

Small Scale LNG BUSINESS

Container type Mobile LNG Plant



1 Small Scale LNG Plant



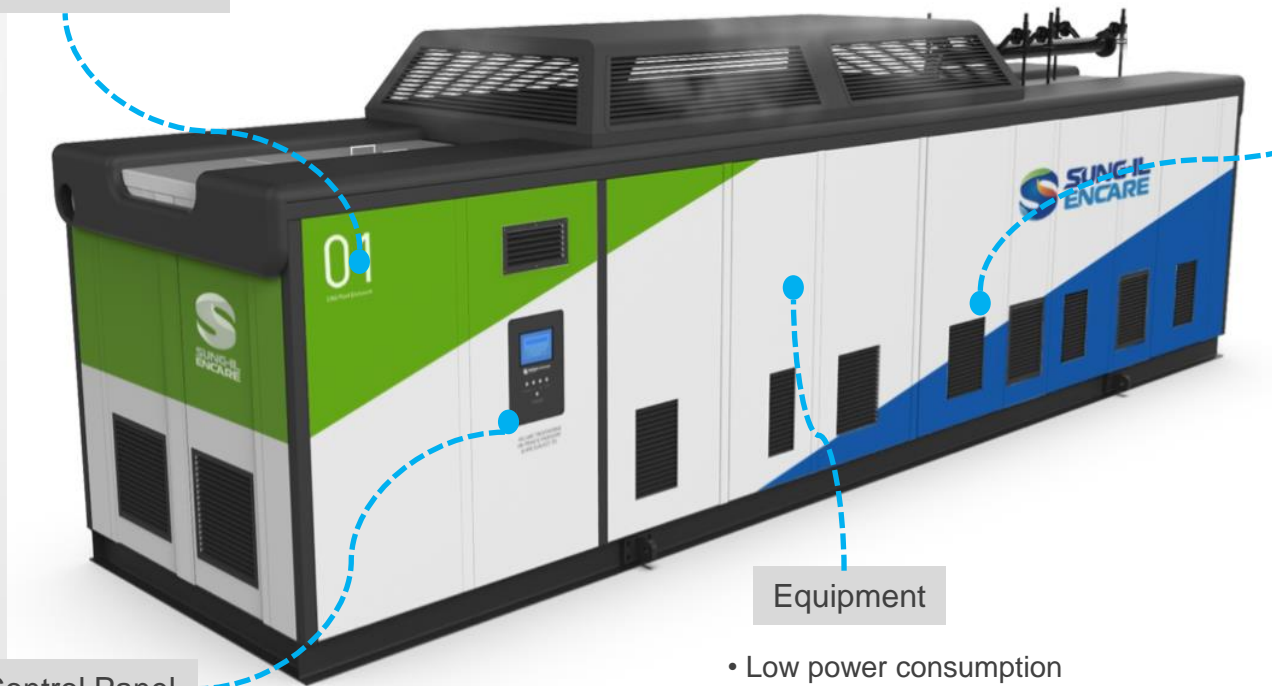
Feature

- Dual PLC system for enhanced safety
- Enhanced electromagnetic shielding
- Isolation from combustible gases
- Gas detector
- ESD switch
- UPS system

- Protection from rain, sunlight and dust (IP 23)
- Explosion proof
- Noise isolation(inner absorbing panel, silencer)
- Easily accessible through doors
- Prevent access by door locks
- Emergency alarm (horn, lighting)

PLC/ Electric Room

Process Room



Local Control Panel

Equipment

Remote Console



- Explosion proof type 12" touch pad
- Local HMI system
- Auto and Manual mode
- Start / ESD buttons

- Low power consumption
- High reliability and duration
- Fast running and stop
- Gas sampling system
- Less utility required
- Less consumables required
- Duplicated sensors

Technical Data

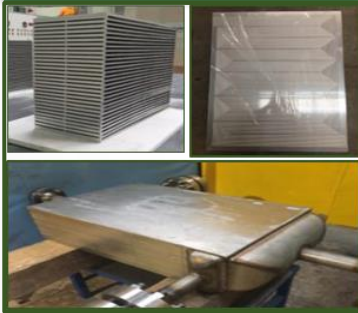
		CLP-130-06	CLP-150-10	CLP-150-30
Input Pressure				
	barg	3~6	10	30
	psi	43.5 ~ 87	145	435
LNG production capacity				
	ton/day	13	15	15
	m ³ /day	32	37	37
	gal/day	8,471	9,774	9,774
	kg/h	542	625	625
LNG delivery condition				
Pressure	barg	4.5 ~ 5.5	4.5 ~ 5.5	4.5 ~ 5.5
	psi	65.3 ~ 79.8	65.3 ~ 79.8	65.3 ~ 79.8
Temperature	°C	-142 ~ -145	-142 ~ -145	-142 ~ -145
	°F	-223.6 ~ -229	-223.6 ~ -229	-223.6 ~ -229
Energy Consumption				
Consumed power	kw	480	440	420

