

VESSEL PARTICULARS (FORM C)

LPG/C ECO UNIVERSE

(last updated 23/10/2018)

Specifications of the vessel and the gas installation which are representations by the Owners.

(A) VESSEL'S CHARACTERISTICS

PREAMBLE

Name : **ECO UNIVERSE**
 Owner : **BASRAH FINANCE INC.**
 Flag : **MARSHALL ISLANDS**
 Build : **MURAKAMI HIDE SHIPBUILDING CO LTD**
 Date on Service : **Delivery Scheduled on 19th June, 2015**
 Class : **Class LR**

GRT International : **4,258** Suez : **4932.35**
 Panama : **3637**

NRT International : **1,376** Suez : **4054.65**
 Panama : **3637**

Is vessel build according to USCG regulations? : **Yes.**
33 CFR Part 155, 156, 159 & 164
46 CFR Part 153
46 CFR Part 154 (COC) except Alaska
 RINA regulations? : **IMO COMPLIANCE**
 Japanese regulation? :

Has vessel received USCG approval? : **USCG Certificate to be obtained at the 1st call of US port**
 RINA approval? : **CLASS NK APPROVAL**

HULL

LOA : **99.98 M**
 LBP : **93.50 M**
 Breadth : **17.50 M (Moulded)**
 Depth : **7.80 M (Moulded)**
 Summer Draft : **6.163 M (Moulded) (LPG98%) (VCM76%)**

Air draft at full load conditon : **26.90 M (est)**

Air draft at ballast load conditon : **29.14 M (est)**

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	4.35	6.13	5.24	3506.52
VCM	5.39	6.89	6.14	4752.58
Isoprene	5.50	6.80	6.15	4752.58
i-Butane	4.62	6.33	5.47	3820.23

Propeller immersion :

Propane	Aft draft	At	6.13 m correspond.	:	109.30 %
VCM	Aft draft	At	6.89 m correspond.	:	130.70 %
Isoprene	Aft draft	At	6.80 m correspond.	:	128.17 %
i-butane	Aft draft	At	6.33 m correspond.	:	114.93 %

COMMUNICATION EQUIPMENT

Call letter	:	VLK92
Radio Station normally watched	:	VHF 16
Radio MF/HF NBDP	:	538006288
Radio MF/HF TEL/DSC	:	MMSI - 538006288
VHF	:	16/70
Satellite Communication	Inmarsat 'C'	: 453841528
	Inmarsat 'F'	: +870 773132397
	:	

MACHINERY

Main Engine x 1	.	Type and make	:	HITACHI – MAN B&W, 5L35MC6.1
	.	Service power	:	3,250kW x 210 min-1 (MCR)
		No of Cylinders		5 Cylinders
		Cyl Bore x Stroke		350φ x 1,050
	.	Grade of fuel used	:	I.F.O. (380 mm²/s @ 50 deg. C)
Auxiliaries		Type and make (Electrical)		TAIYO, AC450V x 3φ x 60Hz 360kW x 1,200min-1
		(Mechanical)		YANMAR, 6NY16L-SW
		Grade of fuel used		M.D.O. (Maximum 14 mm²/s @ 50 deg. C)
		No off		2 sets
Emergency Gen		Type		MITSUI ZOSEN MACHINERY, F5L912, MDG-50E
		No off		1 set
Boiler		Type		MIURA, VWH-600E
		Evaporation		538 kg/h (Actual Evaporation)
		Max Design Pressure		0.7 MPa
		Feed Water Temp		60 deg.
		No off		1 set
Exhaust Economiser		Type		MIURA, KF-101F
		Evaporation		438 kg/h (at M/E 90% load)
		No off		1 set
Air Compressors (Main)		Type / Capacity		J.P. SAUER & SOHN, WP45L
		No off		2 sets
Air Compressors (Emergency)		Type		J.P. SAUER & SOHN, WP15L

