



UNIVERSIDADE DA CORUÑA



Escola Politécnica Superior

**TRABAJO FIN DE GRADO  
CURSO 2017/18**

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*Buque PSV. Buque de suministro a plataformas de 5000  
TPM*

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**Grado en Ingeniería Naval Oceánica**

**ALUMNA/O**

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**FECHA**

3 de SEPTIEMBRE de 2018

# 0 RESUMEN TFG. BUQUE DE SUMINISTRO A PLATAFORMAS

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## RESUMEN

En este trabajo se va a desarrollar el proyecto de un buque de suministro a plataformas petrolíferas.

Las características más importantes que va a poseer este buque han sido las siguientes:

- Necesidad de una amplia cubierta, que se utilizará como plataforma de carga.
- Tanques para carga líquida y seca, entre las cuáles se encuentran los lodos y los cementos usados en los trabajos de explotación.
- Doble casco, ya que al transportar productos contaminantes es necesario que se garantice la flotabilidad.

También cuenta con sistemas de posicionamiento dinámico, en este caso el del nivel máximo actual, ya que es necesario que el buque se mantenga en una posición concreta, incluso en condiciones adversas, mientras se realiza la operación de carga y descarga.

El buque proyecto también contará con la capacidad de dar apoyo en caso de incendio, por ello se le dota de equipos de lucha contra incendios.

Se ha considerado importante que el buque también pueda luchar contra la contaminación del mar, pudiendo cercar y recoger residuos de hidrocarburos del medio marino.

## RESUMO

Neste traballo vaise desenvolver o proxecto dun buque de subministración a plataformas petrolíferas.

As características máis importantes que vai posuír o buque foron as seguintes:

- Necesidade dunha cuberta ampla, que se utilizará como plataforma de carga.
- Tanques para carga líquida e seca, entre os que se encontran lodos e cementos usados nos traballos de explotación.
- Dobre casco, xa que como se van transportar produtos contaminantes é necesario garantir a flotabilidade.

Tamén cona con sistemas de posicionamento dinámico, neste caso conta co do nivel máximo actual, xa que é necesario que o buque se manteña nunha posición concreta, incluso en condicións adversas, mentres realiza as operacións de carga e descarga-

O buque proxecto tamén contará coa capacidade de dar apoio en caso de incendio, por isto dotáselle con equipos de loita contra incendios.

Considérase importante que o buque poida loitar contra a contaminación no mar, poidendo cercar e recoller hidrocarburos do medio mariño.

## **SUMMARY**

In this work is going to develop the project of a platform supply vessel.

The most important characteristics that this vessel will have are the following:

- The need for a wide deck, which will be used as a loading platform.
- Tanks for liquid and dry cargo, among which are the mud and the cement used in the exploitation works.
- Double hull, it is going to transport polluting products and it is necessary to guarantee buoyancy.

It also has dynamic positioning systems, in this case the current maximum level, it is necessary that the ship remains in a specific position, even in adverse conditions, while the loading and unloading operation is carried out.

The project ship will also have the capacity to provide support in case of fire, for this reason it is equipped with firefighting equipment.

It has been considered important that the ship can also fight against marine pollution, being able to enclose and recover oil residues from the marine environment.



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**Grado en Ingeniería Naval Oceánica**

**CUADERNO 1**

**Elección de la cifra de mérito y definición de alternativas  
Selección de la alternativa más favorable**

**Sandra Allegue García**

**PROYECTO 18-02**

**GRADO EN INGENIERÍA NAVAL Y OCEÁNICA**  
**TRABAJO DE FIN DE GRADO**

*CURSO 2.017-2018*

**PROYECTO NÚMERO 18-02**

**TIPO DE BUQUE:** Buque PSV (Platform Vessel Supply). Buque de suministro a plataformas.

**CLASIFICACIÓN, COTA Y REGLAMENTOS DE APLICACIÓN:** DNV GL, SOLAS, MARPOL.

**CARACTERÍSTICAS DE LA CARGA:** Carga líquida y seca a granel para suministro a plataformas, 5000 TPM.

**VELOCIDAD Y AUTONOMÍA:** 13 nudos en condiciones de servicio al 85% de MCR y 15% de margen de mar. 6000 millas a la velocidad de servicio

**SISTEMAS Y EQUIPOS DE CARGA / DESCARGA:** Bombas para la carga y descarga de la carga líquida. Dos grúas.

**PROPULSIÓN:** Propulsión diésel-eléctrica. LNG para estancias en puerto

**TRIPULACIÓN Y PASAJE:** 35 personas.

**OTROS EQUIPOS E INSTALACIONES:** Sistema de posicionamiento dinámico con redundancia DP 3. FIFI

Ferrol, 2 Noviembre 2017

**ALUMNO/A: D<sup>a</sup> Sandra Allegue García**

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ANEXO 1: Fichas de los buques de referencia

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## 1 INTRODUCCIÓN

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En este Cuaderno se van a calcular las dimensiones principales del buque proyecto y los coeficientes del buque necesarios para los Cuadernos posteriores.

Se hará una primera aproximación del coste de construcción del buque, también el estudio un primer estudio de la potencia y la comprobación del francobordo para garantizar su cumplimiento en este momento.

Se estudiará el peso muerto del buque, en este caso viene dado por RPA's, l desplazamiento y el peso en rosca.

Todo lo referente a este Cuaderno es un primer estudio del buque pero va a servir de sustento para el resto del proyecto.

## 1.1 NOTA DE CLASE

Las notas de clase son símbolos con los cuáles se caracteriza el buque, esto sirve para determinar la normativa aplicable al buque y para definir al buque. Hay algunas opcionales y otras obligatorias según el tipo de buque y las operaciones que va a realizar.

A continuación, se encuentra una tabla en la cual se elige la mejor nota de clase para el buque proyecto y con una breve explicación de cada símbolo:

	<b>Símbolo/Notación</b>	<b>Significado</b>
<b>Costruction symbol</b>	✠	Construido mediante la supervisión de la Sociedad
<b>Main Class Notation</b>	1A	Diseñado y construido conforme a los requerimientos de las Sociedades de Clasificación
<b>Ship type notations</b>	Offshore service vessel (Supply)	Buque de suministro a plataformas

<b>Aditonal Class Notations</b>		
<b>Structural strength and integrity</b>	DK	Cubierta principal reforzada para carga pesada
<b>Propulsion, power generation and auxiliary systems</b>	E0	Cámara de máquinas desatendida
	Gas ready AEI	Los motores auxiliares pueden operar con LNG
<b>Navigation and manoeuvring</b>	DPS 3	Sistema de posicionamiento dinámico con redundancia según la guía de la IMO
	NAUT (OSV)	Requerimientos para los barcos de operaciones offshore
<b>Cargo operations</b>	-	-

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<b>Equipment and design features</b>	F(CM)	Protección antiincendios adicional en espacio de carga y maquinaria
	SF	Requerimientos para estabilidad en averías
	OILREC	Recepción y transporte de aceite usado
	CHEM	Transporte de químicos tóxicos de plataformas petrolíferas y similares
<b>Cold climate</b>	Ice A	Para buques que naveguen en aguas infestadas de hielo y con grosor de 1m
	Winterized Basic	Operación en climas fríos ocasionalmente y por cortos periodos
<b>Environmental protection and pollution control</b>	Clean Tier III	Cumplimiento con los índices de NOx de acuerdo con MARPOL
<b>Survey arrangements</b>	-	-

## 2 BASE DE DATOS

Para la base de datos se han escogido buques con un peso muerto que oscila entre las 4000 t y las 6000 t, habiendo una variación máxima de 1000 t con respecto al buque proyecto.

### BASE DE DATOS

Nombre del buque	DWT (tn)	L o.a (m)	Lpp (m)	B (m)	D (m)	T (m)	Velocidad de servicio(kn)	Año	Fuente
Stanford Bateleur	5128	87,07	83,00	18,80	7,41	6,050	12	2013	<a href="http://www.stanford-marine.com">http://www.stanford-marine.com</a>
Bourbon Topaz	4847	86,20	75,40	19,00	8,00	6,650	13	2005	<a href="http://www.bourbon-offshore.no">http://www.bourbon-offshore.no</a>
Breeze	4426	76,80	75,00	18,28	7,70	6,250	10,2	2014	<a href="http://www.joollc.com">http://www.joollc.com</a>
Damen PSV 5000 CD	5000	90,00	82,50	19,00	8,00	6,300	14	2015	<a href="http://www.damen.com/">http://www.damen.com/</a>
Ievoli Sapphire	4900	79,45	76,10	16,80	7,40	6,000	14	2013	<a href="http://www.marnavi.it">http://www.marnavi.it</a>
VS 485 PSV MK III L	5700	90,40	82,50	20,00	8,60	7,050	12	2014	<a href="https://www.wartsila.com/">https://www.wartsila.com/</a>
Stril Pioner	6000	94,90	81,60	20,40	9,28	7,890	13,5	2003	<a href="http://www.mokster.no">http://www.mokster.no</a>
Lewek Aquarius	5200	87,90	81,23	18,80	8,00	6,500	-	2012	<a href="http://www.emasoffshore.com">http://www.emasoffshore.com</a>
Troms Castor	5491	85,00	77,70	20,00	8,60	7,163	12	2009	<a href="http://www.tromsoffshore.no">http://www.tromsoffshore.no</a>
Havila Charisma	4976	92,80	82,80	19,60	8,00	6,569	12	2012	<a href="http://www.havila.no">http://www.havila.no</a>
Juanita	5456	88,90	81,10	20,00	8,80	7,294	13	2014	<a href="http://www.jjuc.no">http://www.jjuc.no</a>
Pacific Gannet	4078	84,65	75,70	18,00	7,60	6,430	12	2014	<a href="http://www.swire.com.sg">http://www.swire.com.sg</a>
E.R. Georgina	4250	93,00	80,80	20,00	8,20	6,600	15	2010	<a href="http://www.er-offshore.com">http://www.er-offshore.com</a>
Vos Patience	4200	83,40	79,55	18,00	7,90	6,700	13	2017	<a href="http://www.vroon.nl">http://www.vroon.nl</a>
Toisa Serenade	5324	87,40	80,40	19,00	8,00	6,550	12	2008	<a href="http://www.sealionshipping.co.uk">http://www.sealionshipping.co.uk</a>
Rem Supporter	5300	94,20	84,90	20,00	8,30	6,800	12	2012	<a href="https://solstad.no">https://solstad.no</a>
UT 776 WP	5000	91,70	82,80	20,00	8,20	6,800	13	2007	<a href="http://www.gondan.com">http://www.gondan.com</a>

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**DIMENSIONAMIENTO: RELACIONES**

Nombre del buque	DWT <sup>1/3</sup>	Lpp/B	Lpp/D	Lpp/T	B/T	B/D	T/D	L*B*T	DWT
Stanford Bateleur	17,24445	4,4148936	11,20108	13,719008	3,107438	2,537112	0,8164642	9440,42	5128
Bourbon Topaz	16,923532	3,9684211	9,425	11,338346	2,8571429	2,375	0,83125	9526,79	4847
Breeze	16,418638	4,1028446	9,7402597	12	2,9248	2,374026	0,8116883	8568,75	4426
Damen PSV 5000 CD	17,099759	4,3421053	10,3125	13,095238	3,015873	2,375	0,7875	9875,25	5000
Ievoli Sapphire	16,984993	4,5297619	10,283784	12,683333	2,8	2,2702703	0,8108108	7670,88	4900
VS 485 PSV MK III L	17,86316	4,125	9,5930233	11,702128	2,8368794	2,3255814	0,8197674	11632,5	5700
Stril Pioner	18,171206	4	8,7931034	10,342205	2,5855513	2,1982759	0,8502155	13134,01	6000
Lewek Aquarius	17,324782	4,3207447	10,15375	12,496923	2,8923077	2,35	0,8125	9926,306	5200
Troms Castor	17,642108	3,885	9,0348837	10,84741	2,7921262	2,3255814	0,832907	11131,302	5491
Havila Charisma	17,072356	4,2244898	10,35	12,604658	2,9837114	2,45	0,821125	10660,699	4976
Juanita	17,604544	4,055	9,2159091	11,118728	2,7419797	2,2727273	0,8288636	11830,868	5456
Pacific Gannet	15,976528	4,2055556	9,9605263	11,772939	2,7993779	2,3684211	0,8460526	8761,518	4078
E.R. Georgina	16,198059	4,04	9,8536585	12,242424	3,030303	2,4390244	0,804878	10665,6	4250
Vos Patience	16,134286	4,4194444	10,06962	11,873134	2,6865672	2,278481	0,8481013	9593,73	4200
Toisa Serenade	17,461412	4,2315789	10,05	12,274809	2,9007634	2,375	0,81875	10005,78	5324
Rem Supporter	17,435134	4,245	10,228916	12,485294	2,9411765	2,4096386	0,8192771	11546,4	5300
UT 776 WP	17,099759	4,14	10,097561	12,176471	2,9411765	2,4390244	0,8292683	11260,8	5000

*DWT: toneladas de peso muerto.*

*L.o.a.: eslora total, en metros.*

*Lpp: eslora entre perpendiculares, en metros.*

*B: manga, en metros.*

*D: puntal, en metros.*

*T: calado, en metros.*

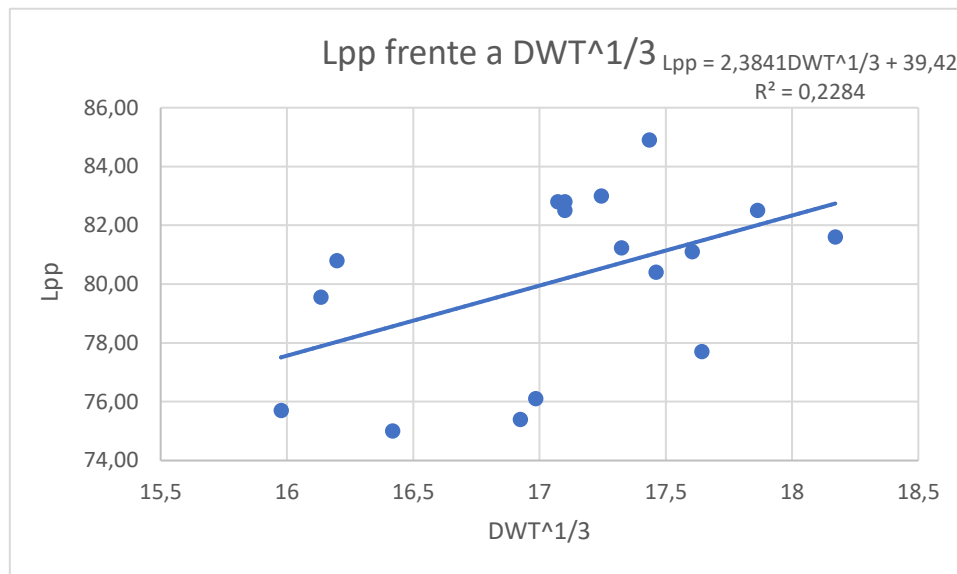
### 3 DIMENSIONAMIENTO BÁSICO

Mediante la base de datos seleccionada se realizará un dimensionamiento en el cual se partirá de una dimensión principal que, en este caso, será el peso muerto. Por lo tanto, el punto de partida será el peso muerto indicado en las RPA, 5000 t.

Con la base de datos se obtienen una serie de relaciones las cuales servirán para determinar las dimensiones del buque elegido mediante una serie de regresiones lineales.

#### 3.1 CÁLCULO DE LA ESLORA ENTRE PERPENDICULARES

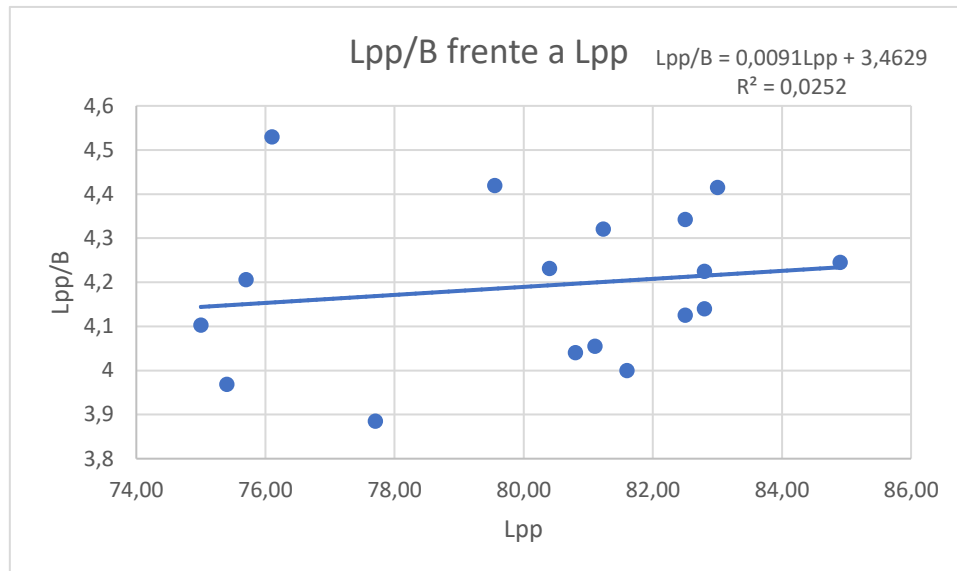
De la regresión  $L_{pp}$  frente a  $DWT^{1/3}$  se obtiene el valor de  $L_{pp}$ :



$$L_{pp} = 2,3841 \cdot DWT^{1/3} + 39,42 = 2,3841 \cdot 5000^{1/3} + 39,42 \rightarrow L_{pp} = 80,19 \text{ m}$$

### 3.2 CÁLCULO DE LA MANGA

Del valor obtenido de la eslora entre perpendiculares y de la regresión  $L_{pp}/B$  frente a  $L_{pp}$  se obtiene el valor de la manga:



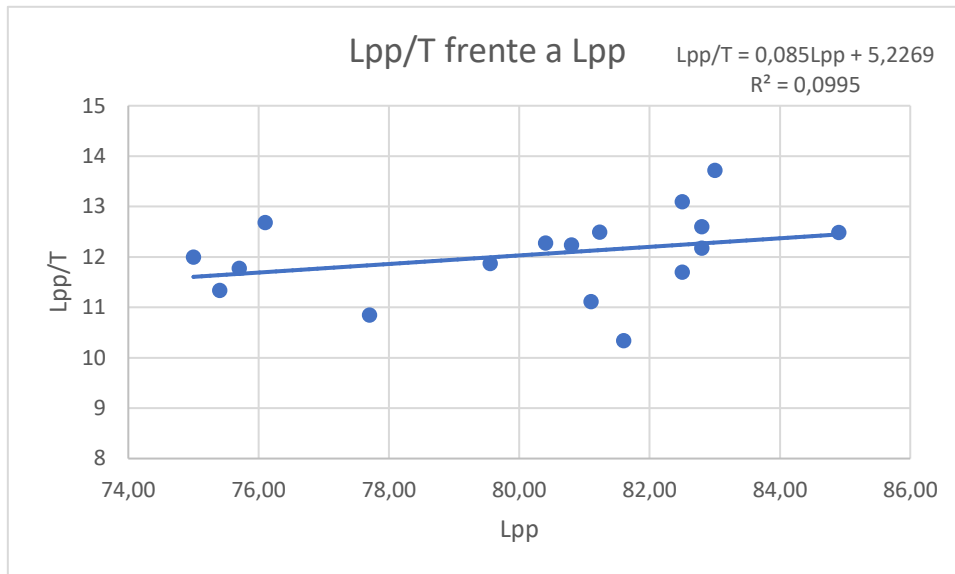
$$L_{pp}/B = 0,0091 \cdot L_{pp} + 3,4629$$

$$B = \frac{80,19}{0,091 \cdot 80,19 + 3,4629} \rightarrow B = 19,13 \text{ m}$$

### 3.3 CÁLCULO DEL CALADO

A partir de los valores anteriores se hallarán dos valores del calado mediante dos regresiones.

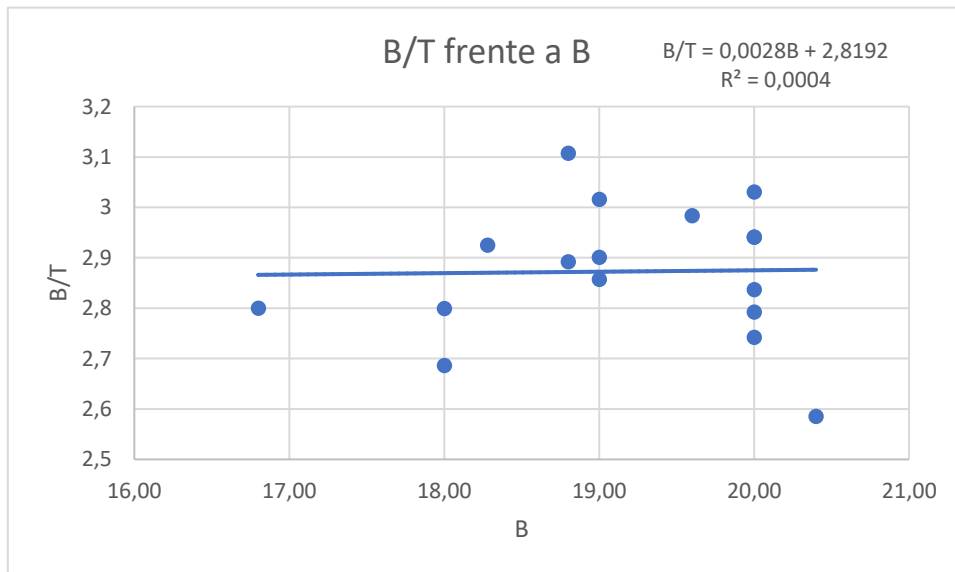
En la primera se representa  $L_{pp}/T$  frente a  $L_{pp}$ :



$$Lpp/T = 0,085 \cdot Lpp + 5,2269$$

$$T = \frac{80,19}{0,085 \cdot 80,19 + 5,2269} \rightarrow T = 6,658 \text{ m}$$

En la segunda se representa BB/T frente a B:



$$B/T = 0,0028 \cdot B + 2,8192$$

$$T = \frac{19,13}{0,0028 \cdot 19,13 + 2,8192} \rightarrow T = 6,657 \text{ m}$$

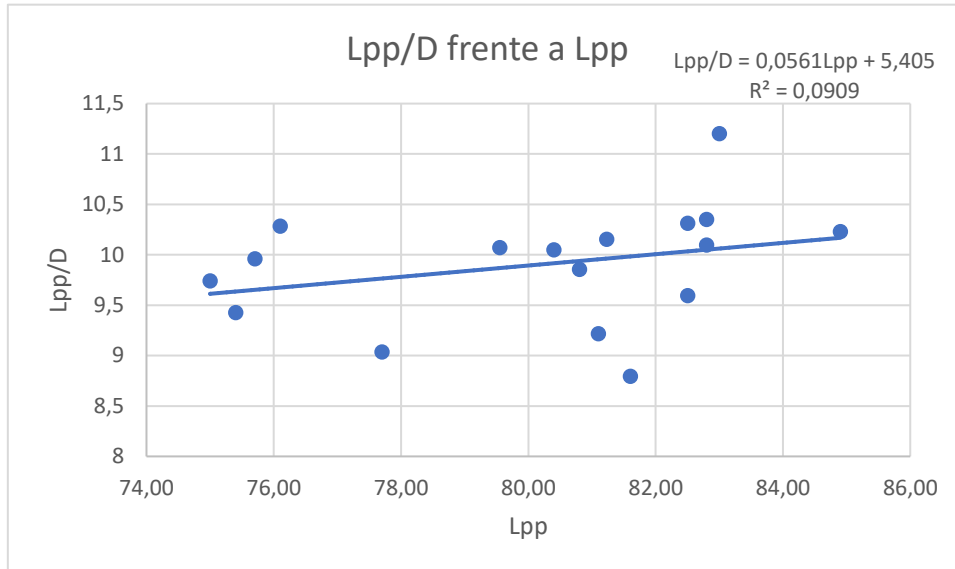
El calado usado será la media de ambos: **T = 6,658 m.**



### 3.4 CÁLCULO DEL PUNTAL

A partir de los valores obtenidos anteriormente se hallarán tres valores del puntal mediante tres regresiones.

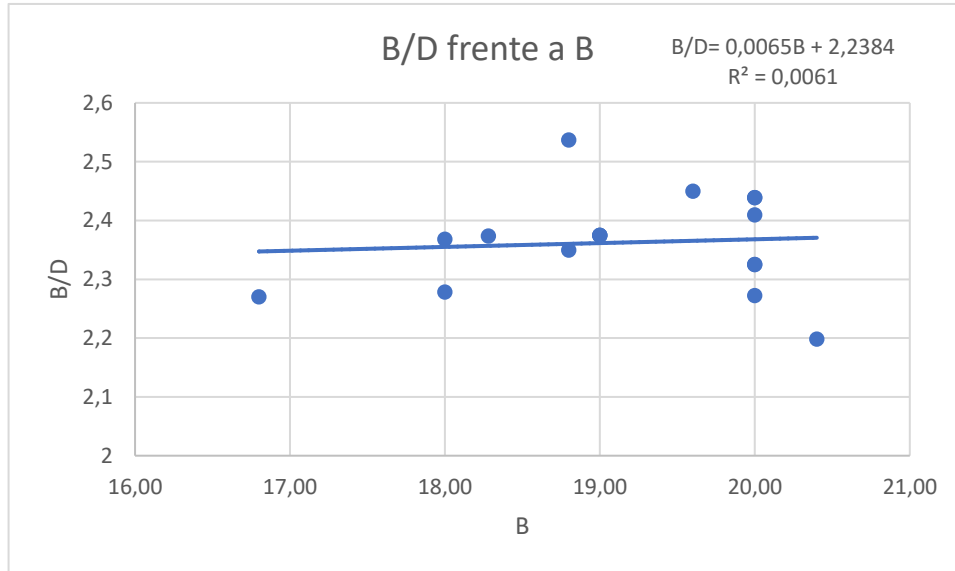
En la primera se representa  $L_{pp}/D$  frente a  $L_{pp}$ :



$$L_{pp}/D = 0,0561 \cdot L_{pp} + 5,405$$

$$D = \frac{80,19}{0,0561 \cdot 80,19 + 5,405} \rightarrow D = 8,097 \text{ m}$$

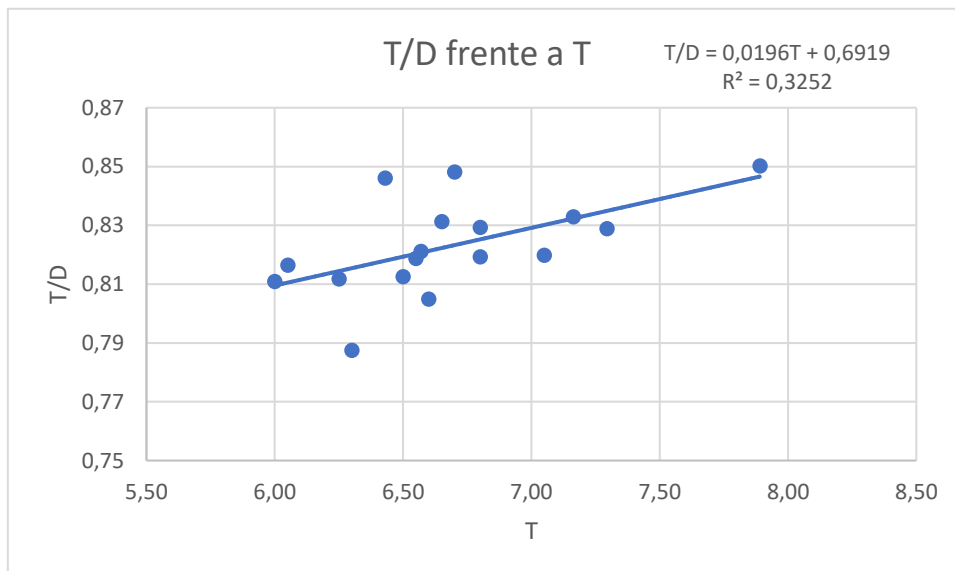
En la segunda se representa B/D frente a B:



$$B/D = 0,0065 \cdot B + 2,2384$$

$$D = \frac{19,13}{0,0065 \cdot 19,13 + 2,2384} \rightarrow D = 8,095$$

En la tercera se representa T/D frente a T:



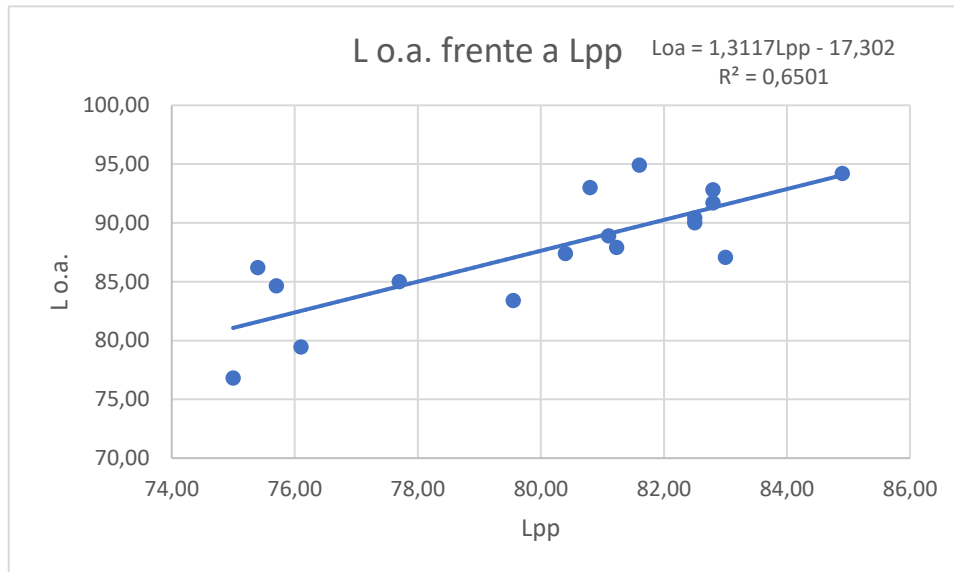
$$T/D = 0,0196 \cdot T + 0,6919$$

$$D = \frac{6,66}{0,0196 \cdot 6,66 + 0,6919} \rightarrow D = 8,096 \text{ m}$$

El puntal usado será la media de estos tres valores: **D = 8,096 m.**

### 3.5 CÁLCULO DE LA ESLORA TOTAL

Mediante el valor obtenido de la eslora entre perpendiculares se puede obtener la eslora total con la representación de  $L_{oa}$  frente a  $L_{pp}$ :



$$L.o.a. = 1,3117 \cdot L_{pp} - 17,302 = 1,3117 \cdot 80,19 - 17,302$$

$$L.o.a. = 87,88 \text{ m}$$

### 3.6 DIMENSIONES PRINCIPALES OBTENIDAS

Con estas regresiones, por lo tanto, hemos obtenido las siguientes dimensiones principales:

Toneladas de peso muerto (RPA)	5000 t
Eslora total	87,88 m
Eslora entre perpendiculares	80,19 m
Manga	19,13 m
Puntal	8,096 m
Calado	6,658 m

## 4 CÁLCULO DE COEFICIENTES

En este apartado se realizará el cálculo de los coeficientes dimensionales del buque, según diferentes formulaciones obtenidas de los apuntes de Proyectos del buque y Artefactos Marinos I.

Estos coeficientes indicarán las formas generales del buque además de dar ciertas características de cómo será el buque.

### 4.1 NÚMERO DE FROUDE

Se calculará mediante la fórmula de Froude, teniendo en cuenta que la velocidad que se usará será la de servicio en m/s:

$$Fn = \frac{V}{\sqrt{g \cdot L}} = \frac{13 \cdot 0,51444}{\sqrt{9,81 \cdot 80,19}} \rightarrow Fn = 0,238$$

### 4.2 COEFICIENTE DE BLOQUE

En este caso se utilizarán varias fórmulas de diferentes autores:

*S/ Schneekluth:*

$$Cb = \frac{0,14}{Fn} \cdot \frac{Lpp/B + 20}{26} = \frac{0,14}{0,238} \cdot \frac{80,19/19,13 + 20}{26} \rightarrow Cb = 0,546$$

*S/ Towsin:*

$$Cb = 0,7 + 0,125 \cdot \arctg [25 \cdot (0,23 - Fn)] = 0,7 + 0,125 \cdot \arctg [25 \cdot (0,23 - 0,238)] \\ Cb = 0,674$$

*S/ Alexander:*

$$Cb = K - \frac{0,5 \cdot V}{\sqrt{3,28 \cdot Lpp}}$$

La constante K se obtiene mediante los datos de la gráfica haciendo el cálculo de:

$$\frac{V}{\sqrt{3,28 \cdot Lpp}} = \frac{13}{\sqrt{3,28 \cdot 80,19}} = 0,801$$

Con el cuál, entrando en la gráfica, se obtiene una  $K = 1,055$  y obtenemos un  $Cb = 0,654$

*S/ Van Lammeren:*

$$Cb = 1,37 - 2,02 \cdot Fn = 1,37 - 2,02 \cdot 0,238 \rightarrow Cb = 0,888$$

*S/ Minorsky:*

$$Cb = 1,22 - 2,38 \cdot Fn = 1,22 - 2,38 \cdot 0,238 \rightarrow Cb = 0,652$$

*S/ Ayre* (para velocidad en servicio y buques de dos hélices):

$$Cb = 1,06 - 1,68 \cdot Fn = 1,06 - 1,68 \cdot 0,238 \rightarrow Cb = 0,659$$

*S/ Katsoulis:*

$$Cb = 0,8217 \cdot f \cdot Lpp^{0,42} \cdot B^{-0,3072} \cdot T^{0,1721} \cdot V^{-0,6135}$$

El factor  $f$  se calcula mediante el buque de la base de datos *MV Juanita* ya que se tienen todas sus dimensiones y el coeficiente de bloque, que es  $C_b = 0,747$ , por lo que despejando la  $f$  de la fórmula se obtiene un valor de  $f = 1,233$ .

Sustituyendo se obtiene un  $C_b = 0,742$ .

Como se observa se obtienen valores muy diferentes según la fórmula que se aplique. En este caso, como se dispone de un buque en la base de datos con dimensiones parecidas al de este proyecto y se tienen suficientes datos como para hacer un cálculo a través de él, se elegirá el coeficiente de bloque de la fórmula de Katsoulis ya que el valor se asemeja bastante a la realidad:

$$C_b = 0,742$$

### 4.3 COEFICIENTE DE LA SECCIÓN MEDIA O DE LA MAESTRA

Para calcular el coeficiente de la maestra se hará lo mismo que con el coeficiente de bloque, usando fórmulas de diferentes autores y eliminado los valores que se desvíen mucho de la media.

*S/ Kerlen:*

$$C_m = 1,006 - 0,0056 \cdot C_b^{-3,56} = 1,006 - 0,0056 \cdot 0,742^{-3,56} \rightarrow C_m = 0,990$$

*S/ El HSVA:*

$$C_m = \frac{1}{1 + (1 + C_b)^{3,5}} = \frac{1}{1 + (1 + 0,742)^{3,5}} \rightarrow C_m = 0,991$$

*S/ T. Torroja (Fn<0,5):*

$$C_m = 1 - 2 \cdot F_n^4 = 1 - 2 \cdot 0,238^4 \rightarrow C_m = 0,993$$

*S/ M. Meizoso:*

$$C_m = 1 - 0,062 \cdot F_n^{0,792} = 1 - 0,062 \cdot 0,238^{0,792} \rightarrow C_m = 0,980$$

Haciendo la media de todos estos valores se obtiene un coeficiente de la maestra:

$$C_m = 0,989$$

### 4.4 COEFICIENTE PRISMÁTICO

Sabiendo la relación entre los anteriores coeficientes:

$$C_b = C_p \cdot C_m$$

Y despejando el coeficiente prismático se obtiene un valor de:

$$C_p = \frac{C_b}{C_m} = \frac{0,742}{0,983}$$

$$C_p = 0,750$$

### 4.5 COEFICIENTE DE LA FLOTACIÓN

Una vez calculados el coeficiente de bloque, el coeficiente de la maestra y el coeficiente prismático, el coeficiente de la flotación queda condicionado.

$$C_f = 1 - 0,3 \cdot (1 - C_p) = 1 - 0,3 \cdot (1 - 0,671) \rightarrow C_f = 0,925$$

$$Cf = Cb + 0,1 = 0,742 + 0,1 \rightarrow Cf = 0,842$$

**S/ Schneekluth** (secciones normales):

$$Cf = \frac{1 + 2 \cdot Cb}{3} = \frac{1 + 2 \cdot 0,742}{3} \rightarrow Cf = 0,829$$

**S/J. Torroja** (para forma U):

$$Cf = 0,248 + 0,049 \cdot G + (0,778 - 0,035 \cdot G) \cdot Cb \quad G = 0 \text{ para formas U}$$

$$Cf = 0,248 + 0,778 \cdot 0,660 \rightarrow Cf = 0,825$$

En este caso, como se observa en el Cuaderno 3, el valor que más se asemeja a la realidad del buque proyecto es el primero, por lo que la primera fórmula es una buena aproximación para el buque de suministro:

$$Cf = 0,925$$

#### 4.6 CÁLCULO DEL DESPLAZAMIENTO

Por último, aunque no es un coeficiente, se hallará el valor del desplazamiento del buque mediante la fórmula siguiente:

$$\Delta = \rho \cdot Cb \cdot (1 + s) \cdot L \cdot B \cdot T$$

Donde  $\rho \cdot (1+s) = 1,030$ , y que  $\rho = 1,025 \text{ t/m}^3$  y  $s$  tiene un valor típico del 5%.

$$\Delta = 1,030 \cdot 0,742 \cdot 80,19 \cdot 19,13 \cdot 6,658 \rightarrow \Delta = 7764 \text{ t}$$

## 5 CÁLCULO DE LA CIFRA DE MÉRITO Y SELECCIÓN DE ALTERNATIVAS

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En este apartado se determinará la mejor alternativa de dimensionamiento en función de una cifra de mérito. En este caso la cifra de mérito es el coste construcción, el cual se quiere reducir todo lo posible sin que el buque pierda ninguna de las funcionalidades para las que ha sido proyectado.

Todas las fórmulas utilizadas en este apartado son las indicadas en las diapositivas de la asignatura de Proyectos del Buque y Artefactos Marinos I.

Por lo tanto, el coste de construcción (CC) viene dado por la siguiente fórmula:

$$CC = CMg + CEq + CMo + CVa$$

Donde:

CMg: coste de materiales a granel

CEq: coste de los equipos del buque

CMo: coste de la mano de obra

CVa: coste de gastos varios en los que pueda incurrir el astillero, como Sociedades de Clasificación, ensayos en el canal, etc.

### 5.1 CÁLCULO DEL COSTE DE LOS MATERIALES A GRANDEL

El coste de los materiales a granel viene dado por la siguiente fórmula:

$$CMg = cmg \cdot PS = ccs \cdot cas \cdot cem \cdot ps \cdot PS$$

Donde:

cmg: coeficiente de costo de materiales a granel

PS: peso de aceros del buque

Para el cálculo del peso del acero se usará la fórmula de Osorio encontrada en el libro de Proyectos de Buques y Artefactos del profesor Fernando Junco:

$$PS = \left(\frac{Lpp}{10}\right)^{1,3760} \cdot \left(\frac{B \cdot D}{100}\right)^{0,7449} \cdot (0,0542 - 0,0017 \cdot Cb) \cdot 1000$$

Sustituyendo obtendremos un valor de:

$$PS = 1286,10 t$$

Para realizar el cálculo del cmg, se descompone en:

ccs: coeficiente ponderado de chapa y acero de distintas calidades

$$1,05 < ccs < 1,10 - 1,50 \rightarrow ccs = 1,30$$

cas: coeficiente de aprovechamiento de acero

$$1,08 < cas < 1,15 \rightarrow cas = 1,11$$

cem: incremento por equipo metálico incluido en la estructura, como barandillas, escotillas, etc.

$$1,03 < cem < 1,10 \rightarrow cem = 1,07$$

ps: precio unitario del acero  $\approx 450\text{€/t}$

Para elegir el valor de esos coeficientes se ha usado como referencia los apuntes de la asignatura de Proyectos del buque.