Configuration

○ Separator



○ MCHE



○ J-T Valve



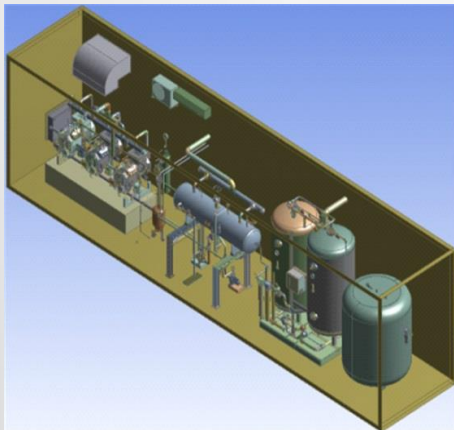
○ Cooling System



○ Multi-Phase Compressor



○ Pre-Treatment & Make-up Module



○ Liquefaction Module



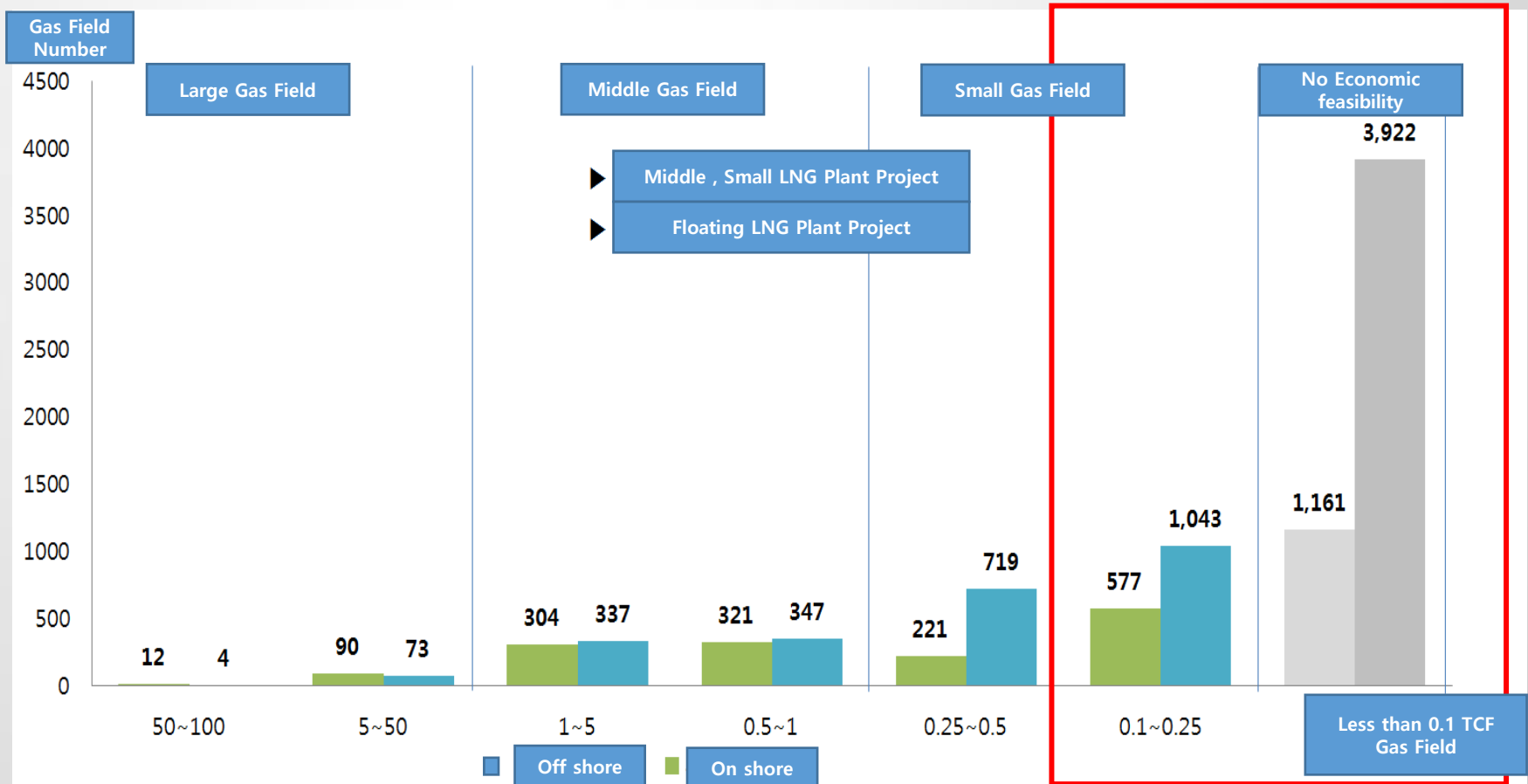
○ Control System



Application

✓ Small Gas Field Development less than 0.25 TCF(Trillion Cubic Feet)

► On shore : 1738 gas field, Offshore: 4965 gas field Low Cost Development



Gas Pipeline



Stranded Gas well



Bio Gas



Flare Gas



Isolation Area



Fueling for Ship and Vehicle



Small Power Plant



✓ Supply LNG in Isolation Area

- Provide LNG in Mountain and Island area for electric generation and heating



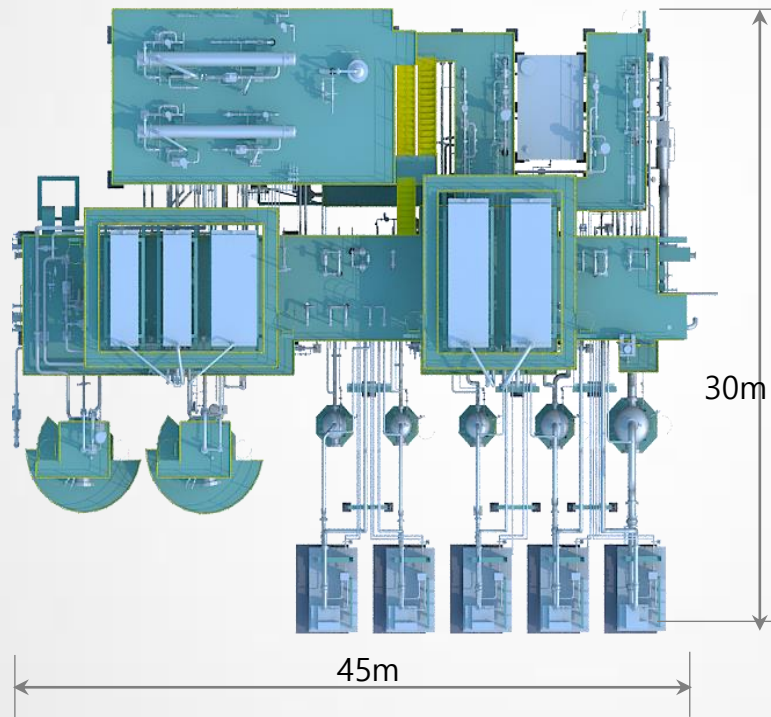
✓ LNG Fueling Vehicle

- ▶ LNG fueled truck and low cost ship Bunkering Facility



Stick built vs. Container Comparison

<Stick Built Type Pilot>



<Container Type>



	Stick Built Type	Container Type
Capacity	100 ton / day	105ton/day
Dimension	30m(L) X 45m(W) X 12m(H)	12m(L) X 38m(W) X 2.3m(H)
Manufacture/Installation/Inspection	Manufacture/Installation/Inspection in Site	Manufacture/Inspection in Factory and Installation in Site
Installation Period	24 month	6 month
Maintenance	Whole Train Maintenance	1 Module Maintenance
Mobile	Not Available	Available

