

# MPP SYSTEMS

## Macro Porous Polymer Extraction Systems (MPPE)

Presentation of Cases:

HYDRO/SHELL, Ormen Lange, Norway

WOODSIDE Pluto, Australia

STATOIL Kollsnes, Norway

SHELL Floating LNG Prelude

VWS Oil & Gas is the global division of Veolia Water Solutions & Technologies dedicated to serving the Oil and Gas industry [www.vwsmppsystems.com](http://www.vwsmppsystems.com)  
[www.vwsoilandgas.com](http://www.vwsoilandgas.com)

**VWS OIL & GAS**

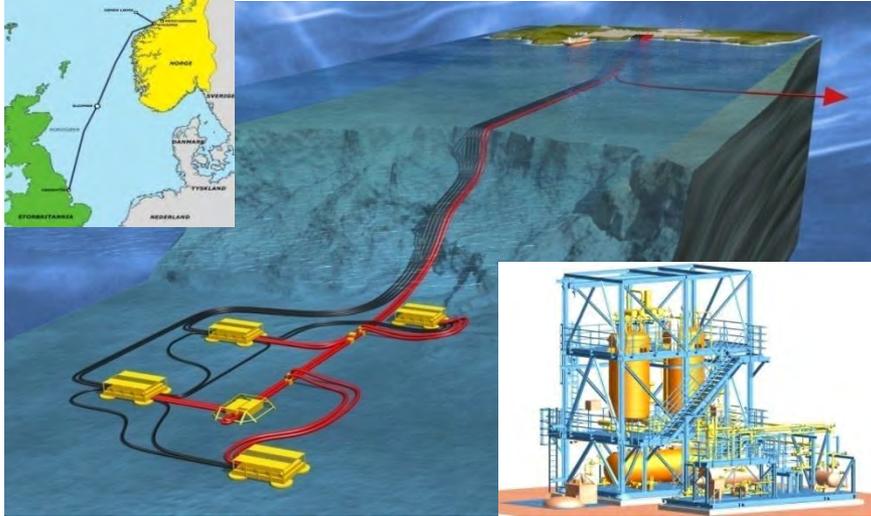


# Offshore produced water

	Gas produced water	Oil produced water
<b>Flow rates (m<sup>3</sup>/h)</b>	< 1 – 150	100 – > 1000
<b>Inlet (ppm)</b>		
Aliphatic HC(dispersed oil)	200 – 1400 (484*)	40 – 100 (15*)
Aromatics (BTEX)	300 – 2500 (482*)	30 – 70 (6* )
PAHs	1 – 80	0.5 – 2
TPH	700 – 4000	> 200
<b>Typical goals</b>		
	Disp. oil < 10 – 30	Disp. oil < 10 – 30
	BTEX < 10	?
	PAHs < 0.1 – 0.01	?
	TPH < 10 – 30	?
	EIF: Zero Harmful	?

\* Shell average offshore data Tekna 2012

# MPPE for Statoil/Hydro-Shell ORMEN LANGE Gas Produced Water Treatment



## Ormen Lange Project

- World's most challenging gasfield development project
- Makes Norway world's largest exporter of natural gas
- Largest industrial project ever carried out in Norway
- 100 kilometer from the northwest coast of Norway

### MPPE Unit removes the:

- Dispersed oil (aliphatics)
  - Dissolved and dispersed aromatics (BTEX)
  - Poly Aromatics (PAHs)
- Flow rate 70 m<sup>3</sup>/h
  - > 99% removal of BTEX, PAHs, Aliphatics (oil)
  - In operation since October 2007



# MPPE for Statoil/Hydro-Shell ORMEN LANGE Gas Produced Water Treatment



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# MPPE for LNG Plant Woodside PLUTO - Australia

