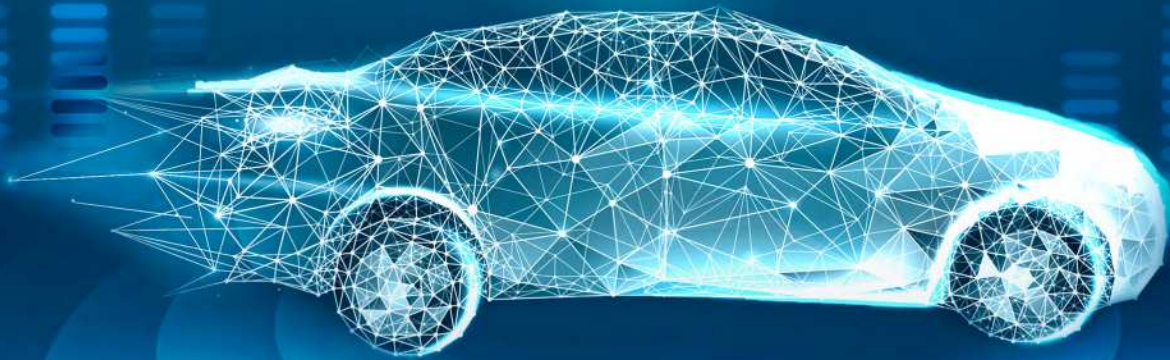


ELECTRIC VEHICLE PARTS SPECIALIST



ASAN FRICTION WELDING CO.,LTD.
ELECTRIC VEHICLE PARTS SPECIALIST

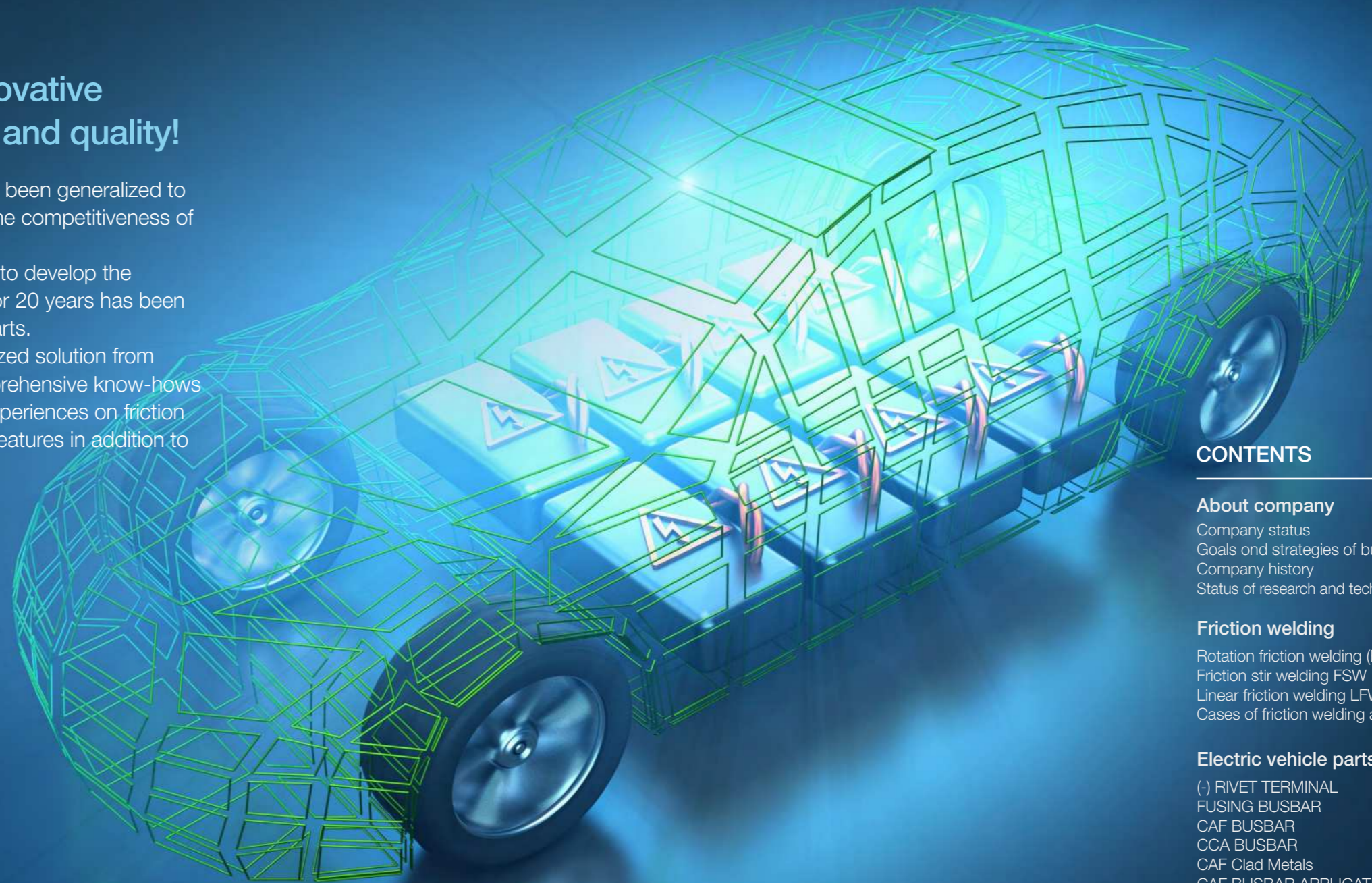
Global Leading Company In Green Energy

Tiptop company with innovative technology development and quality!

Application of friction welding process has been generalized to increase the productivity and strengthen the competitiveness of prime costs.

Our company which has been committed to develop the technology in the field of friction welding for 20 years has been producing more than millions of various parts.

Now, we hope that we can find the optimized solution from A.F.W Co., Ltd., which accumulates comprehensive know-hows including academic research and many experiences on friction welding process and various mechanical features in addition to metal engineering.



CONTENTS

About company

- Company status
- Goals and strategies of business
- Company history
- Status of research and technology development

Friction welding

- Rotation friction welding (RFW)
- Friction stir welding FSW
- Linear friction welding LFW
- Cases of friction welding application

Electric vehicle parts

