 66 17 81 17
AlumenHelmold	Duiselsteinallee 29	CA-Helmold	5705	CA-Helmold	+31 492 598 510
ALUMERODieham	Rosenweg 22	Seeham	5154	Seeham	+43 6217 6841 0
ALUMERODingen	Carl-Benz-Strasse 35	Singen	78224	Singen	+49 7731 9891 0
ALUMERO FINEX Extrusions B.V.	Duiselsteinallee 29	CA-Helmold	5705	CA-Helmold	+31 492 598 510
Alumero LEAN Extrusions GmbH & Co. KG	Carl-Benz-Strasse 35	Singen	78224	Singen	+49 7731 9891 0
ALUMERO Systematic Solutions GmbH	Rosenweg 22	Seeham	5154	Seeham	+43 6217 6841 0
AluSteel SRL	Str. Unirii nr 65/C	Cluj Napoca	440100	Cluj Napoca	+40 744373154
Alumec Group	Paltova Road, Sargodha	Malak		Malak	+91 11 2400332
Alumico Metal and Anodizing Inc.	4343 Hochetaps, Suite 100	Quebec	H1V 1C2	Quebec	+1 514 255 4343
ALUMIG	Winget Dr 21	Rudans	54354	Rudans	+49 6162 96 88 770
aludisGermany	Winget Dr 21	Rudans	54354	Rudans	+49 6162 96 88 770
ALUMIG, Greece - Staronon	Kilias Industrial Area	Staronon	611 00	Staronon	+30 23410 79300 331
Alumi S.A.	Kilias Industrial Area	Staronon	611 00	Staronon	+30 23410 79300 331
Alumini Oberflächentechnik	Auf der Birne 2	Montabaur-Hellgen	56412	Montabaur-Hellgen	+49 2602 63883 0
Alumini Oberflächentechnik GmbH & Co. KG	Auf der Birne 2	Montabaur-Hellgen	56412	Montabaur-Hellgen	+49 2602 63883 0
Alumini Estrado Extral S de C.V.	España # 409	San Nicolas Tolentino	08850	San Nicolas Tolentino	+52 55 5426 2226

Step 2: AluMag CRM Company Database

M&A TARGETS REPORT – METHOD & PROCESSES

Step 3 – Completion Of Long List

Additional M&A targets are added to the excel long list created in step 2 through AluMag[®] market research and interviews of industry experts. The AluMag[®] CRM system contains details of roughly 25.2K+ contacts as potential interview partners.

Step 4 – Short List & Fact Sheet

M&A long list targets will be furrrily analyzed and valuated to detect candidates for M&A based on client specifications. In this process an excel short list of only the most suitable targets will be generated containing all requested specifications listed by the client. Furthermore a factsheet is generated providing an overview and summary of each selected target incl. for example M&A target pros & cons & key financial data, key contact details / persons etc. The initial contact to potential targets can also be executed by AluMag[®].

Source: AluMag[®]

Plant/Location	Location	State	Aluminium Share [%]	Magnesium Share [%]	Force From [T]	Force To [T]	No. HPDC ≤ 400 [T]	No. HPDC ≤ 1000 [T]	No. HPDC ≤ 1500 [T]	No. HPDC ≤ 2000 [T]	No. HPDC ≤ 2500 [T]	No. HPDC > 3000 [T]	Total No. HPDC	ENC	Tool Shop	Casting Processes
int	USA	CA	100	0	125	925								Yes	No	HPDC
Plant	USA	CA	100	0	400	900	1	7	0	0	0	0	8	Yes	No	HPDC, Vacuum
int	USA	TN	100	0	600	1.600	0	9	4	1	0	0	14	Yes	No	HPDC
int	USA	MN	100	0	400	1.000	0	9	0	0	0	0	9	Yes	No	HPDC, Squeeze Castings
int	USA	NC	100	0	1.000	1.000	0	3	0	0	0	0	3	Yes	No	HPDC
int	USA	MN	100	0	250	1.200	2	11	2	0	0	0	15	Yes	No	HPDC
Plant	USA	MN	100	0	250	1.600								Yes	No	HPDC, SC, LPDC, Squeeze cast
Plant	USA	IN	100	0	250	1.200	3		15				18	Yes	Yes	HPDC, Vacuum
Plant	USA	WI	100	0	400	1.600				17			17	Yes	Yes	HPDC, Squeeze Casting
int	USA	WI	100	0	400	1.600							10	Yes	Yes	HPDC, Squeeze Casting
Plant	USA	IN	100	0	250	1.650	15	3	2	1	0	0	21	Yes	No	HPDC
int	MEX	Querétaro	100	0										Yes	No	HPDC
Plant	USA	WI	100	0	700	2.500			25		7		32	Yes	No	HPDC, Low Pressure
int	USA	MI	0	100	800	3.500			6			9	15	Yes	No	HPDC
int	MEX	Coahuila	100	0	800	1.600			1	3	0	0	4	Yes	No	HPDC
Plant	CAN	ON	0	100	420	4.400				23		17	40	Yes	No	HPDC
int	USA	OH	100	0	1.250	1.800								No	No	HPDC
int	USA	WI	100	0	400	3.500							15	Yes	No	HPDC
int	USA	WI	100	0	1.600	3.500							26	Yes	No	HPDC
int	USA	KY	100	0	400	3.500							21	Yes	No	HPDC
int	USA	AI	100	0	1.500	2.500	0	0	0			15	15	Yes	Yes	HPDC

