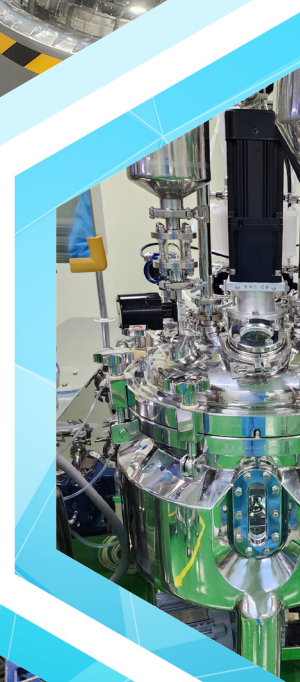
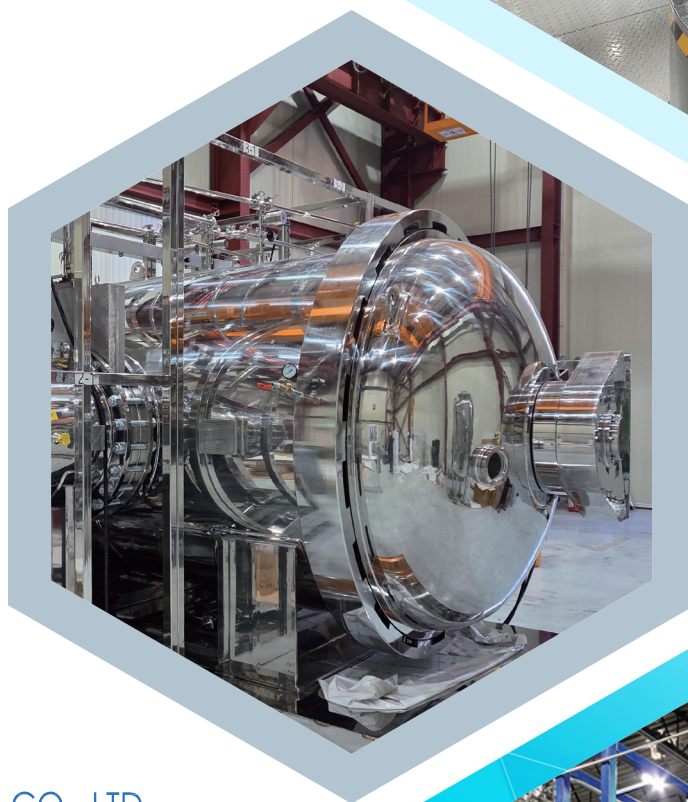


# SEOEUN PLANT TECH

Total engineering company capable of design, certification and consulting.  
Petroleum·Precision Chemistry, Bio, Food, New Materials,  
Energy Environment, High-Performance Equipment  
(Pressure Vessel, Heat Exchanger, Tower, Storage Tank),  
Pilot Plant, Test Bed, National Policy R&D Project, etc



 SEOEUN PLANT TECH CO., LTD.

**Direct** +82-10-5796-2389 / +82-10-7760-6176

**Office** +82-31-703-0480 **Fax** +82-31-703-0481

**E-mail** [septechn@septechn.co.kr](mailto:septechn@septechn.co.kr) **Website** [eng.seplant.com](http://eng.seplant.com)

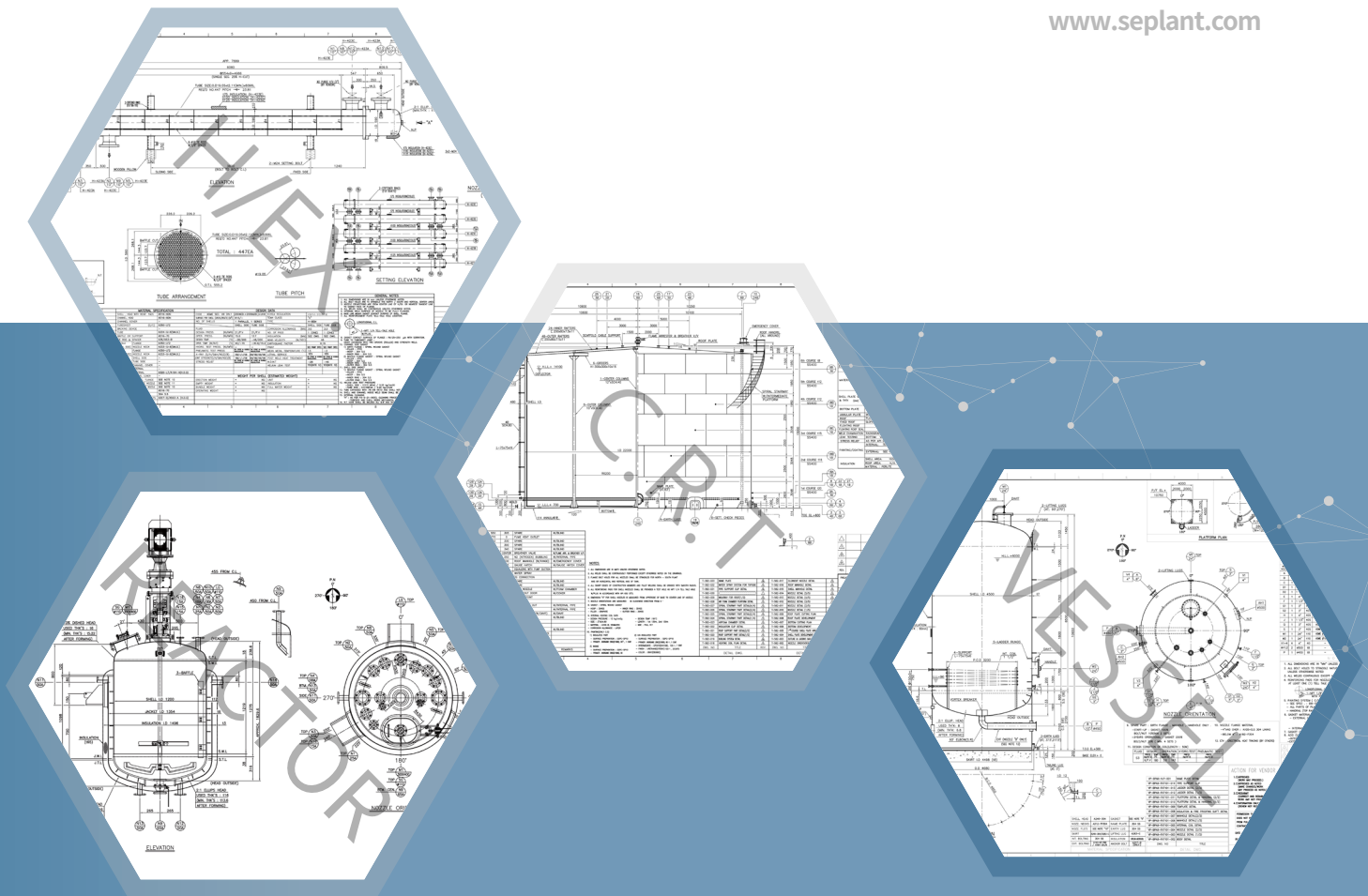
# SEOEUN

## PLANT TECH

### About Company

SEOEUN PLANT TECH CO., LTD. is a total engineering company that provides design, domestic and international certification, consulting, and manufacturing support across the fields of fine chemicals, biotechnology, food, advanced materials, and energy, delivering ONE-STOP solutions to meet customer requirements.

Also, Based on our know-how and trust accumulated over the past 40 years, SEOEUN PLANT TECH CO., LTD. is doing its best to ensure that customers who use our company are recognized not only in Korea but also in all overseas markets. Thank You.



### Contents

#### Company Introduction

#### Design Scope

##### DESIGN

- 1) Drawings And Various Calculations
  - ① Devices such as pressure vessels
  - ② Strength calculation / Thermal Rating  
Finite Element Analysis(FEA) / Structural calculation
- 2) Total Engineering(Process, Mechanical, Electrical)
  - ① PLANT Engineering(Petrochemical, Bio, Food, Energy)
  - ② PILOT Engineering

##### CERTIFICATION

- 1) Domestic Equipment Certification
- 2) Certification of Imported Equipment
- 3) Classification Equipment Certification
- 4) Other Inspection & Certification Agency Services

##### CONSULTING

- 1) Design Training (ASME / KS / JIS / API)
- 2) Domestic Equipment / Import Equipment Inspection Course Training
- 3) Estimate Support / Review of the law
- 4) Manufacture Support

##### TEST BED

##### SPECIAL MANUFACTURE PROJECT

##### PROJECT REFERENCES

### History

- 1998** • Established SEOEUN ENGINEERING (Business Field: Various Petrochemical Equipment, Engineering & Fabrication Design)
- 2002** • Development of MECAL V2.0 strength calculation program (ASME CODE)
- 2005** • MECAL V3.0 Strength Calculation Program NEW Version Release (ASME CODE)
- 2008** • Equipped with Diverse Equipment Design Software  
• Expansion of Business Scope: Thermal Calculation, Piping, Process, and Structural Design
- 2011** • Business Expansion: Inspection agency of Domestic pressure vessel design certification (KOSHA, KEA, KGS, Fire Defence Regulation)
- 2013** • Business Expansion: Classification pressure vessel design certification inspection agency (KR, ABS, DNV, GL, LR)
- 2014** • Taking a new leap forward with SEOEUN PLANT TECH Co., Ltd.  
• Business Expansion: KOSHA, Overseas certification inspection agency
- 2015** • Applied MIDAS GEN Program (Stress Analysis of Specific Shape Structures)  
• Business Expansion: Initiate total engineering such as Process Design, Mechanical, electrical, and instrumentation
- 2017** • Business Expansion: Commencement of KEA Import Pressure Vessel Inspection Agency Services
- 2018** • Development and Application of JIS Strength Calculation Program.(JIS B8265~8267)  
• Support for the manufacturing of high-temperature and high-pressure specialized equipment
- 2020** • Business Expansion: Introduced and designed Test Bed concepts for the first time in Korea
- 2022** • Expansion of experimental facilities such as PILOT PLANT, TEST BED, etc.
- 2024** • Completed the expansion and relocation of Bundang Office and Boeun Plant  
• Achieved 2,500+ cumulative cases in imported vessel certification and inspection services
- 2025** • Certified as an Exclusive R&D Department by the Korea Industrial Technology Association (KOITA).
- 2026** • Launching the development of the world's only design-related program

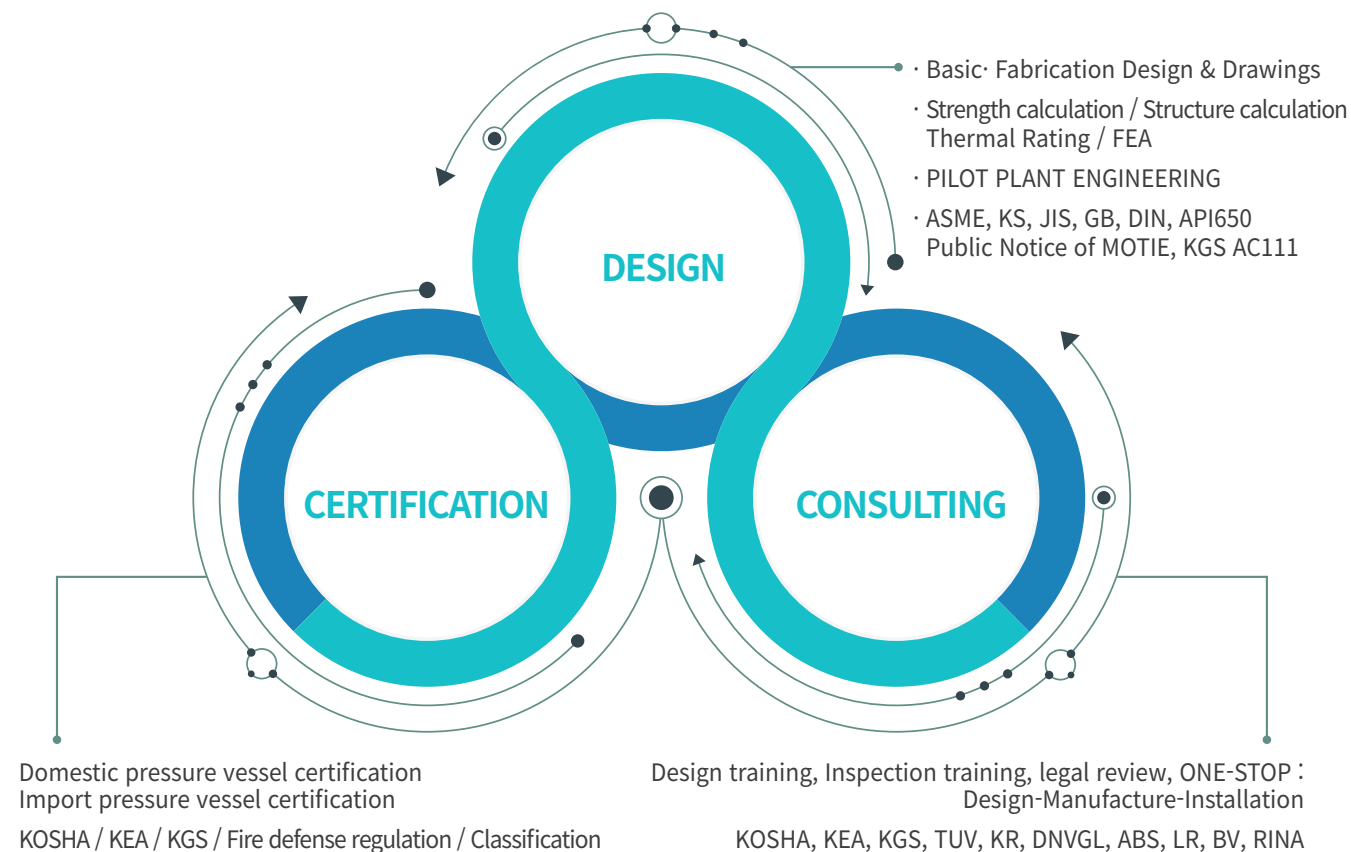
## Design Scope

### Design Scope

- ① All devices in pressurized vessels used in various fields such as Petroleum-Precision Chemical/Bio/ Pharmaceutical /Food/New Materials/Energy Environment
- ② PILOT PLANT, TEST BED, R&D Research project
- ③ Type of scope of work requested by the client

- 01 Participate in the Estimate Phase (Development, New, Expansion, Repair)
- 02 If the client only wants the design (Drawing / Strength Calculation / Structure Calculation / Thermal Rating / PFD / P&ID / PIPING)
- 03 If the client only wants certification (KOSHA / KEA / KGS)
- 04 The Client wants to design & certification
- 05 If the client wants design & certification & manufacture support
- 06 If the Client wants Consulting (Design training / Inspection training / Review of the law)

\*It is recommended to proceed with the Pilot Plant/Test Bed/R&D according to 05.



## Design Target

### Design Target

PILOT engineering of pressure vessels or their entire process facilities used for storage, separation, transfer and mixing of fluids required for processes such as evaporation, absorption, distillation, drying, adsorption, etc

### Design devices

Pressure Vessel / Storage Tank / Heat Exchanger / Tower / Reactor / Agitator / Bio Tank / Air Header / Steam Header / High-Pressure Gas Vessel / Autoclave / Retort / Sterilizer / Dyeing Machine / Receiver Tank / Steam Roller Extractor / Distiller / Dryer / High-Pressure Gas Vessel / Accumulator / Flash Tank / Evaporator



Pressure Vessel



Heat Exchanger



Bio Tank



Reactor



Storage Tank



Autoclave



Silo



Tower



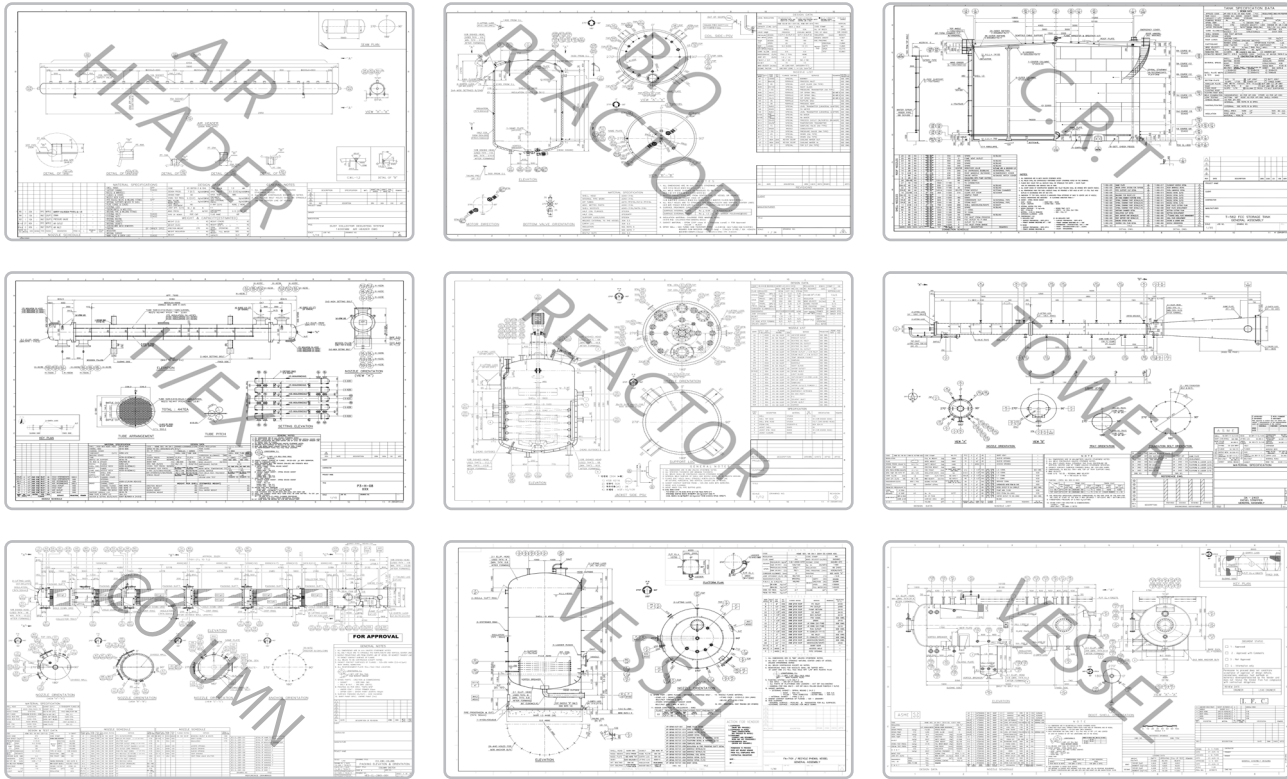
PILOT PLANT



## Design Drawing

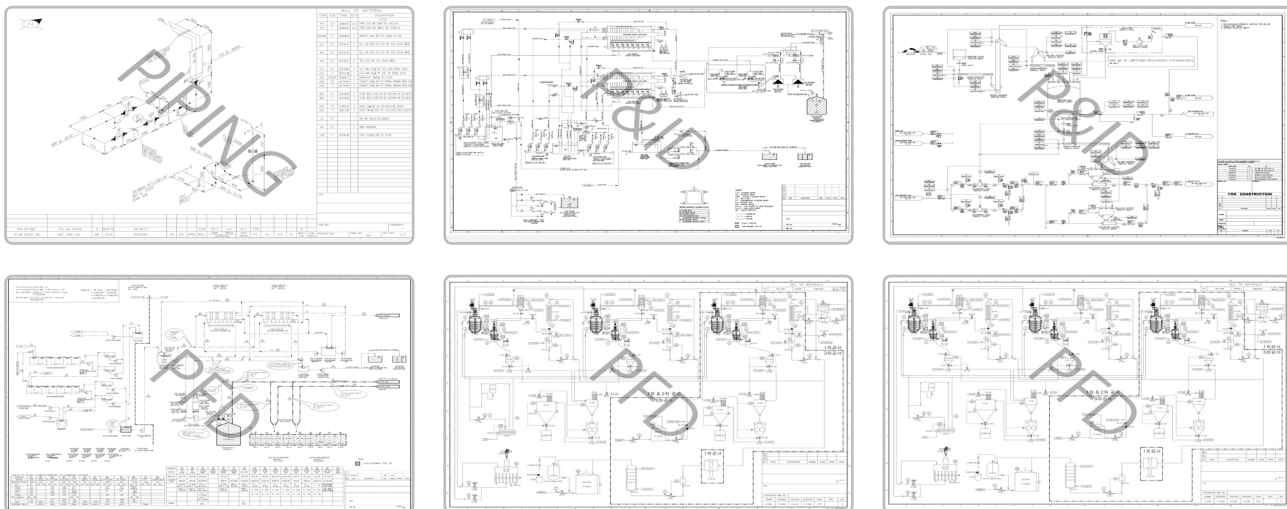
### Pressure Vessel-Basic/ Detailed Drawing

Drawings can be made for all pressure vessels included in the design target, including VESSEL/REACTOR/H/EX./AUTOCLAVE/TOWER/C.R.T./FILTER HOUSING/SILO/AIR HEADER.



### PLANT – PFD / P&ID / PIPING

Designs of plant facilities smaller than a typical factory and larger than a laboratory size can be designed from process design to implementation design.



## Design Calculation

### Design Code

ASME SEC. VIII DIV. 1,2 / KS B6750 / JIS B8265 / Public Notice of MOTIE / KGS AC111 / ASME SEC. X / API 620,650 / Classification Code (KR, ABS, DNV.GL, LR, RINA) etc.

