BWMS MARTECMA workshop

BWMS Operational Experience Survey Results

Date: 25 May 2017

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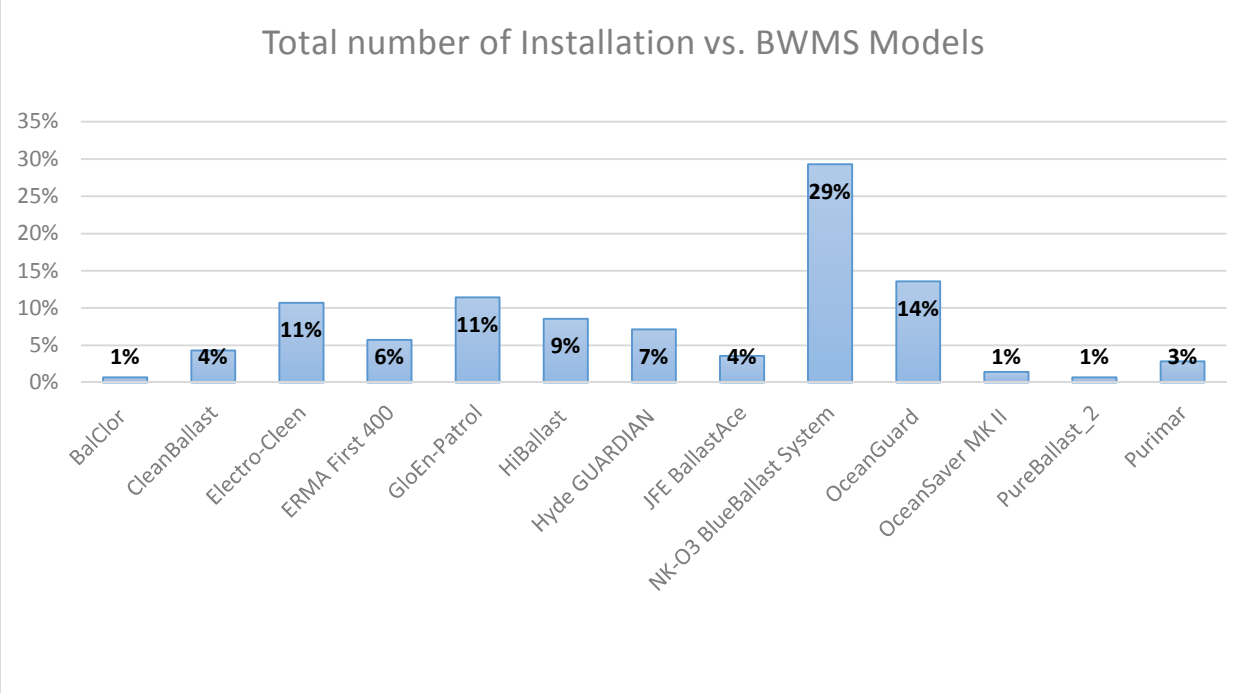
