To be the best in the world!

AJIN GROUP INTRODUCTION

AJIN INDUSTRIAL CO.,LTD.
531, Shinje-Ri, Jinryang-eup, Gyung San-City, Gyungsangbuk-Do, Korea
TEL : +82-53-856-9100 / FAX : +82-53-856-9111

000 | Contents

001 Company Introduction

Brief Company History I

History

1987 year.

- Establishment of **WOOSHIN INDUSTRIAL**

2000~2006 year.

- **2003.12** Acquisition of **AJIN INDUSTRIAL**
- **2006.09** Establishment of **AJIN INDUSTRIAL(SHANGHAI)**

2008~2009 year.

- **2009.03** Establishment of **AJIN USA** (Alabama, U.S.)
- **2009.12** Acquisition of **DAEWOO ECC.**

2010년~CURRENT

- **2011.02** Acquisition of KCO Energy
  (The company name was changed into **AJIN Car In Tech**)
- **2011.09** Acquisition of EMPITECH USA
  (The company name was changed into **WOOSHIN USA / Alabama, U.S.**)
- **2011.12** To confirm investment for Ajin ind. (Yancheng)
  (Scheduled date for corporation registration : December, 2012 / **Yancheng, China**)
- **2013.08** New construction of **AJIN INDUSTRIAL Head office**
  (August, 2013 / Gyeongsan-si, Gyeongbuk)

Awards

2006.12 Gyungbuk Small Business Award
2009.10 Selected as Most Wanted Corporation to work for Labor-Management Cooperation Division Awarded at Productivity Competition
2009.10 Selected as a Best Productivity Enhancement / Innovation Activities Corporation
2010.07 Obtained Safety/Health Management System Certification (Korea Occupational Safety & Health Agency/DNV)
2010.09 National Productivity Award Prime Minister Commendation (Ministry of Knowledge Economy)
2010.09 Best Human Resources Developer: Best-HRD Certificate (Human Resources Development of Korea, Ministry of Employment and Labor)
2011.07 No Injury Records in 13 Years (Korea Occupational Safety & Health Agency)
2011.12 Chosen 2011 Labor and Management Partner Supporting Project (Ministry of Employment and Labor)
2012.02 Best Organization for Specialized High School Global on-Site Training (Ministry of Education and Science Technology Minister Award)
2012.05 Open Hire Leader (Ministry of Employment and Labor Minister Award)
2012.12 Obtained Export Award (One Hundred Million Dollar)
2013.05 Received AEO certification for outstanding general certification company (Korea Customs Service) (Grade A)
2013.12 Presidential certification for contributions in creating jobs
2015.07 Selected organization in The World Class 300
2015.10 Awarded a grand prize of FTA Practical use
2016.12 The prize of “Admired business man, the future leader”

001 Company Introduction

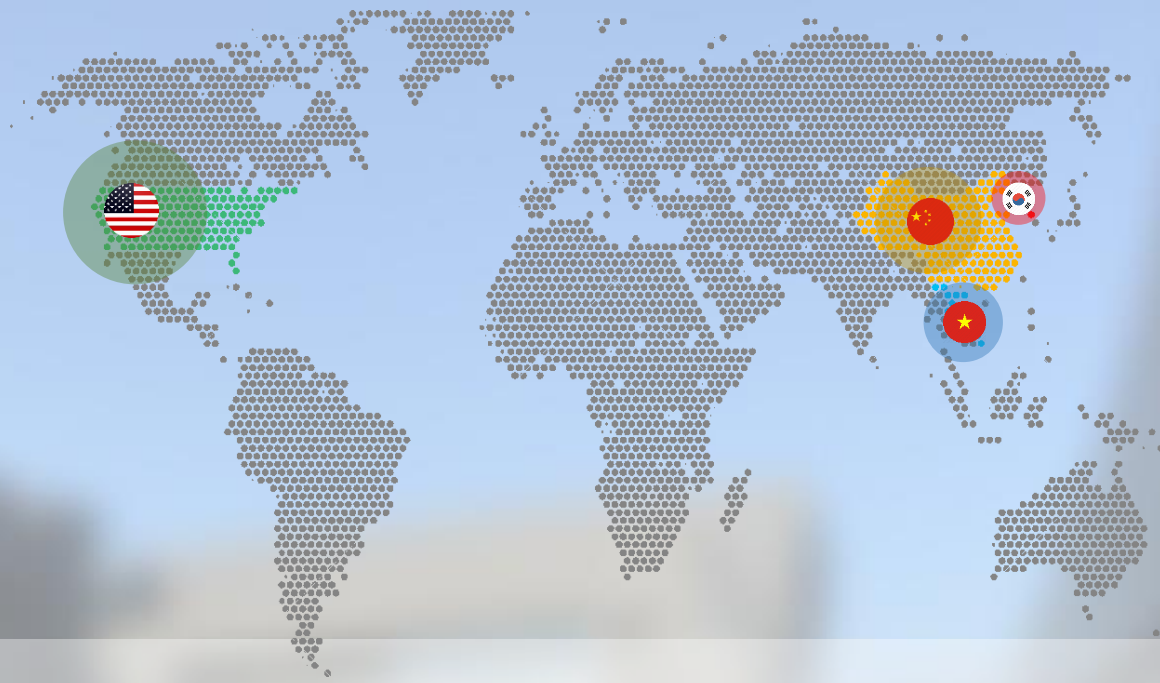
Group Introduction

USA
- AJIN USA
- WOOSHIN USA

VIETNAM
- DAEWOO VIETNAM

CHINA
- AJIN ind. [SHANGHAI]
- AJIN ind. [YANCHENG]
- SHUZHOU A&T TECH

KOREA
- AJIN ind.
- WOOSHIN ind.
- AJIN Car In Tech
- DAEWOO ECC.
- Pinetron



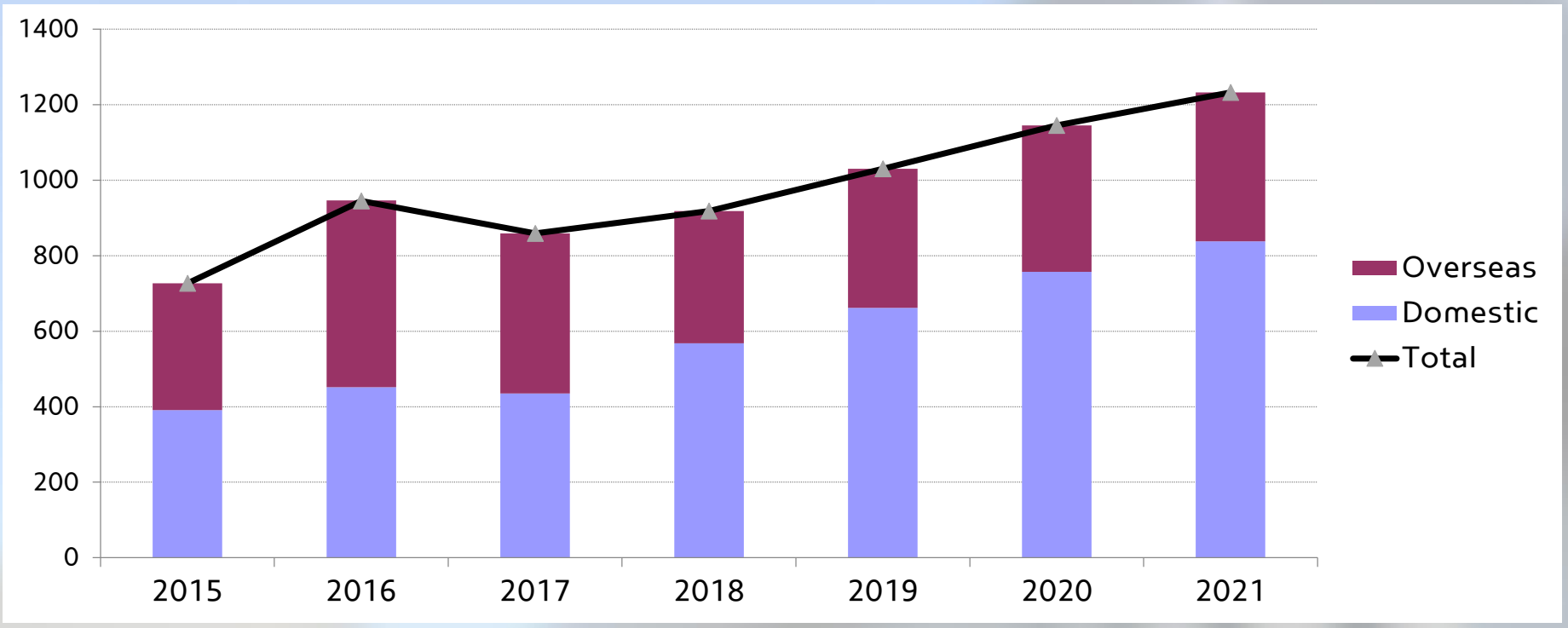
To become a world-class auto parts company!

AJIN Industrial Co., Ltd., spreading throughout the world, will do our best for customer satisfaction with global management strategies, extending automobile parts manufacturing subsidiaries overseas.

001 Company Introduction

Long-term Sales Goal

Million ($)



Classification	2015	2016	2017	2018	2019	2020	2021	Remark
Domestic sales	391	451	435	568	662	757	838	
Overseas sales	336	494	424	350	368	388	394	
Total	727	945	859	918	1,030	1,145	1,232	

001 Company Introduction

Overview

AJIN INDUTRIAL

HEAD office

Establishment : August, 2013

Location : Gyeongsan-si, Gyeongbuk

Area : Land 33,000㎡ / Building : 25,000㎡

Staff numbers : 500 people

Sales : 327 million dollar (Sales projections for 2018)

Main Product : QTR COMPL ,COWL COMPL, RR FLR COMPL, DASH COMPL, SIDE COMPL

AJIN INDUTRIAL

Establishment : April, 1976

Location : Gyeongsan-si, Gyeongbuk

Area : Land 17,000㎡ / Building : 11,000㎡

Staff numbers : 200 people

Sales : Included in Head office's sales

Main Product : QTR INR, DASH, SIDE OTR, COWL, F/APRON, FEM MBR

001 Company Introduction

Overview

AJIN Car In Tech

Establishment : July, 1959

Location : Gyeongju-si, Gyeongbuk

Area : Land 28,000㎡ / Building : 10,000㎡ [Geuncheun Fac.]