- (-) RIVET TERMINAL
- FUSING BUSBAR
- CAF BUSBAR
- CCA BUSBAR
- CAF Clad Metals
- CAF BUSBAR APPLICATIONS

Factory in Samcheong (Head office)



Address	51 Gongdan-ro 1-gil, Waegwan-gup, Chilgok-gun, Gyeongbuk
Date of establishment	May 2016
Main products	Lithium ion battery parts for electric vehicles
Lot area	7,603 m ²
Building area	3,506 m ²

Factory in Geumsan



Address	32-32 Gongdan-ro 5-gil Waegwan-gup, Chilgok-gun, Gyeongbuk
Date of establishment	September 1998
Main products	Drill rod for drilling / Heavy equipment AxleShaft / Friction welding service parts, etc.
Lot area	3,245 m ²
Building area	1,867 m ²

Factory in Naksan



Address	117 Industrial Complex 2 2-gil, Waegwan-gup, Chilgok-gun, Gyeongbuk
Date of establishment	July 2012
Main products	Lithium ion battery parts for electric vehicles
Lot area	3,684 m ²
Building area	2,192 m ²

Research Institute in Guji Factory



Address	Guji-myeon, Dalseong-gun, Daegu (Within Daegu National Industrial Complex)
Date of establishment	March 2020
Main products	Secondary cell parts for electric vehicle, BUSBAR for electric vehicle
Lot area	12,644 m ²



Pursue the best value with industry's top technology and cost competitiveness!



