

Engineering Division

A SPECIAL
DESIGN APPROACH...



Ace Engineering & Technology Co., Ltd

Introduction

Ace Engineering & Technology Co., Ltd

▶ Business Area

Engineering

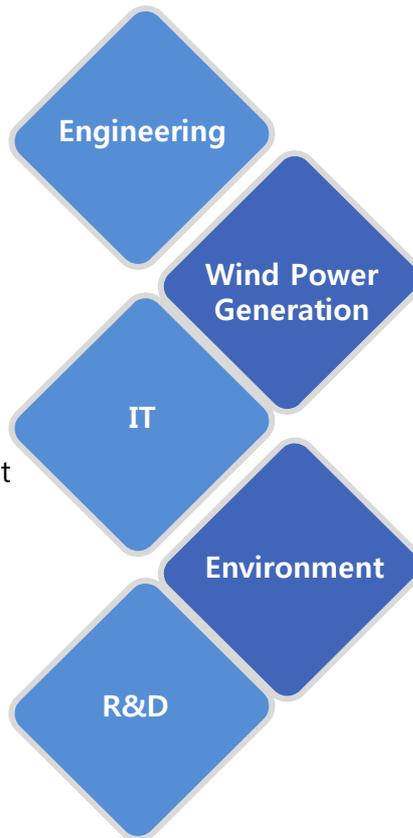
- Onshore & Offshore Plant
- Shipbuilding
- Basic Engineering
- Detail Engineering
- Fabrication & Installation
- 3D Modeling

IT

- Consulting
- Improvement, Development & Support for IT System
- PMS (Project Management System)
- Smart Factory, etc.

R&D

- Development of



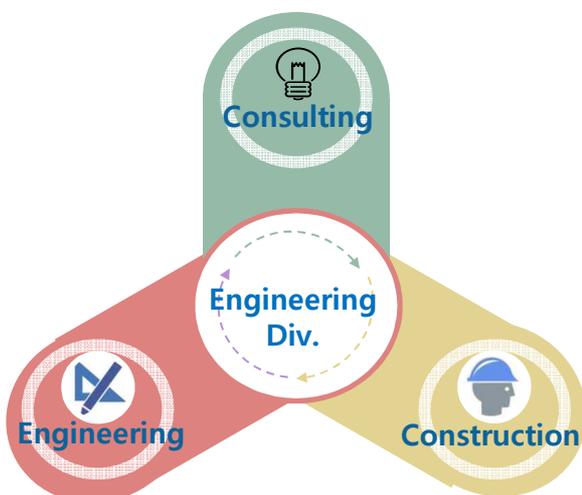
Wind Power Generation

- Floater Type Design
- Basic & Detail Engineering
- Met-ocean & Design Basis Definition
- Seakeeping Analysis
- Mooring Analysis
- Coupled Analysis
- Integrated Load Analysis
- Stability & Damage Analysis
- Outfitting Design
- T&I

Environment

- Patented Cleaning Product
- Cleaning Services from High-Voltage to Low-Voltage of Electricity Equipment by ACE e-CLEAN Solution, which is an uninterruptible power wet cleaning solution.

▶ Service Area



01

Consulting Service

- Engineering Soft Ware
- Engineering for Onshore, Offshore, Shipbuilding and Wind Power
- Man-Power & Supply Chain Management

02

Engineering Service

- Basic, Detail & Construction Design
- MTO, 3D Modeling, As-built drawing
- Engineering Analysis & Simulation

03

Construction Service

- Fabrication & Installation
- Field Engineering
- Supervision Service

Major Capability

Ace Engineering & Technology Co., Ltd

- Specialized for Onshore Module Project & Plant
- Performed 9 FPSOs' Basic and Detail Design for HVAC included LQ
- 2 Units Detailed Design for the Navy Survival Drilling Center
- Developed Floating Offshore Wind Turbine (FOWT) of 5MW

We have done engineering design services for a long time in the areas of shipbuilding and oil & gas plant with three (3) big major clients, HHI (Hyundai Heavy Industries), SHI (Samsung Heavy Industries), and DSME (Daewoo Shipbuilding & Marine Engineering).