Land 8,000㎡ / Building : 5,000㎡ [Mohwa Fac.]

Staff numbers : 130people

Sales : 106 million dollar (Sales projections for 2018)

Main Product : RR P/TRAY CTR, BACK COMPL, QTR INR UPR, SD COMPL, RR FLRRR FLR COMPL, QTR COMPL, SIDE COMPL

WOOSHIN

Establishment : March, 1987

Location : Gyeongsan-si, Gyeongbuk

Area : Land 6,600㎡ / Building : 5,800㎡

Staff numbers : 160 people

Sales : 47 million dollar (Sales projections for 2018)

Main Product : AIR BAG PARTS,ABS/ESP PARTS,MDPS BRKT

001 Company Introduction

Overview

AJIN USA

Establishment : February, 2008

Location : Alabama, U.S

Area : Land 264,000㎡ / Building : 50,000㎡

Staff numbers : 620 people

Sales : 252 million dollar (Sales projections for 2018)

Main Product : F/APRON & MBR COMPL, SIDE COMPL, DASH COMPL, COWL COMPL, T/GATE, QTR COMPL

WOOSHIN USA

Establishment : February, 2008

Location : Alabama, U.S

Area : Land 110,000㎡ / Building : 14,000㎡

Staff numbers : 254 people

Sales : 55 million dollar (Sales projections for 2018)

Main Product : RR COMBI LAMP HOUSING, EXTN QTR INR RR LWR, PNL Sub assembly parts

001 Company Introduction

Overview

AJIN INDUSTRIAL(YANCHENG)

Establishment : January, 2013

Location : Yancheng, China

Area : Land 78,000㎡ / Building : 39,000㎡

Staff numbers : 138people

Sales : 15 million dollar (Sales projections for 2018)

Main Product : : RR COMBI LAMP HOUSING, ROOF, PNL FEM, Sub assembly parts

AJIN INDUSTRIAL(SHANGHAI)

Establishment : February, 2008

Location : Shanghai, China

Area : Land 49,000㎡ / Building : 27,000㎡

Staff numbers : 155 people

Sales : 11 million dollar (Sales projections for 2018)

Main Product : : Air bag parts, ABS/ESP Parts, Seat belt parts, Steering parts

001 Company Introduction

Overview

DAEWOO ECC.

Establishment : Octorber, 1973

Location : Jeongeup-si, Jeonbuk

Area : Land 150,000㎡ / Building : 56,000㎡

Staff numbers : 185people

Sales : 69 million dollar (Sales projections for 2018)

Main Product : ECC(PWM, OBD, REGULATOR, ACU)

DAEWOO VIETNAM

Establishment : May, 1995

Location : Tan Dinh Viliage Ben Cat Disrict Binh Duong Privince S.R. Vietnam

Area : Land 33,000㎡ / Building : 18,000㎡

Staff numbers : 130people

Sales : 18 million dollar (Sales projections for 2018)

Main Product : Parts of ECC(CONDENSOR)

001 Company Introduction

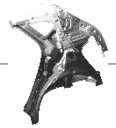
Affiliated Company

002 Main Production I

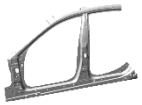
Car Body Product Line

PNL ASS'Y
DASH COMPL

PNL ASS'Y F/APRON
& MBR COMPL



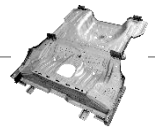
QTR COMPL



SIDE COMPL

PNL ASS'Y
TAIL-GATE COMPL

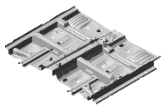
PNL ASS'Y
COWL COMPL



RR FLR COMPL

RING SUN ROOF

PNL ASS'Y-
RR P/TRAY



CTR FLR

COWL
CROSS BAR

PNL ASS'Y
DR COMPL

BATTERY CASE

C/LAMP COMPL

CARRIER ASS'Y

RAIL ROOF

EXTN ASS'Y
QTR OTR RR

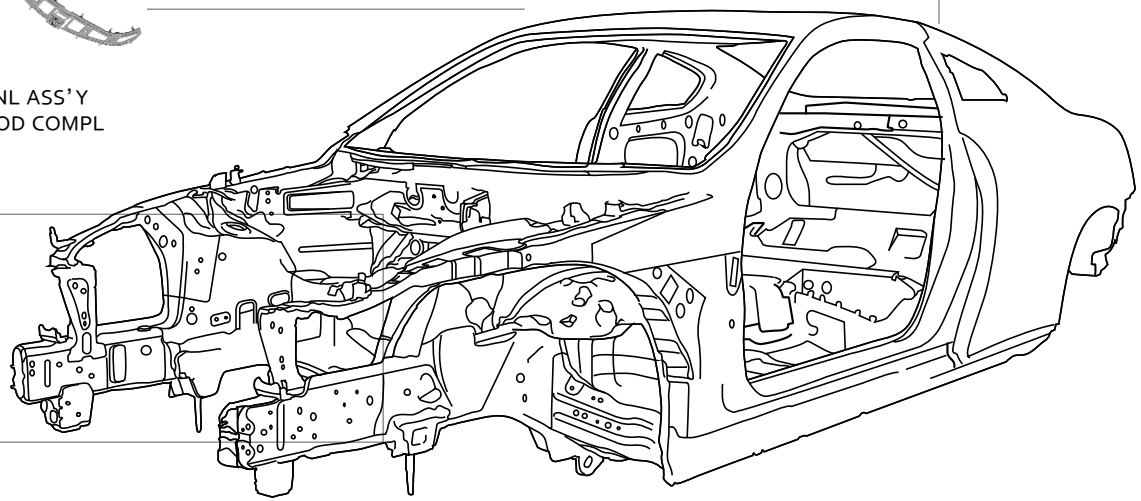
PNL ASS'Y
HOOD COMPL

DAB MOUNTING
PLATE ASS'Y

HOUSING
ASS'Y

ABS BREAK

DOOR PANEL
PLATE



002 | Main Production II

Automotive Parts Product Line

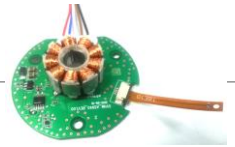
Tip Tronic / LED Indicator

SOLENOID

Voltage Regulator

TAS (Torque Angle Sensor)

CCH (Climate Control Head)



BLDC (Brushless DC Electric motor)

OBC (On Board Charger)

AVM
(Around View Monitor)

ACU (Actuator Control Unit)

PWM (Pulse Width Modulation)

003 Main Clients

Customer

004 R&D Center

R&D Center

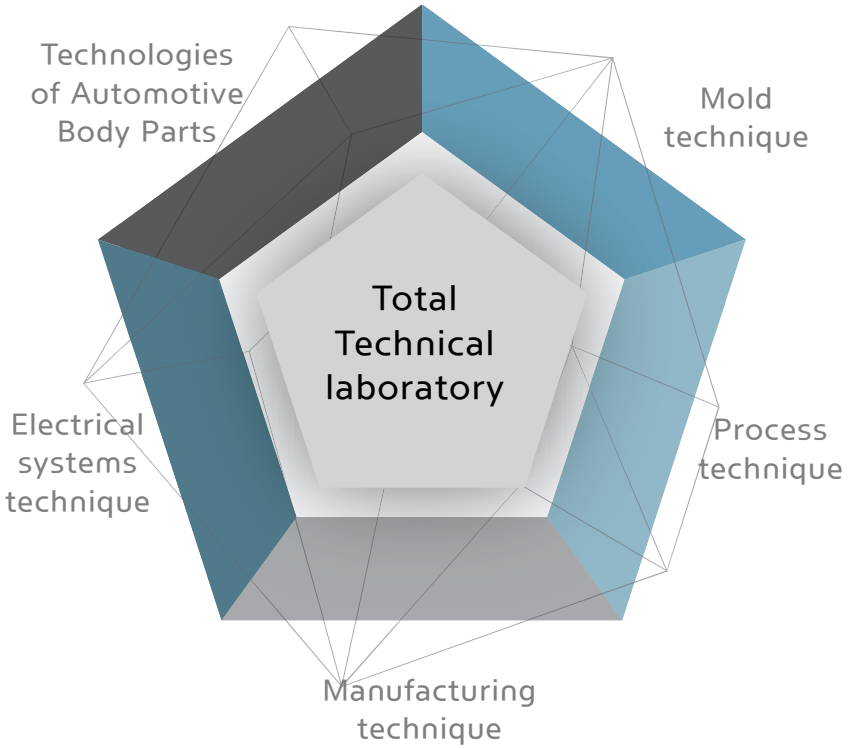
Since AJIN R & D Center was established, our group has achieved impressive results through the effective Task Force.
AJIN R & D Center holds more than 150 patents, carries out a variety of government tasks, and actively engages in industry-academic cooperation activities.