### Operating Program

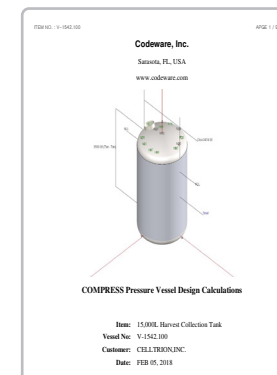
COMPRESS/ MECAL / HTRI / MIDAS / ANSYS / Development and application of other self-made programs



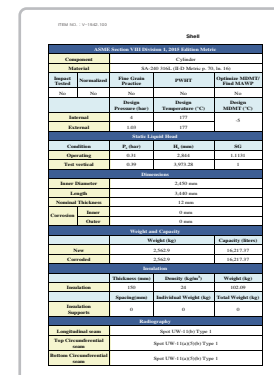
01

### Strength Calculation

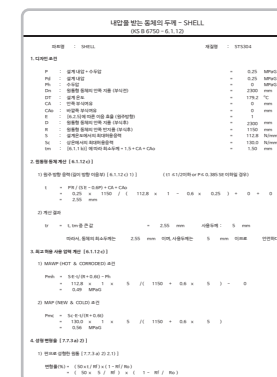
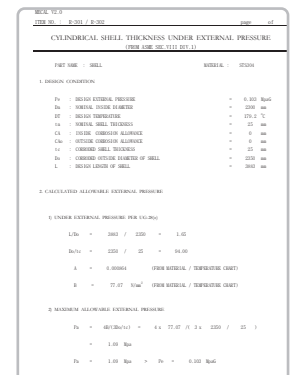
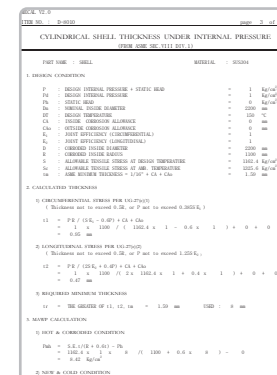
ASME BPVC. SEC.VIII Division 1, 2 - American Mechanical Society Standard  
KS B 6750 - Korean Industrial Standards  
JIS B 8265~7 - Japanese Industrial Standards



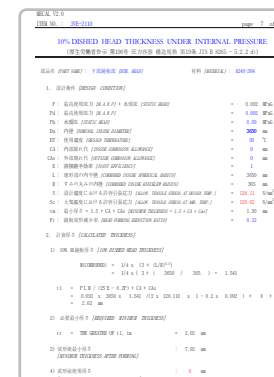
COMPRESS Program



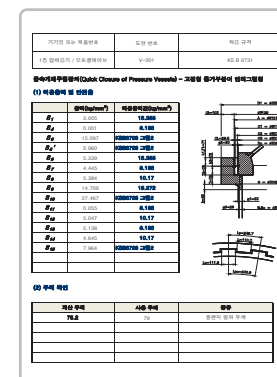
MECAL Program



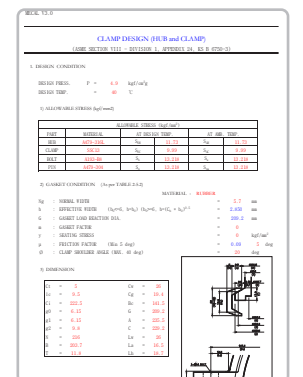
MECAL(Korean) Program



MECAL(Japanese+English) Program



Metal Switchgear / Clamp Calculation



## Public Notice of MOTIE- KEA Inspection Standards

## Self-Made Program

| 1. 설계조건 (Design Data) |                                                                 |        |             |                 |        |        |
|-----------------------|-----------------------------------------------------------------|--------|-------------|-----------------|--------|--------|
| 설비 및 적용 규정            |                                                                 |        |             |                 |        |        |
| 적용 기준                 | 산업보상장비용 고차 수 2019-19-196 (PUBS LC NOT-ICE OF MTF (No.2019-163)) |        |             |                 |        |        |
| 구분                    | 설비 No                                                           | JAGNET | 구분          | 설비 No           | JAGNET | JAGNET |
| 도입비(도입용)              | 273.66                                                          | 273.66 | 유압 Pressure | 비적용(기초)         | 적용(기초) | 적용(기초) |
| 도입용 ON                | NO                                                              | NO     | 수평 비압 [°C]  | 100             | 100    | 100    |
| 압력 압력                 | 0.35                                                            | 0.35   | 수평 비압       | NO              | NO     | NO     |
| 압력 온도                 | 148                                                             | 148    | °C          | 평상시 온도          | 150    | 150    |
| 압력 온도                 | 0.25                                                            | 0.25   | MPa         | 충진압력(충진용) [MPa] | 0.6    | 0.6    |
| 충진 온도                 | 107                                                             | 107    | °C          | 충진 온도 [°C]      | 105    | 105    |
| 충진압력 압력               | 0.59                                                            | 0.59   | MPa         | MT / PT         | NONE   | NONE   |
| 기압상승 압력               | NO                                                              | NO     | MPa         | 비압력[mm]         | 0.0    | 0.0    |
| 내폭률                   | 1.2                                                             | 0.28   | NO          | 내폭률 계수[m]       |        | 1.5    |

## 2. 용접 부위도

|               |                     |      |               |          |          |  |
|---------------|---------------------|------|---------------|----------|----------|--|
| ①. 기구명        | 1. 용접 방법 (1) / 용접기  |      | 2. 용접 용       | 1.5      |          |  |
| 용 용접 방법 (1/2) | 0. 용 / 0. 용 WPM     |      | 용 용접 용        | -        |          |  |
| 용 용 접 용 (1/2) | 0.123456 / 0.123456 |      | 용 용 접 용 (1/2) | 6 / 8    |          |  |
| ⑦. 용이 치위      | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
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| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |
| 용 용 치위        | SPOT                | 4860 | 용             | SPOT     | 1560 × 3 |  |
| FILE          | -                   | 용    | FILE          | -        |          |  |

| 기타용 또는 제품번호           | 도면번호                                                                                                                                                                                                                                                                    | 제품규격                                                                                                                                                                                                                                                                                                    |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1형용용기 (1~12기)         | D-501A-001                                                                                                                                                                                                                                                              | 산원용산정제용부 조제 제 2015-1호                                                                                                                                                                                                                                                                                   |
| 원통형<br>통<br>체<br>(4각) | $I = \frac{P \cdot W}{2 \cdot 0.08 \times 1.2 \cdot P^2} \cdot a = \frac{0.3}{2 \times 114 \times 0.95} \cdot \frac{2.850}{1.2 \times 0.3} = 0.0$ $= 3.95 \text{ mm}$ <p>최소 두께 : 3.95 mm</p>                                                                            | <p>(상부 / 하부)</p> <p>사용률 : 12 / 15 mm</p> <ul style="list-style-type: none"> <li>● 1# 세로방향 (mm)</li> <li>● P# 십자방향 (MPa)</li> <li>● 원통형통체의 부식방지 안지름 (mm)</li> <li>● 재료의 허용 인장응력 (N/mm<sup>2</sup>)</li> <li>● 감리요인용 용량계통</li> <li>● 부식방지 (mm)</li> </ul>                                                 |
|                       | <p>제 호 015304</p> <p>제품 규격 mm = 114 N/mm 30.1 x 1 mm</p>                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                         |
|                       | $I = \frac{P \cdot W}{2 \cdot 0.08 \times 1.2 \cdot P^2} \cdot a = \frac{0.3}{2 \times 114 \times 0.95} \cdot \frac{2.850}{1.2 \times 0.3} = 0.0$ $= 5.78 \text{ mm}$ <p>최소 두께 : 5.78 mm</p>                                                                            | <p>사용률 : 10.44 (성형용)</p> <p>사용률 : 12.00 mm</p>                                                                                                                                                                                                                                                          |
|                       | <p>HEAD</p> <p>정사면 경면 (상부)</p> <p>• 사방 두께 값도</p> <p>• 최소 두께</p> <p>• 1# 세로방향의 값으로</p> <p>(상부)</p> $I = \frac{P \cdot W}{2 \cdot 0.08 \times 1.2 \cdot P^2} \cdot a = \frac{0.3}{2 \times 114 \times 0.95} \cdot \frac{2.850}{1.2 \times 0.3} = 0.0$ $= 6.64 \text{ mm}$ | <ul style="list-style-type: none"> <li>● 1# 세로방향 (mm)</li> <li>● P# 십자방향 (MPa)</li> <li>● 원통형통체의 부식방지 안지름 (mm)</li> <li>● 재료의 허용 인장응력 (N/mm<sup>2</sup>)</li> <li>● 감리요인용 용량계통</li> <li>● 부식방지 (mm)</li> <li>● W# (1/3) × (100/0.5) = 1.54</li> <li>● 7# 구역부의 부식방지의 안지름 (mm)</li> </ul> <p>= 285 mm</p> |
| HEAD                  | <p>제 호 015304</p> <p>제품 규격 mm = 114 N/mm 31.1 mm</p>                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                         |
|                       | <p>HEAD</p> <p>정사면 경면 (상부)</p> <p>• 사방 두께 값도</p> <p>• 최소 두께</p> <p>• 1# 세로방향의 값으로</p> <p>(상부)</p> $I = \frac{P \cdot W}{2 \cdot 0.08 \times 1.2 \cdot P^2} \cdot a = \frac{0.3}{2 \times 114 \times 0.95} \cdot \frac{2.850}{1.2 \times 0.3} = 0.0$ $= 6.64 \text{ mm}$ | <ul style="list-style-type: none"> <li>● 1# 세로방향 (mm)</li> <li>● P# 십자방향 (MPa)</li> <li>● 원통형통체의 부식방지 안지름 (mm)</li> <li>● 재료의 허용 인장응력 (N/mm<sup>2</sup>)</li> <li>● 감리요인용 용량계통</li> <li>● 부식방지 (mm)</li> <li>● W# (1/3) × (100/0.5) = 1.54</li> <li>● 7# 구역부의 부식방지의 안지름 (mm)</li> </ul> <p>= 285 mm</p> |

**Classification Strength Calculation- Type of Classification:**  
ABS, LR, DNV.GL, NK, KR, RINA

## Self-Made Program

| I. DESIGN DATA                     |                          |                                                                                                                      |                        |                      |               |  |
|------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------|----------------------|---------------|--|
| Description                        |                          | Shut Air Receiver                                                                                                    | Auxiliary Air Receiver | Service Air Receiver |               |  |
| Ship Number                        |                          | NCP/134-56/1041                                                                                                      |                        |                      |               |  |
| Classification                     |                          | G.L                                                                                                                  |                        |                      |               |  |
| TYPE                               |                          | Vertical/Cylindrical                                                                                                 |                        |                      |               |  |
| Qty                                |                          | 2 Sets / Unit                                                                                                        | 1 Set / Unit           | 1 Set / Unit         |               |  |
| Capacity                           |                          | M <sup>3</sup>                                                                                                       | 18.5                   | 0.3                  | 1.5           |  |
| PRESSURE                           | DESIGN                   | kg/cm <sup>2</sup> (bar)                                                                                             | 33 (32.37)             | 33 (32.37)           | 77 (7.56)     |  |
|                                    | OPERATING                | kg/cm <sup>2</sup> (bar)                                                                                             | 30 (29.42)             | 30 (29.42)           | 7.6 (0.78)    |  |
|                                    | Hydro Test Pressure      | kg/cm <sup>2</sup> (bar)                                                                                             | 49.5 (48.56)           | 49.5 (48.56)         | 11.55 (11.37) |  |
| Safety Valve Setting Pressure      |                          | kg/cm <sup>2</sup> (bar)                                                                                             | 33 (32.37)             | 33 (32.37)           | 7.7 (5.56)    |  |
| Design Temperature                 |                          | °C                                                                                                                   | 50                     | 50                   | 50            |  |
| Joint Efficiency                   | Shell                    |                                                                                                                      | 0.85                   | 0.85                 | 0.85          |  |
|                                    | Head                     |                                                                                                                      | 1.0                    | 1.0                  | 1.0           |  |
| Corrosion Allowance                |                          | mm                                                                                                                   | 1.0                    | 1.0                  | 1.0           |  |
| Heat Treatment (For Stress Relief) |                          |                                                                                                                      | NO                     | YES<br>(H/AN)        | NO            |  |
| N.D.T                              | L-Scan                   | R.T                                                                                                                  | SPVT (45 %)            | SPVT (45 %)          | SPVT (45 %)   |  |
|                                    | C-Scan                   | R.T                                                                                                                  | SPVT (45 %)            | SPVT (45 %)          | SPVT (45 %)   |  |
|                                    | Fillet weld (Press part) | R.T                                                                                                                  | N / A                  | N / A                | N / A         |  |
| Used Material                      |                          | Shell / Head                                                                                                         | SPV355                 | SPV355               | SPV355        |  |
| Weight (compt)                     |                          | kg / set                                                                                                             | 9,436                  | 292                  | 639           |  |
| Painting                           | Inside                   | Std. Size SSPC-SP10-1 & Modified Epoxy / 125 µm (2 mil) Finish Color / Gray                                          |                        |                      |               |  |
|                                    | Outside                  | Std. Size SSPC-SP10-1 & 1 Coat / Alkyd primer (70 µm), 2nd Coat / Alkyd primer (70 µm), Finish Color / White (N.0.3) |                        |                      |               |  |

\* NOTE : Crossing part of longitudinal to be treated.

SECURE PLANT ENGINEERING

## SHELL THICKNESS UNDER INTERNAL PRESSURE

(SHELL PLATE 1)

### 1. DESIGN CONDITION

|                                   |   |         |                   |
|-----------------------------------|---|---------|-------------------|
| Pr = DESIGN PRESSURE              | 1 | 52.37   | Bar               |
| T = DESIGN TEMPERATURE            | 1 | 90.00   | °C                |
| Do = OUTSIDE DIAMETER             | 1 | 2750.00 | mm                |
| e = CORROSION ALLOWANCE           | 1 | 1.00    | mm                |
| η = JOINT EFFICIENCY OF SHELL     | 1 | 0.85    |                   |
| S1 = ALLOWABLE STRESS OF MATERIAL | 1 | 192.5   | N/mm <sup>2</sup> |

1) ALLOW STRESS (a FOR SHELL) (a) P1 C.2 Sec 8 D.3.1

|                                        |   |         |                   |
|----------------------------------------|---|---------|-------------------|
| Mat = MATERIAL SPECIFICATION           | 1 | SPV-105 |                   |
| Rm = MIN TENSILE STRENGTH AT ROOM TEMP | 1 | 520.00  | N/mm <sup>2</sup> |
| Rm = CONVECTION 0.2% YIELD POINT AT    | 1 | 353.00  | N/mm <sup>2</sup> |
| ROOM TEMP                              |   |         |                   |
| σt = MIN (Rm/2 and Re/1.7)             | 1 | 192.5   | N/mm <sup>2</sup> |

### 2. CALCULATION OF SHELL PLATE

1) MINIMUM REQUIRED THICK : (a) P1 C.2 Sec 8 D.3.1

$$t = \frac{D_o \times P_r}{20.6 \times 10^3 \times F_e} + e = \frac{2750.00 \times 52.37}{20 \times 192.5 \times 0.85} + 1.00 = 28.01$$

2) USED THICKNESS

$$T_s = 29.00 \text{ mm}$$

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DESIGN SECUR PLAN ENGINEERING

## HEAD THICKNESS UNDER INTERNAL PRESSURE

(10.1.1.1)

### 1. DESIGN CONDITION

|                                         |         |                   |
|-----------------------------------------|---------|-------------------|
| Pi = DESIGN PRESSURE                    | 51.37   | Bar               |
| T = DESIGN TEMPERATURE                  | 80.00   | °C                |
| Di = OUTSIDE DIAMETER                   | 2750.00 | mm                |
| e = CORROSION ALLOWANCE                 | 1.00    | mm                |
| η = JOINT EFFICIENCY OF HEAD            | 1.00    |                   |
| kw = DESIGN COEFFICIENT GIVEN BY FIG. 1 | 2.02    |                   |
| S = ALLOWABLE STRESS OF MATERIAL        | 192.5   | N/mm <sup>2</sup> |

#### 1) ALLOW STRESS FOR SHELL (P.1 C.3.5.c.ii C.3.1)

|                                               |                          |
|-----------------------------------------------|--------------------------|
| Mat = MATERIAL SPECIFICATION                  | SPV-035                  |
| Rm = MIN TENSILE STRENGTH AT ROOM TEMP.       | 520.00 N/mm <sup>2</sup> |
| Rm / CONVERSION 0.2% YIELD POINT AT ROOM TEMP | 375.00 N/mm <sup>2</sup> |
| σt = MIN( Rm/2.7 and Rm/1.7 )                 | 192.5 N/mm <sup>2</sup>  |

### 2. CALCULATION OF HEAD

#### 1) MIN. REQUIRED THK; |u| P.1 C.3.5.c.ii C.4.5.1

$$t_h = \frac{Di \times Pa \times Pa}{40 \times s \times \eta} + e = \frac{2750 \times 51.37}{40 \times 192.5 \times 1.00} + 1.00 = 24.42 \text{ mm}$$

#### 2) USED THICKNESS

$$T_h = 29.60 \text{ mm}$$

#### 3) MIN.THA AFTER FORMING

$$T_{hm} = 24.7 \text{ mm}$$

#### 4) DESIGN COEFFICIENT GIVEN BY FIG. 1.7.1

$$kw = 2.02 \rightarrow \text{BY GRAPH}$$

$$f/Dm = 0.21 \quad \eta/Dm = 0.8165$$

INDUSTRIES & CONSTRUCTION CO., LTD.

**Design Code of Plastic such as ASME BPVC SEC. X-FRP, PE**

## Self-Made Program

| MODEL V2.0                                                       |  | page 4 of 26 |                                              |
|------------------------------------------------------------------|--|--------------|----------------------------------------------|
| ITEM NO. : FRP-001                                               |  |              |                                              |
| <b>CYLINDRICAL SHELL THICKNESS</b><br>(FILAMENT WOUND CONDITION) |  |              |                                              |
| <hr/>                                                            |  |              |                                              |
| 1. DESIGN CONDITION                                              |  |              |                                              |
| MATERIAL :                                                       |  | =            | FRP                                          |
| T : DESIGN TEMPERATURE                                           |  | =            | 104 °F ( 40 °C )                             |
| P : DESIGN PRESS. (INT.) INCLUDE STATIC HEAD PRESS.              |  | =            | 3.88 psi ( 0.27 kg/cm <sup>2</sup> )         |
| P <sub>0</sub> : DESIGN PRESS. (EXT.)                            |  | =            | 0 psi ( 0 kg/cm <sup>2</sup> )               |
| D : INSIDE DIAMETER (CORRODED)                                   |  | =            | 98.43 in ( 2500 mm )                         |
| S : ULTIMATE AXIAL TENSILE STRENGTH                              |  | =            | 20,000 psi ( 1960.64 kg/cm <sup>2</sup> )    |
| S <sub>0</sub> : ULTIMATE HOOP TENSILE STRENGTH                  |  | =            | 16,245 psi ( 1442.16 kg/cm <sup>2</sup> )    |
| e : CORROSION ALLOWANCE (EXT. / INT.)                            |  | =            | 0 in ( 0 mm )                                |
| D <sub>0</sub> : OUTSIDE DIAMETER OF THE SHELL ( 2 ( R + e ) )   |  | =            | 99.21 in ( 2520 mm )                         |
| L : LENGTH OF THE SHELL                                          |  | =            | 94.49 in ( 2400 mm )                         |
| F1 : FACTOR FOR INTERNAL PRESSURE                                |  | =            | 10                                           |
| F2 : FACTOR FOR EXTERNAL PRESSURE                                |  | =            | 5                                            |
| N <sub>AX</sub> : AXIAL FORCE PER CIRCUM. INCH OF SHELL          |  | =            | 89.88 lb/in                                  |
| E : HOOP TENSILE MODULUS                                         |  | =            | 1,300,000 psi ( 8,481.3 kg/cm <sup>2</sup> ) |
| P <sub>0</sub> : MAX. ALLOWABLE EXTERNAL PRESS.                  |  | =            | 0 psi ( 0 kg/cm <sup>2</sup> )               |

|                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: left;"> <p>MODEL 12.0</p> <p>ITEMNO. : FRP-001</p> </div> <div style="text-align: right;"> <p>page 5 of 26</p> </div> </div>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <h2 style="margin: 0;">CYLINDRICAL SHELL THICKNESS</h2>                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p>2. STRENGTH CALCULATION</p><br><p style="text-align: center;">(UNDER INTERNAL PRESS)</p><br><p>HOOP LOADING ( CIRCUM. STRESS )</p><br>$\sigma = \frac{P \times R}{t} = \frac{3.74}{0.001} \text{ ksi} = \frac{3.74}{0.01} \text{ in} = \frac{374}{0.1} \text{ in}$<br><p>AXIAL LOADING ( AXIAL STRESS )</p><br>$\sigma = \frac{S_u}{S_u / F_1} = \frac{0.032}{0.02} \text{ in} = \frac{0.032}{0.02} \text{ mm}$ | <p style="text-align: center;">(UNDER EXTERNAL PRESS)</p> <p style="text-align: center;">(NOT APPLIED )</p><br>$I_c = 173 \text{ ( } D_o / t \text{ )}^{1.5} = 138.41$<br>$I / D_o = 0.932 < I_c = 138.41$<br><p>WHEN, <math>I / D_o &lt; I_c</math></p><br>$P_u = \frac{2.6 \text{ ( } E / 32 \text{ ) ( } t / D_o \text{ )}^{1.5}}{( I / D_o ) - 0.01 \text{ ( } t / D_o \text{ )}^{1.5}}$<br>$= 0.73 \text{ psi}$<br><p>WHEN, <math>I / D_o &gt; I_c</math></p><br>$P_u = \frac{2.6 \text{ ( } E / 32 \text{ ) ( } D_o / L \text{ )}}{( t / D_o )^{1.5}}$<br>$= 0.00 \text{ psi}$ |
|                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p>DESIGN THICKNESS (mm)    <math>t = a + 3.74 \text{ in} = 0.15 \text{ in}</math>    MIN. <math>0.25 \text{ in ( } 6.35 \text{ mm)}</math></p><br><p>NOMINAL THICKNESS (mm)    <math>t = 0.394 \text{ in} = 10 \text{ mm}</math></p>                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <p>           1. DESIGN CONDITION<br/>           F : DESIGN PRESS. = 3.88 psi ( 0.27 kg/cm<sup>2</sup> )<br/>           R : RADIUS OF SHELL = 49.2125 in ( 1250 mm )<br/>           t : THICKNESS OF SHELL = 0.394 in ( 10 mm )<br/>           I2 : CIRCUMFERENTIAL SECOND-MOMENT TENSILE MODULES = 3,300,000 psi ( 91,461.3 kg/cm<sup>2</sup> )<br/>           F : DESIGN FACTOR = 10<br/>           S : SECONDARY BOND STRENGTH IN SHEAR ( MAX. 1000 psi ) = 1000 psi ( 70 kg/cm<sup>2</sup> )         </p> |  |
| <p>           2. STRENGTH CALCULATION<br/>           1) THICKNESS OF OVERLAY<br/> <math display="block">t_o = \frac{P(R + t)}{2S \times I_2} = 0.15 \text{ in ( 3.76 mm ) USED } 10 \text{ mm}</math> </p> <p>           2) LENGTH OF OVERLAY<br/> <math display="block">L_o = \frac{PR}{2S \times t} = 0.96 \text{ in ( 24.27 mm ) USED } 100 \text{ mm}</math> </p>                                                                                                                                         |                                                                                       |

