

VESSEL PARTICULARS (FORM C)
LPG/C 3517.382M³
ECO LUCIDITY

Specifications of the vessel and the gas installation which are representations by the Owners, given in good faith but wog.

(A) VESSEL'S CHARACTERISTICS

PREAMBLE

Name : **ECO LUCIDITY**
Owner : **COLORADO OIL AND GAS INC.**
Flag : **MARSHALL ISLANDS**
Build : **HIGAKI SHIPBUILDING CO. LTD.**
Date on Service : **09/01/2015**
Class : **NKK**

GRT International : **Abt. 3,992 ton** Suez : **TBA ton**
Panama : **TBA m³**

NRT International : **Abt. 1192 ton** Suez : **TBA ton**
Panama : **TBA ton**

Is vessel build according to
USCG regulations? : **Yes**
RINA regulations? : **N/A**
Japanese regulation? : **JIS**

Has vessel received
USCG approval? : **YES (for foreign vessel in US water)**
RINA approval? : **N/A**

HULL

LOA : **99.92 M**
LBP : **92.90 M**
Breadth : **17.00 M**
Depth : **7.20 M**
Summer Draft : **5.40 M corresponding to Summer DWT = abt. 3841.88**

Estimated draft with full cargo and full bunkers are as follows.

Product	Draft Fore' (m)	Draft Aft' (m)	Draft Mean (m)	Corresponding Deadweight (t)
Propane	3.52	5.65	4.03	2043.3
Butadiene	2.88	5.66	4.27	2361.1
VCM	4.75	6.04	5.40	3837.7

Propeller immersion :

At draft 6.19m At correspond. : 105.96 %
At draft 5.50m At correspond. : 86.91 %

COMMUNICATION EQUIPMENT

Call letter : **V7CC9**
Radio Station normally watched : **GMDSS**
Radio MF/HFNBDP : **538006120**
Radio MF/HFTEL/DSC : **538006120**
VHF : **Primary & Duplicated system**
Satellite Communication **Inmarsat 'C'** : 453840951
Inmarsat 'FBB' : Voice +870773213618
: (Fax) +870783230450
: (E-mail) ecolucidity@stealth.gr

MACHINERY

Main Engine x 1 . Type and make : **MAKITA-MITSUI-MAN, B & W 5L35MC6.1**
. Service power : **2.500 KWx202 rpm (100 % NCR)**
No of Cylinders **5**
Cyl Bore x Stroke **350 mm x 1050 mm**
. Grade of fuel used : **HFO having a viscosity of not more than 380cst @ 50°C**

Auxiliaries Type and make (Electrical) **Yanmar (6NY 16L - EW)**
(Mechanical) **rated 441 Kw x 1200 min-1**
Grade of fuel used **6 Cyl., stroke160mm x 200mm**
No off **MDO (DMA/DMB)**
2

Emergency Gen Type **mitsui Zosen MAC., F6L912 – 52Kw, AC 450V,**
3 phase, 60 Hz
No off **1**

Boiler Type **MIURA (GK-1424-600/300)**
Fully automatic smoke-tube composite boiler
Evaporation **650/ 350 Kg/Hr (Oil fired / Exhaust gas)**
Max Design Pressure **0.7 Mpa Saturated**
Feed Water Temp **60°C**
No off **1**

Air Compressors (Main) Type / Capacity **MATSUBARA MH108 - Vertical, Electric Motor – driven, 2-stage, F.W. cooled type / 45.0 m³ / Hr**

