

# Viking Airtech Group of Companies

YOUR SPECIALIST IN HVAC&R SOLUTIONS  
FOR CRITICAL ENVIRONMENTS AT SEA AND ON LAND





**Our Profile**

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## Our Profile

**We provide solutions! Your comfort is our business!**

Onshore, offshore and marine HVAC&R systems and solutions ensuring optimal living and working environment since 1994 in Singapore with a Scandinavian heritage

- Founded in 1994 as a Spin-off from Swedish Viking Engineering in Singapore
- Total staff strength of close to 100 in Singapore, Malaysia, Indonesia and China
- Implemented more than 2,000 HVAC&R systems for the onshore, offshore and marine industry
- ISO 9001, ISO 14001, OHSAS 18001 Certified



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## Our Structure

### Close to the market and cost efficient locations

Our regional footprint for sales and marketing, and customer coverage and engagement extend beyond the legal entity structure



#### China Offices

- Shanghai
- Yantai (Factory)
- Nantong

#### SE Asia Offices

- Singapore (**head quarter**)
- Kuala Lumpur, Malaysia
- Johor Bahru, Malaysia
- Jakarta, Indonesia
- Batam, Indonesia

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# Our Key Markets

**Close to the market and well familiar locations since 1994**



- Dalian Shipbuilding Industry
- Guangzhou Shipyard International
- Yantai CIMC Raffles
- China Merchants Heavy Industry
- Jiangsu Yangzijiang Shipbuilding Group
- Qingdao Beihai Shipbuilding
- Qingdao Wuchuan Heavy Industry
- Jiangnan Shipyard Group Co Ltd
- Fujian Mawei Shipbuilding
- Xiamen Shipbuilding Industry
- Keppel Nantong Shipyard
- Cosco Shipyard Group
- Shanghai Waigaoqiao Shipbuilding
- Hudong Zhonghua Shipbuilding
- Singapore Shipyards
- Hyundai Heavy Industries, South Korea
- Malaysia Marine Heavy Industry
- PT Pal Perkapalan, Indonesia





**Our Capabilities**

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# Our Capabilities

## We provide a total solution to customer's needs

What differentiates us from competition is the fact that we can adequately provide a total solution to all the customers needs from initial requirement to service and maintenance



ENGINEERING, DESIGN  
& PROCUREMENT



SERVICE &  
MAINTENANCE



MANUFACTURING,  
ASSEMBLY &  
PRODUCTION

## OUR CAPABILITIES

Total HVAC&R Solutions and  
Global Project Management



START-UP &  
COMMISSIONING



INSTALLATION &  
SITE MANAGEMENT



ACCEPTANCE TEST &  
QUALITY CONTROL

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# Our Products

## Standard and customized products with solution for all needs

Our wide ranging of products and accessories interoperable with other branded systems and varied design specification and configurations



### Designed and built for the most demanding environments

- Explosion-proof units
- Compact and reliable equipment
- **Designed to meet all regulatory and class requirements, and project specifications**

### Employ reputable maker component in our systems

- Electric motors – ABB, Siemens, Hoyer
- Compressors – Carrier, Bock, Bitzer, Copland
- Controls – Allen Bradley, Mitsubishi, Siemens
- Accessories (flow control) – Danfoss, Castel, Alco, Honeywell, Emerson
- Electric actuator – Belimo, Schischek
- Electrical Fire Dampers Trox, Halton



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# Our Products

## Designed to meet needs for demanding environment

Our products are designed, built, installed and commissioned on platforms that are deployed under harsh and extreme operating conditions.

Air-cooled  
Deck Unit



Stainless Steel  
316L Roof Top  
Air-cooled Unit



Double Decker AHU



Water Cooled Deck Unit

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## Our Products

### Designed to meet needs for demanding environment

Our products are designed, built, installed and commissioned on platforms that are deployed under harsh and extreme operating conditions.

Explosion-Proof  
Equipment



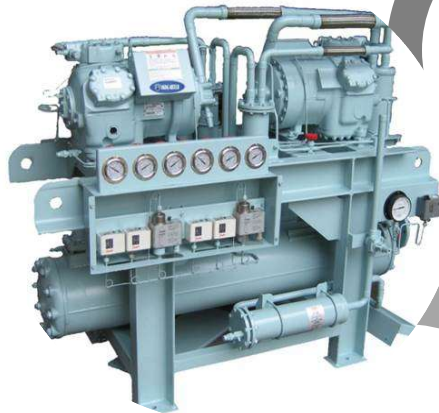
# 11

## Our Products

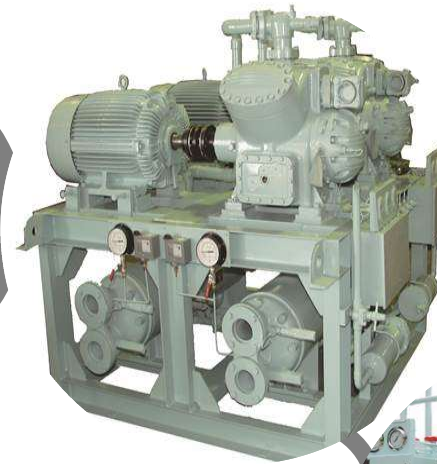
### Designed to meet needs for demanding environment

Our products are designed, built, installed and commissioned on platforms that are deployed under harsh and extreme operating conditions.

Semi-Hermetic  
Condensing Unit



Open Type  
Compressor c/w  
Condenser Skid



Open Type Provision  
Condensing Unit



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## Our Products

### Designed to meet needs for demanding environment

Our products are designed, built, installed and commissioned on platforms that are deployed under harsh and extreme operating conditions.

Air-Cooled  
Condensing  
Unit



Chilled  
Water Plant





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## Our Products

### Designed to meet solution needs for demanding environment

Our products are designed, built, installed and commissioned on platforms that are deployed under harsh and extreme operating conditions.

