The pursuit of customer satisfaction with trust

TRANS GAS SOLUTION

PACKAGE SOLUTION of

Engineering | Procurement | Commissioning
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CEO’s Message

We, Trans Gas Solution (“TGS”), are trying to be a market leader, providing LNG-related engineering services such as:

- Basic & Detail Engineering Service for Small Scaled LNG Supply Chain
- Cryogenic Equipment & Module Supply
- Commissioning & Training Service for LNG-related Products

We have a lot of experience in the shipbuilding and R&D for LNG Carriers and Floating LNG Facilities.

We deliver turnkey EPC (Engineering, Procurement, Commissioning) services for LNG Fuel Supply System.

We are sure this will be very promising market as Blue Ocean. TGS will not be complacent, but always listen to our customers and ensure the foundation of future advancement.

We ask for your continued support and interest in TGS growth to help us grow and become a world class company through innovation and challenges that stick to the basics.

CEO Mi-Young Seo
Introduction

Vision & Strategy

Global Top LNG EPCIC & Energy Trading

Construction / Trading

Engineering
- Small Scaled LNG Supply Chain
  - LNG FPSO
  - LNG Carrier
  - LNG Tank
  - LNG FSRU
  - LNG Power Plant
- LNG Fuel Gas System
  - LNG Fuelled Vessel
  - LNG Fuel Supply System with Tank

Procurement
- Control System
- LNG Tank (Al-5083Q)
- Insulation System
- Combined Vaporizer
- LNG Valve
- Gas Valve Unit
- LNG Fuel Pump
- Gas Engine

Commissioning
- LNG Bunker Vessel
- LNG Carrier
- LNG FSRU
- LNG Power Plant
## Business & Reference List

<table>
<thead>
<tr>
<th>Scope of Business</th>
<th>Reference List</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Ship & Plant Design                | - LNG Bunkering Shuttle (1K, 3K, 5K, 7K, 9K cbm Class)  
- LNG FSRU (15K, 20K)  
- FLPP (20MW Class)                                                                 | - AIP from KR / LR  
- Cooperation with ATEC                       |
| LNG & GAS Handling System Design Package | - FGS for AHTS  
- CHS & BHS for 30K LNG Bunkering Shuttle  
- REASIFICATON for 450MN/2FD                                                                | - HANJIN TMS  
- SAMSUNG HI  
- KRISI  
- KOGASTECH                                      |
| Module Design                      | - LNG Fuel Gas Supply System (CRYO/Pac-H/X/L/P)                                                                                                            | - AIP from ABS / LR / DNV-GL                |
| Numerical Analysis (CFD)           | - Heat-Structure Combined Analysis  
- Heat-Flow Combined Analysis  
- Valve Flow Analysis  
- Tank Heat / Structure Analysis                                                                 | - Hydrogen Tank Trailer  
- BOG Calculation (Heat Ingress )  
- Cryogenic Valve  
- LNG Fuel Tank                                        |
| Procurement (Cryogenic Equipment) | - LNG FGS (CRYO/Pac-P)  
- LNG Insulation System (H-US)  
- S.W. Heating System                                                                 | - PANASIA  
- NK  
- STX O&S                                            |
| Commissioning                      | - 5.1K cbm LNG Bunkering Shuttle  
- BOG Test                                                                 | - HANJIN  
- DSME  
- NK                                                 |
| Automation System                  | - LNG FGS (CRYO/Pac-L/P)                                                                                                                                  | - NK                                         |
| Operator Training System           | - Floating LNG Bunkering Terminal                                                                                                                                                                                   |

## Organization

- Consulting
- LNG ENG. ORG.
- CTO
- R&D
- Marketing
- Engineering

**Under CTO**
- E&I
- Control
- Doc. Contr.
- Proc. & Piping
- General
- Hull Outfitting
- Process
- Machinery
- Piping
- Design
- Layout
- Machinery
- Piping

