

COMPANY INTRODUCTION

- ✓ **H2 CYLINDER TYPE 3**
- ✓ **AEROSPACE, AVIATION & DEFENSE FORGINGS**
- ✓ **ISOTHERMAL FORGING**

HBE F&M



INTRODUCTION



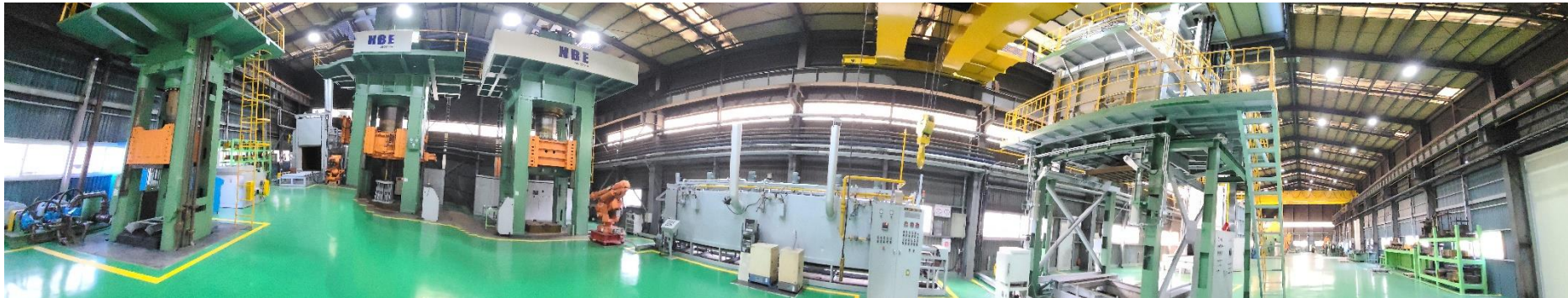
- ❖ HBE F&M maintains partnerships with many domestic and global companies as a manufacturer of TYPE 3 (350bar, 700bar) cylinders for hydrogen electric vehicles (FCEVs). In addition, HBE F&M is manufacturing hydrogen cylinders with holding all manufacturing technology and production facilities in Korea for FCEV.
- ❖ HBE F&M specializes in manufacturing high-technology forgings for aerospace, aviation, and defence fields also only specialize manufacturer of high-tech forgings such as titanium disks and blades with isothermal forging in Korea.

INTRODUCTION

■ PLANT OVERVIEW

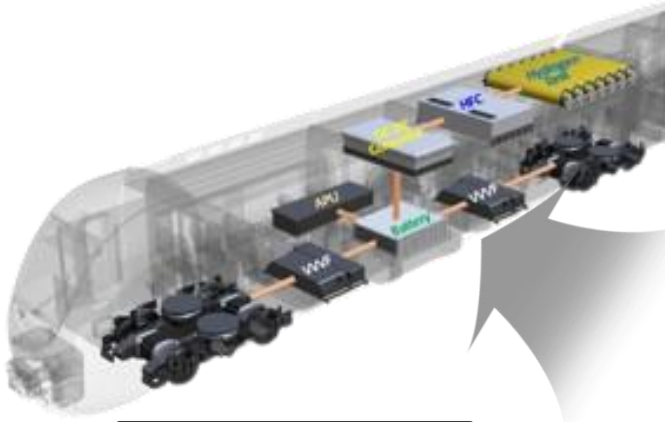


HYDROGEN CYLINDER MANUFACTURING FACILITIES FOR FCEV



FORGING, EXTRUSION FACILITIES

INTRODUCTION

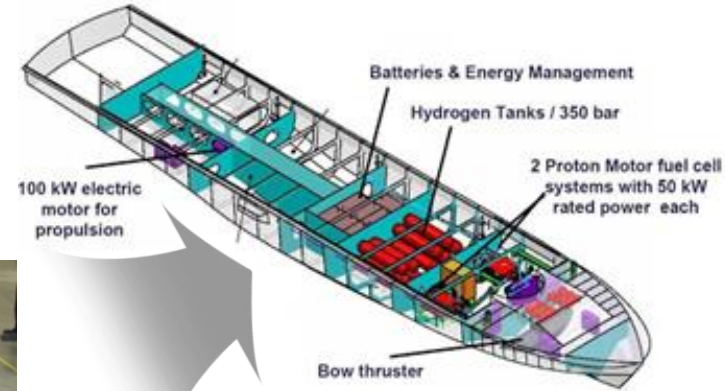
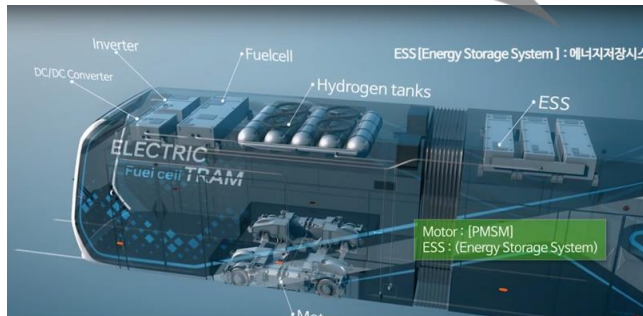