## 02

## Structural Calculation

## API 620 / API 650 - Design Criteria for Large Storage Tank

Earthquake-resistant / Wind Pressure Test - Notice of MPSS / Fire defense regulation

REV 103

ESP-103

PAGE 10

12 OF 14

## DESIGN OF TOP ANGLE

(PREFERRED METHOD)

### 1. DESIGN CONSIDERATION

|                |                                                                                                                                      |   |           |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------|---|-----------|
| PL             | Design Internal Pressure                                                                                                             | = | 0.00 Kpsi |
| N <sub>1</sub> | Compressive Force on Bolt/Plate at Top Corner                                                                                        | = | 0 mm      |
| N <sub>2</sub> | Compressive Force on Roof Flange                                                                                                     | = | 0 mm      |
| D              | Inside Diameter of Tank                                                                                                              | = | 0.0 in    |
| R <sub>1</sub> | Inside Radius of Tank                                                                                                                | = | 3200 mm   |
| θ              | Angle of Roof                                                                                                                        | = | 9.46 °    |
| RZ             | R <sub>1</sub> /tan θ                                                                                                                | = | 19274 mm  |
| W              | $0.625 \sqrt{p} / S$                                                                                                                 | = | 76.0 mm   |
| W <sub>1</sub> | $0.625 \sqrt{p} / S$                                                                                                                 | = | 84.0 mm   |
| W <sub>2</sub> | Total Weight of Shell + any Framing Supported by Shell and Roof (Combined)<br>(Vessel Internal Weight, Bottom Weight, Column Weight) | = | 62477 N   |

| ITEM NO.                                       | P.W. REF. DES.                                      | page | 8 of 4                 |
|------------------------------------------------|-----------------------------------------------------|------|------------------------|
| <b>DESIGN OF SHELL PLATE</b><br>(ITEM APP B05) |                                                     |      |                        |
| <b>PART NAME : SHELL</b>                       |                                                     |      |                        |
| <b>1. DESIGN CONSTRUCTION</b>                  |                                                     |      |                        |
| D                                              | NO. INNAAL INSIDE DIAMETER OF TANK                  | =    | 2.30 m                 |
| H                                              | TOTAL HEIGHT OF TANK SHELL                          | =    | 2.580 m                |
| HD                                             | DESIGN LIQUID LEVEL                                 | =    | 2.500 m                |
| HA                                             | DESIGN HEAD LEVEL                                   | =    | 2.6 m                  |
| DT                                             | DESIGN TEMPERATURE                                  | =    | 40 °C                  |
| H                                              | LIQUID LEVEL FOR THE DESIGN CONDITION               |      |                        |
| P                                              | DESIGN INTERNAL PRESSURE                            | =    | 204 mmHg <sub>0</sub>  |
| Pw                                             | DESIGN EXTERNAL PRESSURE                            | =    | 0.13 mmHg <sub>0</sub> |
| G1                                             | SPECIFIC GRAVITY OF LIQUID                          | =    | 1                      |
| G2                                             | DESIGN SPECIFIC GRAVITY OF LIQUID                   | =    | 1                      |
| CA                                             | CORROSION ALLOWANCE OF SHELL                        | =    | 0 mm                   |
| CAW                                            | WELD JOINT CORROSION ALLOWANCE OF BOTTOM            | =    | 0 mm                   |
| CAB                                            | CORROSION ALLOWANCE OF BOTTOM                       | =    | 0 mm                   |
| CAJ                                            | CORROSION ALLOWANCE OF STRUCTURE                    | =    | 1.0 mm                 |
| NA                                             | REQUIRED SHELL THICKNESS (LARGEST OF TWO) (in mm)   |      |                        |
| NA                                             | CALCULATED SHELL THICKNESS (LARGEST OF TWO) (in mm) |      |                        |
| M                                              | SHELL THICKNESS FOR THE DESIGN CONDITION            |      |                        |
| N                                              | SHELL THICKNESS FOR THE HYDRO. TEST CONDITION       |      |                        |
| N                                              | MINIMUM SHELL THICKNESS                             |      |                        |
| Fy                                             | MINIMUM YIELD STRENGTH                              |      |                        |
| N                                              | MINIMUM TENSILE STRENGTH                            |      |                        |
| Sd                                             | ALLOWABLE STRESS FOR THE DESIGN CONDITION           |      |                        |
| N                                              | ALLOWABLE STRESS FOR THE TEST CONDITION             |      |                        |
| V                                              | DESIGN WIND VELOCITY                                | =    | 102.0 km/hr            |
| Z                                              | DESIGN WIND PRESSURE (ZONE 1)                       | =    | 45 mm/m <sup>2</sup>   |
| Z                                              | DESIGN WIND PRESSURE (ZONE 2)                       | =    | 0.18                   |
| F                                              | WIND YIELD STRENGTH REDUCTION FACTOR                | =    | 1.00                   |

1. **발전 기관**

|                         |   |                       |
|-------------------------|---|-----------------------|
| 발전 방식                   | - | EA-AMP-002            |
| 발전 용량                   | - | 발전소(4개) : 400MW       |
| 내연물                     | - | 발전소(4개) : 100,000t/yr |
| 발전 효율                   | - | 0.31                  |
| 발전소 수                   | - | 4                     |
| 발전소 면적(m <sup>2</sup> ) | - | 7.2                   |
| 발전소 수명 (year)           | - | 1000                  |
| 발전 효율 (%)               | - | 60                    |

2. **발전기의 용량**

|          |   |        |    |
|----------|---|--------|----|
| Empty 용량 | - | 4,138  | kg |
| 내연물 용량   | - | 46,081 | kg |
| 기타 용량    | - | -      | -  |
| Total 용량 | - | 75,250 | kg |

3. **발전기의 내연물 : 연소로가 내연물 : 내연물 저장기 : 저장기 : 저장기**  
(내연물 저장기 : 400,000t/yr, 저장기 : 1,000t)

가. 용량 (t)

① 140 t/yr 용량 (kg)

식 =  $0.088 \times L \times 200 \times 5$   
 $= 0.088 \times L \times 0.7/2 \times 0.5$   
 $= 1.10 \times (km^2 \times t)$   
 $= 112.0 \times (km^2 \times t)$

h. 0.7 km<sup>2</sup>의 내연물 : 0.7 / 2 km<sup>2</sup> 용량 (t)

h. 7.2 km<sup>2</sup>의 내연물 : 7.2 / 2 km<sup>2</sup> 용량 (t)

→ h = H = Length

## Macal Program (Development of Seoeun Plant Tech)

Earthquake resistant & wind pressure calculation

## 03

## Thermal Rating

HTRI-Simulation of the design according to the required performance of the heat exchanger

[illegible][illegible][illegible]

## HTRI Program

## 04

## Finite Element Analysis (FEA)

- ① 1. Pre-processing 2. Analysis 3. Post-processing
- ② Proceed with FEA analysis if it consists of a special type of structure that is difficult to prove by strength calculation
- ③ Create a report that meets the requirements of ASME BPVC SEC.VII DIV.2
- ④ Operational program-APPLY MIDAS GEN/ANSYS.

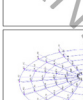
Figure 10 displays the mesh and stress analysis of the driver shell. The image shows a 3D model of the driver shell with a finite element mesh. A color-coded stress distribution is visible, with a legend on the right showing stress values ranging from 0.000E+00 to 1.750E+09. The legend includes a color bar and a table of stress values for different elements.

| Element | Stress    |
|---------|-----------|
| 1       | 1.750E+09 |
| 2       | 1.750E+09 |
| 3       | 1.750E+09 |
| 4       | 1.750E+09 |
| 5       | 1.750E+09 |
| 6       | 1.750E+09 |
| 7       | 1.750E+09 |
| 8       | 1.750E+09 |
| 9       | 1.750E+09 |
| 10      | 1.750E+09 |
| 11      | 1.750E+09 |
| 12      | 1.750E+09 |
| 13      | 1.750E+09 |
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| 15      | 1.750E+09 |
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| 97      | 1.750E+09 |
| 98      | 1.750E+09 |
| 99      | 1.750E+09 |
| 100     | 1.750E+09 |

### 3.3 FRAME ANALYSIS & RESULT DIAGRAM



3D MODELLING



ROOF GRID

## MIDAS GEN Program

ANSYS Program



## Domestic Equipment Certification



### 01 Domestic Pressure Vessel Inspection Agency

- KEA
- KOSHA
- KGS
- KESCO (Handling only pressure vessels used in power generation facilities)



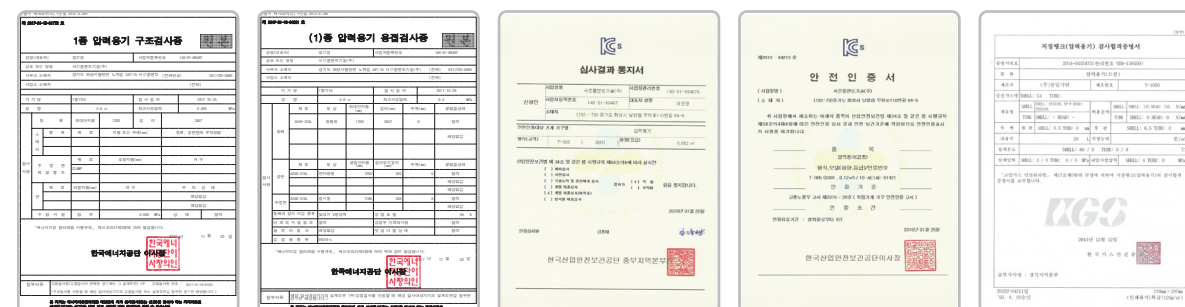
### 02 Criteria For Inspection By Major Institutions

|                    | KEA                                                                                                                                                                                                                      | KOSHA                                                                                                                                                                                            | KGS                                                                                                   |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Inspection subject | Pressure X Volume = Exceeding 0.004 and heated using heat, steam generation, excess atmospheric pressure<br>-First class pressure vessel<br><br>Vessel that holds gas exceeding 0.2 MPa<br>-Second class pressure vessel | Chemical Process Fluid Handling Vessel<br>- "A" pressure vessels<br><br>other vessels except "A"<br>(Air / Nitrogen Tank)<br>- "B" pressure vessels<br><br>Maximum Use Pressure 0.2 Mpa Exceeded | liquefied gas<br>-0.2Mpa or higher<br><br>Compressed gas<br>-1Mpa or higher                           |
| Inspection code    | KS B 6750 or Public Notice of MOTIE ASME SEC.VIII Div.1                                                                                                                                                                  | KS B 6750-3 ASME SEC.VIII Div.1                                                                                                                                                                  | KGS AC111 ASME SEC.VIII Div.1                                                                         |
| Inspection order   | welding inspection > structural inspection > installation inspection                                                                                                                                                     | Written investigation > Individual equipment investigation (material, welding, internal pressure)                                                                                                | Design Review > Site inspection of specific facilities (Material, FIT-UP, Welding, Internal Pressure) |

### 03 Inspection Equipment Certification Flow



### 04 Certificates For Each Institution in Korea



## Certification of Imported Equipment

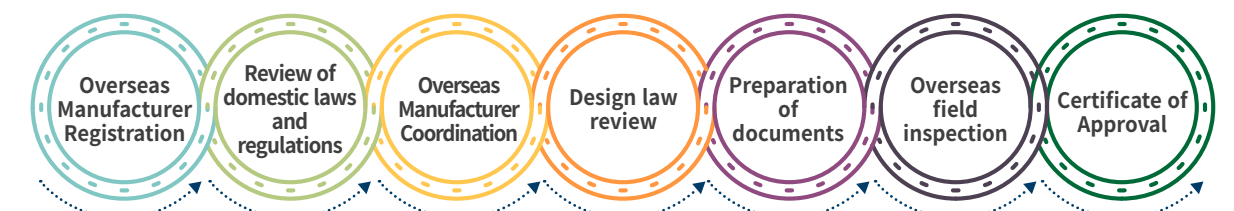


### 01 Overseas Inspection Certification Guide (Imported pressure vessel)

If a client intends to import pressure vessels into Korea, we provide end-to-end support—from determining inspection requirements to obtaining certification for the equipment.  
(Application / documentation / overseas site inspection / interpretation / training / domestic installation)  
For more details, please follow our Insights [blog.naver.com/septech](https://blog.naver.com/septech).

|                      | KEA                                                                                                                              | KOSHA                                                                                                                                                                                                                                         | KGS                                                                                                                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inspection method    | Conduct overseas manufacturing on-site inspection after approval of document review                                              | ① Exemption from inspection if certified by an international accredited institution that has signed an MOU with the public corporation.<br>② Same as domestic inspection. Overseas manufacturing on-site inspection after written examination | ① Exemption from inspection if certified by an international accredited institution that has signed an MOU with the public corporation.<br>② Overseas manufacturing site inspection + Internal pressure inspection |
| Inspection code      | KS B 6700 or Public Notice of MOTIE ASME SEC.VIII Div.1                                                                          | KS B 6750-3 ASME SEC.VII Div.1                                                                                                                                                                                                                | KGS AC111 ASME SEC.VIII Div.1                                                                                                                                                                                      |
| Inspection Procedure | When manufacturing large amounts of the same equipment, it is possible to alleviate inspection by reviewing factory registration |                                                                                                                                                                                                                                               | Manufacture is possible only after obtaining a specific facility manufacturing license                                                                                                                             |

### 02 Inspection Equipment Certification Flow



Support for installation inspection, regular inspection, and continuous use inspection after receiving in Korea

## KOREA ENERGY AGENCY (KEA) Pressure Vessel Import Inspection Services



### 01 KEA Inspection Overview

Due to the revision of the Energy Use Rationalization Act, manufacturing inspections for imported equipment after December 3, 2017, must be conducted at the manufacturers' sites under the same standards applied in Korea. KEA imported vessel inspection is different from other countries. In particular, domestic standards vary depending on the materials used. In addition, since foreign companies do not know the domestic application standards, there are many difficulties in the certification and manufacture process. Accordingly, SEOEUN PLANT TECH consults on KEA inspection to overcome these difficulties.



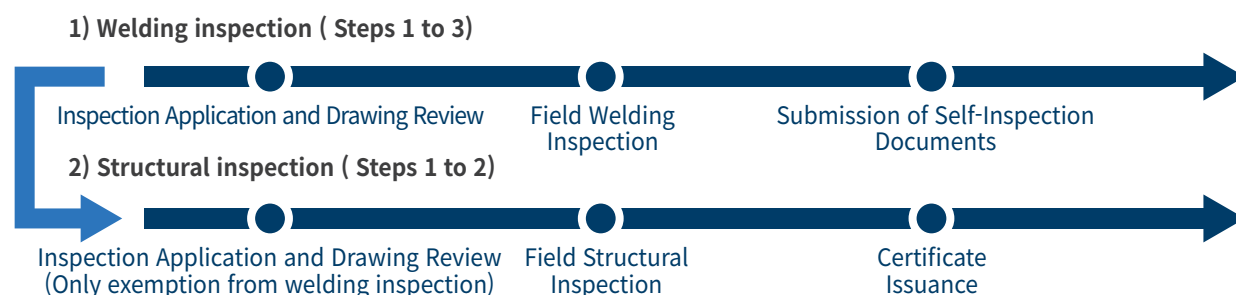
### 02 KEA Inspection Target And Type

- **High-temperature, high-pressure vessels using thermal media in petrochemical, bio, pharmaceutical, food, energy and new materials** [Energy Use Rationalization Act Article 31 Paragraph 6]
- **Inspection Device Type**
  - Pressure Vessel / Heat Exchanger / Reactor / Agitator / Bio Tank / Autoclave / Retort / Sterilizer
  - Dyeing Machine / Extractor / Evaporator / Incubator / Bioreactor / Fermenter / Glass-Lined Vessel

### 03 KEA Inspection Criteria

| Category                 | KS                                                                                           | MOTIE                                                           |
|--------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Technical Standard       | KS B 6750 (=ASME Sec.VIII div.1)                                                             | MOTIE Notice No. 2019-16                                        |
| Available Material       | Only KS or ASME materials allowed                                                            | KS material or higher (JIS, EN, GB)                             |
| Quality Control System   | Documented system required                                                                   | Not required (But WPS required)                                 |
| Specimen Test            | Required only for specific requirements                                                      | Required for vessel shell length or circumferential joint welds |
| Self-Inspection Accepted | Non-destructive, Mechanical testing conducted by government-operated or recognized companies |                                                                 |

### 04 KEA Pressure Vessel Import Inspection Procedure



## Import Inspection and Certification Services (KEA · KOSHA · KGS)

### 01 Seoeeun Plant Tech Overview

SEOEUN PLANT TECH CO., LTD. is a consulting company providing import pressure vessel certification services for KEA, KOSHA and KGS. With 40 years of experience, we consult on all aspects of documentation, drawings, inspection and installation of imported equipment.

### 02 Clients Of Seoeeun Plant Tech

Importers and Exporters : Project owner(User), Equipment supplier(Trading Company), Manufacturer

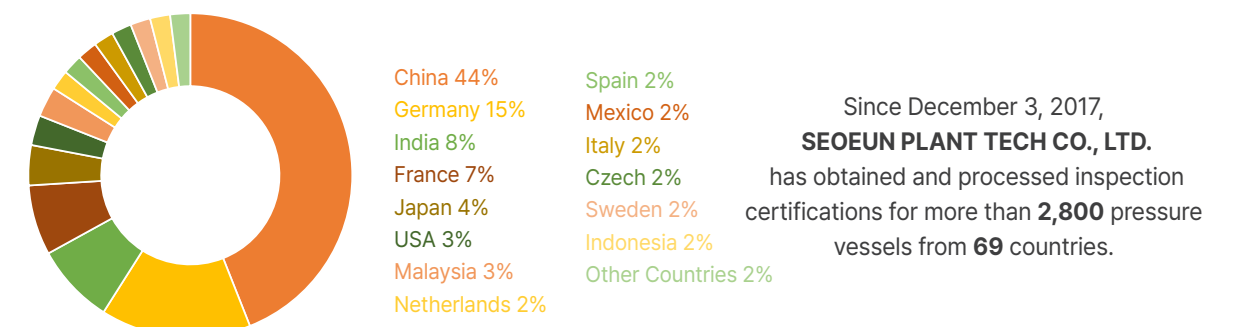
### 03 Scope Of Work – Seoeeun Plant Tech

- 1) Guidance on the information required for the contract
- 2) Manage delivery schedules aligned with the manufacturing process
- 3) Pre-meetings with KEA, KOSHA and KGS
- 4) Drawing review and documentation based on KEA, KOSHA and KGS requirements
- 5) Continuous communication with KEA, KOSHA and KGS until document approval
- 6) Accompanied by welding inspection and structural inspection
- 7) Guidance for installation inspection approval after shipment to Korea

### 04 Why Collaborate With Seoeeun Plant Tech

- 1) We provide consulting with expertise based on 40 years of experience.
  - 2) We directly manage all parts including documents, drawings, inspections, domestic delivery dates and installation completion.
  - 3) We proceed according to the manufacturing and delivery schedule.
- Estimated time required : Document approval - About 3 weeks / Inspection approval - About 6 weeks

### 05 Project References – Seoeeun Plant Tech

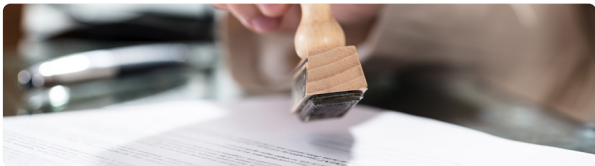


### 06 Other Services – Seoeeun Plant Tech

- Domestic certification and Overseas import certification - KEA, KOSHA, KGS, DNVGL, LR, ABS
- Basic & Detailed Drawing / Strength Calculation / Thermal Design / FEA / Process Design / P&ID / Earthquake-Resistant Design
- Pilot Plant / Test Bed / Lab Bench Scale / Piping