Step 3: Completion Of Long List

Source: AluMag[®]

Group Name	Employees	HPDC CF Range (T)	Yearly Capacity (T)	Yearly Revenue (Mill. US)
Bharat Forge	280	2.500 - 4.000	20.000	58

Company / Facility List				
Facilities	Country	Locations	Province	Continent
Main (HQ)	Germany	Brand-Erbisdorf	Saxony	Europe
Secondary	USA	Tennessee	North America	

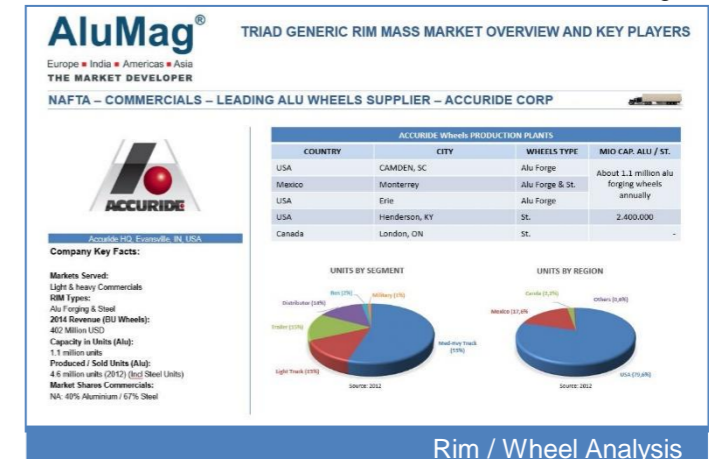
Group Production Processes				
Engineering				
Tool & Die Shop Inhouse				
Tool Shop Maintenance				
HPDC / Vacuum				
LPDC				
GEC				
Squeeze				
CPC				
Sand Cast				
Cast Forging				
Hollow Cast				
Forging				
Heat Treatment				
CNC Machining				
Assembly				

Step 4: Short List & Fact Sheet

EXTRACTED REFERENCES & MERITS: MARKET RESEARCH

- 2011: European aluminum cylinder head market analysis executed for a German aluminum foundry.
- 2015: Top 15 European automotive aluminum permanent mold foundries were detected and analyzed for a German aluminum foundry.
- 2015: Global cast aluminum / magnesium output allocated by regions, processes and segments from 2000 - 2016. The study was executed for one of the world's leading tradeshow organizers.
- 2015: Global aluminum rim / wheels market analysis was executed for a leading producer of forged aluminum rims.
- 2015: Leading Japanese aluminum foundry ordered NAFTA market analysis for automotive BIW cast aluminum applications. Study also incl. a competitor analysis
- 2016: The market potential in NAFTA within automotive BIW & suspension applications, were analyzed for a German aluminum extruder.
- 2016: Global snapshot analysis of the automotive CFRP market for a Chinese electronic applications manufacturer. The study incl. global demand, market shares, supply chain & technology overview.
- 2016: NAFTA automotive sunroof analysis
- 2017: Analysis of the 20 global biggest alloy rim / wheels Tier1 was executed for a leading producer of welding equipment