	No off	1 set
Fuel Oil Purifier	Type	ALFA LAVAL, PA615
	No off	2 sets
	Capacity	900 ltr/h (at 380 cst 50 deg. C)
Lub Oil Purifier	Type	ALFA LAVAL, PA615
	No off	1 set
	Capacity	1,100 ltr/h (at 150 cst 40 deg. C)
Evaporator	Type	ALFA LAVAL, JWP-16-C50
	Capacity	8 ton/day
Fresh Water Sterilizer	Type	NIPPON CONTROLS, L-N201F
	Capacity	2.0 M3/h
Fresh Water Mineraliser	Type / Capacity	N/A
Waste Oil Incinerator	Type	MIURA, BGW-20N
	Capacity	301 kW (Max. Capacity)
Oily Water Separator	Type	HEISHIN, HFM-200
	Capacity	2 M3/h
Sewage Treatment plant	Type	TAIKO, SBH-25
	Capacity	For 25P (Discharge Pump 4M3 x 0.2)
Hot Water Set (Calorifier unit)	No off	1 set
Steering Gear	Type	RV21-017
	Duty Capacity	170 kN.M
	Hydraulic pump unit	LVPO17-210ROL

Speed

In Moderate weather:

About: 13.50 Knots @ CSR with 15% sea margin at VCM Loaded condition

CONSUMPTION/ DAY

Main Engine	HFO	12.8 ton/day at Normal Sea-going (85%, HSFO 380cst)
Aux. Engine	DO	1.00 ton/day at Normal Sea-going (MGO)
In Port Disch.	DO	2.00 ton/day
In Port Idle/Disch.	DO	1.00 ton/day

Use DO 2.00 ton/day
Nitrogen

Permanent bunker
capacity (100%)

HFO	: 144.30	m ³ (est)
Diesel	: 438.42	m ³ (est)
Fresh Water	: 148.32	m ³ (est)

(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	Abt. 2,500	Abt. 2450		
NO.2 CARGO TANK	Abt. 2,500	Abt. 2450		
T O T A L	Abt. 5,000	Abt. 4,900		
	SPSV (bar g)	Ref. Temp. (deg. C.)	Density at (Ref. Temp.)	Corresponding Quantity (MT) at 98%
Propylene	17.65	45.0	0.4655	2297.414
Propane	17.65	45.0	0.4604	2267.372
B/P Mixture Basis C3/30% + C4/70%	17.65	45.0	0.5578	2747.047
n-Butane	17.65	45.0	0.5480	2698.784
i-Butane	17.65	45.0	0.5260	2590.439
Butadiene	17.65	45.0	0.5901	2906.117
Butylene	17.65	45.0	0.5650	2782.505
V.C.M. (75% D 0.914) Due to Summer Draft	17.65	45.0	0,9140	3444.839
Isoprene	17.65	45.0	0.6560	3290.661
Pentanes	17.65	45.0	0.6000	2954.873
Pentene	17.65	45.0	0.6110	3009.046

Note (1)

Mixing ratio of above mentioned B/P mixtures is as follows:

Butane 35 wt% and propane 65 wt%

Note (2): MAX VCM CAN LOAD 3444.839 MT TO MEET THE SUMMER DRAFT.

3. TANKS

- | | | | |
|-----|--------------------------------|---|-----------------------------------------------|
| 3.1 | Design pressure (Vapour) - IGC | : | 17.7 bar (G) for IGC-Code |
| | - USCG | : | 12.7 bar (G) for U.S.C.G. |
| 3.2 | Valve setting | : | High: 17.7 bar (G) IMO, Low: 12.7 bar (G)USCG |
| 3.3 | Maximum vacuum obtainable | : | 0.0 bar (G) |
| 3.5 | Maximum temperature acceptable | : | +45 deg. C |
| 3.6 | Minimum temperature acceptable | : | - 10 deg. C |
| 3.7 | Hydrostatic Test Pressure | : | 36 bar (G) |

4. LOADING RATE (TONS/HOUR) – For Full Cargo Parcels

Ex-atmospheric storage with gas : 1 tank : about 450 m³ per hour
Return : 2 tanks : about 790 m³ per hour