Present ways to reduce the prime cost through friction welding

2010'

- 2020.03 Established factory only for electric vehicle parts (Guji Factory)
- 2019.07 Listed on KOSDAQ
- 2018.12 \$10 Million Export Tower (Korea International Trade Association)
- 2018.08 Certification of IATF 16949
- 2017.12 \$3 Million Export Tower (Korea International Trade Association)
- 2017.12 Certified as Gyeong-buk PRIDE Product (Gyeong-buk)
- 2017.12 Received Grand Prize as SME in Gyeong-buk
- 2017.03 Certified as Global Enterprise Company (MSS)
- 2016.12 Recognized as an excellent company for youth employment in Gyeong-buk
- 2016.06 Received the Best Partner Award from Samsung SDI
- 2016.05 Established an electric vehicle component-dedicated factory (head office)
- 2015.12 Certified as a root manufacturing industry (in the welding field)
- 2015.08 Selected as one of 100 Major pride companies in Gyeong-buk
- 2015.06 Received INNOBIZ Certificate from the Agency for Technology and Innovation
- 2013.06 Designated as a woman-friendly company
- 2013.04 Established affiliated R&D Center
- 2013.02 Certified as a component material dedicated company
- 2012.07 Established an electric vehicle component-dedicated factory (Naksan factory)
- 2010.11 Certification of ISO/TS16949

2000'

- 2009.10 Registered as Samsung SDI partner (Supplied lithium-ion battery parts for electric vehicles)
- 2007.11 ISO 14001 certificate
- 2006.04 Supplied S&T Dynamics AxleShaft
- 2006.03 Supplied Dymos CO.,LTD. large-sized AxleShaft
- 2005.09 ISO 9001 certificate
- 2003.06 Completed to develop friction welding for next generation PropellerShaft (Aluminium + Steel) for Hyundai Motors
- 2002.03 Registered as partner of DoosanInfracore CO.,LTD.
- 2000.07 Registered as partner of Volvo Construction Equipment Korea

1990'

- 1999.09 Participated in Delphi Automotive Systems Corporation CV Joint development project
- 1999.06 Exported Pre-Mat Drilling Supplies Pte Ltd (Singapore)
- 1998.09 Established A.F.W CO.,LTD.

R&D

- 2019.10 Patent [No. 10-2047794] Manufacturing method of Busbar (CCA)
- 2019.10 Patent [No. 10-2034012] Manufacturing method of Busbar using friction stir welding
- 2019.10 Patent [No. 10-2084011] Manufacturing method of Busbar (CAF)
- 2019.09 Patent [No. 10-2019069] Manufacturing method of Busbar for fuse
- 2019.09 Patent [No. 10-2024515] Manufacturing method of Busbar using linear friction welding
- 2018.12 ~ 2019.04 Domestic and overseas patent application : CAF BUSBAR manufacturing method and other 9 cases (Including design and trademark application)
- 2017.08 ~ 2017.09 Technical support proejct (Gyeongbuk Hybrid Parts Research Institute) (Project name : Technology for improving copper forging molding lifespan of cathode terminal)
- 2016.05 Patent [10-1619266] Friction Welder using braking action of inertia offset
- 2016.02 Patent [10-1619266] Friction Welder using braking action of inertia offset
- 2014.12 Patent [10-2015-0003343] Joining of Dissimilar Materials using Servo type Friction welding and it's bonding
- 2014.06 ~ 2014.12 Patent [10-1476590] Cutter using forward and reverse rotation
- 2014.06 Industry-Academia Joint Project (KIT) (Title : Development of Bonding Process of Dissimilar metals by Friction Welding(TiAl + SCM440)
- 2014.06 Patent [10-1411220] Brake-free Friction Welding Machine
- 2013.10 Patent [10-1317497] High Frequency Motor for friction welding
- 2013.08 ~ 2015.07 Project (MSS) (Title : Development of (-)Rivet Terminal using Friction Welding method of Copper forging products)
- 2013.07 ~ 2013.12 Project (KITECH) (Title : Development of Al-Cu Friction Welding Electrode Parts Forging Mold Lifetime Enhancement Technology)
- 2013.04 Established affiliated R&D Center
- 2011.09 ~ 2012.09 Friction Welding Technology Consulting for HAN-HWA