Establishment : March 24, 2001

Number of Personnel : 113

Purpose :

- Innovative process development
- Next generation Auto Resource Development
- Secure Source Technology
- Secure Convergence Technology

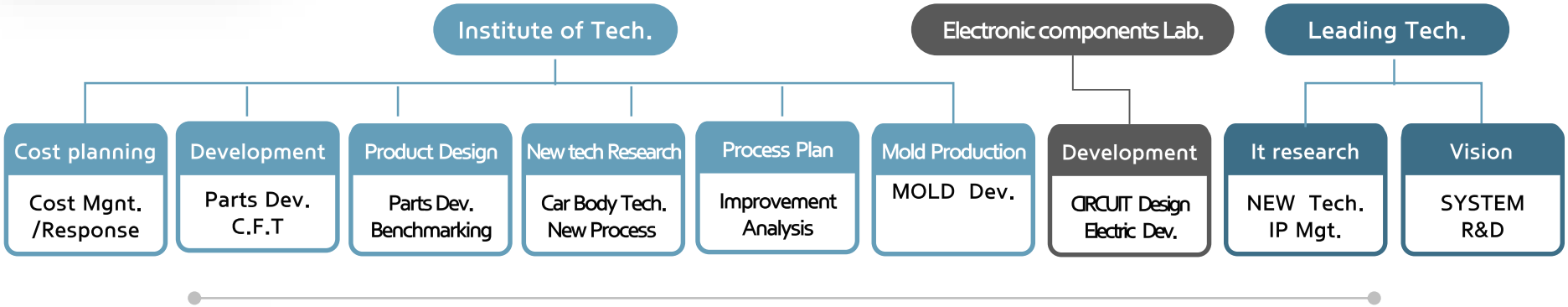


004 R&D Status

R&D Center

R&D Organization

Research personnel 113



Intellectual Property Securing Status

Patents 150

Parts	Main Development Contents
BODY	● Development of Vehicle Lightweight Body Parts Tech. using magnesium ally laminate ● Development of a Laser Assist Roller Hemming System for Magnesium Plate Parts
IT	● Development of Vehicle Component Inspection System using Vision System ● Development of Around View System for Multi-View Function
ELECTRIC DEVICE	● Development of Electronic Vehicle Air Suspension ECU Controller

005 Development of Vehicle Weight Reduction

CFRP

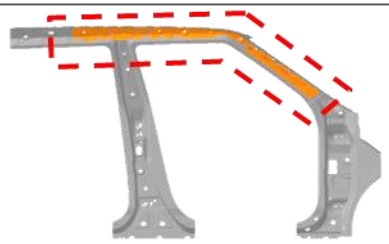
PURPOSE

Development of A-PLR CFRP REINF INSERT for small overlap test

SUMMARY

- Reduction car body weight
  - Parts and weld reduction through integrated design
  - Weight Reduction by applying CFRP material
- High Rigidity Body Structure
  - Reinforce local stiffness of A-PLR for small overlap test

CONTENTS



STEEL

CFRP

[Development Purpose]

CFRP REINF INSERT
- No. of parts: 3 part → 1part
- Weight: 2.8kg/Unit (↓ 26.3%)
- Method: ppg. Oven, Braiding, RTM
- Material: Braiding textile, UD prepreg

[Achievement]

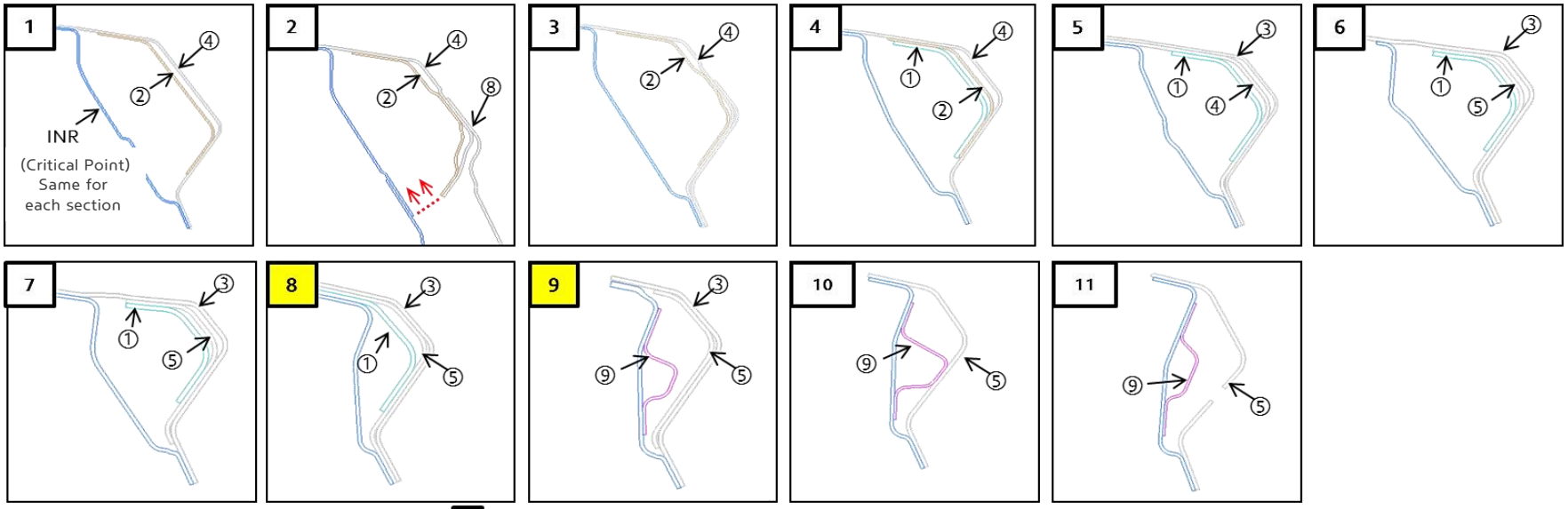
CFRP REINF INSERT
- No. of parts: 3 part → 1part
- Weight: 2.68kg/Unit (↓ 29.4%)
- Method: ppg. Press, Braiding, RTM
- Material: 12K textile, UD prepreg

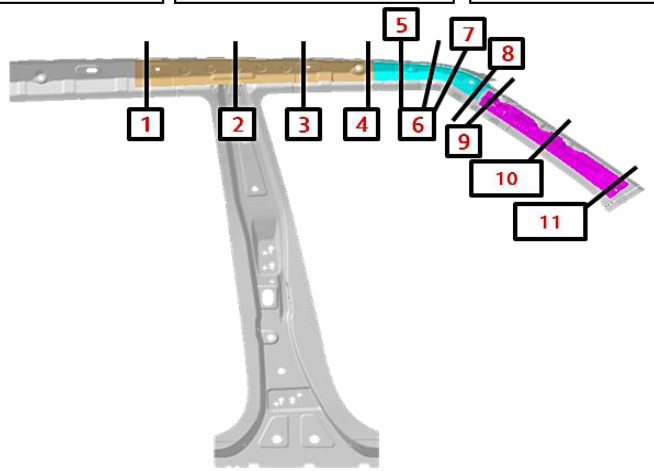
Result of small overlap test simulation
Securing equivalent property to steel

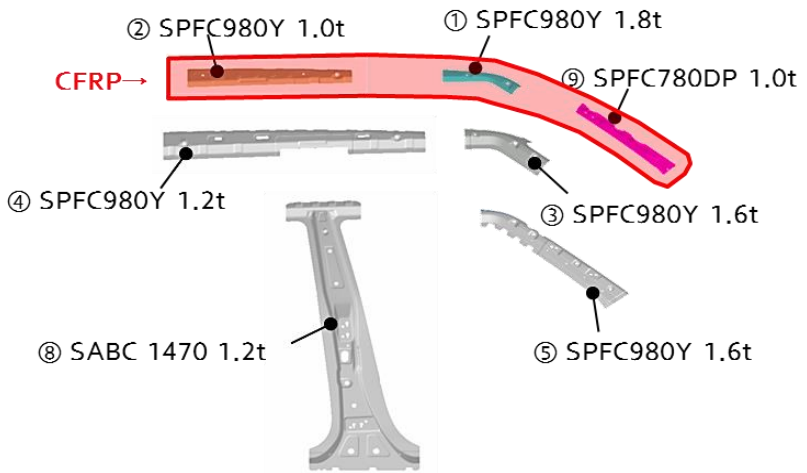
005 Development of Vehicle Weight Reduction

CFRP

▣ Steel Parts Configuration Section



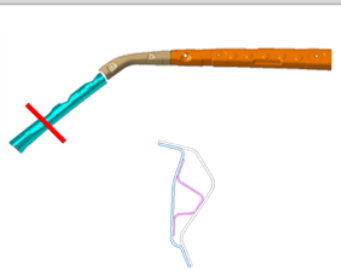
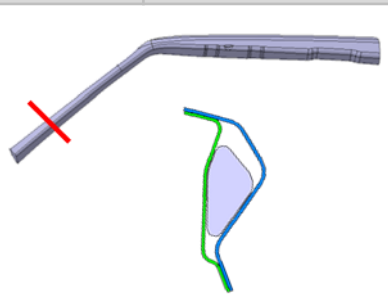
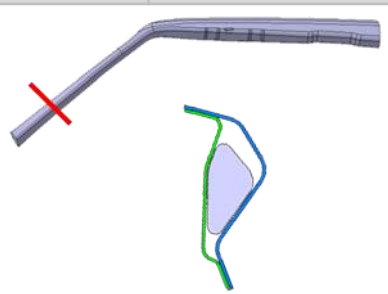
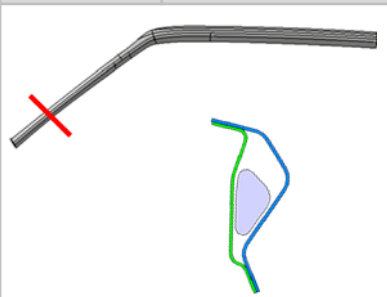