Por lo tanto, el coste de materiales a granel será:

$$CMg = 1,30 \cdot 1,11 \cdot 1,07 \cdot 450 \cdot 1289,48 \rightarrow CMg = 893.587,27 \text{ €}$$

## 5.2 CÁLCULO DEL COSTE DE LOS EQUIPOS

El coste de los equipos viene dado por la siguiente fórmula:

$$CEq = CEc + CEp + CHf + CEr$$

Donde:

CEc: coste de los equipos de manipulación de la carga

CEp: coste de los equipos de propulsión y su montaje

CHf: coste de habilitación y su montaje

CEr: coste de equipo restante

Como en este caso no hay ninguna forma de estimación del coste de los equipos de manipulación de la carga en este punto del proyecto, su coste no se aplicará.

El cálculo del coste de los equipos de propulsión se desglosa en:

$$CEp = cep \cdot BP$$

Donde:

cep: coste por unidad de potencia de equipos de propulsión

$$300 < cep < 400 \frac{\text{€}}{\text{Kw}} \rightarrow cep = 350$$

BP: potencia propulsora total

Para el cálculo de la potencia propulsora se utilizará la fórmula de Watson:

$$BP = \frac{C \cdot \Delta^{2/3} \cdot \left(40 - \frac{Lpp}{61} + 400 \cdot (K - 1)^2 - 12 \cdot Cb\right)}{15000 - 1,81 \cdot N \cdot Lpp^{0,5}} \cdot V^3$$

Donde:

C: constante dependiente del tipo de buque

Para calcularla, se usará el barco de la base de datos *MV Juanita*, ya que se conoce su potencia propulsora,  $BP = 6793,2 \text{ CV}$ , y todos los demás datos necesarios. Por tanto, sustituyendo en la fórmula y despejando:  $C = 2,342$ .

K: constante hallada mediante la fórmula de Alexander

$$K = Cb + \frac{0,5 * V}{\sqrt{3,28 \cdot Lpp}} \rightarrow K = 1,143$$

N: número de revoluciones de la hélice

Como el valor no es conocido se estimará como 150 rpm.



V: velocidad de servicio

Con lo que obtenemos un valor de BP = 6085,24 CV

$$CEp = 350 \cdot 6085,24 = 2.129.833,18 \text{ €}$$

El cálculo del coste de habilitación se desglosa en:

$$CHf = chf \cdot nch \cdot NT$$

Donde:

chf: coeficiente unitario de la habilitación por tripulante  $\approx 33.000 \text{ €/tripulante}$

nch: coeficiente de nivel de calidad de la habilitación

$$0,90 < nch < 1,20 \rightarrow nch = 1,15$$

NT: número de tripulantes = 35 tripulantes (RPA)

$$CHf = 33.000 \cdot 1,15 \cdot 35 = 1.328.250 \text{ €}$$

El cálculo del coste de los equipos restantes:

$$CEr = ccs \cdot ps \cdot PEr$$

Donde:

ccs: coeficiente ponderado de chapa y acero de distintas calidades

$$1,05 < ccs < 1,10 - 1,50 \rightarrow ccs = 1,30$$

ps: precio unitario del acero  $\approx 450\text{€/t}$

PEr: peso de equipo restante

$$PEr = K \cdot Lpp^{1,3} \cdot B^{0,8} \cdot D^{0,3}$$

$$0,03 < K < 0,05 \rightarrow K = 0,04$$

$$PEr = 237,23 \text{ t}$$

Por lo que:

$$CEr = 1,30 \cdot 450 \cdot 237,23 = 138.781,85 \text{ €}$$

Entonces, el coste total de los equipos será:

$$CEq = 2.129.833,18 + 1.328.250 + 138.781,85 \rightarrow CEq = 3.596.865,03 \text{ €}$$

### 5.3 CÁLCULO DEL COSTE DE LA MANO DE OBRA

El coste de la mano de obra viene dado por la siguiente fórmula:

$$CMo = chm \cdot csh \cdot PS$$

Donde:

chm: costo horario medio del astillero

$$21/25 < chm < 10/40 \text{ €/hora} \rightarrow chm = 30$$

csh: coeficiente de horas por unidad de peso

$$20/30 < csh < 80/100 \text{ €/hora} \rightarrow csh = 90$$

PS: peso de aceros del buque = 1286,10 t

Por lo tanto, el coste de la mano de obra:

$$CMo = 30 \cdot 90 \cdot 1286,10 \rightarrow \mathbf{CMo = 3.472.466,91 \text{ €}}$$

#### 5.4 CÁLCULO DEL COSTE DE GASTOS VARIOS

El coste de gastos varios viene dado por la siguiente fórmula:

$$CVa = cva \cdot CCo$$

Donde:

cva: 8% del coste de construcción

CCo: coste de construcción antes de gastos varios

$$CCo = CMg + CEq + CMo = 7.962.912,21 \text{ €}$$

Por lo que:

$$CVa = 0,08 \cdot 7.962.912,21 \rightarrow \mathbf{CVa = 637.033,54 \text{ €}}$$

#### 5.5 CÁLCULO DEL COSTE DE CONSTRUCCIÓN TOTAL

El coste de construcción total será la suma de todos los costes calculados anteriormente, dando un resultado de:

$$\mathbf{CC = 8.599.952,75\text{€}}$$

#### 5.6 OPTIMIZACIÓN DE LA ALTERNATIVA INICIAL

Después de haber calculado el coste de construcción total con las dimensiones obtenidas anteriormente, se va a realizar la optimización de estas dimensiones para así intentar reducir la cifra de mérito, es decir, el coste de construcción.

Para realizarlo, se hará lo siguiente:

- Variar la eslora entre perpendiculares un  $\pm 10\%$ , obteniendo:
  - un valor mínimo de 72,17 m,
  - un valor máximo de 88,21 m y,
  - en cada iteración una variación de 1,60 m.
  
- Para cada valor de eslora se hará variar la manga un  $\pm 10\%$ , obteniendo:
  - un valor mínimo de 17,21 m,
  - un valor máximo de 21,04 m y,
  - en cada iteración una variación de 0,38 m.
  
- Para cada valor de manga se hará variar el coeficiente de bloque un  $\pm 3\%$ , obteniendo:
  - un valor mínimo de 0,720,
  - un valor máximo de 0,764 y,
  - en cada iteración una variación de 0,004.

- El calado variará con la fórmula:

$$T = \frac{\Delta}{1,25 \cdot Lpp \cdot B \cdot Cb}$$

- El puntal variará con la relación:

$$D = \frac{Lppinicial \cdot Binicial \cdot Dinicial}{Lpp \cdot B}$$

Además de estos datos se añadirán también los costes, ya que están relacionados con las dimensiones principales, para así poder observar los cambios que sufren al variarlas.

También se añadirán las relaciones adimensionales usadas en el dimensionamiento con una serie de restricciones, obtenidas de la base de datos, para poder elegir una alternativa que sea coherente con los buques que existen actualmente.

Se ha sido más restrictivo con el L/T ya que es el valor con más volatilidad, por tanto, se ha disminuido el rango para obtener resultados más favorables

Las restricciones usadas son:

$$4,000 < \frac{L}{B} < 4,530$$

$$8,973 < \frac{L}{D} < 10,284$$

$$11,119 < \frac{L}{T} < 12,689$$

$$2,198 < \frac{B}{D} < 2,537$$

$$2,586 < \frac{B}{T} < 3,107$$

$$0,787 < \frac{T}{D} < 0,850$$

Utilizando siempre la eslora entre perpendiculares.

Para hacer variar el desplazamiento se ha usado la fórmula:

$$\Delta = \Delta_{inicial} + DPS + DPEr + DPMAq$$

Donde:

DPS: diferencia de peso del acero, PS alternativas – PS inicial

DPer: diferencia de peso del equipo restante, PEr alternativas – PEr inicial

DPMAq: diferencia de peso de la maquinaria, PMAq alternativas – PMAq inicial

$$PMAq = 0,075 \cdot MCR(Kw) + 300$$

El peso en rosca se calcula mediante la fórmula:

$$PR = \Delta - PM$$

Se restringirá también el coste de construcción total para que no pueda ser mayor al obtenido previamente:

$$CC < 8.599.952,75 \text{ €}$$

Se tiene en cuenta que:

$$L \cdot B \cdot T > 5000$$

Una vez aplicados todos estos filtros se han obtenido un total de 42 alternativas, de las cuáles las 25 más baratas son:

SANDRA ALLEGUE GARCÍA  
CUADERNO 1

Alt. Inicial: 80,19 87,88 19,13 0,742 6,658 8,096 4,193 9,905 12,044 2,362 2,873 0,822 7.764 2.764 5.000 8.599.952,75 €

	Lpp (m)	Loa (m)	B (m)	Cb	T (m)	D (m)	L/B	L/D	L/T	B/D	B/T	T/D	Δ (t)	PR (t)	PM (t)	CC
<b>1</b>	76,98	83,67	19,13	0,742	6,891	8,433	4,025	9,128	11,171	2,268	2,775	0,817	7.714	2.714	5.000	8.421.993,73 €
<b>2</b>	76,98	83,67	19,13	0,737	6,922	8,433	4,025	9,128	11,120	2,268	2,763	0,821	7.703	2.703	5.000	8.425.824,83 €
<b>3</b>	76,98	83,67	19,13	0,746	6,842	8,433	4,025	9,128	11,251	2,268	2,795	0,811	7.705	2.705	5.000	8.432.660,93 €
<b>4</b>	76,98	83,67	19,13	0,760	6,720	8,433	4,025	9,128	11,455	2,268	2,846	0,797	7.703	2.703	5.000	8.434.451,64 €
<b>5</b>	76,98	83,67	19,13	0,755	6,760	8,433	4,025	9,128	11,387	2,268	2,829	0,802	7.704	2.704	5.000	8.436.493,33 €
<b>6</b>	76,98	83,67	19,13	0,764	6,684	8,433	4,025	9,128	11,517	2,268	2,861	0,793	7.707	2.707	5.000	8.439.977,43 €
<b>7</b>	76,98	83,67	19,13	0,751	6,812	8,433	4,025	9,128	11,300	2,268	2,808	0,808	7.718	2.718	5.000	8.447.014,96 €
<b>8</b>	78,58	85,78	18,74	0,742	6,892	8,430	4,193	9,322	11,402	2,223	2,720	0,818	7.718	2.718	5.000	8.459.012,38 €
<b>9</b>	78,58	85,78	18,74	0,728	7,020	8,430	4,193	9,322	11,194	2,223	2,670	0,833	7.720	2.720	5.000	8.464.342,34 €
<b>10</b>	78,58	85,78	18,74	0,746	6,854	8,430	4,193	9,322	11,466	2,223	2,735	0,813	7.721	2.721	5.000	8.477.815,19 €
<b>11</b>	78,58	85,78	18,74	0,760	6,742	8,430	4,193	9,322	11,656	2,223	2,780	0,800	7.732	2.732	5.000	8.478.253,49 €
<b>12</b>	78,58	85,78	18,74	0,733	6,988	8,430	4,193	9,322	11,246	2,223	2,682	0,829	7.731	2.731	5.000	8.482.942,03 €
<b>13</b>	78,58	85,78	18,74	0,755	6,765	8,430	4,193	9,322	11,616	2,223	2,771	0,803	7.713	2.713	5.000	8.485.265,71 €
<b>14</b>	78,58	85,78	18,74	0,751	6,812	8,430	4,193	9,322	11,535	2,223	2,751	0,808	7.721	2.721	5.000	8.488.313,30 €
<b>15</b>	78,58	85,78	19,13	0,764	6,578	8,261	4,109	9,512	11,947	2,315	2,908	0,796	7.742	2.742	5.000	8.489.946,30 €
<b>16</b>	78,58	85,78	18,74	0,764	6,685	8,430	4,193	9,322	11,755	2,223	2,804	0,793	7.711	2.711	5.000	8.490.726,82 €
<b>17</b>	78,58	85,78	18,74	0,724	7,067	8,430	4,193	9,322	11,119	2,223	2,652	0,838	7.725	2.725	5.000	8.491.658,86 €
<b>18</b>	78,58	85,78	19,13	0,720	6,979	8,261	4,109	9,512	11,260	2,315	2,741	0,845	7.736	2.736	5.000	8.499.779,53 €
<b>19</b>	78,58	85,78	19,51	0,755	6,524	8,099	4,028	9,703	12,045	2,409	2,990	0,806	7.742	2.742	5.000	8.511.392,69 €
<b>20</b>	78,58	85,78	19,13	0,724	6,939	8,261	4,109	9,512	11,325	2,315	2,756	0,840	7.740	2.740	5.000	8.511.850,27 €
<b>21</b>	78,58	85,78	19,13	0,733	6,854	8,261	4,109	9,512	11,466	2,315	2,791	0,830	7.738	2.738	5.000	8.513.249,74 €
<b>22</b>	78,58	85,78	19,51	0,728	6,756	8,099	4,028	9,703	11,632	2,409	2,888	0,834	7.733	2.733	5.000	8.517.613,26 €
<b>23</b>	78,58	85,78	19,51	0,733	6,733	8,099	4,028	9,703	11,671	2,409	2,897	0,831	7.754	2.754	5.000	8.525.946,63 €
<b>24</b>	78,58	85,78	19,51	0,724	6,798	8,099	4,028	9,703	11,560	2,409	2,870	0,839	7.734	2.734	5.000	8.526.420,97 €
<b>25</b>	78,58	85,78	19,51	0,720	6,841	8,099	4,028	9,703	11,488	2,409	2,852	0,845	7.734	2.734	5.000	8.526.667,60 €

Como mejor alternativa no se ha elegido la más barata, si no en la cual el L/T se asemeje más al valor medio de la base de datos, que es 12.

Así, las nuevas dimensiones y los nuevos coeficientes serán:

$L_{pp} = 78,58 \text{ m}$
$Loa = 85,78 \text{ m}$
$B = 19,13 \text{ m}$
$T = 6,578 \text{ m}$
$D = 8,261 \text{ m}$
$BHP = 6.094 \text{ CV} = 4.480 \text{ kW}$
$\Delta = 7.742 \text{ t}$
$F_n = 0,241$
$C_b = 0,764$
$C_m = 0,989$
$C_p = 0,772$
$C_f = 0,925$
$Acubierta = 0,7 \cdot L_{pp} \cdot 0,9 \cdot B = 947 \text{ m}^2$

El valor del coste de construcción total se ha reducido en:

$$Ahorro = 8.562.581,90 \text{ €} - 8.489.946,30 \text{ €} = 110.006,44 \text{ €}$$

Aún sin ser la mejor alternativa en cuestión de coste se ha obtenido bastante reducción en el mismo.

## 6 PREDICCIÓN DE POTENCIA

Para la predicción de potencia se usará el programa NavCad, del cual se obtendrá la resistencia al avance, la potencia propulsora y la hélice.

Para los cálculos se han usado los siguientes datos:

<b>Project</b>		
Project ID:		
Description:		
<b>Summary</b>		
Scope:	Undefined	▼
Configuration:	Monohull	▼
Chine type:	Round/multiple	▼
Length on WL:	83,090	m
Displacement:	7742,00	t
Propulsor type:	Propeller	▼
Count:	2	▼
<b>Water properties</b>		
Water type:	Salt	▼
Density:	1026,00	kg/m3
Viscosity:	1,18920e-6	m2/s
<b>Speeds</b>		
Speed [01]	7,00	kt
Speed [02]	8,00	kt
Speed [03]	9,00	kt
Speed [04]	10,00	kt
Speed [05]	11,00	kt
Speed [06]	12,00	kt
Speed [07]	13,00	kt
Speed [08]	14,00	kt
Speed [09]	15,00	kt
Speed [10]	16,00	kt
<b>Design condition</b>		
Design speed:	13,00	▼ kt

La eslora en la flotación se ha determinado mediante el plano del buque base.

<b>Hull</b>		
Configuration:	Monohull	▼
Chine type:	Round/multiple	▼
<b>General</b>		
Length on WL:	83,090	m
Max beam on WL:	19,130	m
Max molded draft:	6,578	m
Displacement:	7742,00	t
Wetted surface:	1693,7	m2
Demi-hull spacing:		m
<b>ITTC-78 (CT)</b>		
LCB fwd TR:	41,545	m
LCF fwd TR:	51,545	m
Max section area:	124,5	m2
Waterplane area:	1351,1	m2
Bulb section area:	11,1	m2
Bulb ctr below WL:	3,503	m
Bulb nose fwd TR:	87,000	m
Imm transom area:	0,0	m2
Transom beam WL:	0,000	m
Transom immersion:	0,000	m
Half entrance angle:	33,61	deg
Bow shape factor:	1,0	[WL flow]
Stern shape factor:	1,0	[WL flow]

<b>Appendage</b>		
Definition:	Percentage	▼
Percent of hull drag:	15.00	... %

Tanto en las formas de popa como en las de proa se ha seleccionado la forma en U. En los apéndices se estima un 15%.

<b>Margin</b>		
Design margin:	15	... %
Basis:	Hull drag only	▼

Como margen de mar se ha indicado el que aparece en las RPA, un 15%.

<b>Vessel drag</b>	Calc	▼	ITTC-78 (CT)
Technique:			Prediction
Prediction:			Holtrop
Reference ship:			
Model LWL:	[m]		
<b>Viscous</b>			
Expansion:			Custom
Friction line:			ITTC-57
Hull form factor:	On	▼	1,369
Speed corr:	Off	▼	
Spray drag corr:	Off	▼	
Corr allowance:			0,000000
Roughness [mm]:	Off	▼	
<b>Catamaran</b>			
Interference:	Off		
<b>Added drag</b>			
Appendage:	Calc	▼	Percentage
Wind:	Off	▼	
Seas:	Off	▼	
Shallow/channel:	Off	▼	
Towed:	Off	▼	
Margin:	Calc	▼	Hull drag only [15%]

Para el cálculo de la resistencia se ha usado el método Holtrop, obteniendo como resultados una resistencia de 174,35 kN.

Ahora, para los cálculos de la hélice se ha introducido el diámetro utilizando como guía los planos del buque base y se ha optado por una hélice de 4 palas ya que al hacer los cálculos era la que ofrecía un mejor rendimiento.

Como se observa a continuación obtenemos:

- el ratio del área expandida y,
- el paso de la hélice.

Se ha usado el método de predicción Holtrop, fijando las RPM del motor a 1200, siendo estas las del buque base.



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CUADERNO 1

<b>Propulsor</b>		
Count:	2	▼
Propulsor type:	Propeller series	▼
Propeller type:	CPP	▼
Propeller series:	B Series	▼
Propeller sizing:	By total drag	▼
Reference prop:		
Blade count:	4	▼
Expanded area ratio:	0,3811	
Propeller diameter:	2500,0	mm
Propeller mean pitch:	2329,7	mm
Hub immersion:	3503,0	mm
<b>Engine/gear</b>		
Engine data:	None defined	▼
Rated RPM:		RPM
Rated power:		kW
Gear efficiency:	1,000	...
Load correction:	Off	▼
Gear ratio:	5,418	
Shaft efficiency:	0,980	...
<b>Propeller options</b>		
Oblique angle corr:	Off	▼
Shaft angle to WL:	0,00	deg
Added rise of run:	0,00	deg
Propeller cup:	0,0	mm
KTKQ corrections:	Custom	▼
Scale correction:	None	▼
KT multiplier:	1,000	...
KQ multiplier:	1,000	...

<b>Hull-propulsor</b>	Calc	▼
Technique:		Prediction ▼
Prediction:		Holtrop ...
Reference ship:		
Max prop diam:	[mm]	2500,0
<b>Corrections</b>		
Viscous scale corr:	Off	▼
Rudder location:		
Friction line:		
Hull form factor:		
Corr allowance:		
Roughness [mm]:	Off	
Ducted prop corr:	Off	▼
Tunnel stern corr:	Off	▼
Effective diam:	[m]	
Recess depth:	[m]	
<b>System analysis</b>		
Cavitation criteria:		Keller eqn ▼
Analysis type:		Free run ▼
CPP method:		Fixed RPM ▼
Engine RPM:		1200,0 ...

Por lo que se obtiene, para la velocidad de servicio, una potencia de 1984,7 kW.  
Se adjuntan como anexo todos los informes obtenidos en NavCad.

## 7 VALIDACIÓN TÉCNICA DE LA SOLUCIÓN MÁS FAVORABLE

En este apartado se realizará el cálculo preliminar de los pesos del buque de forma que se pueda validar la alternativa que se ha obtenido anteriormente.

### 7.1 ESTUDIO DEL PESO MUERTO

Como en el peso muerto es un dato fijado en las RPA debemos valorar, a partir de este, el resto de partidas del buque, que se dividen en:

- Carga útil
- Consumos
- Tripulación
- Pertrechos

#### 7.1.1 Consumos

Los consumos se dividirán en:

- Combustible
- Aceite
- Agua dulce
- Víveres

Todos los consumos se calcularán para la autonomía de 6000 millas a la velocidad de servicio, definida en la RPA.

##### Combustible:

Respecto al combustible se utilizan dos tipos de combustible, diésel para la navegación y LNG para estancias en puerto, por lo que hay que calcular ambas partidas por separado.

Para el diésel, el consumo específico suele ser 190 – 217 g/kW·h, se cogerá el valor medio:

$$\text{Consumo específico} = \frac{190 + 217}{2} = 203 \frac{g}{kW \cdot h}$$

Por lo que, el consumo del combustible será:

$$\text{Consumo DO} = \frac{6000 \text{ millas}}{13 \text{ nudos}} \cdot \frac{203 \text{ g}}{kW \cdot h} \cdot 1984,7 \text{ kW} \cdot \frac{1 \text{ t}}{10^6 \text{ g}} \cdot 0,85 = 158 \text{ t}$$

Para el gas natural licuado, el consumo específico es de 162,17 g/kW·h. Como solo se usará el LNG en las estancias en puerto, se estimará que el buque pasará 5 días en puerto.

$$\text{Consumo LNG} = 5 \text{ días} \cdot 24 \text{ horas} \cdot \frac{162,17 \text{ g}}{kW \cdot h} \cdot 1984,7 \text{ kW} \cdot \frac{1 \text{ t}}{10^6 \text{ g}} \cdot 0,85 = 11,6 \text{ t}$$

##### Aceite:

Para el cálculo del aceite, no hay suficientes datos para en esta fase del proyecto, ya que la cantidad que se transporta están recomendadas por los suministradores de los equipos. Por lo tanto, se usará la estimación de que el aceite transportado es un 3% al peso de combustible de propulsión:

$$0,03 \cdot 158 + 0,03 \cdot 32,83 = 5,72 \text{ t}$$

##### Agua dulce:

En esta partida solo se añadirá el agua dulce usada para consumo propio, no se añade el agua que el buque entrega a la plataforma.

La estimación se hará con unos 175 litros por persona y por día, quedando:

$$175 \text{ litros} \cdot 35 \text{ personas} \cdot \frac{6000}{13 \cdot 24} \text{ días} = 117,79 \text{ t}$$

#### Víveres:

En esta partida de proyectos, en el libro de Proyectos del Buque se recomienda 5 kg por persona y día en buques mercantes y 15 kg por persona y día en buques de pasaje.

Este proyecto no se considera un buque de pasaje, pero como existe un transporte de personal hacia la plataforma, se usará el valor medio de ambos valores: 10 kg.

$$5 \text{ kg} \cdot 35 \text{ personas} \cdot \frac{6000}{13 \cdot 24} \text{ días} = 3,36 \text{ t}$$

Sumando todas las partidas:

$$\text{Consumos} = 158 + 11,6 + 6,71 + 134,62 + 3,36 = 314,29 \text{ t}$$

### **7.1.2 Tripulación y pasaje**

Según el libro de Proyectos del Buque para calcular el peso de la tripulación y pasaje se considerará 125 kg por tripulante y 125-200 kg por pasaje. Como en las RPA no se distingue si las 35 personas son tripulante o pasaje se determinará que 25 personas son tripulantes y las 10 personas restantes son personal de la plataforma, que se tomará como pasajeros, por lo que:

$$125 \text{ kg} \cdot 25 \text{ personas} = 3,125 \text{ t}$$

$$200 \cdot 10 \text{ personas} = 2 \text{ t}$$

### **7.1.3 Pertrechos**

Esta cifra, según el libro, es variable y el campo de variación es entre 10 t y 100 t según el tamaño del buque.

Para el buque proyecto se elegirá un valor de 40 t ya que no es un barco excesivamente grande.

### **7.1.4 Carga útil**

Por tanto, después de haber hecho todos los cálculos y teniendo en cuenta que el peso muerto se marca mediante RPA (5000 TPM), se calculará la carga útil:

$$\text{Carga útil} = \text{Peso Muerto} - \text{Consumos} - \text{Tripulación y Pasaje} - \text{Pertrechos}$$

$$\text{Carga útil} = 4586,525 \text{ t} \cong 4587 \text{ t}$$

## **7.2 PESO EN ROSCA**

Según el libro de Proyecto del Buque para hacer el cálculo del peso en rosca en un buque de suministro, puede ser calculado de la siguiente manera:

$$\text{Peso en Rosca} = \text{Pacero} + \text{Pmaquinaria} + \text{Pequipo}$$

$$\text{Peso en Rosca} = 0,14 \cdot L \cdot B \cdot D + 0,03 \cdot BHP + 0,045 \cdot L \cdot B \cdot D$$

$$\text{Peso en Rosca} = 0,14 \cdot 78,58 \cdot 19,13 \cdot 8,261 + 0,03 \cdot 2007 + 0,04 \cdot 78,58 \cdot 19,13 \cdot 8,261$$

$$\text{Peso en Rosca} = 2295,5 \text{ t} \cong 2296 \text{ t}$$

Ahora, con el peso en rosca y con el peso muerto se calculará el desplazamiento:

$$\Delta = P_{\text{muerto}} + P_{\text{rosca}} = 5000 + 2296$$

$$\Delta = 7.296 \text{ t} < 7.742 \text{ t}$$

Se observa que, comparándolo con el desplazamiento obtenido en las alternativas, se obtiene un margen de 446 t que ese podría meter de carga o para pesos no contemplados en las partidas.

Haciendo un cálculo paralelo con la potencia a 15 nudos de 4917 kW se observa que todavía se obtiene un margen bastante respetable, ya que:

$$\text{Peso en Rosca} = P_{\text{acero}} + P_{\text{maquinaria}} + P_{\text{equipo}}$$

$$\text{Peso en Rosca} = 0,14 \cdot L \cdot B \cdot D + 0,03 \cdot BHP + 0,045 \cdot L \cdot B \cdot D$$

$$\text{Peso en Rosca} = 0,14 \cdot 78,58 \cdot 19,13 \cdot 8,261 + 0,03 \cdot 4917 + 0,04 \cdot 78,58 \cdot 19,13 \cdot 8,261$$

$$\text{Peso en Rosca} = 2382,79 \text{ t} \cong 2383 \text{ t}$$

$$\Delta = P_{\text{muerto}} + P_{\text{rosca}} = 5000 + 2383$$

$$\Delta = 7.383 \text{ t} < 7.742 \text{ t}$$

Se obtiene un margen de 359 t.

## 8 FRANCOBORDO

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Para hacer el cálculo del francobordo se va utilizar como herramienta el Excel proporcionado en la asignatura de Proyectos, el cual está hecho basándose en el Convenio Internacional de Líneas de Carga.

Solo se indicarán las reglas aplicables.

Los datos para utilizar son:

### INTERNATIONAL CONVENTION ON LOAD LINES 1966/1988

Moulded Breadth (B)	19,13 m
Least Moulded Depth	8,261 m
85% Least Moulded Depth	7,022 m
Freeboard deck thickness at side	10 mm
Freeboard Depth (D)	8,271 m
Length of the waterline at 7,022 m of depth	84,59 m
Length betw. Perp. at 7,022 m of depth	77,51 m
Freeboard Length (L)	81,206 m
Volume without appendages at 7,022 m of depth	8334,07247 m <sup>3</sup>
Block coefficient	0,764

### 8.1 TIPO DE BUQUE

Según el Convenio Internacional sobre Líneas de Carga:

Un buque tipo A “será el que haya sido proyectado para transportar solamente cargas líquidas a granel”.

Un buque tipo B serán “los buques que no se ajusten a lo dispuesto para los buques de tipo A”

Por lo que, el buque proyecto será claramente de tipo B, porque, aunque se transporten cargas líquidas a granel también se transporta carga sólida.

### 8.2 TABLAS DE FRANCOBORDO

El francobordo tabular será diferente según el tipo de buque, ya que se determina por medio de interpolación con tablas diferentes, por lo que es muy importante tenerlo bien definido.

Para este caso:

**R-28 Tabular Freeboard**

*Applicable*

<i>Table</i>	
<i>L</i>	<i>freeboard</i>
81	905
82	923

<i>L</i>	<i>freeboard</i>
81,206	909

R-28	909
------	-----

**8.3 CORRECCIÓN PARA BUQUES DE MENOS DE 100 M DE ESLORA**

Esta corrección solo se aplica para buques de tipo B.

Para esta corrección se necesita saber las superestructuras que tiene el buque, para esto se utilizará el buque base *Rem Supporter*, que solamente cuenta con castillo de proa de 26,06 m. Para el cálculo se usa la fórmula:

$$7,5 \cdot (100 - L) \cdot \left(0,35 - \frac{E1}{L}\right)$$

**R-29 Correction for ships under 100 m in length**

*Applicable*

Effective length of superstructure (E)	26,06 m
Length of trunks	0 m
Effective length of superstructure (E1)	26,06 m

R-29	5
------	---

**8.4 CORRECCIÓN POR COEFICIENTE DE BLOQUE**

Cuando el coeficiente de bloque es superior a 0,68 el francobordo tabular se modificará según:

$$\frac{Cb + 0,68}{1,36}$$

**R-30 Correction for block coefficient**

*Applicable*

R-28	909
R-29	5
<i>freeboard</i>	914

Factor 1,0618

R-30	57
------	----

### 8.5 CORRECCIÓN POR PUNTAL

Esta corrección se aplicará cuando el puntal exceda  $L/15$  y se aumentará en:

$$\left(D - \frac{L}{15}\right) \cdot R \text{ siendo: } R = \frac{L}{0,48}$$

También se aplicará, aunque lo anterior no cumpla, si las superestructuras cerradas cubran al menos una longitud de  $0,6 \cdot L$ .

<b>R-31 Correction for depth</b>			<i>Applicable</i>
Enclosed superstructure length		26,06 m	<0.6*L
Height of superstructure		8,509 m	
Standard Height		1,862 m	
R	169,1792	Standard Height correction	1
Correction	484		
			R-31      484

### 8.6 ALTURA NORMAL DE LAS SUPERESTRUCTURAS

La altura se saca mediante interpolación, que en este caso el valor es:

<b>R-33 Standard height of superstructure (in m)</b>		<i>Applicable</i>
<i>Raised quarterdeck</i>	<i>All Other superstructures</i>	
1,274	1,862	

### 8.7 LONGITUD NORMAL Y EFECTIVA DE LAS SUPERESTRUCTURAS

En este caso, solo existe castillo de proa, por lo que:

<b>R-34/35 Effective length of superstructure (in m)</b>						<i>Applicable</i>
<i>Superstructure</i>	<i>Length (S)</i>	<i>Sup. br. (b)</i>	<i>Ship br. (Bs)</i>	<i>Height</i>	<i>Effective Length (E)</i>	
Forecastle	26,060	9,565	9,565	2,500	26,060	
<i>centre</i>						
Poop						



<i>Raised quarterdeck</i>	<i>Length (S)</i>	<i>Sup. br. (b)</i>	<i>Ship br. (Bs)</i>	<i>Height</i>	<i>Effective Length ( E )</i>

### 8.8 REDUCCIÓN POR SUPERESTRUCTURAS Y TRONCOS

Como la superestructura es inferior a 1L, la reducción viene tabulada:

<b>R-37 Deduction for superstructures and trunks</b>	<i>Applicable</i>
--	-------------------

<i>Length of Superstructure</i>	26,06 m
<i>Length of Trunks</i>	0 m
<i>Effective Length ( E )</i>	26,06 m
<i>Effective Length ( E )</i>	0,3209 *L
Deduction for 1L	828 mm

E	%
0,3	21
0,3209	23,1
0,4	31

R-37	-192
------	------

### 8.9 ARRUFO

En este caso no existe arrufo en la cubierta, aunque en este apartado también se aplicará el arrufo existente en las superestructuras

<b>R-38 Sheer</b>	<i>Applicable</i>
-------------------	-------------------

<i>Standard Sheer Profile</i>			
Station	Ordinate	Factor	Product
After perpendicular	927	1	927
1/6 L from A.P.	411	3	1233
1/3 L from A.P.	104	3	312
Amidships	0	1	0
Amidships	0	1	0
1/3 L from A.P.	208	3	624
1/6 L from A.P.	823	3	2469
Forward perpendicular	1853	1	1853
			After Sheer 2472
			Forward Sheer 4946

<i>Sheer Profile</i>					
Station	Ordinate	Sum for Le=L	Total	Factor	Product
After perpendicular	0	0	0	1	0
1/6 L from A.P.	0	0	0	3	0
1/3 L from A.P.	0	0	0	3	0
Amidships	0	0	0	1	0
					After Sheer 0

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Amidships	0	0	0	1	0	
1/3 L from F.P.	0	0	0	3	0	
1/6 L from F.P.	0	0	0	3	0	
Forward perpendicular	0	0	0	1	0	Forward Sheer 0

Forward and After corrections for Sheer be allowed

Corrected After Product Difference      -2472  
 Corrected Forward Product  
 Difference                                      -4946

Sheer credit for poop or forecastle

	Real	Standard	Difference	s
<b>Forecastle</b>	2500	1862	638	68
<b>Poop</b>				

After Sheer variation                      -309  
 Forward Sheer  
 variation                                      -550  
 Sheer variation                              -429

Total length of enclosed superstructures (S1)      26,060 m  
 Extension in midships of superstructures  
 (over L)    0 \*L

Factor                              0,589  
    5 Correction              253 mm

Freeboard correction                      253 mm

R-38	253
------	-----

### 8.10 FRANCOBORDOS MÍNIMOS

Ahora se sumarán todos los apartados anteriores para obtener los diferentes francobordos:

<b>R-40 Minimum freeboards</b>	<i>Applicable</i>
--------------------------------	-------------------

Minimum freeboard without R-32

50 mm

R-28 909 mm  
 R-29 5 mm

Freeboard in Salt Water 1516 mm

R-30 57 mm

<i>Minimum Summer Freeboard</i>	<i>1516 mm</i>
<i>Maximum Summer Draught</i>	<i>6755 mm</i>

R-31 484 mm  
 R-32.1 mm

Maximum Scantling Draught 8000 mm

R-37 -192 mm

Maximum Stability Draught 7297 mm

R-38 253 mm  
**Sum 1516 mm**

R-39.1 0 mm  
 R-39.2 0 mm  
**Sum 1516 mm**

<b><i>Summer Freeboard</i></b>	<b><i>1516 mm</i></b>
<b><i>Summer Draught</i></b>	<b><i>6755 mm</i></b>
<b><i>Tropical Freeboard</i></b>	<b><i>1376 mm</i></b>
<b><i>Winter Freeboard</i></b>	<b><i>1657 mm</i></b>
<b><i>Winter N. Atlantic Freeboard</i></b>	<b><i>1707 mm</i></b>
<b><i>Fresh Water</i></b>	<b><i>1502 mm</i></b>

R-32 0 mm

Displacement at 6,755 m 10816,4 ton  
 TPCM at 6,755 m 18,74 ton/cm

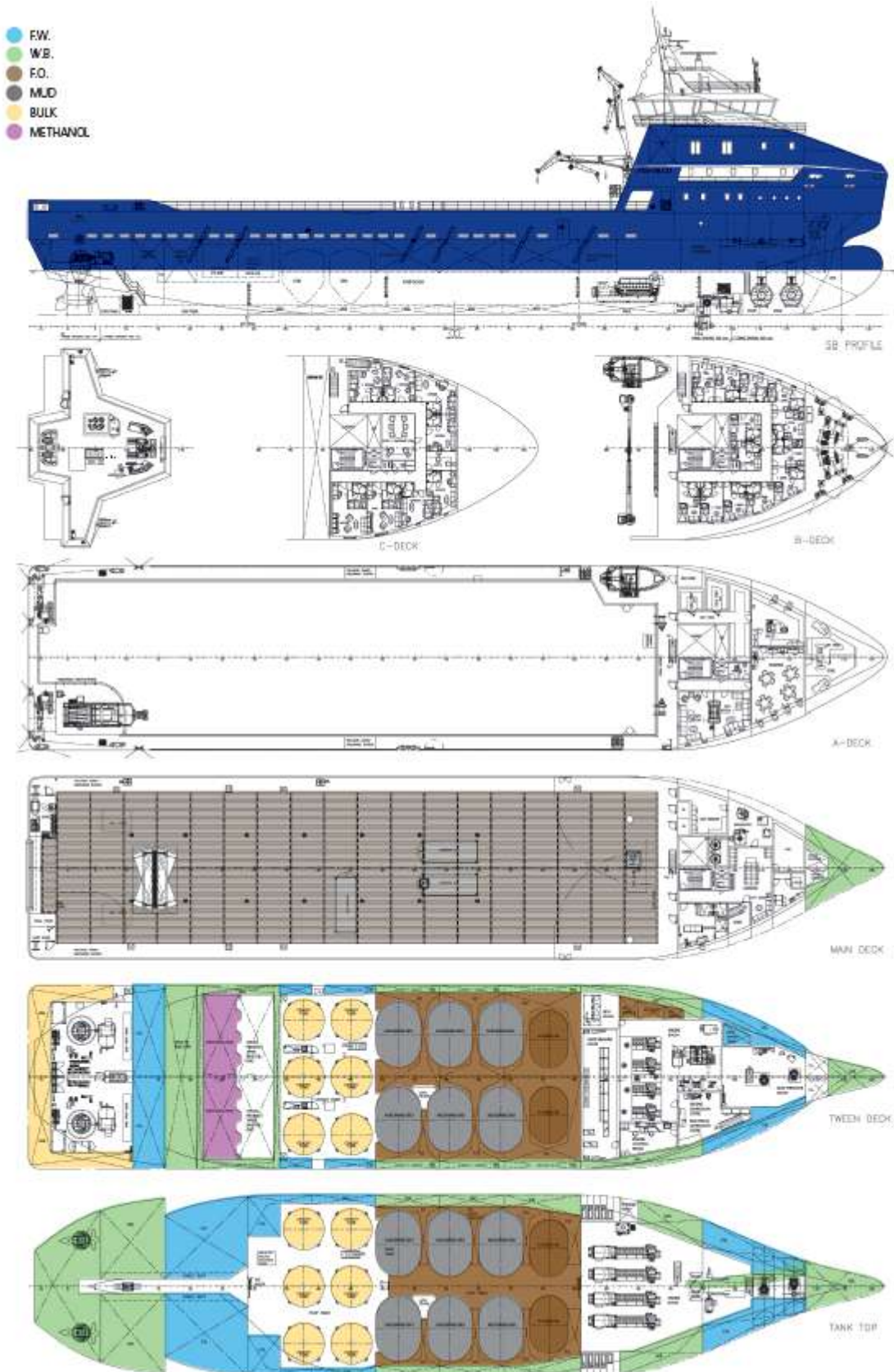
Comparándolo con el francobordo obtenido mediante las alternativas:

$$D - T = 8,261 - 6,578 = 1,683 \text{ m}$$

Que es mayor que el francobordo mínimo de verano, además de que el calado es más alto que el calado mínimo requerido, por lo que el buque proyecto cumple con el francobordo.