Air Handling  
Accessories



Water-Cooled  
Package Unit



Defrosting Unit



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## Our Production

**High quality and cost effective manufacturing facility**

Manufacturing facilities in Singapore and Yantai, China

- Yantai production facility established in 2007 and is an integrated hub for design, fabrication, installation, commissioning and post-sales support center in China



# Our Engineering

## Dedicated design and engineering resources

Differentiating advantage compared to competitors in terms of resource level, skills knowledge and extensive experience in designing and engineering knowhow

● Extensive use of engineering science and tools to enhance professional experience

- Carrier HAP E20 (heat load calculation)
- Viking Airtech proprietary tool (heat load calculation)
- Viking Airtech proprietary tool (pressure loss calculation)
- Zuken E3 (wiring & electrical panel design)
- Carrier Carlyle (compressor selection)
- Bock (compressor selection)
- Bitzer (compressor selection)
- Roller (FCU selection)
- Dupont (refrigerant selection)
- Danfoss (cool pack)
- AutoCAD (drawing)
- Psychometric calculation software
- Noise calculation software
- Magic CAD software
- Evaporator selection software





# Our Network

## Expand reach to support customers anywhere anytime

Worldwide sales & service network allows Viking to effectively and economically support customers vessels anywhere anytime.

### Production Facilities

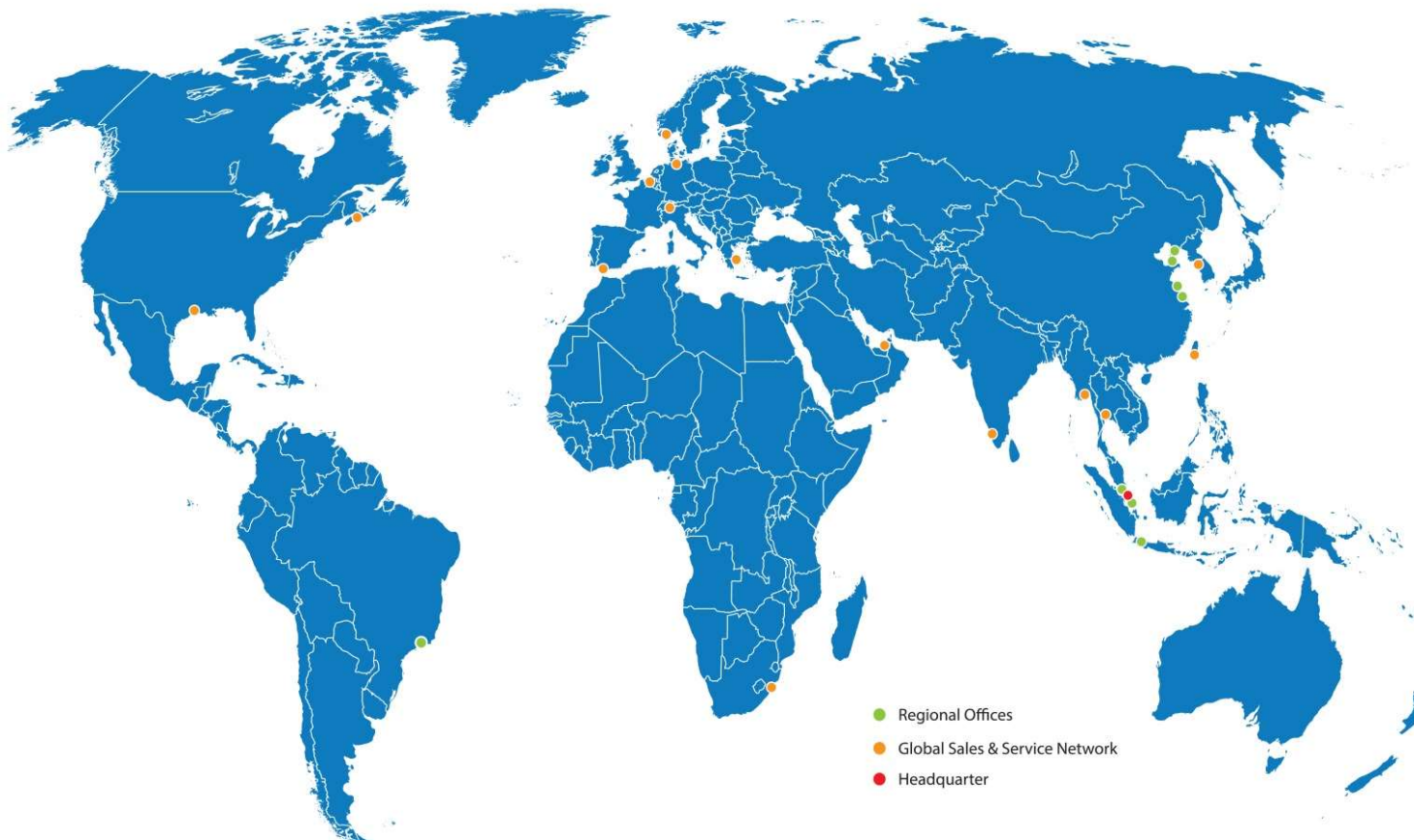
- Singapore
- Yantai, China

### Regional Offices

- Singapore
- Jakarta / Batam, Indonesia
- Johor, Malaysia
- Shanghai, China
- Nantong, China
- Yantai, China

### Sales & Service Network

- |                |                     |
|----------------|---------------------|
| • Belgium      | • Saudi Arabia      |
| • Canada       | • UAE               |
| • Germany      | • Switzerland/Italy |
| • Australia    | • Taiwan            |
| • Greece       | • Thailand          |
| • India        | • Kuwait            |
| • Myanmar      | • USA               |
| • Norway       | • Brazil            |
| • South Africa | • USA, Kuwait       |
| • South Korea  | • Taiwan            |
| • Spain        | • Vietnam           |





# Our Experiences



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## Our Offshore and Marine Experience

**Extensive experience across all offshore and marine segments**

Since 1994, more than 2000 HVAC&R systems have been installed on all sorts of marine and offshore vessels and platforms.