○ Sung-il Encare Mini LNG Plant's Pros

Good Safety
High Reliability
Short Installation Period
Module Extendibility / Mobile
Low CAPEX
Easy Operating
Simple Maintenance



The image shows two workers in blue uniforms and white hard hats, both with "SUNG-IL ENCARE" printed on their backs. They are standing in an industrial environment, looking at a large technical drawing or blueprint. The background features complex piping, valves, and machinery, typical of a gas processing plant. The worker on the right has Korean text on his hard hat: "주성일엔케어" (Juseongil Encare). The worker on the left has "SUNG-IL ENCARE" printed on his uniform. The overall scene is brightly lit, highlighting the industrial equipment and the workers' safety gear.

**SUNG-IL
ENCARE**

**SUNG-IL
ENCARE**

Various safety-related Designs

[HAZID]

ISO CONTAINER TYPE SMALL SCALE LNG PLANT
Hazard Identification
 Korea Institute of Industrial Technology
 Report No.: 2018-9107, Rev. A
 Document No.: DNVGL-PP196105-HAZID
 Date: 2018-03-29

[HAZOP]

ISO CONTAINER TYPE SMALL SCALE LNG PLANT
Hazard & Operability (HAZOP)
 Korea Institute of Industrial Technology
 Report No.: 2018-9453, Rev. 0
 Document No.: DNVGL-10100317-HAZOP
 Date: 2019-09-05

[Dispersion Analysis]

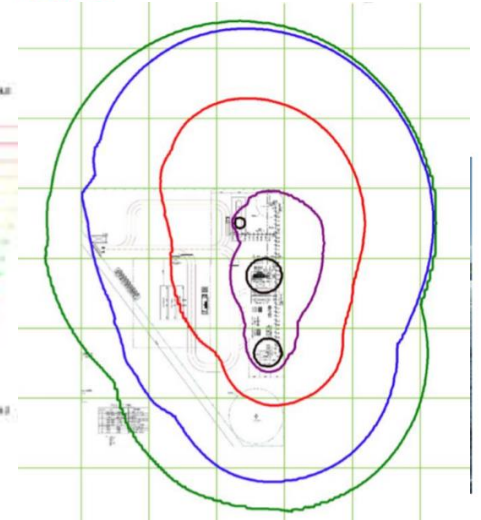
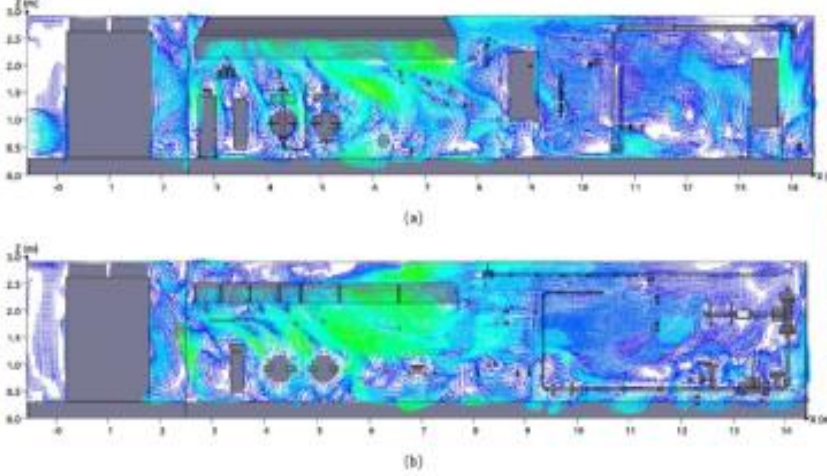
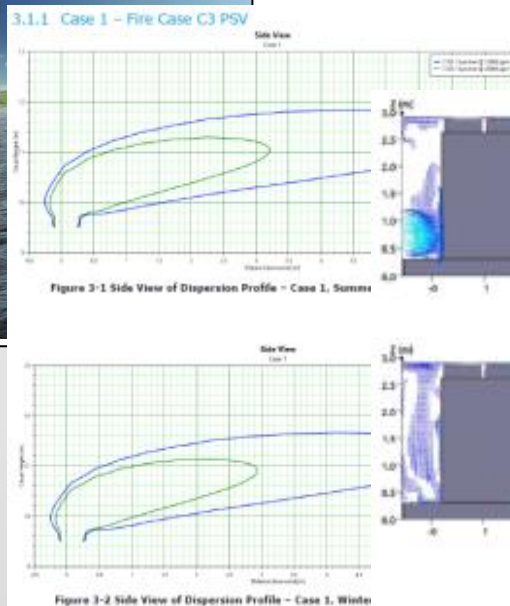
ISO CONTAINER TYPE SMALL SCALE LNG PLANT
Atmospheric Vent Dispersion Analysis
 Korea Institute of Industrial Technology
 Report No.: 11CRW260-3, Rev. B
 Document No.: 11CRW260-3
 Date: 2018-03-08

[CFD Study]

CFD VENTILATION AND DISPERSION STUDY FOR SMALL SCALE LNG PLANT
CFD Ventilation and Dispersion Study for Small Scale LNG Plant
 DNV GL Korea Ltd.
 Report No.: 001, Rev. DRAFT

[QRA]

RISK ASSESSMENT & CONTROL SYSTEM EVALUATION FOR SMALL SCALE LNG PLANT
Quantitative Risk Analysis (QRA)