We have specialized in the field of detail design of HVAC (Heating, Ventilation & Air Conditioning) with Duct and plumbing for Deck House of Shipbuilding, Living Quarters of Offshore Platform, FPSO, Local Electrical Room of Onshore Plant. Based on these capabilities, we are seeking to further enhance our competitiveness and pursue more advanced engineering services for our clients.

We are committed to providing high-quality engineering design services to domestic and overseas customers in the Oil & Gas industry. We have also expanded our reach into the Wind Power sector to develop 5 MW Floating Offshore Wind Power System.

We will provide seamless engineering design services to our clients from Basic Design to Detail Design. In the case of the Project of Floating Offshore Wind Turbine (FOWT), we will support from the early stage such as Feasibility Study and FEED to Detail Design, Construction & Fabrication, Transportation & Installation (T&I) and Offshore Commissioning.

Discipline	Basic Design	Detail Design	Construction Design (Fabrication & Installation)
HVAC	√	√	√
Piping & Plumbing	√	√	√
Structure	√	√	√
Architecture		√	√
E&I		√	√

Applicable Project

Ace Engineering & Technology Co., Ltd



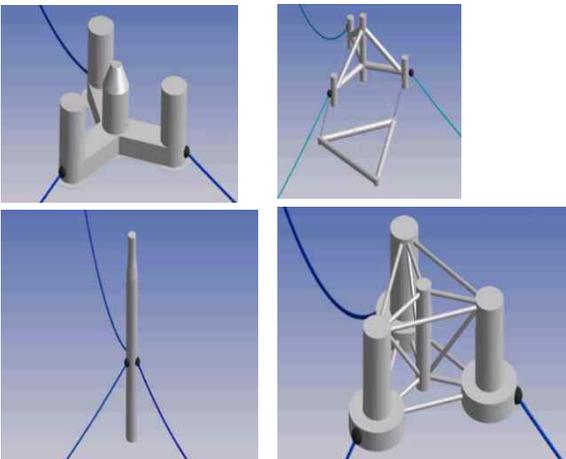
Offshore & Shipbuilding

- FPSO, FLNG, FPU
- TLP, SPAR
- Fixed Platform, Jacket & Pile
- Semi-Submersible Drilling Rig
- Drillship
- Living Quarter (LQ)
- Transportation & Installation (T&I)
- Deck House
- BWTS, Scrubber (De-SO_x, De-NO_x)



Onshore Facilities & Others

- Onshore Process Module
- Onshore LNG Module
- Oil & Gas Plant, Industrial Plant
- LNG Plant
- Refinery Plant, Petrochemical Plant
- Power Plant (Wind Turbine, Combined Cycle, Co-generation & Thermal)
- Boiler & HRSG
- Process Equipment
- FAR & Substation



Wind Turbine

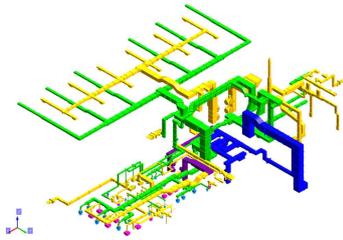
- Floater Type Design
- Met-ocean and Design Basis Definition
- Seakeeping Analysis
- Stability and Damage Analysis
- Mooring Analysis
- Coupled Analysis
- Integrated Load Analysis
- Outfitting Design
- Transportation & Installation (T&I)
- Basic and Fabrication Drawings

Major Portfolio

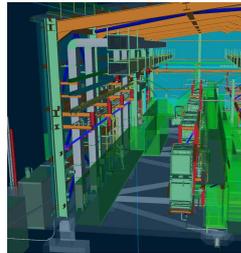
Ace Engineering & Technology Co., Ltd

Project	TCO Module
Client	Tengizchevroil LLP/KPJV/Hi Air Korea
Work Schedule	Jun 2019 ~ Jun 2020
Scope of Work	Detail + Fabrication

- HVAC with Modeling of 12 Modules



HVAC Modeling-1

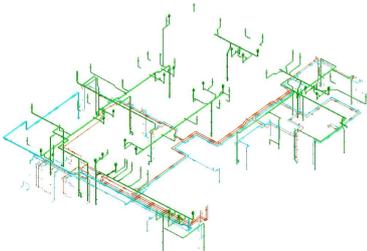


HVAC Modeling-2

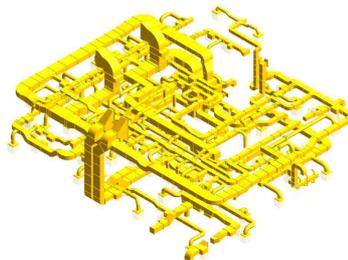


Project	King's Quay FPS
Client	Llog Exploration/HHI
Work Schedule	Apr. 2019 ~ Sep. 2020
Scope of Work	Detail + Fabrication