005 | Development of Vehicle Weight Reduction

CFRP

▣ Design Concept

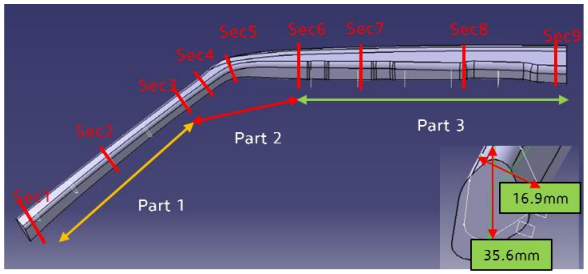
	Current Specifications	Concept 1		Concept 2		Concept 3	
		Max. allowable section	Braiding + UD textile	Max. allowable section	Braiding + UD ppg	Max. allowable section	Braiding + UD ppg
Concept Drawing							
Weight (kg)/unit	3.8	4.6 +0.8 (+21%)		2.6 -1.2 (-32%)		2.7 1.1 (-29%)	
No. of Parts/unit	6	4		4		4	
Materials	SPFC 980Y : 4EA SPFC 780DP : 2EA	UD textile : 2EA Braiding textile : 2EA		UD ppg : 2EA Braiding textile : 2EA		UD ppg : 2EA Braiding textile : 2EA	
No. of tools/ Method	-	1 RTM		2 Oven forming, RTM		2 Internal pressure forming, RTM	
Advantages	-	1. Reduce the no. of process		1. Good for reduce the weight 2. Easy securing adhesive surface 3. Securing rigidity		1. Constant section -> Better forming and process	
Dis-advantages	-	1. Poor weight reduction due to difficult in securing rigidity		1. Increasing no. of process -> Increasing Cost		1. Add bracket for securing adhesive surface -> Increasing weight	

005 Development of Vehicle Weight Reduction

CFRP

▣ CFRP lamination design through single part analysis

- Optimization condition :
  - Equivalent stiffness (displacement) and safety factor 105%
    1) Safety rate calculation : Tsai-wu (FPF factor=0.95)
    2) CFRP density : 1.49 g/cm^3 (Vf=57%/52%)
- Result: Secure formable design ⇒ Require 7t (Thick.) in Part 2
  ⇒ Moldable design ⇒ Predictable and weight reduction
- Weight review result



Current part weight	CFRP weight
1.9kg	1.47kg (77.4%)

Optimization using the maximum thickness for each part

Max. Thickness

SEC. No.		1	2	3	4	5	6	7	8	9
Part1	Braiding Thick. (mm)	1.0	1.0	1.0	1.0	2.9	3.6	2.3	5.2	3.0
	PPg Thick. (mm)	0.1	0.1	0.1	0.1	0.7	0.4	0.2	1.7	1.8
	PART 1 T. Thick (mm)	1.1	1.1	1.1	1.1	3.6	4.0	2.5	6.9	4.8
Part2	Braiding Thick. (mm)	1.0	1.0	1.0	1.0	1.6	7.4	3.1	6.6	3.8
	PPg Thick. (mm)	0.1	0.1	0.1	0.1	0.23	0.13	0.18	0.76	0.77
	PART 2 T. Thick (mm)	1.1	1.1	1.1	1.1	1.8	7.5	3.3	7.4	4.6
Part3	Braiding Thick. (mm)	1.0	1.0	1.0	1.0	1.2	1.6	1.3	3.4	2.7
	PPg Thick. (mm)	0.1	0.1	0.1	0.1	0.16	0.13	0.1	0.27	0.27
	PART 3 T. Thick (mm)	1.1	1.1	1.1	1.1	1.4	1.7	1.4	3.7	3.0

Derive moldable design

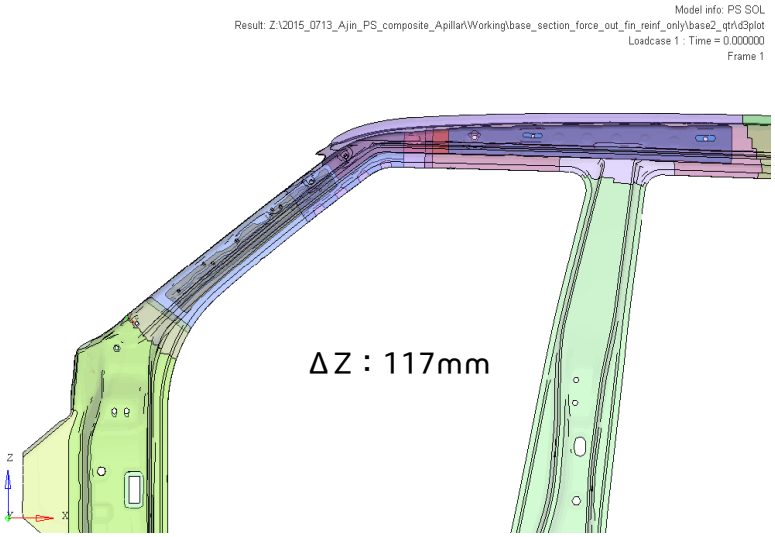
[Braiding+ PPg Reinforcement]

Sec.	Braid (mm)	PPg (mm)	SUM (mm)
1	5	2(0°)	7
2	5	2(0°)	7
3	5	2(0°)	7
4	5	2(±45°)	7
5	5	2(±45°)	7
6	5	2(±45°)	7
7	3.5	0	3.5
8	3.5	0	3.5
9	3.5	0	3.5

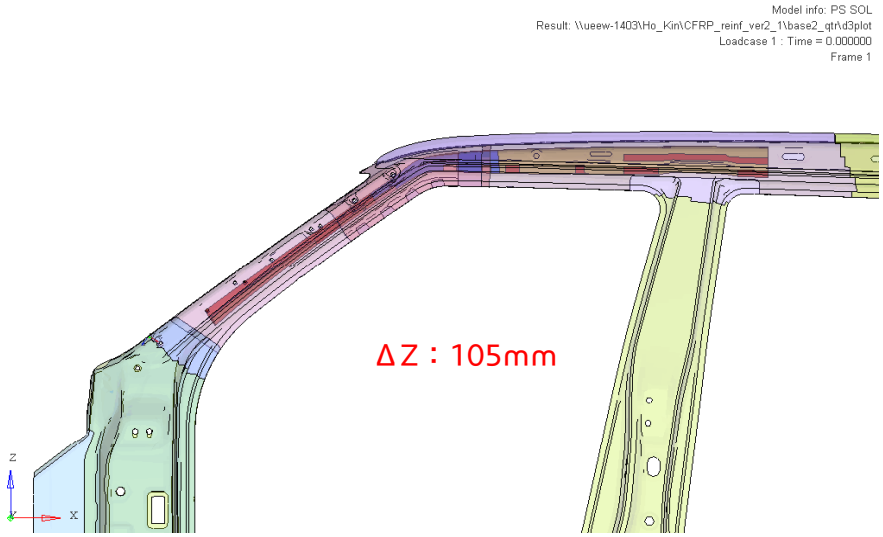
005 Development of Vehicle Weight Reduction

CFRP

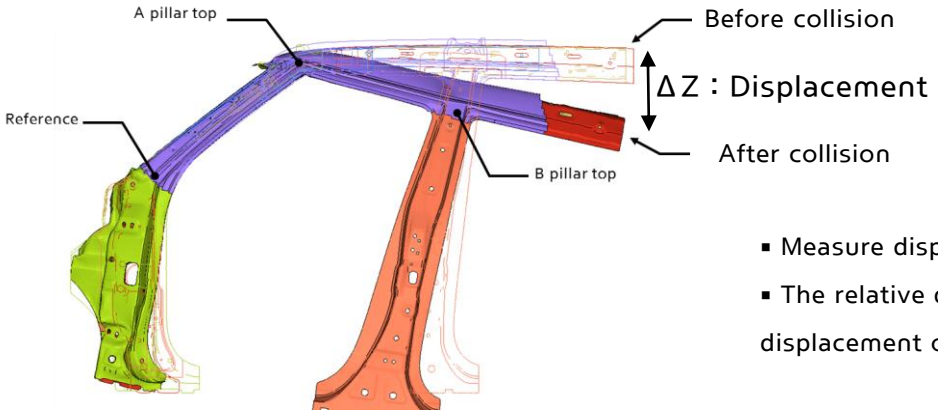
▣ Crash Analysis



Steel inner reinf.



CFRP inner reinf.



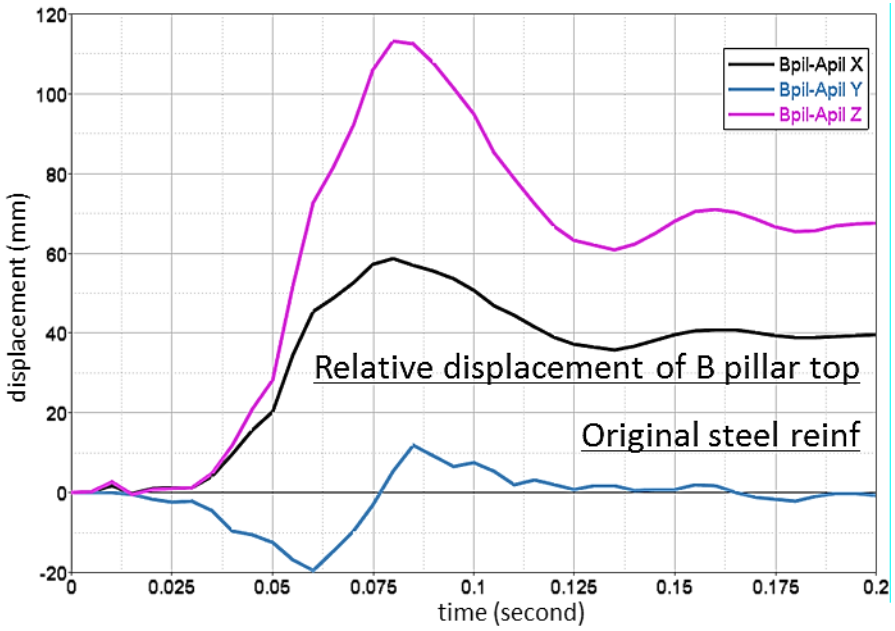
- Measure displacement of A pillar top and B pillar top with reference plane.
- The relative displacement of the B pillar top is measured by subtracting the displacement of the A pillar top from the displacement of the B pillar top.