Hydrogen Fuel Cell Train

BUSINESS SOLUTION



Hydrogen Fuel Cell Tram



H2 Fuel Cell Vessel

FCEV- Hydrogen Fuel Cell Vehicle



H2 Fuel Cell Drone



INTRODUCTION

Unique Technology and Vision of HBE F&M

The only specialize company in Korea with all manufacturing technology and production facilities for H2 cylinder.

Growing Demand for FCEVs

- Development of unconventional energy sources such as shale is expected to be developed in earnest
- Cost of conventional energy sources increase continuously.
- Increase CNG & FCEV vehicles

R&D And Development Capabilities

- Complete production line for missile combustion tubes and from liners to TYPE 3 composite Cylinder.
- Design and production to meet customer requirements
- Global competitiveness through continuous research



Specialized Production Facilities and Related Technologies

- In stock many types of Hydraulic Forging Presses Such as **4000Ton**, **2500Ton** etc.
- Production Facilities and Professional Manpower Facilities to manufacture large size products.
- **HBE** is specialized in forging, flow forming, neck spinning, and heat treatment technologies.
- Fully equipped with various **molds** and **mandrels** for various forging and flow forming.
- Exclusive company in Korea for production of Titanium turbine blade with Isothermal Forging Press (**6000Ton**, **14000Ton**).

INTRODUCTION

LOCATION



Head office in Daejeon

65, Dunsan-ro 31beon-gil, Seo-gu,
Kumkang BD, Daejeon, Korea



Haman plant

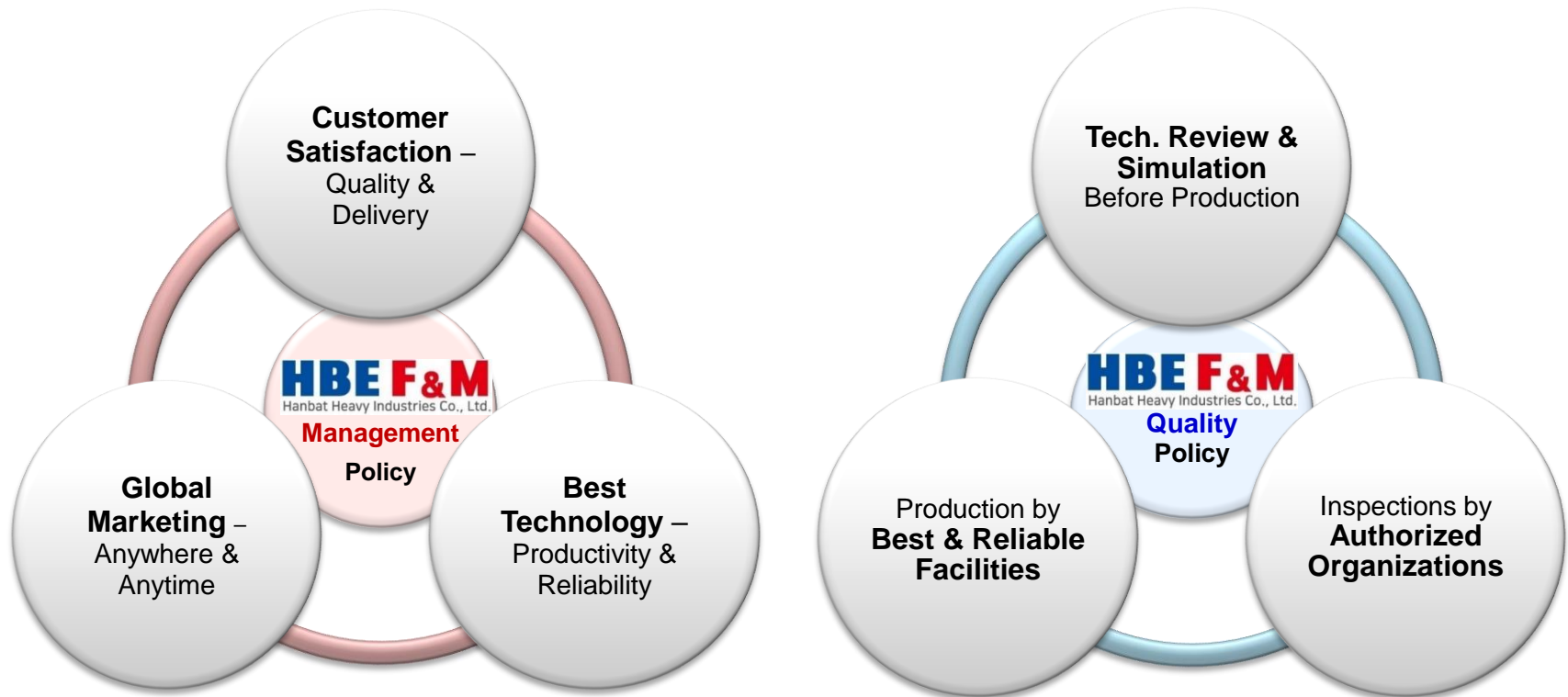
146-1, Hyeonpo-ro, Gunbuk-myeon,
Haman-gun, Gyeongsangnam-do