I&D

- 2019.05 Developed 120-ton friction wlder
- 2018.07 Developed process cleanser only for (-)Rivet Terminal
- 2017.04 Developed hot-air dryer for cutting goods with Cu and Al materials
- 2017.01 Developed tray cleanser
- 2016.12 Developed separator for cutting goods with Cu and Al materials
- 2016.07 Developed bid remover for Cu+Al welding (2Cavity)
- 2016.07 Developed 2Cavity trimming automatic supply device only for (-)RivetTerminal
- 2016.05 Developed forging machine only for (-)RivetTerminal (HeadingMachine)
- 2015.12 Developed bid remover of Cu+Al welding
- 2015.12 Developed dual horizontal friction welder only for (-)Rivet Terminal
- 2015.09 Developed dual vertical friction welder only for (-)Rivet Terminal
- 2015.07 Developed CountingMachine only for (-)Rivet Terminal
- 2015.03 Developed press-type cutter for cutting Cu, Al raw materials
- 2015.01 Developed packaing automation device only for (-)Rivet Terminal
- 2014.12 Developed cam automatic cutter for cutting Cu, Al raw materials
- 2014.05 Developed vertical friction welder only for (-)Rivet Terminal (Auto LoadingType)
- 2014.05 Developed Copper forging press and transfer mold
- 2013.05 Developed automatic forging facilities only for (-)Rivet Terminal
- 2012.10 Developed automatic trimming facilities only for (-)Rivet Terminal
- 2011.06 Developed horizontal fcition selder only for (-)Rivet Terminal (Auto LoadingType)
- 2010.10 Started producing mass production line of (-)Rivet Terminal (No. 1 Line)
- 2010.04 Developed fiction welder only for (-)Rivet Terminal (ManualType)
- 2009.09 Developed Cu + Al friction terminal for (-)Rivet Terminal (Using existing facilities)

FRICION WELDING



ASAN FRICTION
WELDING

FRICION WELDING

Next-generation technology which joint of nonferrous metal, cost competitiveness and various applications are available

01. RFW (Rotary Friction Welding)

High pressure welding that welds with strong mechanical pressure when dissimilar materials become the state enough to be joined by rotating them with high speed of 2,000 r.p.m and generating the friction heat

Process of rotation friction welding



1. Fix welding materials to the side of SPINDLE and TABLE side



2. Quick rotation for SPINDLE, forward along with TABLE side



3. Start contacting with materials, friction heating



4. Sudden stop of SPINDLE, UP SET pressurization



5. Cut uplifted parts made when heating pressurization



6. Welding completed



High-strength joint

High joint strength compared to other welding

Low cost

Reduce material costs, shorten processing time

Stable quality

No defects of bubbles on welding part

Nonferrous metal joint

Not available from general welding

Eco-friendly

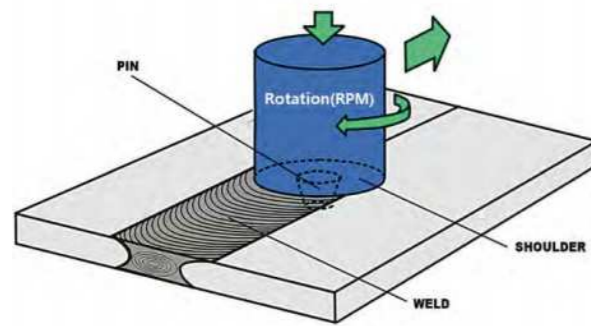
Low CO₂ emission

Various applications

Automobiles, ships, drilling equipment, etc.

02. FSW (Friction Stir Welding)

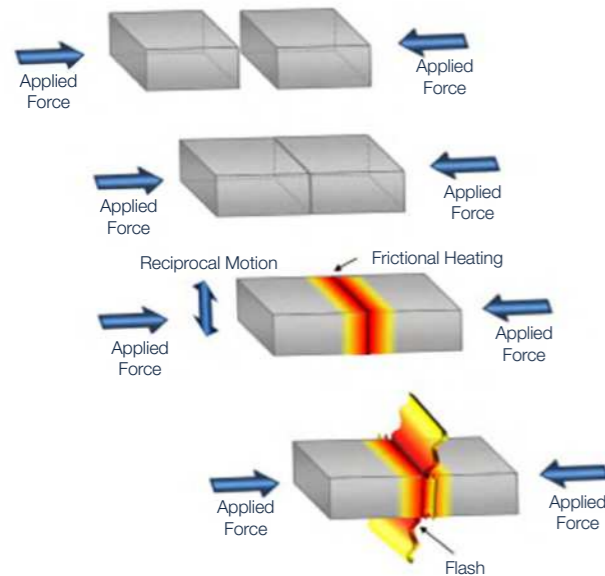
When Nonconsumable tools which have probes are inserted to conjoined materials while rotating them at high speed, the heat is generated by mutual friction of tools and conjoined materials, and this friction heat makes materials around tools soften. This is a welding method which materials on both side of junction are forced to join by plastic flow of materials generated by the stir of tools.