Good Safety

3 steps safety level

1st Step. Pre Alarm

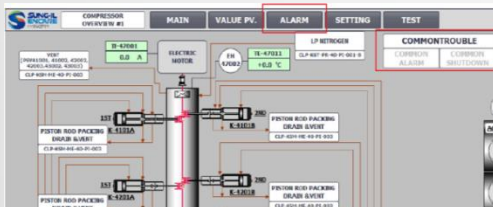
- Pre-Alarm for analogue sensor signals



[Warning Light & Horn]

2nd Step. Shutdown Logic

- 3 level Shutdown Logic ESD level 0~2
- 13sets of Process Shutdown Valves



[HMI Alarm]

3rd Step. Pressure Safety Valve

- 13sets of PSV are arranged in pressure line and Vessels



Good Safety

Gas detector and Flame detector

- Gas detectors and Flame detectors are arranged inside of Container



UV/IR Flame Detector RFD-2FTN

Specification

※Specifications are subject to be changed without prior notice.

SMART & LOCAL DISPLAY TYPE FLAMMABLE GAS DETECTOR			
Model	GTD-2000Ex		
Measuring gas	Flammable gases (LNG, LPG, H ₂ , Methane, Butane & etc)		
Measuring type	Diffusion type		
Measuring method	Catalytic cell	Hot wire semiconductor cell	Thermal conductivity cell
Measuring range	0-100% LEL	0-2000ppm	0-100% Vol
Response time	< 15 sec / 90% scale		
Accuracy	±3% / Full scale		
Parameter control	Non intrusive control with a Magnet bar (calibration, maintenance)		
Operation mode display	1-LED (Power)		
Measuring value display	LCD display (Built in back light 2-Line, 8 characters) / OLED Type (Option)		
Output signal	Analog : Measuring signal : 4-20mA DC Calibration signal : 3mA DC Fault signal : 0mA DC Digital : 2mA (HART 7, HART Device Description Language available, Option)		
Cable/Distance	Power + Signal cable : 3-wire >1.5sq (AWG16) / 2500m max		
Material	Housing : ALDC, SUS316(Optional) / Sensor : SUS316		
Conduit connection	G. Rc. NPT 1/2", 3/4" & M20 (G 3/4" : standard)		
Mounting type	2" Pole mount, Wall mount, Duct mount		
Operating temperature	-20°C ~ +60°C / -40°C ~ +80°C (Option)		
Operating humidity	5 ~ 99% RH (non-condensing)		
Operating power	18-31V DC (24V DC normal) / 200mA max		
Dimensions	136x166x110 (WxHxD)mm		
Weight	1.5kg		
Approval	Explosion proof type (Ex d IIC T5) KCs / IP66/67 Explosion proof type (Ex d IIC Gb T4-T6) ATEX, IECEx Explosion proof type (Ex d IIC T5 Gb) NEPSI Explosion type (Exd IIC T6, T5, T4 Gb) KCs Marine : KR, MED, ABS, DNV KFI, CE, HART, SIL 2, KC, UL, PESO, TRCUex, IEC 60079-29-1 : 2007		

High Reliability

Applying International Code & Standard

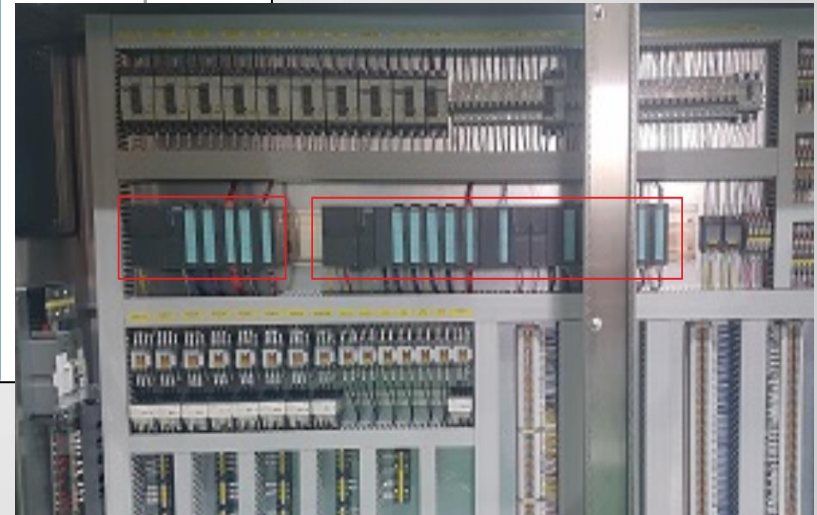
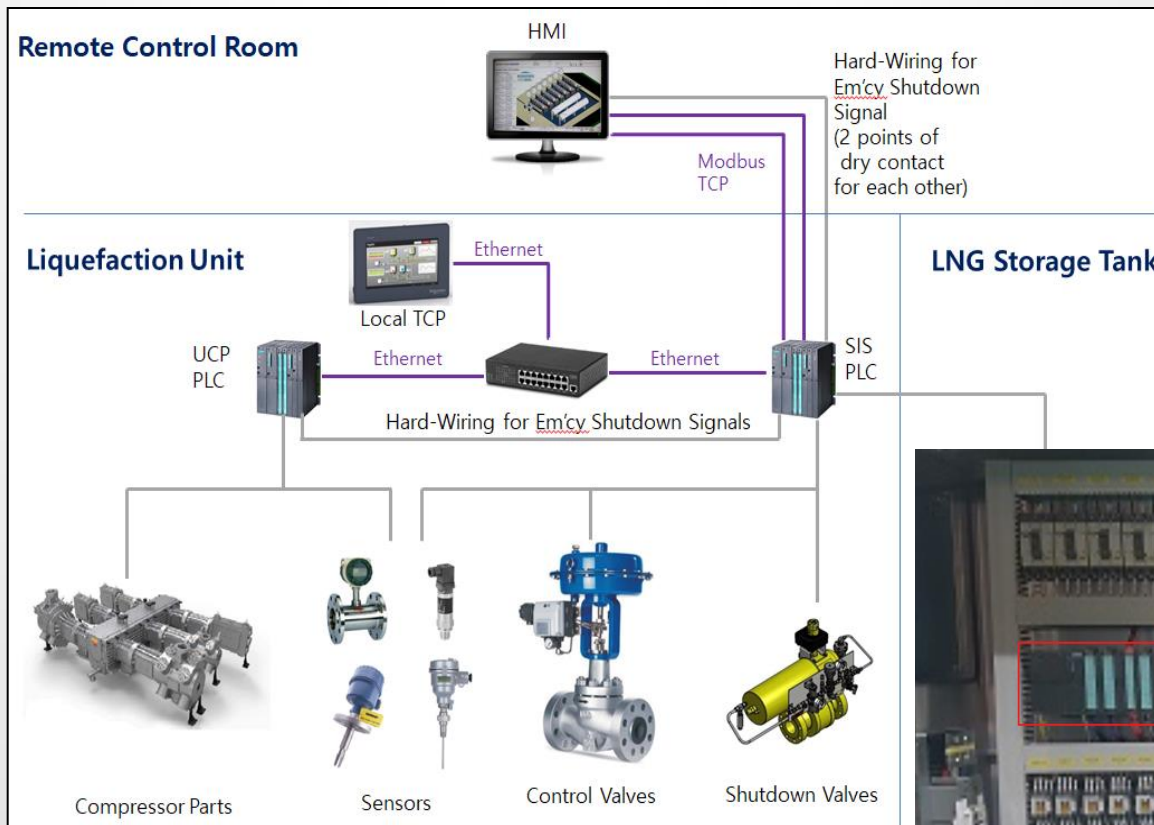
Item	Code & Standard
Piping	ASME B16.34/B16.5/B16.20, ANSI/ASME B31.3, API RP520/526, ASTM A106
Vessel	ASME SEC VIII. DIV.1, KGS AC111/AC112, KS B-6750, KOSHA Guide, KEMCO
Heat Exchanger	ASME SEC VIII. DIV.1, KGS AC111, KSB 6750, KEMCO, TEMA, HEIS
Compressor	ASME SEC VIII. DIV.1, ISO 13631, API 618/661/RP520/RP526, ANSI/ASME B31.3, ANSI B16.34/B16.5, ASTM A106, ISO 20186-8, IEC 60034/60079/60332/61034/60754
Control Valve & PSV	ASME B16.5/B16.10/B16.34, ASTM, KGS AA319, ASME SECTION V/VIII/IX, MSS SP-25/55, API 526/527 BS 6364, FCI 70-2
Manual Valve	ASME B16.5/B16.10/B16.34, ASTM, ASTM A961 ASME SECTION V/VIII/IX, MSS SP-25, API 526/527 BS 6364, API 598
Electrical Components	NMEA, ANSI, NFPA No.70, IEC