## 9 CROQUIS DE LA DISPOSICIÓN GENERAL

En esta fase del proyecto se tomará la disposición general del buque base *Rem Supporter*:



## 10 ESPECIFICACIÓN PRELIMINAR

---

En este apartado se describirán algunos conceptos básicos en la concepción del diseño del buque.

### 10.1 GENERAL

#### 10.1.1 Tipo de buque

En este proyecto se está diseñando un buque de suministro a plataformas, con capacidad para 35 personas y para albergar tanto carga líquida como seca a granel.

Dispone de una cubierta de carga corrida la cual ha de tener una resistencia tal que pueda albergar diferente tipo de maquinaria, así como materiales. Además, contará con dos grúas en cubierta para los procesos de carga y descarga de la carga seca a granel.

La propulsión del buque será diésel-eléctrica para la navegación y para las estancias en puerto se dispondrá de gas natural licuado. Por lo que el buque estará dotado de motores dual-fuel, para que pueda trabajar tanto con diésel como con gas.

La generación se realizará mediante un motor principal que producirá la potencia necesaria y un generador transformará esa potencia en energía eléctrica. Esta energía eléctrica accionará los motores eléctricos encargados de mover las hélices

Dispondrá de dos hélices azimutales para la propulsión y cuatro para el posicionamiento dinámico, dos a proa y dos a popa.

#### 10.1.2 Características principales

Eslora total = 85,78 m

Eslora entre perpendiculares = 78,58 m

Puntal = 8,261 m

Calado = 6,578 m

Peso muerto = 5000 TPM

Área cubierta = 947 m<sup>2</sup>

Número de hélices = 2

Tripulación = 35 personas

Clasificación: DNV·GL

El buque tiene una autonomía de 6000 millas, que son unos 19 días de navegación a velocidad de servicio.

Las estancias en puerto serán de 10 días.

#### 10.1.3 Tripulación

Personal a bordo 25 personas:

1 Capitán

1 Jefe de máquinas

1 Primer Oficial

6 Oficiales

16 Marineros

El resto de personas son el personal de la plataforma.

#### **10.1.4 Capacidades**

El buque tendrá que llevar tanques para carga seca y líquida, además de tanques de diésel, gas natural licuado, aceites y los tanques de agua de lastre.

#### **10.1.5 Peso muerto**

Dentro del peso muerto se incluye:

consumos (combustibles, aceite, agua dulce y víveres),  
tripulación y pasaje,  
pertrechos y  
carga útil.

El peso muerto total será de 5000 TPM.

#### **10.1.6 Formas y estabilidad**

Las formas del buque serán completamente en U tanto en proa como en popa.

Está dotado de bulbo en proa.

Debe cumplir con los criterios de estabilidad general, así como con la estabilidad en averías para garantizar la navegación.

#### **10.1.7 Potencia y velocidad**

La generación de energía será realizada con motores dual fuel, que funcionen con diésel y con gas natural licuado.

La velocidad del buque en servicio será de 13 nudos, con un margen de mar de 15% y el motor trabaja al 85%. La velocidad máxima que alcanzará será de 15 nudos.

Todavía no se ha elegido un motor pero tendrá que ser uno que de la potencia para la velocidad máxima de 15 nudos, que es de 5000 kW aproximadamente.

#### **10.1.8 Clasificación, inspección y reglamentos de aplicación**

El buque será construido de acuerdo con los Reglamentos de Det Norske Veritas · Germanischer Lloyd.

La construcción y el armamento estarán también controlados por el armador, según se especifique en el contrato.

El buque cumplirá, además:

SOLAS

Convenio Internacional de Líneas de Carga

Reglas para prevenir la contaminación del mar MARPOL

Convenio Internacional sobre Arqueo  
Normas sobre niveles de ruido y vibraciones

## **10.2 CASCO**

### **10.2.1 Materiales y tipo de construcción**

El caso se construirá con acero naval el cual cumpla lo exigido con la Sociedad de Clasificación.

La estructura será longitudinal, ya que las mayores fuerzas que tendrá que soportar son longitudinales

Las chapas se unirán mediante soldadura.

### **10.2.2 Cubiertas**

La cubierta de carga se calculará de forma que pueda soportar el peso de la maquinaria que se vaya a utilizar.

### **10.2.3 Superestructuras, mamparos menores, etc.**

El castillo de proa también será de acero y también las cubiertas como los mamparos exteriores.



## **10.3 EQUIPO, ARMAMENTO E INSTALACIONES**

### **10.3.1 Equipo de fondeo amarre y remolque**

- 2 anclas
- 2 cabrestantes
- 2 molinetes

### **10.3.2 Medios de salvamento**

Todas estas normas se han obtenido del Capítulo III del SOLAS.

Aros salvavidas: se dispondrán de 10 aros salvavidas distribuidos en ambas bandas del buque (5 a cada banda) y se situarán 2 aros por lo menos un aro con rabiza flotante. La mitad de los aros tendrán luces de encendido automático y estarán también dotados de señales fumígenas.

Chalecos salvavidas: se dispondrán 35 chalecos salvavidas, uno para cada persona que vaya a bordo y se colocarán de modo que sean fácilmente accesibles. Los chalecos irán provistos de luces.

Trajes de inmersión: se dispondrá de un traje de inmersión a cada miembro de la cuadrilla encargada del sistema de evacuación marino.

Para cada persona que vaya a bordo se le indicarán instrucciones para seguir en caso de emergencia.

Se fijarán cuadros de obligaciones para emergencias en lugares visibles en todo el buque.

### **10.3.3 Alojamiento**

El resto de personas será el personal que se transportará hacia la plataforma, por lo que se tomarán como pasajeros.

Los camarotes del Capitán, del Jefe de Máquinas y del Primer Oficial serán iguales y tendrán despacho. Los oficiales dispondrán de camarotes individuales y los marineros de camarotes dobles. Todos los camarotes dispondrán de ase privado.

El personal de plataforma contará con camarotes dobles también con ase.

### **10.3.4 Aire acondicionado y ventilación**

Se dispondrá de aire acondicionado en cada camarote, además también dispondrán de calefacción.

### **10.3.5 Equipos de navegación y comunicaciones**

- Radares, los cuales tendrán un sistema de detección de aceite
- Piloto automático
- Girocompás
- Ecosonda
- Sistema de visualización e información de cartas electrónicas
- Sistema de registro de datos del viaje

Sistema mundial de socorro y seguridad marítimos (GMDSS)

Intercomunicadores

Canal VHF

Televisión e internet mediante VSAT

### **10.3.6 Medios de contraincendios**

Se dispondrá una instalación de agua nebulizada en todo el buque.

En cubierta se dispondrán mangueras.

## **10.4 INSTALACIÓN PROPULSORA**

### **10.4.1 Motor principal**

El generador principal será de dual fuel.

Como combustibles se usará diésel y gas natural licuado.

Todavía no se puede indicar ningún parámetro del motor principal ya que todavía no se ha seleccionado ningún motor específico para este proyecto.

### **10.4.2 Accesorios del generador**

Control: conocer el estado del motor desde lugares remotos del barco, como el puente. El panel de control nos da información acerca de:

- Temperatura del líquido refrigerante

- Temperatura de los gases de escape

- Presión del aceite

- Carga de la batería

- Potencia producida

- Detección de fugas de agua o funcionamientos anómalos

Los módulos de control ayudan a que el equipo pueda entrar en parada de emergencia si alguno de los datos es anómalo y está en un nivel crítico, permitiendo la interrupción del grupo electrógeno.

Los generadores suelen estar dotados de tomas que se pueden acoplar a la toma de mar del buque para así tomar el agua del mismo lugar que el motor principal. El agua de mar no entrará en contacto con las piezas nobles de la máquina para evitar así la corrosión.

## **10.5 INSTALACIONES ESPECIALES**

### **10.5.1 Grado de automatización**

El buque dispondrá de una cabina de control de máquinas y un centro de control en el puente de gobierno.

### **10.5.2 Instrumentación general**

Sistema de detección de incendios: el panel central de alarma estará en el puente. En la zona de personal de la plataforma se instalará un sistema automático de detección y alarma que cumpla con SOLAS. En los espacios de máquinas se instalará un sistema de detección de incendios mediante detectores de humo que se hará visible en el puente mediante alarmas ópticas y acústicas.

Sistema de alarma general: Se instalará un sistema completo de alarma general controlado desde el puente, con sirenas en cámara de máquinas.

Sistemas de alarmas centralizadas: las alarmas se manifestarán cuando algún sensor detecte situación de alarma.

### **10.5.3 Control de la planta generadora principal**

Los generadores principales dispondrán de un equipo automático de control que permitirá su arranque, lubricación, acoplamiento al cuadro principal y reparto de cargas automáticos.

### **10.5.4 Posicionamiento dinámico**

El posicionamiento dinámico tiene como objetivo mantener al buque en una posición exacta mediante hélices, propulsores y demás sistemas

Sistemas de posición: debido a la alta precisión que se necesita en el funcionamiento del posicionamiento dinámico son varios los sistemas empleados. Además, contra más número de sistemas se usen, mayor será la precisión aplicada.

En este proyecto el buque contará con sistemas de satélites (DGPS VERIPOS) y con sensor láser (CyScan).

Sistemas de medición externos: estos sensores son los encargados de medir el abatimiento producido por el viento, la deriva creada por la corriente y la amplitud culpable del oleaje. Todos están contruidos a partir de unidades de medidas de inercias, que determinan el grado a corregir para los movimientos de rotación del buque.

Equipos de propulsión y gobierno: son los encargados de crear el empuje necesario para contrarrestar las fuerzas externas y guiar al buque.

En este proyecto se usan propulsores azimutales, tanto en proa como en popa.

Sistemas de control: es el algoritmo usado por el sistema informático basado en las mediciones de los sensores externos.

El posicionamiento dinámico será de clase DP3, esto es que cuenta con una gran redundancia para que en caso de avería pueda seguir manteniendo la posición con normalidad para así poder abandonar la operación de una forma controlada y segura.

### **10.5.5 Capacidad de lucha contraincendios (FIFI)**

El buque llevará tanto protección pasiva como activa:

Monitor de protección FIFI

Bombas

Sistemas de proporción de espuma alrededor de la bomba

Sistema de agua y de espuma

### **10.5.6 Lucha contra la contaminación**

El buque llevará un servicio de Oil Recovery de limpieza de derrame de hidrocarburos al mar.

Constará de sistemas de barreras flotantes que concentren el vertido en una zona para luego proceder a su recogida.

# **ANEXO 1: FICHAS DE LOS BUQUES DE REFERENCIA**

# STANFORD BATELEUR

DPS2 , FiFi 1, Diesel Electric Platform Supply



## PRINCIPAL PARTICULARS:

Design : MMC 887  
Builder : Fujian Mawei Shipyard, China  
Class : ABS +A1, (E) offshore Support Vessel  
WILD, AMS + DPS-2 + FFV Class 1

Flag : St.Vincent & Grenadines  
Year : 2013  
Call Sign : J8B4809  
IMO # : 9654177  
GRT/NRT : 3601/1429

## DIMENSIONS:

Length Overall : 87.07 M  
Beam : 18.80 M  
Length BP : 83.00 M  
Draft : 6.05 M  
FreeBoard : 1.359 M  
Air Draft : 27.92 M  
DWT : 5128 MT

## PERFORMANCE:

Max Speed : 13.5 knots @ 85 % MCR  
Service Speed : 12 knots  
Type of Fuel : MGO  
Fuel consumption : 19.1 mt @ 85% MCR

## CAPACITIES:

Cargo Deck Area : 1000 m<sup>2</sup>  
Deck cargo Capacity : 2480 T  
Deck Strength : 5.0 T/m<sup>2</sup>  
Deadweight : 5118 T  
Fuel Oil : 942.42 m<sup>3</sup>  
Fresh Water : 494.18 m<sup>3</sup>  
Drill Water : 1832.23 m<sup>3</sup>  
Potable Water : 670.09 m<sup>3</sup>  
Mud /Methanol : 430 m<sup>3</sup>  
Mud / Brine : 1984 m<sup>3</sup>  
Dry Bulk : 400 m<sup>3</sup>  
Oil-Based Mud : 2409.65 m<sup>3</sup>

## PUMPS WITH DISCHARGE RATE:

Fuel Oil : 1 x 150 m<sup>3</sup>/hr@ 80m/head  
Fresh Water : 1 x 150 m<sup>3</sup>/hr@ 80m/head  
Mud / Brine : 4 x 150 m<sup>3</sup>/hr @ 20m/head  
Methanol : 1 x 65 m<sup>3</sup>/hr @ 80m/head  
Dry Bulk : 2 x 30 m<sup>3</sup>/hr@5.6 bar  
Oil-Based Mud : 4 x 150m<sup>3</sup>/hr @ 20m head  
Main Fire Pump : 65Cbm/h, 0.6MPA head Test  
Emergency Fire Pump : 65Cbm/h, 0.6MPA head Test  
Cement : 6bar x 20.5m<sup>3</sup>/min, 2 nos  
Barite : 6bar x 20.5m<sup>3</sup>/min, 2 nos

## MACHINERY SYSTEM:

Main Engines : 4 x 2547 BHP (Total 10188 BHP)  
Cummins QSK60-D(M)  
Bow Thruster : 1 x 1220 BHP tunnel Thrusters  
1 x 1072 BHP Retractable AZI  
Stern Thruster : 2 x 2000 KW Azipull Thrusters  
Shore Power : 1 x 400A Shore Supply Receptabal  
Emergency Generator : 1 x 150 Kw

## DECK & AUX EQUIPMENT:

Anchors : 2 x 2140 kgs HHP  
Chain : 48mm U2 grade Tot 495 M  
Anchor / Mooring Windlass : 2 x 10t @ 0-09m min C/W warping heads  
Tugger Winches : 2 x 10t @ 12m min  
Capstans : 2 x 5t @15m min  
1 x 10t/d Fresh water maker  
2 x ships Air Compressor 22M3/ hr  
Oily Bilge Water Separator  
Deck Crane : 2 T @ 10 M

## DYNAMIC POSITIONING SYSTEM:

DP – 2 ( Kongsberg) : 3 x Wind Sensor, 3 x MRU,  
1 x Radius System, 3 x Gyro Compass  
Seachest provide for HIPAP (Optional)  
Independent Cjoy

## FIRE EXTINGUISHING SYSTEM:

Fi Fi Class 1 2 x 1600 Cu.m @ 125m Hd  
Monitors Remote control 2 x 1200 Cu.M One with duel Foam /Water  
Emergency Fire Pump 35 Cu.M @ 60m Hd  
Fixed Co2 System Engine Room  
Fixed Water Mist System Engine Room  
4 x fireman outfits  
2 x fire blankets for engine room and galley  
Fire Fighting Monitor 2 x 1600<sup>m<sup>3</sup>/hr</sup> @125m head

## ACCOMMODATION:

Number of Person : 52 Persons  
16 x One Man Cabins 16  
10 x Two Men Cabins 20  
4 x Four men cabins 16  
1 x Dispensary with 1 bed  
1 x office  
Hospital : Sick Bay with 1 Bed  
Sewage System : 52 POB  
Fully Air Conditioned : YES  
Fixed Gas Detection : Being Fitted in DXB

## NAVIGATION/COMMUNICATION EQUIPMENT:

GMDSS: Area 3 1 x DGPS  
1 x Autopilot 1 x Magnetic Compass  
1 x Gyrocompass 1X VDR  
1 x Anemometer 1XBWAS  
1 x Weather Fax Receiver 1 x TV and Radio system  
1 x Auto Telephone system 1XAIS  
1 x Inmarsat C with GPS and LRIT 1 x Duplex VHF with DSC  
1 x MF/HF-DSC Radio Telephone 1 x PA/Talkback System  
2 x VHF-DSC Radio Telephone 1 x Echo Sounder ,Speed log  
1 x SSB Transceiver 6 Channel DSC 4 x VHF Portable radios  
1 x 96nm X-band Radar 20.1" display 1 x 96nm S band 20.1" display  
1 x Sound Powered Telephone system 1 x VSAT  
Local Area Network (LAN) connected 1 x ERIDIUM

## LSA EQUIPMENT:

1 x Diesel Powered 6 Person MOB +Davit  
Launch and Recovery Davit  
8 x 20 man life rafts SOLAS approved each side  
16 x Lifebuoys SOLAS approved  
60 Lifejackets as per SOLAS requirement  
1 x EPIRB SOLAS approved  
1 x Line Throwing Apparatus  
2 x Orange Smoke Signals  
SOLAS approved line throwing appliance  
1 x First Aid Kit  
1 x Daylight signaling light  
1 x Air horn

# TECHNICAL SPECIFICATION

## Bourbon Topaz

PSV Plattform Service Vessel

P 105



Revision: 15.02.2006

IMO no: 9325829

DNV id no: 25678

MMSI: 258552000

Call Sign: LMXS

### MAIN DESCRIPTION

Type:	P 105
Classification:	DnV + 1A1, Supply Vessel, SF, E0, DYNPOS-AUTR, LFL*, CLEAN, COMF-V (3), DK(+), HL(+), OILREC, NAUT-OSV (LOC)
Yard:	Ulstein Verft AS
Yard built no:	267
Place built:	Ulsteinvik
Country built:	Norway
Delivered:	February 2005
Flag:	NOR
Port of registry:	Fosnavåg
Owner:	Bourbon Ships AS

### MEASUREMENT

Lenght oa:	86,20 m
Lenght bpp:	75,40 m
Breath moulded:	19,00 m
Depth moulded:	8,00 m
Draught max:	6,65 m
Gross tonnage GT:	3745 GRT
Corresponding DWT:	4847 DWT
Net tonnage NT:	1146 NT
ISM-Responsible:	Bourbon Offshore Norway AS

### CARGO CAPACITY

Deck cargo:	2840 T, VCG 1m ab. Main deck
Deck area:	960 m <sup>2</sup>
Deck strength:	10,0 t/m <sup>2</sup> aft of fr. 47, 5,0 t/m <sup>2</sup> elsewhere and 12T axle load
Fuel (gasoil):	1375,8 m <sup>3</sup>
Liquid Mud:	837,1 m <sup>3</sup>
Brine:	634,8 m <sup>3</sup>
Drillwater/Ballast:	580,2 m <sup>3</sup> / 1520,2 m <sup>3</sup>
Base Oil:	355,3 m <sup>3</sup>
Dry Bulk:	288,00 m <sup>3</sup> , 6 x 48m <sup>3</sup> vertical tanks
Fresh Water:	1009,6 m <sup>3</sup>
Glycol (MEG,TEG):	202,60 m <sup>3</sup>
Methanol:	163 m <sup>3</sup>
Oil Recovery:	1095 m <sup>3</sup>
Slop:	313,8 m <sup>3</sup>

### DISCHARGE RATES

Loading/Discharge station:	2 each side. 4"/5" Weco/TODO connection
Fuel discharge rate:	2 pumps a' 250m <sup>3</sup> /h and 9 bar, frequency controlled
Mud discharge rate:	4 pumps a' 100m <sup>3</sup> /h and 18 bar, frequency controlled
Brine discharge rate:	2 pumps a' 150m <sup>3</sup> /h and 18 bar, frequency controlled
Drillwater discharge rate:	2 pumps a' 250m <sup>3</sup> /h and 9 bar, frequency controlled
Dry Bulk discharge rate:	2 BHS compressors a' 30 m <sup>3</sup> /min each at 6 bar, 100
Base Oil discharge rate:	2 pumps a' 250m <sup>3</sup> /h and 9 bar, frequency controlled
Fresh Water discharge rate:	2 pumps a' 250m <sup>3</sup> /h and 9 bar, frequency controlled
Glycol discharge rate:	2 pumps a' 100m <sup>3</sup> /h and 9 bar, frequency controlled
Methanol discharge rate:	2 pumps a' 100m <sup>3</sup> /h and 9 bar, hydraulic motor
Slop discharge rate:	1 pumps a' 150m <sup>3</sup> /h and 18 bar, frequency controlled

### MACHINERY / PROPULSION

Main Engine set 1:	2 x Caterpillar 3516 TA 1825 kW-1800RPM	Bow Thruster 1:	1 x Kamewa Ulstein TT 2200 DNP-CP, 241 rpm 883 kW
Main Engine set 2:	2 x Caterpillar 3516 TA 1825 kW-1800RPM	Compass Thruster Forward:	1 x Ulstein Aquamaster TCNS 73/50-180, 883kW
Propulsion Aft:	2 x Rolls & Royce Azipull Thrusters, AZP 120, 2500 kW	Main Generators set 1:	2 x Siemens 1FJ3564-4, 2028kVA/440V/60Hz
Total BHP:	9789 BHP	Main Generators set 2:	2 x Siemens 1FJ3564-4, 2028kVA/440V/60Hz
Total Kw:	7300 kW	Emergency Generator:	1 x Caterpillar C9, 200kW, 3x440V, 60Hz
Garbage handling facility:	Incinerator plant	Shore Connection:	50m 3x440V, 350A



**PERFORMANCE / CONSUMPTION**

Max Speed/Consumption:	15,5 knots, 1388 l/h - 4 engines
Service Speed/Consumption:	13 knots, 800 l/h - 2 engines
Economical Speed/Consumption:	12 knots, 700 l/h - 2 engines
Standby Mode:	290 l/t
Port Consumption:	1,0 m <sup>3</sup>

**ACCOMODATION**

Cabins/Beds:	13 x 1M, 6 x 2M
Crew/Passengers:	Accomodations for 25 persons
Mess/Dayroom:	1 x messroom, 2 x dayroom, 1 x deck pantry
Cool store/Freezer:	4,5 m <sup>2</sup> / 4,5 m <sup>2</sup>
Dry Provision:	12 m <sup>2</sup>

**DECK EQUIPMENT**

Tugger winch:	1 x Hydrakraft 15T, 1 x Hydrakraft 20T, Reduced to 2 x 10T
Crane 1:	1 x Pallfinger Marine, PK 120000 MA
Capacity 1:	10T SKL, 8,0m (maks range 17m w/reduce load)
Crane 2:	1 x TTS Marine AS, GPK 260-10-10
Capacity 2:	10t / 10m
Anchors conventional:	Spek anchors 2 x 3060kg
Chain cables conventional:	495m (total length), stud link ø44mm NV K3
Windlass:	1 x Rauma Brattvåg, LBFMG6-304-4-C
Capstans:	2 x 10T Hydrakraft, 200252

**RESCUE EQUIPMENT**

Rescue class:	Prepared for FI-FI II	Radar transponders:	2 x Jotron Tron Sart
Hospital:	16 m <sup>2</sup> incl. Toilet	Emergency Beacon:	1 x Jotron 40S,FB-4
Fire Fighting equipment:	Co <sup>2</sup> /Water mist in eng. rooms	GMDSS VHF's:	3 x Jotron Tron TR20
MOB Boats:	1 x Mare Safety GRP 700	Survival Suits:	25 x survival suits, 4 x working suits
Heave compensated davits:	1 x Servi Technics HRT 3200	Life Jackets:	29 x SeaMaster adult
Rescue Regulation:	NMD	Life rafts:	4 x Viking 25DK

**NAVIGATION AND COMMUNICATION EQUIPMENT**

Radar 3 cm:	1 x Furuno FAR-2827 X-band, Arpa/AIS/Interswitch	GMDSS Sea Area:	A3
Radar 10 cm:	1 x Furuno FCR-2837S S-band, Arpa/AIS/Interswitch	MF/HF Radio:	1 x Skanti TRP 1250
Radar slave:	1 x 17" monitor aft. w/control	DSC Receiver:	Interfaced in TRP 1250
Gyro:	3 x Anschutz std 22 gyrocompass	VHF 1:	1 x SKANTI VHF 1000 DSC
Compass:	1 x Plath Reflecta	VHF 2:	1 x SKANTI VHF 1000 DSC
Autopilot:	1 x Anschutz Pilotstar D	VHF 3:	1 x SKANTI VHF 1000 P
Chart Plotter:	2 x Furuno TECDIS / CONNING	VHF 4:	1 x SKANTI VHF 1000 P
Navtex:	1 x SRH NAV-5	UHF:	3 x Motorola GM-360
Joystick:	1 x Kongsberg Simrad	Portable VHF:	N/A
AIS:	1 x Furuno FA-100 interfaced to electronic charts	Portable UHF:	3 x Motorola GP 900
VDR:	1 x Furuno voyage data recorder VR-5010	Mobile Telephone 1:	1 x NOKIA 22, interfaced to PABX
SSAS:	N/A	Mobile Telephone 2:	1 x NOKIA 22, interfaced to PABX
Echo Sounder:	1 x Furuno FE-700	Mobile Telephone 3:	1 x NOKIA 30, interfaced to Raydex
Speed log:	1 x Furuno DS-80 doppler log	Iridium:	N/A
Satellite Navigator (GPS):	1 x Furuno GP-90, 12 channel	Sat C 1:	1 x Thrane & Thrane TT-3020C
DP:	1 x Dynpos AUTR,Kongsberg SDP21	Sat C 2:	1 x Thrane & Thrane TT-3020C
DP Reference 1:	1 x DPS 700 (consists of DPS132/DPS200)	Fleet 77:	1 x Thrane & Thrane TT-3038C
DP Reference 2:	Inmarsat / IALA	Vsat Data/Phone link:	128kb up/down-stream, 2 x voice
DP Reference 3:	1 x Fanbeam Mk4	Intercom System:	UlsteinCom Data/Phone/TV
DP Reference 4:	1 x MRU 2 / 1 x MRU 5		
Wind Sensors:	2 x Gill WindObserver II Anemometer		

## DP-2 PLATFORM SUPPLY VESSEL

# M/V Breeze GPA 675-J



### Main Characteristics

Length Overall	252	FT	(76.80 m)
Length Between Perpendicular	246	FT	(75.00 m)
Beam	60	FT	(18.28 m)
Depth	25.3	FT	(7.70 m)
Operating Draft	20.5	FT	(6.25 m)
Light Draft	12.0	FT	(3.66 m)
Tonnage ITC	<6,000	GT	

### Capacities

Deadweight at Loadline Draft	4,357 LT	(4,426 mt)
Deadweight at Operating Draft	4,046 LT	(4,110 mt)
Cargo Deck Area	7,796 Ft <sup>2</sup>	(724 m <sup>2</sup> )
Cargo Deck Dimensions	157.5 x 49.5 Ft	(48.0 x 15.08 m)
Cargo Deck Loading	1024 lb/Ft <sup>2</sup>	(5.0 mt/m <sup>2</sup> )
Deck Cargo	1,476 LT	(1,500 mt)
Fuel Oil Cargo	153,577 USG	(636.6 m <sup>3</sup> )
Fuel Oil Day Tank	14,528 USG	(55.0 m <sup>3</sup> )
Bulk Mud	10,200 Ft <sup>3</sup>	(288.8 m <sup>3</sup> )
Liquid Mud	10,752 BBLs	(1,720.6 m <sup>3</sup> )
Methanol	2,130 BBLs	(340.8 m <sup>3</sup> )
Cargo Fresh Water	119,184 USG	(451.2 m <sup>3</sup> )
Rig Water	468,826 USG	(1774.7 m <sup>3</sup> )
Ship's Fresh Water	47,207 USG	(178.7 m <sup>3</sup> )

### Dynamic Positioning System (Class II)

ABS classed DP2 Redundant Positioning System Comprising:

Rolls-Royce Icon DP System classed ABS DPS-2	1 CyScan
2 Main Operator Stations	1 Mini RadaScan
2 Vertical Reference Unit	1 DP Alarm and Event Printer
3 Wind Sensor System	2 UPS with Minimum 30 Minute Power Output
1 Veripos LID2-GG1 Reference System	1 Independent Joystick Control
1 Veripos LID2-G2 Reference System	

### Propulsion - Machinery

Total Installed Power	6,020 kW (8,070 hp)
Main Diesel Generators	2 X 2100 kW (2,815 hp) Caterpillar 3516C
	2 X 910 kW (1,220 hp) Caterpillar C32
Emergency Generator	1 X 203 kW (272 hp) Caterpillar C9
Main Propulsion	2 x 1,950 kW (2,613 hp) Rolls-Royce Azipull
	AZP 100, 360° Azimuthing
Bow Tunnel Thrusters	2 x 933kW (1,250 hp) Rolls-Royce
	2000 DPN Fixed pitch variable speed tunnel

### Performance

Full Speed	12.7 knots
Economic	10.2 knots

### Cargo Discharge

Fuel Oil	660 GPM at 250 ft TDH (150 m <sup>3</sup> / h at 76 m TDH)
Cargo Fresh Water	860 GPM at 250 ft TDH (195 m <sup>3</sup> / h at 76 m TDH)
Drill Water	860 GPM at 250 ft TDH (195 m <sup>3</sup> / h at 76 m TDH)
Liquid Mud (LM) Pump 1	1,000 GPM at 250 ft TDH (227 m <sup>3</sup> / h at 76 m TDH)
Liquid Mud (LM) Pump 2	660 GPM at 200 ft TDH (150 m <sup>3</sup> / h at 60 m TDH)
Methanol	440 GPM at 250 ft TDH (100 m <sup>3</sup> / h at 76 m TDH)
Bulk Material (BM)	74 LT/h at 250 ft (75 mt / h at 60 m)
LM System	Two cargo segregations with four tanks in each segregation. Each cargo segregation has one 1,000 GPM pump and one 660GPM pump. Mud agitation is provided by two Flygt mixers in each tank.

BM System	Two cargo segregations with two tanks in each segregation. The operating pressure of each segregation is 80 PSI. The system has two bulk mud compressors each rated at 735 SCFM at 120 PSI
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### Deck Equipment

Rescue Boat	1 x MOB boat with davit SOLAS cargo ship safety equipment
Tugger Winch	1 x 12 st (11 mt) pull
Deck Cargo Crane (optional)	3,000 Kg @ 9 m
Anchor Windlass	Fixed Boom / Electro-hydraulic
Off Ship Fire Fighting	1 ABS FIFI-1 2 x Monitors @ 5,280 gpm

### Control & Safety

- Fully integrated DP / control dual redundant system.
- Alarm, monitoring and control system unattended machinery space.
- Remote control and monitoring of liquid mud and bulk mud cargo systems.
- USCG and SOLAS approved Water Mist total flooding and local application fire-extinguishing system.

### Electronics

- 1 - X Band Radar with ARPA
- 1 - S Band Radar with ARPA
- 1 - Navigation Gyro Compass
- 1 - Autopilot
- 1 - Depth Sounder
- 1 - Speed Log
- 1 - Radio System Compliant with GMDSS A3 Rules
- 1 - EPIRB (2 radar transponders)
- 4 - VHF (bridge to bridge)
- 5 - UHF (Onboard communication)
- 1 - Weather Fax
- 1 - Navtex
- 1 - PA / Loud Hailer

### Accommodations

Fully Air-conditioned  
Accommodations for 34 people composed of:  
14 x 2 man cabins  
6 x 1 man cabins  
Galley, Provision Room, Stores, Mess,  
Walk in Refrigerator 423 Ft<sup>3</sup> (11.9 m<sup>3</sup>)  
Walk in Freezer 335 Ft<sup>3</sup> (9.5 m<sup>3</sup>)

### Registration

Type	Offshore Supply Vessel (OSV)
Owner	Jackson Offshore Holdings, LLC
Operator	Jackson Offshore Operators, LLC
Builder	BAE Systems Southeast Jacksonville, Florida
Flag	U.S.A.
Classification	ABS#A1 Offshore Support Vessel, #AMS, #FIFI-1, #DPS-2, ACCU, "circle E", SOLAS, USCG Subchapter I and L, Full Ocean



New Orleans Office  
1217 MacArthur Ave, Harvey, LA 70058  
P : 504 328 8887 | F : 504 328 8897

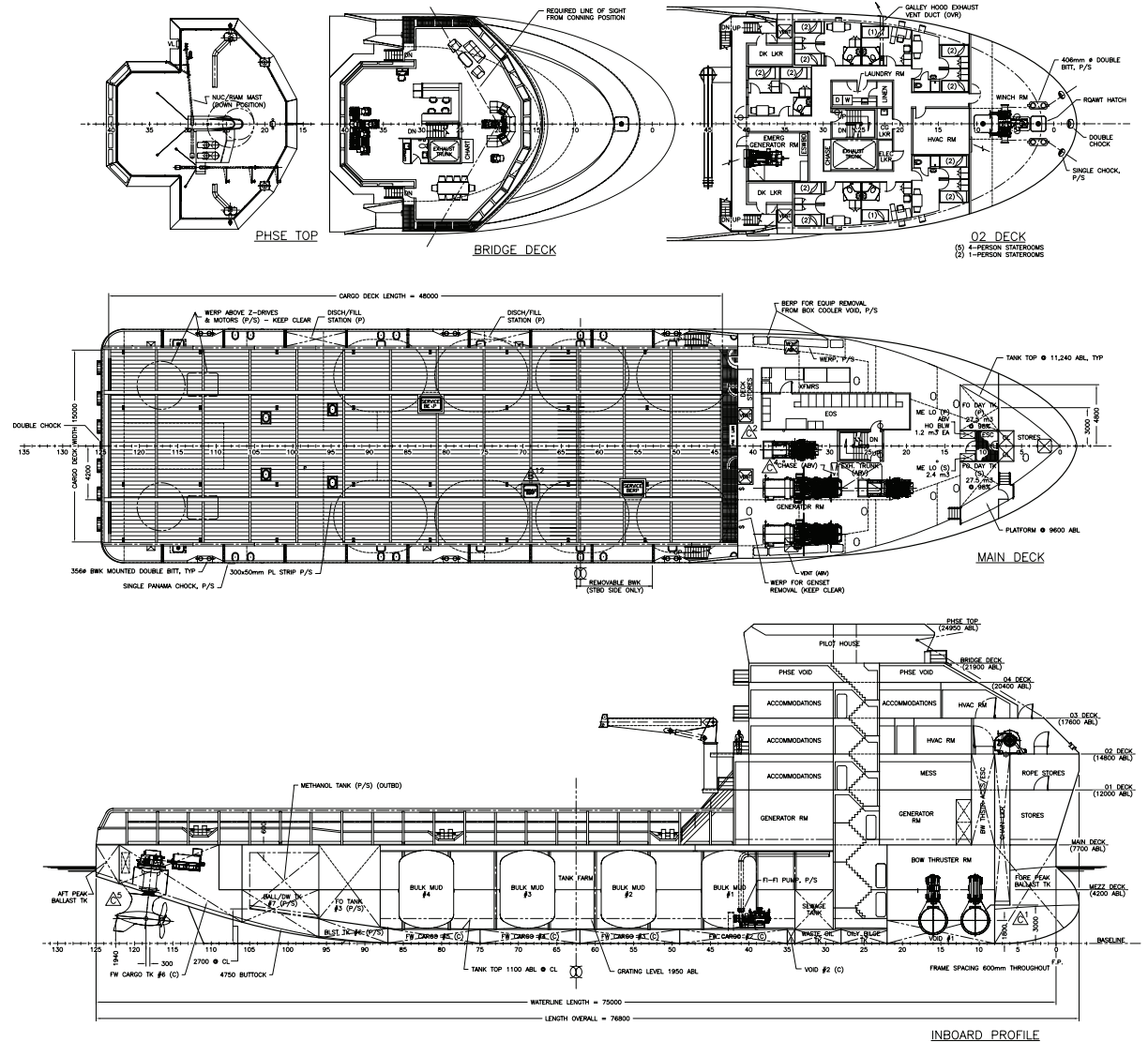
Houston Office  
3100 Wesleyan St. Suite 310, Houston, TX 77027  
P : 713 275 0250 | F : 713 400 9174

NOTICE: The data contained herein is provided to allow users to determine the suitability of the subject equipment. Data may vary from the current condition of equipment which can only be determined by physical inspection. Company has exercised due diligence to ensure that the data contained herein is reasonably accurate. However, Company does not warrant the accuracy or completeness of the data. In no event shall Company be liable for any damages whatsoever arising out of the use of the data contained herein. © Copyright 2014, Jackson Offshore Operators, LLC. All rights reserved.



## DP-2 PLATFORM SUPPLY VESSEL

# M/V Breeze GPA 675-J



### New Orleans Office

1217 MacArthur Ave, Harvey, LA 70058

P : 504 328 8887 | F : 504 328 8897

### Houston Office

3100 Wesleyan St. Suite 310, Houston, TX 77027

P : 713 275 0250 | F : 713 400 9174

NOTICE: The data contained herein is provided to allow users to determine the suitability of the subject equipment. Data may vary from the current condition of equipment which can only be determined by physical inspection. Company has exercised due diligence to ensure that the data contained herein is reasonably accurate. However, Company does not warrant the accuracy or completeness of the data. In no event shall Company be liable for any damages whatsoever arising out of the use of the data contained herein. © Copyright 2014, Jackson Offshore Operators, LLC. All rights reserved.