# Classification Equipment Certification

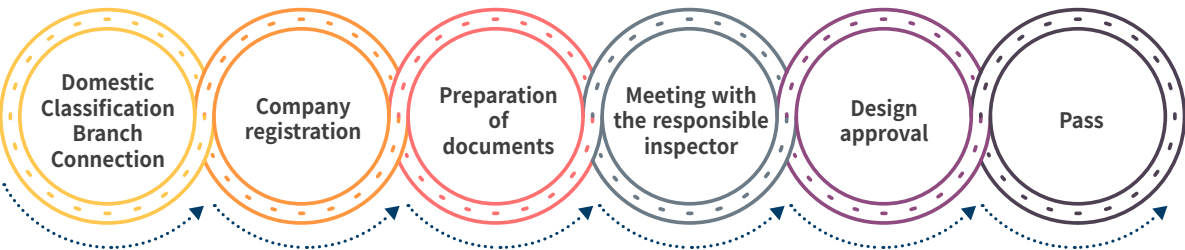


## 01 Classification Inspection Agency

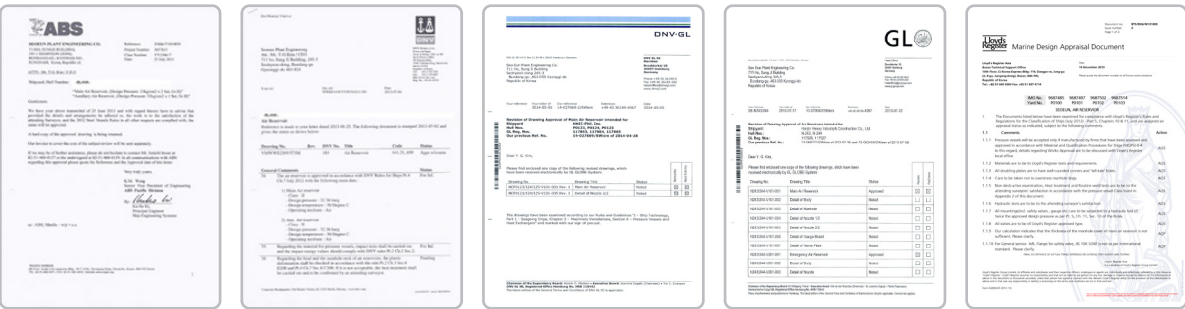
- KR (Korean Register of Shipping)
- ABS (American Bureau of Shipping)
- DNV. GL (Det Norske Veritas&Germanischer Lloyd)
- LR (Lloyds Register)
- Nk (Nippon Kaiji Kyokai)
- RINA (Registro Italiano Navale)



## 02 Inspection Equipment Certification Flow



## 03 Sample Certificates By Major Classification Institutions



# Other Inspection and Certification Services



## 01 KEA

|                                 |                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Installation Inspection</b>  | A person intending to install and operate equipment subject to inspection. [Energy Use Rationalization Act, Article 39]                                                    |
| <b>Internal Inspection</b>      | A person intending to continue operations by undergoing an internal inspection every two years after the initial installation [Energy Use Rationalization Act, Article 31] |
| <b>Continued Use Inspection</b> | A person intending to continue using equipment after the expiration of its current inspection validity period [Energy Use Rationalization Act, Article 31, Paragraph 19]   |
| <b>Modification Inspection</b>  | A person intending to use equipment subject to inspection after modification or alteration [Energy Use Rationalization Act, Article 39]                                    |
| <b>Relocation Inspection</b>    | A person intending to use equipment subject to inspection after changing its installation site [Energy Use Rationalization Act, Article 39]                                |

## 02 KOSHA

|                                                |                                                                                                                                                                       |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Safety Inspection (Periodic Inspection)</b> | Safety Inspection for machinery subject to safety inspection [Occupational Safety and Health Act, Article 93, Paragraph 1]                                            |
| <b>Self Safety Confirmation Declaration</b>    | Self-declaration of Conformity (DoC) for machinery subject to autonomous safety confirmation [ [Occupational Safety and Health Act, Article 89, Paragraph 1]          |
| <b>Harm and Hazard Prevention Report</b>       | Machinery directly related to production processes, used to prevent health hazards, or for construction commencement [Occupational Safety and Health Act, Article 42] |
| <b>PSM</b>                                     | Workplaces with hazardous or dangerous facilities as determined by Presidential Decree [Occupational Safety and Health Act, Article 44, Paragraph 1]                  |
| <b>Off-site Consequence Analysis</b>           | Parties intending to install or operate hazardous chemical handling facilities [Chemicals Control Act, Article 23]                                                    |

## 03 KGS

|                                                      |                                                               |
|------------------------------------------------------|---------------------------------------------------------------|
| <b>Specific Facility</b>                             | High Pressure Gas Safety Management Act Article 5 Paragraph 1 |
| <b>Manufacturing Permit Acquisition Support</b>      |                                                               |
| <b>Overseas Company Factory Registration Support</b> |                                                               |

## 04 Other Inspections

|                                      |                                                  |
|--------------------------------------|--------------------------------------------------|
| <b>Explosion Proof Certification</b> | Items applicable to electricity such as IECEx/KC |
|--------------------------------------|--------------------------------------------------|



## Consulting



### 01 Design Training

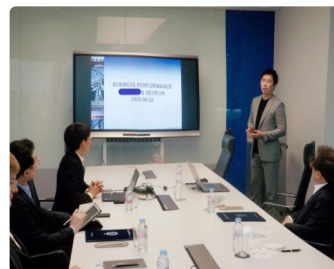
- ① ASME CODE-Design/Manufacturing Training
- ② KS CODE-Design/Manufacturing Training
- ③ JIS CODE-Design/Manufacturing Training
- ④ API650 CODE-Design/Manufacturing Training
- ⑤ Training on how to operate design programs-COMPRESS / MECAL

### 02 Domestic/Import Inspection Process Training

#### Training for the entire process from the beginning of inspection to certification and maintenance (Design + Manufacturing + Inspection Preparation)

- For domestic and imported pressure vessels, on-site meetings are available.
- Most of the subjects of inspection training fall under the following cases.
- Subjects of inspection training
  - ① In the case of domestic import-Overseas Manufacturer manager
  - ② In the case of domestic inspection equipments- manufacturer manager
  - ③ User/Agent/Trader

In the case of KEA import inspection, on-site inspection is mandatory, so it is necessary to respond to foreign manufacturers in accordance with domestic codes.



### 03 Legal Review And Estimate Support

#### ① Review of Pressure Vessel Regulations

- Determining the inspection target of the pressure vessel / Equipments subject to exemption / Type 1, Type 2 Classification / Classification of Class A and Class B
- We will accurately review the laws and solve problems that may arise in the future.

#### ② Priority of equipment to be inspected for pressure vessels

- The priority for each inspection institution is as follows. If the client's pressure vessel is subject to inspection by a higher level institution, it must be inspected by a higher level institution due to the grounds below.

(KGS > KEA > KOSHA)

Basis : KOSHA-[Enforcement Rules of the industry Safety and Health Act Article 58 Paragraph 2]  
KEA-[Energy Use Rationalization Act Enforcement Rules Article 1 Paragraph 2]

#### ③ Preparation of various approval documents

- We support the preparation of various approval documents(JOB REQUIREMENT SPECIFICATIONS, WPS & PQR, INSPECTION & FABRICATION PROCEDURE, LOADING DATA) required by the customer.

#### ④ Estimate support work

- We provide all estimates for the work we provide, such as design / certification / consulting.

#### ⑤ Support for review of various approval documents

- Various documents such as drawings, strength calculations, and inspection documents submitted by VENDOR can be reviewed according to the customer's required specifications and design codes / legal standards.

### 04 Manufacture Support



## Test Bed



### 01 The Only Test Bed Design Company In Korea - From Idea To Reality

#### Test Bed

It means designing and realizing the environment, space, system and facilities to test the performance, effectiveness, stability, mass manufacture possibility and convenience of new technologies and prototypes developed by research institutes and universities.

We have a lot of experience in the design of test beds and can present ideas to realize and implement your thoughts.

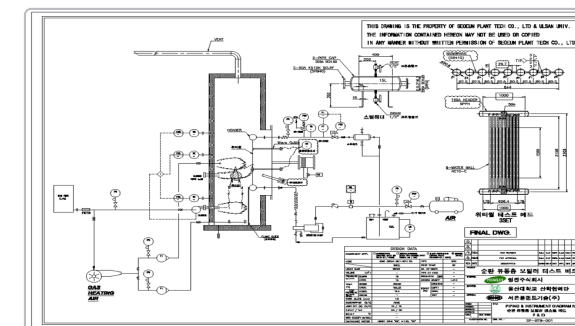
- Possibility of localization of imported equipments and equipment development
- LAB SCALE BENCH / R&D research project / Government project can be performed

### 02 Test Bed performance

**Business Name** Circulating fluidized bed combustion Test bed

**Main Content** Development of Circulating fluidized bed combustion Furnace sound emission failure prediction diagnosis system

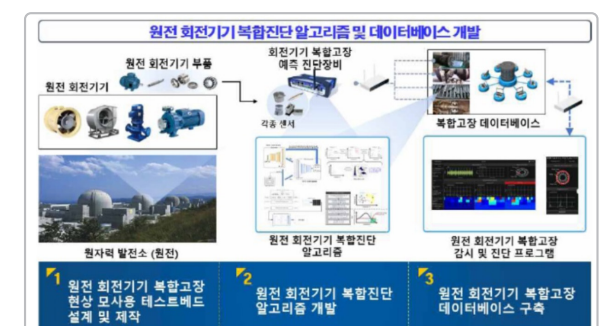
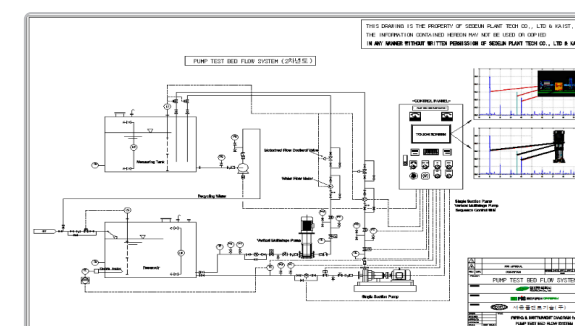
**Customer** KETEP



**Business Name** Nuclear power plant rotating equipment complex failure algorithm and database development ENGINEERING

**Main Content** Development of an Acoustic Emission-Based Fault Prognostics and Diagnostics System for Total Piping Systems

**Customer** KOWEPO

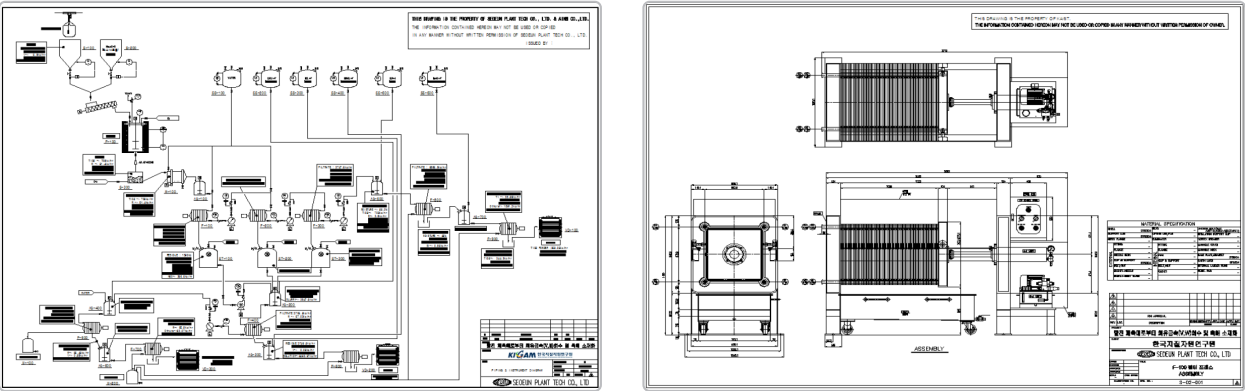


Test Bed performance

**Business Name** Basic engineering design for electrochemical drainage technology verification from automobile waste catalysts

**Main Content** Verification of electrochemical platinum leaching technology from automobile waste catalysts

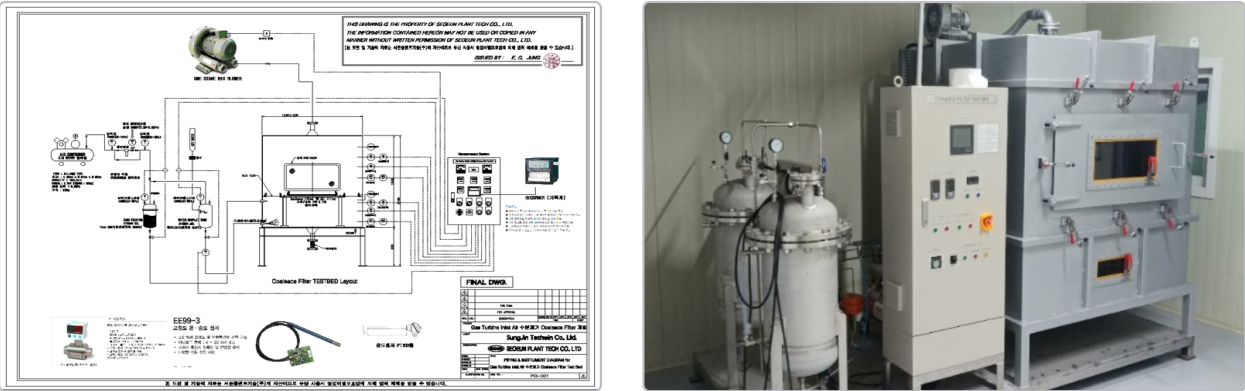
**Customer** KIGAM



**Business Name** Development of gas turbine inlet air moisture removal coalesce filter

**Main Content** Due to the geographical characteristics of the power plant and frequent yellow dust, moisture and dust accumulation deepens inside the air intake system

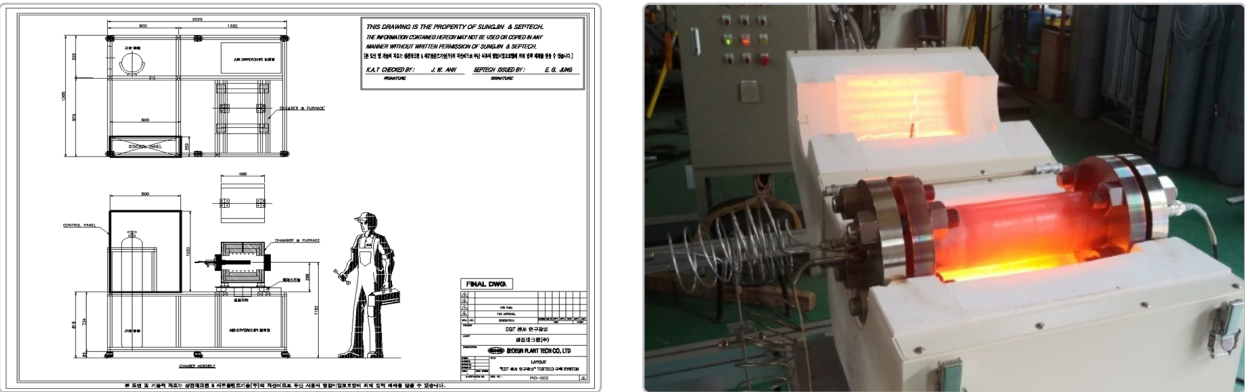
**Customer** KOWEPO



**Business Name** Establishment of EGT sensor reliability test TEST BED

**Main Content** The gas is attached to the frame of the gas turbine to detect the temperature of the burned gas, and the combustion condition of the turbine is monitored in real time. Development of Temperature Sensor for Efficient and Safe Control of Gas Turbine

**Customer** KOWEPO



 **Special Manufacture Project**



01 Manufactured special items with the world's best technology

**Special Manufacture Project**

High-level devices (pressure vessel, heat exchanger, tower, etc.) are manufactured. Process design such as petrochemical, high purity GAS, precision chemistry, bio, and PANT, and design and manufacture of P&ID are carried out. Of course, We have the ability to perform BATCH SYSTEM, PILOT PLANT, COMERCIAL PLANT, etc.

02 Special Manufacture Project Performance

**Business Name** SICL4 REFINEMENT STATION SYSTEM

**Main Content** SICL4 purification method that produces high purity SICL4 by purifying metal impurities, gaseous impurities, moisture, and oil contained in SiCL. High purity SICL4 purification PLANT of 99.999995% or more by simultaneously or continuously removing SICL4 impurity mixed gas using a distillation process

**Customer** SOLEMATERIALS CO., LTD.



**Business Name** HEAVY TAR SALES EQUIPMENT

**Main Content** Installation of Commercial Plant for the purpose of selling heavy tar produced as a by-product in Hyundai Steel's annual steelmaking process

**Customer** HYUNDAI STEEL CO., LTD.

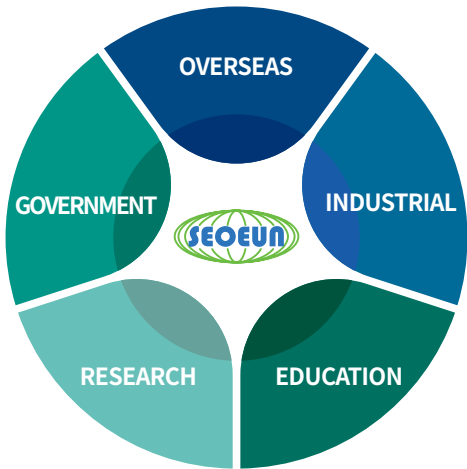




# Project References



## 01 Major partners of Industry, Education, Research, Government, Overseas



### Overseas

USA-(ALBEMARLE CORP, ROSS EQUIP, LOST WAX, KNBS, MATHESON GAS, KBR, ENDORFF),  
CHINA-(WUXI BIOLOGICS, ANHUI JINMA, DTS, JIBO TAIJI, TECH SOLUTION, INTERCONSTEK, SUNGIL HITEK),  
JAPAN-(HITACHI, TOYO ENG'G, CHISSO ENG'G, BASF, KOBELCO, TOYOBO, YAMAGEN, KAJIWARA, HOSOKAWA),  
FRANCE-(STERIFLOW, 3C FRANCE, PETRON BATAAN REFINERY), INDIA-(BIOZEEN),  
GERMANY-(BOSCH, DFT, JANSSEN, THEMATEK, INTRON), SAUDI ARABIA-(SIPCHEM, S.O.C), QATAR-(TASNEE),  
OMAN-(OMAN OIL COMPANY E&P LLC, SALALAH METHANOL), BELGIUM-(SOLVAY), ITALY- (VEOLIA)

### Industrial

SAMSUNG (Bioepis / Heavy Industries /Engineering / Biologics / Electronics),  
POSCO(Holdings, Future-m, M-Tech), LG(Chem./Display/Energy SoluTion/ Electronics),  
SK(Innovation /Chemical / Bio pharm / Bioscience), KAI, HANWHA(Tech/Solutions), HJ Shipbuilding & Construction,  
DOOSAN, HANKOOK TIRE, DL E&C, FOOSUNG, HANSOL CHEMICAL, HUVIS, DUCKSAN, OCI, DOW CHEMICAL,  
KUMHO P&B CHEMICALS, HANIL CEMENT, NAMHAE CHEM., HANMI PHARM., CHEMTROS, CELLTRION,  
HANSOL CHEMICAL, SUNGSHIN CEMENT , SAMPYO CEMENT, KUMHO MITSUI CHEMICALS, HUCHEMS, GS BIO,  
GS CALTEX, KCC SILICONE, LS CABLE & SYSTEM, HANSOL PAPER, GC BIOPHARM., KOREA UNITED PHARM.

### Education

KAIST, AJOU UNIVERSITY, PUSAN NATIONAL UNIVERSITY, SEOUL NATIONAL UNIVERSITY, ULSAN UNIVERSITY,  
JEONBUK NATIONAL UNIVERSITY, CHUNGNAM NATIONAL UNIVERSITY

### Research

KARI, KIGAM, ADD(Engine test equipment), KIMM, NIER, KRICT, KETE, KAERI, KFE, KEPCO-ENC, KETEP, CBF