Friction Stir Welding

03. LFW (Linear Friction Welding)

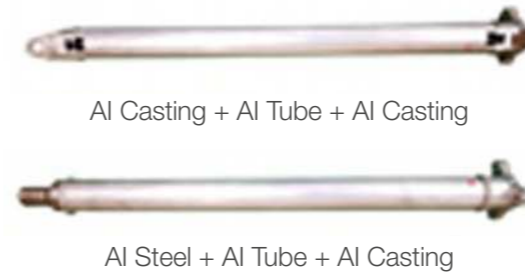
While RFW welds materials by generating friction heat with about 1,200°C temperature using rotation, LFW welds materials after making proper temperature by making friction between two materials using linear vibratory motion.



Linear Friction Welding

Cases of RFW application

Propeller Shaft



Crank Shaft



C/V Joint



Auto Compressor Part



Drill Rod



Al Yube + Stainless Steel



Skid Loader Axle Shaft



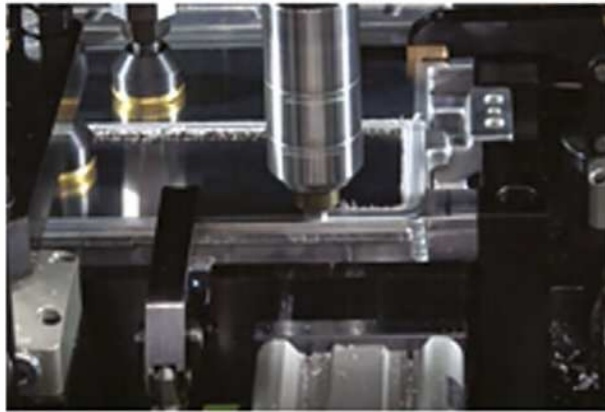
Brake Disk



SS400 + SCM440 + SCM440

Al + Alloy Steel

05. Cases of FSW application



06. Cases of LFW application



ELECTRIC
VEHICLE
PARTS



01. (-) RIVET TERMINAL

Copper + Aluminum

(-) RIVET TERMINAL

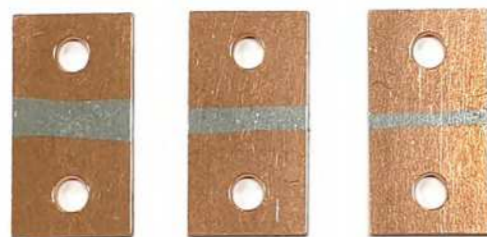
As an output terminal of lithium ion secondary cell battery a part that is assembled to CapAss'y, it is a core part that serves as intermediary material that allows the laser welding of homogeneous materials



Cathode friction welding terminal

02. FUSING BUSBAR

- Electric contact device that is designed to block current by melting one of components when electric overload occurs
- Busbar that blocks the current flow by being broken before electric parts when the current flows strongly
- Manufactured of metal such as tin or lead that is easily melted by heat



03. CAF BUSBAR

Developed CAF BUSBAR for the first time in the world

Emerged as the next-generation product with its productivity and quality

CAF BUSBAR (Copper Aluminum Friction Welding BUSBAR)

Use only advantages of friction welding and forging technology, manufacture parts with desired thickness and width by applying forging technology after joining Cu and Al with friction welding



Maximize joint strength by applying friction welding technique → **High Strength**