Source: AluMag®



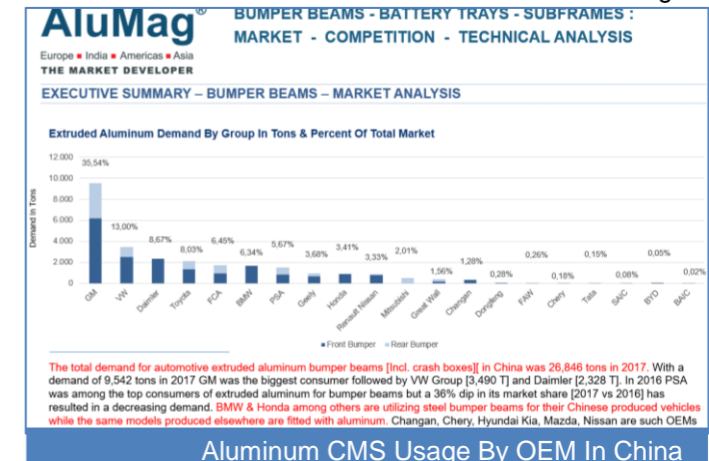
Source: AluMag®



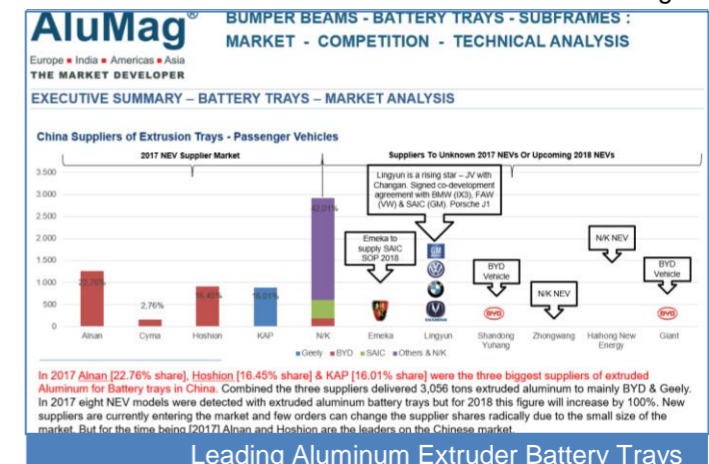
EXTRACTED REFERENCES & MERITS: MARKET RESEARCH

- 2018: BEV & automatic driving with the influences about light weighting, materials, ...
- 2018: Market size, potential, technologies, materials, players, influencing criteria about CMS [Crash Management Systems] front & rear in China 2030
- 2018: Market size, potential, technologies, materials, players, influencing criteria about Subframes [Engine cradles] front & rear in China NA - Europe 2030
- 2018: Market size, potential, technologies, materials, players, influencing criteria about Battery Trays [lower part of the battery housing] for NEV [PHEV = Plug-In Electric Vehicle and BEV = Battery Electric Vehicle] front & rear in China 2030
- 2018: Foundry equipment market size and potential for cast steel and cast gray iron in SA - NA - EU28 – RUSSIA
- 2019: Foundry database / market intelligence about impregnating/sealing for e.motor housing for a mid-sized UK based global acting metal processing & equipment group
- 2019: Aluminum & steel light weighting BIW tendencies at European premium OEM, focused on Germany and its Tier1. Executed for a large global acting Japanese Tier1
- 2019: For a Japanese metal & investment group a Roof Railing market research in EU28 – Thailand - Vietnam - China - S.Korea
- 2019: For an US based global mold and tool lubricant executed a strategic paper about the global mega trends and its business impacts