## Gas/LNG produced water reuse for demin water



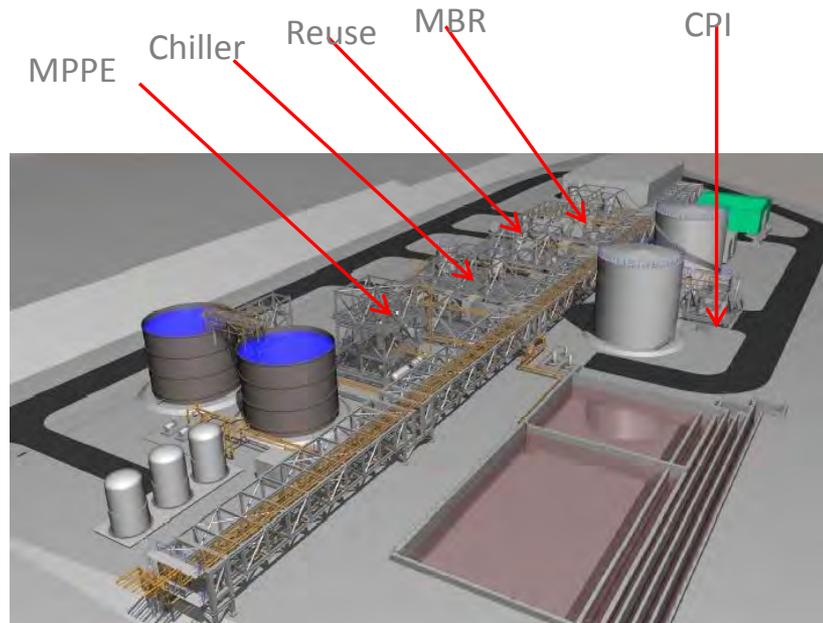
### MPPE Unit removes the:

- Dispersed oil (aliphatics)
- Dissolved and dispersed aromatics (BTEX)
- Poly Aromatics (PAHs)

- Total MPPE Unit capacity 43 m<sup>3</sup>/hr
- 2 parallel column trains guarantee 100% redundancy extraction capability

### Pluto Woodside Project

- Pluto Project will increase the present Natural gas production with approximately 25%
- Veolia Oil & Gas supplied a total Wastewater Treatment Package consisting of: *CPI, MPPE unit, Chiller, MBR, Oxidation/ozone, Activated Carbon & Demin unit.* The treated water is reused.
- Planned to be on stream in 2011



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## MPPE for LNG Plant Woodside PLUTO – Australia

Gas/LNG produced  
water reuse for  
demin water



# MPPE for LNG Plant Woodside PLUTO - Australia Gas/LNG produced water reuse for demin water



# MPPE for LNG Plant Woodside PLUTO - Australia

## Gas/LNG produced water reuse for demin water



# MPPE for Statoil Kollsnes, Norway

## Gas Produced Water Treatment



### MPPE Unit removes the:

- Dispersed oil (aliphatics)
  - Dissolved and dispersed aromatics (BTEX)
  - Poly Aromatics (PAHs)
- 
- Total MPPE Unit capacity 20 m<sup>3</sup>/h
  - Includes Steam Generator and RO unit
  - > 99% removal of BTEX, PAHs, Aliphatics (oil)
  - To be shipped in April 2011

### Kollsnes project

Produced water treatment of 5 gas fields. MPPE Mobile unit is running since 2005. Existing Biological WWTP failed when produced water from new field was added to the feed. Upstream treatment by MPPE Mobile unit removes toxic Aromatics and PAHs. The Biological WWTP recovered within 3 months. Mobile unit will be replaced by permanent unit indicated below.





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# MPPE for Statoil Kollsnes, Norway Gas Produced Water Treatment Boiler Feed Water Reverse Osmosis Unit (1)



**MPP SYSTEMS VWS OIL & GAS**

# MPPE for Statoil Kollsnes, Norway Gas Produced Water Treatment Boiler Feed Water Reverse Osmosis Unit (2)



**MPP SYSTEMS VWS OIL & GAS**

**Top Deck Manifold****MPP SYSTEMS VWS OIL & GAS**

**Steam generator****MPP SYSTEMS VWS OIL & GAS**

**Buffer Tank****MPP SYSTEMS VWS OIL & GAS**



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**MPP SYSTEMS VWS OIL & GAS**