### Offshore Vessels (47%)



**Offshore Platforms**



**Drilling Rigs**



**FPSO & Pipe Laying Vessels**



**Offshore Support Vessels**



### Marine & Naval Vessels (53%)



**Bulk Carriers, Crane Vessels & Barges**



**Crew Boats & Tug Boats**



**Tankers**



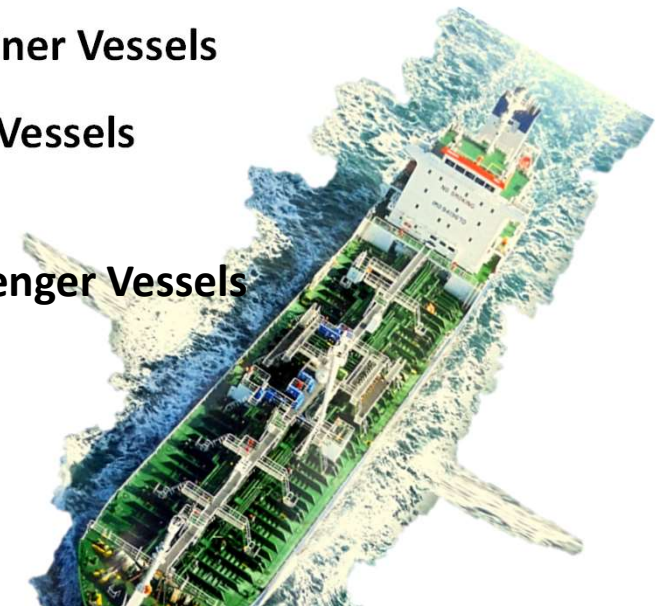
**Container Vessels**



**Naval Vessels**



**Passenger Vessels**



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## Our Offshore & Marine Customers

### Extensive and reputable client base

Our customers and partners include the leading shipyards, owners and major industry players from all over the world





# Our Offshore & Marine Customers

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# Our Offshore & Marine Customers

## Extensive and reputable client base

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BRIESE SCHIFFAHRT



Carsten Reeder, Germany



HARTMANN REEDEREI  
SETTING THE RIGHT COURSE



OCEAN TANKERS



Peter Dohle, Germany



LouisDreyfus  
ARMATEURS



H. VOGEMANN  
Established 1886



裕民航運股份有限公司  
U-MING MARINE TRANSPORT CORP.

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# Our Offshore & Marine Customers

## Extensive and reputable client base

Our customers and partners include the leading shipyards, owners and major industry players from all over the world

### Madiva Navigation Inc



### Allied Shipbroking



SEA TRADERS S.A.



WISBY TANKERS AB  
WISBY SHIP MANAGEMENT AB



# ONSHORE MARKET SEGMENTS



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# Selection of Infrastructure Projects

Our land-based systems are for various applications



Customer	Wesmech Engineering Pte Ltd
Areas Served	Air Bases in Singapore
Classification	Explosion Proof Class 1, Div 2, Group B&C
Equipment Data	<b>Job Number:</b> VAS709 <b>Type:</b> Air Cooled Split AC Units <b>Cooling Capacity:</b> 45,000Btu – 125,000Btu <b>Casing Materials:</b> Galvanized Indoor Fans and Motors c/w ATEX certification <b>Quantity:</b> 10 sets
Scope of Supply	Design and Equipment Supply



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# Selection of Infrastructure Projects

Our land-based systems are for various applications



Customer	Fidec Engineering Pte Ltd
Areas Served	Dangerous Cargo Warehouse at Penjuru Road, Singapore
Classification	Explosion Proof EXII, 2G, Exe IIC, T3 (ATEX)
Equipment Data	<b>Job Number:</b> VAS710 <b>Type:</b> Air Cooled Split AC Units <b>Cooling Capacity:</b> 300,000Btu <b>Casing Materials:</b> Galvanized <b>Indoor Fans and Motors c/w</b> <b>ATEX certification</b> <b>Quantity:</b> 10 sets
Scope	Design and Supply Equipment

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# Selection of infrastructure Projects

Our land-based systems are for various applications



Customer	<b>SIEMENS</b>
Areas Served	Substation for Jurong Cogen
Classification	Safe Zone
Equipment Data	<b>Job Number:</b> VAT1879 <b>Type:</b> Air Cooled Split AC Units <b>Cooling Capacity:</b> 60,000-250,000Btu <b>Casing Materials:</b> Galvanized <b>Quantity:</b> 6 sets
Scope	Turn key including installation and site work

# Selection of infrastructure Projects

Our land-based systems are for various applications




Customer	PT Sapta Reksa Utama, Indonesia
Owner	Husky-CNOOC Madura Ltd
VA Project Ref	VAT1889
Building/Vessel Name and Type	Gas Metering Station
Classification	Safe Zone
Commencement and Completion Date	14 <sup>th</sup> January 2016 – 1 May 2017
Scope / Equipment	<b>HVAC System including Design, Supply, Installation, Commissioning of 10 ACCUS and FCUs, 2 Package Units, Fans, Accessories</b>

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# Selection of infrastructure Projects

Our land-based systems are for various applications



Customer	
Areas Served	BP Tangguh Expasion – Project LNG EPC (8 x Substations)
Classification	Explosion Proof
Equipment Data	<b>Job Number:</b> VAT1942 <b>Type:</b> Air Cooled Split AC Units/RTU <b>Cooling Capacity:</b> 50kw-400kw <b>Casing/Skid/Frame Materials:</b> SS316L Materials <b>Quantity:</b> 16 sets
Scope	Turnkey including installation and site work



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# Selection of infrastructure Projects

Our land-based systems are for various applications



Customer

**ExxonMobil**  
Chemical

Areas Served

Analyzer House SOP-AH3,5 &7  
& SAR-AH06& 07

Classification

Explosion Proof

Equipment  
Data

**Job Number:** VAT1125

**Type:** Air Cooled Packaged Unit

**CW:** Ex II 2(1)G Ex db (Ia Ga)

**IIC T5Gb IP66 control panel**

**Cooling Capacity:** 2 x 22Kw

3set, 2 x 16kw 1set, 2x 8Kw

1set

**Casing/Skid/Frame Materials:**

SS316L Materials

**Quantity:** 05 Set

Scope

Design , supply &  
Commissioning

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# Selection of infrastructure Projects

Our land-based systems are for various applications



Customer	<b>ExxonMobil</b> <i>Chemical</i>
Areas Served	Reactive Ion Etching (RIE) cabin 1~4
Classification	Explosion Proof
Equipment Data	<b>Job Number:</b> VAT1126 <b>Type:</b> Air Cooled Packaged Unit & Pressurization unit <b>Packaged unit Cooling Capacity:</b> 2 x 17.6Kw <b>Pressurization unit capacity:</b> <b>1350CMH</b> <b>Casing/Skid/Frame Materials:</b> SS316L Materials <b>Quantity:</b> 04 Set
Scope	Design , supply &



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# Selection of infrastructure Projects

Our land-based systems are for various applications



Customer

**ExxonMobil**  
Chemical

Areas Served

Analyzer House: 11 & 12

Classification

Explosion Proof

Equipment  
Data

**Job Number:** VAT1130

**Type:** Air Cooled Packaged Unit  
& Pressurization unit

**Packaged unit Cooling Capacity:**  
2 x 14Kw 1set & 2 x 22Kw 1set

**Pressurization unit capacity:**  
**1350CMH**

**Casing/Skid/Frame Materials:**  
SS316L Materials

**Quantity:** 02 Set

Scope

Design , supply &  
Commissioning

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# Selection of infrastructure Projects