# DAMEN PLATFORM SUPPLY VESSEL 5000 CD

## GENERAL

### BASIC FUNCTIONS CLASSIFICATION

Offshore supply  
 ⚓1A1, SF, EO, Offshore Service Vessel,  
 Supply – DYNPOS AUTR, DK(+), HL(2.8),  
 COMF V(3), C(3), CLEAN DESIGN,  
 NAUT-OSV(A), OILREC, RECYCLABLE

## DIMENSIONS

LENGTH O.A.	90.00 m
BEAM MLD.	19.00 m
DEPTH MLD.	8.00 m
DRAUGHT SUMMER	6.30 m
DEADWEIGHT (SUMMER)	5000 t
DECK AREA	1020 m <sup>2</sup>
DECK LOAD (VCG AT 1 M ABOVE DECK)	2800 t

## TANK CAPACITIES

BALLAST / DRILL WATER	2000 m <sup>3</sup>
FUEL OIL (SERVICE)	600 m <sup>3</sup>
POTABLE WATER	1060 m <sup>3</sup>
LIQUID MUD	1250 m <sup>3</sup>
RECOVERED OIL (OPTION)	1500 m <sup>3</sup>
FUEL OIL CARGO	1200 m <sup>3</sup>
DRY BULK	380 m <sup>3</sup>

## PERFORMANCES (APPROX.)

SPEED (AT 5.00 M DRAUGHT)	14 kn
---------------------------	-------

## PROPULSION SYSTEM

MAIN ENGINES	Diesel-electric, 690 V, 60 Hz
PROPULSION POWER	2x Electric motors of 2200 kW each
AZIMUTING THRUSTERS	2x Twin-propeller thrusters; each 2 x FP propeller, 2650mm diameter
BOW THRUSTERS	2x 880 kW, 1800 mm, FP

## AUXILIARY EQUIPMENT

NETWORKS	690 V, 440 V and 230 V – 60 Hz
MAIN GENERATOR SETS	4x 1800 ekW at 900 rpm
EMERG./HARBOUR GEN. SET	1x 238 ekW at 1800 rpm
SHORE SUPPLY	1x 400A
HEATING SYSTEM	Waste heat recovery system

## DECK LAY-OUT

ANCHOR MOORING WINCH	1x Electric-hydraulic, with rope drum and two warping heads
CAPSTANS	2x Electric, each 5 t pull
DECK CRANE	1x Knuckle boom 2.3 t at 11 m (harbour)
TUGGER WINCH	2x Electric-hydraulic, 10 t pull

## CARGO HANDLING SYSTEM

BALLAST / DRILL WATER PUMP	2x 200 m <sup>3</sup> /hr
LIQUID MUD PUMP	2x 100 m <sup>3</sup> /hr
FUEL OIL PUMP	2x 200 m <sup>3</sup> /hr
FRESH WATER PUMP	2x 200 m <sup>3</sup> /hr
DRY BULK SYSTEM	2x 75 ton/hr
LIQUID MUD SYSTEMS	Agitators, circulation system, hot-water tank cleaning system

## ACCOMMODATION

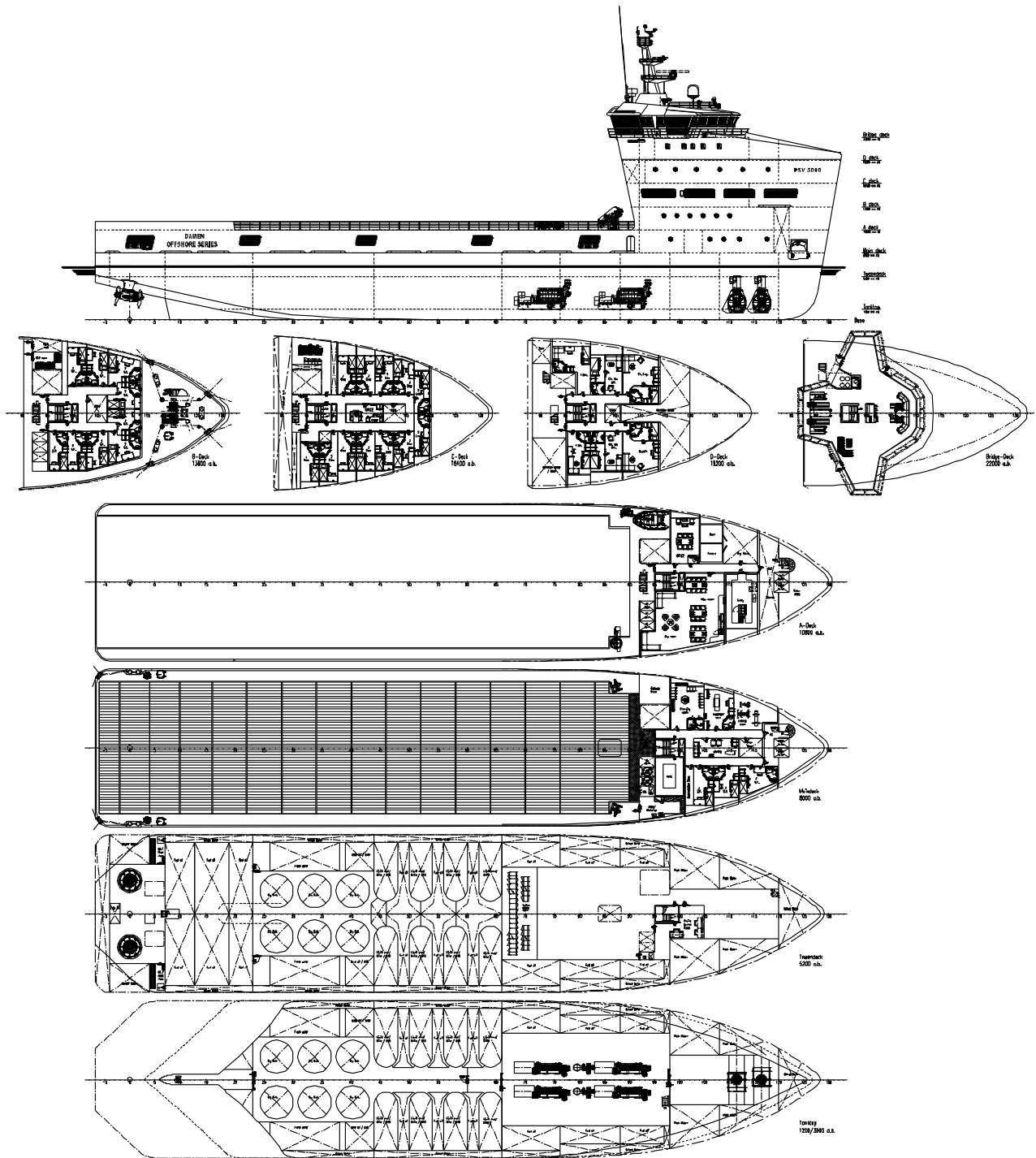
CREW	16 persons
SPECIAL PERSONNEL	28 persons
Cabins provided with Internet, telephone and satellite tv	

## NAUTICAL AND COMMUNICATION EQUIPMENT

NAUTICAL	Radar X-band + S-band, ECDIS, Conning
DP- SYSTEM	DP-2
GMDSS	Area A3

## OPTIONS

3rd tunnel thruster or retractable thruster  
 Capacity for Low-flash point liquids  
 Fire-fighting Ship 1  
 Exhaust gas cleaning system (SCR)  
 Damen E3 trademark



## DAMEN PLATFORM SUPPLY VESSEL 5000

# DAMEN

DAMEN SHIPYARDS GORINCHEM

Member of the DAMEN SHIPYARDS GROUP



Industrieterrein Avelingen West 20  
4202 MS Gorinchem

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4200 AA Gorinchem  
The Netherlands

phone +31 (0)183 63 99 11  
fax +31 (0)183 63 21 89

info@damen.nl  
www.damen.nl



## IEVOLI SAPHIRE

### PSV IEVOLI SAPHIRE - MMC 879 CP

THE VESSEL IS EQUIPPED AND FITTED FOR THE FOLLOWING CONTINGENCY SERVICES:

- FIRE FIGHTING
- MOB OPERATIONS
- SUPPLY DUTIES
- RESEARCH SHIP
- UNDERWATER ACTIVITIES

### MAIN DESCRIPTION

Year Built : Delivery October 2013  
 Vessel built : Selah Shipyard – Tuzla (Turkey)  
 Type : Standby Platform Supply Vessel / FiFi 1 / DP2  
 Classification : **ABS** -  A1 (E) Offshore Support Vessel,  
 AMS,  ACCU,  DPS-2,  FFV Class 1,  
 ENVIRO, UWILD, GP, OIL RECOVERY  
 CAPABILITY Class 2  
 Additional Notes :  SPS Code – Resolution MSC.266(84)  
 Port of registry : TBA  
 Flag : Italian  
 Call Sign : TBA  
 IMO Nr. : 9658111  
 Regulations : ABS, COLREG, Load Line, SOLAS Certificates,  
 Tonnage Certificate, Marpol Annex I,II,IV,V,  
 VI, IMO A493-494, IMO A749 (18), IMO 673  
 (16), IMO A325, ISPS Code, MSC 645, MSC  
 664, MSC 235 (82)

### MAIN PARTICULARS

Design : MMC 879 CP  
 LOA : 79,45 m  
 Length PP : 76,10 m  
 Breath Moulded : 16,80 m  
 Depth Moulded : 7,40 m  
 Summer Draft : 6,00 m  
 Gross tonnage : TBC  
 Net tonnage : TBC

### PERFORMANCE

Trial Speed : 14,00 Knots  
 At 100% : 920 Kg/h (approx)  
 At 85% : 765 Kg/h (approx)  
 At Economical Speed : 350 Kg/h (approx)  
 Port consumption : 1 m<sup>3</sup>/day (approx)  
 Type of Fuel : M.G.O.

### CAPACITIES

Dead weight : 4000 t (approx)  
 Gross Tonnage : TBC  
 Net Tonnage : TBC  
 Deck cargo : 1400 Tonn  
 Cargo deck dimensions : 58,60 x 14,00 m  
 Deck area : 820 m<sup>2</sup>  
 Deck strength : 05 t/ m<sup>2</sup>  
 Freezer Room : Available  
 Cooler Room : Available  
 Tank washing : Available  
 Agitator LM Tanks System : Available  
 Sewage Treatment Unit : Available

### DECK EQUIPMENT

Capstans : 2 x 10 t  
 Tugger Winches : 2 x 10 t  
 Deck Crane : 2 t @ 10mt  
 Fast Rescue Craft : TBA

### CARGO CAPACITIES - Preliminary

Water Ballast / Drill Water : 1380 m<sup>3</sup>  
 Cargo Fresh water / Potable Water : 910 m<sup>3</sup>  
 Fuel Oil : 952 m<sup>3</sup> / Max 1483 m<sup>3</sup>  
 Liquid Mud : 1062 m<sup>3</sup>  
 Brine : 531 m<sup>3</sup>  
 Dry Bulk : 231 m<sup>3</sup>  
 Recovered Oil : 265 m<sup>3</sup>  
 Methanol : 202 m<sup>3</sup>  
 Base Oil : 531 m<sup>3</sup>  
 Inert Gas System : Fitted  
 Cargo and Ballast Monitoring System : IAS - Fitted

### CARGO PUMPS - Preliminary

Drill water : 200 m<sup>3</sup>/h at 9 Bar  
 Potable water : 200 m<sup>3</sup>/h at 9 Bar  
 Fuel oil : 200 m<sup>3</sup>/h at 9 Bar  
 Base Oil : 200 m<sup>3</sup>/h at 9 Bar  
 Liquid mud / Brine : 2 x 75 m<sup>3</sup>/h at 14 Bar  
 Methanol : 75 m<sup>3</sup>/h at 9 Bar

### DRY CARGO CAPACITIES - Preliminary

4 pressure tanks for bulk : 552 t  
 cement/barite : 231 m<sup>3</sup>  
 Compressor capacity : 1278 m<sup>3</sup>/h  
 Work pressure : 6,0 bar  
 Discharging capacity : 2 x 100 t/h at 90 m head  
 Pipe and manifold : 2 x 5" Weco

### PIPE LINE CONNECTIONS

Dry Bulk : 5" Hammer Lug Union (Weco) Male  
 Liquid Mud : 5" Avery Hardoll Male  
 Fuel oil : 5" Avery Hardoll Male  
 Potable Water : 4" Hammer Lug Union (Weco) Male  
 Ballast Drill Water : 4" Hammer Lug Union (Weco) Male  
 Methanol : 4" Avery Hardoll Male  
 Reducers Connections : 4" and 5" for each connection type

### ENGINE AND PROPULSION

Main engines Power : 2 x 2500 Kw / 2 x 3440 Bhp  
 Gear : 2 Main Gear  
 Propellers : Dia. 3000mm  
 Variable pitch in fixed nozzels  
 Tunnel thruster : - 2 Tunnel Bow Thruster  
 2 x 800 Kw / 1070 Bhp  
 - 2 Tunnel Stern Thruster  
 2 x 600 Kw / 800 Bhp  
 Steering gear : 2 x High lift profile rudder blades  
 2 x Electro independent hydraulic system  
 2 x Hydraulic Power Pack

### AUXILIARY ENGINES

Shaft Generators : 2 x 1400 Kw  
 Diesel Generators : 3 x 585 Kw  
 Emergency generator : 1 x 200 Kw

### DP SYSTEM

DP Class : II  
 DP Type : Kongsberg  
 Gyro Compass : 3 Navigat X Mk1  
 Position Reference Units : 2 x DGPS + 3 Wind Sensor  
 Laser Reference : 1 x Cyscan Mk4  
 Acoustic Reference : HiPap Trunk fitted  
 Hypap 500 Predisposition  
 Motion Reference : 2 x MRU  
 ERN : TBA

### MANOEUVRING

Joystick : Fully Integrated, serviceable from various  
 wheelhouse positions + 1 portable

### NAVIGATION EQUIPMENT

1 x Radar, JRC JMA-5300 ARPA X-band  
 1 x Radar, JRC JMA-5300 ARPA S-band  
 2 x high resolution color display, radar plotter 19"  
 1 x Radar repeater (slave radar) at aft wheelhouse console  
 1 x DGPS JRC JLR 7800  
 1 x Navtex JRC  
 1 x Echo Sounder JRC  
 1 x Speed Log  
 1 x AIS JRC A-Class  
 1 x Gyro Compasses Yokokawa  
 1 x Magnetic Compass Plath  
 1 x Autopilot Kongsberg  
 1 x Doppler Log - Off Course Alarm  
 1 x BNWAS/1 Navitron  
 1 x Voyage Data recorder

CCTV coverage for all key areas with display at Wheelhouse and ECR

### COMMUNICATION EQUIPMENT

GMDSS Station Area A1+A2+A3  
 - 1 MF/HF JRC DSC + ATIS  
 - 2 VHF DSC JRC  
 - 3 Emergency VHF Jotron Tron  
 - 2 Inmarsat C JRC JUE-85  
 - 1 Inmarsat C SSAS Sailor  
 - 1 Radio telex  
 - 1 EPIRB Jotron Tron  
 - 2 SART Jotron Tron  
 - 1 Fleet Broadband 500 data/fax/mail transfer  
 - 1 Public Address System

### ACCOMODATION

Type of cabins	No. of cabins	No. Of berths
1 man cabins	6	6
2 man cabins	12	24
Hospital / Dispensary	1	2
Total number of bunks	18 + 1	30 + 2
Recreation Rooms	: Gym, Day room Lounge, Smoking Room	
Ship's Office	: Fitted	
Sky Lobby	: Fitted	

### FIRE FIGHTING

*Fifi, class I*

The fire fighting system consists of the following main components:

- 2 off fire-fighting centrifugal pumps FFS SPF250x350HD  
 capacity: 1742 m<sup>3</sup>/h head: 11,8 mlc 1800 rpm / 790 Kw
- 2 single/dual flow monitors FFS 1200/300LB  
 joystick controlled from bridge  
 capacity: 1200 m<sup>3</sup>/h - 10,0 bar  
 throw length – capacity full : 120 m  
 throw length – capacity reduced : 75 m
- 1 foam pump DPVFSF 18-100  
 18 m<sup>3</sup>/h - 18,5 Kw head: 185 mlc 3420 rpm
- 2 fog monitors for own protection type ABS  
 Water spray system with standard tug nozzles  
 1061 m<sup>3</sup>/h at 7,8 bar

### RESCUE AND LIFESAVING EQUIPMENT

- 1 x Fast Rescue Boat
- 4 x Liferrafts
- 2 x Search Light remotely controlled from bridge
- 6 x Lifebuoys provided with strobe lights and lifelines
- 1 x Hospital with treatment bench, racks for stretchers,  
 Desk, medicine, poison locker
- 1x Dispensary with medical equipments / medicine in accordance  
 with Flag's State and International requirements

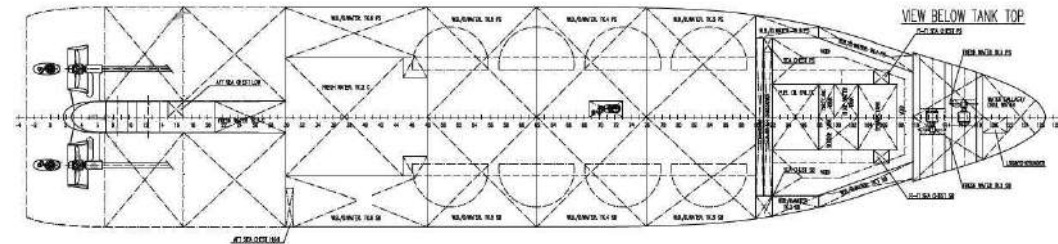
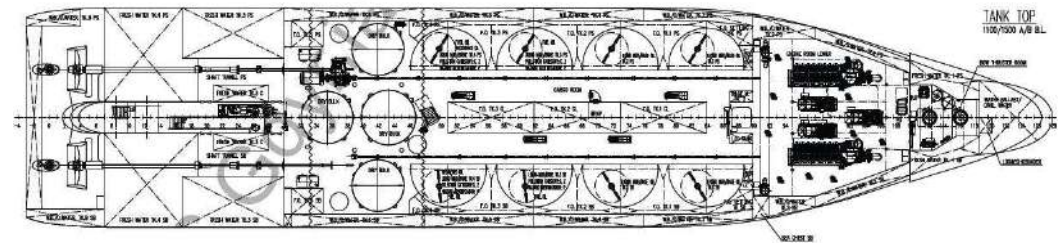
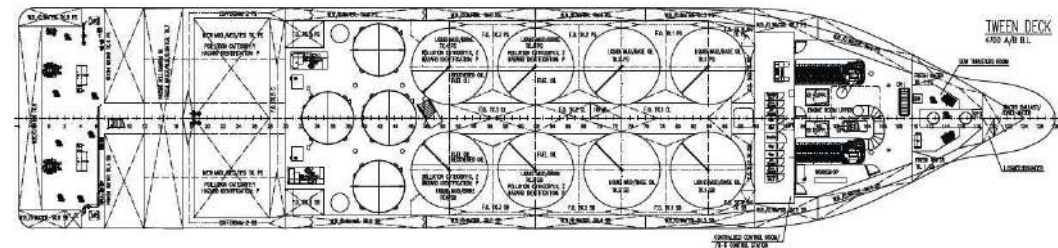
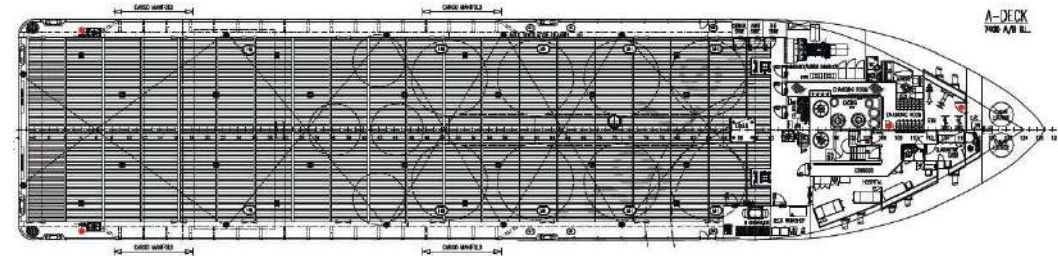
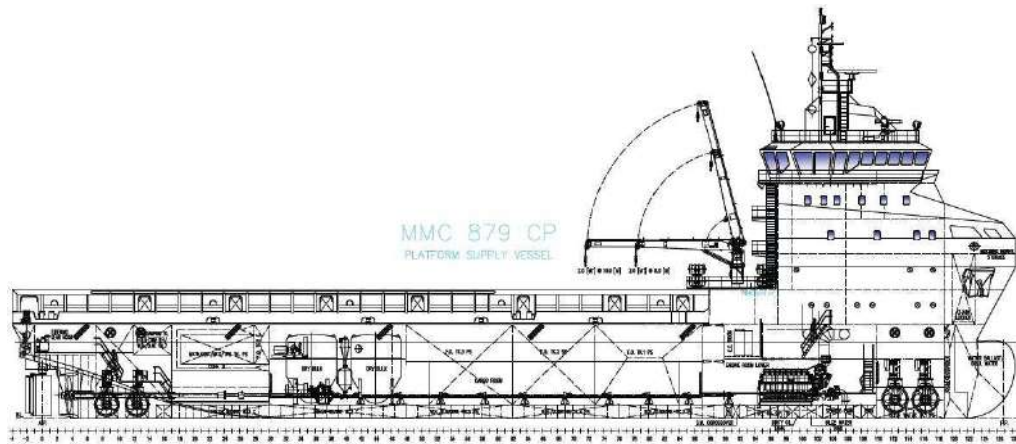
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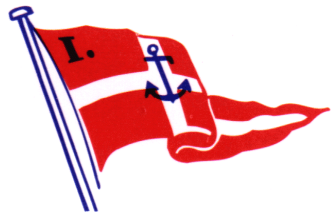
**MARNAVI OFFSHORE S.r.l.**

**OPERATION & TECHNICAL MANAGER**

# Ievoli Sapphire – MMC 879 CP Design Platform Supply Vessel



Whilst care has been taken in the preparation of this document, the data and/or information referred to herein are purely indicative and are not contractually binding. They must be checked with reference to the specific operations and are subject to change. No liability is accepted by the owners for any errors which may exist in this document.



**MARNAVI** S. P. A.  
TRASPORTI MARITTIMI

ENERGY  
ENVIRONMENT  
ECONOMY**MAIN DATA**

Length over all .....	90.40 m
Deadweight.....	5700 tonnes
Deck area .....	1060 m <sup>2</sup>
Speed .....	15.3 knots
ERN.....	99.99.99.99

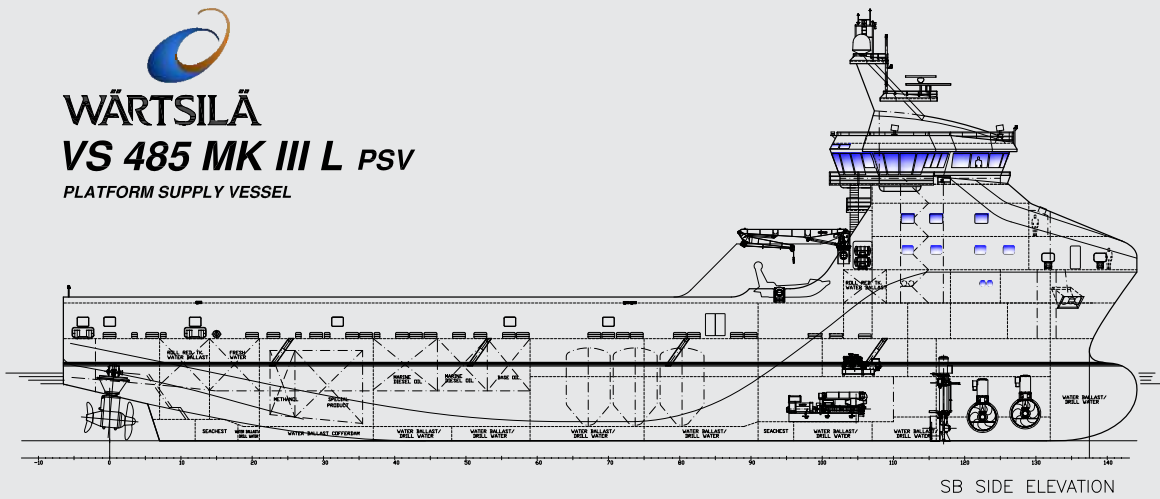
**PLATFORM SUPPLY VESSEL**

- Proven exceptional hull lines
- 4-split high redundancy switchboard and ship systems
- Attractive new look

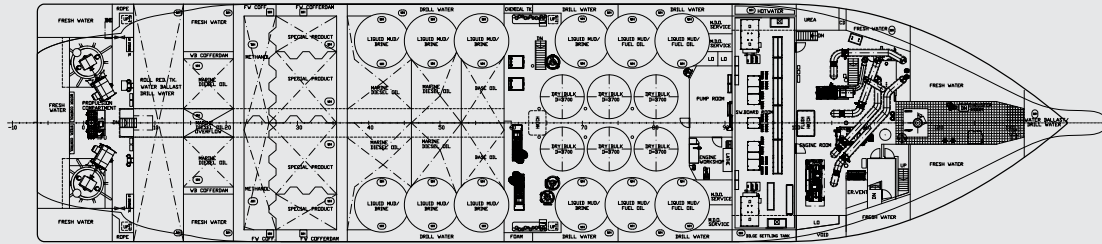




**WÄRTSILÄ**  
**VS 485 MK III L PSV**  
PLATFORM SUPPLY VESSEL



SB SIDE ELEVATION



2nd DECK

#### MAIN DIMENSIONS

Length over all	90.40 m
Length between p.p.	82.50 m
Breadth moulded	20.00 m
Depth to 1st Deck	8.60 m
Design draught	5.20 m
Summer draught	7.05 m

#### CAPACITIES

Deadweight	5700 tonnes
Deck area	1060 m <sup>2</sup>
Fresh water	900 m <sup>3</sup>
Ship Fuel Oil	510 m <sup>3</sup>
Cargo Fuel Oil	950 m <sup>3</sup>
Dry bulk	300 m <sup>3</sup>
Liquid mud	1390 m <sup>3</sup>
Brine	920 m <sup>3</sup>
Base oil	190 m <sup>3</sup>
Ballast water / Drillwater	700 m <sup>3</sup>
Methanol	180 m <sup>3</sup>
Special products	430 m <sup>3</sup>

#### CLASS

DnV, + 1A1, OFFSHORE SERVICE VESSEL+ SUPPLY, SF, DYNPOS AUTR, E0, ESV-DP (HIL), CLEAN DESIGN, COMF-V(2) & C(3), LFL\*, NAUT-OSV (A), DK(10t/m<sup>2</sup>) and HL(2.8), BIS.

#### SPEED

Max speed	15.3 knots
Service speed	12.0 knots

#### MACHINERY AND PROPULSION

Main generator sets Wärtsilä 9L20	4 x 1665 kW
Fwd. tunnel thrusters	2 x 1000 kW
Fwd. retractable thrusters	1 x 880 kW
Steerable azimuths thrusters	2 x 2200 kW

#### ELECTRICAL SYSTEM

Wärtsilä Low Loss Concept - 690 V

#### ACCOMMODATION

State cabins	3
Single cabins	10
Double cabins	6
Total	25 persons

#### DECK EQUIPMENT

Deck cranes	1 x 3 t @ 13 m
	1 x 1.5 t @ 12 m
Tugger winches	2 x SWL 15 T

#### REFERENCE

Design ID	VS 485 MK III L
Reference number	4960
E-mail for info	shipdesign@wartsila.com
Details are believed to be correct but not guaranteed	



# SIMON MØKSTER SHIPPING



## M/S STRIL PIONER

Supply /Service Vessel / Oil Rec/ Gas Fuelled / ERN 99.99.97

### OWNERS

Simon Møkster Rederi AS  
c/o Simon Møkster Shipping AS  
PO Box 108  
N-4001 Stavanger  
NORWAY

Phone: +47 51839000  
Fax: +47 51839090  
E-mail: [post@mokster.no](mailto:post@mokster.no)

### MANAGING COMPANY (DOC HOLDER)

Simon Møkster Shipping AS (same address as above)  
manages the vessel.

### IDENTIFICATION

Call Sign: LLVM  
IMO No: 9258430  
DnV no: 23616  
MMSI no: 258169000

### SERVICES AVAILABLE

The vessel is equipped and fitted for the following services:

**Platform Supply**  
**Oil Rec**  
**Gas fuelled**  
**Good station keeping**



### MAIN DETAILS

#### Type: VS 4403

Supply /Service Vessel / Oil Rec / Gas Fuelled

#### Class DnV

1A1 Supply vessel Clean COMF (V-3) DK (+) DYNPOS (AUTR) E0 Gas fuelled HL (1.2, 2.5) LFL (\*) OILREC SF

#### Certificates

World Wide, SOLAS 74/78  
Load line conv. 1969

#### Yard and Registry

Builders Kleven, Norway.  
Vessel built 2003  
Port of registry Stavanger  
Flag Norwegian

### MAIN DIMENSIONS

L.o.a.	94,90 m
L.p.p.	81,60 m
Breadth	20,40 m
Deadweight	approx. 6000t
Draught, summer	7,89 m
Accommodation	24 persons

### DECK SPACE / STRENGTH

Deck areal	17,6m x 58,2m	1024 m <sup>2</sup>
Deck Cargo		3550 tons
Deck strength		5 t/m <sup>2</sup>

### TANK CAPACITIES

Ballast water (Drill water)	2081 m <sup>3</sup>
Freshwater	1127 m <sup>3</sup>
Dry bulk	464 m <sup>3</sup>
Base oil	220 m <sup>3</sup>
Fuel oil	1292 m <sup>3</sup>
Liquid Mud (8 tanks)	882 m <sup>3</sup>
Liquid Brine (4 tanks)	834 m <sup>3</sup>
Methanol (2 tanks)	206 m <sup>3</sup>
Special Prod (2 tanks)	278 m <sup>3</sup>
Recovered oil	882 m <sup>3</sup>

### DISCHARGING PUMPS

Fuel oil (Hyd-driven)	2x 0-250 m <sup>3</sup> /h -	10 bar
Ballast/Drillwater	2x 0-200 m <sup>3</sup> /h -	10 bar
Freshwater	2x 0-200 m <sup>3</sup> /h -	10 bar
Liq. Mud (Screw)	2x 0-100 m <sup>3</sup> /h -	24 bar
Liq. Mud (Centrifugal)	2x 75-125 m <sup>3</sup> /h -	24 bar
Brine (Hyd-driven)	2x 0-100 m <sup>3</sup> /h -	25 bar
Methanol (Hyd-driven)	4x 75 m <sup>3</sup> /h -	10 bar
Spec. Prod.	2x 75 m <sup>3</sup> /h -	12 bar
Dry bulk	2x 30 m <sup>3</sup> /h -	10 bar

### CRANES

Two deck Cranes Knuckle jib Hydramarine 10 T @ 10m.

### DYNAMIC POSITION SYSTEM DP-2

Kongsberg, K-thrust, ERN Number: 99.99.99.97  
DnV class DYNPOS – AUTR  
2 DGNSS (Seatex DPS 200 GPS)  
RADIUS 1000 D – Dual Interrogator)  
Cyscan

### NAVIGATION EQUIPMENT

1 x Radar 10 cm Arpa 40 target  
1 x Radar 3 cm Arpa 40 target  
1 x GPS with 12 channel receiver  
2 x DGPS with interface to all rel. navigations  
3 x Gyro compasses with digital repeaters  
1 x Magnet compass  
1 x Doppler log  
1 x Echo sounder  
1 x Electronic chart system interface to all relevant navigation systems and with AIS interface

### COMMUNICATION SYSTEMS

The radio installation is according to GMDSS-A3 (World Wide)

1 x HF / MF Duplex radiostation 500 W  
1 x HF / MF DSC  
2 x Duplex VHF W/DSC  
5 x Simplex VHF  
1 x Navtex Receiver  
2 x inmarsat C with EGC receiver  
1 x Inmarsat "Mini M"  
1 x inmarsat B  
1 x Fax provided for inmarsat B  
1 x Weather facsimile  
1 x VHF Directions finder  
3 x Portable VHF GMDSS  
4 x Fixed UHF with 200 channels  
1 x free float bacon  
2 x radar transponders  
3 x portable VHF  
6 x portable UHF, EEX Proof W EX – Battery  
4 x wireless telephones interfaced to cell phones  
4 x GSM mobilephone Voice/Fax/Data

### DECK MACHINERY

Tugger winch: 2 x 16 tons  
Cargo winch: 8 x 5 tons  
Deck Crane: 2 x 10t/10m  
Capstans: 2 x 10 tons

### SPEED AND CONSUMPTION

Service speed: 13,5 knots - approx. 40m<sup>3</sup> LNG/24hrs or 17m<sup>3</sup> Diesel/24hrs  
Eco Speed: 11 knots - approx. 27m<sup>3</sup> LNG/24hrs or 12m<sup>3</sup> Diesel/24hrs  
DP operation: approx. 13m<sup>3</sup> LNG/24hrs or 7m<sup>3</sup> Diesel/24hrs  
Stand by: approx. 10m<sup>3</sup> LNG/24hrs or 4,3m<sup>3</sup> Diesel/24hrs

### ACCOMMODATION

Total 24 –Persons  
12 x Single Cabins for officers and crew  
6 x Double Cabins for passengers  
1 x Mess  
2 x Dayrooms  
1 x Gym  
1 x Deck office  
1 x hospital  
Safety equipment acc. to Solas for 24 persons



### RESCUE AND LIFE SAVING EQUIPMENT

1x FRC type Norsafe Mako 655 212HP

Hospital with treatment bench, stretchers, medicine and poison lockers, intercom and direct ship to shore communication. Medical equipment/medicine in accordance to NMD

### ENGINES AND PROPULSION

#### Main Engines and Generators:

4 x Wartsila 6R 32 DF 2010 kW, 690V - 60Hz  
4 x ABB AMG 630 S 10 – 2438 kVA 1950 ekW, 690V / 60 Hz

#### Generator

1 x Cat 3304 Rating: 116 BKW Voltage: 3 x 440 V 60Hz

#### Azimuth thrusters aft:

2 x Rolls Royce Contaz 25 Azimut 3300kW

#### Azimuth thrusters forward:

1 x Rolls Royce 880 kW Azimuth

#### Tunnell thrusters:

2 x Rolls Royce(Kamewa) Bow Thruster 1000 kW

### OPERATING COMPANY

Simon Møkster Shipping AS  
PO Box 108  
N-4001 Stavanger  
NORWAY  
Phone: +47 51839000  
E-mail: [post@mokster.no](mailto:post@mokster.no)  
URL: [www.mokster.no](http://www.mokster.no)

### QSHE – CERTIFICATIONS

ISM  
ISPS  
ISO-9001:2008  
ISO-14001:2004

### QA QUALIFICATIONS

IMCA Member  
FPAL Registered  
Achilles Registered  
OVID Registered

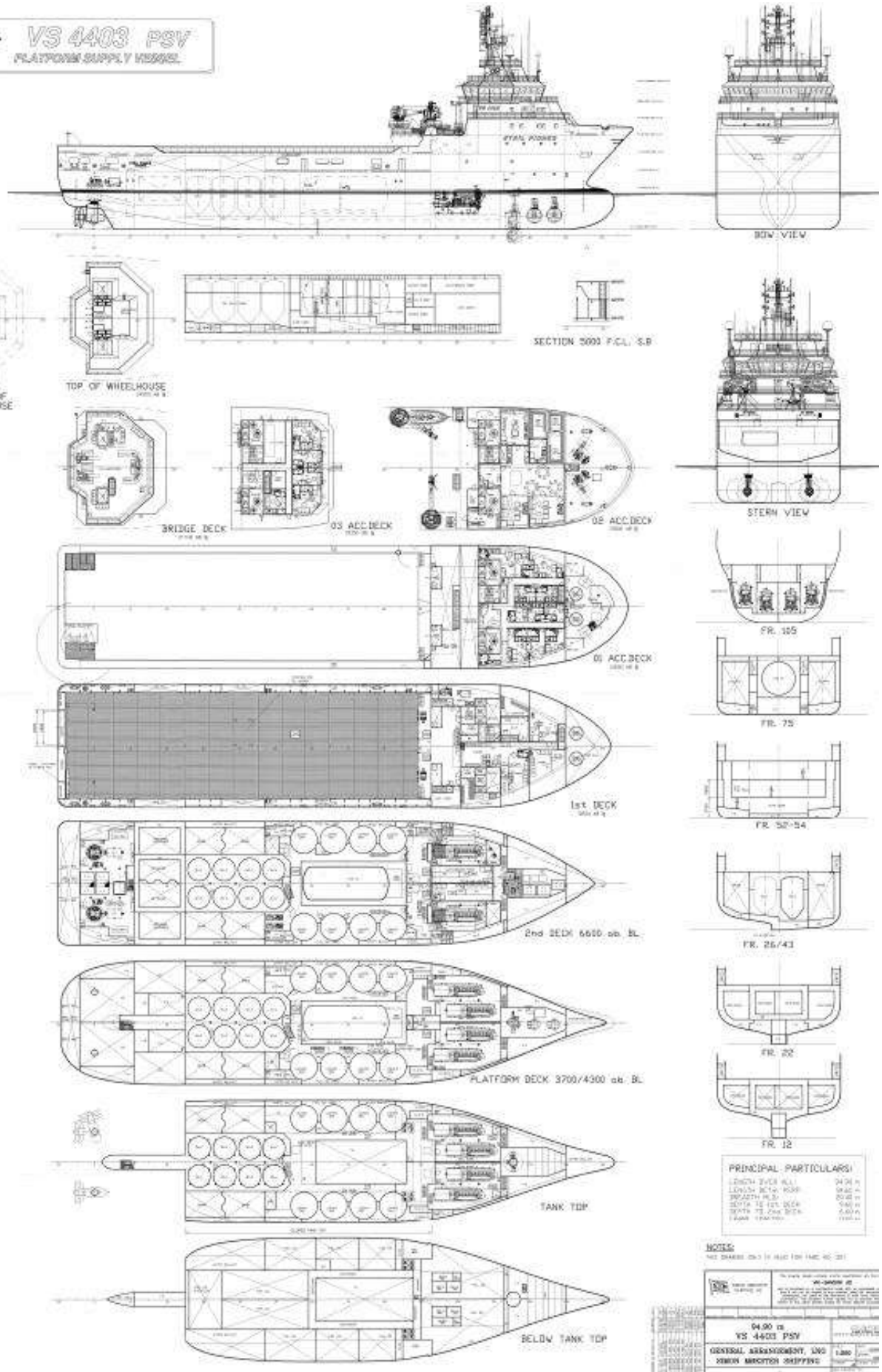


# M/S "STRIL PIONER"



SIMON MØKSTER SHIPPING

**VS 4403 PSV**  
PLATFORM SUPPLY VESSEL



**PRINCIPAL PARTICULARS**

LENGTH OVER ALL	24.28 m
LENGTH B.T.W. POSTS	20.42 m
BREADTH B.T.W.	20.42 m
DEPTH 15 MET. DECK	5.40 m
DEPTH 75 MET. DECK	5.50 m
DEPTH 12 MET. DECK	5.50 m

**NOTES:**  
NO SHARPS ONLY IN ACC. FOR TANK NO. 201

SHIP NAME	VS 4403 PSV
GENERAL ARRANGEMENT, LWS	1:200
SHIPYARD	SIMON MØKSTER SHIPPING

# Lewek Aquarius



PSV/ FIFI 1/ 8,716 BHP/ DP 2



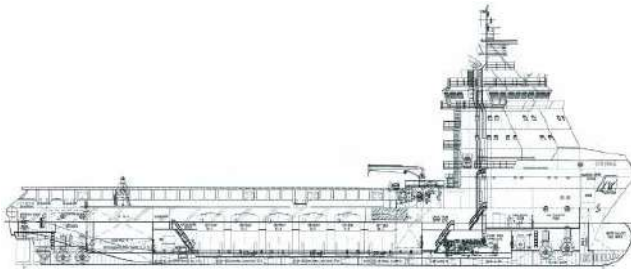
Lewek Aquarius is a Platform Supply Vessel built:

- 1) For Worldwide Operations to Service Drilling Units;
- 2) To Provide Logistics Support for Oil & Gas Production Platforms;
- 3) With Special Equipments for Fire-Fighting, Safety Standby Operations, Emergency Evacuations, ROV Duties, and Seismic Services.