	No off	2
Air Compressors (Emergency)	Type	NO.2 Main air compressor will serve as an emergency during black out driven by emergency generator.
	No off	
Fuel Oil Purifier	Type	Mitsubishi SJ15H – Centrifugal
	No off	2
	Capacity	1,400 Ltrs / Hr at 380 mm²/s at 50°C
Lub Oil Purifier	Type	Mitsubishi SJ15H – Centrifugal
	No off	1
	Capacity	1,400 Ltrs / Hr at 40°C
Evaporator	Type	MIURA CO., LTD. (WM-10DK) – Waste heat recovery
	Capacity	1 x 10 t/day
Fresh Water Sterilizer	Type	USUSHIO USS -500 ULTRA VIOLET
	Capacity	TBA
Waste Oil Incinerator (IMO MEPC 76 (40))	Type	MIURA CO., LTD. (BGW-10N)
	Capacity	Oil @ 100,000 kcal/h & Solids @ 5 Kg/h, 13kg/h Per burner (Waste oil)
Oily Water Separator	Type	TAIKO KIKAI INDUSTRIES CO., LTD. (USH-10) –
	Capacity	1 x 1.0 m³/h ,15ppm
Sewage Treatment plant	Type	TAIKO KIKAI INDUSTRIES CO., LTD. (SBH-25)- Activated sludge aeration (Biological) – USCG certified
	Capacity	1 x 25 persons per day
Hot Water Set (Calorifier unit)	No off	HARISON SANGYO CO., LTD. (CFT-300XX-S) 300L/h, 70°C SET / 1 set
Bow Thruster	Type	Kawasaki Heavy Industries, Ltd. (KT-32B3)- 260kW x 1,800 min⁻¹ (synchronous speed)
Steering Gear	Type	Kawasaki Heavy Industries, Ltd. Electro-Hydraulic system (RV21-010-H) with 2-pump units (dual system) – (one pump to be able to supply full power)
	Duty Capacity	105 KN-m (10.7 t-m)
	Hydraulic pump unit	Electric motor driven, 2 x 3.7 Kw

Speed

Always up to Beaufort scale 4 and Douglas sea state 3
SPEED about 13.0 kts

CONSUMPTION/ DAY

Always up to Beaufort scale 4 and Douglas sea state 3

Main Engine	HFO	@ NCR & scantling Draft:	Cons.: Abt 8.9 MT/day
Boiler	HFO		Cons.: Abt 0.6 MT/day
Auxiliary Engine	DO	At Sea	Cons.: Abt 0.9 MT/day
		At Port – Load / Idle / Anchor	Cons.: Abt 0.9 MT/day
		At Port – Disch / Inerting	Cons.: Abt 2.2 MT/day

Permanent bunker capacity (100%)

HFO	:	355.54 m ³ (Fuel oil bunker tanks to be DH)
Diesel	:	107.78 m ³ (Diesel oil bunker tanks are DH)
Fresh Water	:	167.10 m ³

(B) CARGO INSTALLATIONS

1. Transportable products and respective quantities, calculated in accordance with IMO – maximum filling formula. (Tonnes)

	100% (CBM)	98% (CBM)				
NO.1 CARGO TANK	1758.647	1723.474				
NO.2 CARGO TANK	1758.735	1723.560				
TOTAL	3517.382	3447.034				
	SPSV (bar g)	Ref. Temp. (deg. C.)	Density at (Ref. Temp.)	Corresponding Quantity (MT)		
Propane	17.65	45.0	0.459	1574		
Propylene			0.470	1612		
B/P Mixture			0.487	1670		
I-Butane			0.526	1804		
N-Butane			0.548	1879		
Butylene			0.565	1937		
Butadiene			0.588	2016		
V.C.M.			0.872	2982		
Isoprene			0.656	2250		
Pentane			0.600	2058		
Pentene			0.611	2095		
B/P Mixtures			12.75	45.0	0.487	1670
N-Butane					0.548	1879
I-Butane					0.526	1804
Butadiene	0.588	2016				
Butylene	0.565	1937				
V.C.M.	0.872	2982				
Isoprene	0.656	2250				
Pentane	0.600	2058				
Pentene	0.611	2095				

Note(1):In case of there is no request by USCG, setting pressure of safety valve may use 17.65 bar g. Propylene, Propane and Butane/Propane Mixtures are to be carried. In case of there is request by USCG,propylene, propane and Butane/Propane mixtures are not to be carried except the vapour pressure of Butane/Propane mixtures is not more than 12.75 bar g, 13.0 kg/cm² @ 45°C

Note(2): On and after, the pressure value in parentheses is shown as a conversion value
Mixing ratio of above mentioned B/P mixtures is as follows:

Butane 35 wt% and propane 65 wt%

Note (3): Figures are preliminary

*Subject to change according to displacement

2. Other transportable products N/A

	SPSV	Ref. Temp. (°C.)	Density at Ref. Temp.	Corresponding Quantity (MT)
Raffinate 1				
Raffinate 2				