High Reliability

Independent PLC system for Process and Safety

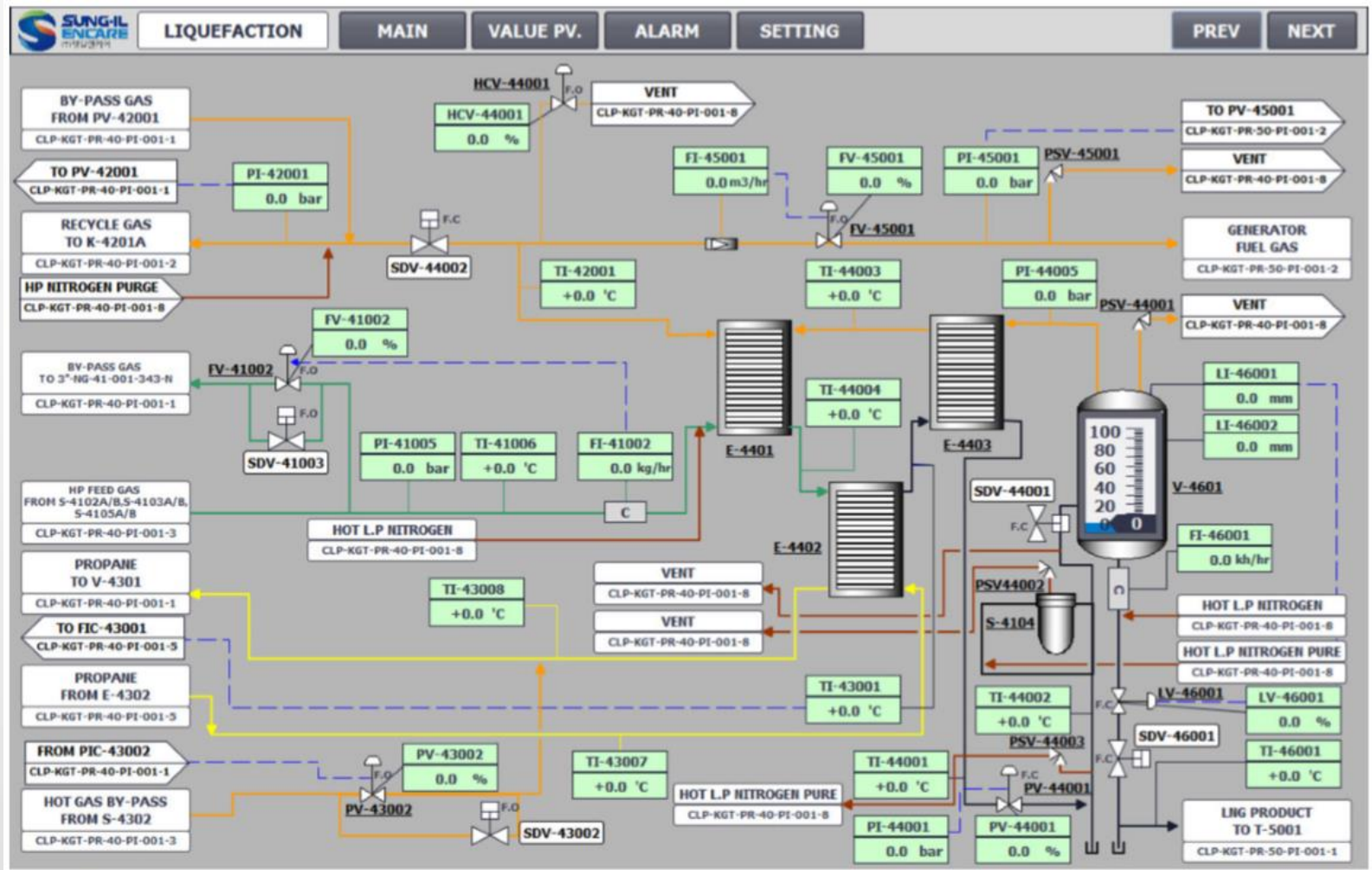
- User Control PLC and Safety Integration PLC are arranged separately.