Our land-based systems are for various applications



Customer

**ExxonMobil**  
Chemical

Areas Served

Reactive Ion Etching (RIE) cabin 5  
~8

Classification

Explosion Proof

Equipment  
Data

**Job Number:** VAT1162

**Type:** Air Cooled Packaged Unit  
& Pressurization unit

**Packaged unit Cooling Capacity:**  
2 x 17.6Kw

**Pressurization unit capacity:**  
**1350CMH**

**Casing/Skid/Frame Materials:**  
SS316L Materials

**Quantity:** 04 Set

Scope

Design , supply & Commissioning



# HVAC KARISH AND TANIN FIELD DEVELOPMENT for LQ & Machinery Space



Customer, Country	Sembcorp Yard, Singapore
Owner / Deployment	Energean Israel/ Karish FPSO
VA Project Ref / Hull Number	VAT1981
Vessel Names, Type, Model	Karish and Tanin FPSO
Commencement & Completion	January 2019 - April 2022
Classification / Regulations	DNV
Viking Airtech Scope	Design, Supply, Installation, Commissioning of 5 AHU, 3 Chillers, 11 Self Containing Units (DX) Zone 1, 6 Roof Top Units (Zone 1), Ventilation and Pressurization Fans for explosion proof and safe areas, Electric Control Panels, Dampers, Duct Heaters, Air Terminals and Instruments for Living Quarters & Machinery Space
Vessel Size / Accommodation capacity	Summer Deadweight (t) of 148089, Length / Beam: 227 / 50 m, The Energean Power FPSO will have a gas treatment capacity of 800 MMscf/day (8 BCM/per annum) and liquids storage capacity of 800,000 bbls.

# HVAC for KARISH AND TANIN FIELD DEVELOPMENT E-HOUSE



Customer, Country	Siemens Yard, Batam, Indonesia
Owner / Deployment	Energean Israel/ Karish FPSO
VA Project Ref / Hull Number	VAT1975
Vessel Names, Type, Model	Karish and Tanin FPSO
Commencement & Completion	November 2018 - January 2020
Classification / Regulations	DNV
Viking Airtech Scope	Design, Supply, Installation, Commissioning of 2 AHU, 2 Air Cooled Condensing Units, 4 Floor Standing (FCU), Ventilation and Pressurization Fans for explosion proof and safe areas, Electrical Control Panels, Dampers, Duct Heaters, Ducting, Air Terminals and Instruments for E-House
Vessel Size / Accommodation capacity	Summer Deadweight (t) of 148089, Length / Beam: 227 / 50 m, The Energean Power FPSO will have a gas treatment capacity of 800 MMscf/day (8 BCM/per annum) and liquids storage capacity of 800,000 bbls.

# HVAC LQ & Machinery Space upgrade on tanker converted to FPSO for deployment in the harsh North Sea environment



Customer, Country	Keppel Shipyard, Singapore
Owner / Deployment	Bumi Armada, Malaysia / Kraken Field West of the North Viking Graben (North Sea) and 125km east of Shetland Islands
VA Project Ref / Hull Number	VAS577 / T21518
Vessel Names, Type, Model	Armada Kraken FPSO (formerly known as Prisco Alcor), FPSO Tanker
Commencement & Completion	8 <sup>th</sup> July 2014 - 31 October 2016
Classification / Regulations	DNV/UK HSE/IMO Cabin Level 40-45dBA
Viking Airtech Scope	Design, Supply, Installation, Commissioning of 2 DX AHU, 2 Fresh Water Cooled Condensing Units, 4 Fresh Water Water-cooled Packaged Units, Air-cooled Split Unit system with 2 Explosion-proof outdoor units and 5 Indoor units in safe areas., Ventilation and Pressurization Fans for explosion proof and safe areas, Electric Control Panels, Dampers, Duct Heaters, Air Terminals, Ducting and Accessories for Living Quarters & Machinery Space
Vessel Size / Accommodation capacity	166546 DWT Length and Breadth Extreme 270m x 30m, Production rate 80,000 bbl / day / 91 persons



# HVAC for E-house on tanker converted to FPSO for deployment in the harsh North Sea environment



Customer, Country	McPec Marine & Offshore, Singapore
Owner / Deployment	Bumi Armada, Malaysia / Kraken Field West of the North Viking Graben (North Sea) and 125km east of Shetland Islands
VA Project Ref / Hull Number	VAS596 / T21518
Vessel Names, Type, Model	Armada Kraken FPSO (formerly known as Prisco Alcor), FPSO Tanker
Commencement & Completion	16 <sup>th</sup> September 2014 - 18th April 2016
Classification / Regulations	DNV/UK HSE
Viking Airtech Scope	Design, Supply, Installation, Commissioning of 2 DX AHU, 2 Ex-proof ACCUs, Ventilation Fans for explosion proof and safe areas, Electric Control Panels, Dampers, Duct Heaters, Air Terminals, Duct Heaters, Ducting and Accessories for E-house
Vessel Size / Accommodation capacity	166546 DWT Length and Breadth Extreme 270m x 30m, Production rate 80,000 bbl / day / 91 persons



# DX AHUs and ACCUs in pursuit of excellence in HVAC for E-house FPSO on a 12 year contract generating 80,000 barrels of oil a day in Offshore Angola operated by Bumi Armada chartered by ENI



470kW Viking Airtech ACCU (Zone 2 IIB T3)