## Specifications:

- |                 |                        |
|-----------------|------------------------|
| • Length        | 87.90 m                |
| • Breadth       | 18.80 m                |
| • Propulsion    | 8,716 BHP              |
| • Deck Area     | 945.0 m <sup>2</sup>   |
| • Fuel Oil      | 965.0 m <sup>3</sup>   |
| • Potable Water | 663.0 m <sup>3</sup>   |
| • Liquid Mud    | 2,077.0 m <sup>3</sup> |
| • Dry Bulk      | 310.0 m <sup>3</sup>   |
| • Methanol      | 204.0 m <sup>3</sup>   |
| • Crane         | 1 x 2 T @ 12 m         |
| • Accommodation | 60 men                 |

# Lewek Aquarius General Specifications



## CLASSIFICATION

### American Bureau of Shipping

✳ A1, (E), Offshore Support Vessel, ✳ AMS, ✳ Oil Recovery Class 2, ✳ ACCU, ✳ DPS-2, ✳ FFV Class 1, ENVIRO, UWILD, GP, TCM, ✳ Safety Standby Service GR B-(300)

Builder	Remontowa Shipbuilding S.A.
Year Built	2012
Flag	Singapore

## MEASUREMENT

Length Overall	87.90 m
Length BP	81.23 m
Breadth Moulded	18.80 m
Depth Moulded	8.00 m
Max Draft	6.50 m

## TONNAGE

Deadweight	Approx. 5,200 T
GRT	TBA
NRT	TBA

## MANEUVERING & PROPULSION SYSTEM

Main Engine	2 x MAK 6M25 rated 1,900 kW (2,548 BHP) each
Electric Motor PTI	2 x PTI Motors rated 2,000 kW (2,682 BHP) each
Combined Propulsion (Hybrid Mode)	6,500 kW / 8,716 BHP
Propeller	2 x CPP, Berg, 3 m (Ø)
Bow Thruster	2 x 900 kW, 12.5 T Thrust, Scana
Stern Thruster	2 x 600 kW, 8.7 T Thrust, Scana

## DYNAMIC POSITIONING SYSTEM

DP-2 System	Kongsberg K-Pos DP-2
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## ELECTRIC POWER GENERATION

Main Generator	2 x CAT 3516C rated 2,350 kW (3,151 BHP)/ 690V/ 60Hz/ 3Ph
Shaft Generator	2 x 2,000 kW (2,435 BHP)/ 690V/ 60Hz/ 3Ph
Emergency Generator	1 x 398 kW (533 BHP)/ 690V/ 60Hz/ 3Ph

## CARGO DECK

Deck Area	945.0 m <sup>2</sup>
Deck Strength	5.0 T/m <sup>2</sup>
Deck Cargo Capacity	TBA

## ACCOMMODATION

Berth / Cabin	20 x 1 man 20 x 2 men
Total	60 men

## STORAGE CAPACITY

Fuel Oil	965.0 m <sup>3</sup>
Potable Water	663.0 m <sup>3</sup>
Drill Water / SWB	2,155.0 m <sup>3</sup>
Liquid Mud / Base Oil / Brine	2,077.0 m <sup>3</sup> (8 Tanks) (Include Recovered Oil)
Dry Bulk	310.0 m <sup>3</sup> (6 Tanks)
Methanol	204.0 m <sup>3</sup>
Recovered Oil	464.0 m <sup>3</sup>

## DISCHARGE CAPACITY

Fuel Oil	1 x 100 m <sup>3</sup> /hr @ 90 m head
Potable Water	1 x 100 m <sup>3</sup> /hr @ 90 m head
Drill Water	2 x 100 m <sup>3</sup> /hr @ 90 m head
Liquid Mud	3 x 150 m <sup>3</sup> /hr @ 200 m head
Liquid Mud / ORO / Base Oil / Brine	1 x 100 m <sup>3</sup> /hr @ 73 m head
Dry Bulk	2 x 75 m <sup>3</sup> /hr
Methanol	2 x 75 m <sup>3</sup> /hr @ 95 m head

## DECK EQUIPMENT

Anchor Windlass	2 x 11 T, Electric driven, Brattvaag
Anchor Chain	2 x 275 m x 54 mm (Ø)
Anchor (Bow)	2 x 2,840 kg, High Holding Power Anchors
Tugger Winch	2 x 11 T @ 27.5m/min, Brattvaag
Capstan	2 x 10 T @ 35.2m/min, Brattvaag
Deck Crane	1 x TTS Marine GPT 80-2-12, SWL: 2 T @ 12 m

## NAVIGATION AND COMMUNICATION EQUIPMENT

GMDSS (Area 3)	Area 3
VHF DSC	2 x Furuno FM-8800S
MF/HF SSB	1 x Furuno FS-1570
MF/HF DSC	1 x Furuno FS-1570
EPIRB	1 x Furuno McMurdo E5A
SART	2 x Furuno McMurdo S4
Navtex Receiver	1 x Furuno NX-700A
Portable VHF GMDSS	3 x Furuno McMurdo R2
Inmarsat	1 x Furuno Felcom-250
Radar	1 x Furuno FAR-2X17BB 1 x Furuno FAR-2X37S-BB
Gyrocompass	1 x Sperry Marine NAVIGAT X MK1
Magnetic Compass	1 x Lilley & Gillie, MK2000S SR4
Auto Pilot	1 x Sperry Marine Navipilot 4000
GPS	1 x Furuno GP-150
Joystick	Kongsberg cJoy fitted
Echo Sounder	1 x Furuno FE-700
Speed Log	1 x Furuno DS-60
Anemometer	3 x Kongsberg WindObserver II
Weather Fax	1 x Furuno FAX-408
AIS	1 x Furuno FA-150
VDR	1 x Furuno VR-3000

## FIRE FIGHTING & ANTI POLLUTION EQUIPMENT

FIFI Class (1) with Water Spray	
Pump	2 x FFS/SFP 300x400, 2,000m <sup>3</sup> /hr @ 125m head
Monitor (water)	2 x FFS/ 1200x300LB, 1,200m <sup>3</sup> /hr
Oil Dispersant System	2 x 10 m Spray Boom, 50 m <sup>3</sup> /hr

## SAFETY EQUIPMENT

Life Raft	12 x 20 persons, Viking
Rescue Boat	2 x 15 persons, Jiangyin Neptune Marine FRP Boat, NPT60RB, 2 x Steyr MO144M38, 144 HP each
Davit	2 x NDM PRHE 30, SWL: 3.0T

## MISCELLANEOUS

Oily Water Separator	1 x RWO SKIT/S-DEB 0.25, 1.0 m <sup>3</sup> /hr
Sewage Treatment	1x 75 persons x RWO WWT LC 06, 10.8 m <sup>3</sup> /hr
Tank Cleaning Machines & Agitator	Provided in Liquid Mud Tank



**TROMSOFFSHORE**  
A TIDEWATER COMPANY



# **MV "Troms Castor" PSV VS 485 CD**

## **SPECIFICATION AND DATA**



## REGISTRY INFORMATION

Vessel Name	MV Troms Castor
Vessel Call sign	LALC
IMO No.	9422213
Ship Owner	Troms Offshore Fleet 1 AS
Operator	Troms Offshore Management AS
Port of registry	Tromsø, Norway
Building year	2009
Yard	Hellesøy Verft
Register	NOR
Flag	NOR
V-Sat Bridge	21 03 82 90
V-Sat Engine	21 03 82 91
GSM Mobile	+47 46 85 61 08
GSM Fax	+47 94 76 07 95
E-Mail	<a href="mailto:bridge@castor.tromsoffshore.no">bridge@castor.tromsoffshore.no</a> <a href="mailto:captain@castor.tromsoffshore.no">captain@castor.tromsoffshore.no</a>
Number of crew:	12
Crew nationality	Norwegian/Scandinavian

## CLASSIFICATION INFORMATION

Classification society	Det Norske Veritas
Type of vessel	Platform Supply Vessel PSV. Design VS 485 CD
Class:	DNV 1A1, ICE-C, OILREC, NOFO 2005, Standby Vessel(S) SF, LFL*, COMF-V(3)C(3), E0, DYNPOS-AUTR, NAUT-OSV(A), CLEAN DESIGN, DK(+), HL(2.8)
Planned Maintenance System	OCS Premaster
ERN	99,99,99,56

## VESSEL MEASUREMENTS

Gross tonnage	4366 t
Net tonnage	1813 t
Length overall	85 m
Length between PP:	77,70 m
Breadth, Molded	20 m
Depth, Molded	8,60 m
Draught max (Summer)	7,163 m
Dead weight at max draught (Summer)	5491 t
Bulwark height / height of rail	4,40 m



## CARGO EQUIPMENT

Cranes	<b>Dacon Scoop Crane TTS Boom Jib Crane GPK 115 – 3 - 13</b> <b>Provision service crane TTS Jib GPT 80 – 3 - 13</b> 1. Outreach from rail: 7 m- SWL: 3t Position: aft of superstructure on port side. 2. Outreach from rail: 11,5 m- SWL: 3t Position: aft of superstructure on stbd. side.
Agitators in mud tanks	Yes
Tank washing system	Yes
Bulk cargo stations	X 2 Midship STB / PS / x 2 Aft STB / PS (4)
Vessel able to load/discharge simultaneously	Yes

## CARGO DECK CAPACITIES

Deck area	1005 m2 (60,6m x 16,8m)
Useable Deck area	972 m2
Deck cargo capacity	2800 t
Deck strength	10 t/m <sup>2</sup>

## TANK CAPACITIES

	Tank Capacity	Pump capacity	Pump pressure	Number of tanks
Fuel oil	903 m3	2 x 150 m3/h	9 bar	5
Water ballast*	2470 m3	2 x 150 m3/h	9 bar	18
Fresh water	1007 m3	2 x 150 m3/h	9 bar	11
Drill Water*	2470 m3	2 x 150 m3/h	? bar	11
Dry bulk	440 m3	2 x 31 m3/h	21.6 bar	8
Brine*	418 m3	2 x 150 m3/h	8 bar	2
Methanol	146 m3	1 x 75 m3/h	9 bar	1
Base oil	203 m3	2 x 100 m3/h	24 bar	2
Liquid Mud*	703 m3	4 x 100 m3/h	24 bar	6
Special Product	146 m3	1 x 75 m3	7,2bar	1
ORO*	1808 m3	8 x 100 m3	7 bar	14

\* Includes combination tanks

## MACHINERY/PROPULTION

Main engines	4 x CAT 3516 BTA 1901 kW
Main generators	4 x AvK DSG 86 M1-4W
Main propellers	2 x Steerprop SP 35 CRP Azimuth - 2300 kW
Azimuth bow thruster	1 x Brunvoll ret. thruster AR-63-LNA-1650-800 kW
Bow thruster	2 x Brunvoll tunnel thruster FU-80LTA-2000-1000 kW
Emergency generators	Volvo Penta D9A MGRC 265kW; 1800rpm
SRC –catalytic converter	No

## PERFORMANCE/CONSUMPTION

Full speed	15 knots – 24 m <sup>3</sup> /day
Service speed	12 knots – 16 m <sup>3</sup> /day
Economical speed	11 knots – 12 m <sup>3</sup> /day
Stand/by (average)	3,5 m <sup>3</sup> /day
DP operations by rig	5 - 6 m <sup>3</sup> /day
In port	2 m <sup>3</sup> /day

## NAVIGATION AND COMMUNICATION EQUIPMENT

Radar 10 cm	Furuno FAR-2837S
Arpha radar 3 cm	Furuno FCR-2827
Autopilot	Simrad AP-50
Gyro	3 x Simrad GC-80
GPS	Furuno GP-150
AIS	Furuno FA-150
Speed log	Skipper EML224
Echo sounder	1 x Furuno FE-700
Digital speed and distance repeater	Skipper IR300
GSM telephone	Nokia
Electronic chart computer ECDIS	Furuno Tecdis T-2137
GMDSS hand portable VHF	Jotron Tron TR-20
UHF Portable radio	Motorola GP-340
Inmarsat C	Furuno Felcom 15
Radio Station MF/HF	Furuno FS-2570C
Radio Station VHF/DSC	Furuno FM-8800S
DSC terminal	MF/HF-Furuno FS-2570C

## DP SYSTEM

DP system	Kongsberg DP II K-pos 21
Joystick	Kongsberg C-Joy Constant
Reference systems	2 x DGPS, Fanbeam and RADIUS

## LIFE SAVING EQUIPMENTS

<b>NMD</b>	200 POB
<b>FRC</b>	1 x ALUSAFE 700 FRC MKII TWIN
<b>Rescue Net</b>	Dacon Rescue Scoope
<b>Rafts</b>	4 x 25 persons Viking
<b>Davit</b>	1 x HLT 3500 TTS

## ACCOMODATION

<b>Total capacity</b>	23 beds
<b>1 men cabins</b>	11 x 1
<b>2 men cabins</b>	6 x 2
<b>Available for charter</b>	10 beds

<b>DESIGN</b>	HAVYARD 833L
<b>CLASSIFICATION</b>	DNV : +1A1 - SF - E0 - HL(2.8) - LFL* - DYNPOS AUTR - OFFSHORE SERVICE VESSEL+ - SUPPLY - CLEAN DESIGN - NAUT OSV(A) - COMF - V(3) - C(3) -DK(+)
<b>BUILDERS</b>	HAVYARD LEIRVIK AS
<b>FLAG</b>	NORWEGIAN
<b>MMSI</b>	257 419 000
<b>IMO NO</b>	9631890
<b>DELIVERY DATE</b>	DECEMBER 2012
<b>CALLSIGN</b>	LCWZ

DETAILS BELIEVED TO BE CORRECT, BUT NOT GUARANTEED.



## HAVILA CHARISMA

*Platform Supply Vessel - PSV*



# HAVILA CHARISMA

Platform Supply Vessel - PSV

## MEASUREMENTS

Length o.a.	92.80 m
Length b.p.p.	82.80 m
Breath moulded.	19.60 m
Depth moulded	8.00 m
Draught, Max.	6.569 m
Freeboard S, min	1.443 m
DWT	4 976 t
Gross tonnag	4 327 t
Net tonnage	1 578 t
Higt from keel	36.630 m

## CLASSIFICATION

DNV : +tAI - SF - Eo - HL(2.8) - LFL\* - DYNPOS AUTR - OFFSHORE SERVICE VESSEL+ - SUPPLY - CLEAN DESIGN - NAUT OSV(A) - COMF - V(3) - C(3) -DK(+)

## CARGO CAPACITIES

Deck area max	L x B= 66 m x 16.4 m = 1082.4 m <sup>2</sup>
Deck strength	Main deck from stern to fr. 102 = 10 t/m <sup>2</sup>
Fuel Oil	711.3 m <sup>3</sup>
Liquid Mud SG 2.8	1044.1 m <sup>3</sup> Total 8 tanks
1 Agitators in each tank (El. Driven)	
Brine SG 2.8	516.9 m <sup>3</sup>
Base oil	308.9 m <sup>3</sup>
(Can be used for fuel. separated with sout ventil)	
Pot water:	814 m <sup>3</sup>
Drillwater / ballast	1958.1 m <sup>3</sup> / 1958.1 m <sup>3</sup>
Methanol +	
Nitrogen bottle rack system + 1 Nitrogene Comp.	317.2 m <sup>3</sup>
Special Product:	
Nitrogen bottle rack system + 1 Nitrogene Comp.	217.3 m <sup>3</sup>
Slop:	50.4 m <sup>3</sup> + Use of mud tanks
Cement / Barite / Bentonite:	
3 seperate systems	6 Vertical tanks each 50.6 m <sup>3</sup> Tot. 303.7 m <sup>3</sup>

## DISCHARGE RATES

Fuel Oil	2 x spindle Screw 0-200 m <sup>3</sup> /h - 9 bar
Liquid Mud	2 x Ecc. Screw 0-100 m <sup>3</sup> /h - 24 bar
Brine	2 x Ecc. Screw 0-100 m <sup>3</sup> /h - 24 bar
Mineral oil	1 x spindle Screw 0-100 m <sup>3</sup> /h - 9 bar
Pot. water	2 x Spindle Screw 0-200 m <sup>3</sup> /h - 9 bar
Drillwater/ballast	2 x Spindle Screw 0-200 m <sup>3</sup> /h - 9 bar
Methanol	2 x Centrifugal hydr. Driven 0-75 m <sup>3</sup> /h - 9 bar
Special Product	4 x 2-Screw pump hydr. Driven "heavy duty" - 0- 75 m <sup>3</sup> /h - 9 bar sg 1.2
Slop	1 x Ecc. Screw 0-15 m <sup>3</sup> /h - 12 bar
Cement / Barite	2 x Screw Comp. 25 m <sup>3</sup> /min - 5.6 bar with 1 x external dryer on each comp. 2 x Cyclone 2 x Dust Collector

## TANK CLEANING SYSTEM

A total of 15 cleaning machines fitted in: MUD, Brine and Slop tanks	
Slop Tank	1 x 50.4 m <sup>3</sup>
Hot Water Tank	1 x 15.6 m <sup>3</sup>

## CARGO MANIFOLDS

Manifolds midships inside starboard and port cargo rail.

And inside aft starboard and port cargo rail.

Brine, Mud og Baseoil	Mann-Tek 4" NPT Viton WP - 25 bar
Fuel	Mann-Tek 4" NPT Alu/Viton - 16 bar
Fw, Dw	Anson 4" Female Sub
LFL	Mann-Tek 4" SS NPT Viton WP25Bar with Breakaway 52 KN

## MACHINERY / D/E-PROPULSION Resiliently Mounted

Main Engines	4 x 2080 KW MTU 16V 4000 M33S
Main generators	4 x 2222 KVA. Type Marelli MJR 500 SC4 B20
Harbour Engine	1 x 695 KW MTU 12V 2000 M41B
Harbour Generator	1 x 667 KVA Type Mirelli MJBM 355 MB4 B35
Emergency Engine	1 x 265 KW Volvo Penta D9A2A MG
Emergency Generator	1 x 202 KVA Stamford UCM274HI

## MAIN PROPULSION

Fixed pitch	2 x 2100 KW Steerprop SP25CRP
Electric drives	2 x Quadro Drive 2100 KW
Fwd. Tunnel thrusters type	2 x 1000 KW. FU74LRC2000
Brunnvoll (S Silent)	2 x Quadro Drive 1000 KW
Fwd. azimuth thruster type:	1 x 880 KW AR63LNC 1650
Brunnvoll Retractable	1 x Quadro Drive 800 KW
Azimuth	

## PERFORMANCE / CONSUMPTION at draft 5.00 m

Max speed	15.3 knots / 24.1 m <sup>3</sup> / 24 hrs
Econ- speed	10 knots / 6.9 m <sup>3</sup> / 24 hrs
Service. speed	12.0 knots / 11.5 m <sup>3</sup> / 24 hrs
DP II Average	Draft 5.8 mtr / 5.6 m <sup>3</sup> / 24 hrs
Harbour Mode	1.6 m <sup>3</sup> / 24 hrs

## BRIDGE DESIGN: NAUT - OSV HAVYARD CONCEPT BRIDGE

1 x Consol forward bridge  
3 x Consol aft bridge, and two equal operator stations  
1 x Consol each bridge wing  
1 x Radio station. connected to forward bridge console  
1x Office / work station

## IAS SYSTEM

Hayard Power system (HPS) Concept HMA HC800

## AUTOMATION SYSTEM

Hayard Power system (HPS) Concept HMA HC800

## LOADING COMPUTER

1 x Autoload from Coastal design

## ACCOMODATION 27 PERSONS

Cabins	11 off single cabins 6 off 1M+1 cabins 2 off 2 x 2 men cabin 1 off office C-deck 1 off Hospital Main deck
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## DP SYSTEM DYNPOS AUTR

Kongsberg K-Pos, cJoy and K-Master Dynamic Positioning System  
DYNPOS-AUTR  
2 x K-Master Work Stations with integrated independent Joystic (cJoy) in Chair  
3 x K-Pos OS  
2 x cJoy OT independent Joystic on bridge wings  
1 x Seatex DPS 122 DGPS  
1 x Seatex DPS 200 DGPS  
1 x Radius with 2 interrogator Radius 1000  
1x Transponder type Radius 700  
1 x Cyscan  
1 x Wind sensor: OMC 139  
1 x Wind sensor: OMC 139D  
3 x Seatex MRU type MRU-M-MB1  
1 x Kongsberg History station

## THRUSTER CONTROL

Kongsberg K-Thrust

## BRIDGE WATCH MONITORING SYSTEM

Havyard Power system (HPS) BWAS

## LIFE SAVING EQUIPMENT

Safety Equipment: Acc to NMD/SOLAS for 27 pers.  
Life Raft: 6 x 16 persons. 3 on each side  
Mob boat type: Mare Safety GTC 700-2VD 10 pers.  
Mob boat davit type: TTS HL9D MOB3800  
Survival suits: 27 persons + 5  
Lifejackets: 32 + 2 childrens size  
1 x Danscope Rescue basket  
2 x Climbing net  
1 x Diver's ladder aluminium 5 mtrs.  
4 x Boathooks w/4 mtrs GRP shaft  
Rescue/St-By for 250pers Acc to NMD

## INCINERATOR

1 x Teamtec OG-200-CS

## DECK EQUIPMENT

Windless Electric driven 2x Adria Anker/Mooring Winch type:  
AMW-ER-46/U3/45-CDDCG 100 KN  
2x Adria Mooring Winch type: MC-E-100/12.2/24.5-DG 100 KN  
Tugger winch Electric driven 2 x Adriawinch PWE 100 100 KN each.  
Capstan Hydr driven 2 x Adriawinch 100KN  
Deck Crane 1 x TTS GPK115-3-15  
SWL 3T 2.1 – 15 m (Starboard)  
1 x Palfinger PK 23500 m (Port)  
SWL 1865 kg-10 m / 2140 kg – 6.1 m  
Cargo securing winch 6 x AdriaWinch type:  
PW-E-30/6-15/28-DG Pull 30 KN. 3 on each side in cargo rail  
Karmøy Winch Hose securing Midship Starboard and Port  
Unit. Remote controlled from AFT. Starboard and Port  
bridge.  
RRM ASFA 4-2 . Automated 8 pc Hydraulic winches. Pull 4tonn  
Sea Fastening Arrangements.

## ENTERTAINING EQUIPMENTS

1 x Sat. TV: Seatel  
Triax TDX Tv system with 24 channels

1 x TV in all crew cabins  
1 x TV in all lounges  
1 x Radio / DVD in all cabins  
1 x Gymnasium B - Deck w/Equipments

## TERMINALS FOR REFRIGERATE CONTAINER

4 Terminals with 7 socket on each terminal. Placed on stb: fwd and mid ship, and port: aft and mid ship.  
A total of 28 conections for Refrigerate containers

## ANTI ROLLING SYSTEM

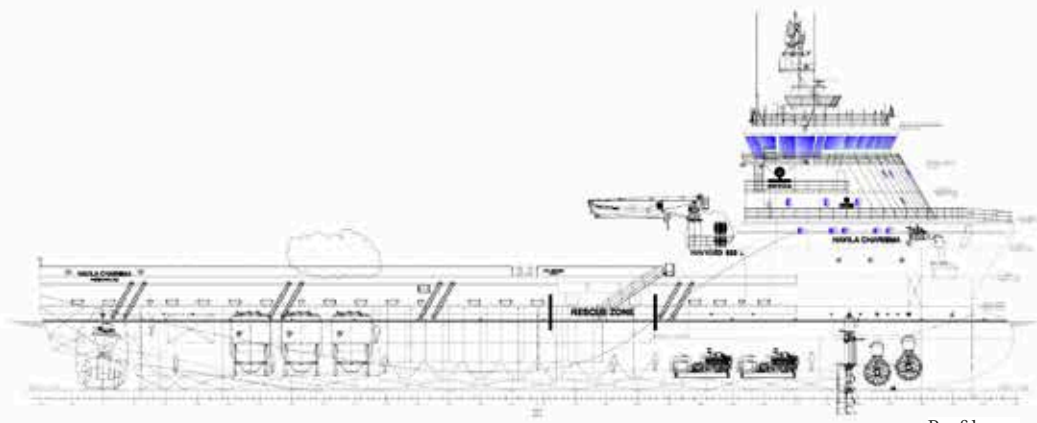
2 x Stabilizing tanks. Passive roll reduction system.  
One on aft peak and one aft on D-dekk

## COMMUNICATION EQUIPMENT GMDSS A 3

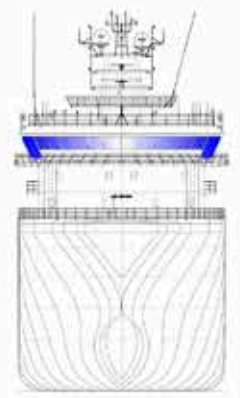
1 x Sailor 6000 SSB Simplex Radio station  
2 x Sailor 6000 Inmarsat-C w/EGC  
1 x Sailor Fleet Broadband 250 Voice / Mail  
2 x Sailor 6222 Semi duplex VHF With DS  
3 x Sailor 6248 Simplex VHF  
3 x Jotron GMDSS approved portable VHF, Model Tron TR-20  
1 x Icom Portable VHF Air Band Transceiver IC-AGE  
2 x Jotron Radar Transponder, Model TRON SART-20  
1 x Jotron EPIRB Automatic, Modell TRON 40S  
1 x Jotron EPIRB Manuel, Model TRON 45SXX  
5 x Motorola GM-380 Fixed UHF.  
6 x Motorola Portable UHF, EX approved, Model GP380 AteX  
4 x Motorola Portable VHF, EX approved, Model GP340 AteX  
10 x Headset to build inn safety helmets  
1 x Marlink VSAT Antenna. Bandwidth 512  
2 x GSM Phone: Voice  
1 x Icenet : Internet/E-mail. Bandwidth 512  
Integrated Communication System Zenitel Stentofone  
7 x Dect C3105B Handset  
7 x Indoor base stations + 1 lekagecable below MD  
1 x Outdoor base station  
PA Anlegg type Steenhans CBT-10  
1 x Loudhailer system: Speaker 1 x 100 W, 1 x 30 W, 12 x 15 W  
6 x Batteryless phones type: VSP-211-L, VSP-213-L, VSP-223-L

## NAVIGATION EQUIPMENT

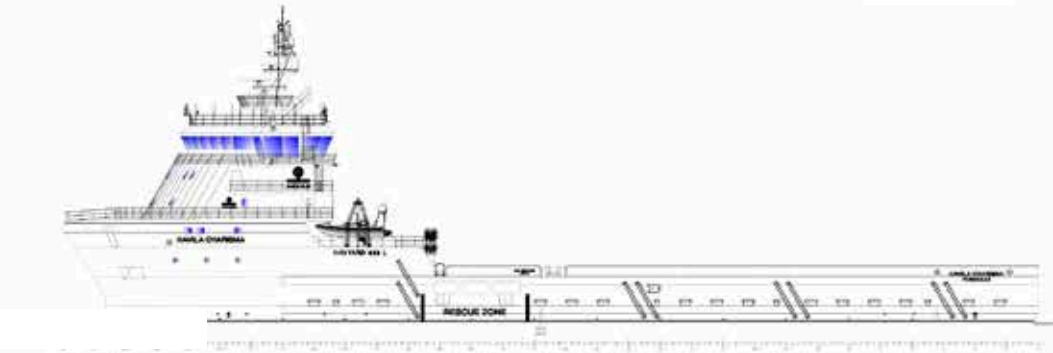
1 x Furuno S-Band ARPA Radar, Model FAR-2x27S BB  
1 x Furuno X-Band ARPA Radar, Model FCR-2x17 BB  
2 x Furuno ECDIS, Model TECDIS T-2138A  
4 x Furuno Conning system, Model Furuno  
2 x Furuno DGPS Navigator, Model GP-150  
1 x Taiyo VHF Direction Finder, Model TD-L1550  
1 x JRC NCR – 333 Navtex  
3 x Anschutz Standar 22 Digital Gyrocompass  
2 x Anschutz Gyro selector system  
1 x Anschutz Analogue repeater forward  
2 x Anschutz Digital repeater  
2 x Anschutz Bearing repeater 3600  
1 x Anschutz Adaptive Autopilot, Pilotstar D  
1 x Furuno FE-700 Navigational Echo Sounder (IMO approved)  
1 x Furuno Doppler speed log, Model DS-820  
1 x Furuno FA 150 AIS transceiver  
1 x Furuno Voyage Data Recorder, Model VR-3000  
1 x Vingtor VSS Sound Reception System



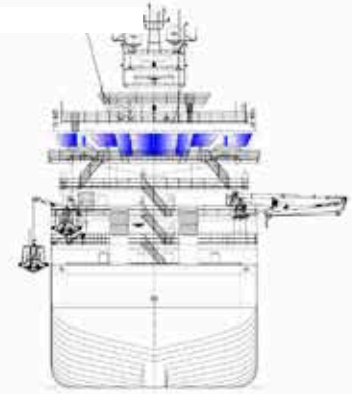
Profile



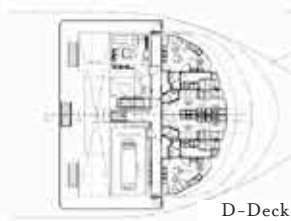
Front view



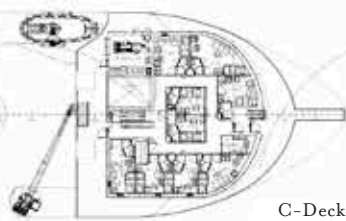
Profile Port



APT view



D-Deck



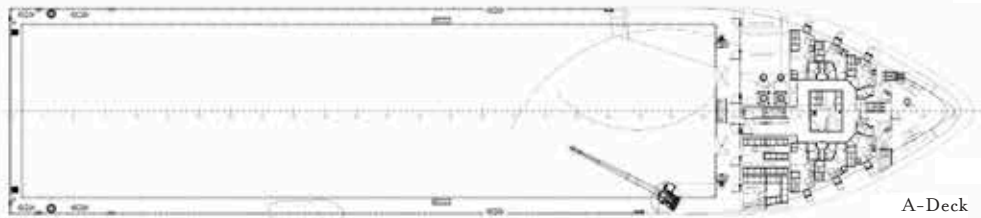
C-Deck



B-Deck



Bridge Deck



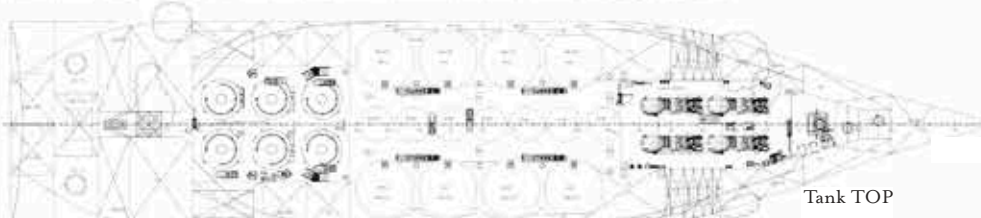
A-Deck



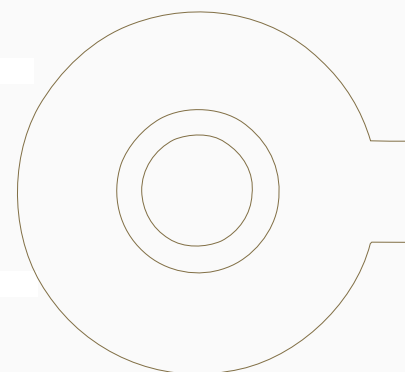
Main Deck



Tween Deck



Tank TOP





## CARGO CAPACITY PLAN

TANK No.	Volume M <sup>3</sup>	Fuel M <sup>3</sup>	Pot Water	Drill Water	Ballast Water	Mud SG SG 2.8	Brine SG 2.8	Base Oil	Methanol	Special product	Slop	Urea	Dry Bulk
1	185,5			185,5	185,5								
4 PS	36,7			36,7	36,7								
5 SB	36,7			36,7	36,7								
6 PS	27,2			27,2	27,2								
7 CL	45,4			45,4	45,4								
8 SB	27,2			27,2	27,2								
9 PS	65,4			65,4	65,4								
10 SB	65,4			65,4	65,4								
11 PS	67,7			67,7	67,7								
12 SB	67,7			67,7	67,7								
13 PS	68,7			68,7	68,7								
14 SB	68,7			68,7	68,7								
15 PS	73,4			73,4	73,4								
16 SB	73,4			73,4	73,4								
17 PS	80,8		80,8										
18 SB	80,8		80,8										
19 CL	40,0			40,0	40,0								
20 PS	115,9		115,9										
21 SB	115,9		115,9										
22 PS	58,3			58,3	58,3								
23 SB	58,3			58,3	58,3								
24 PS	70,0			70,0	70,0								
25 SB	70,0			70,0	70,0								
26 PS	28,9			28,9	28,9								
27 SB	28,9			28,9	28,9								
28 PS	27,9			27,9	27,9								
29 SB	27,9			27,9	27,9								
30 PS	27,9			27,9	27,9								
31 SB	27,9			27,9	27,9								
32 PS	41,9			41,9	41,9								
33 SB	41,9			41,9	41,9								
34 PS	65,1		65,1										
35 SB	65,1		65,1										
36 PS	102,7			102,7	102,7								
37 SB	102,7			102,7	102,7								
38 PS	58,7								58,7	58,7			
39 SB	58,7								58,7	58,7			
40 PS	51,7								51,7	51,7			
41 SB	48,2								48,2	48,2			
42 PS	51,7								51,7				
43 SB	48,2								48,2				
44 PS	52,4		52,4										
45 SB	52,4		52,4										
46 PS	56,4			56,4	56,4								
47 SB	56,4			56,4	56,4								
48 CL	44,1			44,1	44,1								
49 ROL	185,6		185,6										
50 PS	67,0	67,0											
51 SB	61,9	61,9											
53 SB	87,4	87,4											
54 SB	49,3	49,3											
55 PS	106,8	106,8											
56 SB	106,8	106,8											
57 PS	91,4	91,4											
58 SB	91,4	91,4											
59 PS	154,4							154,4					
60 SB	154,4							154,4					
61 PS	156,4					156,4							
62 SB	156,4					156,4							
63 PS	157,6					157,6							
64 SB	157,6					157,6							
65 PS	157,6					157,6							
66 SB	157,6					157,6							
67 PS	157,6						157,6						
68 SB	157,6						157,6						
69 CL	50,4					50,4							
70 CL	50,4					50,4							
71 CL	50,4						50,4						
72 CL	50,4						50,4						
73 CL	50,4						50,4						
74 CL	50,4						50,4						
75 PS	50,6											50,6	
76 SB	50,6											50,6	
77 PS	50,6											50,6	
78 SB	50,6											50,6	
79 PS	50,6											50,6	
80 SB	50,6											50,6	
81 ROL	107,3			107,3	107,3								
82 PS	14,8			14,8	14,8								
83 SB	14,8			14,8	14,8								
127 CL	50,4										50,4		
147 PS	49,3	49,3											
179 SB	56,5											56,5	
TOTAL		711,3	814,0	1958,1	1958,1	1044,0	516,8	308,8	317,2	217,3	50,4	56,5	303,6

Domestic  
Domestic  
Domestic

Barite  
Barite  
Cement  
Cement  
Cement  
Bentonite

1 M<sup>3</sup> = 6,289 BARREL (BBLs) — 1 M<sup>3</sup> = 35,315 F3



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*The*  
**J. J. Ugland**  
*Companies*

# MV JUANITA

Salt 100 PSV - Platform Supply Vessel



**OWNER:** Ugland Supplier AS  
**OPERATOR:** Ugland Offshore AS  
**TECHNICAL MANAGER:** Ugland Marine Services AS

**OFFICE ADDRESS:** J.M. Uglands vei 20, N-4878 Grimstad, Norway  
(P.O. Box 128, N-4891 Grimstad, Norway)  
Tel: +47-37 29 26 00  
Fax: +47-37 29 26 61  
E-mail: [tank-psv@jjuc.no](mailto:tank-psv@jjuc.no)  
Website: [www.jjuc.no](http://www.jjuc.no)

**BUILT BY:** Kleven Verft AS  
**YEAR BUILT:** 2014

# JUANITA Salt 100 - Platform Support Vessel

## Main Description

Type of Vessel	Platform Supply Vessel
Classification	DNV+1A1, ICE-C, SF, DYNPOS AUTR, EO, LFL*, OILREC (NOFO 2009), Clean Design, Naut OSV (A), COMF-V(3)C(3), NMD Stand-by Vessel, BIS, BWM-T, DK(+) and HL (2.8), TIMON, DEICE
ERN Number	99.99.99.99
NOFO	2009
Stand-By	NMD - 225 Survivors
Place of Build	Kleven Maritime AS, Norway
Year of Build	04/2014
Flag	NOR
Design Company	Salt 100 Ship Design Norway
Yard Number	361
IMO Number	9665011
Call Sign	LDLA
Shipowning Company	Ugland Supplier AS J.M. Uglands vei 20, N-4878 Grimstad, Norway

## Measurements

Length Overall	88.90 m
Length Between	
Perpendiculars	81.10 m
Breath Moulded	20.00 m
Draft Mid. Main Deck	8.80 m
Draft Summer Marks	7.294 m
DW Summer Draft	5 456 T
Gross Tonnage	4 902 GRT
Net Tonnage	1 514 NRT
Displacement Summer	9 056 T

## Machinery

Generator set:	
Engines	3 x 1665 kW, total 4995 kW Type Wärtsilä - 9L20
Engine	1 x 750 kW Type Wärtsilä - 4L20
Engine (Harbour)	1 x 750 kW Type Wärtsilä - 4L20
Generators	3 x 1784 KVA, 690 Volt, 60Hz, 900 rpm Type: AVK DSG 99 M1 - 8W
Generators	2 x 784 KVA 690 Volt 60Hz, 900 rpm Type AVK DSG 86 KO - 8W
Main Propulsion	2300 kW + 1700 kW Scana Volda CRP Type FP3400/FP3800/TH750/PM2054
Emergency Generator	1 x 270 KW, Engine Volvo Penta Type D9A2A MG 1 x 216 KW Generator Stamford Type HCM 434D1 690 Volt 60Hz

## Thruster

Retractable Thruster	1 x 880 kW, Brunvoll AR63 LNC 1650
Bow Thrusters	2 x 1200 kW Brunvoll FU-80-LTC-2250-1200 Tunnel
Aft Thrusters	2 x 1400 kW Brunvoll FU-74-LTC-2000-1400 Tunnel

## Vessel Speed and Consumption

Max Service Speed	14.9 knots	Approx	19.4 m <sup>3</sup>
Economic Speed	11 knots	Approx.	7.2 m <sup>3</sup>
DP Operation		Approx	5.5 m <sup>3</sup>
Stand-By at Sea		Approx	2.6 m <sup>3</sup>
In Port (idle, hotel load only)		Approx.	1.5 m <sup>3</sup>

The above is based on max. draft 5.0 m/ 2000 Mt Dwt., max 1.5 m significant wave height, average value of head/tail winds and seas, light winds and no swell.  
For DP and St.by. at sea, varying heading, max. Beaufort force 5 and max Hs 2 m.

## Accommodation

Single Cabins	12
Double Cabins	6
Hospital	1
Total Accommodation	24 berths, all cabins fully Air-Conditioned
Laundry	1
Messroom	1
Dayroom	1
Galley	1
Cool Store	1
Freezers	1
Dry Provision	1
Offices	1
Gymnasium	1

## Capacities

Deck Load Max	3 150 Mt	
Deck Strength	10 t/m <sup>2</sup>	
Dry Bulk Capacities	394 m <sup>3</sup> in 6 tanks. 6 bar max	SG 2.32
Ballast/Drillwater	1 216 m <sup>3</sup> in 12 tanks	
Freshwater	681 m <sup>3</sup> in 6 tanks	
Freshwater	298 m <sup>3</sup> in 2 stainless steel tanks	
Liquid Mud, LFL*	1 080 m <sup>3</sup> in 8 tanks w/agitators and circulation by cargo pump	SG 2.8
Liquid Mud, LFL	289 m <sup>3</sup> in 2 tanks w/agitators and circulation by cargo pump	SG 2.8
Liquid Mud	118 m <sup>3</sup> in 2 tanks w/circulation by cargo pumps	SG 2.8
Brine (in liquid mud tanks)	984 m <sup>3</sup> in 8 tanks	SG 2.8
Base Oil/Fuel oil	183 m <sup>3</sup> in 2 tanks	
Fuel Oil	814 m <sup>3</sup> in 12 tanks	
Methanol/ Special Products	104 m <sup>3</sup> in 2 tanks	SG 1.4
Special Products/ ORO	146 m <sup>3</sup> in 2 tanks w/ heating coils	SG 1.4
Special Products	104 m <sup>3</sup> in 2 tanks	SG 1.4

ORO Mode Capacity: 1 738.6 m<sup>3</sup>

Aut. Tankwashing System in OBM/Brine/Spec. Product/Methanol tanks

N2 Generator	6000-C-210,
Capacity	188Nm3@95% N2
N2 Receiver/Storage	1000ltr/10bar
Connection for shore filling	

Covering:

All Liq Mud/LFL tanks (12) and incl dedicated Slop tank Special product and Methanol tanks

WB/N2 tanks surrounding LFL\* tanks, Special product, Methanol tanks and cofferdam

Roll reduction tanks 126.4 + 327.9 m<sup>3</sup>

## Discharge

Dry Bulk	2 x 0-30 m <sup>3</sup> /min at 6,5 bar
Ballast/Drill Water	2 x 150 m <sup>3</sup> /hr at 9 bar – Screw pump, Frequency control, PG NM 81200999
Fresh Water	2 x 150 m <sup>3</sup> /hr at 9 bar – Centrifugal pump, Frequency control, PG 80/250 A4
Liq,Mud/Brine/Slop	12 x 120 m <sup>3</sup> /hr at 9 bar - Hydraulic Submerged Pump. Framo Type SD150
Base Oil	2 x 100 m <sup>3</sup> /hr at 9 bar – Centrifugal pump, Frequency control, PG 65/250 A4
Fuel Oil	2 x 150 m <sup>3</sup> /hr at 9 bar – Centrifugal pump, Frequency control. PG 80/250 A4
Special Products	4 x 75 m <sup>3</sup> /hr at 9 bar – Hydraulic Submerged Pump. Framo Type SD100
Methanol	2 x 75 m <sup>3</sup> /hr at 9 bar – Hydraulic Submerged Pump. Framo Type SD100

Reducer fittings available

## Bulk Cargo Stations

PS/SB Mid Ship	Dry Bulk, DW, FW, Mud, Brine, Base Oil, FO, Special Products, Methanol, Slop
PS Aft	Base Oil, FO, DW, FW, Dry Bulk
SB Aft	Mud, Brine, Special Products, Metanol, Slop

## Deck Equipment

Deck Dimensions	60.0 x 16.8 m
Deck Area	1 016 m <sup>2</sup>
Deck Area Workable	1 000 m <sup>2</sup> - Approximately
Deck Strength	10 t/m <sup>2</sup>
ASFA 2-4	Force on chock 4 tonnes. 0-50mtr/min. 8 units arranged in 2 groups
Capstans	2 x 10 t NDM Capstan10
Aft Winches	2 x 10 t NDM mw.mw 10
Tugger Winches	2 x 15 t NDM twtu15
Knuckle Boom Crane	1 x 2 t at 18 m
Life Rafts	4 x 25 persons
Man Overboard Boat	1 x MARE GTC 700 2 VD.35 knts. 10 Persons. Redundant engines
Socket Outlets on Deck	2 pcs. 16A 450V 3 phase + earth 2 pcs. 16A 230V 2 phase + earth
NOFO Cabinet Fwd	2 pcs. 32A 450V 3 phase + earth Eex-ed 2 pcs. 16A 230V 2 phase + earth Eex-ed
NOFO Cabinet PS Aft	2 pcs. 16A 230V 2 phase + earth Eex-ed
NOFO Cabinet SB Aft	2 pcs. 16A 230V 2 phase + earth Eex-ed
Sockets for Cargo Stb	12 pcs. 16A 230V 2 phase + earth Eex-ed
Sockets for Cargo Port	12 pcs. 16A 230V 2 phase + earth Eex-ed
Towing Strong point	1 pcs.100 t SWL. Fr. 2. Lgt. 4 f. CL

## Navigation Equipment

Radars	1 x L3 Multiplot Platinum X-band radar Arpa 1 x L3 Multiplot Platinum S-band radar Arpa 1 x Miros OSD System NOFO 2009 compliant
Autopilot	1 x L3 Track pilot
Gyro	3 x Navigat X Mk1 (Sperry)
Navtex	Furuno Navtex NX-700
GPS/DGPS	2 x Furuno GPS GP-150
Echo Sounder	1 x Furuno FE-700
El-Chart / ECDIS	2 x L3 ECDISpilot Platinum
Voyage Recorder	1 x L3 VDR, SAM 4350

## Anchoring Equipment

Anchor Points	2 x 12 t
Winches	2 x Electric driven anchor/mooring. NDM W.AW 48-48 K3

## Dynamic Position

Class	DYNPOS AUTR
Type	Kongsberg K-Master.DP21
Reference Systems	2 x DGPS Kongsberg DPS 232 2 x Spotbeam 1 x CyScan 1 x Radius
ERN	99.99.99.99

## Gas Monitoring Equipment

Type Omnicron Gas Sampling System.OGS 3.1/20

Automatic gas monitoring and alarm system connected to vessels IAS.