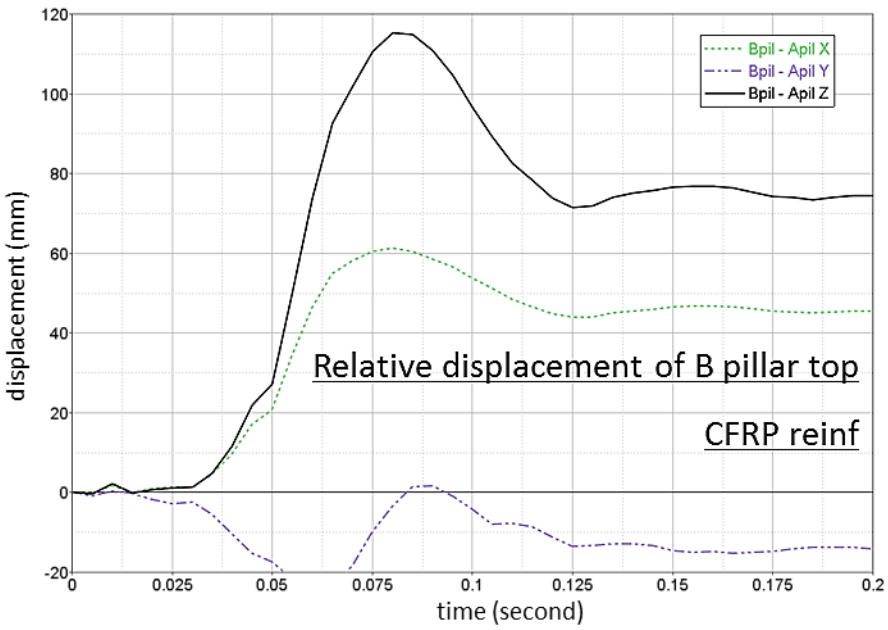
005 Development of Vehicle Weight Reduction

CFRP

▣ Crash Analysis

- Compare the performance of the steel reinforced part and CFRP specifications.
- Two results shows almost same behavior based on comparisons of displacements of the B pillar top with the hinge pillars





005 Development of Vehicle Weight Reduction

CFRP

▣ Adhesive Test Evaluation

▶ Shear bond strength test result

NO.	Adhesive Type	Room temperature (20~25℃, 24h) [MPa]	After heating (210℃, 30min) [MPa]
1	Hysol E-60HP (Henkel)	6.0	17.2
2	Pliogrip 5760B (Ashland)	11.1	13.6
3	Araldite 2011 (Huntsman)	6.6	9.4
4	Plexus AO420 (ITW)	6.8	4.6
5	Duralco 4525 (COTRONICS)	2.7	5.0
6	Adhesive D type (MS-750-60)	N/A	8.2

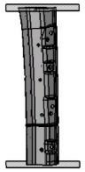
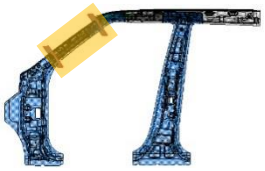
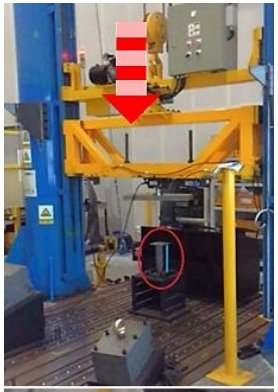
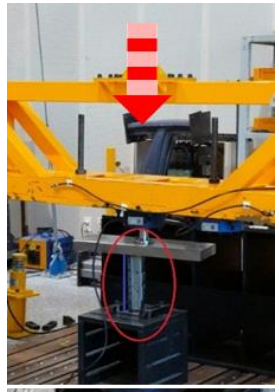
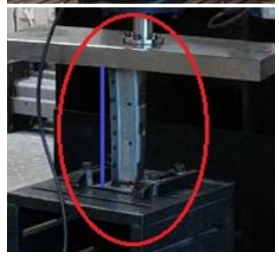
▶ Corrosion resistance test result

순번	Adhesive Type	Before	After
1	Hysol E-60HP (Henkel)		
2	Pliogrip 5760B (Ashland)		

005 | Development of Vehicle Weight Reduction

CFRP

▣ Drop-top Test

	Test evaluation side	Steel		CFRP	
		Before Test	After Test	Before Test	After Test
Test condition	-	Test load : 400kg (Free fall)		Test load : 800kg (Free fall)	
Image	Impact direction    Cutting test side	 	 	 	 

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

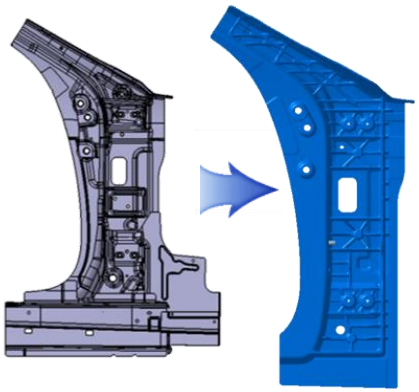
PURPOSE

Developing the same level of integrated aluminum die-casting A-PLR as Steel.

SUMMARY

- Reduction car body weight
  - Parts and weld reduction through integrated design
  - Weight Reduction by applying aluminum ally
- High Rigidity Body Structure
  - Securing body rigidity and increasing collision energy absorption efficiency through application of Rib structure

CONTENTS



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	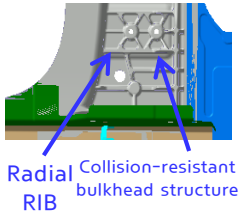
STEEL box section	Radial RIB structure

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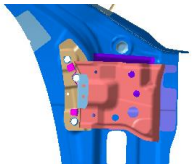
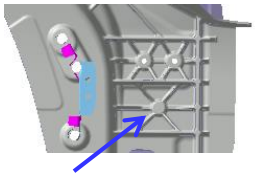
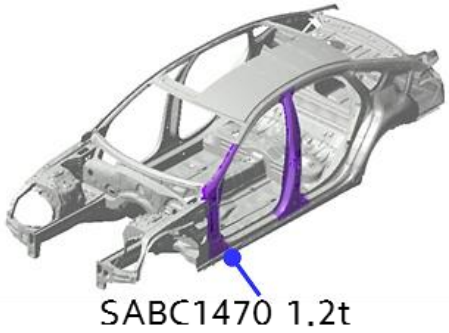
	
STEEL box section	Radial RIB structure

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Required Properties for Aluminum Applied A-PLR

	Steel		AL	
Material	SABC1470		Silafont36	
Property	Yield Strength (MPa)	Elongation (%)	Yield Strength (MPa)	Elongation (%)
	1000	6% ↑	200 ↑ (Highest level)	6% ↑



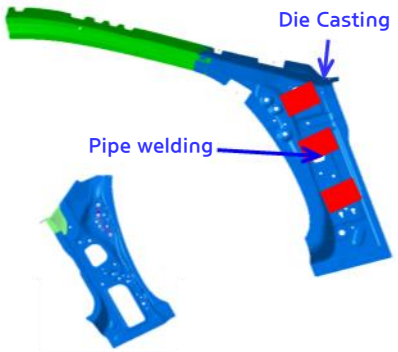
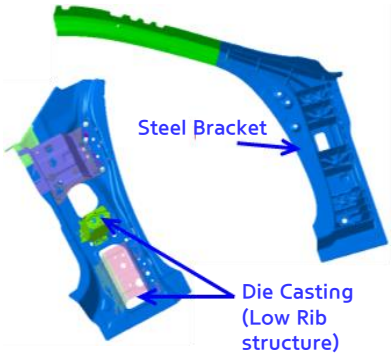
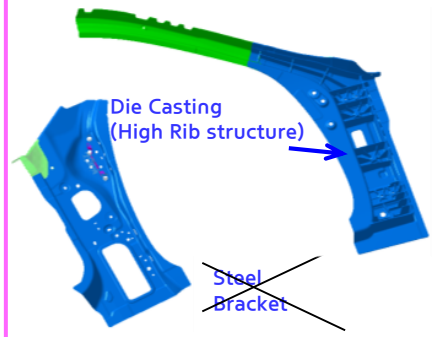
▣ Analysis of High degree Vacuum Die Casting Products for Major Vehicle Body

	Material for high degree vacuum die casting (RHEINFELDEN, Germany)								
	Silafont36			Magsimal59			Castasil37		
Characteristic	• Heat treatment material (T6) • Patent Expiration • Implementation of various mechanical properties by heat treatment • High casting performance (Min. Thicks. 1.5mm)			• Non-Heat treatment material • Patent not expired • Very good dynamic properties (fatigue strength) • High casting performance (Min. Thicks. 2mm)			• Non-Heat treatment material • Patent not expired • Short aging, high dimensional stability • High casting performance (Min. Thicks. 1.5mm)		
Property	Yield Strength (MPa)	Tensile (MPa)	Elongation (%)	Yield Strength (MPa)	Tensile (MPa)	Elongation (%)	Yield Strength (MPa)	Tensile (MPa)	Elongation (%)
	210~280	290~340	7~12%	160~220	210~340	12~18%	120~150	260~300	10~14%
Application cases in oversea s									
Result	• Using silafont36 - Mechanical properties of three cases are similar. - It has cost advantage because of patent expiration.								