High Reliability

Sensor Arrangement

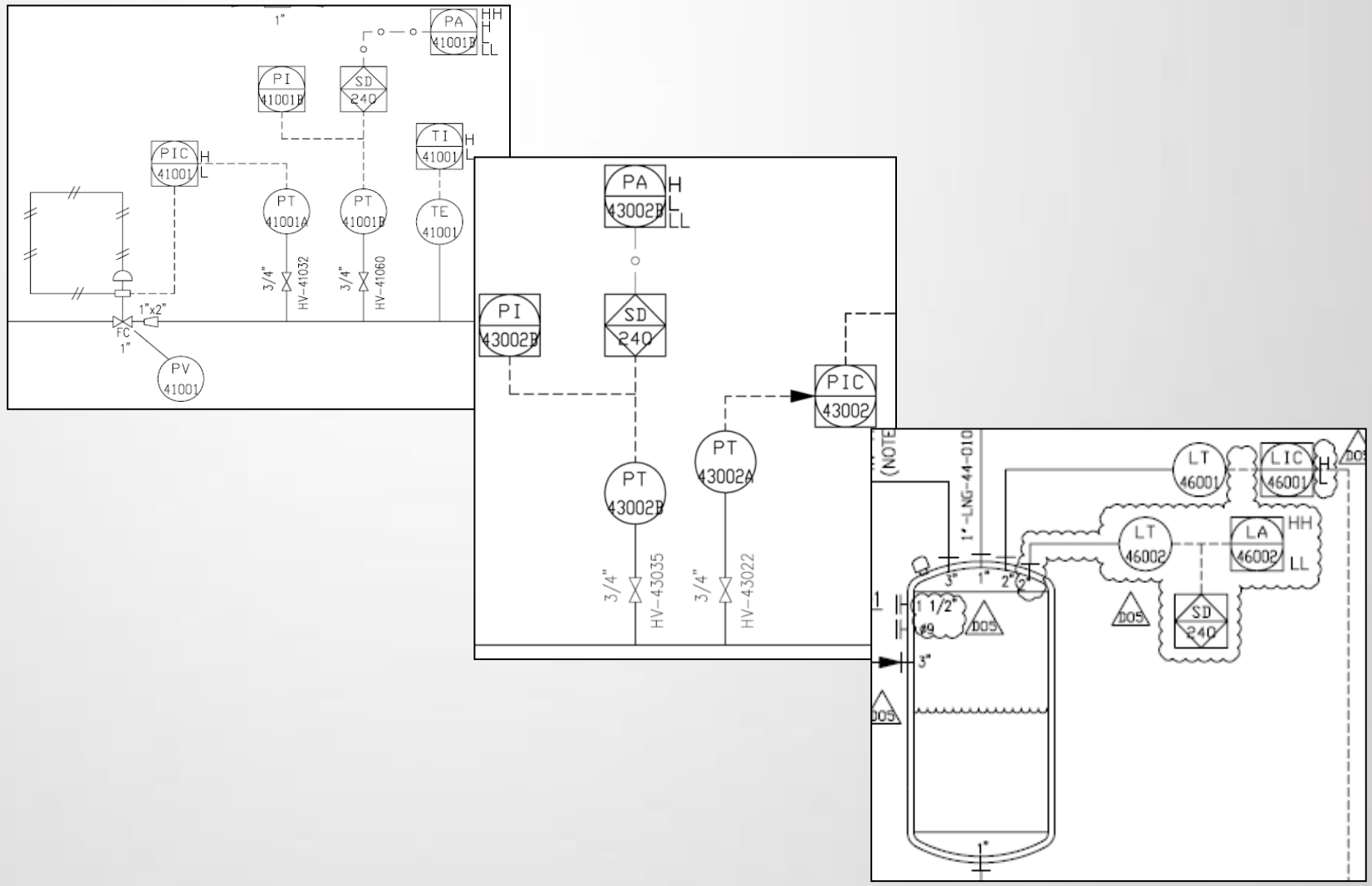
- The pressure, temperature and flow of all process lines are completely monitored.



High Reliability

Sensor Arrangement

- Duplicated sensors for Control & ESD



High Reliability

UPS for Control Power

- Uninterrupted Power Supply is arranged for Control Power (over 30 minutes)



Batteries and runtime					
Battery type	Maintenance-free sealed lead-acid battery with suspended electrolyte; leak proof				
Replacement battery	RBC48	RBC6	RBC7	RBC55	
Runtime estimates					
200 W	:22	:45	1:24	2:17	2:29
500 W	:05	:10	:23	:51	:55
700 W	-	:06	:12	:34	:37
1000 W	-	-	:07	:21	:23
1400 W	-	-	-	:13	:14
1600 W	-	-	-	:10	:12
Full Load	:05	:06	:07	:07	:06
Communication and management					
Interface ports	Serial ((RJ45), USB, and SmartSlot				
Control panel and audible alarms	Alpha-numeric LCD display with LED status indicators; alarm on battery, distinctive low battery alarm and configurable delays				
Emergency power off (EPO)	Optional			Yes	
Physical					
Maximum height - cm (in)	16.1 (6.2)	21.9 (8.5)	21.9 (8.5)	43.5 (17)	
Maximum width - cm (in)	13.8 (5.4)	17.1 (6.7)	17.1 (6.7)	19.7 (7.7)	
Maximum depth - cm (in)	36.3 (14.1)	43.9 (17.3)	43.9 (17.3)	54.4 (21.5)	
Net weight - kg (lb)	13.2 (29)	18.86 (42)	18.86 (53)	48.8 (108)	52.5 (116)
Conformance					
Regulatory	RCM, CE, EN62040-1, EN62040-2, EAC, VDE				
Warranty	3-year electronics, 2-years battery				

Life Is On

APC
by Schneider Electric

Mobility (Pre-Treatment)

Movable by trailer

For completion of gas processing, pre-treatment system shall be required depending on feed gas composition.