INTRODUCTION

■ BUSINESS STRATEGY

Based on **leading convergence technologies** of Forging and Flow Forming, Neck Spinning, **HBE F&M** wants customers to be satisfied with our superior products, “**Excellent Forged Products**” and “**Hydrogen Composite Cylinders, Tanks and CNG Cylinders**”.



MAIN PRODUCTS & BUSINESS FIELD

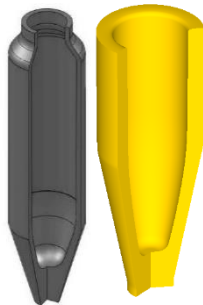
■ TECHNOLOGY BASED BUSINESS



H2 TYPE 3 Cylinder
300bar, 700bar

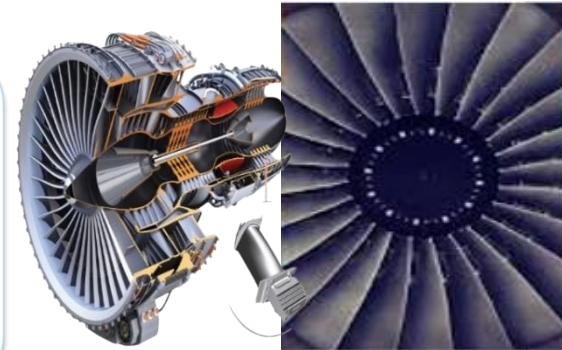


Defense Forgings



**HYDROGEN FUEL
COMPOSITE
CYLINDERS
& TANKS
TYPE 3**

■ **ISOTHERMAL
FORGING**
■ **TURBINE**
TITANIUM DISK,
BLADE,
SUPER ALLOY



Titanium Turbine Blade, Disk

DEFENSE
■ **FORGING**
■ **SHELL, CYLINDER**

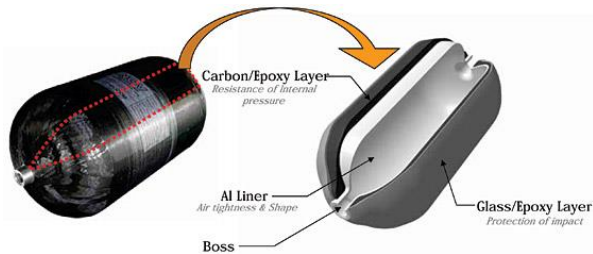
AEROSPACE
■ **ALUMINUM
FORGING**



Aerospace, Aviation Aluminum Forgings

MANUFACTURING PROCESS

■ HYDROGEN FUEL COMPOSITE TANK, CYLINDER



Raw material
Aluminum billet



Backward extrusion
preform



Flow forming



Filament winding



Heat treatment T4, T6



Neck spinning



H2 TANK TYPE 3

MAIN FACILITIES- H2 CYLINDER

✓ 4000TON BACKWARD EXTRUSION PRESS



Description	Specification
Forging capacity	4000Ton
Stroke	1900 mm
Daylight	3700 mm
Bolster parameters	2400 mm X 1800 mm
Eject Cylinder	300 Ton
Upper die shuttle	Upper punch, die, 3 shuttle devices