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

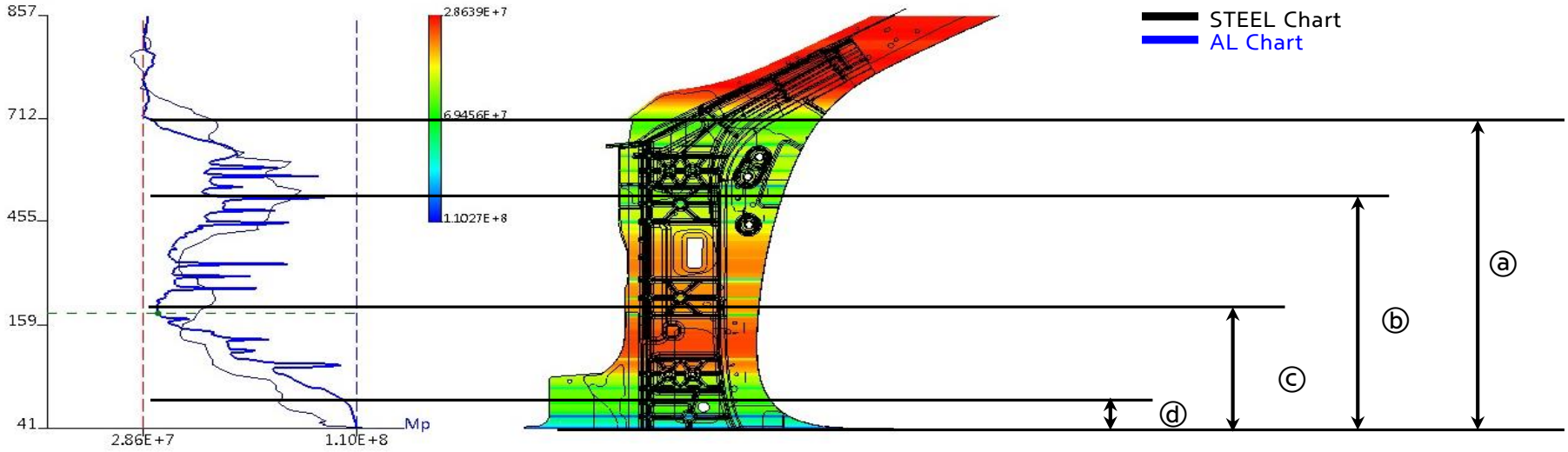
▣ Design Concept

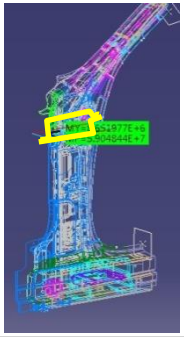
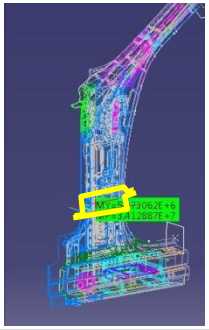
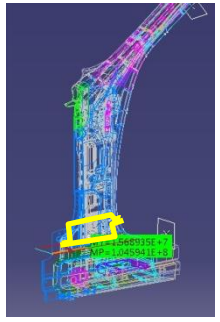
	Current Specifications	Concept 1 (OTR:AL D/C+PIPE)		Concept 2 (OTR:AL D/C)		Concept 3 (OTR:AL D/C+INR)	
Concept Drawing							
Weight (kg)	19.3kg	14.9kg -4.4kg (-23%)		17.1kg -2.2kg (-11.4%)		13.9kg -5.4kg (-28%)	
No. of Parts/Unit	36	22 (-14)		28 (-8)		16 (-20)	
Lightweight effect	Reference (Points: -3 ← 0 → 3)	2	Effect : Low	1	Effect : Middle	3	Effect : High
COST		-3	Increasing cost compared to steel body	-2	Increasing cost compared to steel body	-2	Increasing cost compared to steel body
NO. of Parts		2	Add additional pipe	1	Integrated die casting structure	3	Reduce additional parts
Assembly/ Productivity		-2	Add assembly process by adding pipe	-1	Disadvantage with adding mechanical coupling	-1	Disadvantage with adding mechanical coupling
TOTAL		-1	Disadvantage with Lightweight effect and number of parts	-1	Low Lightweight effect	3	Optimal agenda with Lightweight effect and cost

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Product Design: Geometrical moment of inertia

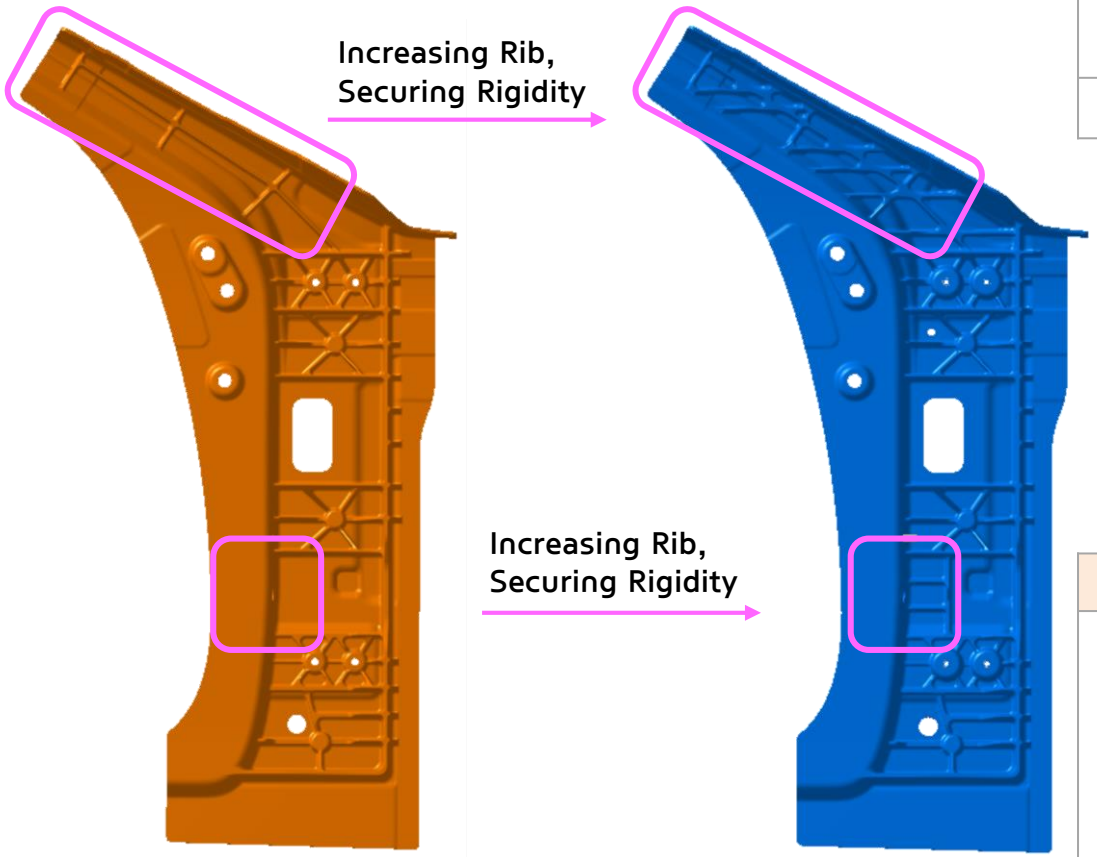


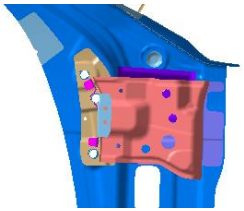
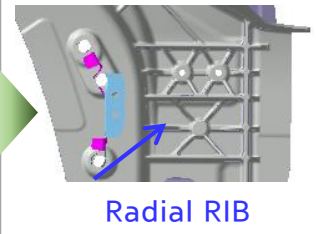
	ⓐ Upper Hinge top	ⓑ Upper Hinge	ⓒ Lower hinge top	ⓓ Lower hinge bottom
Measuring Position	 H: 697mm	 H: 507mm	 H: 213mm	 H: 64mm
Result	Reinforced (Increase Thickness and Rib)	Maintain current specifications	Reinforced (Reinforced Rib)	Reduced (Over strengthened, Reduced Rib)

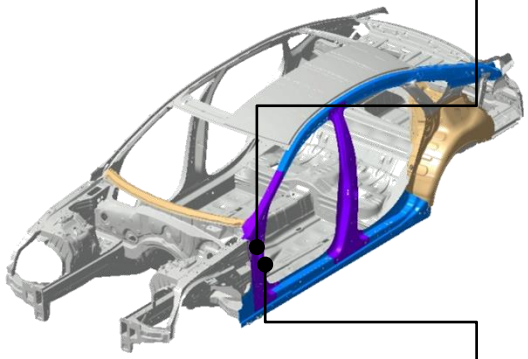
006 Development of Vehicle Weight Reduction

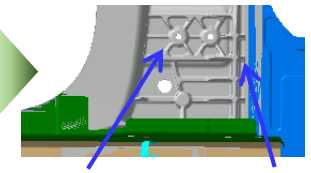
Aluminum Alloy for Die Casting

▣ Product Design: : Change Rib structure



A PLR UPPER	
	 Radial RIB
STEEL box section	Radial RIB structure

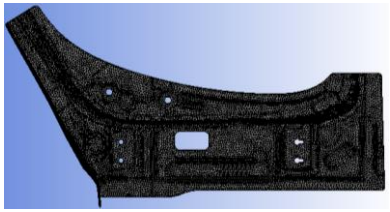
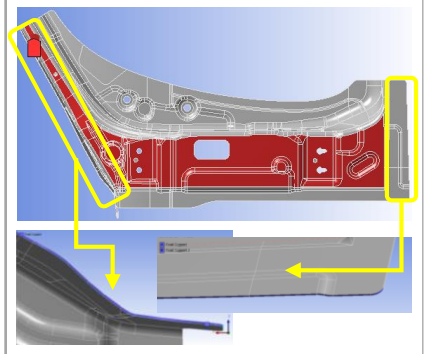
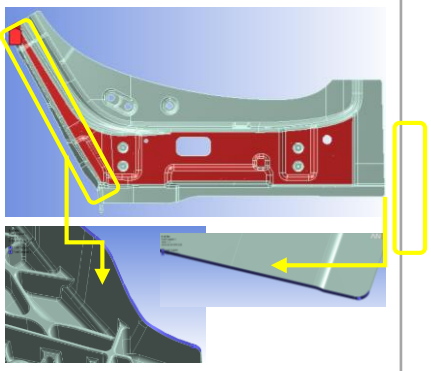