SungilEncare's liquefaction unit is small package equipment as treating small gas well or small power plant source.

That's why it is required to small pre-treatment unit and it is able to delivery.

If feed gas composition is tainted, pre-treatment system **MUST** be required for increasing purity of feed gas. It can be serial installed depending on number of impurities.



Mobility (Pre-Treatment)

Movable by trailer

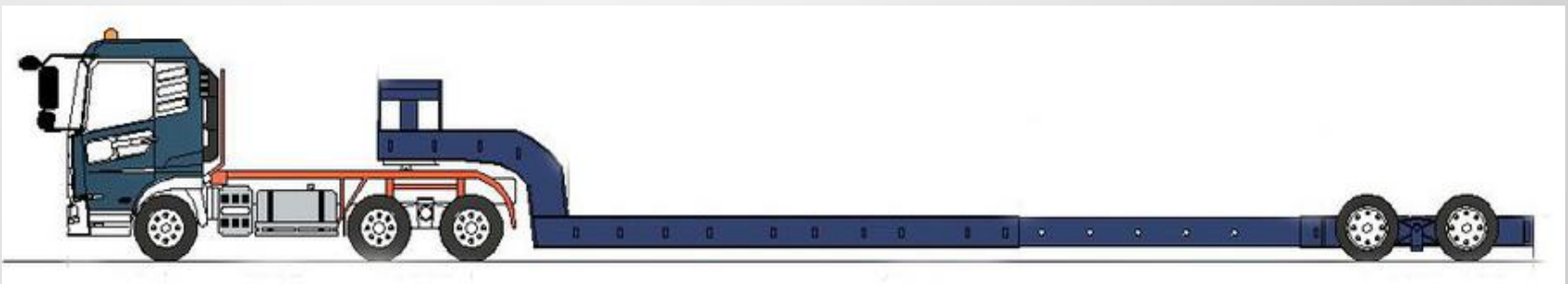
- Skid structure to be provided



Mobility (Liquefaction)

Movable by trailer

- Can be moved to anywhere by trailer



Easy Operation & Simple Maintenance

Fast Running and Stop

- Based on the Dynamic Simulation, Cool down and LNG production can be done shortly. And, the shut down can be done without any problem.

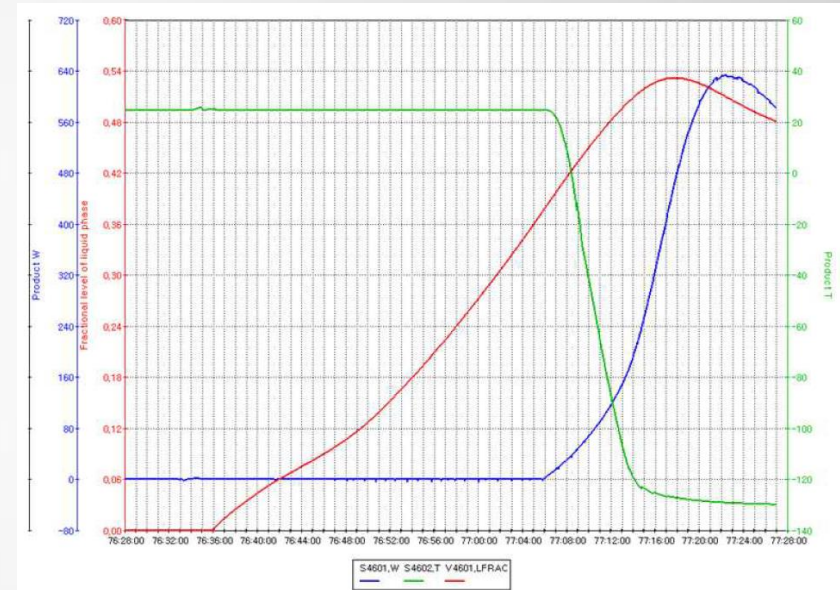


그림 10. Start-up 시 Product Profile

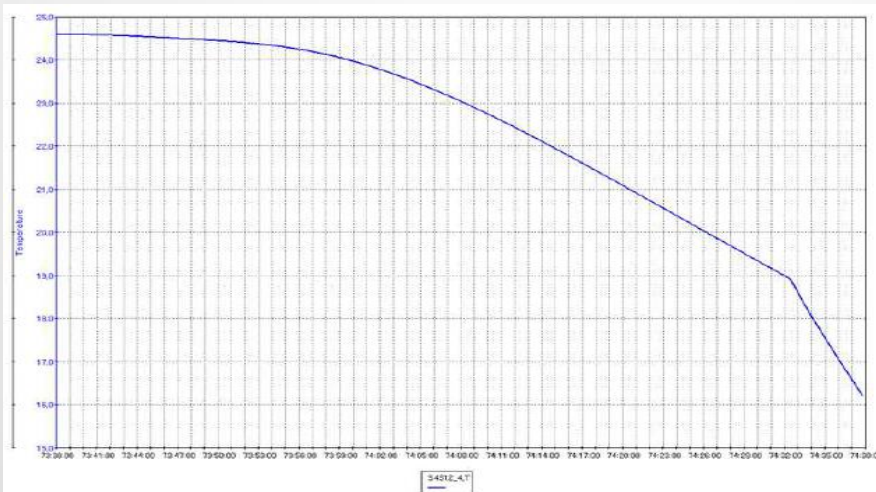


그림 5. Propane Line Cool-down Example (TI-43007)