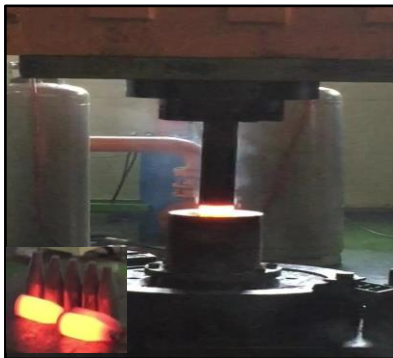


MAIN FACILITIES- H2 CYLINDER

✓ 2500TON BACKWARD EXTRUSION PRESS



Description	Specification
Forging capacity	Max. 2500Ton
Stroke	2380 mm
Daylight	3650 mm
Bolster parameter	1900 mm X 1370 mm
Eject Cylinder	200 Ton
Upper die shuttle	Punch, Upsetting die shuttle



MAIN FACILITIES- H2 CYLINDER



EXTRUSION PRESSES

500TON BACKWARD EXTRUSION PRESS



Description	Specification
Forging Capacity	500Ton
Stroke	1400 mm
Daylight	2700 mm
Bolster Parameters	1000 mm X 1000 mm
Eject Cylinder	30 Ton

800TON BACKWARD EXTRUSION PRESS



Description	Specification
Forging capacity	800Ton
Stroke	1400 mm
Daylight	3000 mm
Bolster Parameter	1100 mm X 1100 mm
Eject Cylinder	50Ton



MAIN FACILITIES- H2 CYLINDER

✓ Dia 1800mm CNC FLOW FORMING MACHINE

WORLD WIDE LARGE DIA



Description	Specification
Tube processing capacity	Min 700 mm Max 1800 mm
Length	Max. 3700mm, Max 5500mm
Spindle	DC 350kW motor Torque 194kg.m
Stagger Roller	Roller Dia 450 mm,3roll Power 65.9 Ton/each
Material for flow forming	Special material (stainless steel, Aluminum and Nickel base alloys, Mareging steel, Aerospace Motor case)



MAIN FACILITIES- H2 CYLINDER

✓ Dia 520mm CNC FLOW FORMING MACHINE



Description	Specification
Tube processing capacity Dia	Min 150 mm, Max 520 mm
Tube processing capacity Length	Max 4000mm
Spindle	AC 100kW motor
Stagger Roller	Roller Dia 400 mm,3roll Power 10 Ton
Material for flow forming	Special material (stainless steel, Aluminum and non-ferrous materials.



MAIN FACILITIES- H2 CYLINDER

✓ LARGE CNC SPINNING MACHINE



Description	Specification
Tube processing capacity Dia	Max Dia 600 mm, Min 100mm
Processing Length	Max 4000mm
Material	Special materials and aluminum gas cylinders (stainless steel, Nickel base, etc)



✓ Dia 400mm CNC SPINNING MACHINE



Description	Specification
Processing capacity	Max Dia 400 mm
Processing Length	Max 4000mm
Material	Special materials and aluminum gas containers (stainless steel, aluminum, etc.)



MAIN FACILITIES- H2 CYLINDER

✓ CNC H2 CYLINDER CARBON WRAPPING MACHINE



Description	Specification
Winding Dia	3 pass, Max Dia 550mm
Length	Max 4000 mm
Control	CNC Control
Material	<ul style="list-style-type: none">• CNG Cylinder• Hydrogen Composite, HFCV• 350 bar Cylinders (H₂, CNG)• 700 bar Cylinders (H₂)



MAIN FACILITIES- H2 CYLINDER

✓ FURNACES



VERTICAL T4 SOLUTION HEAT TREATMENT FURNACE

Capacity	3Ton/ch
Furnace Working area	W4615 x L5240 x H5117mm
Quenching Tank	W3400 x L3000x H5400mm
Quenching Tank	Water quenching
Heating temperature	Max. 550°C
Material	Aluminum

VERTICAL T4 SOLUTION HEAT TREATMENT FURNACE

Capacity	2 Ton/ch
Furnace Working area	W 3000 x L 3000 X H 2500 mm
Heating temperature	550°C
Quenching Tank	Water quenching
Material	Aluminum