Special pumps for transporting separated hydrocarbons (oil) as a product



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# MPPE for Statoil Kollsnes, Norway Gas Produced Water Treatment



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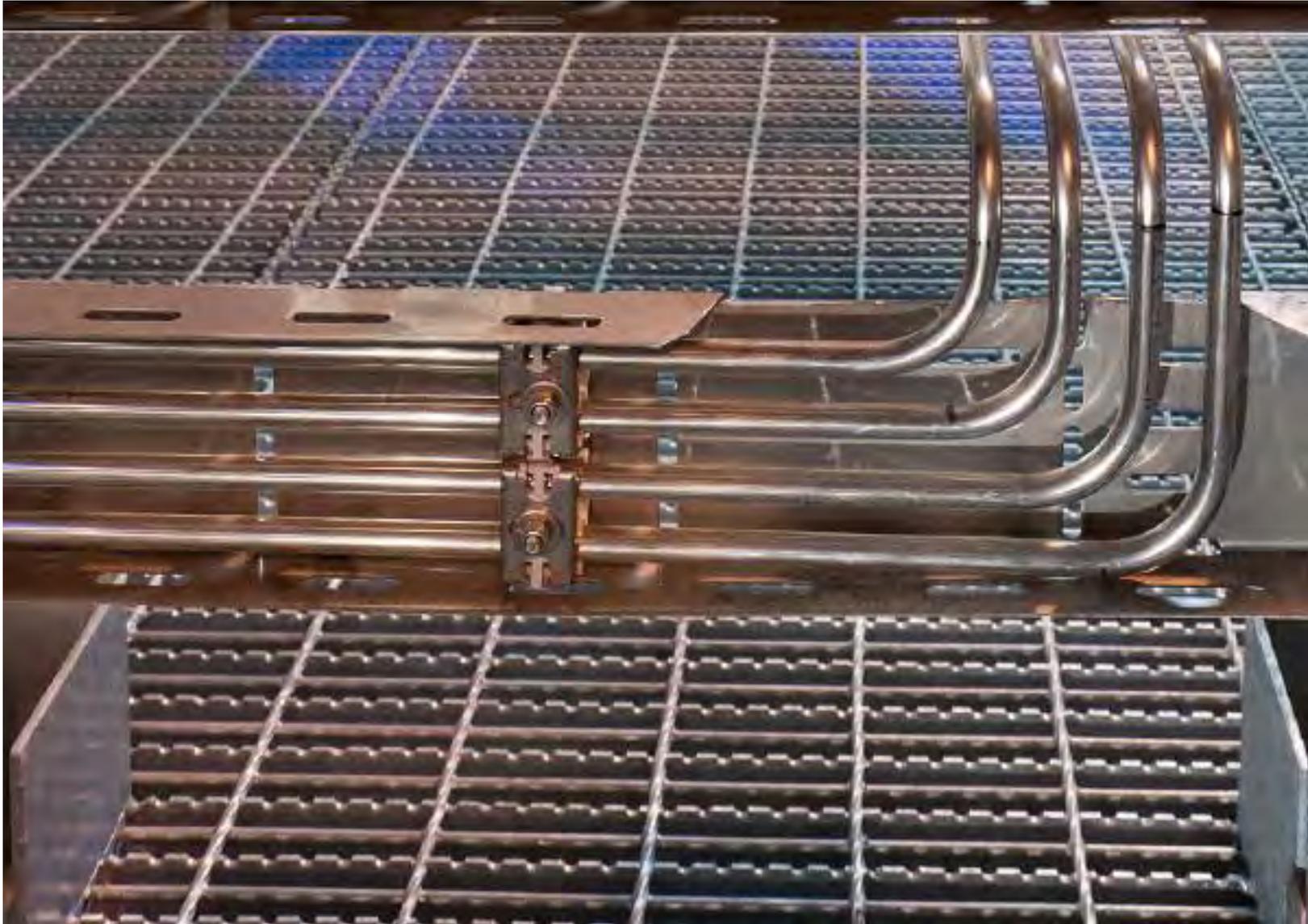
**MPP SYSTEMS VWS OIL & GAS**