Covering:

All Liuuq Mud/ LFL\* tanks (12) and incl dedicated Slop tank.  
WB/N2 tanks surrounding LFL tanks, special product, methanol tanks and cofferdam

Sensors:

H2S  
H2  
HC

No pumproom, all LFL, special product and methanol has FRAMO submerged pumps

## NOx Reduction Equipment

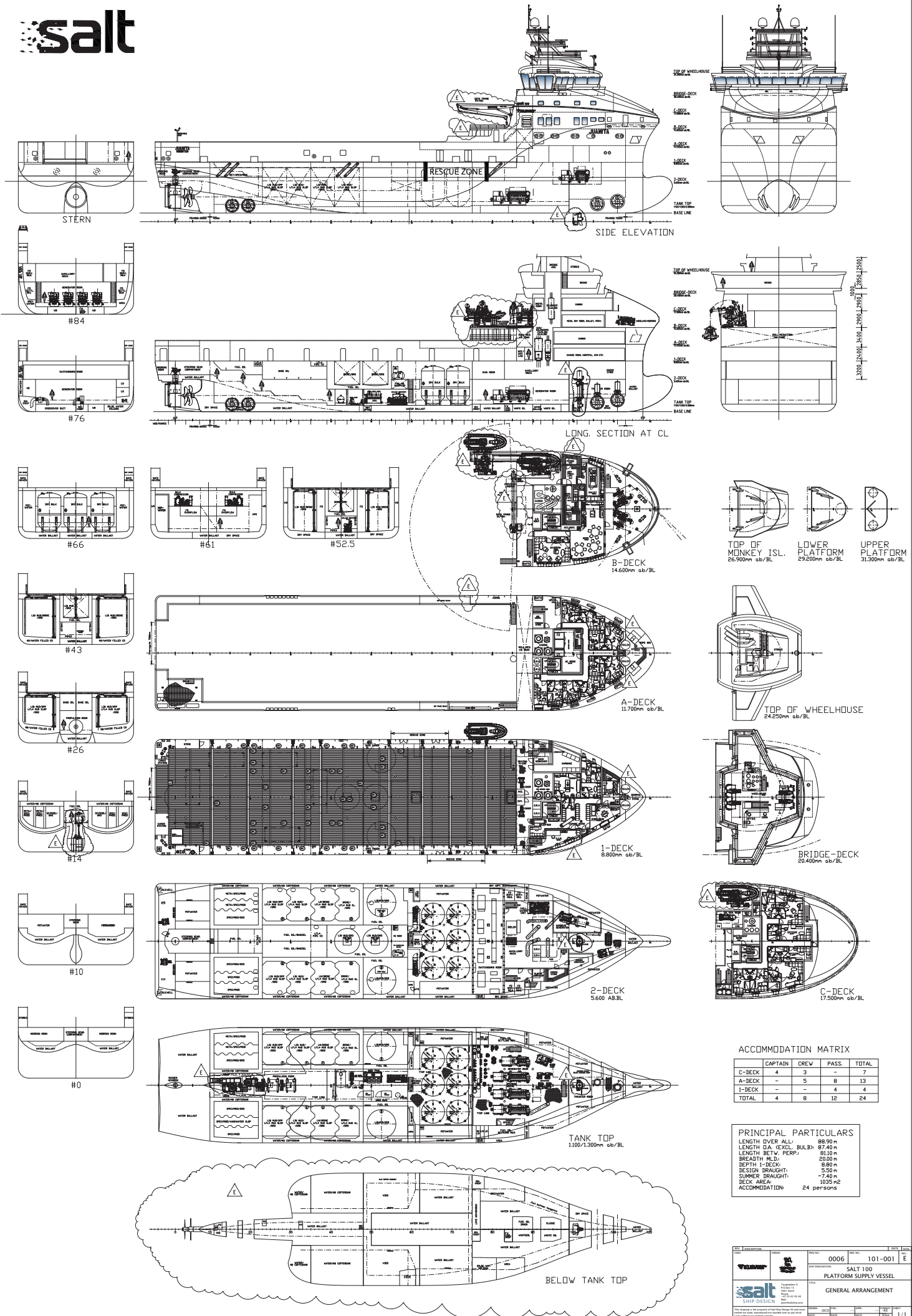
Type H+H. SCR UREA based.  
Emission 3.46 kg NOx/metric ton MGO

## Communication Equipment

GMDSS	A3 type Sailor
Intercom	VingCom Zenitel Maine
Fleet Broadband	Sailor Fleet Broadband 500
VHF	3 x Sailor RT 6210
Mobile Phone	
TV System	Seatel 6004 EUR
V-Sat	12-3004 Inmarsat Xpress Link
Data Capacity	512 kb/s

## Other

Prepared for:	Fi Fi 1 DEICE C Triplex or sliding crane
---------------	--



**ACCOMMODATION MATRIX**

	CAPTAIN	CREW	PASS.	TOTAL
C-DECK	4	3	-	7
A-DECK	-	5	8	13
1-DECK	-	-	4	4
<b>TOTAL</b>	<b>4</b>	<b>8</b>	<b>12</b>	<b>24</b>

**PRINCIPAL PARTICULARS**

LENGTH OVER ALL:	88.90m
LENGTH G.A. (EXCL. BULB):	87.40m
LENGTH BETW. PERP.:	81.0m
BREADTH MLD:	20.0m
DEPTH 1-DECK:	8.80m
DESIGN DRAUGHT:	5.50m
SUMMER DRAUGHT:	7.40m
DECK AREA:	1035m <sup>2</sup>
ACCOMMODATION:	24 persons

REVISION	NO.	DATE	BY	APP.
	0006	101-001	E	

**PROJECT INFORMATION**

PROJECT NO: 0006  
 VESSEL NAME: SALT 100  
 VESSEL TYPE: PLATFORM SUPPLY VESSEL

**DESIGNER**

**salt SHIP DESIGN**

GENERAL ARRANGEMENT

DATE: 12.06.11  
 SCALE: 1/1





## M/V Pacific Gannet

- ▶ **Brake Horsepower** 6,434 BHP
- ▶ **Clear Deck Space** 810 m<sup>2</sup>
- ▶ **Deadweight** 4,054 - 4,103 tonnes
- ▶ **Deck Cargo Capacity** 1,750 tonnes

# M/V Pacific Gannet

Brake Horsepower	6,434 BHP	Clear Deck Space	810 m2
Deadweight	4,054 - 4,103 tonnes	Deck Cargo Capacity	1,750 tonnes

## General Information

Port of registry:	Singapore
Built:	Japan Marine United Corporation - September 2014
Flag:	Singapore
Call Sign:	9VFJ7
IMO No.:	9666883
Classification:	DNV +1A1, Offshore Service Vessel – Supply, SPS, Dynpos AUTR, FiFi 1, Clean, SF, E0.
ERN:	99,99,99,97

## Dimensions

Length, overall:	84.65 metres
Length, BP:	75.70 metres
Breadth, moulded:	18.00 metres
Depth, main deck:	7.60 metres
Design draft:	6.30 metres
Maximum draft midship:	6.43 metres
GT:	3585 tonnes
NT:	1076 tonnes

## Capacities

Deadweight (maximum):	4078 tonnes
Clear Deck Area:	810 m2
Deck Strength:	10 t/m2 / 5 t/m2
Deck Cargo:	1750 tonnes
Ship Fuel:	306 m3 + 591 m3 (Using NLS tanks)
Cargo Fuel:	797 m3 + 172 m3 (Using NLS tanks)
Potable Water:	684 m3
Ballast Water / Drill Water:	1753 m3
Brine / DMA / Glycol / Liquid Mud:	762 m3 @ 2.5 t/m3
Dry Bulk:	318 m3
Base Oil:	190 m3
Ship's Stores:	Freezer Room (-25deg C.) - approximately 19 m3 Cold Room (+4deg C.) - approximately 21 m3 Provisions store (+12deg C.) - approximately 30 m3

## Machinery

Main Engines:	2 x Yanmar 6EY26LW; 1720 kW 2 x Yanmar 6EY18(A)LW; 680 kW Gensets = 4,800 kW (6,434 BHP)
Propulsion:	Automated Power Management Diesel Electric System
Azimuth Thruster:	2 x 2,000 kW (2 x 2,680.97 BHP) RRM Contaz 15 Azimuth Thrusters
Bow Thrusters:	3 x 730 kW (3 x 979 BHP) Brunvoll FU 63 LTC 1750 electric motor driven tunnel type, CPP, frequency controlled



# M/V Pacific Gannet

Brake Horsepower	6,434 BHP	Clear Deck Space	810 m2
Deadweight	4,054 - 4,103 tonnes	Deck Cargo Capacity	1,750 tonnes

Emergency Generators: 1 x Doosan Infracore AD136TI 125kW Generator Engine

## Deck Machinery

Tuggers: Rolls Royce Marine, 2 x 20t (@ 1st layer) with 250m of 22mm diameter wire capacity. Provided with portable controller.

Capstans: Rolls Royce Marine, 2 x 10t with warping head and drum capacity for 100m of 18mm diameter wire

Windlass: Rolls Royce Marine, 2 x combined mooring winch/anchor windlasses with warping ends and centre line rope mooring/storage drum.  
2 x Cable lifters for 46mm chain, 10.1T line pull at a speed of 12m/min

Bow Mooring: 1 Drum, Capacity 220m of 64mm polypropylene mooring rope

Smit Towing Bracket: 1 x 200 t

Crane Capacity: 1 x 5t @ 14 metres radius, knuckle boom crane

## Electronics

Main Radar: Furuno FAR-2837S-D ARPA Radar, S Band, 23.1"

Auxiliary Radar: Furuno FAR-2817-D ARPA Radar, X Band, 23.1"

Auto Pilot: Tokyo Keiki PR-6000

Gyro Compass: 3 x Tokyo Keiki TG-8000

Magnetic Compass: 1 x Tokyo Keiki

Echo Sounder: Furuno FE-700, dual frequency 50Hz and 200Hz

DGPS : Furuno GP-150

Anemometer : 2 x Gill Wind Observer

Speed Log: Furuno Doppler Speed Log DS-80

Communications: 1 x Furuno MF-HF (SSB) Transceiver integrated with DSC/Watch Receiver  
2 x McMurdo S4 SART, 2 x McMurdo E5 EPIRB  
1 x Furuno Inmarsat-C (no.1) - Felcom 18 (Integrated with EGC)  
1 x Furuno NX-700B Navtex, 2 x FURUNO FM-8900S VHF Radios  
1 x Furuno Inmarsat-C (no. 2) - Felcom 18"

Watch System: Furuno BR 510

Navtex Receiver: Furuno NX 700

Weather Fax: Furuno FAX-410

Satellite Communication: FBB: Sailor 500

AIS: Furuno FA-150

Satellite Navigation: Furuno GP-150

Voyage Data Recorder(VDR): Furuno VDR VR 3016

VHF: Furuno FM-8900S Semiduplex VHF

Electronic Chart Display: 2 x Furuno ECDIS FMD-3300

BNWAS: Furuno BR 510

## Discharge Pumps

Fuel Oil: 1 x 150m3/Hr -9 Bar

Base Oil: 1 x 150m3/Hr -9 Bar

Potable Water: 1 x 150m3/Hr -9 Bar

Ballast Water: 1 x 150m3/Hr -9 Bar

# M/V Pacific Gannet

Brake Horsepower	6,434 BHP	Clear Deck Space	810 m2
Deadweight	4,054 - 4,103 tonnes	Deck Cargo Capacity	1,750 tonnes

Drill Water:	1 x 150m3/Hr -9 Bar
NLS (Brine / Liquid Mud / Base Oil):	3 x 75m3/Hr - 18 bar at SG of 2.5
Dry Bulk:	80 tonnes/hr at 70m head
Cargo Flow Meters :	Fuel oil and fresh water
Special liquid (Methanol):	Prepared for Methanol with designated space for N2 plant and pumps
Hose Connections :	Fuel - TODO 4" Male Potable Water - WECO 4" Hammer Lug Union Figure 100 Female Drill Water - WECO 4" Hammer Lug Union Figure 100 Female NLS including Brine - TODO 4" Male Base Oil - TODO 4" Male Dry Bulk Tanks - WECO 5" Hammer Lug Union Figure 50 Female

## Dynamic Positioning

Type:	GE Energy DPS21 - Duplex DP+IJS
Reference Systems:	1 x MDL Fan Beam Laser System, 2 x Veripos LD5 DGPS, 1 x HPR Sonardyne Acoustic Positioning System deployable by HPR tubes built into hull.
Control Modes:	Manoeuvre / Autopilot Position Aft bridge, Manual Thruster Control levers, Independent Joystick System and 2 DP workstations.
Joystick:	Independent Joystick GEE-CVT

## External Fire Fighting

Capacity:	3700 m3/hr pump driven by electric motor
Monitors:	2 x 1200 m3/hr
Throw Length:	120 metres from bow
Throw Height:	50 metres at 70 metres distance
Drenching System:	1200 m3/hr combined with main pump
Foam Tank :	9.9 m3

## Standby Rescue Equipment

1. 1 x MOB boat MP-660 Springer with 230hp inboard diesel engine and water jet propulsion. Maximum speed 3 persons 32 knots. Maximum capacity - 10 persons.
2. Rescue zone on both port and starboard side Main Deck.

## Anti-Pollution

Dispersant Tank:	10.9 m3
Spray Nozzles:	Wartsila, Fixed installed spray nozzles for neat and dilute, port and stbd sides.

## M/V Pacific Gannet

Brake Horsepower	6,434 BHP	Clear Deck Space	810 m2
Deadweight	4,054 - 4,103 tonnes	Deck Cargo Capacity	1,750 tonnes

### Accommodation

Berths:	14 x 1 man (single) cabins
	13 x 2 men (double) cabins
	2 x 4 men (quadruple) cabins
	48 berths total
	1 x Messroom (with TV Lounge)
	1 x Hospital (1 bed)
	1 x Gymnasium

### Environmental Features

1. All NLS cargo tanks built with free flowing design with external stiffening 2 metres from the bottom and sloped bottoms.
2. Oily Water Separator. Certified in accordance with IMO MEPC.107(49).
3. Sewage Treatment Plant certified to the latest IMO MEPC.159(55).
4. Prepared for future installation of a Ballast Water Treatment Plant.
5. Cargo loading and discharge stations provided with save-alls to an inboard Saveall Drains Tank.
6. Incinerator capable of burning plastics.

### Miscellaneous

1. MRC Sound Reception System MSR-9200A
2. NLS Cargo re-circulating pumps, 3 x 50m<sup>3</sup>/hr - 7.5 bar.
3. Prepared for future installation of an N2 generator.
4. Two (2) HPR tubes built into hull
5. Wood sheathed main deck.
6. 3 x Xenon 2000W search lights on top of bridge, remotely controlled.

# M/V Pacific Gannet

Brake Horsepower	6,434 BHP	Clear Deck Space	810 m <sup>2</sup>
Deadweight	4,054 - 4,103 tonnes	Deck Cargo Capacity	1,750 tonnes

## FUEL EFFICIENCY

### FUEL OIL CONSUMPTION ON PASSAGE

Fuel Oil Consumption (t/24 hours)-Seastate 2Φ				
Draft(m)	10.00 knot	12.00 knot	14.00 knot	15.00 knot
4	4.53	6.63	10.94	16.41
4.5	5.13	7.28	12.03	18.04
5	5.61	7.93	13.09	19.64
5.5	5.98	8.57	14.14	21.21
6	6.46	9.19	15.17	22.75
6.45	6.85	9.74	16.08	24.11

Φ: Seastate 2 is Light breeze, 4–6 knot wind, 1–2 ft wave height



E.R. OFFSHORE



# PLATFORM SUPPLY VESSEL (DP2)

UT 776 CD



E.R. ATHINA · E.R. GEORGINA

[www.er-offshore.com](http://www.er-offshore.com)



GENERAL	E.R. ATHINA	E.R. GEORGINA
MANAGERS	E.R. Offshore GmbH & Cie. KG	
BUILDER	STX Europe AS, Brevik	
YARD NUMBER	66	68
BUILT	Nov 2009	Mar 2010
FLAG	Liberia	Liberia
IMO NUMBER	9448528	9448530
CALL SIGN	A8NP7	A8NP6
CLASSIFICATION	DNV+1A1-E0-SF-Supply vessel Basic-DK(+)-HL(2.8)-LFL*-DYNOS AUTP-CLEAN DESIGN-COMF-V(3)-NAUT-OSV(A)-FI-FI1,OILREC,STANDBY VESSEL	
LOA	93,00 m	
LENGTH BP	80,80 m	
BREATH MOULDED	20,00 m	
DEPTH TO 1st DECK	8,20 m	
DRAUGHT max.	6,60 m	
GT / NT	4488 mt / 1617 mt	
DWT	4250 mt	



## VESSEL SPECIFICATION

**DECK**

DECK AREA	1000 m <sup>2</sup>
DECK DIMENSION	60 m x 16,8m
POINT LOAD	10 mt / m <sup>2</sup>
DECK LOAD	3000 mt

**TANK CAPACITIES**

FUEL	948 m <sup>3</sup>
LIQUID MUD (DEDICATED)	762 m <sup>3</sup> (4792 bbl)
BRINE (DEDICATED)	631 m <sup>3</sup> (3968 bbl)
BASE OIL	250 m <sup>3</sup> (1572 bbl)
DRY BULK	311 m <sup>3</sup> in 6 bulk tanks
RECOVERY OIL	1020 m <sup>3</sup> in 8 tanks
METHANOL/SPECIAL PRODUCT	341 m <sup>3</sup> in 2 tanks
DRILL WATER	2120 m <sup>3</sup>
POTABLE WATER	960 m <sup>3</sup>

**DECK EQUIPMENT**

DECK CRANES	2 x 3 mt @ 8 m
TUGGER WINCHES	2 x 15 mt
CAPSTANS	2 x 10 mt

**DISCHARGE RATE**

	2 x 200 m <sup>3</sup> / hr
	2 x 100 m <sup>3</sup> (630 bbl) / hr
	3 x 100 m <sup>3</sup> (630 bbl) / hr
	2 x 150 m <sup>3</sup> (945 bbl) / hr
	2 x 30 m <sup>3</sup> / min at 5,6 bar
	2 x 100 m <sup>3</sup> / hr
	2 x 100 m <sup>3</sup> / hr
	2 x 100 m <sup>3</sup> / hr
	2 x 200 m <sup>3</sup> / hr

**MACHINERY & PROPULSION**

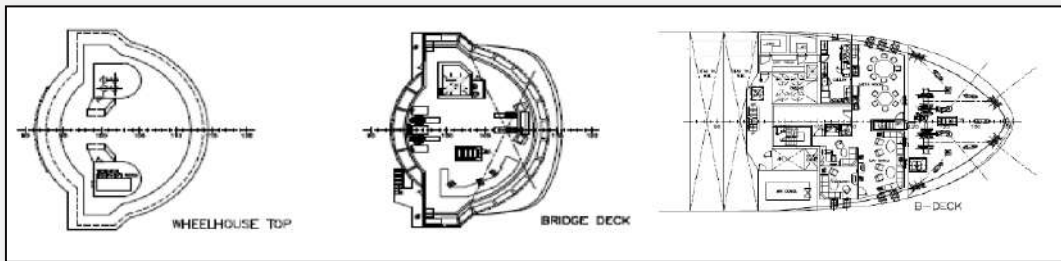
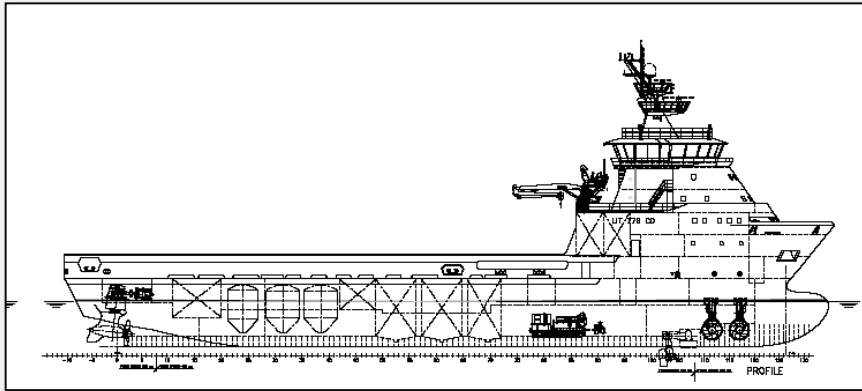
MAIN ENGINES	Bergen Diesel; C25:33L6A 4 x 1740 kW (4 x 2330 BHP)
BOW THRUSTER	2 x 883 kW / 2 x 1158 BHP (Tunnel Thrusters) 1 x 884 kW / 1 x 1158 BHP (Azimuth retractable)
EMERGENCY GEN.	300 kW (405 BHP)
PROPULSION	2 x Azipull thruster systems 2 x 2500 kW (2 x 3400 BHP)
PROPELLERS	3200 mm controllable pitch

**DYNAMIC POSITIONING**

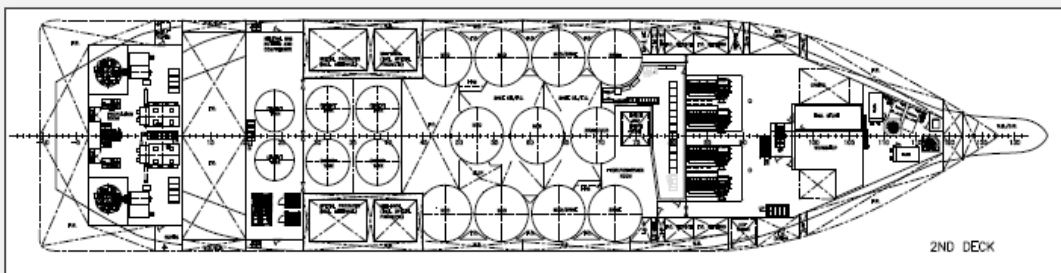
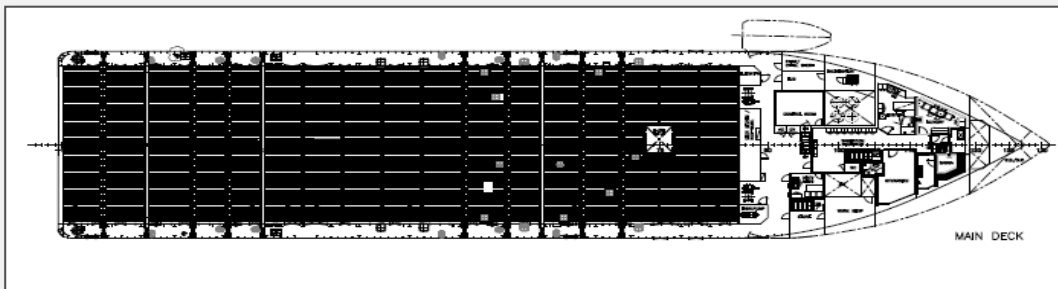
DP SYSTEM	RRM ICON DP-2
DP CLASS	DNV Class II
DP REFERENCES	E.R. Athina: DGPS, DGNS, Cyscan / E.R. Georgina: DGPS, DGNS, Cyscan, Radscan

**ACCOMODATION**

Certified for 25 Person



# DRAWINGS





E.R. OFFSHORE



# TANK CAPACITIES

TANK NO.	TANK ID	CONTENTS	VOLUME (M <sup>3</sup> )										
			FRESH WATER	FUEL OIL	BRINE	DRILL WATER	MUD	DRY BULK	BASE OIL	WATER BALLAST	SPECIAL PRODUCTS	ORO	
71	Roll Reduction TK3	WB/DW				337,4					337,4		
19	Wing TK 8 PS	WB/DW				118,0					118,0		
18	Wing TK 8 SB	WB/DW				118,0					118,0		
15	DB TK centre aft	WB/DW				116,6					116,6		
11	DB TK 5 PS	WB/DW				182,5					182,5		
10	DB TK 5 SB	WB/DW				190,6					190,6		
9	DB TK 4 PS	WB/DW				157,2					157,2		
8	DB TK 4 SB	WB/DW				150,9					150,9		
7	DB TK 3 PS	WB/DW				146,7					146,7		
6	DB TK 3 SB	WB/DW				146,7					146,7		
1	Fore peak TK	WB/DW				168,0					168,0		
70	Roll Reduction TK2	WB				287,4					287,4		
68	Methanol TK 2 PS	SPE/MET										75,9	
67	Methanol TK 2 SB	SPE/MET										75,9	
61	Methanol TK 1 PS	SPE/MET										94,5	
60	Methanol TK 1 SB	SPE/MET										94,5	
97	Circular TK No 8	MUD/ORO					122,3						122,3
96	Circular TK No 7	MUD/ORO					122,3						122,3
95	Circular TK No 6	MUD/ORO					129,0						129,0
94	Circular TK No 5	MUD/ORO					129,0						129,0
53	Centre TK No 3	MUD/ORO					129,8						129,8
52	Centre TK No 2	MUD/ORO					129,8						129,8
93	Circular TK No 4	MUD/BRI/ORO				129,1							129,1
92	Circular TK No 3	MUD/BRI/ORO				129,1							129,1
51	Centre TK No 1	MUD/BRI				115,8							
91	Circular TK no 2	BRI				128,5							
90	Circular TK no 1	BRI				128,5							
54	SLOP TK	MIS											
87	FW TK FWD (opt urea)	FW	21,0										
86	FW TK FWD (opt urea)	FW	17,3										
21	Aft Peak TK PS	FW	216,5										
20	Aft Peak TK SB	FW	216,5										
5	DB/Wing TK 2 PS	FW	82,3										
4	DB/Wing TK 2 SB	FW	93,3										
3	DB/Wing TK 1 PS	FW	168,0										
2	DB/Wing TK 1 SB	FW	145,1										
9A	FO TK 5 PS	FO		24,1									
8A	FO TK 5 SB	FO		24,1									
7A	Wing TK 4 PS	FO		24,2									
6A	FO TK 4 SB	FO		17,2									
11A	FO TK 6 SB	FO		20,3									
10A	FO TK 6 PS	FO		20,3									
66	Centre TK 6	FO		196,5									
34	FO setl TK PS	FO		27,3									
32	FO setl. TK SB	FO		27,3									
33	DAY TK	FO		18,6									
31	FO serv TK PS	FO		29,6									
30	FO serv TK SB	FO		29,6									
17	Wing TK 7 PS	FO		244,4									
16	Wing TK 7 SB	FO		244,4									
79	Cement TK 3 PS	Cement						46,1					
78	Cement TK 3 SB	Cement						46,1					
77	Cement TK 2 PS	Cement						54,7					
76	Cement TK 2 SB	Cement						54,7					
75	Cement TK 1 PS	Cement						54,7					
74	Cement TK 1 SB	Cement						54,7					
65	Centre TK 5	BO/FO							133,0				
64	Centre TK 4	BO/FO							116,0				
	<b>TOTAL VOLUME</b>		<b>960,0</b>	<b>948,0</b>	<b>631,0</b>	<b>2120,0</b>	<b>762,0</b>	<b>311,0</b>	<b>250,0</b>	<b>2120,0</b>	<b>340,8</b>	<b>1020,0</b>	



# PX121 PSV 83M DP2- VOS PATIENCE (3265)



## GENERAL

Flag	Dutch
Port of registry	Breskens
Place of Built	COSCO Guangzhou Shipyard, China
Year Built	2017
Class	ABS
IMO	9742089
Call Sign	PDGJ
MMSI	236699000
ERN Number	99.99.94.86

## PRINCIPAL DIMENSIONS

Length Overall	83.40 m
Breadth Moulded	18.00 m
Length B.P.P.	79.55 m
Design Draft	6.00 m
Max. Draft	6.70 m
Deadweight (Design Draft)	3,300 t
Deadweight (Max. Draft)	4,200 t
Nett Tonnage	1,295 t
Gross Tonnage	3,638 t

## MACHINERY & PROPULSION

Propulsion System	Diesel Electric
Stern Thrusters	2 x 1,600 kW Schottel propellers
Engines	2 x Diesel Engines 1,630 kW 2 x Diesel Engines 990 kW
Output	4,920 kW
Bow Thrusters	2 x 880 kW
Propulsion System	Diesel Electric, 2 x Azimuth Thrusters
Total propulsion	2 x 1,600 kW
Emergency generator	130 ekW

## PERFORMANCES (Design Draft)

Fuel Consumption at 13 Knots	15.5 MT/day
Fuel Consumption at 10 Knots	7 MT/day
DP Mode	4 MT/day
In Port	1 MT/day
Fuel Type	ISO 8217: 2005 DMA or later revisions

## CARGO CAPABILITIES

Fresh water	1035 m3 (705 m3 dedicated)
Heeling Tanks	391.7m <sup>3</sup>
Drill water / W.B.	1674 m <sup>3</sup>
Fuel Capacity (100%)	1464 m3 (370 dedicated)
Liquid Mud / Brine	1293 m <sup>3</sup>
Dry Bulk	260 m <sup>3</sup>
Methanol	150 m <sup>3</sup>
Base oil	257 m <sup>3</sup>
Clear Deck Area	850 m <sup>2</sup>
Deck Loading	10 t/m <sup>2</sup> aft of #35 5 t/m <sup>2</sup> forward of #35

## COMMUNICATIONS EQUIPMENT

MF/ HF radio	JRC JSS-2150
VHF Radio	JRC JHS-770S
Portable VHF Radio	3 x Entel HT8982
Satellite EPIRB	McMurdo Model E5
Inmarsat	1 Inmarsat-C SSAS, 1 Inmarsat-C LIRT
Navtex Receiver	JRC NCR-333
SART	2 x McMurdo S4
Automatic Identification System (AIS)	AIS JHS-183
Fleet Broad Band	1 x JRC JUE-251
Weather Facsimile	1 x JRC JAX-9B

## NAVIGATION EQUIPMENT

Radar No. 1	1 x X-Band Radar : JRC JMA -9122-9XA
Radar No. 2	1 x S-Band Radar : JMCJMA -9132-SA
Radar Transponder Unit (9G)	2 x Mc Murdo S4
DGPS	1 x JRC JAN-901B-FOR
Eco Sounder	1 x JRC JFE-680
Auto Pilot	1 x YOKOGAWA PT500A-P-Analog
Gyro Compass	1 x YOKOGAWA CMZ900d +1 x 900S
Magnetic Compass	1 x YOKOGAWA SR-165
Joystick Control	Integrated Joystick Control
ECDIS	1 x JRC Navi-Sailor 4000 ECDIS MFD
VDR	1 x JRC JCY-1800

## DECK MACHINERY

Tuggers	2 x 10 t @ 35m/min
Capstans	2 x 10 t @ 30m/min
Deck Crane	3 t SWL @ 18 m

## LIFE SAVING APPARATUS

Life rafts	2 x 20 man and 1 x 6 man on each side
Rescue Boat	1 x 6 men MOB boat

## EXTERNAL FIRE FIGHTING

Capacity	ABS FiFi Class - 1 3820 m <sup>3</sup> per hr
Monitor	2 x 1200 m <sup>3</sup> per hr
Throw	> 120 m

## ACCOMMODATION

Total pax + crew	26 persons
Crew compliment	14 single cabins 14 persons
Charterer personnel	12 passengers
	6 double cabins
Compliance	MLC 2006
Crew comfort	2 x anti-rolling tanks

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Leaders in Safety



**VOS PACE / VOS PARADISE /  
VOS PARTNER / VOS PASSION /  
VOS PATIENCE / VOS PATRIOT**  
Platform-supply vessel

**V** **VROON**  
**OFFSHORE SERVICES**  
.... connecting markets



**MACN**  
Maritime Anti-Corruption Network

## VROON OFFSHORE SERVICES

**VROON OFFSHORE SERVICES is a leading maritime offshore-services provider, with over fifty years' experience in the business. The company delivers safe, reliable, high-quality and cost-effective services to all customers. When it comes to offshore-support work, Vroon provides a new approach, but one based on traditional qualities and a proven track record.**

With a versatile fleet of more than 100 vessels and 2,400 highly qualified and experienced colleagues, Vroon Offshore Services (VOS) provides a diverse range of services and solutions for key offshore-support needs, including platform supply, emergency response and rescue, anchor handling, walk-to-work and subsea support.

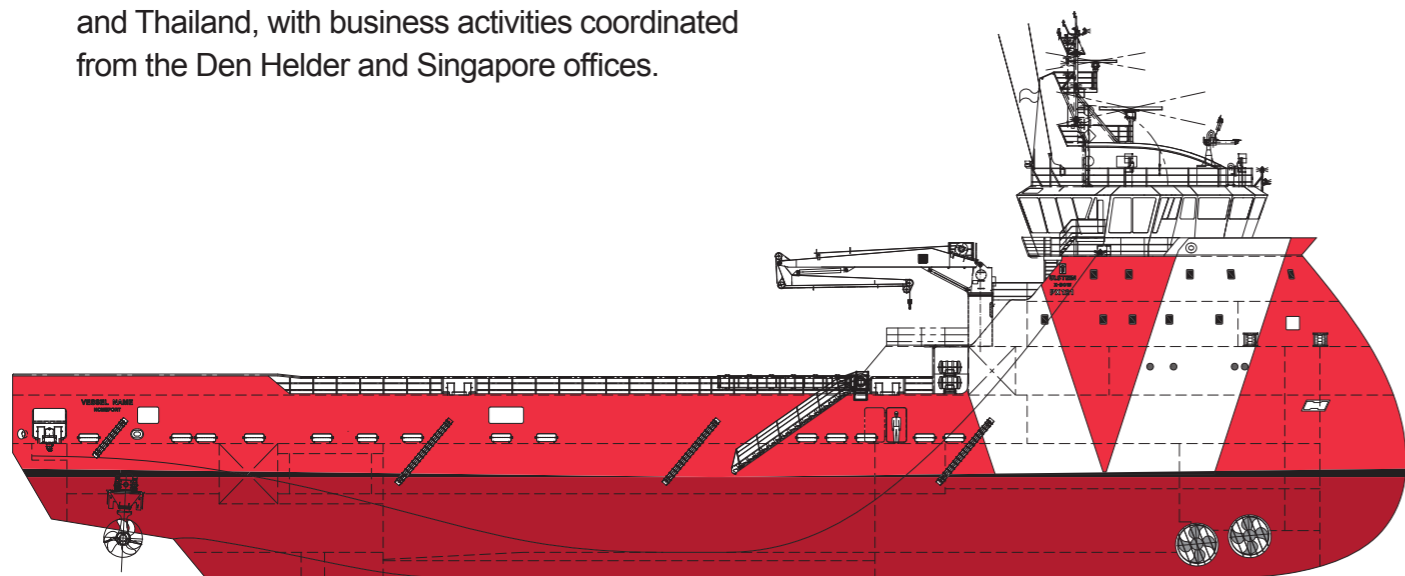
Vroon Offshore Services operates internationally, with a strong geographical presence in Northern Europe, the Mediterranean, North and East Africa, the Indian Ocean and Asian regions. The company has offices in Aberdeen (UK), Den Helder (NL), Genoa (IT) and Singapore (SG). VOS also operates in Mozambique, Malaysia and Thailand, with business activities coordinated from the Den Helder and Singapore offices.

The fleet services the oil and gas market segments and supports installation and maintenance of offshore wind farms and renewable-energy market segments.

The high level of expertise demonstrated by all VOS employees is the result of the company's extensive training and personal-development programmes, combined with many years of experience in offshore markets. A behavioural-based safety programme, "Leaders in Safety", forms an integral part of the VOS service deliverables.

The VOS platform-supply vessel (PSV) portfolio is based on vessel designs developed by the company's Performance and Engineering Department, reflecting both client specifications, market requirements and substantial in-house offshore experience.

Newest additions to the fleet are the six 83-metre sister PSVs: VOS Pace, VOS Paradise, VOS Partner, VOS Passion, VOS Patience and VOS Patriot.