Source: AluMag®



Source: AluMag®



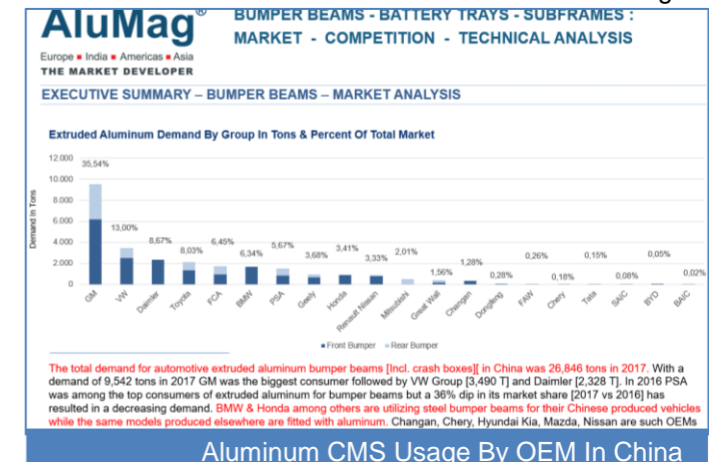
EXTRACTED REFERENCES & MERITS: MARKET RESEARCH

- 2019: Native Chinese & Japanese OEM analysis & outlook about Battery Trays, Subframes & Body structures in HPDC aluminum & magnesium for a Suisse group
- 2020: EU28+ market intelligence battery trays, body in white with trends in global architectures, crash management systems and suspension components for a global Japanese supplier
- 2020: CO2 footprint analysis of European leading foundry equipment suppliers for a large Japanese automotive OEM

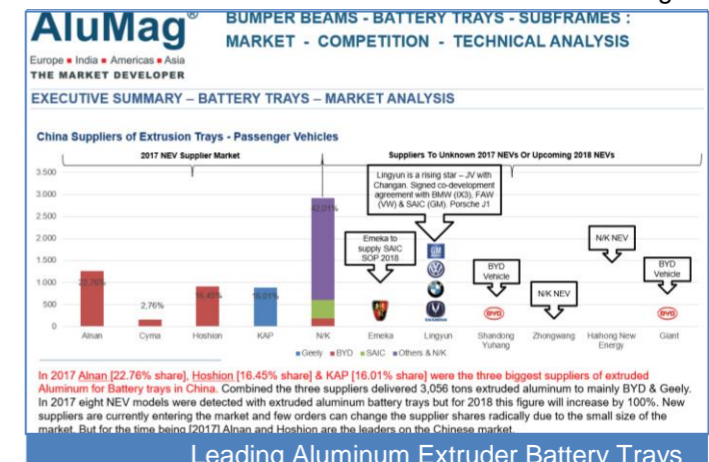
EXTRACTED REFERENCES & MERITS: MARKET DEVELOPMENT

- 1995 - 2018: Market development for the largest AL extruder in the automotive market
- 2002 - 2005: W.L. GORE Market Development active / passive climate seats in cars
- 2005 - 2014: Global market development Kruse Chemie with OEM, Tier1 & distributor for the urea [AdBlue] filling and re-filling devices incl. the engineering to reduce NOx
- 2009 - 2013: Global market development for KSM Casting with Japanese and Korean OEM and selected Tier1 focused on chassis and suspension
- 2013 - 2014: Global market development Otto Fuchs for 3D seamless extruded and high strength pipes in the O&G, Autonomous Underwater Vehicles, Accumulator, ...
- 2013 - xxxx: NAFTA market development of an automotive aluminum system supplier
- 2015 - 2016: Japan OEM market development in the triad for Bharat Forge

Source: AluMag®



Source: AluMag®



EXTRACTED REFERENCES & MERITS: MARKET DEVELOPMENT

- 2015 - 2017: PRESS METAL [a Malaysian Chinese aluminum extruder] continental Europe market development for in the non-automotive market mainly
- 2015 - xxxx: NAFTA market development for a German Tier II aluminum fabricator
- 2017 - 2018: Global market development for a German highly technology leading electron beam welding manufacturer and contract welder
- 2017 - 2018: European market development for a Taiwanese aluminum forging public listed company, automotive focused
- 2018 - 2019: Interim CSO surface first class automotive system supplier
- 2020 - 2xxx: SYBAC European project business market development of large area PV Carports
- 2020 - 20xx: Global project, business, market development hydro forming for an East German automotive supplier
- 2021 - 2xxx: PRESS METAL [a Malaysian Chinese aluminum extruder] Southeast ASIAN Automotive business & market development
- 2021 - 2xxx: North American business & market development in automotive and non-automotive applications for an Italo-American aluminum die caster