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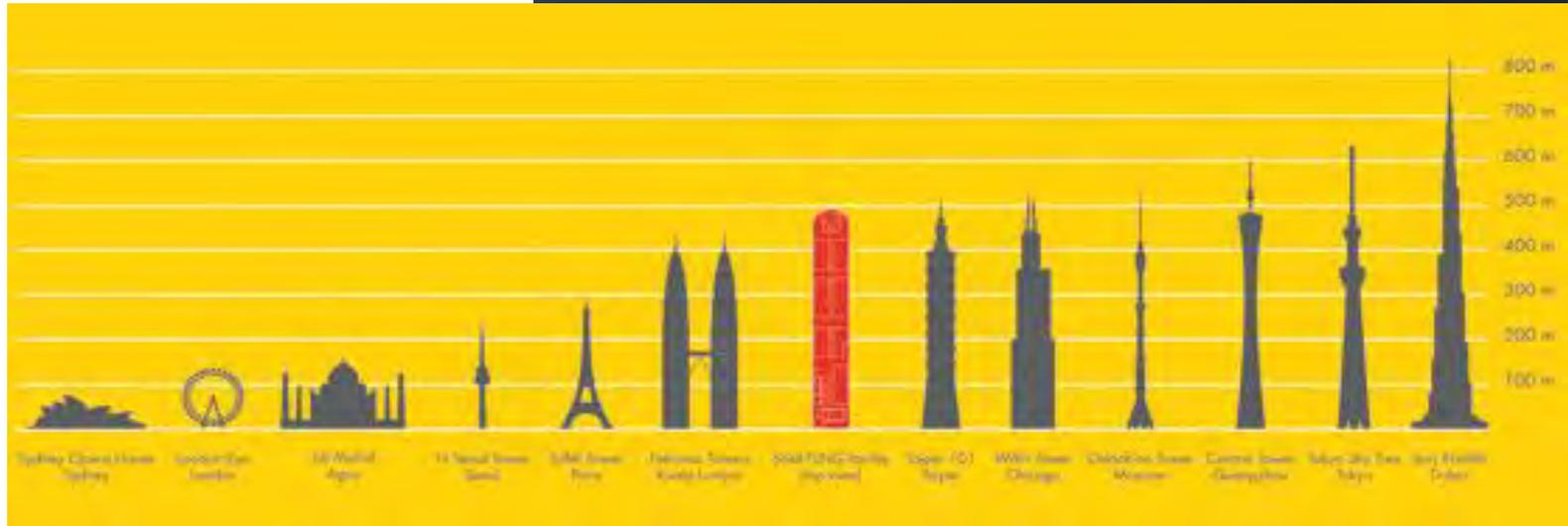
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**Connections**

**Shipment for Norway****MPP SYSTEMS VWS OIL & GAS**

# Shell Prelude Floating LNG

- Treatment + liquefaction
- 488m x 74m: largest floating structure
- Avoids: pipelines, coastal modifications, land use
- Lower environmental footprint
- Flexibility to relocate and reuse
- For “stranded” gas assets