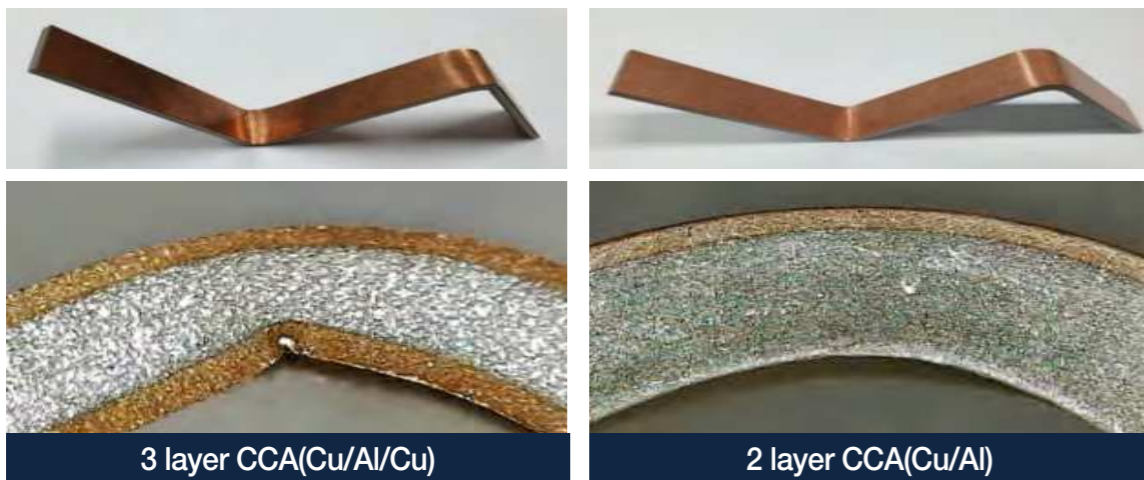
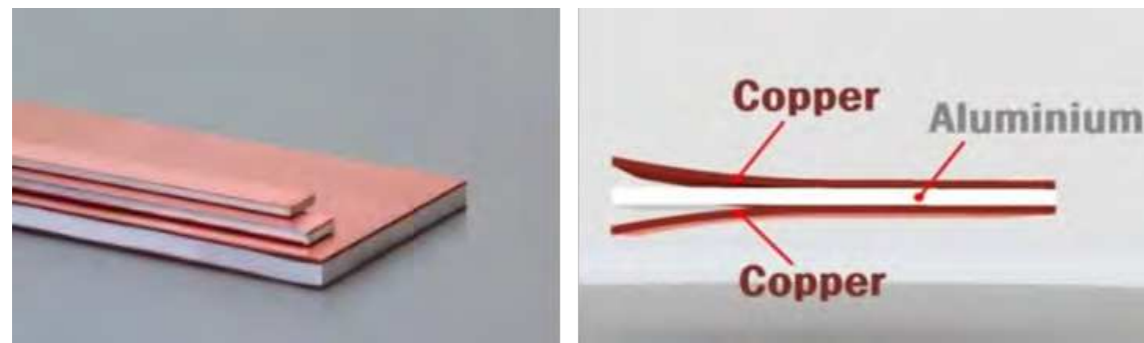
Replace expensive copper with cheap aluminum → **Cost Reduction**

Use aluminum instead of copper which is used as a conductor → **Light Weight**

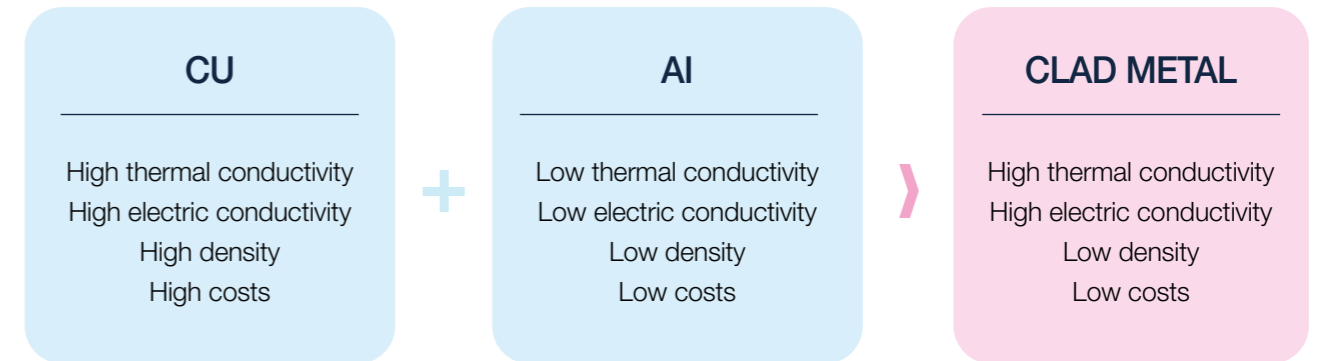


04. CCA BUSBAR(Copper Clad Aluminum BUSBAR)

A part as a conductor for electricity by making copper as the skin layer through hot rolling or strand casting of Copper and Aluminum