- Topside & Hull for HVAC and Plumbing with Modeling



Plumbing Modeling

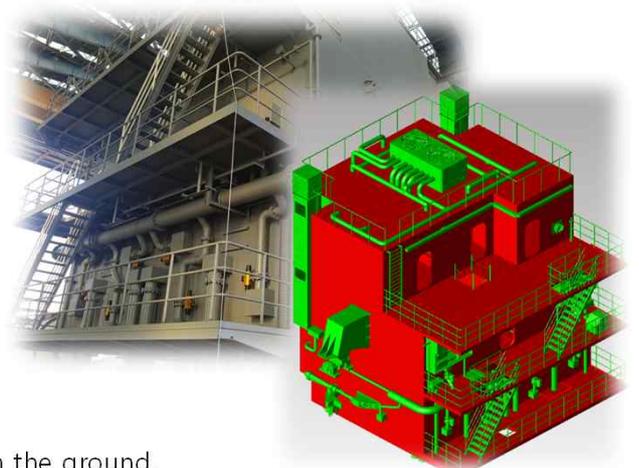


HVAC Modeling



Project	Navy Survival Drilling Center
Client	Naval Command, Korea
Work Schedule	2 nd Dec. 2019 ~ May. 2020 1 st Sep. 2017 ~ Nov. 2017
Scope of Work	Detail + Fabrication

- 180 weight tons for Structure, Piping, Electricity, HVAC, and Outfitting
- A situation training facility that can use to train survival on the ground.
- This training facility creates an emergency where the battleship is flooded or stranded due to attacks or wrecks in a virtual battle situation, and the crew trains in immediate damage control and damage recovery and escape in each compartment of the battleship such as the engine room. Also, the crew can receive survival and standby training until rescued in this facility.

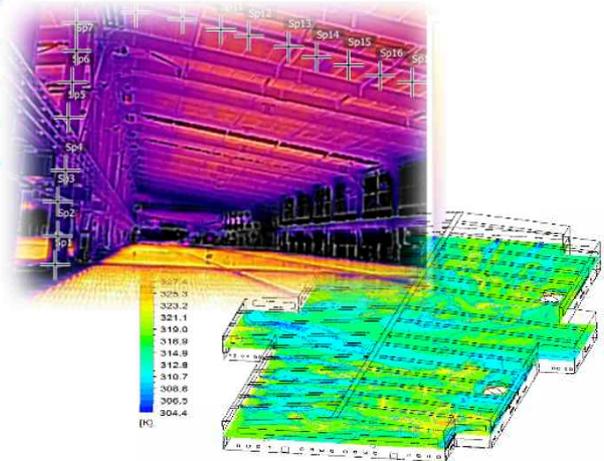


Major Portfolio

Ace Engineering & Technology Co., Ltd

Project	Improvement of Ventilation System
Client	LS-Nikko No. 1 & No. 2 Shop
Work Schedule	Aug. 2017 ~ Mar. 2018
Scope of Work	Ventilation System Analysis

- Before
 - Difficulty in controlling the airflow of the factory during the summer season due to humid and hot working conditions inside the factory.
- After
 - Computer Fluid Dynamics (CFD) design analysis techniques change the airflow inside the factory to reduce the temperature in the summertime to create a pleasant working environment to improve workers'.