## PSV FLEET OPERATIONS AND EXPERTISE



- Cargo transportation
- Bulk transfers (wet and dry): generic liquids / muds / special products / chemicals
- Fire fighting
- Oil-spill recovery
- Bunker transfers
- Safety standby



## BENEFITS

- Leaders in Safety
- Hotel-type comfort: 26 beds
- Extensive client email and data-communication facilities
- 850 m2 clear deck area
- Dynamic Positioning class 2
- Fuel efficient
- Optimised hull characteristics



Leaders in Safety



## INTERIOR IMPRESSIONS



Captain's cabin



Cabin



Mess room



Recreation room



Bridge



Gym

## TECHNICAL SPECIFICATIONS

<b>Type:</b>	Platform-supply vessel	Portable two-way VHF	3 x Entel HT8982
<b>Flag/classification:</b>		UHF portable	3 x Entel HT882
Flag	Gibraltar / Dutch	UHF fixed	1 x Motorola GM-360
Port of registry	Gibraltar / Breskens	Satellite EPIRB	1 x McMurdo model E5
Classification	LR	Navtex receiver	1 x JRC NCR-333
Class notation	DPS-2 / A1 (E) OSV (supply - HNLS, FFV1) / AMS / ACCU / GP / ENVIRO / UWILD / HAB(WB)	SART	2 x McMurdo S4
		Inmarsat	1 x C SSAS JRC JUE-87
		Automatic Identification System (AIS)	1 x JRC JHS-183
		Fleet broad band	1 x JRC JUE-251
		Weather facsimile	1 x JRC JAX-9B
<b>Main particulars:</b>		<b>Positioning reference system:</b>	
Year built	2015 / 2016 / 2017	Dynamic Positioning (DP)	Kongsberg DP2
Length overall	83.4 m	Gyro compass	3 x YOKOGAWA CMZ900D + 1 x 900 S
Breadth moulded	18 m	DGPS	1 x JRC JAN-901B-FOR
Depth moulded	8 m	CyScan	1 x Mk4 laser reference system
Draft max	6.7 m	Motion sensors (MRU)	2 x Kongsberg MRU-D
GT / NT	3,638 / 1,295	Wind sensors	3 x Gill Ultrasonic
Deadweight	4,200 t		
<b>Capacities:</b>		<b>Navigational equipment:</b>	
Deck strength	10 t/m2 aft of #35 5 t/m2 fwd of #35	Radar no. 1	1 x X-band radar JRC JMA-9122-9XA
Clear deck space	850 m2	Radar no. 2	1 x S-band radar JRC JMA-9132-SA
Fuel	1,464 m3	Echo sounder	1 x JRC JFE-680
Fresh water	1,035 m3 (705 m3 dedicated)	Auto pilot	1 x YOKOGAWA PT500A-P-Analog
Drill water / water ballast	1,674 m3	Magnetic compass	1 x YOKOGAWA SR-165
Mud / brine	1,293 m3	Joystick control	Integrated joystick control
Base oil	257 m3	Electric Chart Display System (ECDIS)	1 x JRC Navi-sailor 4000 ECDIS MFD
Dry bulk	260 m3		
Methanol	150 m3	<b>Life-saving equipment:</b>	
Slop	507 m3	Lifeboat	1 x 6 men MOB boat
		Liferafts	2 x 20 men + 1 x 6 men on each side
<b>Machinery:</b>		<b>External fire fighting:</b>	
Main engines	2 x diesel engines 1,630 kW (2,186 BHP) 2 x diesel engines 990 kW (1,328 BHP)	Capacity	LR FiFi class 1 - 3,820 m3 per hr
Propulsion system	2 x Azimuth thrusters 1,600 kW diesel electric	Monitor	> 1,200 m3 per hr
Bow thrusters	2 x 880 kW	Throw	> 120 m
Emergency generator	1 x 130 kW (VOS Pace / VOS Paradise 99 kW)	Foam system	1 x foam monitor
		<b>Accommodation:</b>	
<b>Performance:</b>		Total	26 beds
Fuel consumption (subject to weather)		Crew	14 beds (single cabins)
Full speed (13.5 knots)	abt 15.50 t/day	Charterer	12 beds (double cabins)
Service speed (10 knots)	abt 7 t/day	Hospital	1 bed
DP mode	abt 4 t/day	Gym	1
In port	abt 1 t/day	Recreation room	1
ERN number	99.99.94.86	Offices	1
		Compliance	MLC 2006
		Crew comfort	2 x anti-rolling tank
<b>Deck machinery:</b>			
Deck crane	3 t SWL @ 18 m		
Tuggers	2 x 10 t @ 35 m/min		
Capstans	2 x 10 t @ 30 m/min		
<b>Communication equipment:</b>			
MF/ HF radio	1 x JRC JSS-2150		
VHF radio (with out DSC)	1 x JRC JHS-770S		
VHF radio telephone (DSC)	2 x JRC JHC-770S		

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 **VROON**  
OFFSHORE SERVICES

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**ABERDEEN • DEN HELDER • GENOA • SINGAPORE**



Version 4

## Toisa Serenade

### Type VS 483 MkII - Platform Supply Vessel

#### OUTLINE SPECIFICATION / DATA SHEET



#### GENERAL

Builder / Year	Wuchang China / 2008
Flag / POR	Bahamas / Nassau
Class	DNV + 1A1, SF, OIL REC, E0, Dynpos-AUTR, CLEAN, COMF-V(3) C(3), DK(+), HL(2.8), Tmon. Intact & Damage Stability according to IMO Resolution A.469 (XII).
Gross tonnage	3,665
Nett tonnage	1,582
Deadweight (summer)	5,324 tonnes

#### DIMENSIONS

Length OA	87.40 m
Breadth mld.	19.00 m
Draught (summer)	6.55 m

#### PERFORMANCE

Service speed	abt. 10 - 12 knots
---------------	--------------------

#### CARGO DECK

Clear deck area	abt. 63.8m x 16.0m = 1,020 m <sup>2</sup>
Deck strength	5 tonnes /m <sup>2</sup>
Deck load	Up to 3,210 tonnes

#### CARGO CAPACITIES

Fuel oil cargo	abt. 980 m <sup>3</sup>
Ship's fuel oil	abt. 749 m <sup>3</sup>
Potable water	abt. 1,723 m <sup>3</sup>
Drill water	abt. 1,034 m <sup>3</sup>
Dry bulk @ 5.5 Bar.	abt. 8 x 54.3 m <sup>3</sup> = 434 m <sup>3</sup> (15,256 ft <sup>3</sup> )
Liquid mud @ 2.8 sg	abt. 450 m <sup>3</sup> - (2,836 bbls)
Base oil	abt. 225 m <sup>3</sup> - (1,418 bbls)

#### CARGO PUMPING

Fuel oil cargo	2 x 150 m <sup>3</sup> /hr @ 9 bar
Potable water	2 x 150 m <sup>3</sup> /hr @ 9 bar
Drill water	2 x 150 m <sup>3</sup> /hr @ 9 bar
Dry bulk compressors	2 x 30 m <sup>3</sup> /m @ 5.6 bar
Liquid mud	2 x 75 m <sup>3</sup> /hr @ 21 bar
Base oil	1 x 150 m <sup>3</sup> /hr @ 9 bar

#### STABILISATION

Two passive roll reduction stabilisation tanks

#### DP2 SYSTEM

DP / Joystick Control	IMO Class 2 DP System – Kongsberg K-Pos DP-21
Reference systems	Fan beam laser + 2 x DGPS

#### PROPULSION

Two Wärtsilä W6L32: 6cyl in line marine diesel engines each developing 3,000 kW @ 750 rpm each driving a 2,000 kW shaft alternator and CP propeller.  
Two independent spade rudders.  
Total developed power 6,000 kW (8,042 BHP)

#### ECONOMIC MODE

Only one engine is required to operate in the Economic Mode, with either engine driving two propellers. One propeller via gearbox, conventional drive, the other propeller via shaft alternator / electric motor, diesel electric drive.

#### GENERATORS

440V / 3Ph / 60Hz	
Shaft alternators / motors	2 x 2,000 kW
Main alternators	2 x 320 kW
Emergency alternator	1 x 250 kW

#### THRUSTERS

Forward tunnels	2 x 830 kW
Aft tunnels	2 x 830 kW

#### DECK MACHINERY

Deck/stores crane	5t SWL @ 15 m radius
Tugger Winches	2 x 12t hyd.
Capstans	2 x 10t hyd.

#### ACCOMMODATION

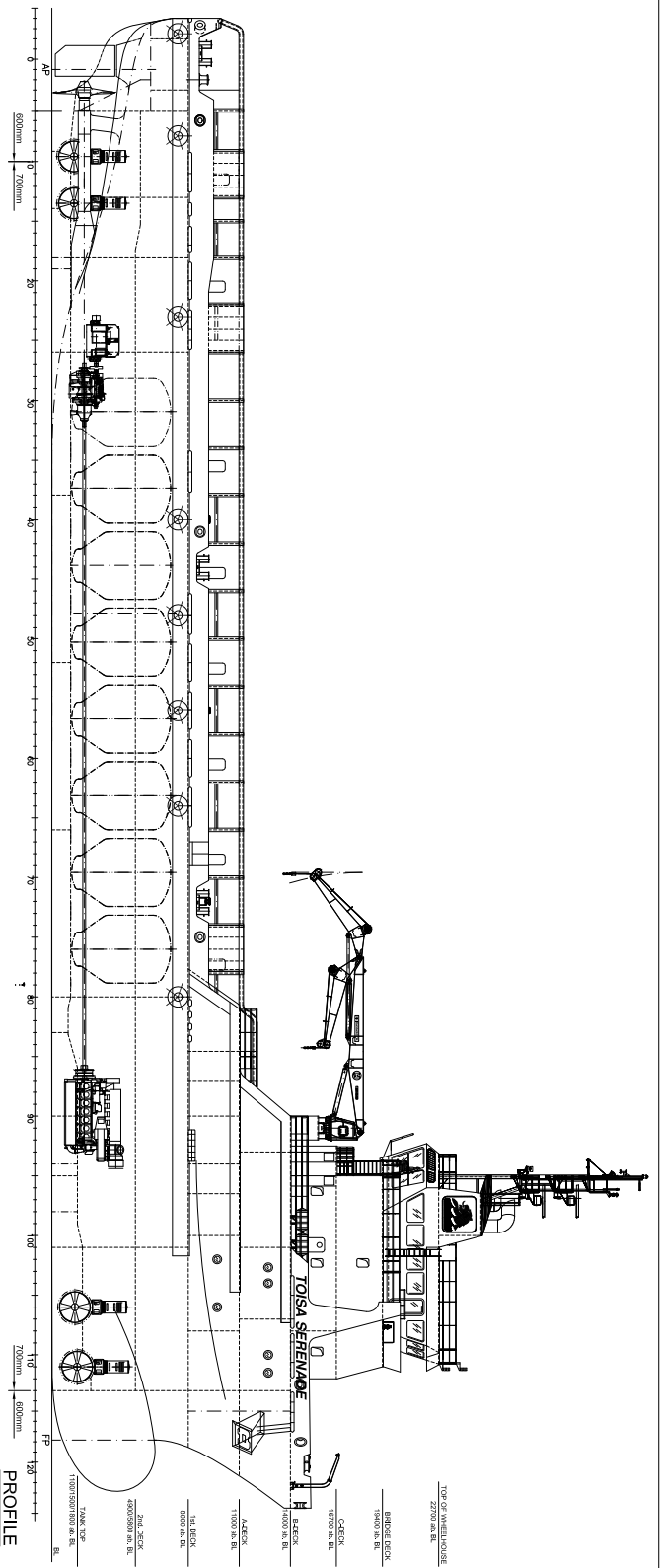
Wheelhouse and accommodation fully air conditioned	
Single berth cabins	2 suites + 10 en-suite
Two & four berth cabins	2 x 2 + 2 x 4
Complement	24 persons

#### OIL RECOVERY AND DISPERSANT

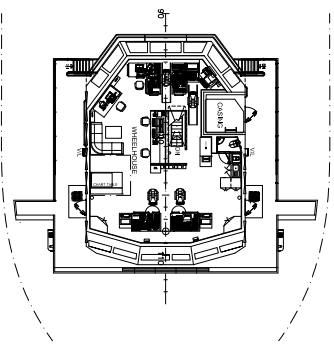
Portable deck mounted recovery booms, skimmers and pumps can be provided. Built-in ORO storage tanks.

Recovered Oil Tanks	450 m <sup>3</sup> (approx)
Slops Tanks	96 m <sup>3</sup> (approx)

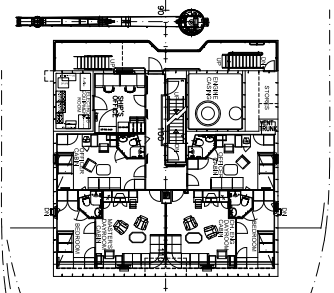
Portable deck mounted dispersant booms and ejectors can be provided. Built-in dispersant tank 10.0 m<sup>3</sup>



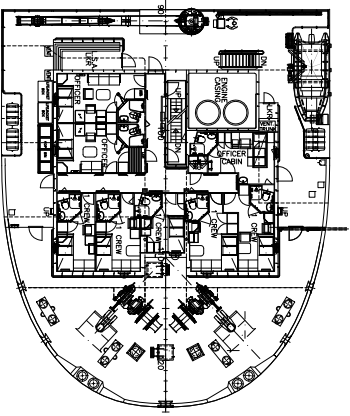
PROFILE



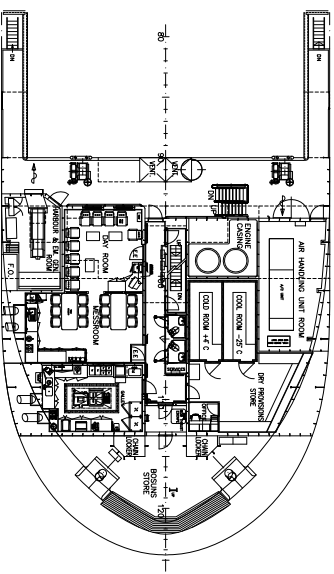
BRIDGE DECK  
19400 ab. BL.



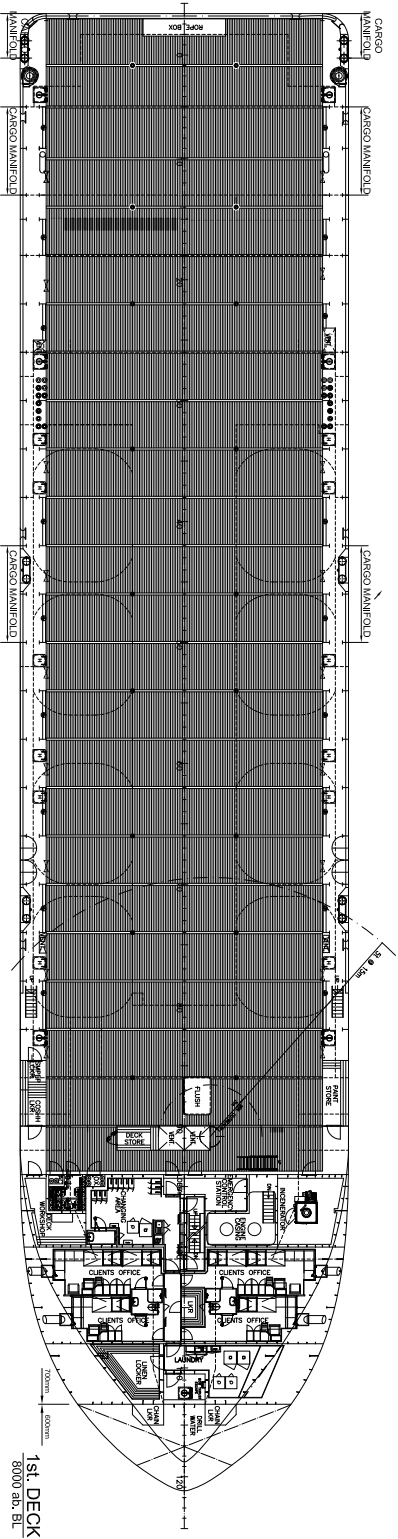
C-DECK  
16700 ab. BL.



B-DECK  
14000 ab. BL.



A-DECK  
11000 ab. BL.



1st. DECK  
8000 ab. BL.

PRINCIPAL PARTICULARS	
LENGTH OVER ALL:	87.40 m
LENGTH BETW. PERP.:	80.40 m
BREADTH:	19.00 m
DEPTH TO 1st DECK:	8.00 m
DEPTH TO 2nd DECK:	4.90 m
FRAME SPACING:	600/700/600 mm

PARTICULARS BELIEVED CORRECT BUT NOT GUARANTEED

<b>Sealion Shipping Ltd.</b> Outline General Arrangement	
1st Floor: 01 232 27779 2nd Floor: 01 232 27778 3rd Floor: 01 232 27777 4th Floor: 01 232 27776 5th Floor: 01 232 27775 6th Floor: 01 232 27774 7th Floor: 01 232 27773 8th Floor: 01 232 27772 9th Floor: 01 232 27771 10th Floor: 01 232 27770	11th Floor: 01 232 27769 12th Floor: 01 232 27768 13th Floor: 01 232 27767 14th Floor: 01 232 27766 15th Floor: 01 232 27765 16th Floor: 01 232 27764 17th Floor: 01 232 27763 18th Floor: 01 232 27762 19th Floor: 01 232 27761 20th Floor: 01 232 27760
DATE: 02/11/11	SCALE: 1:100
DESIGNER: NIS	DWG. NO.: 0
CHECKED: NIS	SERIAL: 0
DATE: 02/11/11	SCALE: 1:100
DESIGNER: NIS	DWG. NO.: 0
CHECKED: NIS	SERIAL: 0





**REM SUPPORTER STX06CD PLATFORM SUPPORT VESSEL**



The REM fleet is designed by experienced and recognized Norwegian naval architects and built by yards in Norway. The fleet consists of PSV, AHTS, MPSV and OCV. The advanced fleet operates on a world wide basis and is operated by experienced crew, both on board and on shore. This makes REM a highly respected and preferred player in the Offshore Industry.

## REM SUPPORTER STX06CD PLATFORM SUPPORT VESSEL

### MAIN DESCRIPTION

Type of vessel	PSV 06 CD
Classification	DNV +1A1, SF, E0, DYNPOS- AUTR,DK (+),HL (2,8), Clean Design, NAUT-OSV(A), Comf-V(3), LFL*, ICE-C, Oil Rec,
Place of build	STX,Langstein, Norway
Year of build	January 2012
Flag	NOR
Ship Owner	Rem Supply AS
Ship Manager	Rem Maritime AS
Design Company	STX OSV
Yard Number	754
IMO Number	9591868
Call Sign	LCLW

### MEASUREMENTS

Lenght o.a	94.20 m
Lenght b.p.p	84.90 m
Breath mld	20.00 m
Draft mld Main Deck	8.30 m
Draft summer	6.80 m
Dead Weight tonnes	5300 T at draught 6,77 m midship
Gross tonnage	4218 GRT

### MACHINERY

Generator sets:	
Genset	4 x 1980 kW/900 rpm, Type: MAN 9L21/31
Main propulsion	2 x 2500 kW / 0-1200 rpm, Azipull 100 FP, Rolls Royce,
Emergency Generator	1 x 133 kW / 1800 rpm, Mitsubishi 6D16T
SCR system installed on main engines for NOX reduction	

### THRUSTER FORW.

Azimuth thruster	1 x 880 kW, Rolls Royce TCNS 73/50-180 CP
Tunnel thrusters	2 x 880 kW, Rolls Royce TT2000 DNP CP

### VESSEL SPEED

Max speed	Approx 16 knots
Economic speed	Approx. 11 – 12 knots

### CONSUMPTION

Max speed	Approx 24 m <sup>3</sup>
Economic speed	Approx 11 m <sup>3</sup>
DP Operation	Approx 5 - 6 m <sup>3</sup>
St. by at sea	Approx 3.5 m <sup>3</sup>
Port consumption	Approx 2 m <sup>3</sup>

### CAPACITIES

Deck load max	3200 t
Dry Bulk Capacities	400 m <sup>3</sup>
Potable/Fresh Water	1100 m <sup>3</sup>
Drill Water/Ballast	2450 m <sup>3</sup>
Mud / Braine	1250 m <sup>3</sup>
Base Oil	550 m <sup>3</sup>
Fuel Oil	1300 m <sup>3</sup>
Methanol	230 m <sup>3</sup>
Urea	40 m <sup>3</sup>
ORO	1900 m <sup>3</sup>
Slop	35 m <sup>3</sup>
NOFO 2099	

2 x Passive rell reduction tanks

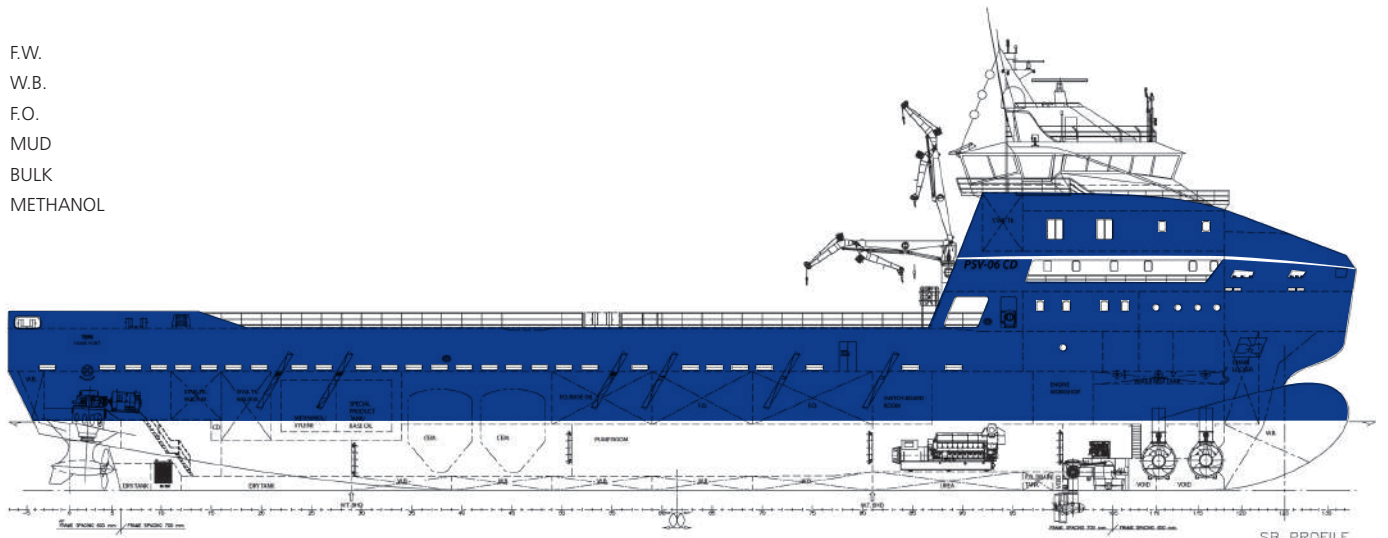
### DISCHARGE

Dry Bulk	2 x 1554 m <sup>3</sup> / hr at 5,6 bar - screw compressors TMC
Fresh Water	2 x 250 m <sup>3</sup> / hr at 9 bar – Electric 2 speed + 1 x EX due to ORO mode
Drill water / Ballast	2 x 250 m <sup>3</sup> / hr at 9 bar – 1 hydraulic , 1 electric / EX
Liquid Mud (SG 2,5)	2 x 100 m <sup>3</sup> / hr at 9 bar – Hydraulic
Brine (SG 2,0)	2 x 100 m <sup>3</sup> / hr at 9 bar – Hydraulic
Base oil	2 x 250 m <sup>3</sup> / hr at 9 bar – Electric 2 speed
Fuel Oil	2 x 250 m <sup>3</sup> / hr at 9 bar – Electric 2 speed
Special product	2 x 75 m <sup>3</sup> / hr at 9 bar - Hydraulic
Methanol	2 x 75 m <sup>3</sup> / hr at 9 bar - Hydraulic
Slop	1 x screw 20m <sup>3</sup> / hr 10 bar - Electric
ORO 5	1 x 109 m <sup>3</sup> / hr at 3 bar - Hydraulic

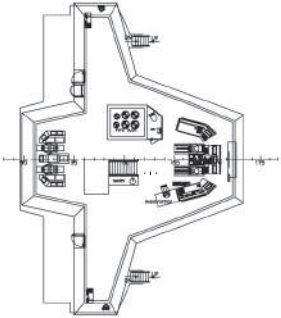
### BULK CARGO STATIONS

PS / SB mid ship	FO, FW, DW, Dry bulk, Mud, Brine & Base oil, Methanol, Special Product
SB aft	FO
PS aft	DW, Dry bulk, Base Oil, Brine & Mud, FW

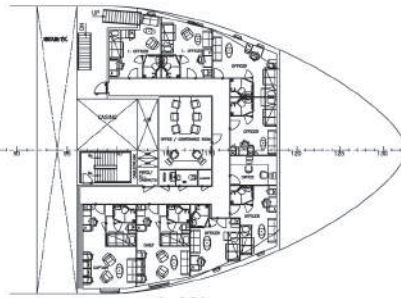
- F.W.
- W.B.
- F.O.
- MUD
- BULK
- METHANOL



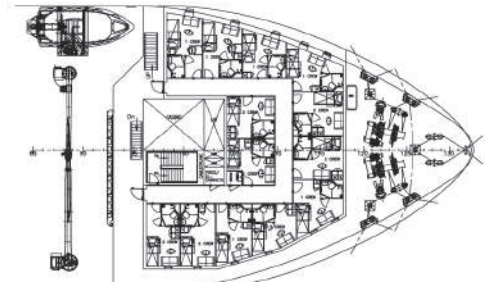
SB PROFILE



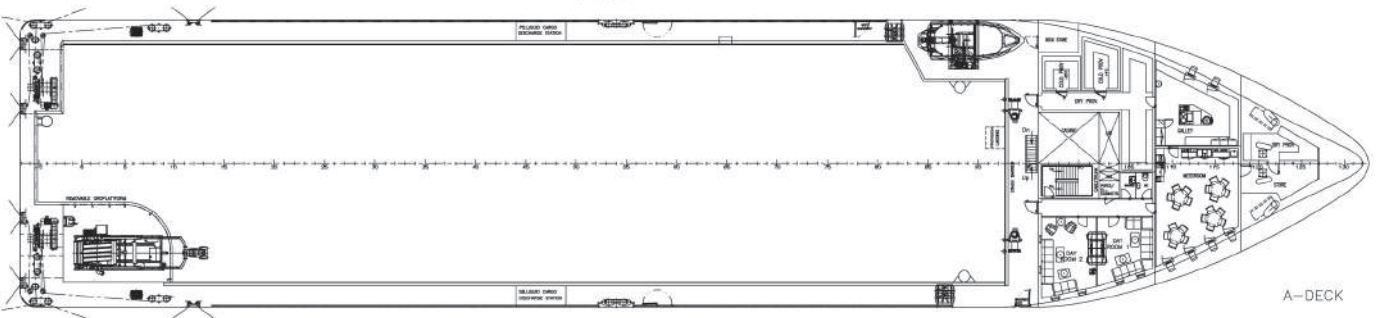
C-DECK



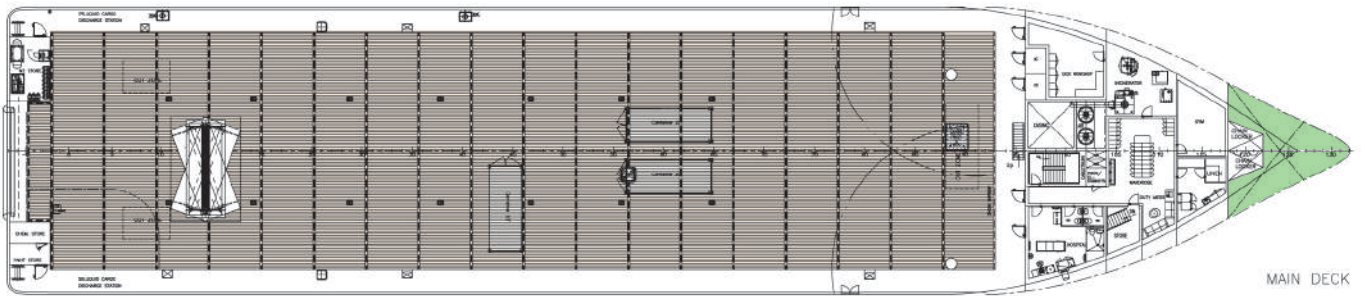
B-DECK



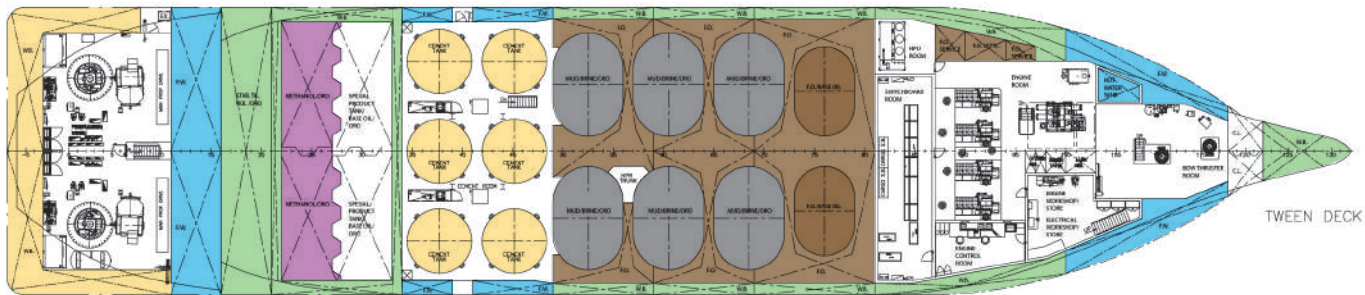
A-DECK



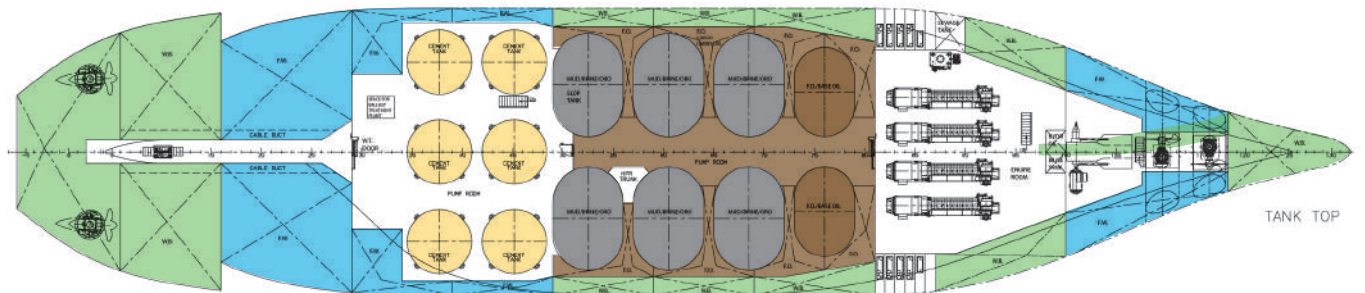
MAIN DECK

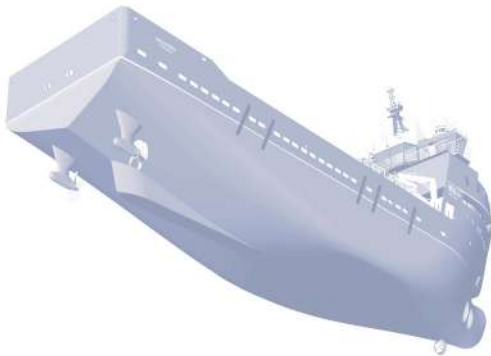
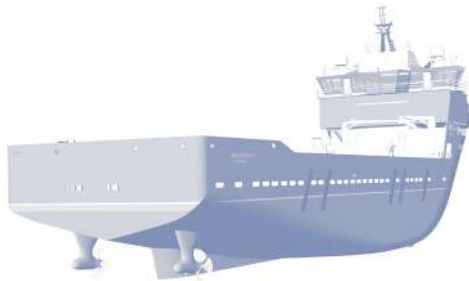
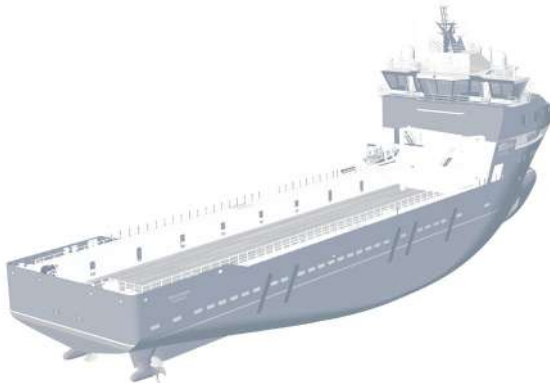


TWEEN DECK



TANK TOP





*The REM fleet is a modern and sophisticated fleet, designed by experienced and recognized Norwegian naval architects and built to a high quality by experienced yards in Norway.*

### DECK EQUIPMENT

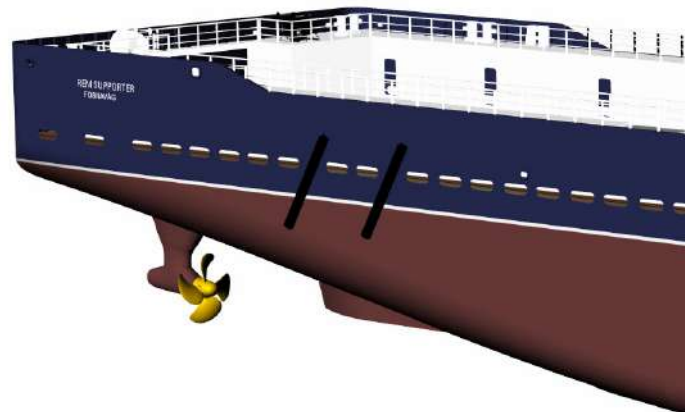
Deck Area	1075 m <sup>2</sup>
Deck cargo (COG = 1 m above deck)	1005 m <sup>2</sup>
Deck Strength	10 t/m <sup>2</sup>
Mooring winces	2 x 10 tonnes
Windlass	2 x 10 tonnes
Tugger winches	2 x 10 tonnes

Deck Crane	1 x 5 t at 10 m – TTS
Deck Crane	1 x 1 t at 10 m – TTS

Tank Washing	Alpha Laval
Life Rafts	6 x 16 Pers
Man Overboard Boat	1 x Mare FRB 700, 15 persons.
NOFO cabinet fwd. SB	1 x 2 pcs. 32A 450V 3 phase + earth Eex-ed. + 2 pcs. 16A 230V 2 phase + earth Eex-ed
NOFO cabinet PS aft.	2 pcs. 16A 230V 2 phase + earth Eex-ed
NOFO cabinet SB aft.	2 pcs. 16A 230V 2 phase + earth Eex-ed

### DYNAMIC POSITION

Class	DP II (AUTR)
Type	Rolls Royce Icon
Reference systems	2 x DGPS Veripos 1 x SyScan laser



### ANCHORING EQUIPMENT

Anchor Points	2 x 12 tons
Winches	2 x electric driven anchor/mooring

### ACCOMMODATION

Number of cabins	
Single cabins	14
Double cabins	7
Hospital	1
Total Accommodation	28 Berths,
All cabins are fully Air-conditioned	

Laundry	1 of
Messroom	1 of
Dayrooms	2 of
Galley	1 of
Cool store	1 of
Freezers	1 of
Dry provision	2 of
Offices	1 of
Gymnasium	1 of

## NAVIGATION EQUIPMENT

Radars	1 x 1 of Furuno Radar FAR 2117 BB 1 x 1 of Furuno Radar FCR-2137 S IACS E 10 approved maritime computer for Wavex/OSD Oil Detection Radar
Autopilot	3 x Anschutz Gyro compass, STD22 GG-R/GGM-R
Gyro	Anschutz PilotStar D
Navtex	Furuno NX-700-B
GPS /DGPS	1 x Furuno GP 150 1 x Furuno GP 150 m/DGPS GPA019S
Echo sounder	1 x Furuno FE-700
El-Chart / ECDIS	
Voyage recorder	Furuno VDR VR-3000 6G

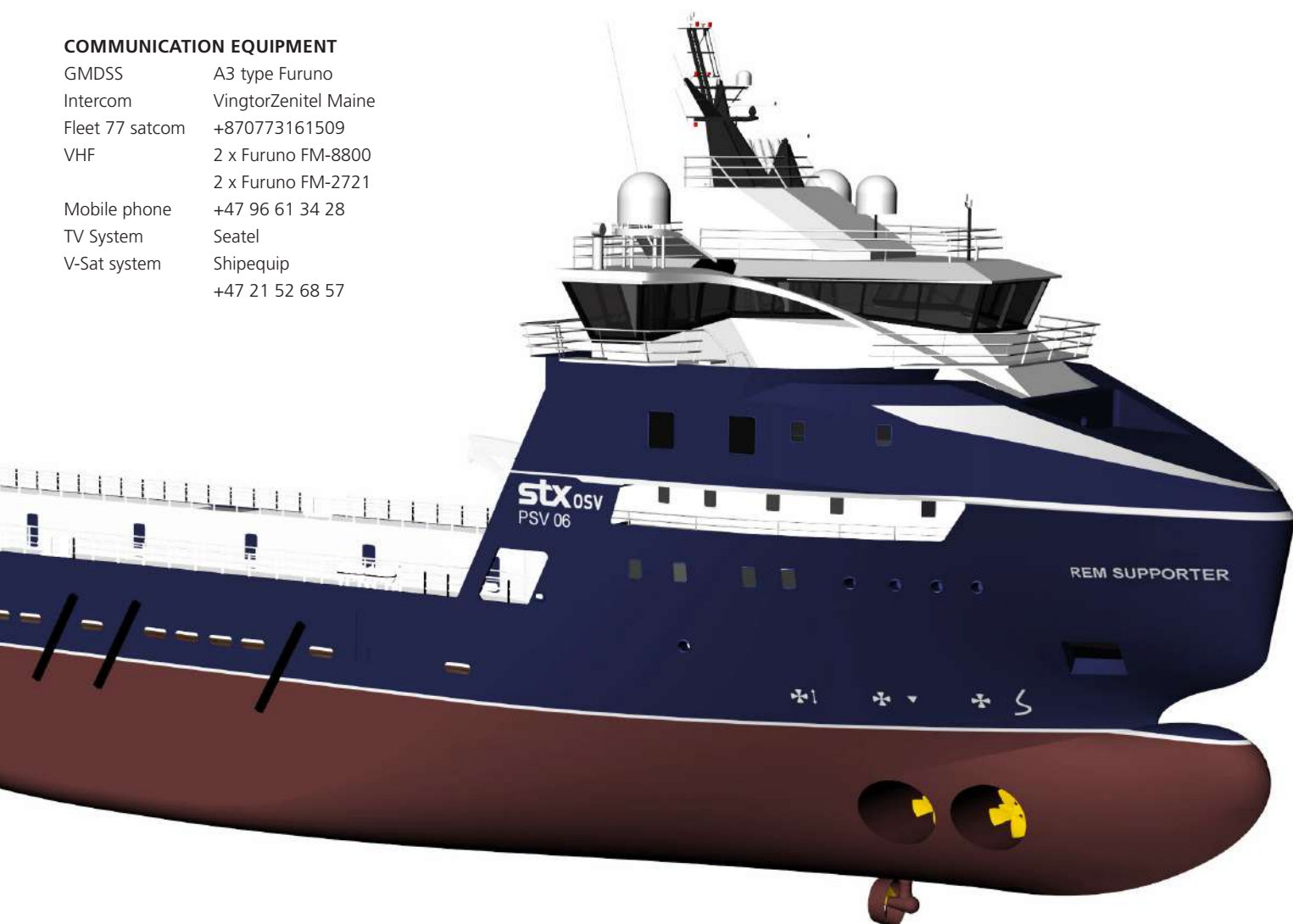
## COMMUNICATION EQUIPMENT

GMDSS	A3 type Furuno
Intercom	VingtorZenitel Maine
Fleet 77 satcom	+870773161509
VHF	2 x Furuno FM-8800 2 x Furuno FM-2721
Mobile phone	+47 96 61 34 28
TV System	Seatel
V-Sat system	Shipequip +47 21 52 68 57

All data are believed to be correct but are not guaranteed.

3D illustration is of an almost identical sister ship. For exact details please see the GA plan.

The vessel specifications are subject to modifications and may change without prior notice.



*Rem Maritime AS was founded in 1996 with Åge Remøy as owner after a spin-off in a family company, where the activity was mainly fishing. The Company manages today both fishing and offshore service vessels.*



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Owner: **Rem Ship AS**  
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Tel.: +47 70 08 11 60,  
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[www.rem-maritime.no](http://www.rem-maritime.no)



# UT-Design™

UT 776 WP – Platform Supply Vessel



## UT 776 WP - General

This specification together with general arrangement plan describes a Platform Supply Vessel of UT-Design™ type UT 776 WP which is designed for satisfying the general demands of the offshore industry.