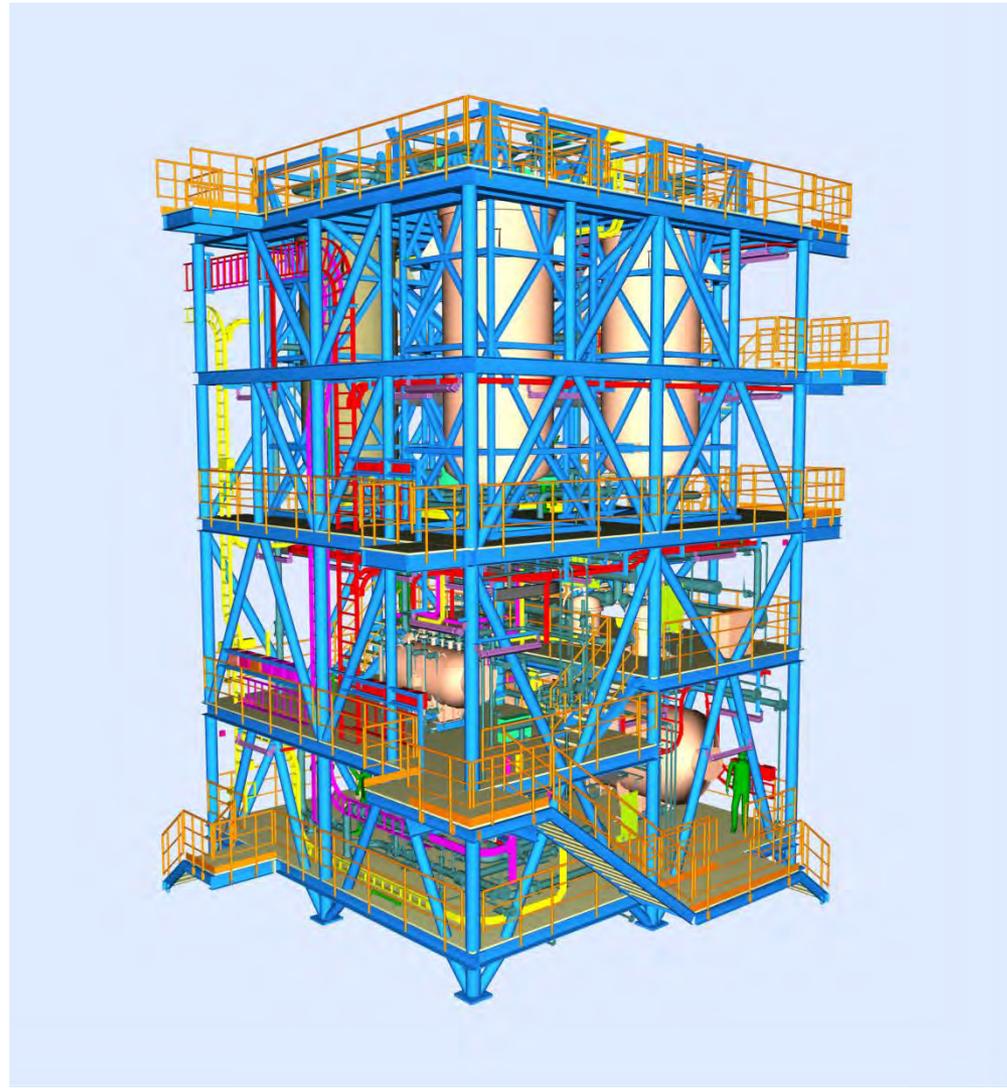


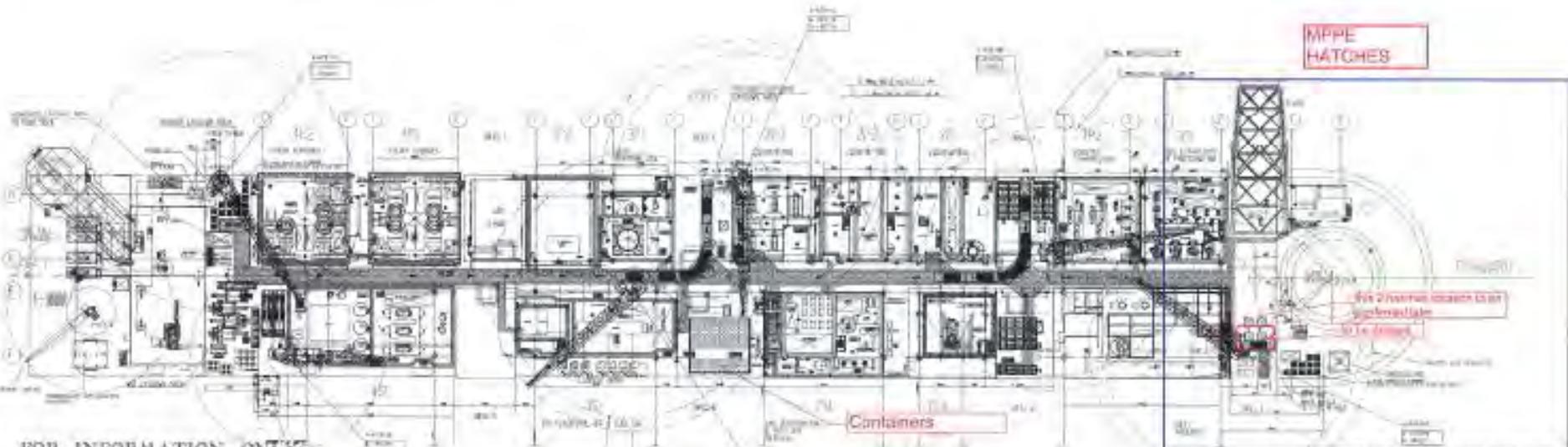
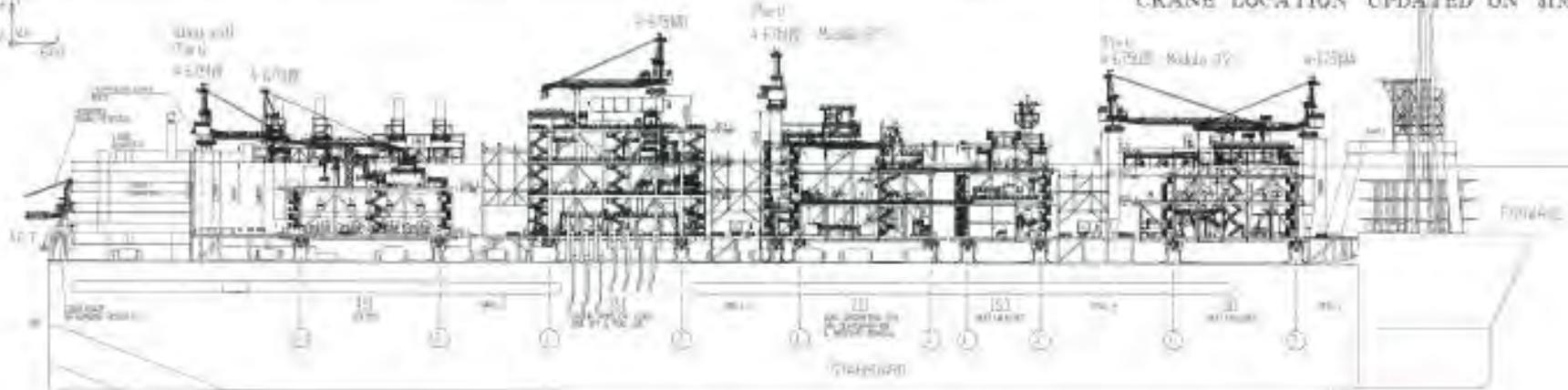
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# MPPE Shell Prelude 3D model



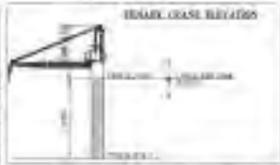


FOR INFORMATION ONLY  
 NOTE  
 PLAN VIEW EQUIPMENT LAYOUT IS NOT COMPLETELY UPDATED  
 TOPSIDE PERSPECTIVE CRANES DIMENSION ARE REQUIRED TO NOT VISIBLE

LIST OF MAIN VERTICAL CRANE FOR TOPSIDE PLND FROM AFT TO FWD

CRANE ID	WORKSHOP IN ORIGINAL	CRANE DATE	TYPE OF CRANE	MAX. AHS RISE	CRANE CAPACITY	UNIT
1	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
2	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
3	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
4	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
5	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
6	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
7	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
8	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
9	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
10	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
11	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg
12	WORKSHOP IN ORIGINAL	2007/08	CRANE	11.400 m	10000	kg

TO BE UPDATED



REVISIONS

NO.	DATE	DESCRIPTION
1	2011/03/31	CRANE LOCATION UPDATED

40000 | Project

MADE BY: [Name] AND CHECKED BY: [Name]

MPPE

# MPPE in hull Shell Prelude FLNG