3. TANKS

- 3.1 Design pressure (Vapour) – BV-IGC : **17.65bar g (1.765 MPag)**
- USCG : **12.75 bar g (1.275 MPag)**
- 3.2 Valve setting : **17.65 bar g (1.765 MPag) / 12.75 bar g (1.275 MPag)**
- 3.3 Maximum vacuum obtainable : **Atmospheric**
- 3.5 Maximum temperature acceptable : **45 °C**
- 3.6 Minimum temperature acceptable : **-10 °C**
- 3.7 Hydrostatic Test Pressure : **26.48 bar g (2.648 MPag)**

4. LOADING RATE – For Full Cargo Parcels

- Ex-atmospheric storage with gas : 1 tank : **Abt 450 m3/hr**
- Return : 2 tanks : **Abt 550 m3/hr**

Remarks:

- * If cargo temperature is less than -10 °C, shore heater to be used. If ship heater used, max rate is **250 m³** per hour.
- * Based on maximum velocity of 6.5 metres/sec except VCM, and 5.0 meters/sec for VCM in the liquid piping.
- * Loading by shore pump only, proper size gas return line to be connected
- * Subject to both ship and shore tanks being under favourable conditions

5. CARGO PUMPS

- 5.1 Type : **Deepwell type of vertical centrifugal multistage design**
- Make : **WARTSILA SVANEH φ J A/S**
- How many : **1 set per tank (2 sets)**
- Maximum specific gravity : **0. 601(LPG) / 0.965 (VCM)**
- 5.2 Capacity (CMB/Hour) : **300 m³/hr at 110 m (SG 0.601)
250 m³/hr at 130 m (SG 0.948)**
- Two speed or variable speed : **Single Speed**
- Rated kW (each) : **123 kW**
- Working pressure maximum : **TBA**

- 5.3 Location : **At each cargo tank**
Removable : **Not removable**
- 5.4 Booster pumps : **1 set**
Type : **Horizontal**
Maker : **WARTSILA SVANEH ϕ J A/S**
- 5.5 Capacity (CMB/Hour) : **300m³/hr at 120 m (SG 0.601)**
Working pressure : **TBA**
- 5.6 Location : **Aft part of Starboard side manifold platform**
- 5.7 Time to discharge a full liquid cargo using all pumps against back pressure at pump
1 bar : **Abt. 12 hrs**
5 bars : **Abt. 16 hrs**
10 bars : **-----**
- 5.8 Nominal back pressure when working : **TBA**
In series corresponding head : **TBA**
Maximum back pressure : **TBA**
Nominal pressure at rail (propane) : **TBA**
- 5.9 What amount of cargo remains in tanks after completion pumping before stripping:
- liquid : **About 0.164 m3**
- vapour : **TBA**

6. STRIPPING

- 6.1 Stripping system, if any : **Nil**
- 6.2 Time required to remove all traces of liquid cargo as stated in 5.9 for:
- LPG : **TBA**

7. CARGO COMPRESSORS

- 7.1 Type : **Vertical water cooled 1 stage double acting**
Make : **TANABE PNEUMATIC MACHINERY CO., LTD**
How many : **2 sets**
Piston displacement : **460m³/h**
Rated Kw : **75 kW**
Stroke : **177.8 mm**
Max discharge pressure : **20 bar g**
Pressure differential : **4 bar**
Max 7 bar at single action
No of Revolutions : **540 rpm**
- 7.2 Are compressors oil free : **Yes**
- 7.3 Can they reliquefy VCM without risk : **N/A**
- 7.4 State time to bring full cargo of butane to atmospheric pressure from : **N/A**