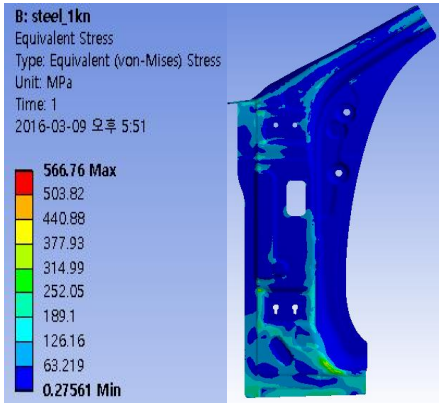
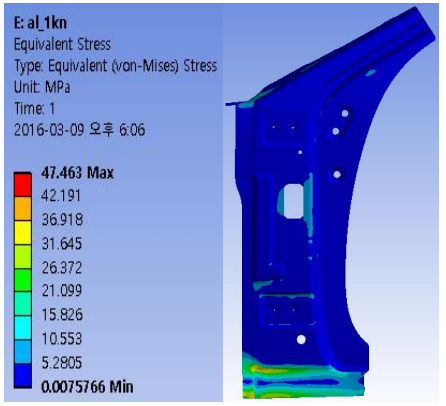
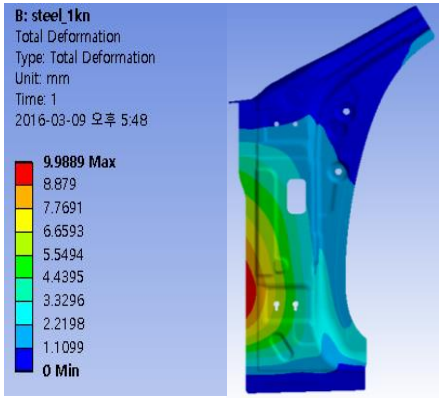
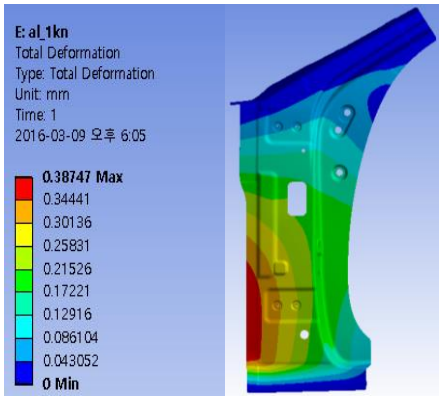
A PLR LOWER	
	 Radial RIB Collision-resistant bulkhead structure
STEEL box section	Radial RIB structure

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Stiffness Analysis

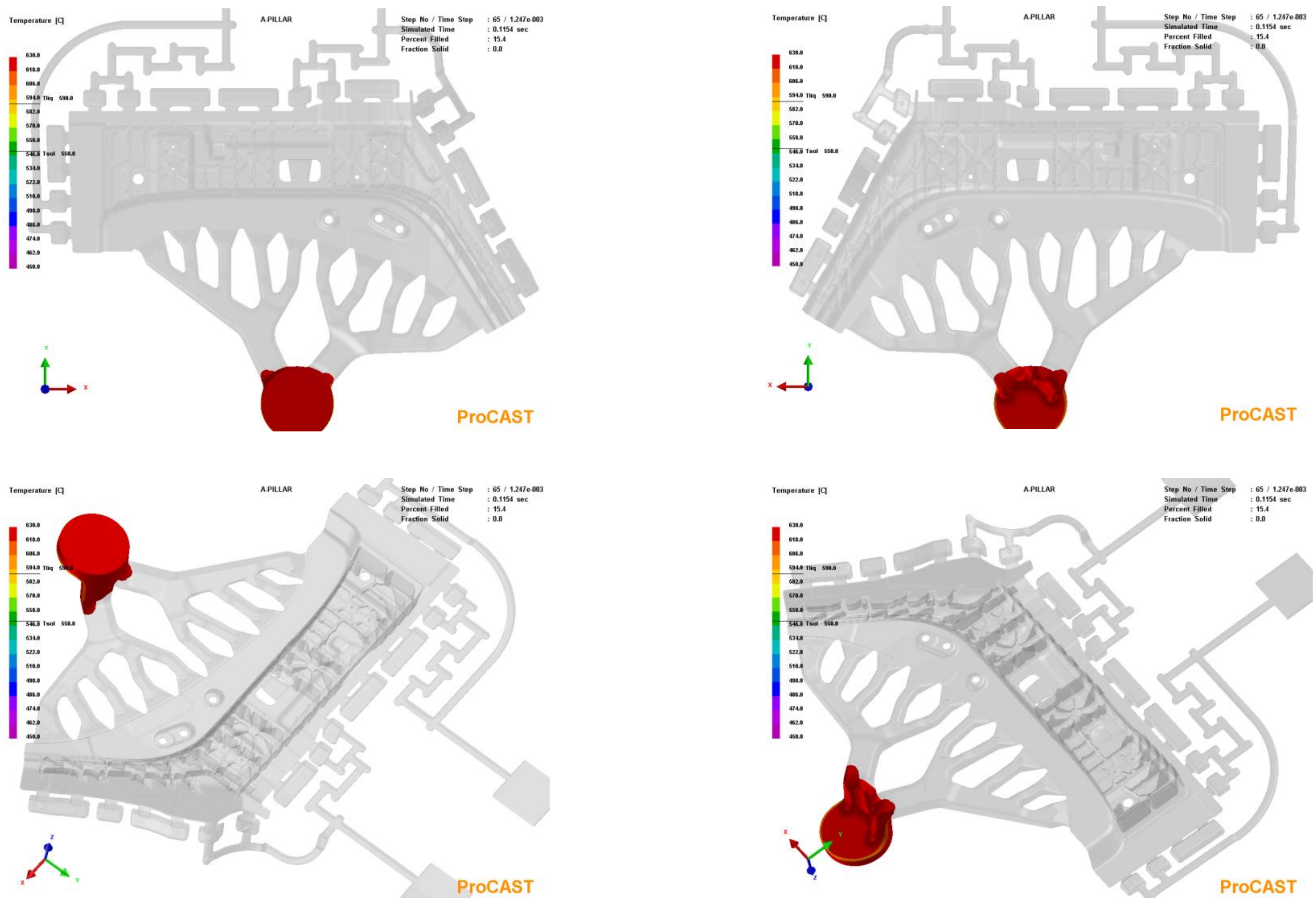
STEEL	AL
FE Modeling	FE Modeling
	
• Node No. : 205,271 • Element No. : 103,506	• Node No. : 355,397 • Element No. : 196,260
• Distributed load (-z Direction) • Boundary condition (2 sections)	• Distributed load (-z Direction) • Boundary condition (2 sections)
	

STEEL (1.0KN)	AL (1.0KN)
	
Max. Stress [567Mpa]	Max. Stress [47Mpa]
	
Max. Displacement [9.98mm]	Max. Displacement [0.38mm]

006 | Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Flow Analysis



006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Material Development

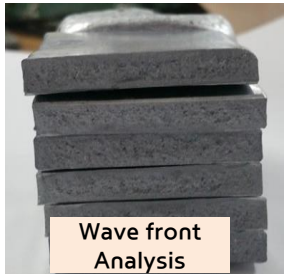
Dissolution & GBF Treatment

Dissolution	3 tons		Ladle Dissolution
GBF	1st T/O	5 min.	N_2 Gas
	Resting	10 min.	-
	2nd T/O	10 min.	Ar Gas

Molten metal Correction Analysis

- Wave front Analysis using K-MOLD

Grade	K Value	Result
A	0.16 (1/6)	OK
Below Grade C (1.0~2.0), retreatment needed		



- Cleanliness analysis by Decompression Solidification method

	1st T/O	Resting	2nd T/O
D.I Value	3.13	1.20	1.63
D.I Value : 0 ~ 3.0 (Excellent cleanliness)			

Ingredient Analysis

Ingredient	Cu	Si	Mg	Zn	Fe	Mn	Ti	Sr
SPEC (silafont36)	0.03↓	9.50~11.50	0.10~0.50	0.08↓	0.15↓	0.50~0.80	0.04~0.15	0.01~0.02
Holding furnace 1st T/O	0.25	10.1	0.41	0.08	0.11	0.563	0.058	0.014
Holding furnace 2nd T/O	0.25	10.2	0.392	0.11	0.12	0.56	0.058	0.013
Holding furnace 3rd T/O	0.376	10.2	0.38	0.137	0.15	0.516	0.057	0.015
ADC12	1.50~3.50	9.6~12.0	0.3↓	1↓	1.3↓	0.50↓	0.30↓	-

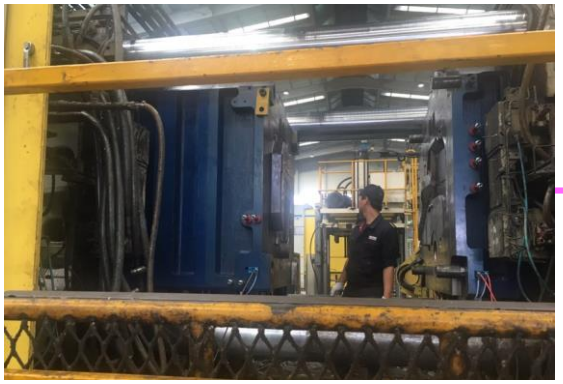
006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Production of Prototype

- Dissolving material

- Input in to Holding furnace



- Mold Mounting, Equipment Setup

- Mold cleaning & Operating Heater

- Molding

- Washing Process

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ Casting Condition

Casting Condition

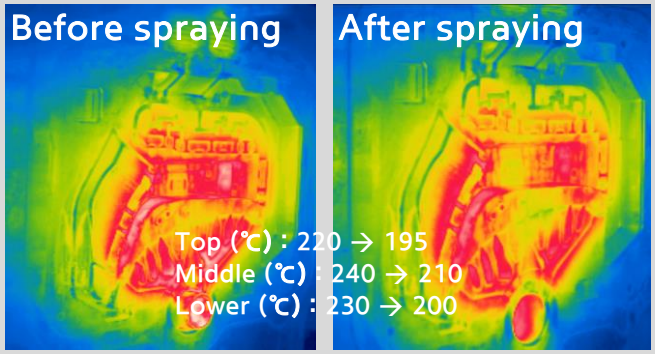
Condition	Metal pressure (Mpa)	Low Speed (m/s)	High Speed (m/s)	High Speed Section (mm)	GATE Sectional area (mm^2)	GATE Passing speed (m/s)	Filling Rate (%)
A PILLAR	60	0.48	2.2	200	1289.2	23.68	34.20