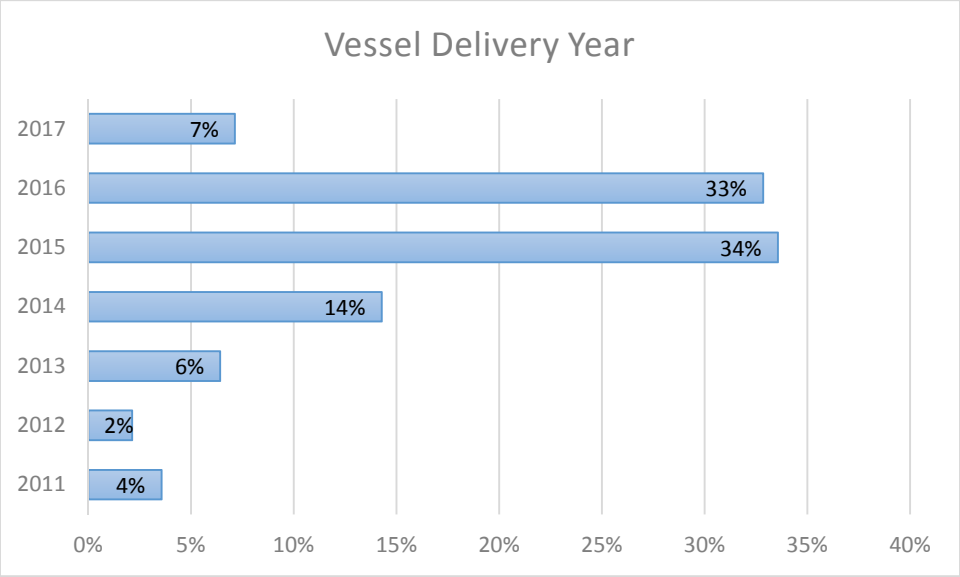
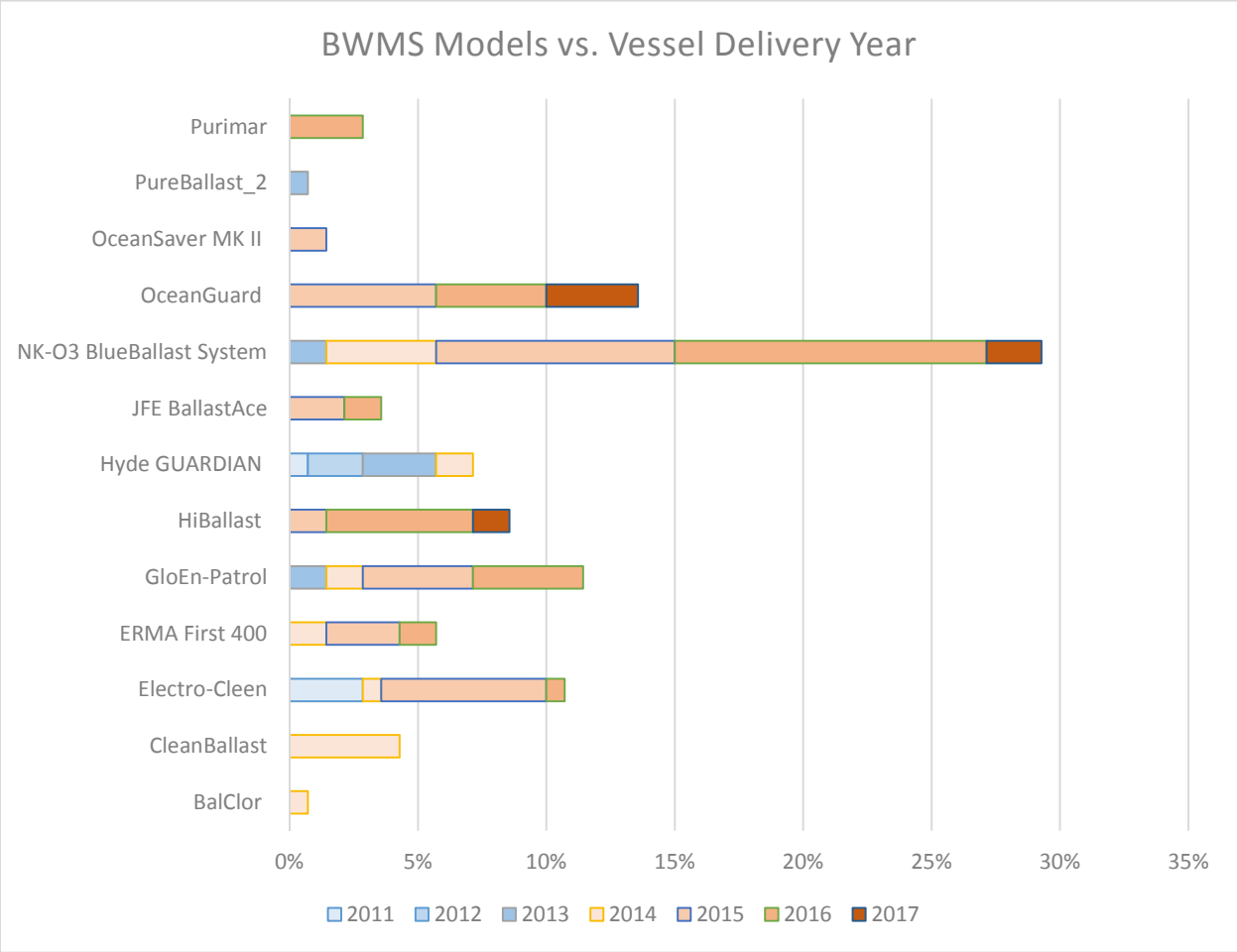
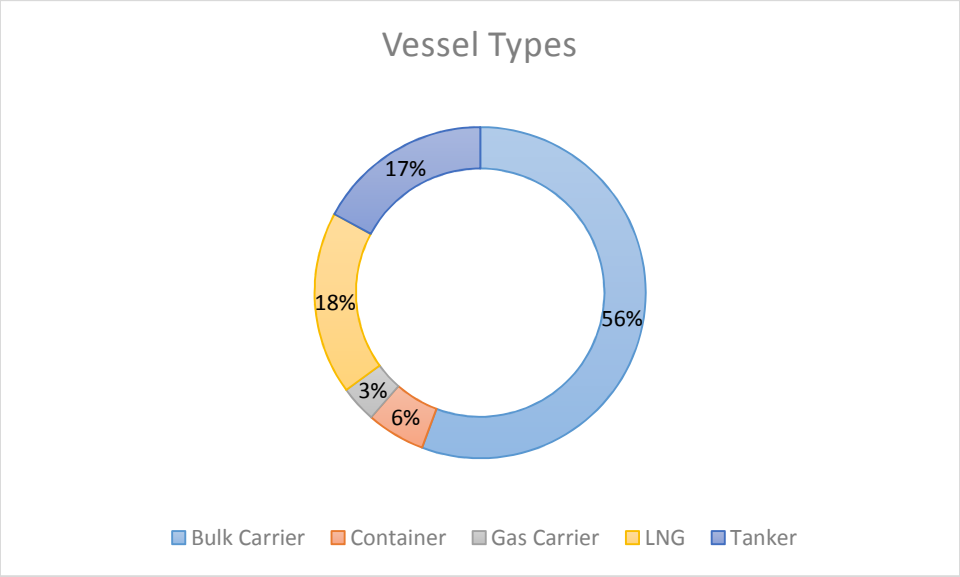
1 BWMS Operational Experience Survey Results – By Maker Models