8. INERT GAS SYSTEM

- 8.1 Does the vessel use inert gas? : **Yes (N2 Generator)**
If so, state utilization and quantities (type) /quantity : **MR – 130M x 1set**
- 8.2 Can the vessel produce inert gas? : **Yes (N2)**
If so, state type and composition of gas produce:
Nitrogen: 97 % to 99.9% **Capacity (discharge) @ 97.00% N2 is 260 Nm3/h**
Capacity (discharge) @ 99.50% N2 is 185 Nm3/h
Capacity (discharge) @ 99.90% N2 is 130 Nm3/h
Oxygen: 1.0 % to 0.05% **N2 purity at flow rate of 260 Nm3/h = 99.06 Vol% or more , 0.94 vol% or less**
Discharge Capacity **N2 purity at flow rate of 185 Nm3/h = 99.820 Vol% or more , 0.180 vol% or less**
N2 purity at flow rate of 130 Nm3/h = 99.975 Vol% or more , 0.025 vol% or less
- 8.3 Maximum production obtainable : **99.975 vol% or more ,0.025 vol% or less**
- NOTE:- Above quantities obtained at engine room temperature 24.5° C
- 8.4 State if there are storage facilities for inert gas onboard: **N/A**
- Size : **N/A**
- Pressure : **N/A**
- 8.5 State if any shore supply of nitrogen may be required: : **N/A**
- for what purpose : **N/A**
- what quantities : **N/A**

9. GAS FREEING

- 9.1 State method used giving all details : **Nitrogen Plant / Fans**
9.2 State time required including stripping : **TBA**

10. CHANGING GRADE

- 10.1 From completion discharge of cargo Propane, time required in hours and inert gas in CBM required to reach a tank and gas installation atmosphere of less than 100 ppm of Propane in Vapour phase.:TBA
- 10.2 Can this operation be carried out at sea? : **Yes**
- 10.3 Can the ship measure the number of ppm in vapour phase? : **Yes**
- 10.4 Has vessel deck tank for changing grade/cooling operations? : **No**
- 10.5 Deck tanks : **NIL**
Capacity :
Purpose :

11. COOLING BEFORE LOADING :

12. CARGO HEATER

- | | | | |
|-------|-----------------------------|---|---------------------------------------|
| 12.1 | Type | : | Horizontal Shell and Tube type |
| 12.2 | Inside Diameter | | 700 mm |
| 12.3 | Overall length | | 6430 mm |
| 12.4 | Cargo flow rate | | 250 m3/h (Propane) |
| 12.5 | Min Inlet Temp | | -48 °C |
| 12.6 | Min Outlet Temp | | 6 °C |
| 12.7 | Required Sea water Capacity | | 450 m3/h (Min 16°C) |
| 12.8 | Design Pressure | | 20 bar g |
| 12.9 | Hydrostatic Test Pressure | | 30 bar g |
| 12.10 | Tightness Test Pressure | | 20 bar g |
- 12.0 State discharging rate for propane to be brought from atmospheric pressure **NA**
Loading rate for Propane –**minus 42° C/(minus10° C: 450 m3/hr in one tank)**

13. CARGO VAPORIZER

In case vapour gas is needed to feed compressors, can vessel produce its own if no shore available:

No

14. REFRIGERATING APPARATUS

NA

- | | | | |
|------|---|---|-----------|
| 14.1 | Is it independent of cargo? | : | NA |
| | Is so, state cooling agents | : | NA |
| 14.2 | What minimum temperature can be maintained | : | NA |
| 14.3 | What time required at sea to lower by 1°C the full cargo of | : | NA |

15. MEASURING APPARATUS

What gauges on board?

- | | | |
|----------|---|--|
| Type | : | Float type level gauge |
| Location | : | Tank 1 & 2 near cargo pump disch valve. |

16. SAMPLES

- 16.1 State how tank atmosphere samples can be taken and where from?
Sample points at tank bottom, mid and top

Standard of fitting? : **JIS PT1/2 thread**

- | | | | |
|------|--|---|------------|
| 16.2 | Same question for cargo | : | TBA |
| 16.3 | Are sample bottles available on board? | : | No |

17. CARGO LINES

- | | | | |
|------|--|---|-----------------------------------|
| 17.1 | Is ship fitted with a port and starboard cargo manifold? | : | Yes |
| 17.2 | Position of cargo manifold | | |
| | - distance from stern (AP) (S / P) | : | 53.23 M |
| | - distance form stem (FP) (S / P) | : | 46.69 M |
| | - height above deck | : | 1.50 m for Liquid manifold |
| | - distance from ship's rail | : | 2.80 M |
| | - underside keel to manifold | : | 8.50 M |