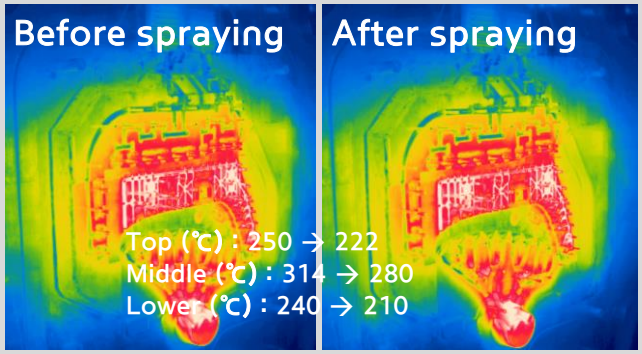
- Sleeve Diameter (130mm), 슬리브 Length (1,030mm)

Temperature Condition

Condition	Furnace Temperature (℃)	Mold Heater(℃)	Mold Temperature (Fixed)	Mold Temperature (Operating)	Vacuum Position (mm)	Vacuum Time (Sec)	Vacuum Degree (mmHg)	DIE TiME(Sec.)	Cycle time
A PILLAR	660	135 (Fixed) 180 (Operating)	Refers below		450	5	150	13	70

Fixed		Operating	
Before spraying	After spraying	Before spraying	After spraying





006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

▣ T/O Result

Casting Date

- 2016. 08. 16 Samkee Automotive (Seosan Factory 2250-5), Applied Material: Silafont36

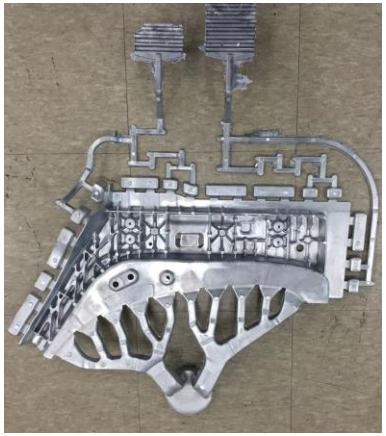
Weight

Product	Injection weight (g)	Material weight (g)
A PILLAR	11,206	4,522

Injection Condition

Product	Temperature (℃)	Low (m/s)	High (m/s)
A PILLAR	660	0.48	2.2

Casting Result



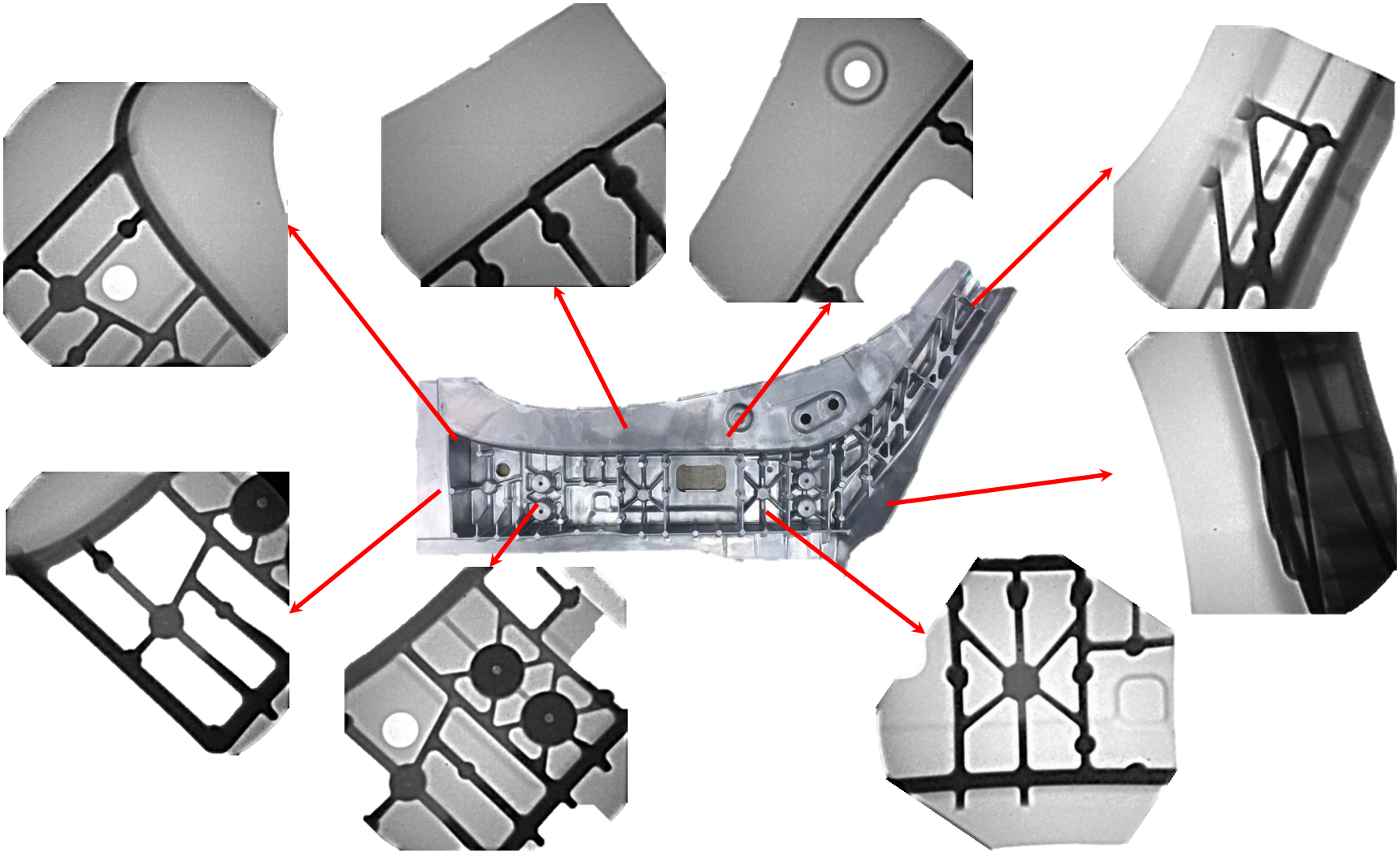
Conclusion

- Ingredient Inconsistency due to mixing with ADC12 residue in the furnace
  (Cu – 0.03 → 0.376, Zn – 0.08 → 0.137 : Spec over)
- Mg Additional input (Actual value **0.380 wt%**)

006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

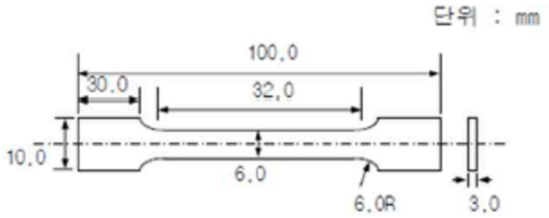
▣ Test evaluation: X-ray measurement



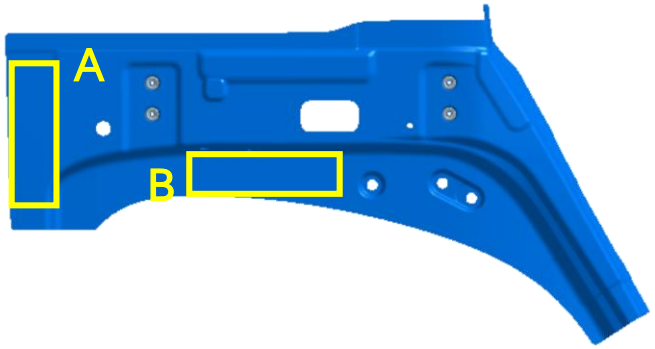
006 Development of Vehicle Weight Reduction

Aluminum Alloy for Die Casting

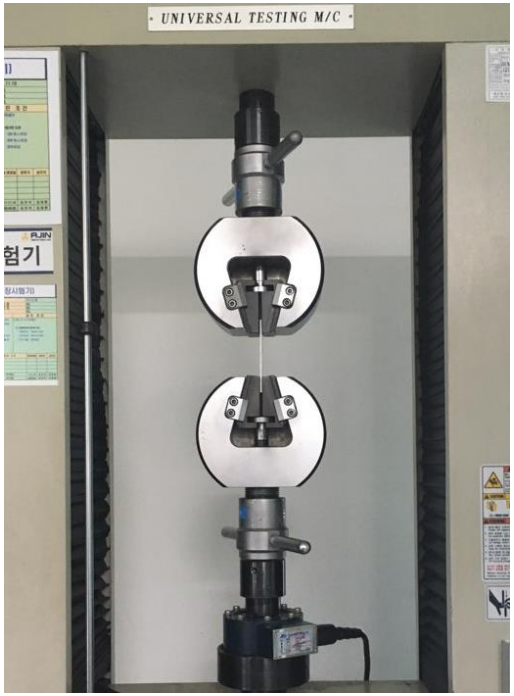
▣ Test evaluation: Tensile test



<인장시편 형상 : ASTM E8M>



- Tensile Test



- Test Result

Sample No.	Yield Strength (MPa)	Tensile strength (MPa)	Max. displacement (mm)	Elongation (%)
1차 T/O A	153.56	277.14	1.96	6.1
1차 T/O B	307.03	307.03	1.85	5.8
2차 T/O A	248.82	296.94	2.01	6.3
2차 T/O B	264.60	320.16	2.81	8.8
3차 T/O A	237.43	297.43	2.34	7.3
3차 T/O B	260.77	304.87	1.77	5.5
4차 T/O A	176.24	273.81	2.00	6.3
4차 T/O B	231.37	331.04	2.45	7.7

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