Customer, Country	McPec Marine & Offshore Engineering Pte Ltd, Singapore
Vessel Operator / Charterer / Deployment	Bumi Armada (Malaysia) ENI (Italy) Block 15/06 Offshore Angola
VA Project Ref / Customer Project Number	VAS655 / McPec 65072 / 21021
Vessel Name, AIS Vessel Type	Armada Olombendo / Other (FPSO)
Commencement & Completion	8 <sup>th</sup> June 2015 - 27 June 2017
Classification / Regulations	ABS / IEC / ATEX
Viking Airtech Scope	<p>Design, Supply, Installation, Commissioning</p> <p>2 Vertical 470kW Viking Airtech ACCU (Electrical and instrumentation equipment ATEX Zone 2 IIB T3) SS316 2 470kW Viking Airtech DX AHUs (Electrical and instrumentation equipment ATEX Zone 1 IIB T3) Casing SS316, 50mm Mineral Wool</p> <p>2 55kW Viking Airtech ACCU (Electrical and instrumentation equipment ATEX Zone 1 IIB T3) SS316, 2 55kW Viking Airtech DX AHUs (Safe area) Casing GI 25mm Mineral Wool</p> <p>Valves, Gauges and Switches</p> <p>18 Trox Fire &amp; Gas Dampers for safe and ATEX Zone 1 IIC T3, 2 Shut Off Dampers, 7 Non Return Dampers, 6 Pressure Relief Dampers, 6 Transformer Room Supply and Exhaust Fans 31,000CMH 400 Pa, 6 VEAB Duct Heaters (Safe Area and Zone 1, IIC, T3)</p> <p>1 HVAC MCC, 1 HVAC Control Panel, Ex D Purging Control Panel, IER HVAC Starter &amp; Control Panel, 6 Local Control Stations, for ACCUs and Fans,</p> <p>26 Air Grilles, 23 Wire Mesh, 12 Louvers, 1 Mist Eliminator and 32 Air Diffusers</p>
Vessel Size / Accommodation capacity	Gross Tonnage 164496 301963 DWT Length Overall x Breadth Extreme: 335m x 58m Production rate 80,000 barrels of oil a day

# HVAC&R for highly advanced ultra-deep water semi-submersible drilling rigs



Customer ,Country	CIMC Raffles Yantai Shipyard, China
Owner, Country	CIMC, China
VA Project Ref / Hull Number	VAT1710 / Y12-H1277
Vessel Name, Type, Model	Frigstad Shekou, Ultra-deep water semi-submersible drilling rig, Frigstad D90
Commencement & Completion	26th November 2013 - 3 <sup>rd</sup> April 2017
Classification / Regulations	DNV +1A1 COLUMN STABILIZED DRILLING UNIT, DYNPOS AUTRO and ER (DP3), POSMOR-ATA, CRANE, HELIDECK-SH, ECO, F-AM, DRILL & BWM / SOLAS 2008, MARPOL 1973/78, IMO MODU CODE 2009, all with latest amendments , ASHRAE, SMACNA
Viking Airtech Scope	Design, Engineering support, FAT, Integration with other systems, Installation, MC, Testing & Commissioning, Class spares & Special tools for the supply of 3 Water Cooled Chillers 370 RT each, 10 CWAHU 46-66RT cooling, 45-81kW heating, 32 CWFCU 1-20RT cooling, 6kW-20kW heating, 29 PAC 3-18RT cooling, heating 6kW-14kW, 261 Fans, Dampers, Duct Heaters, Air Terminals, Ducting, Accessories and Provision Refrigeration System
Building / Vessel Size & Accommodation Capacity	Length of pontoons 117 m, Width & length, pipe rack deck 89 x 81m Height to pipe rack deck (ABL) 43.3 m Displacement Operational 69802 t / 200 persons with all single person bedrooms with windows. Ample office space and service facilities.



# Viking Airtech delivered a world record 7 HVAC&R systems for Jack-up rigs in 2013



Customer	Keppel FELS, Singapore
Owner	Arabian Drilling Company
VA Project Ref / Hull Number	VAT1550 / B325
Building/Vessel Name and Type	ArabDrill50 / Jack-up Rig
Commencement and Completion Date	1 Feb 2011 - 8 <sup>th</sup> June 2013
Classification & Class Notation & Regulations	ABS / Mobile Offshore Self Elevating Drilling Unit / IMO, SOLAS, ASHRAE, SMACNA
Scope/Equipment	HVAC&R system including design, supply, installation, commissioning of AHUs, Air-cooled DX Condensing Units,, Air Cooled Package Roof Top Units, Window Unit, Fans, Dampers, Duct Heaters, Air Terminals, Ducting, Accessories, Provision Refrigeration System for LQ, Production and Machinery Space
Building/Vessel Size/People on board	Length 234ft Width 208ft / 130 persons

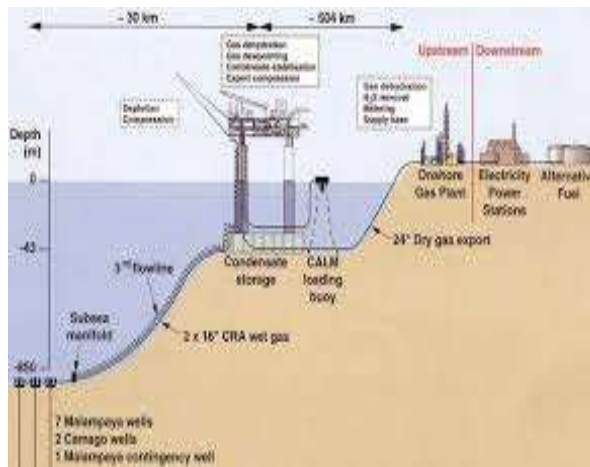
# Explosion proof HVAC&R in South Korea for Italian barge floating production unit (FPU) deployed in Indonesia



Customer	Hyundai Heavy Industries, South Korea
Owner / Deployment	Saipem of Italy / Kutei Basin, the Makassar Strait, East Kalimantan, Indonesia
VA Project Ref	VAT1843
Vessel Name and Type	Barge Floating Production Unit (FPU) for The Jangkrik Complex Project Development
C <sub>1</sub> Commencement and Completion	13 November 2014 – 18 March 2017
Class Notation / Regulations	BKI/DNV-GL
Viking Airtech Scope	10 AHUs Zone 2 Group IIA Temperature Classification T3, 10 Fans Ex-proof Motor Zone 1 Group IIA Temperature Classification T3, 30 Fans Ex-proof Motor Zone 2 Group IIA Temperature Classification T3 for Living Quarters, Provision Refrigerant Plant with 2 Condensing Units, 3 Fan Coil Units and PLC Electric Control Panel
Vessel Size	83,000 barrels of oil equivalent per day produced



# HVAC&R system for shallow water gas production platform installed 50km offshore from Palawan in the western Philippines



Customer	Shell Philippines Exploration BV
Owner / Deployment	Shell Philippines BV
VA Project Ref / Hull Number	VAS695
Building / Vessel Name and Type	Malamraya Shallow Water Platform (SWP)
Commencement and Completion	26 Nov 2015 – 9 October 2017
Class Notation / Regulations	<b>SHELL DEP</b> SAFE AREA ASHRAE, NFPA & SMACNA
Viking Airtech Scope	Supply, Design, Installation & Commissioning of HVAC System
Building / Vessel / Area	SWP Instrument Rack Room