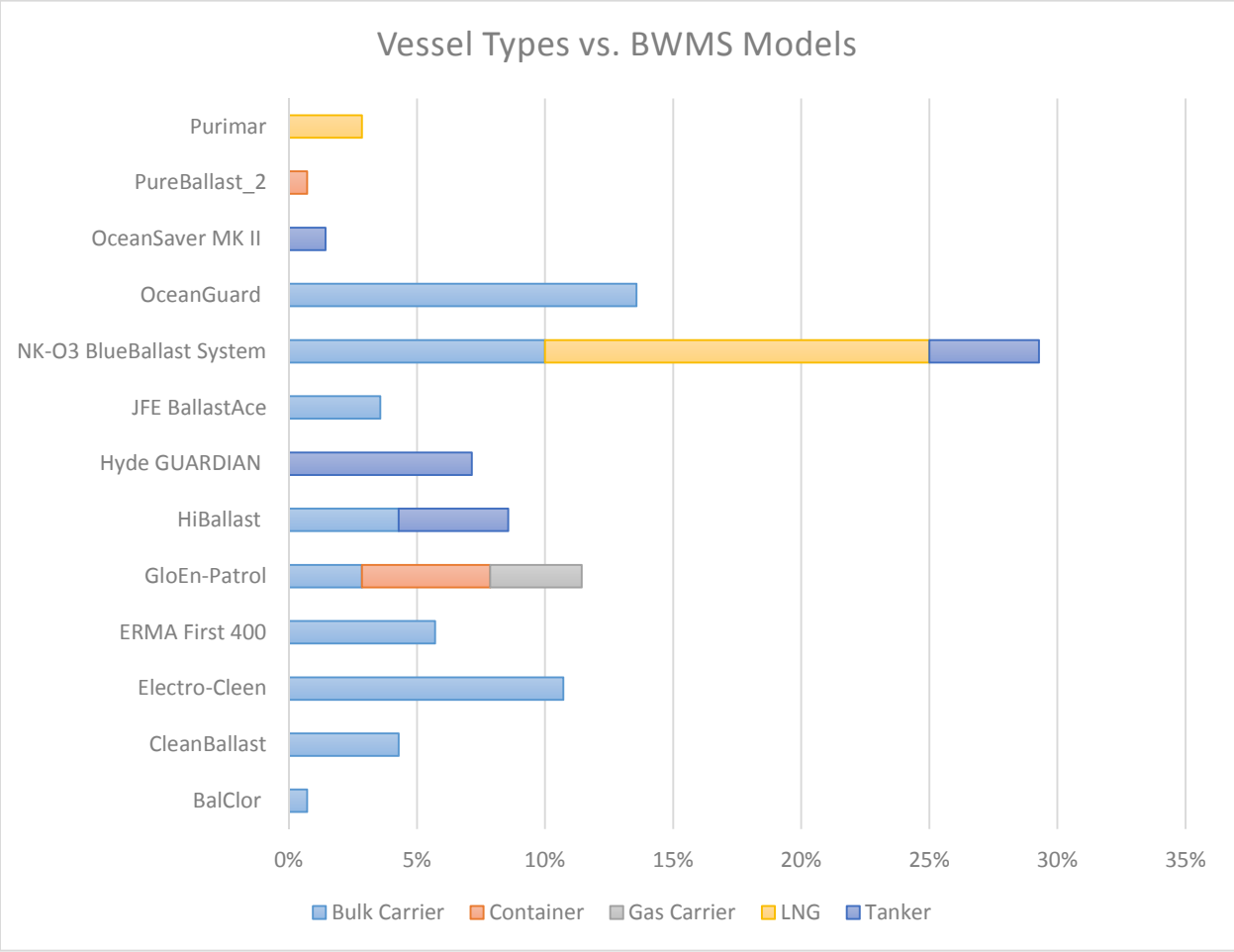
Through the BWMS Operational Experience Surveys, we have received 140 surveys from 19 Vessel owners. From the given