### Government

Ministry of National Defense, KORES, KORAIL, KT, Changwon City, Daegu Metropolitan City,  
Busan Metropolitan City, Seoul Metropolitan City, HOIL, KOEN, KOWEPO, KEWP, KHNP

| NAME OF PROJECT                    | DESCRIPTION                                     | CLIENT                   | SITE     | YEAR |
|------------------------------------|-------------------------------------------------|--------------------------|----------|------|
| BCC PROJECT                        | VESSEL                                          | SSANGYONG OIL REFINERY   | KOREA    | 1998 |
| INCINERATOR SYSTEM                 | INCINERATOR                                     | HANYANG CHEMICAL         | KOREA    | 1998 |
| E/O PURIFICATION PROJECT           | TOWER                                           | HYUNDAI PETROCHEMICAL    | KOREA    | 1998 |
| BTX PROJECT                        | VESSEL / H/EX.                                  | JEONGWOO CHEMICAL        | KOREA    | 1998 |
| NCC PROJECT                        | H/EX.                                           | NAMHAE CHEMICAL          | KOREA    | 1998 |
| JILIN CAK PROJECT                  | FLARE STACK                                     | TOYO ENGINEERING         | JAPAN    | 1998 |
| COMPANY PARK BUILDING              | TOTAL ENGINEERING                               | KYUNGHANG NEWSPAPER      | KOREA    | 1998 |
| TCL PROJECT                        | VESSEL / TOWER                                  | TOYO ENGINEERING         | JAPAN    | 1998 |
| HSR PROJECT                        | VESSEL / REACTOR                                | HYUNDAI PETROCHEMICAL    | KOREA    | 1998 |
| FCC PROJECT                        | VESSEL(HIGH PRESSURE)                           | YUKONG                   | KOREA    | 1998 |
| CUPOLA FLUE CLEANING SYSTEM        | FILTER / H/EX. / DUCT STEEL S TRUCTURE / PIPING | BUEKSAN                  | KOREA    | 1998 |
| RFCC F/G SOX SCRUBBER              | STRUCTURE                                       | SK CORPORATION           | KOREA    | 1998 |
| BIBA-1 PROJECT                     | VESSEL                                          | BIBACO                   | KOREA    | 1998 |
| SOLVENT RECOVERY SYSTEM            | VESSEL                                          | YOUL CHON CHEMICAL       | KOREA    | 1998 |
| OZONE TANK SYSTEM TANK & PIPING    | TANK, PIPING                                    | YOUL CHON CHEMICAL       | KOREA    | 1998 |
| SBR-9 PROJECT                      | C.R.T                                           | KUMHO PETROCHEMICAL      | KOREA    | 1999 |
| TSING MA BRIDGE PROJECT            | TOTAL                                           | HONGKONG                 | HONGKONG | 1999 |
| UTILITY & FACILITY PROJECT         | TOWER                                           | DAELIM INDUSTRIAL        | KOREA    | 1999 |
| PTA PROJECT                        | VESSEL                                          | SAMSUNG GENERAL CHEMICAL | KOREA    | 1999 |
| LG 3AA PROJECT                     | C.R.T                                           | LG ENGINEERING           | KOREA    | 1999 |
| PL/TCM PLANT PROJECT               | TOTAL                                           | HANBO IRON STEEL         | KOREA    | 1999 |
| FEB PROJECT                        | TOTAL                                           | DONGYANG NYLON           | KOREA    | 1999 |
| YER-11 PROJECT                     | H/EX.                                           | KUMHO PETROCHEMICAL      | KOREA    | 1999 |
| OXYGEN SUPPLY PLANT PROJECT        | TOTAL                                           | POSCO                    | KOREA    | 1999 |
| SR PROJECT                         | C.R.T                                           | LG ENGINEERING           | KOREA    | 1999 |
| HP24M PROJECT                      | VESSEL                                          | OCI                      | KOREA    | 1999 |
| CRT PROJECT                        | H/EX.                                           | KOOKDO CHEMICAL          | KOREA    | 1999 |
| P PROJECT                          | TOWER / H/EX.                                   | DCI / KT                 | KOREA    | 1999 |
| 40,000 MTY K-RESIN PROJECT         | FILTER, H/EX.                                   | DAELIM INDUSTRIAL        | KOREA    | 1999 |
| 396,000 T/Y #3 SULFURIC ACID PLANT | BIG TOWER                                       | NAMHAE CHEMICAL          | KOREA    | 1999 |
| FLARE STACK                        | TOTAL                                           | LG CHEMICAL              | KOREA    | 2000 |

| NAME OF PROJECT               | DESCRIPTION             | CLIENT                   | SITE   | YEAR |
|-------------------------------|-------------------------|--------------------------|--------|------|
| YDR-4 PROJECT                 | REACTOR / TOWER / H/EX. | KKPC                     | CHINA  | 2000 |
| VCM PROJECT                   | TOWER / H/EX.           | HYUNDAI PETROCHEMICAL    | KOREA  | 2000 |
| PEB STRUCTURE                 | TOTAL                   | HANKOOK TIRE             | KOREA  | 2000 |
| KEROSENE/ DIESEL PROJECT      | STRUCTURE / H/EX.       | LG CALTEX OIL            | KOREA  | 2000 |
| NO.2 UTILITY OFF-SITE PROJECT | VESSEL / C.R.T          | SAMSUNG GENERAL CHEMICAL | KOREA  | 2000 |
| CDP-1 PROJECT                 | TOTAL                   | SK NJC                   | KOREA  | 2000 |
| NO.2 PP PROJECT               | VESSEL / H/EX.          | PEMEX                    | KOREA  | 2000 |
| HEAVY NAPHTHA SPLITTER UNIT   | TOTAL                   | SAMSUNG GENERAL CHEMICAL | KOREA  | 2000 |
| P PROJECT                     | TOWER / H/EX.           | KT                       | KOREA  | 2000 |
| AGC AVL PROJECT               | VESSEL / H/EX.          | CHISSO ENGINEERING       | JAPAN  | 2000 |
| GWANGJU 2ND FACTORY           | TOTAL                   | SAMSUNG ELECTRONICS      | KOREA  | 2000 |
| HYDROGEN PLANT                | VESSEL                  | FPC                      | KOREA  | 2000 |
| FLARE STACK SYSTEM            | FLARE STACK             | PE CHEMICAL              | TAIPEI | 2001 |
| CHEONGJU NO.5 PLANT           | VESSEL                  | DAESUNG SAN SO           | KOREA  | 2001 |
| PET OFF GAS SCRUBBING SYSTEM  | TOWER                   | SAMNAM                   | KOREA  | 2001 |
| AGC AVL PROJECT               | VESSEL / H/EX.          | CHISSO ENGINEERING       | KOREA  | 2001 |
| NEW TDI PROJECT               | VESSEL / H/EX.          | BASF                     | JAPAN  | 2001 |
| NEW HYVAHL COMPLEX PROJECT    | H/EX.                   | S-OIL                    | KOREA  | 2001 |
| VOC SYSTEM                    | VESSEL                  | BASF                     | KOREA  | 2001 |
| YM-2 PROJECT                  | H/EX.                   | LG                       | KOREA  | 2001 |
| KA1, K2, K4 PROJECT           | VESSEL / H/EX.          | CHEIL ENGINEERING        | KOREA  | 2001 |
| SGC AROMATICS REVAMPING       | H/EX.                   | SAMSUNG ENGINEERING      | KOREA  | 2001 |
| TORAY OCP-3 PROJECT           | VESSEL H/EX.            | TEK KOREA                | KOREA  | 2001 |
| EXPANSION PROJECT 2002        | VESSEL / H/EX.          | LG NIKKO COPPER          | KOREA  | 2002 |
| NYLON POWDER 50 MTPY PLANT    | VESSEL / H/EX.          | SHINHO PETROCHEMICAL     | KOREA  | 2002 |
| WORK TANK FABRICATION         | VESSEL                  | DAEWOO ELEC.             | KOREA  | 2002 |
| VITAMIN PRODUCTION PROJECT    | VESSEL / H/EX./ C.R.T   | BASF                     | KOREA  | 2002 |
| GWANGMYEONG DISTRICT HEATING  | HEATER(TWO ZONE)        | LG POWER                 | KOREA  | 2002 |
| HP-SCWO PILOT PROJECT         | VESSEL                  | KOREA PETROCHEMICAL.     | KOREA  | 2002 |
| PL/TCM PROJECT                | H/EX.                   | DONGBU STEEL             | KOREA  | 2002 |
| BAIONGAN BLUE SKY PROJECT     | VESSEL                  | HITACHI                  | KOREA  | 2002 |

| NAME OF PROJECT                     | DESCRIPTION            | CLIENT                             | SITE         | YEAR |
|-------------------------------------|------------------------|------------------------------------|--------------|------|
| S-PROJECT                           | VESSEL / H/EX.         | KCC                                | KOREA        | 2002 |
| WATER JET PROJECT                   | SPECIAL SYSTEM         | MINISTRY OF NATIONAL DEFENSE (국방부) | KOREA        | 2002 |
| FPCC ARDS-I PROJECT                 | VESSEL                 | FORMOSA                            | TAIWAN       | 2003 |
| SK 2nd LBO PROJECT                  | TOTAL                  | SK CHEMICAL                        | KOREA        | 2003 |
| CHANGWON CITY HALL                  | TOTAL                  | GOVERNMENT                         | KOREA        | 2003 |
| AIR FIN COOLER                      | COOLER                 | HYUNDAI OIL                        | KOREA        | 2003 |
| BP SHAH DENIZ PROJECT               | VESSEL                 | SOC                                | SAUDI ARABIA | 2003 |
| SK 2nd LBO PROJECT                  | TOTAL                  | SK CHEMICAL                        | KOREA        | 2004 |
| CHANGWON CITY HALL                  | TOTAL                  | GOVERNMENT                         | KOREA        | 2004 |
| HANWHA VENT CONDENSER               | H/EX.                  | HANHWA                             | KOREA        | 2004 |
| DONGBU H/EX.                        | H/EX.                  | DONGBU                             | KOREA        | 2004 |
| KANGMYUNG LOCAL HEATING             | H/EX.(TWO ZONE)        | LG CONS.                           | KOREA        | 2004 |
| AN WASTE WATER T-N TREATMENT SYSTEM | TOTAL                  | TAEKWANG PETRO.                    | KOREA        | 2004 |
| J-PROJECT                           | REACTOR / STORAGE TANK | JOHN ZINK                          | THAILAND     | 2004 |
| 5th GAS SEPARATION PLANT PROJECT    | VESSEL                 | HITACHI                            | JAPAN        | 2004 |
| M-PROJECT                           | REACTOR                | HANMAEK IND.                       | MYANMAR      | 2004 |
| FLARE STACK                         | FLARE STACK            | HAMWORTHY                          | INDONESIA    | 2004 |
| SUCTION HEATER OF FUEL OIL          | STORAGE TANK           | KOREA WESTERN POWER (한국서부발전)       | KOREA        | 2004 |
| CURING OVEN INCINERATOR             | H/EX.                  | BUEKSAN                            | KOREA        | 2004 |
| N-PROJECT                           | REACTOR / VESSEL       | HYOSUNG CORP.                      | KOREA        | 2004 |
| LOTTE SAMGANG CHON-AN FACTORY       | VESSEL                 | DOOSAN MECHATEC                    | KOREA        | 2004 |
| VENT CONDENSOR & H/EX.              | H/EX.                  | DONG YANG CHEMICAL                 | KOREA        | 2004 |
| SK COPORATION                       | STRUCTURE              | DOOSAN MECHATEC                    | KOREA        | 2005 |
| SOLVENT RECOVERY SYSTEM             | TOTAL                  | SAMKUN E&C                         | KOREA        | 2005 |
| OZONE TANK                          | PIPING / STRUCTURE     | YOUL CHON CHEMICAL                 | KOREA        | 2005 |
| YM-2 PROJECT                        | H/EX.                  | LG                                 | KOREA        | 2005 |
| KA1, K2, K4 PROJECT                 | TOTAL                  | CHEIL ENGINEERING                  | KOREA        | 2005 |
| EXPANSION PROJECT 2002              | VESSEL / H/EX.         | LG NIKKO COPPER                    | KOREA        | 2005 |
| WORK TANK FABRICATION               | TOWER / VESSEL         | DAEWOO ELEC.                       | KOREA        | 2005 |
| VITAMIN B2 PRODUCTION PROJECT       | VESSEL / C.R.T / H/EX. | BASF                               | KOREA        | 2005 |
| GWANGMYEONG DISTRICT                | H/EX.(TWO ZONE)        | LG POWER                           | KOREA        | 2005 |

| NAME OF PROJECT                     | DESCRIPTION                          | CLIENT                       | SITE      | YEAR |
|-------------------------------------|--------------------------------------|------------------------------|-----------|------|
| DONGBU H/EX.                        | H/EX.                                | DONGBU                       | KOREA     | 2005 |
| AN WASTE WATER T-N TREATMENT SYSTEM | TOTAL                                | TAEKWANG PETRO.              | KOREA     | 2005 |
| FLARE STACK                         | FLARE STACK                          | JOHN ZINK                    | THAILAND  | 2005 |
| 5th GAS SEPARATION PLANT PROJECT    | VESSEL                               | HITACHI                      | JAPAN     | 2005 |
| M-PROJECT                           | REACTOR                              | HANMAEK IND.                 | MYANMAR   | 2005 |
| FLARE STACK                         | FLARE STACK                          | HAMWORTHY                    | INDONESIA | 2005 |
| SUCTION HEATER OF FUEL OIL          | STORAGE TANK                         | KOREA WESTERN POWER (한국서부발전) | KOREA     | 2005 |
| N-PROJECT                           | REACTOR / VESSEL                     | HYOSUNG CORP.                | KOREA     | 2005 |
| N-PROJECT                           | ENG'G DWG.                           | HYOSUNG                      | KOREA     | 2006 |
| PLASMA PILOT PLANT                  | VESSEL                               | KGC                          | KOREA     | 2006 |
| PIT VESSEL                          | TOTAL                                | SEC                          | KOREA     | 2006 |
| POHANG H2 PROJECT                   | VESSEL                               | BOCK                         | KOREA     | 2006 |
| PILOT PLANT                         | H/EX.                                | JEIO                         | KOREA     | 2006 |
| WTP 1st LINE TRANSFER PROJECT       | PIPING / STRUCTURE / TOTAL EQUIPMENT | KAI                          | KOREA     | 2006 |
| FORMOSA NINGBO                      | FILTER                               | FORMOSA                      | TAIWAN    | 2006 |
| JEBEL ALI POWER PHASE 2             | FILTER                               | HEC                          | KOREA     | 2006 |
| INITIAL Z                           | VESSEL / H/EX.                       | SAN NOPCO                    | KOREA     | 2006 |
| BD PROJECT                          | VESSEL / C.R.T                       | DANSUK                       | KOREA     | 2006 |
| DUNG QUAT REFINERY PROJECT          | STORAGE TANK                         | PETROVIETNAM                 | VIETNAM   | 2006 |
| P2-PROJECT                          | VESSEL                               | SAMSUNG TOTAL PETROCHEMICALS | KOREA     | 2006 |
| A-PROJECT                           | VESSEL / H/EX.                       | SK CHEMICAL                  | KOREA     | 2006 |
| MODACRYL RESIN 800L PILOT PLANT     | VESSEL                               | HANWHA CHEMICAL              | KOREA     | 2006 |
| SKICO REVAMP PROJECT                | H/EX.                                | SK INCHEON OIL               | KOREA     | 2006 |
| CELLTRION EXPANSION PROJECT         | VESSEL                               | CELLTRION                    | KOREA     | 2006 |
| WTP 2nd LINE TRANSFER PROJECT       | PIPING / STRUCTURE / TOTAL EQUIPMENT | KAI                          | KOREA     | 2006 |
| HP-ECH PILOT                        | VESSEL / H/EX.                       | HANWHA CHEMICAL              | KOREA     | 2006 |
| P2 PROJECT                          | ENG'G DWG. TOTAL EQUIPMENT           | OCI                          | KOREA     | 2007 |
| HP-ECH PILOT                        | TOWER / VESSEL                       | HANWHA CHEMICAL              | KOREA     | 2007 |
| 45m3 REACTOR                        | REACTOR                              | KOBELCO                      | JAPAN     | 2007 |
| KPPR-PROJECT                        | REACTOR / VESSEL                     | KUMHO P&B CHEMICAL           | KOREA     | 2007 |
| P PILOT PROJECT                     | SPECIAL REACTOR                      | KCC                          | KOREA     | 2007 |

| NAME OF PROJECT                   | DESCRIPTION                | CLIENT                         | SITE         | YEAR |
|-----------------------------------|----------------------------|--------------------------------|--------------|------|
| DISTILLATION UNIT SYSTEM          | TOTAL EQUIPMENT            | KAYA ENERGY                    | KOREA        | 2007 |
| B-1 PROJECT                       | TOWER / VESSEL / H/EX.     | BIZEL CORPORATION              | KOREA        | 2007 |
| ACP PLANT PROJECT                 | VESSEL / C.R.T             | ECOPRO                         | KOREA        | 2007 |
| BPA(III) PLANT PROJECT            | VESSEL                     | KUMHO P&B CHEMICAL             | KOREA        | 2007 |
| MIBK PLANT REVAMP PROJECT         | TOWER                      | KUMHO P&B CHEMICAL             | KOREA        | 2007 |
| FUMED SILICA PROJECT              | TOWER                      | KCC                            | KOREA        | 2007 |
| KFCT PROJECT                      | C.R.T                      | OCI                            | KOREA        | 2007 |
| GLOW 115MW CFB3 PROJECT           | SPECIAL VESSEL             | GLOW ENERGY PUBLIC             | KOREA        | 2007 |
| ARQ PROJECT                       | ENG'G DWG. TOTAL EQUIPMENT | TASSNI                         | QATAR        | 2008 |
| HMC PP PROJECT LINE-3             | VESSEL                     | HMC POLYMERS                   | KOREA        | 2008 |
| 40m3 REACTOR                      | SPECIAL REACTOR            | KOBELCO                        | JAPAN        | 2008 |
| RUSSIA PROJECT                    | REACTOR                    | SAMHWA MIXING TECH             | RUSSIA       | 2008 |
| THAILAND ASR PROJECT              | REACTOR / VESSEL / H / EX. | HANWHA CHEMICAL THAILAND       | THAILAND     | 2008 |
| P2 PROJECT                        | TOWER / VESSEL / H/EX.     | OCI                            | KOREA        | 2008 |
| SALALAH METHANOL PROJECT          | H/EX.                      | SALALAH METHANOL               | OMAN         | 2008 |
| P3 PROJECT                        | ENG'G DWG.                 | OCI                            | KOREA        | 2008 |
| CNP PROJECT                       | TOWER / VESSEL / C.R.T     | HANWHA TECH                    | CHINA        | 2008 |
| CNP PROJECT                       | VESSEL                     | HANWHA CHEMICAL                | CHINA        | 2009 |
| P3.5 PROJECT                      | VESSEL                     | OCI                            | KOREA        | 2009 |
| OSAN STEAM SUPPLY GENERATION      | H/EX. (TWO ZONE)           | KOSEP                          | KOREA        | 2009 |
| DINH VU POLYESTER PLANT PROJECT   | VESSEL                     | PV-TEX                         | VIETNAM      | 2009 |
| HP-2 PROJECT                      | TOWER / REACTOR            | HANSOL CHEMICAL                | KOREA        | 2009 |
| NO.4 DNT PROJECT                  | VESSEL / H/EX.             | HUCHEMS                        | KOREA        | 2009 |
| ADD ENGINE TEST FACILITY PROJECT  | TOTAL                      | AGENCY FOR DEFENSE DEVELOPMENT | KOREA        | 2009 |
| PAPER WASTE INCINERATION          | INCINERATOR                | HYOSUNG EBARA ENGINEERING      | INDONESIA    | 2009 |
| YEO SU THERMAL POWER PLANT UNIT 2 | SILO                       | KOSEP                          | KOREA        | 2009 |
| MAIN, AUXILIARY FUEL HEATER       | TOTAL                      | AGENCY FOR DEFENSE DEVELOPMENT | KOREA        | 2010 |
| GYP SUM WATER 2ND SLUDGE PROCESS  | TOTAL                      | NAMHAE CHEMICAL                | KOREA        | 2010 |
| OCIMC PROJECT                     | ENG'G DWG.                 | OCI                            | KOREA        | 2010 |
| P3.7 PROJECT                      | TOTAL EQUIPMENT            | OCI                            | KOREA        | 2010 |
| EA PROJECT                        | TOTAL EQUIPMENT            | SIPCHEM                        | SAUDI ARABIA | 2010 |

| NAME OF PROJECT                       | DESCRIPTION                         | CLIENT                          | SITE      | YEAR |
|---------------------------------------|-------------------------------------|---------------------------------|-----------|------|
| NEOTECHS ROTARY PRESSURE FILTER       | TOTAL                               | SK PETROCHEMICAL                | KOREA     | 2010 |
| CAPE PROJECT                          | C.R.T                               | KPX LIFE SCIENCE                | KOREA     | 2010 |
| CA2 PROJECT                           | VESSEL                              | OCI                             | KOREA     | 2010 |
| AUTO CRAVE PROJECT                    | VESSEL                              | ROULUNDS RUBBER                 | DENMARK   | 2010 |
| 2x60MW MERAK CFPP PROJECT             | SILO                                | PT. MERAK ENERGI INDONESIA      | INDONESIA | 2010 |
| NO.4 DNT PROJECT                      | ENG'G DWG.                          | HUCHEMS                         | KOREA     | 2010 |
| P4-PROJECT (18000 TON)                | TOTAL                               | OCI                             | KOREA     | 2011 |
| EAGLE PROJECT                         | REACTOR / VESSEL / H / EX.          | HANWHA CHEMICAL                 | KOREA     | 2011 |
| C.R.T (2000 M3)                       | C.R.T                               | SKC                             | KOREA     | 2011 |
| SPC ULSAN NO.1 PTA DBN PROJECT        | TOTAL                               | SAMSUNG TOTAL                   | KOREA     | 2011 |
| NORTH STAR PROJECT (1200 M3)          | D.R.T                               | THE DOW CHEMICAL COMPANY        | KOREA     | 2011 |
| A/R PILOT PROJECT                     | TOTAL                               | JEONBUK UNIVERSITY              | KOREA     | 2011 |
| NO.1 TAC PROJECT                      | H/EX.                               | SK INNOVATION                   | KOREA     | 2011 |
| 1000 MT/y K-991 3RD PLANT             | TOWER / VESSEL / H/EX.              | FOOSUNG CO., LTD.               | KOREA     | 2011 |
| GARNET BLASTING MACHINE               | VESSEL                              | SAMSUNG HEAVY INDUSTRY          | KOREA     | 2011 |
| KPA(III) REVAMP PROJECT               | TOWER                               | KUMHO P&B CHEMICAL              | KOREA     | 2011 |
| EDISON PROJECT                        | REACTOR                             | SAMSUNG BIOLOGICS               | KOREA     | 2011 |
| SMVR-01 PROJECT                       | TOTAL                               | SK PETROCHEMICAL                | KOREA     | 2011 |
| #2 BTX-PROJECT                        | VESSEL                              | HC PETROCHEM                    | KOREA     | 2011 |
| NaOH CONCENTRATION                    | TOTAL                               | PKC CHEMICAL & BIOTECH          | KOREA     | 2011 |
| EA PROJECT                            | ENG'G DWG.                          | SIPCHEM                         | SOUDI     | 2011 |
| CIVP PROJECT                          | REACTOR                             | HITACH PLANT TECHNOLOGIES       | JAPAN     | 2011 |
| 3PZ-PROJECT                           | REACTOR                             | HONAM MITSUI CHEMICALS INC      | KOREA     | 2011 |
| EVALUATION REACTOR                    | PILOT PLANT SYSTEM                  | HANWHA                          | KOREA     | 2011 |
| SOUTH PARS GAS FIELDDEVELOPMENT       | PIPING                              | NIOC PARS OIL AND GAS CO.,LTD.  | IRAN      | 2011 |
| #2 BTX PROJECT                        | STRAINER                            | HC PETROCHEM                    | KOREA     | 2012 |
| YDR-S-1 SSBR PROJECT                  | H/EX.                               | DAELIM INDUSTRIAL CO.,LTD.      | KOREA     | 2012 |
| NO.2 SPENT CAUSTIC INCINERATOR SYSTEM | INCINERATOR / VESSEL / H/EX / STACK | GS CALTEX CORPORATION           | KOREA     | 2012 |
| 30,000 MTPA AC/ ECH PLANT             | TOWER / VESSEL                      | SAMSUNG FINE CHEMICALS CO.,LTD. | KOREA     | 2012 |
| REACTOR PROJECT                       | REACTOR                             | TOYOBO CO., LTD.                | JAPAN     | 2012 |
| MUSANDAM GAS PLANT                    | VESSEL / FILTER                     | OMAN OIL COMPANY                | OMAN      | 2012 |