# World Class HVAC&R on Offshore Platform forms part of Filipino Can Do Spirit



Customer	SHELL PHILIPPINES EXPLORATION BV
Owner / Deployment	SHELL PHILIPPINES EXPLORATION BV
VA Project Ref / Hull Number	VAS466
Building / Vessel Name and Type	MALAMPAYA MP3 DEPLETION COMPRESSION PLATFORM
Commencement and Completion	DEC 02 Dec 2013 17 Nov 2015
Class Notation / Regulations	<b>SHELL DEP</b> Ex-proof Zone 2, Group IIA, T3 area classification ASHRAE, NFPA & SMACNA
Viking Airtech Scope	DESIGN, SUPPLY, INSTALLATION HVAC SYSTEM FOR THE MALAMPAYA DEPLETION COMPRESSION PROJECT (Ex Proof Equipment)
Building / Vessel	DEPLETION COMPRESSION PLATFORM CONSTRUCTED WITH INDEPENDENCE LER WITH IRR, MCC, SWITCHGEARS, BATTERY & HVAC ROOMS

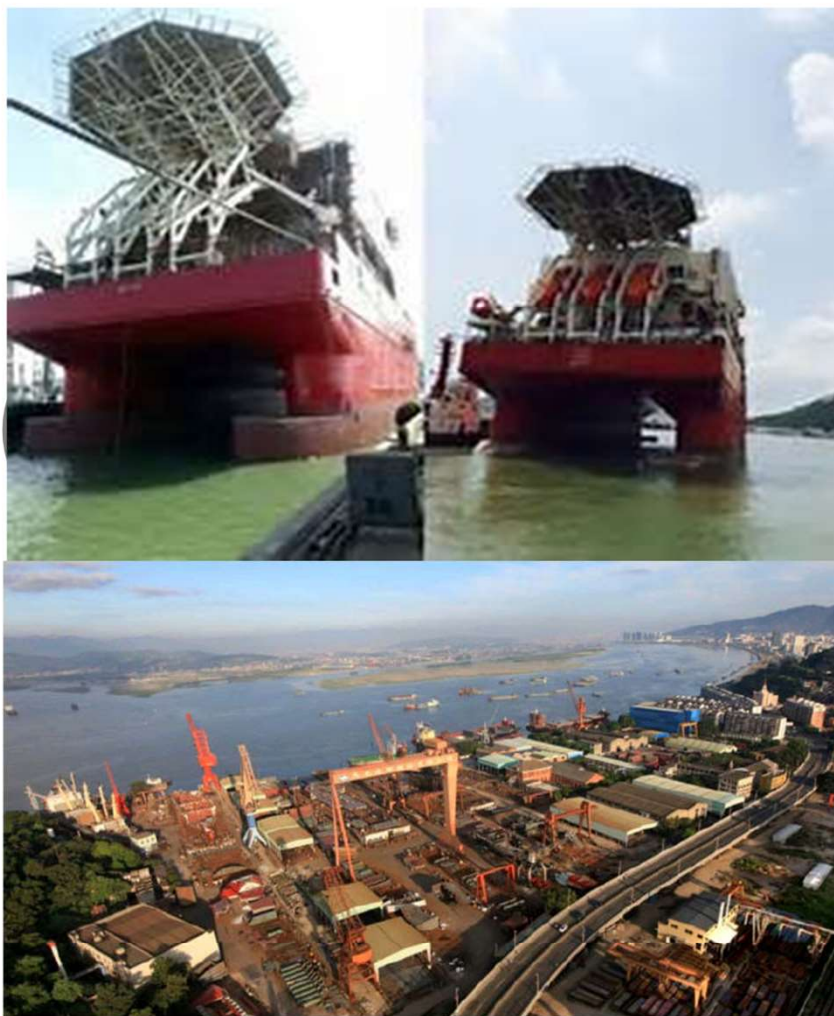
# Floatel HVAC&R for world wide operations



Customer	Keppel FELS, Singapore
Owner / Deployment	Floatel / Worldwide including the North Sea
VA Project Ref / Hull Number	VAT1603 / B343
Building / Vessel Name and Type	Floatel Victory / Semi-submersible Accommodation and Construction Support Vessel (Floatel)
Commencement and Completion	20 <sup>th</sup> Dec 2011 - 27 <sup>th</sup> Dec 2013
Classification / Regulations	ABS/DP3/UK HSE/IMO Cabin Noise Level 40-45 dBA
Viking Airtech Scope	Engineering, Procurement & Construction of HVAC&R system including design, supply, installation, commissioning of Seawater Cooled Chillers, AHUs, FCUs, Seawater cooled DX Condensing Units and AHUs, Roof Top Unit, Fans, Dampers, Duct Heaters, Air Terminals, Ducting, Accessories and Provision Refrigeration System
Building / Vessel Size & People	Air-conditioned living quarters for 560 persons, fully equipped hospital and offices for client use, cinema, recreation rooms and gymnasium. Length 120m. Breadth 78m.



# Floatel HVAC&R to highest international standards and comfort



Customer	Fujian Mawei Shipyard, China
Owner / Deployment	GranEnergia, Brazil / Brazil
VA Project Ref / Hull Number	VAT1730 / 610-3
Building / Vessel Name and Type	CSS THEMIS / Compact Semi-Submersible Floating Accommodation Unit for Rig Personnel (FLOATEL)
Commencement and Completion	September 2013 - December 2014
Classification / Regulations	ABS MODU Rules 2009/DP3/IMO MODU CODE 2001, ASHRAE, SMACNA
Viking Airtech Scope	Engineering, Procurement of HVAC&R system including design, supply, commissioning of 3 Water Cooled Chillers, 3 Chilled Water Pumps 9 AHUs, 14 FCUs, 1 Split Unit, Air Terminals, Provision Refrigeration System
Building / Vessel Size & People	Air-conditioned living quarters for 451 men fully equipped hospital and offices for client Length 84m. Beam 32m.