T5, T6 AGING FURNACE

Furnace Working area	W 4060mm x H 4800mm x L 9250mm
Furnace Type	Roller conveyor Continuous type
Heating method and heating temperature	180-220°C Electric heating
Material	Aluminum

FORGING FACILITIES

✓ FURNACES



BELL TYPE RING HEAT TREATMENT FURNACE

Size of heating rings	Max Dia 5000mm
Heating temperature	Max. 900°C
Heating Method	Gas
Material	Aluminum, Steel, Special alloys
Q'ty	50Ton 1 Set 60Ton 1 Set



MESH BELT TYPE ALUMINUM BILLET HEATING FURNACE

Heating Capacity	2Ton/hr. 5", 6"
Heating Temperature	450°C
Heating Method	Gas
Material	Aluminum



ALUMINUM FORGING BILLET HEATING FURNACE

Heating Capacity	7"- 12" For forging
Heating Temperature	450°C
Heating Method	Gas, Continuous Roller
Material	Aluminum

FORGING FACILITIES

✓ BILLET HEATING FURNACES, CARBON STEEL, NICKEL BASE



BILLET HEATING FURNACE

Heating Capacity	50Ton/ch
Heating Temperature	1250°C
Heating Method	Gas Burner
Material	Steel, Special Alloy (Titanium, Nickel bas) Steel,



BILLET HEATING FURNACE

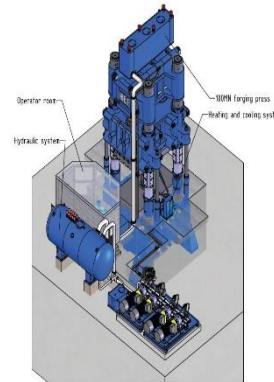
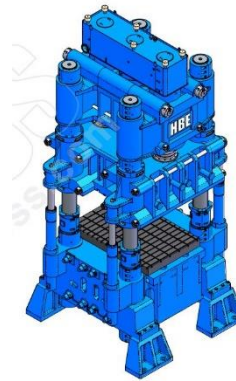
Heating Capacity	10 Ton/hr
Heating Temperature	Nor. 1250°C Max. 1500°C
Heating method	Electric . Batch
Material	Steel, Nickel based alloys, Titanium alloys

FORGING FACILITIES

- ✓ **14000TON(140MN)CLOSED DIE & ISOTHERMAL FORGING PRESS**
THIS PRESS WILL BE INSTALLED IN OCT. 2023.



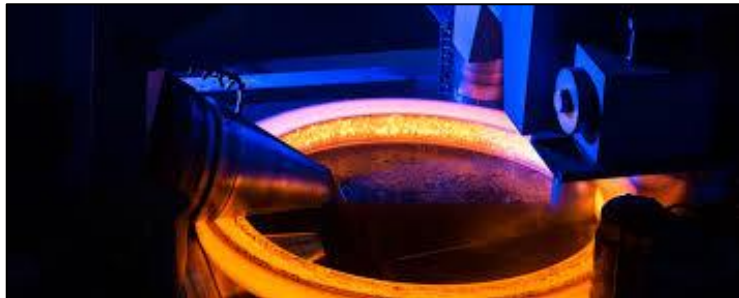
Description	Specification
Forging Capacity	14000Ton (140MN)
Forging Speed	0.05-40 mm/sec
Stroke	1600 mm
Daylight	3500 mm
Moving Table	W 4000 mm x L6500 mm
Isothermal heating temperature	Max 1400°C



✓ CNC 3000mm/500mm RING ROLLING MACHINE



Description	Specification
Ring Dia	Min. 400 mm, Max. 3000 mm
Ring Height	Min 50 mm, Max 600 mm
Radial force	150 Ton
Axial force	120 Ton
Ring material	Aluminum, Special alloys (such as nickel based alloys, titanium alloys, etc.)