| NAME OF PROJECT                  | DESCRIPTION              | CLIENT                               | SITE        | YEAR |
|----------------------------------|--------------------------|--------------------------------------|-------------|------|
| DONGHAE BIOMASS POWER PLANT      | SILO                     | KOREA EAST-WEST POWER                | KOREA       | 2012 |
| REFINERY MASTER PLAN 2 PROJECT   | VESSEL                   | PETRON BATAAN REFINERY               | FRANCE      | 2012 |
| P3.9 PROJECT                     | VESSEL                   | OCI                                  | KOREA       | 2012 |
| PURE GROWTH PROJECT              | ENG'G DWG.               | ALBEMARLE CORPORATION                | U.S.A       | 2012 |
| CF DRYER PROJECT                 | VESSEL                   | YOUGUANG CHEMICAL CO.,LTD.           | KOREA       | 2012 |
| HIB 1000L PROJECT                | VESSEL                   | LG LIFE SCIENCES CO.,LTD.            | KOREA       | 2012 |
| TOTE TANK PROJECT                | VESSEL                   | BOKWANG CO.,LTD.                     | KOREA       | 2012 |
| EDISON II PROJECT                | REACTOR / VESSEL         | SAMSUNG BIOLOGICS                    | KOREA       | 2013 |
| LP-1 PPB EXTENSION PROJECT       | REACTOR / VESSEL         | HANWHA CHEMICAL                      | KOREA       | 2013 |
| TRIM HEATER PROJECT              | H/EX.                    | DAELIM INDUSTRIAL CO.,LTD.           | KOREA       | 2013 |
| P0093s&P0095 PROJECT (ABS & G.L) | AIR RESERVOIR            | HANJIN HEAVY IND.&CON.               | PHIL- SUBIC | 2013 |
| OLE-SIV BENCH SCALE PROJECT      | REACTOR / VESSEL         | SK INNOVATION                        | KOREA       | 2013 |
| RESIN REACTOR SYSTEMPROJECT      | REACTOR / VESSEL / H/EX. | FTC KOREA CO.,LTD.                   | KOREA       | 2013 |
| HYDROMETALLURGY PILOT PLANT      | ENG'G DWG.               | KORES                                | KOREA       | 2013 |
| 400 BAR TEST BENCH PROJECT       | VESSEL (HIGH PRESSURE)   | SVC                                  | KOREA       | 2013 |
| SEWAGE TREATMENT EQUIPMENT       | VESSEL / H/EX.           | BUSAN PORT AUTHORITY                 | KOREA       | 2013 |
| AUTO CLAVE PROJECT               | AUTO CLAVE               | Hosiden Vietnam (Bac Giang) Co.,Ltd. | VIETNAM     | 2013 |
| NCP0104-0119 PROJECT (DNV)       | AIR RESERVOIR            | HANJIN HEAVY IND.&CON.               | PHIL- SUBIC | 2013 |
| CFRTPC PROJECT                   | REACTOR / VESSEL         | HANWAH L&C                           | KOREA       | 2013 |
| DEG DRYING FACILITY PROJECT      | TOTAL                    | YOUKWANG CHEMICAL CO.,LTD.           | KOREA       | 2013 |
| WARA PRESSURE MAINTENANCE        | STRUCTURE                | KUWAIT OIL COMPANY (K.S.C.)          | KUWAIT      | 2013 |
| GMP PROJECT                      | REACTOR / VESSEL / H/EX. | NATURALENDO TECH CO.,LTD.            | KOREA       | 2013 |
| S721s PROJECT (DNV)              | AIR RESERVOIR            | HYUNDAI SAMHO                        | KOREA       | 2013 |
| SLUDGE RECOVER PROJECT           | STORAGE TANK / RECTOR    | NAMHAE CHEMICAL CO.,LTD.             | KOREA       | 2013 |
| VACUUM DEFOAMER PROJECT          | REACTOR / VESSEL         | KISCO                                | KOREA       | 2013 |
| NCP0123s PROJECT (G.L & RINA)    | AIR RESERVOIR            | HANJIN HEAVY IND.&CON.               | PHIL- SUBIC | 2013 |
| DUST COLLECTOR PROJECT           | VESSEL                   | KORAIL                               | KOREA       | 2014 |
| RESIN PROJECT                    | VESSEL                   | SAMSUNG TOTAL                        | KOREA       | 2014 |
| SLP CCGT Power Plant PROJECT     | VESSEL / FRP VESSEL      | SAMSUNG ENGINEERING                  | KOREA       | 2014 |
| NCP0113 PROJECT                  | AIR RESERVOIR            | HANJIN HEAVY IND.                    | PHIL- SUBIC | 2014 |
| WATER HEATING SYSTEM PROJECT     | REACTOR / H/EX.          | HANSEO CHEMICAL                      | KOREA       | 2014 |

| NAME OF PROJECT                       | DESCRIPTION            | CLIENT                        | SITE       | YEAR |
|---------------------------------------|------------------------|-------------------------------|------------|------|
| YANBU POWER AND DESALINATION PLANT    | SILO / STRUCTURE       | SALINE WATER CONVERSION CORP. | SAUDI      | 2014 |
| NTP0137s PROJECT (DNV)                | AIR RESERVOIR          | HANJIN HEAVY IND.             | PHIL-SUBIC | 2014 |
| Premixing PROJECTT                    | VESSEL                 | OCI Special CO.,LTD.          | KOREA      | 2014 |
| PURIFICATION COLUMN PROJECT           | TOWER / REACTOR        | SOULBRAIN Co.,Ltd.            | KOREA      | 2014 |
| BCCM PLANT PROJECT                    | VESSEL                 | SEAH BESTEEL                  | KOREA      | 2014 |
| FIXED BED REACTOR SYSTEM              | VESSEL (HIGH PRESSURE) | DAELIM IND. CO.,LTD.          | KOREA      | 2014 |
| MPPU PROJECT                          | STACK / HEATER         | STYROLUTION                   | THAILAND   | 2014 |
| A1 PROJECT                            | FILTER                 | KPX Green Chemical            | KOREA      | 2014 |
| WASTEWATER TREATMENT DRYING           | DRYER                  | CHEON-IL CHEMICAL             | KOREA      | 2015 |
| SUPERCONDUCTING FAULT CURRENT LIMITER | VESSEL                 | KIMM                          | KOREA      | 2015 |
| BIOGAS ENERGY PROJECT                 | VESSEL                 | UIJEONGBU CITY                | KOREA      | 2015 |
| STEAM GENERATOR PROJECT               | HEATER                 | KEPCO ENG                     | KOREA      | 2015 |
| J-N20 PLANT EXPANSION PROJECT         | TOTAL EQUIPMENT        | WONIK MATERIALS               | KOREA      | 2015 |
| SRF LN2 SEPARATOR PROJECT             | VESSEL (HIGH PRESSURE) | NIER                          | KOREA      | 2015 |
| LP&HP HEATER                          | HEATER                 | BESAT POWER PLANT             | KOREA      | 2015 |
| SUNNY PROJECT                         | DRYER                  | SOLVAY                        | KOREA      | 2015 |
| RO-COMP. CALORIMETER PROJECT          | VESSEL                 | SAMSUNG                       | KOREA      | 2015 |
| BAS-514H PROJECT                      | H/EX.                  | OCI                           | KOREA      | 2015 |
| A PROJECT                             | REACTOR / VESSEL       | ROSS EQUIP.                   | USA        | 2015 |
| REACTOR PROJECT                       | REACTOR                | HANSEO CHEM.                  | KOREA      | 2015 |
| FFC MIXING SYSTEM PROJECT             | VESSEL                 | DOOSAN                        | KOREA      | 2015 |
| DANYANG PLANT PROJECT                 | VESSEL                 | HANIL CEMENT CO.,LTD.         | KOREA      | 2016 |
| UK3 PROJECT                           | BIO REACTOR            | HITACHI                       | JAPAN      | 2016 |
| EDISON III PROJECT                    | BIO REACTOR            | SAMSUNG BIOLOGICS             | KOREA      | 2016 |
| CP-2 LM-V PROJECT                     | C.R.T                  | HUVIS                         | KOREA      | 2016 |
| TOTAL PIPING SYSTEM                   | PIPING                 | KGS                           | KOREA      | 2016 |
| REACTOR PROJECT                       | REACTOR                | HANSEO CHEM.                  | KOREA      | 2016 |
| LN2 SEPARATOR PROJECT                 | VESSEL (HIGH PRESSURE) | NIER                          | KOREA      | 2016 |
| FILTER HOUSING PROJECT                | FILTER                 | ELCOM KOREA LIMITED           | KOREA      | 2016 |
| EDISON III PROJECT                    | BIO REACTOR            | SAMSUNG BIOLOGICS             | KOREA      | 2016 |
| S PROJECT                             | VESSEL / C.R.T / H/EX. | WONIK MATERIALS               | KOREA      | 2016 |

| NAME OF PROJECT                    | DESCRIPTION              | CLIENT                | SITE  | YEAR |
|------------------------------------|--------------------------|-----------------------|-------|------|
| E PROJECT                          | REACTOR / TOWER / VESSEL | DAELIM                | KOREA | 2016 |
| 100,000 MTY PB2 PLANT              | REACTOR                  | DAELIM                | KOREA | 2016 |
| HANMI BIOPLANT PROJECT             | BIO REACTOR              | HANMI PHARM CO.,LTD.  | KOREA | 2016 |
| UK3 PROJECT                        | BIO REACTOR              | HITACHI               | JAPAN | 2016 |
| 50L PURIFICATION SYSTEM            | TOTAL                    | HANSOL CHEMICAL       | KOREA | 2016 |
| C-PURIFICATION SYSTEM              | VESSEL / HEX.            | DUKSAN UMT            | KOREA | 2016 |
| HCDS SYNTHESIZER SYSTEM            | VESSEL                   | DUKSAN UMT            | KOREA | 2016 |
| HIGH EFFICIENCY CYCLONE SEPARATOR  | VESSEL                   | HANWHA                | KOREA | 2016 |
| YEOJU PLANT                        | AIR HEADER               | HANIL CEMENT CO.,LTD. | KOREA | 2016 |
| DREAM PROJECT                      | BIO REACTOR              | POLUS                 | KOREA | 2017 |
| RO-COMP. CALORI JECTION            | VESSEL                   | SAMSUNG               | KOREA | 2017 |
| SHIN-KORI NUCLEAR POWER PLANT      | VESSEL / TANK            | "KHNP (한국수력원자력)"      | KOREA | 2017 |
| J-N20 1800MTPY EXPANSION           | H/EX.                    | WONIK MATERIALS       | KOREA | 2017 |
| CIRCULATING POWER GENERATION       | TEST BED                 | ULSAN UNIVERSITY      | KOREA | 2017 |
| FLUID REACTOR                      | TEST BED                 | KAIST                 | KOREA | 2017 |
| RESIDUE UPGRADING COMPLEX          | VESSEL / TANK            | S-OIL                 | KOREA | 2017 |
| BIO PLANT NO.2 FACTORY             | BIO REACTOR              | HANMI PHARM           | KOREA | 2017 |
| STERILIZED INCUBATOR               | BIO REACTOR              | CHUNGCHEONGBUK-DO.    | KOREA | 2017 |
| NTS PROJECT                        | VESSEL                   | KUKDO CHEMICAL        | KOREA | 2017 |
| PRESSURIZATION CHAMBER             | TEST BED                 | SAMSUNG               | KOREA | 2017 |
| BIO KOMBINAT                       | REACTOR / H/EX.          | GS CALTEX             | KOREA | 2017 |
| PHEONIX                            | BIO REACTOR              | CELLTRION             | KOREA | 2017 |
| SPENT CATALYST RARE METAL RECOVERY | PILOT PLANT              | KIGAM (한국지질자원연구소)     | KOREA | 2018 |
| KORENO KT-Z PROJECT                | REACTOR / H/EX.          | KRICT (한국화학연구원)       | KOREA | 2018 |
| HASTELLOY REACTOR /H/EX.           | REACTOR / H/EX.          | CHEMTROS              | KOREA | 2018 |
| IMPORT OOMMODITY(BIO)              | REACTOR                  | BIOZEEN               | INDIA | 2018 |
| HCDS EP FACILITIES PROJECT         | VESSEL / SYSTEM          | DS TECHOPIA           | KOREA | 2018 |
| DK-PROJECT                         | REACTOR / H/EX.          | DK PHARM              | KOREA | 2018 |
| PURIFICATION SYSTEM                | VESSEL / PIPING          | DUKSAN UMT            | KOREA | 2018 |
| GAS PURIFIER                       | VESSEL                   | LEADERS & GLOBAL      | KOREA | 2018 |
| PILOT YSTEM                        | TOTAL                    | WONIK MATERIALS       | KOREA | 2018 |

| NAME OF PROJECT                     | DESCRIPTION               | CLIENT                          | SITE       | YEAR |
|-------------------------------------|---------------------------|---------------------------------|------------|------|
| T-PROJECT                           | REACTOR / H/EX.           | CERES R&D                       | KOREA      | 2019 |
| NCK B2 PROJECT                      | VESSEL                    | NCK                             | KOREA      | 2019 |
| ACTIVATED CARBON 20L REACTOR SYSTEM | REACTOR                   | HI AIR KOREA                    | KOREA      | 2019 |
| MONOMER REACTOR SYSTEM              | REACTOR                   | HANSOL                          | KOREA      | 2019 |
| REACTOR 12m SYSTEM                  | REACTOR / H/EX.           | SHINSUNG MATERIALS              | KOREA      | 2019 |
| NITROGEN GENERATOR INSTALLATION     | VESSEL                    | HYUNDAI MOTOR UIWANG R&D CENTER | KOREA      | 2019 |
| PYEONGTAEK RESIN PLANT PHASE 2      | VESSEL                    | JEVISCO                         | KOREA      | 2019 |
| PURIFICATION VESSEL                 | VESSEL                    | 3C FRANCE                       | FRANCE     | 2019 |
| RETORT SYSTEM                       | AUTOCLAVE                 | CST                             | CHINA      | 2019 |
| REACTOR SYSTEM                      | REACTORS & HEAT EXCHANGER | DAEDAL                          | CHINA      | 2019 |
| FERMENTAL SYSTEM                    | FERMENTAL VESSEL          | SATORIOUS                       | GERMANY    | 2019 |
| FERMENTAL SYSTEM                    | FERMENTAL VESSEL          | SATORIOUS                       | INDIA      | 2019 |
| CIP PROCESS                         | HEAT EXCHANGERS           | BOSH                            | GERMANY    | 2019 |
| DRYER SYSTEM                        | DRYER                     | HAKO PLAN                       | JAPAN      | 2019 |
| REACTOR SYSTEM                      | REACTORS                  | HITACHI                         | JAPAN      | 2019 |
| RETORT SYSTEM                       | AUTOCLAVE                 | DFT                             | GERMANY    | 2019 |
| RETORT SYSTEM                       | AUTOCLAVE                 | STERIFLOW                       | FRANCE     | 2019 |
| BIO PROCESS                         | CLEAN VESSEL              | M-PRO TECH                      | FRANCE     | 2019 |
| REACTOR SYSTEM                      | REACTORS & HEAT EXCHANGER | JINHEUNG                        | CHINA      | 2019 |
| AUTO CLAVE                          | AUTO CLAVE                | THEMATEC                        | JAPAN      | 2019 |
| CIP PROCESS                         | HEAT EXCHANGERS           | TECH SOLUTION                   | CHINA      | 2019 |
| FOOD SYSTEM                         | PEELER                    | JUNGWOO                         | NETHERLAND | 2019 |
| HEAT PROCESS                        | HEAT EXCHANGER            | VEOLIA                          | ITALIA     | 2019 |
| DRYER SYSTEM                        | DRYER MACHINE             | GEM-BIO                         | JAPAN      | 2019 |
| PHC1 PROJECT                        | SILO                      | HUVIS                           | KOREA      | 2019 |
| REACTOR SYSTEM                      | REACTORS & HEAT EXCHANGER | DOOYOUNG                        | CHINA      | 2019 |
| IN-PROJECT                          | AUTO CLAVE                | INTERCONSTEC                    | JAPAN      | 2019 |
| CIP PROCESS                         | HEAT EXCHANGER            | EKL                             | FRANCE     | 2019 |
| EGT SENSOR TEST BED                 | TEST BED                  | KHNP(한국수력원자력)                   | KOREA      | 2019 |
| COALESCE FILTER TEST BED            | TEST BED                  | ADD (국방과학연구소)                   | KOREA      | 2019 |
| RO-COMP. CALORIMETER                | VESSEL                    | SAMSUNG                         | KOREA      | 2019 |

| NAME OF PROJECT              | DESCRIPTION                      | CLIENT                | SITE       | YEAR |
|------------------------------|----------------------------------|-----------------------|------------|------|
| MFG-8 WuXi SHIJIAZHUANG      | BIO TANK                         | WUXI BIOLOGICS        | CHINA      | 2020 |
| FK3 PROJECT                  | VESSEL                           | HITACHI PLANT SERVICE | JAPAN      | 2020 |
| REACTOR SYSTEM               | REACTOR / VESSEL / H/ EX.        | DONGYANG PNE          | KOREA      | 2020 |
| SR RECOVERY PROJECT          | H/EX.                            | DAEWOONG BIO          | KOREA      | 2020 |
| PM1 CORRUGATING MEDIUM PAPER | VESSEL                           | 경산제지㈜                 | KOREA      | 2020 |
| REACTOR SYSTEM               | REACTOR / H/EX.                  | ㈜대원포리머                | KOREA      | 2020 |
| HONGIK PROJECT               | REC.VESSEL                       | HONGIK                | KOREA      | 2020 |
| YOUNGCHANG CHEMICAL PLANT 4  | VESSEL                           | 영창케미칼                 | KOREA      | 2020 |
| VERTICAL PLANETARY MIXER     | MIXER VESSEL                     | HANWHA                | KOREA      | 2020 |
| CIP PROCESS                  | HEAT EXCHANGER / CONDENSER       | YOORYOUNG PHARMACY    | GERMANY    | 2020 |
| JW-PROJECT                   | AUTO CLAVE                       | JW PHARMACY           | FRANCE     | 2020 |
| IN-PROJECT                   | AUTO CLAVE                       | INTERCONSTEK          | CHINA      | 2020 |
| JWO-PROJECT                  | STEAM PEELER & ACCULULATOR       | JUNGWOO               | NETHERLAND | 2020 |
| TMT-PROJECT                  | AUTO CLAVE                       | THEMATEK              | GERMANY    | 2020 |
| SYB-PROJECT                  | REACTOR & CONDENSER              | SAMYANG BIO           | CHINA      | 2020 |
| JTM-PROJECT                  | H/EX / REACTANGLER CLAVE         | JETEMA                | SWEDEN     | 2020 |
| SC-PROJECT                   | REACTOR & CONDENSER              | SK CHEM               | GERMANY    | 2020 |
| TS-PROJECT                   | HEAT EXCHANGER / CONDENSATE TANK | TS TECH               | CHINA      | 2020 |
| HEAT EXCHANGER               | HEAT EXCHANGER / STORAGE TANK    | KOREA UNITED PHARMACY | CHINA      | 2020 |
| YM-PROJECT                   | REACTOR                          | YAMAGEN               | JAPAN      | 2020 |
| CHEMICAL TOWER               | TOWER                            | HANWHA E&C            | CHINA      | 2020 |
| UHT PROCESS                  | UHT                              | SAMYOOK FOOD          | ITALY      | 2020 |
| BA-PROJECT                   | AUTO CLAVE                       | BINEX                 | AUSTRIA    | 2020 |
| SKB-PROJECT                  | BIO JACKET VESSEL                | SK BIO                | KOREA      | 2020 |
| CHEMICAL PROCESS             | EVAPORATOR                       | SAMYANG BIO           | KOREA      | 2020 |
| FERMENTAL PROCESS            | FERMENTAL VESSEL                 | LG CHEMICAL           | INDIA      | 2020 |
| PHARMACY PROCESS             | STEAM GENERATOR                  | KOREA UNITED PHARM.   | CHINA      | 2020 |
| SEPARATOR PROCESS            | SEPARATOR                        | SAMSUNG BIO           | GERMANY    | 2020 |
| CHEMICAL PROCESS             | EVAPORATOR                       | SAMYANG INNOCHEM      | GERMANY    | 2020 |
| FOOD PROCESS                 | UHT                              | SAMYOOK FOOD          | ITALY      | 2020 |
| SCORPION PROJECT             | VESSEL / REACTOR                 | UJL INC.              | KOREA      | 2020 |