# HVAC&R for Pipe Laying Vessel



Customer	Keppel Singmarine, Singapore
Owner	McDermott
VA Project Ref / Hull Number	VAT1692 / H381
Building/Vessel Name and Type	DLV2000 Deepwater Pipe Laying Vessel
Commencement and Completion Date	21 <sup>st</sup> September 2013 - 8 <sup>th</sup> June 2016
Classification	ABS, DP3, ENVIRO+, HAB. Cabin Noise Level 50dBA (Australian Standard AS 2254 -1988)
Scope/Equipment	HVAC&R system including design, supply, installation, commissioning of Water Cooled Chillers, AHUs, FCUs, Water cooled DX Condensing Units and AHUs, Water Cooled Package Units, Air-cooled Split Units, Fans, Accessories, Provision Refrigeration System for LQ, Production and Machinery Space
Building/Vessel Size/People	341 persons (2-man rooms) or 401 persons (4-man rooms) + 2 Medical Clinics with 5 beds total. LOA/LWL 184/180m Beam 39m, Deck Area 40,000 sq ft

# HVAC&R for Greek Bulk Carrier still going strong five years after the delivery



Customer	Zhejiang Shipbuilding Co Ltd, Ningbo (China)
Owner / Ship Manager	Madiva Navigation Inc / Transman Shipmanagers S A (Greece)
VA Project Ref / Hull Number	VAT1536 / ZJB10-195
Vessel Names, AIS Vessel Type	Ex-names: TIGER TIAN (2013) PRIVBALTIC (2014) Name: KOSMAN (2014), Cargo
Commencement & Completion	14 February 2011 - 30 January 2013
Classification / Regulations	BV / IMO A468 (XII), SOLAS (1974)
Viking Airtech Scope	Design, Supply, Commissioning of Main AC Deck Unit (146kW, Danfoss Scroll Compressor, ABB Motor, Fresh Water Condensing Unit for Provision (Cooling Capacity 5kW), Scroll Compressor Copeland, Fresh Water-Cooled Packaged Unit for ECR & Galley (Cooling Capacity 17kW with 100% circulation air & 17.4kW with 100% Fresh Air), Refrigerant Gas R404A, Polyester Lubricant, Cabin Unit Air Terminals, Non Return Damper for Hospital, Steam Generator, Valve Control Panel, AC ECP, Provision System ECP, Remote Temperature Indicator Panel, Steam valve plate, Ozone Generator, Thermometer Panel, Counter Flanges
Vessel Size and number of persons	Gross Tonnage: 32839, Deadweight 58,000 t Length Overall x Breadth Extreme 190m x 32m 20 persons



# Main AC Deck Units and Packaged Units for Bulk Carriers in Japan



Customer ,Country	Oshima Shipbuilding Ltd, Japan
Owner	U-Ming Marine, Taiwan
VA Project Ref / Hull Number	VAT1726-VAT1729 / 10753-10756
Vessel Names, Type, Model	CEMTEX Hunter, CEMTEX Leader, CEMTEX Honor, CEMTEX Fortune, Bulk Carriers ,Panamax
Commencement & Completion	31 <sup>st</sup> October 2013 - 2 July 2015
Classification / Regulations	DNV/NK
Viking Airtech Scope	Design, Supply, Commissioning of Main AC Deck Unit, Packaged Unit for Galley, Packaged Unit for Engine Control Room
Vessel Size	85,066 DWT

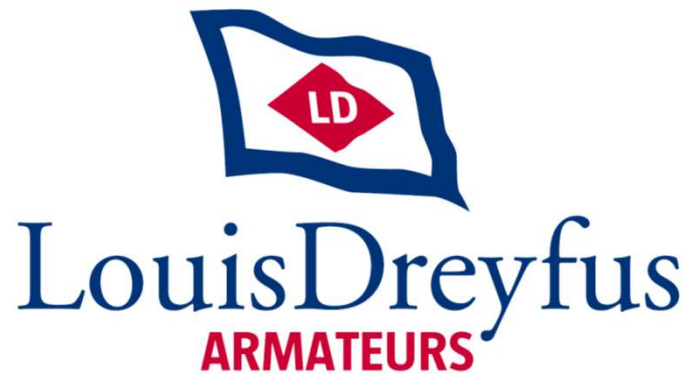


# HVAC&R for Deck Cargo Vessel for French Louis Dreyfus Armateurs Group



Customer ,Country	Xiamen Shipbuilding Industry, China
Owner, Country	LD Ports & Logistics Pte Ltd (Subsidiary of Louis Dreyfus Armateurs Group, France)
VA Project Ref / Hull Number	VAT1923-VAT1927 / 451A-451D
Vessel Type	Deck Cargo Vessel
Commencement & Completion	20 January 2017 – 2018 Projected
Classification / Regulations	BV / SOLAS
Viking Airtech Scope	Design, Supply, Testing & Commissioning of 2 Water-cooled condensing units 44RT each, 1 AHU , 6 Package Units, Accessories
Building / Vessel Size / Accommodation Capacity	5800DWT L102.9m / 16 persons

# HVAC for 24 x 7 crew ensures effective round the clock transshipment operations



Customer ,Country	Xiamen Shipbuilding Industry, China
Owner, Country	LD Ports & Logistics Pte Ltd (Subsidiary of Louis Dreyfus Armateurs Group, France)
VA Project Ref / Hull Number	VAT1927-VAT1928/ 489A-489B
Vessel Name, Type, Model	Floating Crane Pontoon
Commencement & Completion	15 March 2017 – 2018 Projected
Classification / Regulations	BV / SOLAS
Viking Airtech Scope	Design, Supply, Testing & Commissioning of 2 Water-cooled condensing units 53RT each, 1 AHU 53RT, 4 Package Units, Accessories
Building / Vessel Size / Accommodation Capacity	48T / 32 persons

## HVAC&R with minimum weight and maximum operational efficiency simplifies the defense mission at sea



Customer	Singapore Technologies Marine Ltd
Owner / Deployment	Republic of Singapore Navy
VA Project Ref / Hull Number	VAT1738 / BB668
Building / Vessel Name and Type	Sovereignty/ Independence Class Littoral Mission Vessel (LMV)
Commencement and Completion	26 May 2014 - 28 May 2016
Class Notation / Regulations	DNV, +1a1 LCR0 Naval E0 / IMO, Solas, ISO7547, ASHRAE, IEC
Viking Airtech Scope	Design, Supply, Installation, Testing & Commissioning of 2 nos of AHU, 8 nos of FCU, Duty and Standby Water Cooled Chillers, Chilled Water Pumps, Ventilation Fans, Dampers, Air Terminals, Duct Heaters, Ducting, Provision Refrigeration System
Building / Vessel Size & People	Displacement 1250 tons / Length 80m / Standard Crew 23 men