The vessel to be designed and equipped for following duties:

- Carrying and unloading to rigs and production platforms, pipe laying barges etc.:
- Deck cargo
- Pipes on deck
- Liquid cargo(maximum 800 m<sup>3</sup> of hazardous and noxious liquid like brine, mud etc.)
- Cement / Barite
- Oil recovery according to NOFO 2009
- Rescue operations (NMD 150)

## Solutions to your marine needs

Rolls-Royce provides an unrivalled range of products and services to the marine industry. With production facilities in nine countries and a comprehensive support network World Wide, we are a global supplier of marine solutions.

We deliver fully integrated ship systems comprising innovative and well proven

products customised to the individual ship and it's specific operation, ensuring an optimum solution for any application.

Whether you choose complete ship systems or less comprehensive solutions, you will always have the advantage of our special competence and technology.

# Fact sheet

## UT 776 WP – Platform Supply Vessel

### General:

This specification together with general arrangement plan describes a Platform Supply Vessel of UT-Design™ type UT 776 WP which is designed for satisfying the general demands of the offshore industry.

### Main Particulars:

Length overall	approx.	91,7 m
Length between p.p.	approx.	82,8 m
Breadth moulded	approx.	20,0 m
Depth main deck	approx.	8,2 m
Design draft	approx.	6,0 m
Max. draft midship	approx.	6,8 m
Draft with 2,0 m freeboard	approx.	6,2 m

### Tank Capacities:

Ballast water	approx.	1850 m3
Drillwater	approx.	1850 m3
Freshwater	approx.	1000 m3
Dry bulk cargo tanks (cement)	approx.	350 m3
Base oil	approx.	180 m3
Fuel oil incl Base oil (cargo and domestic)	approx.	1060 m3
Liquid Mud (6 tanks)	approx.	900 m3
Liquid Brine (4 tanks)	approx.	600 m3
Methanol/Special Prod(4 tanks)	approx.	340 m3
Recovered oil (NOFO 2009)	approx.	1500 m3
Cargo deck area (10 t /m2)	approx.	1030 m2
Deck cargo (G=1.0 m above deck)	approx	2700 T
Deadweight at summer-draught	approx.	5000 T
Gross Tonnage (1969) Intern. Above	.	4000 GRT

### Class:

Det Norske Veritas +1A1, E0, SF, Offshore Service Vessel Supply, DK(+), HL(2.8), LFL\*, DYNPOS AUTR, CLEAN DESIGN, COMF-V(2), NAUT-OSV(A), OILREC, BWM-T, STANDBY-VESSEL (150), Winterization Basic, ICE 1C

### Option:

ICE 1B

Option end

### Performance:

Service Speed at d= 6,0 m:	Approx. 12-15 knots
Trial Speed at d= 4,0 m	Approx. 17,0 knots
Economic speed :	Approx. 11-13 knots

### Cargo Discharge Pumps:

2 x Ballast/Drill water	Cap.: 250 m3/h - 9 bar
2 x Fuel (ORO)	Cap.: 250 m3/h - 9 bar
2 x Freshwater	Cap.: 250 m3/h - 9 bar
2 x Brine	Cap.: 100 m3/h - 24 bar each
3 x Liquid mud (ORO)	Cap.: 100 m3/h - 24 bar each
1 x Base oil	Cap.: 75 m3/h - 9 bar each
4 x Methanol/Special Product	Cap.: 75 m3/h - 9 bar each

### Side Thrusters:

1 x TT 2200 DPN FP SuperSilent, 883 kW  
1 x TCNS 73/M-180 FP, 880 kW

### Roll Reduction System:

Two off Rolls-Royce Marine's type roll reduction tanks.

### DP-System:

A DP system, making the vessel comply with DNV notation DYNPOS AUTR to be arranged.

### Communication Equipment:

Radio installation according to GMDSS, A3 and of latest modern and practical navigation equipment available according to separate specification.

### Winches/Cranes:

One double windlass/mooring winch  
Two 15 tonnes tigger winches  
Two 10 tonnes capstans  
Two deck Cranes 10 tonnes - 8-14 m.arm. (approved by NMD for rescue basket operations)

### Safety Equipment:

The vessel to have safety equipment according to SOLAS for min. 27 persons.

### Accommodation:

The vessel to have accommodation and equipment for 27 persons.

### Main Azimuth Thrusters:

2 x Rolls-Royce Marine's CP Compass Thruster Systems, Azipull120 FP, with the following particulars:  
Electric motor output : 0 - 2500 kW each  
Rated speed : 0 - 1200 rpm  
Propeller diameter : 3200 mm

### Main Generator Set:

Four off Rolls-Royce Marine's main generator sets.  
4 x Bergen Diesel C25:33L6ACD  
MCR approx. : 4 x 1843 kW  
Rating approx. : 4 x 2048 kVA  
Voltage : 690 V / 60 Hz

### Generator Sets:

1 off Harbour generator set:  
600 kW / 750 kVA, 690V, 60 Hz



## **ANEXO 2: INFORMES DE NAVCAD**

# Resistance

7 nov 2017 10:19

HydroComp NavCad 2014

Project ID

Description

File name **Potencia preliminar.hcnc**

## Analysis parameters

<b>Vessel drag</b>		<b>ITTC-78 (CT)</b>	<b>Added drag</b>	
Technique:	[Calc] Prediction		Appendage:	[Calc] Percentage
Prediction:	Holtrop		Wind:	[Off]
Reference ship:			Seas:	[Off]
Model LWL:			Shallow/channel:	[Off]
Expansion:	Custom		Towed:	[Off]
Friction line:	ITTC-57		Margin:	[Calc] Hull drag only [15%]
Hull form factor:	[On] 1,369		<b>Water properties</b>	
Speed corr:	[Off]		Water type:	Salt
Spray drag corr:	[Off]		Density:	1026,00 kg/m3
Corr allowance:	0,000000		Viscosity:	1,18920e-6 m2/s
Roughness [mm]:	[Off]			

## Prediction method check [Holtrop]

Parameters	FN [design]	CP	LWL/BWL	BWL/T	Lambda
Value	0,23	0,73	4,34	2,91	0,92
Range	0,06-0,34	0,55-0,85	3,90-14,90	2,10-4,00	0,01-1,07

## Prediction results

SPEED [kt]	SPEED COEFS		ITTC-78 COEFS						
	FN	FV	RN	CF	[CTLT/CF]	CR	dCF	CA	CT
7,00	0,126	0,260	2,52e8	0,001831	1,369	0,000016	0,000000	0,000000	0,002522
8,00	0,144	0,297	2,88e8	0,001798	1,369	0,000026	0,000000	0,000000	0,002487
9,00	0,162	0,334	3,24e8	0,001770	1,369	0,000064	0,000000	0,000000	0,002487
10,00	0,180	0,371	3,59e8	0,001745	1,369	0,000158	0,000000	0,000000	0,002547
11,00	0,198	0,408	3,95e8	0,001723	1,369	0,000344	0,000000	0,000000	0,002703
12,00	0,216	0,445	4,31e8	0,001704	1,369	0,000657	0,000000	0,000000	0,002990
+ 13,00 +	0,234	0,482	4,67e8	0,001686	1,369	0,001143	0,000000	0,000000	0,003451
14,00	0,252	0,519	5,03e8	0,001670	1,369	0,001826	0,000000	0,000000	0,004112
15,00	0,270	0,556	5,39e8	0,001655	1,369	0,002539	0,000000	0,000000	0,004805
16,00	0,288	0,593	5,75e8	0,001641	1,369	0,003728	0,000000	0,000000	0,005975
	<b>RESISTANCE</b>								
SPEED [kt]	RBARE [kN]	RAPP [kN]	RWIND [kN]	RSEAS [kN]	RCHAN [kN]	RTOWED [kN]	RMARGIN [kN]	RTOTAL [kN]	
7,00	28,42	4,26	0,00	0,00	0,00	4,26	4,26	36,94	
8,00	36,60	5,49	0,00	0,00	0,00	5,49	5,49	47,58	
9,00	46,31	6,95	0,00	0,00	0,00	6,95	6,95	60,21	
10,00	58,57	8,79	0,00	0,00	0,00	8,79	8,79	76,14	
11,00	75,20	11,28	0,00	0,00	0,00	11,28	11,28	97,77	
12,00	99,00	14,85	0,00	0,00	0,00	14,85	14,85	128,69	
+ 13,00 +	134,11	20,12	0,00	0,00	0,00	20,12	20,12	174,35	
14,00	185,32	27,80	0,00	0,00	0,00	27,80	27,80	240,92	
15,00	248,59	37,29	0,00	0,00	0,00	37,29	37,29	323,17	
16,00	351,72	52,76	0,00	0,00	0,00	52,76	52,76	457,23	
	<b>EFFECTIVE POWER</b>					<b>OTHER</b>			
SPEED [kt]	PEBARE [kW]	PETOTAL [kW]	CTLR	CTLT	RBARE/W				
7,00	102,3	133,0	0,00015	0,02352	0,00037				
8,00	150,6	195,8	0,00024	0,02319	0,00048				
9,00	214,4	278,8	0,00059	0,02319	0,00061				
10,00	301,3	391,7	0,00147	0,02375	0,00077				
11,00	425,6	553,2	0,00320	0,02520	0,00099				
12,00	611,1	794,5	0,00613	0,02788	0,00130				
+ 13,00 +	896,9	1166,0	0,01066	0,03218	0,00177				
14,00	1334,7	1735,2	0,01703	0,03834	0,00244				
15,00	1918,3	2493,8	0,02368	0,04480	0,00327				
16,00	2895,0	3763,5	0,03476	0,05572	0,00463				

# Resistance

7 nov 2017 10:21

HydroComp NavCad 2014

Project ID

Description

File name **Potencia preliminar.hcnc**

## Analysis parameters

<b>Vessel drag</b>		<b>ITTC-78 (CT)</b>	<b>Added drag</b>	
Technique:	[Calc] Prediction		Appendage:	[Calc] Percentage
Prediction:	Holtrop		Wind:	[Off]
Reference ship:			Seas:	[Off]
Model LWL:			Shallow/channel:	[Off]
Expansion:	Custom		Towed:	[Off]
Friction line:	ITTC-57		Margin:	[Calc] Hull drag only [15%]
Hull form factor:	[On] 1,369		<b>Water properties</b>	
Speed corr:	[Off]		Water type:	Salt
Spray drag corr:	[Off]		Density:	1026,00 kg/m3
Corr allowance:	0,000000		Viscosity:	1,18920e-6 m2/s
Roughness [mm]:	[Off]			

## Prediction method check [Holtrop]

Parameters	FN [design]	CP	LWL/BWL	BWL/T	Lambda
Value	0,23	0,73	4,34	2,91	0,92
Range	0,06-0,34	0,55-0,85	3,90-14,90	2,10-4,00	0,01-1,07

## Prediction results

SPEED [kt]	SPEED COEFS		ITTC-78 COEFS						
	FN	FV	RN	CF	[CTLT/CF]	CR	dCF	CA	CT
7,00	0,126	0,260	2,52e8	0,001831	1,369	0,000016	0,000000	0,000000	0,002522
8,00	0,144	0,297	2,88e8	0,001798	1,369	0,000026	0,000000	0,000000	0,002487
9,00	0,162	0,334	3,24e8	0,001770	1,369	0,000064	0,000000	0,000000	0,002487
10,00	0,180	0,371	3,59e8	0,001745	1,369	0,000158	0,000000	0,000000	0,002547
11,00	0,198	0,408	3,95e8	0,001723	1,369	0,000344	0,000000	0,000000	0,002703
12,00	0,216	0,445	4,31e8	0,001704	1,369	0,000657	0,000000	0,000000	0,002990
+ 13,00 +	0,234	0,482	4,67e8	0,001686	1,369	0,001143	0,000000	0,000000	0,003451
14,00	0,252	0,519	5,03e8	0,001670	1,369	0,001826	0,000000	0,000000	0,004112
15,00	0,270	0,556	5,39e8	0,001655	1,369	0,002539	0,000000	0,000000	0,004805
16,00	0,288	0,593	5,75e8	0,001641	1,369	0,003728	0,000000	0,000000	0,005975
	RESISTANCE								
SPEED [kt]	RBARE [kN]	RAPP [kN]	RWIND [kN]	RSEAS [kN]	RCHAN [kN]	RTOWED [kN]	RMARGIN [kN]	RTOTAL [kN]	
7,00	28,42	4,26	0,00	0,00	0,00	4,26	4,26	36,94	
8,00	36,60	5,49	0,00	0,00	0,00	5,49	5,49	47,58	
9,00	46,31	6,95	0,00	0,00	0,00	6,95	6,95	60,21	
10,00	58,57	8,79	0,00	0,00	0,00	8,79	8,79	76,14	
11,00	75,20	11,28	0,00	0,00	0,00	11,28	11,28	97,77	
12,00	99,00	14,85	0,00	0,00	0,00	14,85	14,85	128,69	
+ 13,00 +	134,11	20,12	0,00	0,00	0,00	20,12	20,12	174,35	
14,00	185,32	27,80	0,00	0,00	0,00	27,80	27,80	240,92	
15,00	248,59	37,29	0,00	0,00	0,00	37,29	37,29	323,17	
16,00	351,72	52,76	0,00	0,00	0,00	52,76	52,76	457,23	
	EFFECTIVE POWER		OTHER						
SPEED [kt]	PEBARE [kW]	PETOTAL [kW]	CTLR	CTLT	RBARE/W				
7,00	102,3	133,0	0,00015	0,02352	0,00037				
8,00	150,6	195,8	0,00024	0,02319	0,00048				
9,00	214,4	278,8	0,00059	0,02319	0,00061				
10,00	301,3	391,7	0,00147	0,02375	0,00077				
11,00	425,6	553,2	0,00320	0,02520	0,00099				
12,00	611,1	794,5	0,00613	0,02788	0,00130				
+ 13,00 +	896,9	1166,0	0,01066	0,03218	0,00177				
14,00	1334,7	1735,2	0,01703	0,03834	0,00244				
15,00	1918,3	2493,8	0,02368	0,04480	0,00327				
16,00	2895,0	3763,5	0,03476	0,05572	0,00463				

# Resistance

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File name **Potencia preliminar.hcnc**

## Hull data

General		Planing	
Configuration:	<b>Monohull</b>	Proj chine length:	<b>0,000 m</b>
Chine type:	<b>Round/multiple</b>	Proj bottom area:	<b>0,0 m2</b>
Length on WL:	<b>83,090 m</b>	LCG fwd TR:	[XCG/LP 0,000] <b>0,000 m</b>
Max beam on WL:	[LWL/BWL 4,343] <b>19,130 m</b>	VCG below WL:	<b>0,000 m</b>
Max molded draft:	[BWL/T 2,908] <b>6,578 m</b>	Aft station (fwd TR):	<b>0,000 m</b>
Displacement:	[CB 0,722] <b>7742,00 t</b>	Deadrise:	<b>0,00 deg</b>
Wetted surface:	[CS 2,139] <b>1693,7 m2</b>	Chine beam:	<b>0,000 m</b>
<b>ITTC-78 (CT)</b>		Chine ht below WL:	<b>0,000 m</b>
LCB fwd TR:	[XCB/LWL 0,500] <b>41,545 m</b>	Fwd station (fwd TR):	<b>0,000 m</b>
LCF fwd TR:	[XCF/LWL 0,620] <b>51,545 m</b>	Deadrise:	<b>0,00 deg</b>
Max section area:	[CX 0,989] <b>124,5 m2</b>	Chine beam:	<b>0,000 m</b>
Waterplane area:	[CWP 0,850] <b>1351,1 m2</b>	Chine ht below WL:	<b>0,000 m</b>
Bulb section area:	<b>11,1 m2</b>	Propulsor type:	<b>Propeller</b>
Bulb ctr below WL:	<b>3,503 m</b>	Max prop diameter:	<b>2500,0 mm</b>
Bulb nose fwd TR:	<b>87,000 m</b>	Shaft angle to WL:	<b>0,00 deg</b>
Imm transom area:	[ATR/AX 0,000] <b>0,0 m2</b>	Position fwd TR:	<b>0,000 m</b>
Transom beam WL:	[BTR/BWL 0,000] <b>0,000 m</b>	Position below WL:	<b>0,000 m</b>
Transom immersion:	[TTR/T 0,000] <b>0,000 m</b>	Transom lift device:	<b>Flap</b>
Half entrance angle:	<b>33,61 deg</b>	Device count:	<b>0</b>
Bow shape factor:	[WL flow] <b>1,0</b>	Span:	<b>0,000 m</b>
Stern shape factor:	[WL flow] <b>1,0</b>	Chord length:	<b>0,000 m</b>
		Deflection angle:	<b>0,00 deg</b>
		Tow point fwd TR:	<b>0,000 m</b>
		Tow point below WL:	<b>0,000 m</b>

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## Appendage data

General		Skeg/Keel	
Definition:	Percentage	Count:	0
Percent of hull drag:	15,00 %	Type:	Skeg
Planing influence		Mean length:	0,000 m
LCE fwd TR:	0,000 m	Mean width:	0,000 m
VCE below WL:	0,000 m	Height aft:	0,000 m
Shafting		Height mid:	0,000 m
Count:	2	Height fwd:	0,000 m
Max prop diameter:	2500,0 mm	Projected area:	0,0 m2
Shaft angle to WL:	0,00 deg	Wetted surface:	0,0 m2
Exposed shaft length:	0,000 m	Stabilizer	
Shaft diameter:	0,000 m	Count:	0
Wetted surface:	0,0 m2	Root chord:	0,000 m
Strut bossing length:	0,000 m	Tip chord:	0,000 m
Bossing diameter:	0,000 m	Span:	0,000 m
Wetted surface:	0,0 m2	T/C ratio:	0,000
Hull bossing length:	0,000 m	LE sweep:	0,00 deg
Bossing diameter:	0,000 m	Wetted surface:	0,0 m2
Wetted surface:	0,0 m2	Projected area:	0,0 m2
Strut (per shaft line)		Dynamic multiplier:	1,00
Count:	0	Bilge keel	
Root chord:	0,000 m	Count:	0
Tip chord:	0,000 mm	Mean length:	0,000 m
Span:	0,000 m	Mean base width:	0,000 m
T/C ratio:	0,000	Mean projection:	0,000 m
Projected area:	0,0 m2	Wetted surface:	0,0 m2
Wetted surface:	0,0 m2	Tunnel thruster	
Exposed palm depth:	0,000 m	Count:	0
Exposed palm width:	0,000 m	Diameter:	0,000 m
Rudder		Sonar dome	
Count:	0	Count:	0
Rudder location:	Behind propeller	Wetted surface:	0,0 m2
Type:	Balanced foil	Miscellaneous	
Root chord:	0,000 m	Count:	0
Tip chord:	0,000 m	Drag area:	0,0 m2
Span:	0,000 m	Drag coef:	0,00
T/C ratio:	0,000		
LE sweep:	0,00 deg		
Projected area:	0,0 m2		
Wetted surface:	0,0 m2		

## Environment data

Wind		Seas	
Wind speed:	0,00 kt	Significant wave ht:	0,000 m
Angle off bow:	0,00 deg	Modal wave period:	0,0 sec
Gradient correction:	Off	Shallow/channel	
Exposed hull		Water depth:	0,000 m
Transverse area:	0,0 m2	Type:	Shallow water
VCE above WL:	0,000 m	Channel width:	0,000 m
Profile area:	0,0 m2	Channel side slope:	0,00 deg
Superstructure		Hull girth:	0,000 m
Superstructure shape:	Cargo ship		
Transverse area:	0,0 m2		
VCE above WL:	0,000 m		
Profile area:	0,0 m2		

# Resistance

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## Symbols and values

SPEED = Vessel speed  
FN = Froude number [LWL]  
FV = Froude number [VOL]  
  
RN = Reynolds number [LWL]  
CF = Frictional resistance coefficient  
CV/CF = Viscous/frictional resistance coefficient ratio [dynamic form factor]  
CR = Residuary resistance coefficient  
dCF = Added frictional resistance coefficient for roughness  
CA = Correlation allowance [dynamic]  
CT = Total bare-hull resistance coefficient  
  
RBARE = Bare-hull resistance  
RAPP = Additional appendage resistance  
RWIND = Additional wind resistance  
RSEAS = Additional sea-state resistance  
RCHAN = Additional shallow/channel resistance  
RTOWED = Additional towed object resistance  
RMARGIN = Resistance margin  
RTOTAL = Total vessel resistance  
  
PEBARE = Bare-hull effective power  
PETOTAL = Total effective power  
  
CTLR = Telfer residuary resistance coefficient  
CTLT = Telfer total bare-hull resistance coefficient  
RBARE/W = Bare-hull resistance to weight ratio  
  
+ = Design speed indicator  
\* = Exceeds parameter limit

# Resistance

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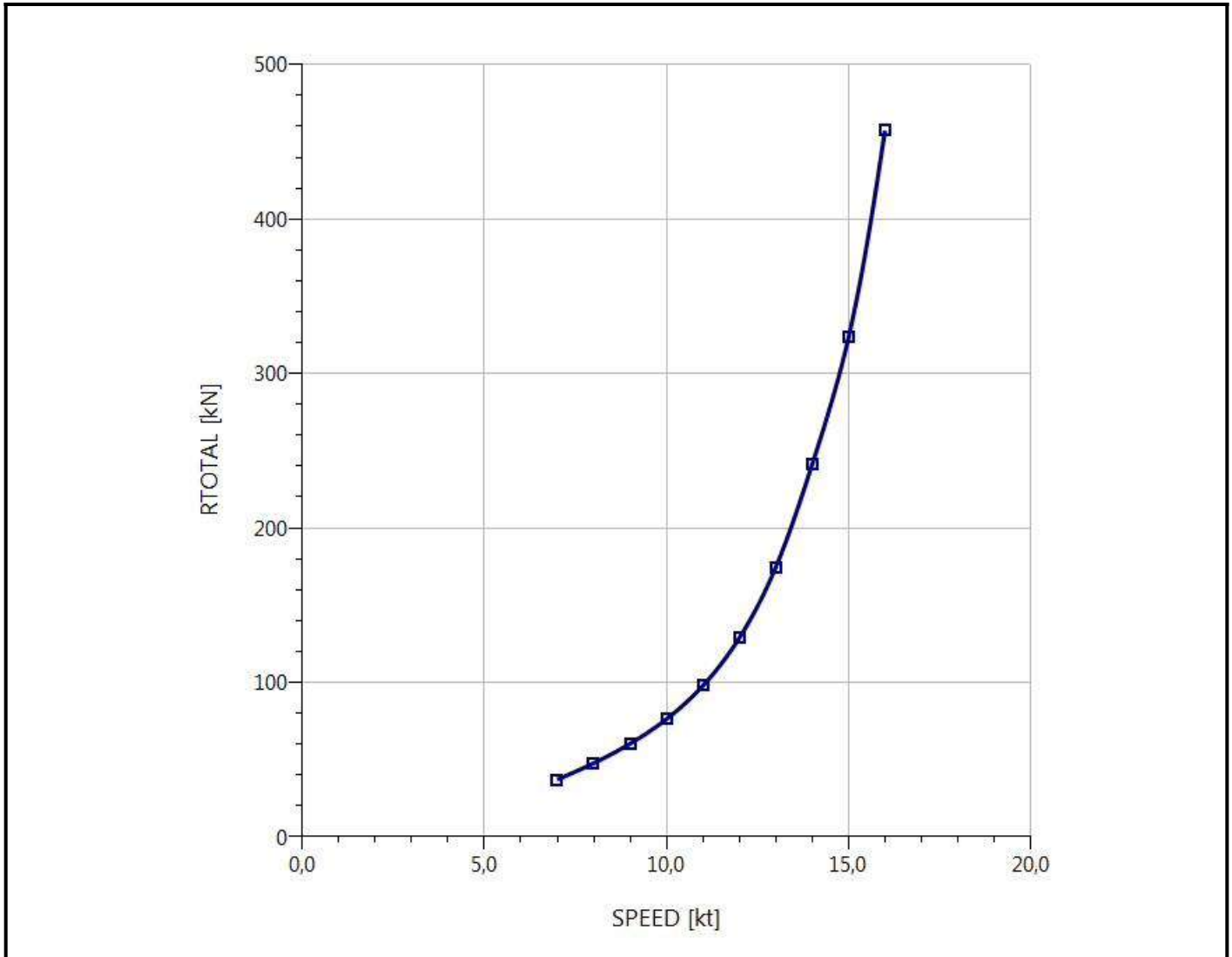
Description

File name **Potencia preliminar.hcnc**

## Analysis parameters

Vessel drag		ITTC-78 (CT)	Added drag	
Technique:	[Calc]	Prediction	Appendage:	[Calc] Percentage
Prediction:		Holtrop	Wind:	[Off]
Reference ship:			Seas:	[Off]
Model LWL:			Shallow/channel:	[Off]
Expansion:		Custom	Towed:	[Off]
Friction line:		ITTC-57	Margin:	[Calc] Hull drag only [15%]
Hull form factor:	[On]	1,369	Water properties	
Speed corr:	[Off]		Water type:	Salt
Spray drag corr:	[Off]		Density:	1026,00 kg/m3
Corr allowance:		0,000000	Viscosity:	1,18920e-6 m2/s
Roughness [mm]:	[Off]			

## Predicted resistance



# Propulsion

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Description

File name **Potencia preliminar.hcnc**

## Analysis parameters

<b>Hull-propulsor interaction</b>		<b>System analysis</b>	
Technique:	[Calc] Prediction	Cavitation criteria:	Keller eqn
Prediction:	Holtrop	Analysis type:	Free run
Reference ship:		CPP method:	Fixed RPM
Max prop diam:	2500,0 mm	Engine RPM:	
<b>Corrections</b>		Mass multiplier:	
Viscous scale corr:	[Off]	RPM constraint:	
Rudder location:		Limit [RPM/s]:	
Friction line:		<b>Water properties</b>	
Hull form factor:		Water type:	Salt
Corr allowance:		Density:	1026,00 kg/m3
Roughness [mm]:		Viscosity:	1,18920e-6 m2/s
Ducted prop corr:	[Off]		
Tunnel stern corr:	[Off]		
Effective diam:			
Recess depth:			

## Prediction method check [Holtrop]

Parameters	FN [design]	CP	LWL/BWL	BWL/T
Value	0,23	0,73	4,34	2,91
Range	0,06-0,80	0,55-0,85	3,90-14,90	2,10-4,00

## Prediction results [System]

SPEED [kt]	HULL-PROPULSOR				ENGINE				
	PETOTAL [kW]	WFT	THD	EFFR	RPMENG [RPM]	PBPROP [kW]	FUEL [L/h]	LOADENG [%]	
7,00	133,0	0,1929	0,1925	0,9958	977	144,9	---	0,0	
8,00	195,8	0,1926	0,1925	0,9958	1114	213,6	---	0,0	
9,00	278,8	0,1923	0,1925	0,9958	1200	290,1	---	0,0	
10,00	391,7	0,1920	0,1925	0,9958	1200	368,0	---	0,0	
11,00	553,2	0,1918	0,1925	0,9958	1200	484,4	---	0,0	
12,00	794,5	0,1916	0,1925	0,9958	1200	670,9	---	0,0	
+ 13,00 +	1166,0	0,1914	0,1925	0,9958	1200	992,4	---	0,0	
14,00	1735,2	0,1913	0,1925	0,9958	1200	1570,7	---	0,0	
15,00	2493,8	0,1911	0,1925	0,9958	1200	2458,5	---	0,0	
16,00	3763,5	0,1910	0,1925	0,9958	1361	4019,7	---	0,0	
POWER DELIVERY									
SPEED [kt]	RPMPROP [RPM]	QPROP [kN·m]	QENG [kN·m]	PDPROP [kW]	PSPROP [kW]	PSTOTAL [kW]	PBTOTAL [kW]	TRANSP	CPPITCH [mm]
7,00	180	7,49	1,38	142,0	144,9	289,9	289,9	943,2	1125,2
8,00	206	9,69	1,79	209,4	213,6	427,3	427,3	731,3	1125,1
9,00	221	12,20	2,25	284,3	290,1	580,2	580,2	605,9	1196,7
10,00	221	15,48	2,86	360,6	368,0	735,9	735,9	530,7	1401,2
11,00	221	20,38	3,76	474,7	484,4	968,7	968,7	443,5	1639,3
12,00	221	28,23	5,21	657,5	670,9	1341,9	1341,9	349,3	1935,1
+ 13,00 +	221	41,75	7,71	972,5	992,4	1984,7	1984,7	255,8	2329,7
14,00	221	66,08	12,20	1539,3	1570,7	3141,3	3141,3	174,1	2890,3
15,00	221	103,43	19,09	2409,4	2458,5	4917,0	4917,0	119,2	3648,2
16,00	251	149,09	27,52	3939,3	4019,7	8039,3	8039,3	77,7	3849,8
EFFICIENCY									
SPEED [kt]	EFFICIENCY				THRUST				
	EFFO	EFFG	EFFOA	MERIT	THRPROP [kN]	DELTHR [kN]			
7,00	0,4701	1,0000	0,4589	0,34468	22,88	36,94			
8,00	0,4697	1,0000	0,4583	0,34186	29,46	47,58			
9,00	0,4925	1,0000	0,4805	0,35834	37,28	60,21			
10,00	0,5458	1,0000	0,5322	0,40173	47,15	76,14			
11,00	0,5858	1,0000	0,5711	0,44407	60,54	97,77			
12,00	0,6074	1,0000	0,5921	0,48416	79,69	128,69			
+ 13,00 +	0,6028	1,0000	0,5875	0,51615	107,96	174,34			
14,00	0,5669	1,0000	0,5524	0,52973	149,18	240,92			
15,00	0,5206	1,0000	0,5072	0,52578	200,11	323,17			
16,00	0,4806	1,0000	0,4681	0,54119	283,13	457,23			



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## Prediction results [Propulsor]

PROPULSOR COEFS									
SPEED [kt]	J	KT	KQ	KTJ2	KQJ3	CTH	CP	RNPROP	
7,00	0,3867	0,0631	0,00827	0,42226	0,14296	1,0753	2,2972	7,76e6	
8,00	0,3880	0,0626	0,00824	0,41609	0,141	1,0596	2,2656	8,85e6	
9,00	0,4052	0,0683	0,00894	0,41572	0,13433	1,0586	2,1585	9,55e6	
10,00	0,4504	0,0863	0,01134	0,42556	0,12411	1,0837	1,9941	9,58e6	
11,00	0,4955	0,1108	0,01492	0,45136	0,12263	1,1494	1,9705	9,61e6	
12,00	0,5407	0,1459	0,02067	0,49902	0,13076	1,2707	2,101	9,65e6	
+ 13,00 +	0,5859	0,1977	0,03058	0,57577	0,15201	1,4662	2,4425	9,69e6	
14,00	0,6311	0,2731	0,04839	0,68576	0,19252	1,7463	3,0935	9,74e6	
15,00	0,6763	0,3664	0,07575	0,80102	0,24487	2,0398	3,9347	9,79e6	
16,00	0,6361	0,4029	0,08487	0,99576	0,32973	2,5357	5,2981	1,11e7	
CAVITATION									
SPEED [kt]	SIGMAV	SIGMAN	SIGMA07R	TIPSPEED [m/s]	MINBAR	PRESS [kPa]	CAVAVG [%]	CAVMAX [%]	PITCHFC [mm]
7,00	31,12	4,65	0,93	23,61	0,142	12,23	2,0	2,0	1179,7
8,00	23,81	3,58	0,72	26,91	0,162	15,75	2,0	2,0	1181,1
9,00	18,80	3,09	0,62	28,99	0,184	19,93	2,0	2,0	1233,3
10,00	15,22	3,09	0,61	28,99	0,210	25,20	2,0	2,0	1375,6
11,00	12,57	3,09	0,61	28,99	0,247	32,36	2,0	2,0	1527,6
12,00	10,56	3,09	0,60	28,99	0,300	42,60	4,2	4,2	1694,4
+ 13,00 +	8,99	3,09	0,60	28,99	0,381	57,71 !!	11,1	11,1	1882,5
14,00	7,75	3,09	0,59	28,99	0,500	79,74 !!	29,1 !!	29,1	2096,2
15,00	6,75	3,09	0,58	28,99	0,648	106,97 !!	68,5 !!	68,5	2319,3
16,00	5,93	2,40	0,46	32,89	0,897	151,34 !!	100,0 !!	100,0	2290,3

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File name **Potencia preliminar.hcnc**

## Hull data

General		Planing	
Configuration:	<b>Monohull</b>	Proj chine length:	<b>0,000 m</b>
Chine type:	<b>Round/multiple</b>	Proj bottom area:	<b>0,0 m2</b>
Length on WL:	<b>83,090 m</b>	LCG fwd TR:	[XCG/LP 0,000] <b>0,000 m</b>
Max beam on WL:	[LWL/BWL 4,343] <b>19,130 m</b>	VCG below WL:	<b>0,000 m</b>
Max molded draft:	[BWL/T 2,908] <b>6,578 m</b>	Aft station (fwd TR):	<b>0,000 m</b>
Displacement:	[CB 0,722] <b>7742,00 t</b>	Deadrise:	<b>0,00 deg</b>
Wetted surface:	[CS 2,139] <b>1693,7 m2</b>	Chine beam:	<b>0,000 m</b>
<b>ITTC-78 (CT)</b>		Chine ht below WL:	<b>0,000 m</b>
LCB fwd TR:	[XCB/LWL 0,500] <b>41,545 m</b>	Fwd station (fwd TR):	<b>0,000 m</b>
LCF fwd TR:	[XCF/LWL 0,620] <b>51,545 m</b>	Deadrise:	<b>0,00 deg</b>
Max section area:	[CX 0,989] <b>124,5 m2</b>	Chine beam:	<b>0,000 m</b>
Waterplane area:	[CWP 0,850] <b>1351,1 m2</b>	Chine ht below WL:	<b>0,000 m</b>
Bulb section area:	<b>11,1 m2</b>	Propulsor type:	<b>Propeller</b>
Bulb ctr below WL:	<b>3,503 m</b>	Max prop diameter:	<b>2500,0 mm</b>
Bulb nose fwd TR:	<b>87,000 m</b>	Shaft angle to WL:	<b>0,00 deg</b>
Imm transom area:	[ATR/AX 0,000] <b>0,0 m2</b>	Position fwd TR:	<b>0,000 m</b>
Transom beam WL:	[BTR/BWL 0,000] <b>0,000 m</b>	Position below WL:	<b>0,000 m</b>
Transom immersion:	[TTR/T 0,000] <b>0,000 m</b>	Transom lift device:	<b>Flap</b>
Half entrance angle:	<b>33,61 deg</b>	Device count:	<b>0</b>
Bow shape factor:	[WL flow] <b>1,0</b>	Span:	<b>0,000 m</b>
Stern shape factor:	[WL flow] <b>1,0</b>	Chord length:	<b>0,000 m</b>
		Deflection angle:	<b>0,00 deg</b>
		Tow point fwd TR:	<b>0,000 m</b>
		Tow point below WL:	<b>0,000 m</b>

## Propulsor data

Propulsor		Propeller options	
Count:	<b>2</b>	Oblique angle corr:	<b>Off</b>
Propulsor type:	<b>Propeller series</b>	Shaft angle to WL:	<b>0,00 deg</b>
Propeller type:	<b>CPP</b>	Added rise of run:	<b>0,00 deg</b>
Propeller series:	<b>B Series</b>	Propeller cup:	<b>0,0 mm</b>
Propeller sizing:	<b>By total drag</b>	KTKQ corrections:	<b>Custom</b>
Reference prop:		Scale correction:	<b>None</b>
Blade count:	<b>4</b>	KT multiplier:	<b>1,000</b>
Expanded area ratio:	<b>0,3811</b> [Size]	KQ multiplier:	<b>1,000</b>
Propeller diameter:	<b>2500,0 mm</b> [Keep]	Blade T/C [0.7R]:	<b>0,00</b>
Propeller mean pitch:	[P/D 0,9319] <b>2329,7 mm</b> [Size]	Roughness:	<b>0,00 mm</b>
Hub immersion:	<b>3503,0 mm</b>	Cav breakdown:	<b>Off</b>
<b>Engine/gear</b>		<b>Design condition</b>	
Engine data:		Max prop diam:	<b>2500,0 mm</b>
Rated RPM:	<b>0 RPM</b>	Design speed:	<b>13,00 kt</b>
Rated power:	<b>0,0 kW</b>	Reference power:	<b>0,0 kW</b>
Gear efficiency:	<b>1,000</b>	Design point:	<b>0,000</b>
Load correction:	<b>Off</b>	Reference RPM:	<b>1200,0</b>
Gear ratio:	<b>5,418</b> [Size]	Design point:	<b>1,000</b>
Shaft efficiency:	<b>0,980</b>		

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## Symbols and values

SPEED = Vessel speed

PETOTAL = Total vessel effective power  
WFT = Taylor wake fraction coefficient  
THD = Thrust deduction coefficient  
EFFR = Relative-rotative efficiency

RPMENG = Engine RPM  
PBPROP = Brake power per propulsor  
FUEL = Fuel rate per engine  
LOADENG = Percentage of engine max available power at given RPM

RPMPROP = Propulsor RPM  
QPROP = Propulsor open water torque  
QENG = Engine torque  
PDPROP = Delivered power per propulsor  
PSPROP = Shaft power per propulsor  
PSTOTAL = Total vessel shaft power  
PBTOTAL = Total vessel brake power  
TRANSP = Transport factor

EFFO = Propulsor open-water efficiency  
EFFG = Gear efficiency (load corrected)  
EFFOA = Overall propulsion efficiency [=PETOTAL/PSTOTAL]  
MERIT = Propulsor merit coefficient

THRPROP = Open-water thrust per propulsor  
DELTHR = Total vessel delivered thrust

J = Propulsor advance coefficient  
KT = Propulsor thrust coefficient [horizontal, if in oblique flow]  
KQ = Propulsor torque coefficient  
KTJ2 = Propulsor thrust loading ratio  
KQJ3 = Propulsor torque loading ratio  
CTH = Horizontal component of bare-hull resistance coefficient  
CP = Propulsor thrust loading coefficient  
RNPROP = Propeller Reynolds number at 0.7R

SIGMAV = Cavitation number of propeller by vessel speed  
SIGMAN = Cavitation number of propeller by RPM  
SIGMA07R = Cavitation number of blade section at 0.7R  
TIPSPEED = Propeller circumferential tip speed  
MINBAR = Minimum expanded blade area ratio recommended by selected cavitation criteria  
PRESS = Average propeller loading pressure  
CAVAVG = Average predicted back cavitation percentage  
CAVMAX = Peak predicted back cavitation percentage [if in oblique flow]  
PITCHFC = Minimum recommended pitch to avoid face cavitation

+ = Design speed indicator  
\* = Exceeds recommended parameter limit  
! = Exceeds recommended cavitation criteria [warning]  
!! = Substantially exceeds recommended cavitation criteria [critical]  
!!! = Thrust breakdown is indicated [severe]  
--- = Insignificant or not applicable

# Propulsion

6 nov 2017 06:59

HydroComp NavCad 2014

Project ID

Description

File name **Potencia preliminar.hcnc**

## Analysis parameters

Hull-propulsor interaction		System analysis	
Technique:	[Calc] Prediction	Cavitation criteria:	Keller eqn
Prediction:	Holtrop	Analysis type:	Free run
Reference ship:		CPP method:	Fixed RPM
Max prop diam:	2500,0 mm	Engine RPM:	
<b>Corrections</b>		Mass multiplier:	
Viscous scale corr:	[Off]	RPM constraint:	
Rudder location:		Limit [RPM/s]:	
Friction line:		<b>Water properties</b>	
Hull form factor:		Water type:	Salt
Corr allowance:		Density:	1026,00 kg/m3
Roughness [mm]:		Viscosity:	1,18920e-6 m2/s
Ducted prop corr:	[Off]		
Tunnel stern corr:	[Off]		
Effective diam:			
Recess depth:			

## Predicted propulsion