| NAME OF PROJECT              | DESCRIPTION              | CLIENT                         | SITE    | YEAR |
|------------------------------|--------------------------|--------------------------------|---------|------|
| DEEP-SEA WIRE TEST           | AUTO CLAVE               | LS CABLE & SYSTEM LTD.         | KOREA   | 2020 |
| HIGH-PRESSURE / TEMP-PROJECT | VESSEL                   | KNT                            | KOREA   | 2020 |
| CHEMICAL PRODUCT SYSTEM      | REACTOR / VESSEL / H/ EX | CCCE                           | KOREA   | 2020 |
| CHEMICAL LINE SYSTEM         | CONDENSER                | DS CHEMSOL                     | KOREA   | 2020 |
| BATTERY MATERIALS            | VESSEL                   | UMICORE                        | KOREA   | 2020 |
| LSP PROJECT                  | LSP REACTOR              | HUVIS                          | KOREA   | 2020 |
| MAINTENANCE SYSTEM           | H/EX / VESSEL / PIPING   | SUWON ENVIRONMENT AGENCY       | KOREA   | 2020 |
| FACTORY EQUIPMENT SYSTEM     | REACTOR / RETORT         | PEPTRON                        | KOREA   | 2020 |
| PROCESS SYSTEM               | VESSEL                   | SUNGEEL HITECH                 | KOREA   | 2020 |
| NEW PROCESS PROJECT          | C.R.T. / VESSEL          | JEVISCO                        | KOREA   | 2020 |
| EDISON-3 PROJECT             | BIO-TANK / REACTOR       | SAMSUNG BIOLOGICS              | KOREA   | 2020 |
| FERMENTER LINE PROJECT       | FERMENTOR                | CJ CHEILJEDANG CORP            | KOREA   | 2020 |
| POLYMERIZATION PROJECT       | SILLO                    | HUVIS                          | KOREA   | 2020 |
| TEST EQUIPMENT               | VESSEL.                  | KIER                           | KOREA   | 2020 |
| CEMENT PROJECT               | AIR HEADER               | HANIL CEMENT                   | KOREA   | 2020 |
| PI CONSTRUCTION PROJECT      | VESSEL / REFLUX TANK     | DL E&C                         | KOREA   | 2021 |
| GL PROJECT                   | REACTOR                  | SUNGIL                         | CHINA   | 2021 |
| RO-COMP PROJECT              | VESSEL                   | SAMSUNG ELECTRONICS            | KOREA   | 2021 |
| DRYING FACILITY PROJECT      | DRYER / VESSEL           | SEOUL CITY                     | KOREA   | 2021 |
| BRP PROJECT                  | AGING TANK / H/EX        | ECOPRO                         | KOREA   | 2021 |
| CHEMICAL SYSTEM              | REACTOR / TANK           | SAKURANOMIYA CHEMICAL          | KOREA   | 2021 |
| DOUST COLLECTOR PROJECT      | VESSEL / COLLECTOR       | HYUNDAI SAMHO HEAVY INDUSTRIES | KOREA   | 2021 |
| CHAMBER SYSTEM               | HEAT EXCHANGER           | BINEX                          | ITALY   | 2021 |
| FERMENTER SYSTEM             | FERMENTER VESSEL         | NOROO HOLDINGS                 | INDIA   | 2021 |
| SMT VESSEL PROJECT           | REACTOR / VESSEL         | PI ADVANCED MATERIALS          | KOREA   | 2021 |
| N-PROJECT                    | FEED GAS PRE-COOLER      | TEMC                           | KOREA   | 2021 |
| SK PROJECT                   | MIXER TANK               | ECELL                          | KOREA   | 2021 |
| HELUIM SYSTEM                | VESSEL                   | JH ENG                         | KOREA   | 2021 |
| FILTER SYSTEM                | VESSEL                   | TOPS                           | KOREA   | 2021 |
| DISTILLATION SYSTEM          | HEAT EXCHANGER           | YOORYOUNG PHARM                | GERMANY | 2021 |

| NAME OF PROJECT                      | DESCRIPTION                      | CLIENT                      | SITE    | YEAR |
|--------------------------------------|----------------------------------|-----------------------------|---------|------|
| ASPHALT RUBBER SYSTEM                | HEAT EXCHANGER                   | POINIX                      | USA     | 2021 |
| EDISON-PROJECT                       | BIO REACTOR / VESSEL             | SAMSUNG BIOLOGICS           | KOREA   | 2021 |
| SPECIA-PROJECT                       | HEAT EXCHANGER / COOLER          | TY PFAUDLER                 | GERMANY | 2021 |
| SK PROJECT                           | MIXER TANK                       | ECELL                       | KOREA   | 2021 |
| FOOD STERILIZER SYSTEM               | AUTO CLAVE                       | HARIM                       | GERMANY | 2021 |
| SUI-PLANT FILTER HOUSING PROJECT     | FILTER HOUSING                   | AEKYUNG CHEMICAL            | KOREA   | 2021 |
| KOLMAR PROJECT                       | MIXER TANK                       | ECELL                       | KOREA   | 2021 |
| WASTE WATER BOILER SYSTEM            | BOILER PKG                       | SAMPYO CEMENT               | CHINA   | 2021 |
| DONGJIN CHEMICAL BUYEO PLANT PROJECT | REACTOR / H / EX / RECEIVER TANK | DONGJIN CHEMICAL            | KOREA   | 2021 |
| H2 SYSTEM                            | ACCUMULATOR                      | DOOSAN FUELCELL             | CANADA  | 2021 |
| 150HP DISSOLVER PROJECT              | BUCKET STRAINER                  | DAEKWANG HIGHPOLYMER        | KOREA   | 2021 |
| DISTILLATION SYSTEM                  | HEAT EXCHANGER                   | EYON PHARM.                 | GERMANY | 2021 |
| H2 COLUMN SYSTEM                     | COLUMN / TANK                    | DAEJOO ELECTRONIC MATERIALS | KOREA   | 2021 |
| NA50 PROJECT                         | REACTOR                          | ANP CORP.                   | KOREA   | 2021 |
| DISTILLATION SYSTEM                  | HEAT EXCHANGER                   | BMI                         | GERMANY | 2021 |
| EVAPORATOR SYSTEM                    | VESSEL                           | THE O FOUR                  | ITALY   | 2021 |
| BIO PROJECT                          | WATER TANK                       | SAMSUNG BIO                 | GERMANY | 2021 |
| FILTER HOUSING PROJECT               | FILTER HOUSING                   | ECOPRO INNOVATION           | KOREA   | 2021 |
| ASPHALT RUBBER SYSTEM                | BOILER                           | POINIX                      | USA     | 2021 |
| DISTILLATION SYSTEM                  | HEAT EXCHANGER                   | HUONS                       | GERMANY | 2021 |
| N2 CHEMICAL TANK                     | TANK                             | KUMHO PETROCHEMICAL         | KOREA   | 2021 |
| SB01 PROJECT                         | JACKET VESSEL                    | CELLTRION                   | KOREA   | 2021 |
| DISTILLATION SYSTEM                  | HEAT EXCHANGER                   | DONG-A                      | GERMANY | 2021 |
| AHF SYSTEM                           | VESSEL                           | ENF TECHNOLOGY              | CHINA   | 2021 |
| 100ML PROJECT                        | BIO VESSEL                       | KUMHO PETROCHEMICAL         | KOREA   | 2021 |
| STEAM CONCRET SYSTEM                 | DRAIN TANK                       | GIANT                       | CHINA   | 2021 |
| C-2 PROJECT                          | REACTOR / VESSEL                 | HYOSUNG                     | KOREA   | 2021 |
| P-PROJECT                            | BIO REACTOR / TANK               | DAEWON HEALTHCARE           | KOREA   | 2021 |
| BIO PROJECT                          | WATER TANK                       | SAMSUNG BIO                 | GERMANY | 2021 |
| QR01 PROJECT                         | BIO VESSEL                       | HANMI                       | KOREA   | 2021 |

| NAME OF PROJECT                     | DESCRIPTION                     | CLIENT                    | SITE    | YEAR |
|-------------------------------------|---------------------------------|---------------------------|---------|------|
| SEMI- CONDUCTOR SYSTEM              | REACTOR                         | NCK                       | JAPAN   | 2021 |
| N2 PKG SYSTEM                       | VESSEL                          | CARTOOLS                  | CHINA   | 2021 |
| HIGH PRESSURE REACTOR 200L          | REACTOR                         | CHEMTROS                  | KOREA   | 2021 |
| AIR COMPRESSOR PKG                  | AIR RECEIVER TANK               | BINGGRAE                  | KOREA   | 2021 |
| SMELTING PROCESS PROJECT            | TOTAL SYSTEM                    | KIGAM                     | KOREA   | 2021 |
| QR02 PROJECT                        | BIO VESSEL                      | CELLTRION                 | KOREA   | 2021 |
| FORM SPONGE SYSTEM                  | REACTOR                         | KM&I                      | GERMANY | 2021 |
| N-PROJECT                           | BUFFER TANK                     | TEMC                      | KOREA   | 2021 |
| DISTILLATION SYSTEM                 | HEAT EXCHANGER                  | HONEX                     | CHINA   | 2021 |
| SK PROJECT                          | MIXER TANK                      | SK BIO                    | KOREA   | 2021 |
| NMP PURIFICATION SYSTEM             | TOWER / VESSEL / H/EX           | KOKAM                     | KOREA   | 2021 |
| DANGJIN THERMAL POWER 1-4 PROJECT   | REACTOR / H/EX                  | KOREA EAST-WEST POWER     | KOREA   | 2021 |
| WASTE WATER BOILER SYSTEM           | BOILER                          | NONGSHIM                  | CHINA   | 2021 |
| EC05 PROJECT                        | BIO VESSEL                      | CELLTRION                 | KOREA   | 2021 |
| FOOD STERILIZER SYSTEM              | AUTO CLAVE                      | LOTTE FOOD                | FRANCE  | 2021 |
| REACTOR SYSTEM                      | REACTOR / H/EX                  | DS CHEMSOL                | KOREA   | 2021 |
| FERMENTER SYSTEM                    | FERMENTER VESSEL                | INTRON                    | GERMANY | 2021 |
| EC010 PROJECT                       | BIO VESSEL                      | CELLTRION                 | KOREA   | 2021 |
| PLASTIC PRODUCTION SYSTEM           | HEAT EXCHANGER                  | INEOS                     | GERMANY | 2021 |
| PG-4 PROJECT                        | REACTOR / VARNISH TANK          | PI ADVENCED MATERIALS     | KOREA   | 2021 |
| DISTILLATION SYSTEM                 | HEAT EXCHANGER                  | JANSSEN                   | GERMANY | 2021 |
| EDISON IV PROJECT                   | BIO REACTOR                     | SAMSUNG BIOLOGICS         | KOREA   | 2021 |
| WASTE INCINERATION FACILITY PROJECT | AIR PREHEATER                   | JEJU PROVINCE DEVELOPMENT | KOREA   | 2021 |
| CMDL PLANT EXPANSION PROJECT        | REACTOR / H/ EX / RECEIVER TANK | CMDL                      | KOREA   | 2021 |
| DISTILLATION SYSTEM                 | BIO VESSEL                      | KOREA UNITED PHARM        | CHINA   | 2022 |
| MACHINING SPOT                      | P.C.I FEED HOPPER CONE          | POSCO                     | KOREA   | 2022 |
| SHIPPING PIPING PROJECT             | PIPING / TANK                   | POINIX INC.               | KOREA   | 2022 |
| FERMENTER SYSTEM                    | VESSEL                          | KNBS                      | USA     | 2022 |
| CHEMICAL SYSTEM                     | BIO VESSEL / TANK               | DONG-A PHARM              | KOREA   | 2022 |
| T-PROJECT                           | CONDENSER / SEPARATOR           | DONGSUNG CHEMICAL         | KOREA   | 2022 |
| REACTOR SYSTEM                      | BIO VESSEL                      | MI PHARM                  | CHINA   | 2022 |

| NAME OF PROJECT              | DESCRIPTION                      | CLIENT                       | SITE        | YEAR |
|------------------------------|----------------------------------|------------------------------|-------------|------|
| FOOD STERILIZER SYSTEM       | VESSEL                           | CJ FOOD                      | USA         | 2022 |
| V-PROJECT                    | STORAGE TANK                     | KTL                          | KOREA       | 2022 |
| H2 PSA SYSTEM PROJECT        | ADSORBER COLUMN / TANK           | EN2CORE TECH                 | KOREA       | 2022 |
| UHT PKG SYSTEM               | VESSEL                           | SAMYANG HOLDINGS             | GERMANY     | 2022 |
| VACUUM SYSTEM                | VESSEL                           | KOREA LOST WAX               | USA         | 2022 |
| BIO SYSTEM                   | FILTER HOUSING / VESSEL          | KUKDO CHEMICAL               | KOREA       | 2022 |
| OIL PURIFICATION SYSTEM      | TUBE CLUSTER                     | S-OIL                        | TAIWAN      | 2022 |
| WASTE WATER FILTERING SYSTEM | HEAT EXCHANGER                   | THE O FOUR                   | ITALY       | 2022 |
| SOLBRAIN PROJECT             | VESSEL / RECOVERY TANK           | SOLBRAIN                     | KOREA       | 2022 |
| BIO PROJECT                  | BIO REACTOR                      | CELLTRION                    | KOREA       | 2022 |
| STEAM PJG SYSTEM             | BIO VESSEL                       | FROM BIO                     | GERMANY     | 2022 |
| UHT PJG SYSTEM               | HEAT EXCHANGER                   | SAMYANG HOLDINGS             | GERMANY     | 2022 |
| H1 PROJECT                   | HEAT EXCHANGER                   | TEMC                         | KOREA       | 2022 |
| H/EX MANUFACTURE PROJECT     | HEAT EXCHANGER                   | WELCRON HANTEC               | KOREA       | 2022 |
| VACUUM COOLING SYSTEM        | AUTO CLAVE                       | SHIMADZU                     | CHINA       | 2022 |
| E4-PROJECT                   | C.R.T.                           | HYOSUNG CHEMICAL             | KOREA       | 2022 |
| STS316L REACTOR SYSTEM       | REACTOR / H / EX / RECEIVER TANK | CHEMTROS                     | KOREA       | 2022 |
| CMDL PLANT EXPANSION         | REACTOR / H / EX                 | CMDL                         | KOREA       | 2022 |
| LG PROJECT                   | MIXING TANK / VESSEL             | LG ENERGY SOLUTION           | GERMANY     | 2022 |
| CHEMICAL SYSTEM              | BIO VESSEL                       | KUMHO MITSUI CHEMICALS, INC. | KOREA       | 2022 |
| AIR FILTER PROJECT           | FILTER HOUSING                   | SAMSUNG DISPLAY              | KOREA       | 2022 |
| DISTILLATION SYSTEM          | HEAT EXCHANGER                   | STGEN BIO                    | GERMANY     | 2022 |
| REACTOR SYSTEM               | REACTOR                          | LG CHEM                      | SWITZERLAND | 2022 |
| STS304 PROJECT               | HOT OIL TANK / RECEIVER TANK     | CHEMTROS                     | KOREA       | 2022 |
| BIO PROJECT                  | BUFFER PREP TANK / BIOREACTOR    | CELLTRION                    | KOREA       | 2022 |
| KIA MOTORS TANK PROJECT      | STORAGE TANK                     | KIA CORP                     | KOREA       | 2022 |
| DISTILLATION SYSTEM          | H/EX / SEPARATOR                 | DM BIO                       | GERMANY     | 2022 |
| SINGLE USE MIXER SYSTEM      | DOUBLE JACKET VESSEL             | DONG-A PHARM                 | KOREA       | 2022 |
| REACTOR PROJECT              | VESSEL / TANK / DRUM / SEPARATOR | META BIOMED                  | KOREA       | 2022 |
| DISTILLATION SYSTEM          | H/EX / PROCESS VESSEL            | RF BIO                       | GERMANY     | 2022 |
| DAEJEON PLANT PROJECT        | REACTOR / H / EX / RECEIVER TANK | DONGYANG                     | KOREA       | 2022 |

| NAME OF PROJECT                       | DESCRIPTION                 | CLIENT                      | SITE    | YEAR |
|---------------------------------------|-----------------------------|-----------------------------|---------|------|
| PG5 PROJECT                           | REACTOR                     | PI ADVANCED MATERIALS       | KOREA   | 2022 |
| DISTILLATION SYSTEM                   | STERILIZER                  | BINEX                       | AUSTRIA | 2022 |
| MDI PLANT PROJECT                     | BIO VESSEL                  | KUMHO MITSUI CHEMICALS CORP | KOREA   | 2022 |
| HEAT EXCHANGER SYSTEM                 | HEAT EXCHANGER              | METHISON GAS                | USA     | 2022 |
| CO2 PSA SYSTEM PROJECT                | STRUCTURE / PIPING / VESSEL | HYUNDAI ROTEM               | KOREA   | 2022 |
| LITHIUM SYSTEM                        | VESSEL                      | POSCO HOLDINGS              | GERMANY | 2022 |
| BIO PROJECT                           | BIO REACTOR / STORAGE TANK  | CELLTRION                   | KOREA   | 2022 |
| LGESOC2 1P PROJECT                    | COOLER / REBOILER / H/ EX   | LG ENERGY SOLUTION          | KOREA   | 2022 |
| HSPP PROJECT                          | REACTOR / VESSEL            | P&O CHEMICAL                | KOREA   | 2022 |
| MH-PROJECT                            | C.R.T.                      | KUKDO CHEMICAL              | KOREA   | 2022 |
| EPOXY PILOT INSTALLATION PROJECT      | BIO VESSEL / STERILIZER     | KUMHO P&B CHEMICALS         | KOREA   | 2022 |
| POSCO CONTINENTAL                     | VESSEL                      | POSCO HOLDINGS              | GERMANY | 2022 |
| WASTEWATER TREATMENT FACILITY PROJECT | PROCESS VESSEL              | HYUNDAI STEEL               | KOREA   | 2022 |
| PITK PROJECT                          | REACTOR / VEESEL            | DAEWON PHARMACEUTICAL       | KOREA   | 2022 |
| NORTHVOLT D. S-3                      | BINDER MIXER / STORAGE TANK | NORTHVOLT                   | KOREA   | 2022 |
| POLY-E PROJECT                        | VESSEL / FILTER HOUSING     | SOLBRAIN                    | KOREA   | 2022 |
| OXO RTO-PROJECT                       | RTO / FERMENTER             | LG CHEMICAL                 | KOREA   | 2022 |
| BIO PROJECT                           | BIO VESSEL                  | SAMSUNG BIOLOGICS           | KOREA   | 2022 |
| DRYER PKG SYSTEM                      | VESSEL                      | TAEKWANG                    | JAPAN   | 2022 |
| POSCO LITHIUM SOULTION                | HEAT EXCHANGER              | POSCO HOLDINGS              | GERMANY | 2022 |
| T20 PROJECT                           | REACTOR / STORAGE TANK      | LG CHEM.                    | KOREA   | 2022 |
| NH3 VPSA PROJECT                      | TOTAL EQUIPMENT             | KIER                        | KOREA   | 2022 |
| J-PROJECT                             | VESSEL                      | KIER                        | KOREA   | 2022 |
| LINE-PROJECT                          | AIR FLOTATION               | LOTTE CHEMICAL              | KOREA   | 2022 |
| OCI STC PROJECT                       | REACTOR / H/EX              | OCI                         | KOREA   | 2022 |
| POLYMER PROJECT                       | STORAGE TANK                | LG CHEMICAL                 | KOREA   | 2022 |
| V.E. PROJECT                          | WATER COOLER                | LOTTE CHEMICAL              | KOREA   | 2022 |
| DUST PNEUMATIC CONVEYING SYSTEM       | TANK / VESSEL               | POSCO                       | KOREA   | 2022 |
| VAPOR BOILER SYSTEM                   | BOILER                      | SAMSHIN                     | USA     | 2022 |
| DISTILLATION SYSTEM                   | HEAT EXCHANGER              | DONG-A PHARM.               | GERMANY | 2022 |
| PISTON PRESSURE VESSEL                | VESSEL / DRYER              | SK GEO CENTRIC              | KOREA   | 2022 |

| NAME OF PROJECT                   | DESCRIPTION                    | CLIENT                 | SITE    | YEAR |
|-----------------------------------|--------------------------------|------------------------|---------|------|
| EDISON PROJECT                    | BIO REACTOR / STERILIZER       | SAMSUNG BIOLOGICS      | KOREA   | 2023 |
| AU PROJECT                        | AUTOCLAVE / H/EX               | CIS CHEMICAL           | KOREA   | 2023 |
| STEAM COOKER SYSTEM               | VESSEL / DRYER                 | KAJIWARA               | JAPAN   | 2023 |
| STEAM BOILER PKG                  | STEAM BOILER                   | KBR                    | USA     | 2023 |
| T1 PROJECT                        | EVAPORATOR                     | LG CHEM                | KOREA   | 2023 |
| REACTOR SYSTEM                    | REACTOR                        | CMDL                   | KOREA   | 2023 |
| BIO PROJECT                       | HOLD VESSEL                    | SAMSUNG BIOLOGICS      | KOREA   | 2023 |
| UHT SYSTEM                        | HEAT EXCHANGER                 | GEA TDS                | GERMANY | 2023 |
| CHEMICAL SYSTEM                   | VESSEL                         | MIWON CHEM             | USA     | 2023 |
| POLY-E PROJECT                    | STORAGE TANK                   | SOLBRAIN               | KOREA   | 2023 |
| BPA POWDER PROJECT                | TRANSPORTER                    | KUMHO P&B CHEMICALS    | KOREA   | 2023 |
| QL-PROJECT                        | C.R.T.                         | CHEMTRONICS            | KOREA   | 2023 |
| CHEMICAL PROCESS                  | DRYER / STORAGE TANK           | CIS CHEMICAL           | GERMANY | 2023 |
| VESSEL PROJECT                    | H/EX / AUTOCLAVE / REACTOR     | HUMEDIX                | KOREA   | 2023 |
| LITHIUM SYSTEM                    | VESSEL                         | POSCO                  | ITALY   | 2023 |
| LITHIUM SYSTEM                    | VESSEL                         | SUNGIL HITEK           | CHINA   | 2023 |
| DISTILLATION SYSTEM               | H/EX / STERILIZER              | STGEN BIO              | GERMANY | 2023 |
| DS-1 PROJECT                      | REACTOR / BUFFER TANK          | NORTHVOLT              | KOREA   | 2023 |
| SEJONG PLANT PROJECT              | VESSEL                         | KCC GLASS CORP         | KOREA   | 2023 |
| CHEMICAL SYSTEM                   | HEAT EXCHANGER                 | HOSOKAWA               | JAPAN   | 2023 |
| CHEMICAL SYSTEM                   | EVAPORATOR                     | WUXI LIMA              | CHINA   | 2023 |
| LITHIUM SYSTEM                    | VESSEL                         | POSCO                  | TURKIYE | 2023 |
| BIO PROJECT                       | BIO VESSEL                     | DAEWON PHARMACEUTICAL  | KOREA   | 2023 |
| GLASS FIBER NO.2 PROJECT          | PROCESS VESSEL                 | KCC GLASS CORP         | KOREA   | 2023 |
| INSTALLATION OF USER TANK PROJECT | C.R.T.                         | KUMHO MITSUI CHEMICALS | KOREA   | 2023 |
| BOILER SYSTEM                     | BOILER                         | ENDORFF                | USA     | 2023 |
| HF PH2 PROJECT                    | TOWER / REACTOR / STEAM HEADER | ENF TECHNOLOGY         | KOREA   | 2023 |
| BIO SYSTEM                        | VESSEL                         | TDS                    | GERMANY | 2023 |
| CHEMICAL PROCESS                  | TOWER / PROCESS VESSEL         | CIS CHEMICAL           | KOREA   | 2023 |
| REACTOR SYSTEM                    | REACTOR                        | CHEMTROS               | KOREA   | 2023 |
| A-PROJECT                         | VESSEL / MIXER / DRUM          | SAMSUNG SDI            | KOREA   | 2023 |