# HVAC for Royal Thai Navy



Customer	Sevenoaks Co Ltd, The Bangkok Dock Company Ltd
Owner	Royal Thai Navy
VA Project Ref	VAT1931
Vessel Name and Type	OPV2 / Offshore Patrol Vessel
Commencement and Completion	2 August 2017 – December 2017 (Projected)
Class Notation / Regulations	LR SOLAS/ASHRAE
Viking Airtech Scope	Design, Supply of 2 Seawater-Cooled Chillers 130RT each, 3 AHUs, 9 FCUs, 5 Gravity Coil Units (GCUs), PLC Control Panels
Vessel Size	Length 90m Beam 13.5m

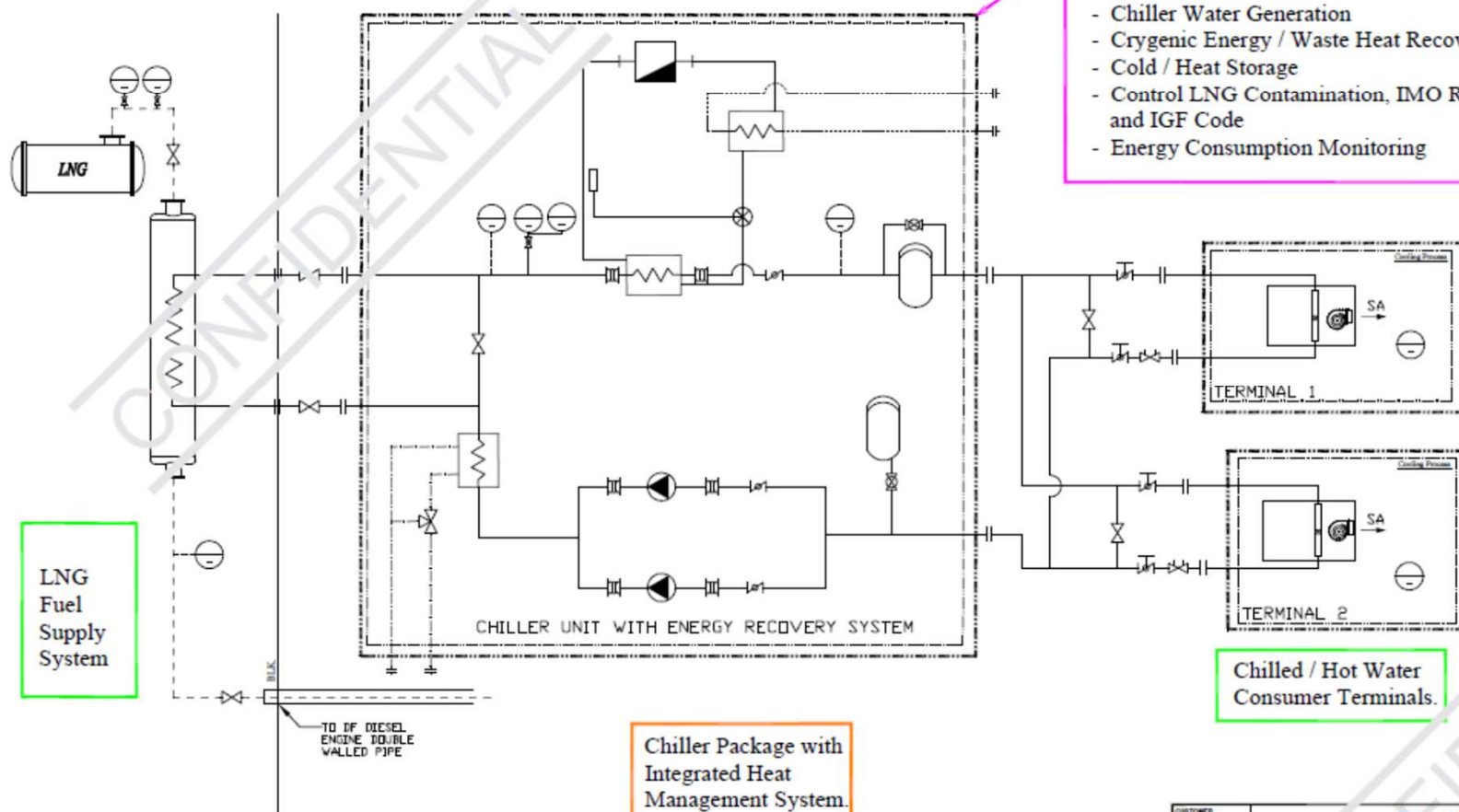
**Other Customers: United States Naval Ship (USNS), Royal Malaysian Navy (RMN), Indonesian Navy, Royal Navy of Oman**

# LNG energy recovery HVAC system



## Typical Schematic Diagram

REV.	DESCRIPTION	DATE	ISSUED	CHECKED	APPR.
-	-	-	-	-	-



### Notes:

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CUSTOMER: _____ SET DRAW NO: _____ PROJECT NO: _____ PRODUCTION NO: _____ OPERATION NO: _____	PROJECT: LNG Energy Recovery System with HVAC DRAW TITLE: Typical Schematic Diagram Energy Recovery System with with HVAC Chiller

## APPROVAL IN PRINCIPLE



### Particulars of Product

Designer: Viking Airtech Pte. Ltd.  
Product: LNG Energy Recovery System

### This is to verify:

That the containment system has been assessed by DNV GL and found to comply with current Rules of the Society, as specified below.

Part 4, Chapter 6                      System and Components; Piping systems  
Part 6, Chapter 2, Section 5        Gas Fuelled Ship Installations

### Basis for Approval

The documentation specified in letter GP/tec 07/0-2018, dated 08-March-2018, has been assessed with respect to:

LNG Energy Recovery System with HVAC Pages 1-5 of 5, Energy Recovery System with HVAC chiller

### Conditions and Assumptions for Approval

- The conditions for approval in principle are given in letter M-SA-MP/Pew/P26997-1, dated 2018-09-13.
- Before construction and installation onboard any particular ship or object subject to classification, a complete set of documentation relevant for the particular ship is to be approved by the Society according to normal classification procedures.

Place: **Hamburg** Date: **2018-10-19**



for **DNV GL**  
Digitally Signed By: Drews, Olaf  
Location: DNV GL SE Hamburg, Germany  
Signing Date: 2018-10-18

**Olaf Drews**  
Head of Section