**Under Engineering**
- Basic Plan
- Ship Shape
- Fluid Dynamic
- Structure
5,000 CBM LNG Bunkering Shuttle [KOLT-05]

- Gas GENSET
- Dual Fuel GENSET
- Liquefaction Unit
- LNG Bunkering Arm (Emergency Release Coupling)
- Active Fire & Gas Detection System
- Azimuth Thruster
- Fuel Gas Supply System
- Active Fender System
- Automatic Self-Behavior Laser Distance Detection
<table>
<thead>
<tr>
<th>Items</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.O.A / L.B.P</td>
<td>100.0m / 20.0m</td>
</tr>
<tr>
<td>Breadth</td>
<td>20.0m</td>
</tr>
<tr>
<td>Depth / Draft</td>
<td>9.7m / 4.0m</td>
</tr>
<tr>
<td>Selection of Engine</td>
<td>Gas Engine &amp; Dual Fuel Diesel Engine</td>
</tr>
<tr>
<td>Selection of Propulsion System</td>
<td>Electric Propulsion (Azimuth Thruster)</td>
</tr>
<tr>
<td>Ship Performance</td>
<td>13knots with S.M. 15%</td>
</tr>
<tr>
<td>Electric Power Consumption</td>
<td>1.8MW*3ea</td>
</tr>
<tr>
<td>Fuel Supply System</td>
<td>Up to 3.4MW</td>
</tr>
<tr>
<td>(including Arrangement)</td>
<td></td>
</tr>
<tr>
<td>BOG Handling System</td>
<td>0.7t/h</td>
</tr>
<tr>
<td>Functional Diagram</td>
<td>LNG Loading/Bunkering, BOG Handling, Fuel Gas Supply, Warming up, Inerting, Aerating, Cool-down, etc.</td>
</tr>
<tr>
<td>Berthing &amp; Mooring Method</td>
<td>Fixed Type Fender, QRH with Active Winch</td>
</tr>
</tbody>
</table>

*Appears to be a table listing various specifications for a ship, including dimensions, engine types, propulsion systems, and other related details.*
Process Design

Process Simulation
- Accurate process analysis of steady/dynamic simulation
- Confirmation and review of equipment specifications through process analysis

[ Floating LNG Bunkering Terminal]  [ LNG Fuel Gas Supply System]

[ Dynamic Process Simulation with UNISIM ]
Numerical Analysis, CFD

- New Systems and Complex Piping System Design or Problem Analysis of the Existing System
- Accurate Analysis of the Pipe System to Receive Both Static and Dynamic Conditions

1. Tank

Tank Structural Analysis

2. Valve

Valve Structure / Fluid Analysis

Equivalent Stress
Type: Von Mises Stress
Unit: MPa

Total Deformation
Type: Total Deformation
Unit: mm

Time: 1
Procurement

LNG Fuel Gas Supply System Package, GVU/GVT, DF/GAS Engine

- Bunkering Station, Fuel Tank, FGSS Skid, Heating Medium Skid, Control & Safety System, GVU/GVT, DF/GAS Engine

Containerized CRYOPac® (40ft size)
Automation System for LNG Bunkering Supply Chain

CRYOPac®

Operator Training System

- Rockwell Automation based Hybrid DCS Control System
- Real Time Dynamic Process Simulation

Small-scaled LNG Carrier / Bunkering Shuttle

Cargo Overview

Cargo Pumps Operation

One-Line Diagram Overview
LNG Bunkering Shuttle & LNG Fuel Gas System, Gas Commissioning

Training for LNG Fuel Gas Supply System, Cargo Handling System

- Dynamic Simulation for Electric Propulsion Type LNGC
- Real Time Check for Control Functions (HILS)

Process Simulator Station
- Mathematical Modeling
  - Cargo Tanks
  - Cargo Pumps
  - Compressors
  - Heaters
  - GENSET

Interface Module

Main Control System
- Control & Safety Logic
  - Cargo Handling Sequence
  - Bridge Maneuvering Logic
  - Gas Handling Logic
  - GENSET Logic & Sequence
  - Power Management Sequence
  - Electric Propulsion Logic

Control Center
- Monitoring & Control
  - Bridge Maneuvering
  - Cargo Handling
  - Gas Handling
  - GENSET Handling
  - Power Management

Process Modeling

Main Equipment & Process
AL-50830 LNG Fuel Tank, HoneyCell™

HoneyCell™ means a tank that forms a grid-like pentagon or hexagon structure on its internal surface to store LNG and with stand pressure without additional reinforcement for the structure.