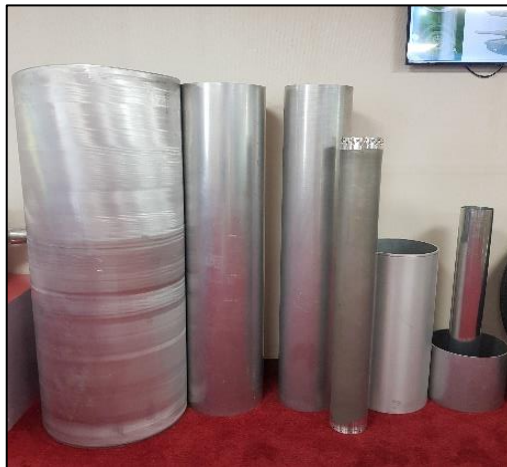
HIGH TECHNOLOGY PRODUCTS

✓ TECHNOLOGY OF FORGED PRODUCTS

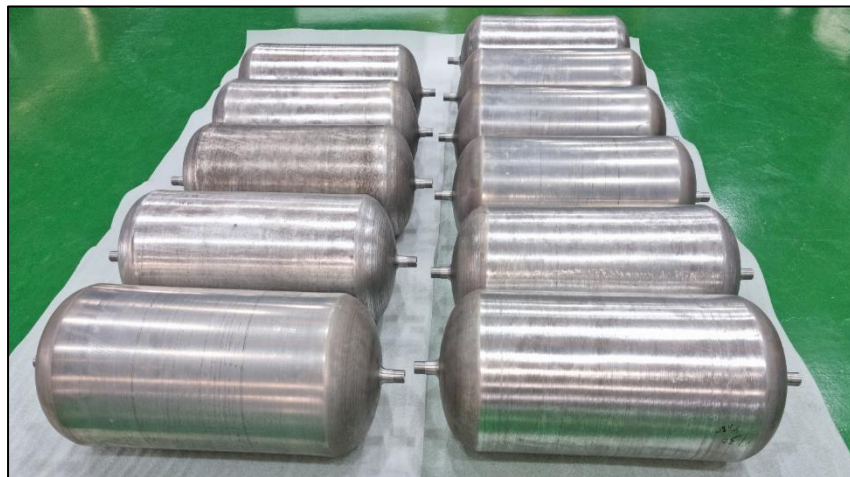
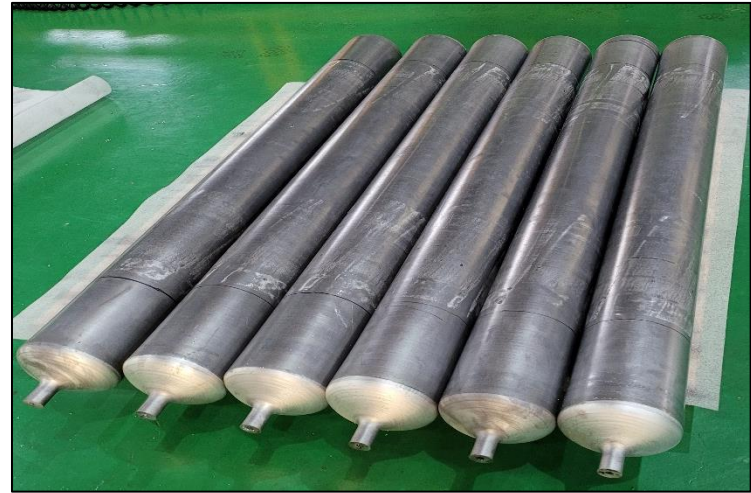


HIGH TECHNOLOGY PRODUCTS

✓ TECHNOLOGY OF H2 CYLINDER



✓ TECHNOLOGY OF DEFENSE, AERO SPACE



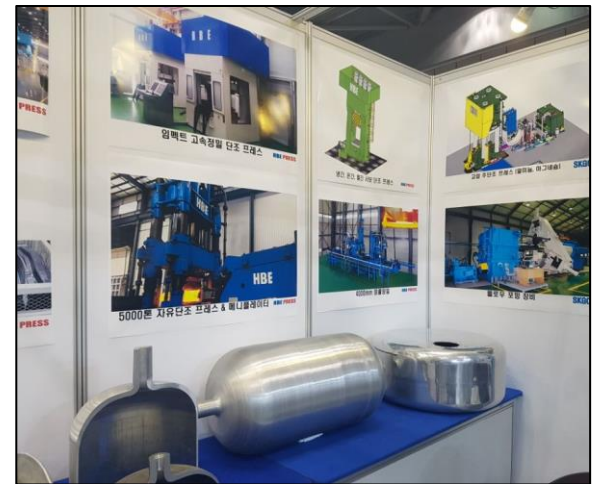
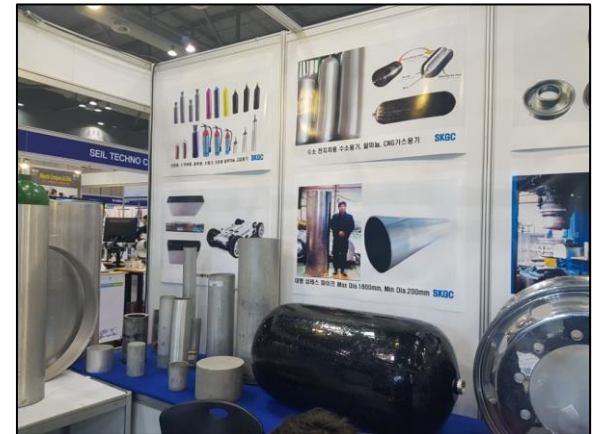
✓ TECHNOLOGY OF AEROSPCE CYLINDER PRODUCTS