Source: AluMag®



Example about Timing – Pricing - Tasking

Source: AluMag®

AluMag® XXXXX AUTOMOTIVE - SERIEN ENTWICKLUNG
 Europe ■ India ■ Americas ■ Asia THE MARKET DEVELOPER
 ADBLUE 3,5 & 5,0 LITER NACHBEFÜLLUNG PKW

KONZEPT- / KOSTENVORSCHLAG: XXXXX ADBLUE LIQUIDE POUCH PROJECT



AdBlue / DEF / UREA Project For NOx Reduction

EXTRACTED REFERENCES & MERITS: ROADSHOWS / EVENTS

- 2008: Light Weighting Roadshow at VW in WOB & DAIMLER in SiFi with KSM, FWB, LEIBER, NEUMAN, SAPA, RAUFOSS
- 2009: Light Weighting Roadshow at DAIMLER in SiFi, FORD in Cologne, OPEL in Ruesselsheim, MAGNA in St. Valentin & Graz with KSM, RWTH Aachen, FWB, IAMT, IFAM, HERBST
- 2010: Light Weighting Roadshow at AUDI in Neckarsulm & Ingolstadt, BOSCH in Feuerbach, DAIMLER in SiFi, Ford in Cologne with KSM, RHEINFELDEN Alloys, IFAM, IAMT, FWB
- 2011: Carbon Composite Roadshow <https://vimeo.com/79304087> at AUDI Neckarsulm & Ingolstadt, MAGNA in Graz, BMW in Munich, DAIMLER in SiFi, PORSCHE in Weissach and Carbon Composite Congress in Augsburg with 3B FIBREGLASS; GFM; KRAIBURG; LIBA; MITSUBISHI; MOMENTIVE; SAERTEX
- 2011: Light Weighting Roadshow at BMW in Munich, AUDI in Ingolstadt, DAIMLER in SiFi, OPEL in Ruesselsheim, ZF in Stenwede-Dielingen with KSM, HYDRO Extrusion, Hydro Rolling, RHEINFELDEN, IAMT, IFAM
- 2012: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with IXETIC, RHEINFELDEN, KIENLE+SPIESS/SUMITOMO, KSM, KIPP
- 2012: Light Weighting Roadshow at HONDA in Swindon, JLR in Gaydon, NISSAN in Cranfield, DAIMLER in SiFi, BMW in Munich, PORSCHE in Weissach & OPEL in Ruesselsheim with HYDRO, KSM, RHEINFELDEN, IFAM, IAMT, IMPERIA

Pic: AluMag®



2010 Tech Speeches Insight The Roadshow Trailer

Pic: AluMag®



2012 Roadshow Stop At BMW FIZ / Project House

EXTRACTED REFERENCES & MERITS: ROADSHOWS / EVENTS

- 2012: Light Weighting Roadshow at MAGNA in Graz, AUDI in Ingolstadt, DAIMLER in SiFi, BMW in Munich, JLR in Gaydon with ALERIS, BHARAT FORGE, FINOBA, MARTINREA HONSEL
- 2013: Light Weighting Roadshow at PORSCHE in Weissach, DAIMLER/SMART in SiFi, AUDI in Ingolstadt with ALERIS, AHC
- 2013: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KSM, RHEINFELDEN Alloys, KIENLE+SPIESS/SUMITOMO, BOELLHOFF
- 2013: OEM in-house tech meetings at NISSAN in Farmington Hills, MI, HONDA in Ohio, TOYOTA in MI with KSM, WKW, RHEINFELDEN
- 2013: Light Weighting Roadshow at PORSCHE in Weissach, DAIMLER in SiFi, BMW in Munich, AUDI in Ingolstadt with KSM, RHEINFELDEN, SAPA, IFAM, BOELLHOFF
- 2014: Technology Roadshow at AUDI in Ingolstadt, DAIMLER in Ulm & SiFi, OPEL in Ruesselsheim, FORD in Cologne with CONSTELLIUM, MOMENTIVE, RHEINFELDEN Alloys, BROEKELMANN, KSM, AMERICAN AXLE
- 2014: OEM in-house tech meetings at MAZDA in Hiroshima, TOYOTA in Toyota-cho, HONDA in Tochigi, SUBARU in Ota-cho, ISUZU in Fujisawa-shi, JTEKT in Nara, AISIN in Kariya, CALSONIC KANSEI in Saitama-shi with BHARAT FORGE, GIANT and OTTO FUCHS