Innovative LNG Insulation System, ILIS™

ILIS™ is a pre-formed insulation material for independent-type storage tanks which can be easily attached to the tank walls. And new fire-retardant material is adopted for ILIS™.

- IMO Type ‘C’ or Equivalent
- Tank Material Conductivity: 0.02W/m-K
- Overall Heat Flux: 6.6W/m² at 45°C
- Low Heat Conductivity Material Used: K=0.0061W/m-K at -160°C

1.1K CBM Class Tug Pulling LNG Barge

LNG Valve
1K LNG Tank
Control System
Vent Riser & Vaporizer
300m 3/h LNG Pump
Cargo Piping
LNG Manifold

Instrument
Commissioning & Manual
Floating LNG Bunkering Terminal

Developing the topside process and hulside process of FLBT (Floating LNG Bunkering Terminal) and operator training system.

1. LNG Carrier  2. Floating LNG Bunkering Terminal  3. LNG Bunkering Shuttle  4. LNG Fueled Ship

[Cooperation with KRISO]
Fuel Gas Supply System of 50K MR Tanker and 1,000TEU Container Vessel

Basic Design Package for Medium & Small Scaled LNG Fuelled Vessel
Developing fuel gas supply system of 50K MR Tanker and 1,000TEU Container Vessel

- Functional Diagram
- FGSS P&ID
- Main Equipment Data Sheet
- Instrument Specification
- Alarm Point List & Instrument List
- Functional Design Specification
- Capacity Calculation
- LNG Pump, Vaporizer, IHM Heating System P&ID (included in FGSS P&ID)

Floating LNG Power Plant (FLPP)

A “barge-mounted power plant” is a power plant installed on a deck barge. Sometimes called “floating power plant” or power barge

- LNG Fuel Gas Supply System
- Waste Heat Recovery System

Principal Dimension
- Length OA : abt. 76.00m
- Length B.P : 76.00m
- Breadth : 32.00m
- Depth MLD : 10.00m
- Draft MLD : 3.30m

Heat & Structure Combined Analysis, Buckling Analysis and Heat-Flow Analysis of Combined LNG Vaporizer

DF Engine Gas Supply System applied to Small LNG Vessel
Heat & Structure Combined Analysis, Buckling Analysis, Heat Flow Analysis
11,000 TEU LNG Fuelled Container Vessel

11,000 TEU LNG Fuelled Container Vessel General Information

<table>
<thead>
<tr>
<th>Main Dimension</th>
<th>Main Engine</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Overall</td>
<td>334.0m</td>
<td>MAN B&amp;W 8G95ME-C9.5-G1</td>
</tr>
<tr>
<td>Length Between Perpendiculars</td>
<td>320.0m</td>
<td>MCR</td>
</tr>
<tr>
<td>Breadth Moulded</td>
<td>48.2m</td>
<td>40,590 kW x 76.4 rpm</td>
</tr>
<tr>
<td>Depth Moulded</td>
<td>27.2m</td>
<td>NCR</td>
</tr>
<tr>
<td>Design Draft</td>
<td>12.5m</td>
<td>32,472 kW x 70.9 rpm</td>
</tr>
<tr>
<td>Scantling Draft</td>
<td>14.5m</td>
<td>Wartsila BL34DF</td>
</tr>
<tr>
<td>Design Draft</td>
<td>89,000 MT</td>
<td>Diesel Generator</td>
</tr>
<tr>
<td>Scantling Draft</td>
<td>113,600 MT</td>
<td>3,840 kW x 4 sets</td>
</tr>
</tbody>
</table>

[Cooperation with SUNGDONG SHIPBUILDING & MARINE ENGINEERING]

Certificates

- [DNV-GL] AIP of 50,000 DWT MR Tanker, Gas Fuelled
- [ABS] AIP of LNG Fuelled 1,000 TEU Class Containership
- [ISO 9001 : 2015]
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