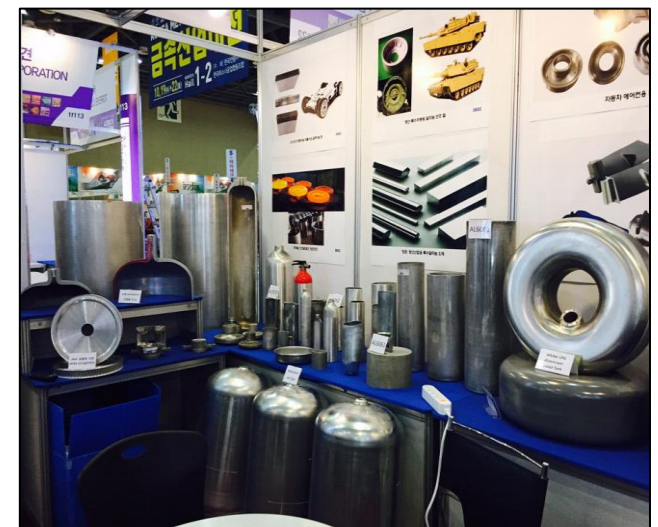
AEROSPACE CYLINDER



EXHIBITION



EXHIBITION





LIST OF FACILITIES

1. Forging and Backward Extrusion presses	1.1	4000Ton	Shell forging press	1 set
	1.2	2500Ton	Shell forging press	2 sets
	1.3	800Ton	Shell forging press	1 set
	1.4	500Ton	Shell forging press	1 set
2. Indirect Extrusion Presses	2.1	1000Ton	Indirect Extrusion Press	1 set
3. Open die Forging Presses & Blanking Presses	3.1	3000Ton	Open Die Forging/Blanking Press	1 set
4. Ring Rolling Machine	4.1	3000mm/600mm	Aluminum . Titanium ring	1 set
5. CNC Flow Forming Machine	5.1	Dia 1800mm, L 3700mm	Flow Forming Machine	1 set
	5.2	Dia 520mm, L 4000mm	Flow Forming Machine	1 set
6. CNC Spinning Machine & Necking Machine	6.1	Max Dia 600mm Large Spinning Machine		1 set
	6.2	Max Dia 400mm Small Spinning Machine		1 set
	6.3	300Ton Neck Press aluminum gas cylinder, Max dia 300mm		2 sets
7. Heat Treatment Furnaces	7.1	3 ton/ch aluminum alloy Vertical T4 Solution Heat Treatment Furnace		1 set
	7.2	2Ton/ch aluminum alloy Vertical T4 Solution Heat Treatment Furnace		1 set
	7.3	Aluminum alloy T5, T6 Aging Furnace		2 sets
	7.4	Bell Type (50Ton/ch) alloy steel. Nickel base. Titanium alloy Ring Heat Treatment Furnace		2 sets
8. Heating Furnaces	8.1	Aluminum Billet Heating Furnace		1 set
	8.2	Aluminum Billet Heating Furnace		1 set
	8.3	Steel and nickel .STS. Titanium Billet Heating Furnace		3 sets
	8.4	Steel and nickel .STS Billet, Ingot Heating Furnace		1 set
9. Carbon Wrapping Machine	9.1	Hydrogen, CNG cylinders Carbon wrapping machine Dia 520mm Length 4000mm 4 pass		1 set

THANK YOU!



HBE F&M

**E-mail : info@hfm.kr
hbepress@hebepress.com
Website: www.hfm.kr**