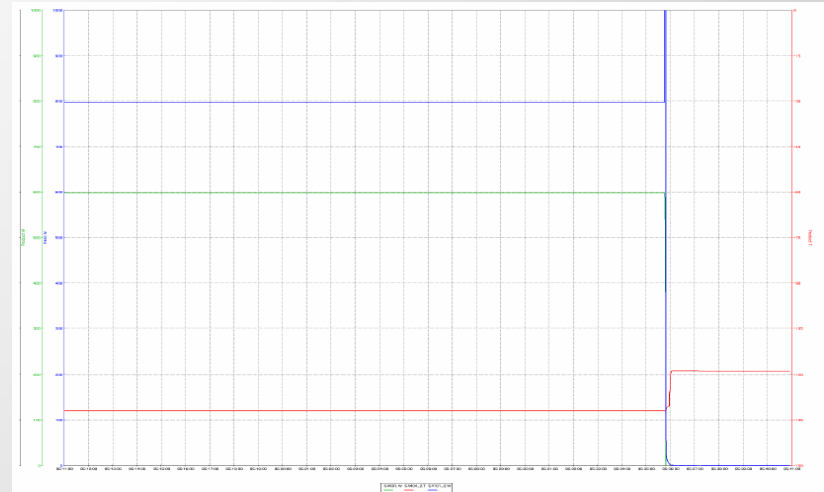


그림 14. Shut-down 시 Key Performance Index Profile

Easy Operation & Simple Maintenance

Local Touch Control Panel, Remote Control Console and Manual CV control

- Control & Monitoring can be done in both Local and Remote Station

Local Panel



Remote Control Console with DCS Display



- Control Valve can be operated by manual wheel in emergency situation



Easy Operation & Simple Maintenance

Easy direct access and disassembly of all equipment through many doors



15, Container Type LNG Liquefaction Plant

Feature



		CLP-130-06	CLP-150-10	CLP-150-30
Input Pressure				
	barg	3~6	10	30
	psi	43.5 ~ 87	145	435
LNG production capacity				
	ton/day	13	15	15
	m ³ /day	32	37	37
	gal/day	8,471	9,774	9,774
	kg/h	542	625	625
LNG delivery condition				
Pressure	barg	4.5 ~ 5.5	4.5 ~ 5.5	4.5 ~ 5.5
	psi	65.3 ~ 79.8	65.3 ~ 79.8	65.3 ~ 79.8
Temperature	°C	-142 ~ -145	-142 ~ -145	-142 ~ -145
	°F	-223.6 ~ -229	-223.6 ~ -229	-223.6 ~ -229
Energy Consumption				
Consumed power	kw	602	583	568

Gas Sources

Natural gas pipeline
Associated gas
Bio methane

Application fields

Filling station for vehicles/ vessels/ trains
Industrial use
Gas distribution
Bunker fueling
Small power plant

Advantage

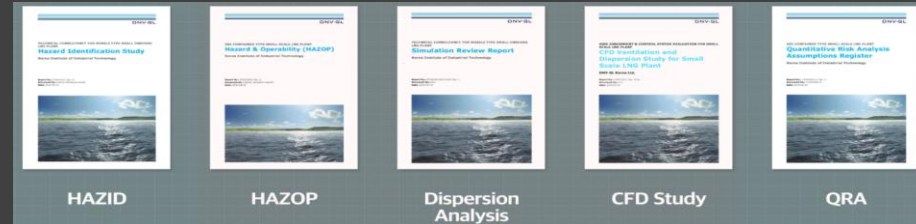
Easy to transport
Short Installation Period



Module Extensibility



Good Safety / High Reliability



Easy Operating



Simple Maintenance

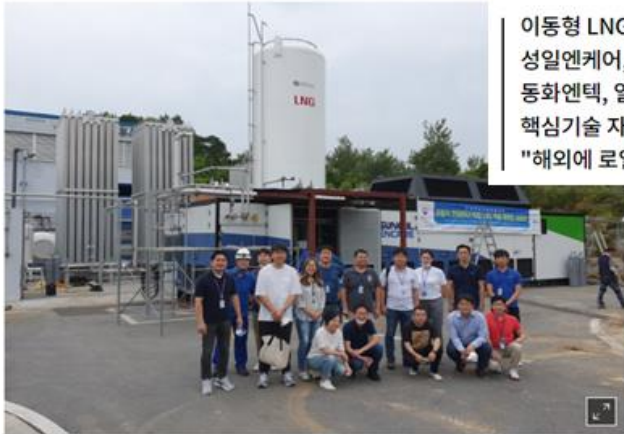


Success of Liquefaction

서울경제

성일엔케어·동화엔텍, 국내 최초 천연가스 액화 기술 개발

입력 2020-09-10 13:40:54 수정 2020.09.10 13:40:49 조원진 기자



이동형 LNG 액화 플랜트 기술 개발 성공
성일엔케어, 설계·제작·실증 진행
동화엔텍, 열교환기 개발 맡아
핵심기술 자립화·국산 기자재 적용
"해외에 로열티 지급 필요 없어"

한국가스안전공사 에너지안전 실증연구센터에 설치된 "이동식 컨테이너 타입 LNG 액화 플랜트 시운전 사업" / 사진제공=부산시

부산 중소기업인 성일엔케어와 동화엔텍이 국내 최초로 천연가스 액화 기술 개발과 상용화에 성공했다. 조선·해양 경기 침체에 따른 시장 위축과 수출 감소 해결책의 하나로 부산시가 지역 기업과 함께 추진해 온 사업 다각화의 결실이다.

부산시는 2017년부터 추진해 온 기술 개발을 거쳐 국내 처음으로 천연가스 액화 기술과 하루 15톤 정도의 액화천연가스를 생산할 수 있는 이동형 LNG 액화플랜트 개발에 성공했다고 10일 밝혔다.



Thanks for your attentions