Remarks:

5. CARGO PUMPS

- 5.1 Type : **Wartsila Svanehoj A/S**
Make : **Deep Well Pump, Vertical Centrifugal Multistage**
How many : **2 sets**
Maximum specific gravity : **0.965**
- 5.2 Capacity (CMB/Hour) : **300 m³/h at 110m TH / 250m³/h at 120m TH**
Two speed or variable speed : **Two speed**
Rated kW (each) : **130 kW at 1800 min⁻¹**
Working pressure maximum : **17.65 bar G**
- 5.3 Location : **On top of each Cargo Tank**
Removable : **Permanent Type**
- 5.4 Booster pumps : **Yes (1 set)**
Type : **Horizontal**
Maker : **Wartsila Svanehoj A/S**
- 5.5 Capacity (CMB/Hour) : **300 m³/h**
Working pressure : **17.65 bar G**
- 5.6 Location : **On upper deck, above stbd manifold**
- 5.7 Time to discharge a full liquid cargo using all pumps against back pressure at pump
1 bar : **LPG- 18 hrs approx**
5 bars : **LPG- 24 hrs approx**
10 bars : **LPG- 48 hrs approx**
- 5.8 Nominal back pressure when working : **1.0 bar approx**
In series corresponding head : **N/A**
Maximum back pressure : **13.0 Bars approx**
Nominal pressure at rail (propane) : **13.0 Bars @ 20degC Cargo Temp.**
- 5.9 What amount of cargo remains in tanks after completion pumping before stripping:
- liquid : **1.0 m3 per cargo tank**
- vapour : **15.0 mt per cargo tank**

NOTE: To reduce pressure by 1 bar/tank:- 3.8 hrs.

6. STRIPPING

- 6.1 Stripping system, if any : **N/A**
- 6.2 Time required to remove all traces of liquid cargo as stated in 5.9 for: **Liquid Free approx 2 hrs**
- LPG :

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 : **About 460 m³/h**
 Rated Kw : **75kw**
 Stroke : **177.8 mm**
 Max discharge pressure : **20 bar g**
 Pressure differential : **4 bar Maximum 7 bar at single action**
- No of Revolutions : **540 min⁻¹**
- 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.**
 If so, state utilization and quantities :
- 8.2 Can the vessel produce inert gas? : **Yes.**
 If so, state type and composition of gas produce:
Nitrogen: 97.0 % to 99.9%
- | | |
|--------------|-------------------------|
| 97.0% | : Abt. 250 NM3/h |
| 98.0% | : Abt. 240 NM3/h |
| 99.0% | : Abt. 210 NM3/h |
| 99.5% | : Abt. 185 NM3/h |
| 99.9% | : Abt. 130 NM3/h |
- Discharge Capacity : **Abt. 185 NM3/h at N2 Purify 99.5%**
- 8.3 Maximum production obtainable
 NOTE:- Above quantities obtained at engine room temperature 45° C
- 8.4 State if there are storage facilities for inert gas onboard:
 - Size : **1.5M3**
 - Pressure : **10 Bar**
- 8.5 State if any shore supply of nitrogen may be required: :
 - for what purpose : Shore supply of nitrogen is required in order to reduce oxygen contents in cargo tanks less than 0.5% by volume or to save time for inerting.
 - what quantities : It depends on the requirement of oxygen contents of cargo tanks and time required.

9. GAS FREEING

- 9.1 State method used giving all details : **1. Discharge remaining cargo in cargo tanks as much as possible.**
2. Purge remaining cargo in cargo tanks with inert gas produced by nitrogen generator on board the vessel.
3. After the atmosphere inside cargo tanks being reached the area well lower than critical dilution line, purge the atmosphere inside cargo tanks with open air by using portable fan or cargo compressors or nitrogen generator (air mode)
- 9.2 State time required including stripping : **Abt. 3 days (remain 0.2 vol%)**

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.