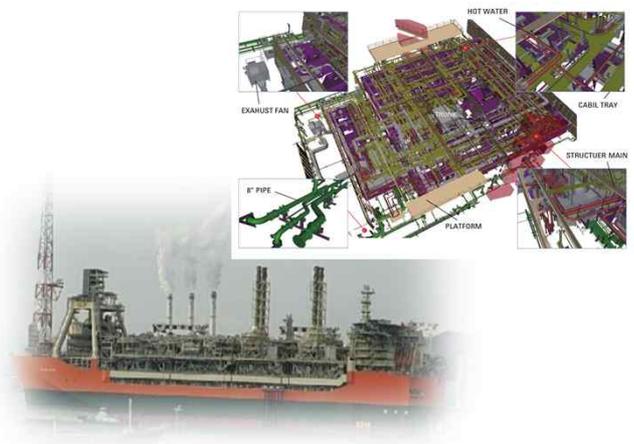
Project	Goliat FPSO
Client	Eni Norge AS/HHI
Work Schedule	Oct. 2013 ~ Mar. 2015
Scope of Work	Basic + Detail + Fabrication

- HVAC, plumbing included 3D Modeling & LQ
- The world's largest cylindrical FPSO
 - ✓ Hull Dimension Dia. 112m x Height 75m
 - ✓ LQ Accommodation 120 persons



Project	Quad 204 FPSO
Client	BP/HHI
Work Schedule	Oct. 2011 ~ Aug. 2013
Scope of Work	Basic + Detail + Fabrication

- 1,200 weight tons for HVAC, plumbing, outfitting, included 3D Modeling & LQ
 - ✓ Hull Dimension 310m x 61m x 31m
 - ✓ LQ Accommodation 220 persons
- Successful performed 9 FPSOs' for HVAC included LQ (See Project Reference)

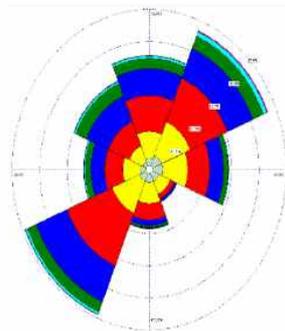


Floating Offshore Wind Turbine (FOWT)

Ace Engineering & Technology Co., Ltd

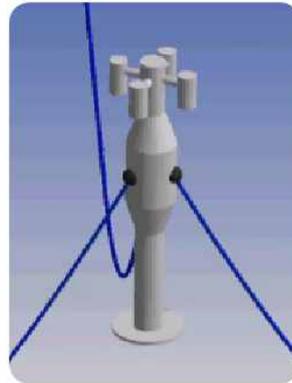
Project	Development of 5 MW FOWT System Technology
Project Schedule	Jun. 1, 2018 - May 31, 2020 (2 years)
Project Location	Around the Donghae-1 Gas Field located 58km southeast of Ulsan
Scope of Work	Floating body, mooring, turbine, grid connection, etc.

Engineering Summary



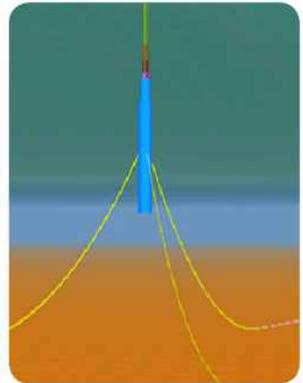
1 Sea state analysis

- Extreme value analysis of Metocean data



2 Floating body design

- Scantling
- Motion analysis
- Stability (Intact & Damage)
- Structural fatigue analysis
- Structural strength calculation



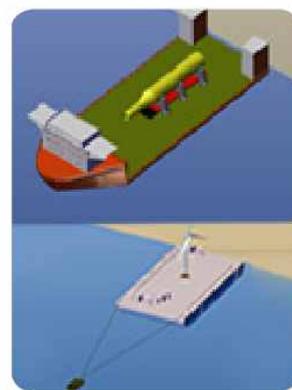
3 Mooring design

- Mooring system selection
- Ultimate tensile load analysis
- Coupled analysis between floater and mooring



4 Outfitting design

- Working platform design
- Boat landing design
- Fairlead design
- Export tube design (I & J Type)



5 Transportation design

- Towing analysis
- Sea-fastening design



6 Installation design

- Marine operation
- Lifting analysis
- Upending analysis

Engineering Area

Ace Engineering & Technology Co., Ltd

Structure

- Basic Design
- GA Design
- Structure Layout & Dwg.
- Onshore & Offshore Structural
- Analysis with Commercial Simulation Programs (SACS, STAAD, ANSYS, MIDAS, ANSYS CFX/Fluent/NCode, ABAQUS, MOSES, Solidworks, NREL FAST V8, etc.)
- Module & Piperack Structure
- MTO & BM
- Outfitting
 - Basic Design
 - Ship's Maneuvering System
 - Anchoring & Mooring System
 - Dry Cargo Handling & Lashing System
 - Container System
 - Mast System Cargo Hatch Cover System
 - Traffic System
 - Special for Car Carrier System
 - Navigation System
 - Life Saving System
 - Ventilation System
 - Hold Ceiling, Sparring System
 - Marking & Canvas System
 - Other Hull Outfitting System
 - Escape Route Plan
 - Equipment Layout design
 - MTO & BM