| NAME OF PROJECT        | DESCRIPTION                                          | CLIENT                      | SITE     | YEAR |
|------------------------|------------------------------------------------------|-----------------------------|----------|------|
| GRAPHENE PILOT PLANT   | REACTOR                                              | JNC MATERIALS               | KOREA    | 2023 |
| FTS PROJECT            | REACTOR / TANK /                                     | DNF                         | KOREA    | 2023 |
| STEAM COOKER SYSTEM    | PRESSURE VESSEL                                      | KAJIWARA                    | JAPAN    | 2023 |
| STEAM BOILER PKG       | POWER BOILER                                         | KBR                         | USA      | 2023 |
| UHT SYSTEM             | HEAT EXCHANGER                                       | GEA TDS                     | GERMANY  | 2023 |
| CNT DISPERSION PROJECT | MIXER BOWL                                           | SAMSUNG SDI                 | KOREA    | 2023 |
| CHEMICAL SYSTEM        | EVAPORATOR                                           | MIWON CHEM                  | USA      | 2023 |
| DISTILLATION SYSTEM    | HEAT EXCHANGER                                       | STGEN BIO                   | GERMANY  | 2023 |
| CHEMICAL SYSTEM        | H/EX / STORAGE TANK                                  | HOSOKAWA                    | JAPAN    | 2023 |
| H2 PSA SYSTEM          | HIGH-PURITY HYDROGEN SEPARATION& PURIFICATION SYSTEM | KTL                         | KOREA    | 2023 |
| DP010 PROJECT          | NITROGEN PURIFICATION COLUMN                         | SK HYNIX INC                | KOREA    | 2023 |
| CHEMICAL SYSTEM        | EVAPORATOR                                           | WUXI LIMA                   | CHINA    | 2023 |
| C PROJECT              | METHANOL ADSORPTION TOWER                            | DAEJOO ELECTRONIC MATERIALS | KOREA    | 2023 |
| DRINK PRODUCE SYSTEM   | HEAT EXCHANGER                                       | DONGWON SYSTEMS             | CHINA    | 2023 |
| CS050(020) PROJECT     | NITROGEN PURIFICATION COLUMN                         | WONIK MATERIALS             | KOREA    | 2023 |
| CLEAN WATER SYSTEM     | HEAT EXCHANGER                                       | BINEX                       | ITALY    | 2023 |
| BIO SYSTEM             | REACTOR                                              | SK BIO                      | USA      | 2023 |
| Lar PROJECT            | LIQUID ARGON CRYOGENIC CHAMBER                       | SEOUL NATIONAL UNIVERSITY   | KOREA    | 2023 |
| FOOD PRODUCE SYSTEM    | AUTO CLAVE                                           | LOTTE FOOD                  | FRANCE   | 2023 |
| PHARMACY SYSTEM        | HEAT EXCHANGER                                       | KOREA UNITED PHARM.         | CHINA    | 2023 |
| TaV PROJECT            | HEAVY TAR SALES FACILITY                             | HYUNDAI STEEL               | KOREA    | 2023 |
| NO.2 MNB PROJECT       | TANK / H/EX                                          | DAEWOO E&C                  | KOREA    | 2023 |
| PHARMACY SYSTEM        | PRESSURE VESSEL                                      | HANMI PHARM.                | GERMANY  | 2023 |
| BIO SYSTEM             | HEAT EXCHANGER                                       | SAMSUNG BIO                 | JAPAN    | 2023 |
| N-1(Maf) PROJECT       | AMMONIA PRESSURE VESSEL / STORAGE TANK               | HANWHA CORPORATION          | KOREA    | 2023 |
| LSP PROJECT            | RAW MATERIAL FEEDING SYSTEM                          | LG PRI                      | KOREA    | 2023 |
| FOOD PRODUCE SYSTEM    | AUTO CLAVE                                           | DONGWON                     | FRANCE   | 2023 |
| FOOD OIL SYSTEM        | EVAPORATOR                                           | DONGSUH                     | MALAYSIA | 2023 |
| PILOT PLANT PROJECT    | PROCESS VESSEL                                       | ISU SPECIALTY CHEM.         | KOREA    | 2023 |
| CHEMICAL SYSTEM        | REACTOR                                              | MIJOOENBICHEM               | CHINA    | 2023 |
| P.C.I PROJECT          | HIGH-PRESSURE GAS FEED HOPPER                        | POSCO                       | KOREA    | 2023 |

| NAME OF PROJECT             | DESCRIPTION                                | CLIENT                 | SITE    | YEAR |
|-----------------------------|--------------------------------------------|------------------------|---------|------|
| 3MS PROJECT                 | 3MS SYNTHESIS SYSTEM                       | SOLEMATERIALS          | KOREA   | 2024 |
| PHARMACY RESEARCH SYSTEM    | H/EX / FERMENTER                           | YOORYOUNG PHARMACY     | GERMANY | 2024 |
| FOOD PRODUCE SYSTEM         | AUTO CLAVE                                 | HARIM FOOD             | FRANCE  | 2024 |
| AFTER COOLER PROJECT        | H/EX / DRAIN TANK                          | SAMYANG HOLDINGS CORP. | KOREA   | 2024 |
| C2H2 PROJECT                | HIGH-PURITY C2H2 FILLING SYSTEM            | TAEKYUNG ECO           | KOREA   | 2024 |
| CHEMICAL SYSTEM             | PRESSURE VESSEL                            | GLCHEM                 | CHINA   | 2024 |
| PROCESS MILK SYSTEM         | UHT / STERILIZER                           | BINGGRAE               | GERMANY | 2024 |
| YEP-VI PROJECT              | HEATER / EVAPORATOR                        | KUMHO POLYCHEM         | KOREA   | 2024 |
| HE PROJECT                  | H/EX / FILTER / HARVEST TANK               | HUMEDIX                | KOREA   | 2024 |
| SECONDARY CELL              | PROCESS VESSEL                             | INNOX                  | CHINA   | 2024 |
| A144 PROJECT                | HIGH-PURITY HELIUM CHARGING UNIT           | SK HYNIX INC.          | KOREA   | 2024 |
| RECYCLE PLASTIC SYSTEM      | REACTOR / BIO VESSEL                       | LG CHEMICAL            | SWEDEN  | 2024 |
| BIO SYSTEM                  | REACTOR / BIO VESSEL                       | SK BIO                 | USA     | 2024 |
| A145 PROJECT                | HIGH-PRESSURE NITROGEN CHARGING SYSTEM     | TEMC                   | KOREA   | 2024 |
| A148 PROJECT                | NITROGEN PURIFICATION SYSTEM               | SAMSUNG SDI            | KOREA   | 2024 |
| CONCRETE SYSTEM             | BOILER                                     | POINIX                 | USA     | 2024 |
| CN200 PROJECT               | HIGH-PRESSURE HYDROGEN PURIFICATION SYSTEM | SAMSUNG SDI            | KOREA   | 2024 |
| HSC COSMOS PROJECT          | BIOVESSEL                                  | HANWHA SOLUTIONS       | KOREA   | 2024 |
| BIO SYSTEM                  | BIO VESSEL / TOWER                         | SAMSUNG BIO            | FRANCE  | 2024 |
| DCD-401 PROJECT             | MELT POLYMERIZATION REACTOR                | META BIOMED            | KOREA   | 2024 |
| P.C.I PROJECT               | LOW-VOLATILITY PCI STORAGE TANK            | POSCO                  | KOREA   | 2024 |
| CHEMICAL SYSTEM             | AUTO CLAVE / DRYER                         | HYOSUNG                | CHINA   | 2024 |
| BH-1 PROJECT                | NOx EMISSION REDUCTION SYSTEM              | LG CHEM                | KOREA   | 2024 |
| DE-PROJECT                  | REACTOR / TOWER                            | DONGIN CHEM            | KOREA   | 2024 |
| SAL DE ORO PROJECT          | PROCESS VESSEL                             | POSCO                  | KOREA   | 2024 |
| RF PROJECT                  | ETHYLENE GLYCOL STORAGE TANK               | KUMHO PETROCHEMICAL.   | KOREA   | 2024 |
| PAPER PRODUCE SYSTEM        | PROCESS VESSEL                             | MOORIM                 | CHINA   | 2024 |
| E PROJECT                   | MOISTURE SEPARATION SYSTEM                 | OCI & KUMHO            | KOREA   | 2024 |
| GMP PROJECT                 | H/EX / STERILIZER                          | DAEWOONG BIO           | KOREA   | 2024 |
| RECHARGEABLE BATTERY SYSTEM | HEAT EXCHANGER                             | VEOLIA                 | ITALY   | 2024 |
| HT PROJECT                  | VACUUM SYSTEM                              | HUMANTEK               | KOREA   | 2024 |

| NAME OF PROJECT                        | DESCRIPTION                                | CLIENT                         | SITE      | YEAR |
|----------------------------------------|--------------------------------------------|--------------------------------|-----------|------|
| ENVIRONMENTAL ANALYSIS LAB VENT SYSTEM | TOWER                                      | SK SPECIALITY                  | KOREA     | 2024 |
| C-PROJECT                              | STERILIZER / CYCLONE                       | DAEWOONG                       | KOREA     | 2024 |
| HM-PROJECT                             | STORAGE TANK / REACTOR / H/EX / AUTO CLAVE | HUMEDIX                        | KOREA     | 2024 |
| PAPER PRODUCE SYSTEM                   | PROCESS VESSEL                             | MOORIM                         | CHINA     | 2024 |
| GLP PROJECT                            | GLYCOLIDE PRODUCTION SYSTEM                | POLY BIOTECH                   | CHINA     | 2024 |
| CS500 PROJECT                          | NITROGEN PURIFICATION COLUMN               | SK HYNIX INC.                  | KOREA     | 2024 |
| CMN250 PROJECT                         | OXIDATION SYSTEM                           | SAMSUNG SDI                    | KOREA     | 2024 |
| LGESOC2 1P PROJECT                     | CONDENSER / H/EX                           | LG ENERGY SOLUTION             | KOREA     | 2024 |
| RECHARGEABLE BATTERY SYSTEM            | HEAT EXCHANGER                             | VEOLIA                         | ITALY     | 2024 |
| HOSPITAL RESEARCH SYSTEM               | CHAMBER                                    | BUSAN UNIVERSITY               | ITALY     | 2024 |
| HL-PROJECT                             | TANK / STERILIZER                          | HANLIM PHARM.                  | KOREA     | 2024 |
| CS200 PROJECT                          | H2 / N2 / NH3 PURIFIERS                    | SAMSUNG SDI                    | KOREA     | 2024 |
| FOOD PRODUCE SYSTEM                    | DRYER / STERILIZER                         | HARIM FOOD                     | DENMARK   | 2024 |
| CHEMICAL SYSTEM                        | REACTOR / BIO VESSEL                       | LG CHEMICAL                    | GERMANY   | 2024 |
| FOOD PRODUCE SYSTEM                    | AUTO CLAVE / BIO VESSEL                    | CJ                             | FRANCE    | 2024 |
| UT PROJECT                             | AIR HEADERS FOR SEWAGE TREATMENT           | GUNSAN SEWAGE TREATMENT CENTER | KOREA     | 2024 |
| OXO SUPER                              | HEATER                                     | LG CHEM.                       | KOREA     | 2024 |
| BIO SYSTEM                             | PROCESS VESSEL / CYCLONE                   | LOTTE BIO                      | FRANCE    | 2024 |
| VHE PROJECT                            | CONDENSER                                  | CGP MATERIALS                  | KOREA     | 2024 |
| SI2H6 PROJECT                          | SI2H6 RESIDUAL GAS PURIFICATION EQUIPMENT  | SOLEMATERIALS                  | KOREA     | 2024 |
| PAPER PRODUCE SYSTEM                   | DRYER                                      | AJIN P&P                       | CHINA     | 2024 |
| LNG TERMINAL PROJECT                   | DRYER / FILTER                             | POSCO E&C                      | KOREA     | 2024 |
| SHAHEEN PROJECT                        | STORAGE TANK                               | S-OIL CORP.                    | KOREA     | 2024 |
| GAS PRODUCE SYSTEM                     | HEAT EXCHANGER                             | ENF                            | CHINA     | 2024 |
| PHARMACY SYSTEM                        | H/EX / SEPARATOR                           | JANSSEN                        | GERMANY   | 2024 |
| A180 PROJECT                           | HELIUM GAS PURIFICATION GETTER TOWER       | SAMSUNG SDI                    | KOREA     | 2024 |
| JIO-PROJECT                            | DRYER / REACTOR                            | JIOS AEROGEL                   | SINGAPORE | 2024 |
| BIOGAS UPGRADING SYSTEM                | TOWER / BIO VESSEL                         | ECO BIO                        | KOREA     | 2024 |
| SECONDARY CELL                         | PRESSURE VESSEL                            | POSCO                          | GERMANY   | 2024 |
| GL-R PROJECT                           | MEDICAL DEVICE MANUFACTURING EQUIPMENT     | META BIOMED                    | KOREA     | 2024 |
| BIO DIESEL PROJECT                     | EVAPORATOR / DRYER / CONDENSER             | GS BIO                         | KOREA     | 2024 |

| NAME OF PROJECT                 | DESCRIPTION                               | CLIENT               | SITE     | YEAR |
|---------------------------------|-------------------------------------------|----------------------|----------|------|
| NUCLEAR FUEL TEST FACILITY      | TOWER / VESSEL                            | KEPCO NUCLEAR FUEL   | KOREA    | 2025 |
| GL PJT                          | SURGICAL SUTURE MANUFACTURING EQUIPMENT   | META BIOMED          | KOREA    | 2025 |
| FOOD PREDUCE SYSTEM             | AUTO CLAVE                                | LOTTE FOOD           | FRANCE   | 2025 |
| JNPP PROJECT                    | DRYER                                     | HS BIO               | KOREA    | 2025 |
| XLP PJT                         | CHEMICAL & PHYSICAL ADSORPTION COLUMN     | SAMSUNG              | KOREA    | 2025 |
| CHEMICAL SYSTEM                 | GL REACTOR                                | MIJOO                | CHINA    | 2025 |
| HP PROJECT                      | NITROGEN PURIFICATION SYSTEM              | WOORIM               | KOREA    | 2025 |
| BIO SYSTEM                      | HEAT EXCHANGER                            | GREEN CROSS          | CHINA    | 2025 |
| CIS-PROJECT                     | MIXING TANK                               | CIS CHEMICAL         | KOREA    | 2025 |
| EUV THINNER                     | REACTOR / CONDENSER / RECEIVER TANK       | CHEMTROS             | KOREA    | 2025 |
| SECONDARY CELL                  | PRESSURE VESSEL                           | POSCO                | GERMANY  | 2025 |
| CHEMICAL SYSTEM                 | EVAPORATOR                                | SGC                  | CHINA    | 2025 |
| ELECTRIC PROVIDING SYSTEM       | PRESSURE VESSEL                           | LS ELECTRIC          | GERMANY  | 2025 |
| BIO SYSTEM                      | HEAT EXCHANGER                            | BIO POUR             | CHINA    | 2025 |
| SHORT PATH DISTILLATOR          | DISTILLATOR /                             | SK CHEMICAL          | KOREA    | 2025 |
| O2 AD PJT                       | HIGH-PRESSURE OXYGEN DECOMPOSITION COLUMN | SAMSUNG              | KOREA    | 2025 |
| R-101 PJT                       | PYROLYSIS & CRYSTALLIZATION REACTORS      | META BIOMED          | KOREA    | 2025 |
| D PROJECT                       | LNG HIGH-PRESSURE CYLINDER                | HD HYDROGEN          | KOREA    | 2025 |
| DEEP OCEAN WATER PRODUCE SYSTEM | REACTOR                                   | COOP ENG             | CHINA    | 2025 |
| 1HAPL PICKLING PROJECT          | LOW-PRESSURE HYDROGEN EQUIPMENT           | POSCO                | KOREA    | 2025 |
| CHEMICAL SYSTEM                 | PROCESS VESSEL                            | LG CHEMICAL          | MALAYSIA | 2025 |
| BIO SYSTEM                      | BIO VESSEL                                | SAMSUNG BIO          | FRANCE   | 2025 |
| ABN-PROJECT                     | HEATER                                    | ALBANY INTERNATIONAL | USA      | 2025 |
| K-CALL PROJECT                  | H/EX / REACTOR                            | WELKIN BIOTECHNOLOGY | CHINA    | 2025 |
| RS-101 PROJECT                  | HIGH-CONCENTRATION SLURRY REACTOR         | EcoPro BM            | KOREA    | 2025 |
| PROCESS DRINK PRODUCE SYSTEM    | PRESSURE VESSEL                           | GAONNURI             | CHINA    | 2025 |
| PS PROJECT                      | PURE STEAM GENERATION SYSTEM              | DALIMBIOTECH         | KOREA    | 2025 |
| BIO SYSTEM                      | HEAT EXCHANGER                            | BINEX                | ITALY    | 2025 |
| PAPER PRODUCE SYSTEM            | DRYER                                     | MOORIM P & P         | ITALY    | 2025 |
| H2 PROJECT                      | LOW-PRESSURE HYDROGEN SYSTEM              | TAEGUTEC             | KOREA    | 2025 |
| MEDICAL EQUIPMENT SYSTEM        | CHAMBER                                   | CYTIVA               | UK       | 2025 |

| NAME OF PROJECT           | DESCRIPTION                                       | CLIENT                   | SITE     | YEAR |
|---------------------------|---------------------------------------------------|--------------------------|----------|------|
| INCINERATION FACILITY     | REACTOR / DRYER                                   | ANSAN CITY               | KOREA    | 2025 |
| HEXA 1500 L/H             | HEXA MIXER                                        | SAMSUNG ELECTRONICS      | KOREA    | 2025 |
| NH3 Recovery PROJECT      | AMMONIA RECOVERY & PURIFICATION SYSTEM            | RIST                     | KOREA    | 2025 |
| CHEMICAL SYSTEM           | GL REACTOR                                        | SDC                      | CHINA    | 2025 |
| H1 PLANT                  | HEAT EXCHANGER                                    | KCC CORP.                | KOREA    | 2025 |
| Sapphire Modify PROJECT   | LAB CHEMICAL SYSTEM MAINTENANCE UNIT              | PKC                      | KOREA    | 2025 |
| BIO SYSTEM                | REACTOR                                           | SK BIO                   | USA      | 2025 |
| MEDICAL EQUIPMENT SYSTEM  | CHAMBER                                           | AJOO UNIVERSITY HOSPITAL | ITALY    | 2025 |
| CDQ PROJECT               | CDQ BOILER                                        | POSCO                    | KOREA    | 2025 |
| DEG PROJECT               | DEG PRESSURE VESSEL                               | SAMYANG HOLDINGS CORP.   | KOREA    | 2025 |
| HW PROJECT                | MIXER BOWL                                        | HANWHA AEROSPACE         | KOREA    | 2025 |
| H2 PSA SYSTEM             | HIGH-PURITY HYDROGEN PURIFICATION SYSTEM          | HYUNDAI MOTOR COMPANY    | KOREA    | 2025 |
| RECHARGEABLE BATTERY      | HEAT EXCHANGER                                    | SUNG HIMETAL             | CHINA    | 2025 |
| SLUDGE TREATMENT SYSTEM   | DRYER                                             | BUCHEON CITY             | KOREA    | 2025 |
| FOOD PRODUCE SYSTEM       | BIO VESSEL                                        | LOTTE WELL FOOD          | SWISS    | 2025 |
| SECONDARY CELL            | VESSEL                                            | POSCO PLANTEC            | INDIA    | 2025 |
| DCD PROJECT               | MELT POLYMERIZATION REACTOR                       | META BIOMED              | KOREA    | 2025 |
| GAS PROVIDING SYSTEM      | PROCESS VESSEL                                    | ISTE                     | CHINA    | 2025 |
| P PROJECT                 | PRESSURE TANK                                     | POSCO                    | KOREA    | 2025 |
| PRSTG                     | H/EX / EVAPORATOR / TANK                          | PRESTIGE BIOLOGICS       | KOREA    | 2025 |
| CDQ3 PROJECT              | DUST COLLECTING & COOLING SYSTEM                  | POSCO                    | KOREA    | 2025 |
| PHARMACY RESEARCH SYSTEM  | HEAT EXCHANGER                                    | CHUNGANG VACCINE         | GERMANY  | 2025 |
| FOOD PRODUCE SYSTEM       | PROCESS VESSEL                                    | DONGWON FOOD             | FRANCE   | 2025 |
| GREEN STEAM POWER PROJECT | CONDENSER / H/EX                                  | MOORIM P&P               | KOREA    | 2025 |
| BF3 CLEANING SYSTEM       | BF3 FROM 11BF3 SCRUBBING & DECONTAMINATION SYSTEM | TEMC                     | KOREA    | 2025 |
| PROCESS MILK SYSTEM       | PROCESS VESSEL                                    | BINGGRAE                 | GERMANHY | 2025 |
| FOOD PEELER SYSTEM        | BOILER & STEAM PEELER                             | AGRICULTURAL CORPORATION | TURKIYE  | 2025 |
| SOLID PROJECT             | HEAT EXCHANGER                                    | KIER                     | KOREA    | 2025 |
| SORTER PROJECT            | H/EX / CYCLONE                                    | SAMSUNG SDI              | KOREA    | 2025 |
| Ar PROJECT                | ARGON GAS STORAGE TANK                            | WOORIM                   | KOREA    | 2025 |
| 1HAPL PICKLING PROJECT    | HEAT EXCHANGER                                    | POSCO                    | KOREA    | 2025 |

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