Time required:

- 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? : **N/A**
- 10.5 Deck tanks :
Capacity :
Purpose :

11. COOLING BEFORE LOADING : No cooling plant on board the vessel.

12. CARGO HEATER

- 12.1 Type : **Shell and Tube**
- 12.2 Inside Diameter : **700 mm**
- 12.3 Overall length : **5800 mm**
- 12.4 Cargo flow rate : **300 m³/h**
- 12.5 Min Inlet Temp : **-48 °C**
- 12.6 Min Outlet Temp : **-10 °C**
- 12.7 Required Sea water Capacity : **500 m³/h (min.18 °C)**
- 12.8 Design Pressure : **20 bar G (2.0 MPa g)**
- 12.9 Hydrostatic Test Pressure : **30 bar G (3.0 MPa g)**
- 12.10 Tightness Test Pressure : **20 bar G (2.0 MPa g)**

12.0 State discharging rate for propane to be brought from atmospheric pressure

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

14.1 Is it independent of cargo? : **N/A**

Is so, state cooling agents :

14.2 What minimum temperature can be maintained : **N/A**

14.3 What time required at sea to lower by 1°C the full cargo of : **N/A**

15. MEASURING APPARATUS

What gauges on board? **Float type level gauges (Local & Remote reading)**
Type : **MUSASINO, LMC-VA**
Location : **1 set for each tank**

16. SAMPLES

16.1 State how tank atmosphere samples can be taken and where from?
Cargo samples for vapour and liquid can be taken from the following positions;

- 1. Fixed sampling connection at tank domes**
- 2. Through drain connection of cargo manifold**
- 3. Close loop sampling system is equipped**
- 4. Through pressure gauge tube connection of tank top**

Standard of fitting? :

16.2 Same question for cargo : **Same as above**

16.3 Are sample bottles available on board? :

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)	:	53.24	M
- distance from stem (FP)	:	46.74	M
- height above deck	:	1.40	m for Liquid manifold
- distance from ship's rail	:	2.60	M
- underside keel to manifold	:	9.20	M

17.3 Liquid line

- flange-size	:	8 inches
- type	:	ANSI 300 LB

Gas line

- flange-size	:	5 inches
- type	:	ANSI 300 LB

17.4 What reducers on board? :

For Liquid line (low temperature)

ANSI#300-200A * ANSI#300-250A – 1 set
ANSI#300-200A * ANSI#300-150A – 1 set
ANSI#300-200A * ANSI#300-125A – 1 set
ANSI#300-200A * ANSI#300-100A – 1 set
ANSI#300-200A * ANSI#300-80A – 1 set

For Vapor line (normal temp.)

ANSI#300-125A * ANSI#300-150A – 1 set
 ANSI#300-125A * ANSI#300-100A – 1 set
 ANSI#300-125A * ANSI#300-80A – 1 set
 ANSI#300-125A * ANSI#300-50A – 1 set
 ANSI#300-125A * ANSI#150-150A – 1 set
 ANSI#300-125A * ANSI#150-125A – 1 set
 ANSI#300-125A * ANSI#150-100A – 1 set
 ANSI#300-125A * ANSI#150-80A – 1 set
 ANSI#300-125A * ANSI#150-50A – 1 set

Blind Flange for Manifold

ANSI#300-200A – 2 sets
 ANSI#300-125A – 4 sets

17.5 Is ship fitted with stern discharge? **N/A**
 - Liquid line - diameter :
 - flange – size :
 - type :

18. HOSES

Are serviceable hoses available on board? : **No Cargo Hoses are Onboard**

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 : **Yes.**
 - Where situated : **Midship**
 - Lifting capacity : **5.0 t**
 - Working radius : **13.0 m/R**

20. SPECIAL FACILITIES

20.1 How many grades can be segregated? : **No segregation**
 20.2 How many cooled? : **No cooling plant**
 20.3 Can vessel sail with slack cargo tanks? : **No. (Depends on stability calculation)**