Pic: AluMag®



AluMag® 2014 Roadshow Pics DAIMLER SiFi Piazza

Pic: AluMag®



AluMag® 2015 Light Weighting Symposium Shanghai

EXTRACTED REFERENCES & MERITS:

- 2014: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KSM, RHEINFELDEN Alloys, KIENLE+SPIESS/SUMITOMO, KIPP, SCHOCK METAL
- 2014: Europe Automotive Lightweight Procurement Symposium 2014 in Duesseldorf
- 2015 NA Automotive Lightweight Procurement Symposium in Detroit
- 2015: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KSM, RHEINFELDEN Alloys, KIENLE+SPIESS/SUMITOMO, KIPP, SCHOCK METAL
- 2015: Asia Automotive Lightweight Procurement Symposium in Shanghai
- 2016: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KSM, RHEINFELDEN Alloys, KIENLE+SPIESS/SUMITOMO, KIPP, SCHOCK METAL
- 2016: Asia Automotive Lightweight Procurement Symposium in Shanghai
- 2017: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KIPP, RHEINFELDEN Alloys, NIKKEI MC, KIENLE+SPIESS/SUMITOMO, PRO-BEAM
- 2018: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KIPP, AMT Die Casting, RHEINFELDEN Alloys, NIKKEI MC, UNITED STARS ADVANCED MAT., AMALGA Composites, HYCAL, ACE, GF LINAMAR, KAMAX, SALYAM, LIGHTMAT, IMA
- 2019: Light Weighting Technology Pavilion at SAE in Detroit Cobo Center with KIPP, AMT Die Casting, RHEINFELDEN Alloys, NIKKEI MC, ACE, KAMAX, IMA

Pic: AluMag®



2014 SAE Exhibitor Group Pic

Pic: AluMag®



AluMag® 2018 SAE Light Weighting Pavilion Detroit

EXTRACTED REFERENCES & MERITS: STRATEGIC LOCALIZATION

- 2006 - 2014: Projection, execution and operation about and in the name and order of 14 Kruse Chemie JVs. De-solving, tank storage and delivery of fully truck loads to re-seller and OEM with AdBlue / DEF / UREA in NAFTA and Brazil. Further handling the spare part warehouse in Detroit
- 2011 - 2011 Research about the production project partnership of an European automotive group for a potential NAFTA partner about aluminum sub frames [cradles]
- 2013 - 2015: Entire localization, from site selection to turn-key building for a German premium Tier 1 in Mexico to ensure the supply to AUDI and CADILLAC
- 2014 - 2014: First validation and selection about a localization in China for a German Tier 1 and its sister company, engaged in general engineering
- 2014 - 2014: Aluminum extrusion supplier assessment for German Tier1
- 2012 - 2019: Validation, selection and execution phase to localize a Norwegian - Austrian Group in Mexico
- 2014 - 2015: First localization study incl. mid term profit & loss statement about potential localization in Germany for a Malaysian- Chinese Aluminum Group
- 2015 - 2017: Project management support for the on-site installation of the fuel tank farm at AUDI Mexico for a German liquid & fluid storage equipment manufacturer
- 2015 - 2018: After sales service for a German CNC tool supplier in USA and MEX
- 2016 - 2019: Mexico localization of tool rework center for German Tool maker

Source: AluMag®

MSK PROCESSINGS GMBH

Final Executive Summary Overview

MSK Partner Search	Partner Capability										Ranking 1-3 1=Best 3=High	
	Partner	Assembly	Welding	Design & Dev't	Program Mgt	GM Customer	Part Sourcing	Extruder	US location near MI + 200 MI	China location		NDA
Benteler	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	Signed	1
Dyna-Mig / F&P = F-Tech	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	3
Metalsa	yes	yes	yes	yes	yes	yes	yes	no	no	no	Signed	3
Metro Technologies	yes	yes	yes	yes	yes	yes	yes	no	yes	no	Signed	3
Sodecia	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	Signed	3
Whitehall Industries	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	1