17.3 Liquid line

- flange-size : 8 in.
 - type : 8" ANSI 300LB

Gas line

- flange-size : 5 in.
 - type : 5" ANSI 300LB

17.4 What reducers on board? : (NK) STEEL

For Liquid line (low temp - 48 C TO +45 C)

Ship Side	Terminal side	(L mm)	Wt (kg/l.)	Qty
200 A(8B) X ANSI 300 lbs	+ 250A(10B)x ANSI300 lbs	250105	1	
200 A(8B) X ANSI 300 lbs	+ 150A(6B) x ANSI300 lbs	250	66	1
200 A(8B) X ANSI 300 lbs	+ 125A(5B) x ANSI300 lbs	250	59	1
200 A(8B) X ANSI 300 lbs	+ 100A(4B) x ANSI300 lbs	250	53	1
200 A(8B) X ANSI 300 lbs	+ 80A(3B) x ANSI300 lbs	250	48	1
200 A(8B) X ANSI 300 lbs	+ 200A(8B) x ANSI300 lbs	250	63	1
200 A(8B) X ANSI 300 lbs	+ 150A(6B) x ANSI300 lbs	250	53	1
200 A(8B) X ANSI 300 lbs	+ 100A(4B) x ANSI300 lbs	250	4	1
200 A(8B) X ANSI 300 lbs	+ 200A(8B) x JIS 20K	250	65	1
200 A(8B) X ANSI 300 lbs	+ 150A(6B) x JIS 20K	250	60	1
200 A(8B) X ANSI 300 lbs	+ 100A(4B) x JIS 20K	250	48	1
Total	11			

For Vapor line (normal temp. - 10 C to + 45 C)

For Liquid line (low temp - 48 C TO +45 C)

Ship Side	Terminal side	(L mm)	Wt (kg/l.)	Qty
125 A(5B) X ANSI 300 lbs	+ 100A(4B) x ANSI300 lb	250	31	1
125 A(5B) X ANSI 300 lbs	+ 80A(3B) x ANSI300 lb	250	26	1
125 A(5B) X ANSI 300 lbs	+ 50A(2B) x ANSI300 lb	250	22	1
125 A(5B) X ANSI 300 lbs	+ 150A(6B) x ANSI150 lb	250	27	1
125 A(5B) X ANSI 300 lbs	+ 125A(5B) x ANSI150 lb	250	26	1
125 A(5B) X ANSI 300 lbs	+ 80A(3B) x ANSI150 lb	250	23	1
125 A(5B) X ANSI 300 lbs	+ 50A(2B) x ANSI150 lb	250	22	1
125 A(5B) X ANSI 300 lbs	+ 125A(5B) x JIS 20K250	26	1	
125 A(5B) X ANSI 300 lbs	+ 100A(4B) x JIS20K250	24	1	
Total	9			

Total reducers 20 pcs.

Cover Flange for shore connection

Ship Side	Size	Wt (kg/l.)	Qty
200 A(8B) X ANSI 300 lbs	LIQUID T 41.5mm x D 381 mm	37 /1P	2
125 A(5B) X ANSI 300 lbs	VAPOR T 35.5mm x D 270 mm	17 /1P	4

For VCS /VCS (-10 C to +45 C)

Ship Side	Terminal side	(L mm)	Wt (kg/l.)	Qty
125 A(5B) X ANSI 300 lbs	+ 150A (6B) X ANSI 150lb	200	28	1
125 A(5B) X ANSI 300 lbs	+ 100A (4B) X ANSI 150lb	200	24	1

17.5 Is ship fitted with stern discharge? **No**
- Liquid line - diameter : **N/A**
- flange – size : **N/A**
- type : **N/A**

18. HOSES

Are serviceable hoses available on board? : **None**

18.1 Two pieces, each :
Length :
Diameter :
Flange-size :
Type :
Bending radius :

18.2 Minimum temperature acceptable :
Maximum pressure acceptable :

18.3 For what products are hoses suitable? :

19. DERRICKS

- Hose cranes : **1 set**
- Where situated : **Frame 72**
- Lifting capacity : **4.0 tons @ 0.167m/sec**
- Working radius : **16.0m**

20. SPECIAL FACILITIES

20.1 How many grades can be segregated? : **Single Grade**

20.2 How many cooled? : **N/A**

20.3 Can vessel sail with slack cargo tanks? : **Yes**