HVAC & Duct

- HVAC Design Basis & Spec.
- HVAC Air Flow Diagram
- HVAC Heat Load Calculation & Duct Size
- HVAC Equipment Spec. & Data Sheet
- HVAC Equipment & Duct Layout Design
- HVAC Plant Room Design
- HVAC Equipment 3D Modeling
- HVAC Duct GA & Detail
- HVAC Duct Fab. Dwg.
- HVAC Duct Support Detail Arrangement
- HVAC Duct Support Fab. Dwg.
- HVAC Duct 3D Modeling
- HVAC Duct Support 3D Modeling
- Test & Commissioning Procedure
- Hole Plan for Large Size
- Bulk Material MTO & BM

E&I

- Single Line Diagram
- Connection Diagram
- Wiring Diagram
- Cable Schedule
- Substation Equipment Layout Design
- Control & Technical Room Equipment Arrangement Dwg.
- Cable Routing Dwg.
- Loop Diagram
- Cable & Cable Tray
- MTO & BM

Piping & Plumbing

- Piping & Plumbing Basic Design
- Piping & Plumbing Routing Dwg.
- Piping & Plumbing Layout Design
- Piping & Plumbing GA Design
- Piping & Plumbing ISO Dwg. & Spool Dwg.
- Piping & Plumbing Support Detail Arrangement
- Piping & Plumbing Support Fab. Dwg.
- Piping & Plumbing 3D Modeling
- Piping & Plumbing Support 3D Modeling
- Fire Fight Extinguishing System
- P&ID
- Bulk Material MTO & BM

Architecture

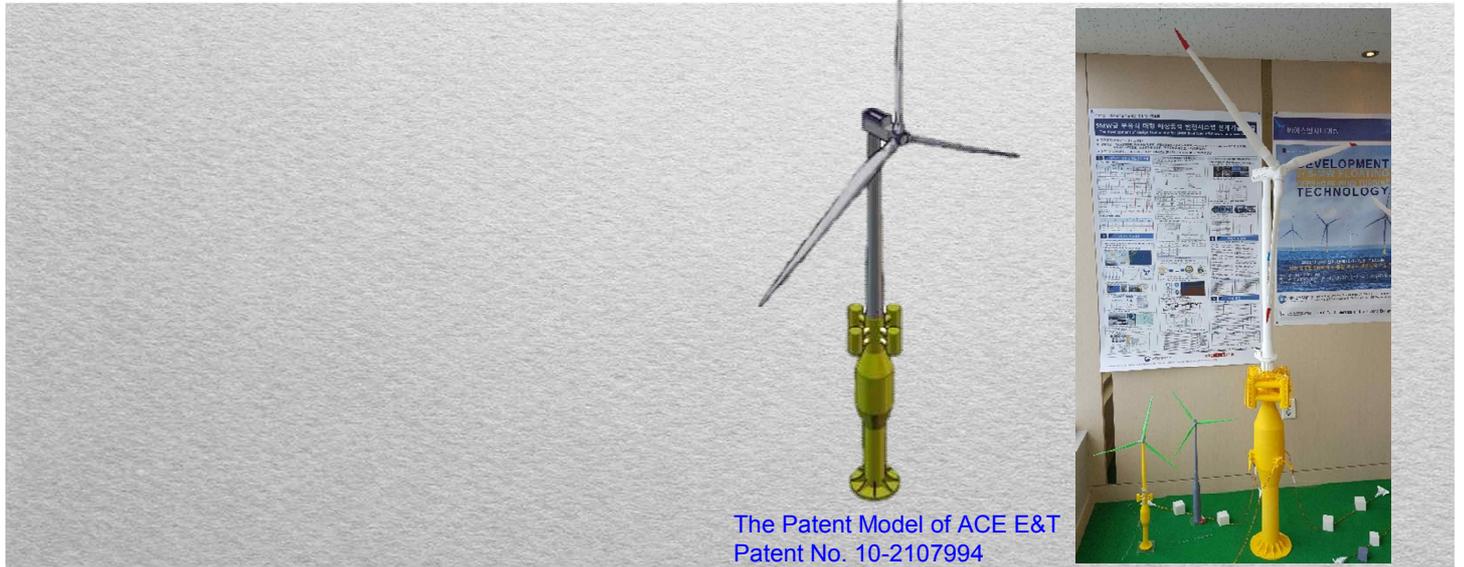
- Architectural Design Specification
- Architectural Plans
- Fire wall Layout
- Enlarged Plan and Details
- Door & Window Schedule and
- Details Room Finish Schedules
- Insulation Plan and Detail
- Floor Plan & Detail
- Lining and Partition Plan and Detail
- Reflected Ceiling Plan and Detail
- First MTO
- Vendor Data & Drawings Review
- Practices & Up-date
- Large size Hold Plans