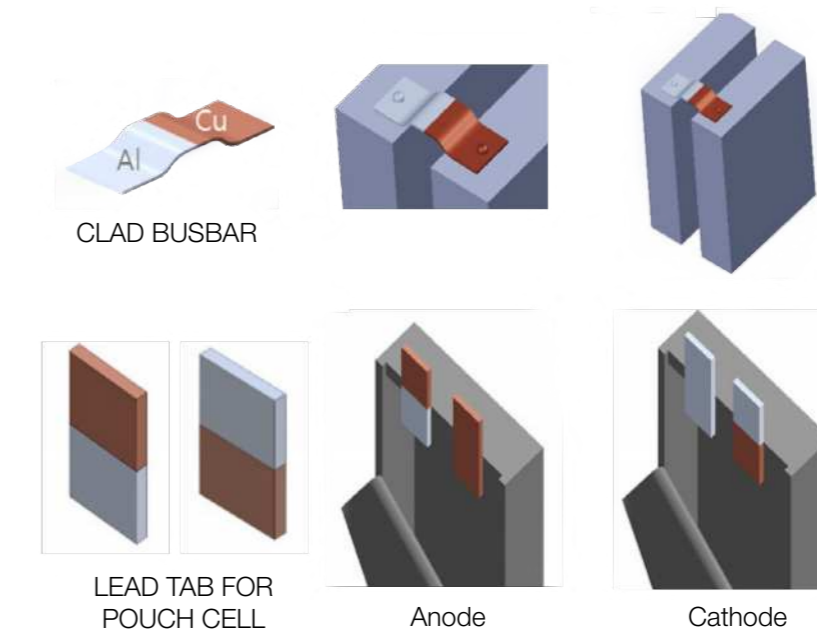
05. CAF Clad Metals



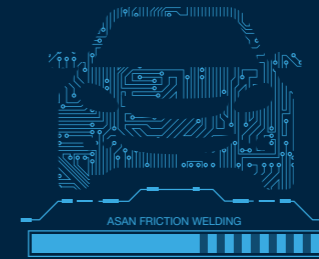
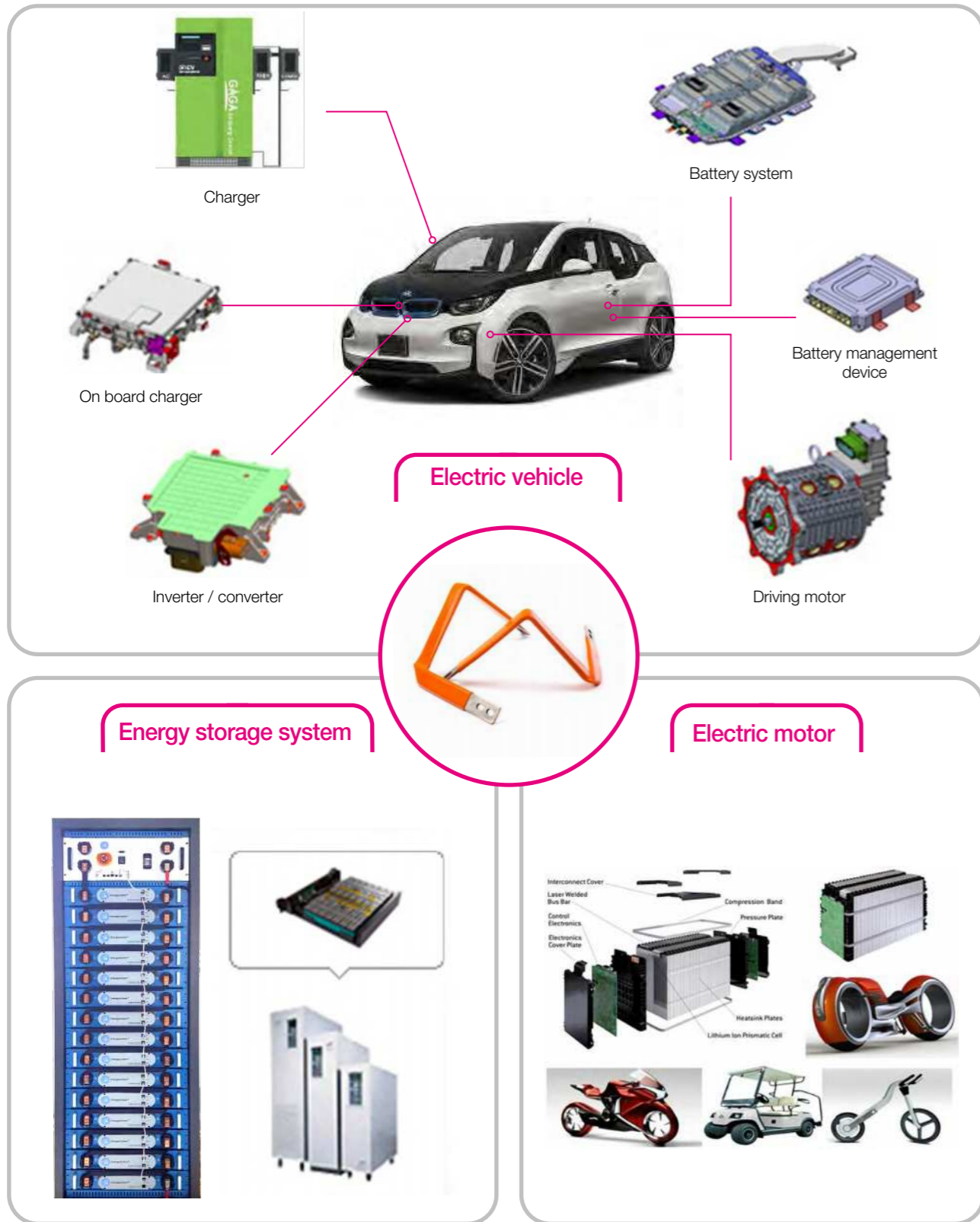
As Fabricated



Applications



06. CAF BUSBAR APPLICATIONS



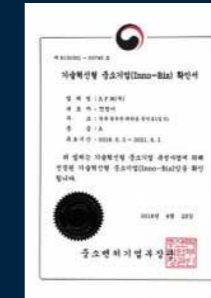
Certification



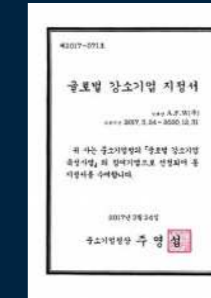
IATF 16949:2016



ISO 14001



INNOBIZ certificate



Global small hidden champion



Company-affiliated research institute



Top 100 companies of Gyeongbuk Pride



Specialized company in part materials



Patent [No. 10-1317497] High frequency motor for friction welding



Patent [No. 10-1411220] Friction welder



Patent [No. 10-1476590] Cutter with rotation and reverse rotation system



Patent [No. 10-1597777] Friction welder



Patent [No. 10-1619266] Friction welder using brake action of inertia offset



Patent [No. 10-2019069] Manufacturing method of Bosbar for fuse



Design [No. 30-1015068] Bosbar for grounding



Design [No. 30-1015070] Bosbar for grounding



Patent [No. 10-2034011] Manufacturing method of Bosbar



Patent [No. 10-2024575] Manufacturing method of Bosbar using linear friction welding



Patent [No. 10-2034012] Manufacturing method of Bosbar using friction stir welding



Patent [No. 10-2084949] Manufacturing method of Bosbar (CCA)



A Top-notch Company through Innovative
Technology Development and Top Quality

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ASAN FRICTION WELDING CO.,LTD.

ELECTRIC VEHICLE PARTS SPECIALIST

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