NAFTA Sub Frame / Engine Cradle Project Partners

Source: AluMag®

AluMag® THE MARKET DEVELOPER

KKKK CHINA LOCALIZATION CONCEPT

Yangtze River Delta

Nanjing Jiangning Development Zone

Logistic Location	7km away from the downtown Nanjing, water, air and land transportation routes extend in all directions. 30 minutes' drive from Nanjing Port and Nanjing Lukou Airport.
Encouraged Industry	Garment and Textiles Production, automobile production/assembly, biotechnology/pharmaceuticals
Land cost reference	Utilization term more than 10 years. 1st year free, 2nd year 50%, 3rd and 4th year RMB 100/m², 5th year RMB 120/m², afterwards adjust with Chinese national price index. Acquisition: Min price RMB252/m².
Infrastructure cost	Water RMB2.28/ton Electricity RMB0.30-1.12/KWH Gas RMB2.30/m³
Labor cost	Minimum wage: RMB1480/month
Tax condition	Income Duty 25% (15% as high tech industry, tax of local part 5 years free+5 years 7.5% with additional equity return by local government), VAT 17%, Turnover Tax: 5%(partly return by local government), Stamp Tax: 0.1% of contract amount, 0.05% of increasing capital

CHINA Side Selection Green Field Study

EXTRACTED REFERENCES & MERITS: STRATEGIC LOCALIZATION

- 2016 - 2017: M&A target analysis and execution for a 20% invest in a technology leading aluminum forming company by a Japanese
- 2018 - xxxx: Localization of a family owned innovative automotive light weighting company in the southern united states, driven by BMW, Daimler and Volkswagen
- 2018 - 2018: Selling a 10 Mill Euro real estate “high pressure die casting” facility in China with an area 700 a [70K sqm / 753,498 sq. ft] and 12K sqm production & office
- 2018 - 2018: Individualized foundry databases for a US based global transmission system tier1 to support the supply chain
- 2018 - 2019: Individualized foundry databases for three global leading HPDC groups based in MEX, US and GER as M&A target market intelligence
- 2018 - 2019: Individualized foundry databases for a Japanese based metal processing group and strategic investor for M&A reason
- 2018 - 2019: Interim COO in MEX to re-organize / -structure an aluminum extruder and the improvement of productivity incl. quality
- 2019 - 2019: Global M&A JV aluminum forger target analysis for an Indian client
- 2019 - 2019: EU28+ hidden champion M&A list AL & ST subframe supplier for a Japanese global metal processing group
- 2019 - 2019: EU28+ M&A list automotive structures for a Japanese global supplier
- 2020 - 2021: EU27+ M&A from longlist to on-site pre due diligence for a multi billion USD Japanese trading and metal house

Source: AluMag®



Source: AluMag®



MARKET RESEARCH MARKET DEVELOPMENT ROADSHOWS / EVENTS STRATEGIC LOCALIZATION

WHY DOES CLIENTS ENGAGE ALUMAG[®]:

- Since 1994 successful globally active and experienced with:
 - Automotive, O&G, Truck/Tractor, Trailer, GE, ...
 - Aluminum, Carbon/Composite, Magnesium, Reinforced Plastics, ...
 - Light weighting, Joining, Surface, ...
 - Creating demands and markets
 - Backed with dozen of studies, databases and analysis
 - Organizer and supporter of the “Automotive Lightweight Events” in Detroit, Duesseldorf, Shanghai and from 2020 in Puebla too...” which generates further executive contacts
- Clients recommended to engage AluMag[®], due to their excellent experiences in former projects
- AluMag[®] capability and reputation as well as skill and network to execute cross selling in various industries and applications, regardless of the region
- Access and use of the entire databases and network, AluMag[®] has “off the shelf”
- Due to the active AluMag[®] relations globally, the maybe shortest way to connect
- Exclusive partnership for defined applications and materials as well as processes, in the areas agreed
-

Source: AluMag[®]



Successful Market Development

Source: AluMag[®]



..... with the right, trustful, connected Performer

AluMag®

Europe ■ India ■ Americas ■ Asia
THE MARKET DEVELOPER

AluMag® Further Links



● AluMag® Worldwide



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