Project Reference

Ace Engineering & Technology Co., Ltd

No.	PROJECT NAME	CLIENT/YARD	TYPE	SCOPE OF SERVICES	DESCRIPTION	PROJECT PERIOD
1	NAVY SURVIVAL DRILLING CENTER	NAVY, KOREA	MILITARY EQUIPMENT	DETAIL+FAB	STR+HVAC+PIPING+ELEC+OUTFITTING	FEB 2020-MAY 2020
2	Scrubber Package (De-Sox)	FMSI, Indonesia	Shipbuilding	DETAIL+FAB	STR+PIPING	APR. 2019-DEC. 2019
3	TCO (TENGIZCHEROIL LLP, KAZAKHSTAN)	TCO/KPJV/HI AIR KOREA	OIL & GAS PLANT	DETAIL+FAB	MODULE DUCT	DEC 2019-JUN 2020
4	KINGS QUAY FPS HULL & Topside	LLOG EXPLORATION/HHI	FPS	DETAIL+FAB	HVAC+DUCT+ ARCH+PPF OUTFITTING+3D MODELING	APR 2019-SEP 2020
5	FACTORY VENTILATION SYSTEM	LS-NIKKO	INDUSTRIAL PLANT	FEED+BASIC+DETAIL	HVAC	AUG 2017-MAR 2018
6	NAVY SURVIVAL DRILLING CENTER	NAVY, KOREA	MILITARY EQUIPMENT	DETAIL+FAB	STR+HVAC+PIPING+ELEC+OUTFITTING	SEP 2017-DEC 2017
7	HEAT TREATMENT PLANT (7 & 8)	HYOSUNG, VIETNAM	INDUSTRIAL PLANT	DETAIL+FAB	HVAC	AUG 2017-OCT 2017
8	NASR PKG2 TOPSIDE	ADMA-OPCO/HHI	FIXED PLATFORM	DETAIL+FAB	HVAC+PLUMBING	FEB 2017-JUN 2017
9	NASR PKG2 TOPSIDE	ADMA-OPCO/HHI	FIXED PLATFORM	DETAIL	HVAC 3D MODELING	NOV 2015-JUL 2016
10	BARONIA	PETRO. CALIGALI/HHI	FIXED PLATFORM	DETAIL	PLUMBING	MAR 2016-OCT 2016
11	ROSEBANK	CHEVRON/HHI	FPSO	PRE FEED	PLUMBING	OCT 2015-FEB 2016
12	BADAMYAR	TOTAL/HHI	FIXED PLATFORM	DETAIL	HVAC	SEP 2015-JAN 2016
13	BERGADING	HESS E&P/HHI	FIXED PLATFORM	DETAIL	HVAC	APR 2015-FEB 2016
14	JANGKRIK	ENI/HHI	FPU	DETAIL+FAB	HVAC	FEB 2014-FEB 2015
15	CLAIR RIDGE	BP/HHI	FIXED PLATFORM	FAB	HVAC+PIPING	APR 2013-JAN 2014
16	HEBRON	EXXONMOBIL/HHI	FIXED PLATFORM	DETAIL+FAB	HVAC	APR 2013-JUN 2015
17	QUAD 204	BP/HHI	FPSO	BASIC+DETAIL+FAB	HVAC	OCT 2011-AUG 2013
18	GOLIAT	ENI/HHI	FPSO	DETAIL+FAB	HVAC+PIPING	JAN 2011-JUN 2012
19	GORGON	CHEVRON/HHI	LNG MODULE PLANT	DETAIL+FAB	HVAC	JAN 2011-JUN 2012
20	EGP3-B	CHEVRON/HHI	FIXED PLATFORM	BASIC+DETAIL+FAB	HVAC+PIPING	JUN 2010-JUN 2011
21	IGD DAS ISLAND	ADGAS/HHI	ONSHORE MODULE	DETAIL+FAB	HVAC+PLUMBING	APR 2010-JUN 2011
22	SHWE	DAEWOO INTERNATIONAL/HHI	FIXED PLATFORM	BASIC+DETAIL+FAB	HVAC+PIPING	APR 2009-APR 2010
23	NORTH RANKIN (NR) 2	WOODSIDE/HHI	FIXED PLATFORM	DETAIL+FAB	HVAC+PIPING	FED 2009-DEC 2009
24	OFON	TOTAL+NNPC/HHI	FIXED PLATFORM	DETAIL	HVAC+ARCH+ OUTFITTING	NOV 2008-SEP 2009
25	GAZFLOT (NO. 1 & 2)	GAZPROM/SHI	SEMI RIG	DETAIL	HVAC+ARCH+ OUTFITTING	OCT 2008-JUN 2009
26	USAN	TOTAL/HHI	FPSO	DETAIL	HVAC+ARCH+ OUTFITTING	OCT 2008-SEP 2009
27	ODFJELL GVA 7500	DSME	SEMI RIG	DETAIL	CABLE TRAY	SEP 2008-DEC 2008
28	6,000 DWT ASPHALT TANKER	VROON TANKERS/GEO	60K	DETAIL	HVAC+PIPING	DEC 2007-AUG 2008
29	UMM SHAIK	ADMA-OPCO/HHI	FIXED PLATFORM	DETAIL	HVAC+ARCH+ OUTFITTING	SEP 2007-OCT 2008
30	60K TLC BARGE (ALL)	STX/OPCE	SKID BARGE	DETAIL	HVAC+PIPING+ ARCH+OUTFITTING	SEP 2007-SEP 2008
31	PETROSERV GVA 7500	DSME	RIG	DETAIL	HVAC	MAY 2007-DEC 2007
32	MOSVOLD DRILL	SHI	DRILL SHIP	DETAIL	HVAC+PIPING	FEB 2007-OCT 2007
33	SEEDRILL DRILING RIG	SEADRILL/DSME	RIG	DETAIL	HVAC	OCT 2006-MAY 2007
34	AKPO	TOTAL/HHI	FPSO	DETAIL	HVAC+PIPING	AUG 2006-JUL 2007
35	POSCO PROJECT	POSCO/STEMP	ONSHORE PLANT	DETAIL	STR+PIPING	MAR 2006-DEC 2006
36	AGBAMI	CHEVRON/DSME	FPSO	DETAIL	HVAC+PIPING	OCT 2005-MAR 2007
37	SAKHALIN-1 OPF	EXXON NEFTEGAS/HHI	ONSHORE MODULE	DETAIL	HVAC	OCT 2005-SEP 2006
38	EGP 3A PLATFORM	CNL/HHI	FIXED PLATFORM	DETAIL	HVAC+PIPING	OCT 2005-MAR 2006
39	BP PLUTONIO	BP/HHI	FPSO	DETAIL	HVAC+ARCH+ OUTFITTING	MAR 2005-AUG 2006
40	KNOC RONG DOI	KNOC/HHI	FIXED PLATFORM	DETAIL	HVAC+PIPING+ CABLE TRAY	JUN 2005-AUG 2005
41	MOHO FPSO	TOTAL/HHI	FPSO	DETAIL	HVAC+PIPING	OCT 2005-JUN 2006
42	KIZOMBA	EXXONMOBIL/HHI	FPSO	DETAIL	HVAC+PIPING	MAR 2005-AUG 2005

We will lead Floating Offshore Wind Turbine (FOWT) in the World.



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