information, the results were aggregated according to the thirteen maker models. All data has been anonymized and presented as percentages.

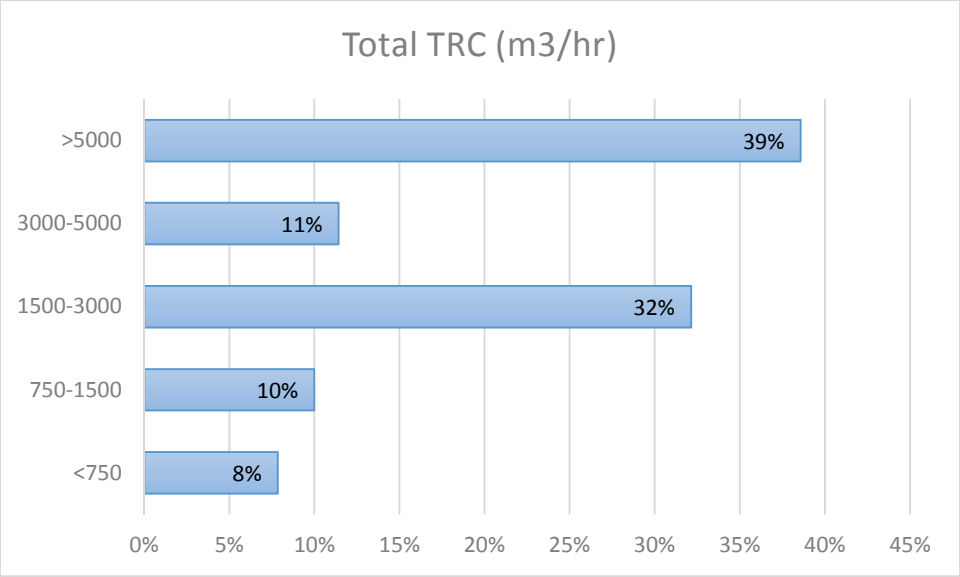


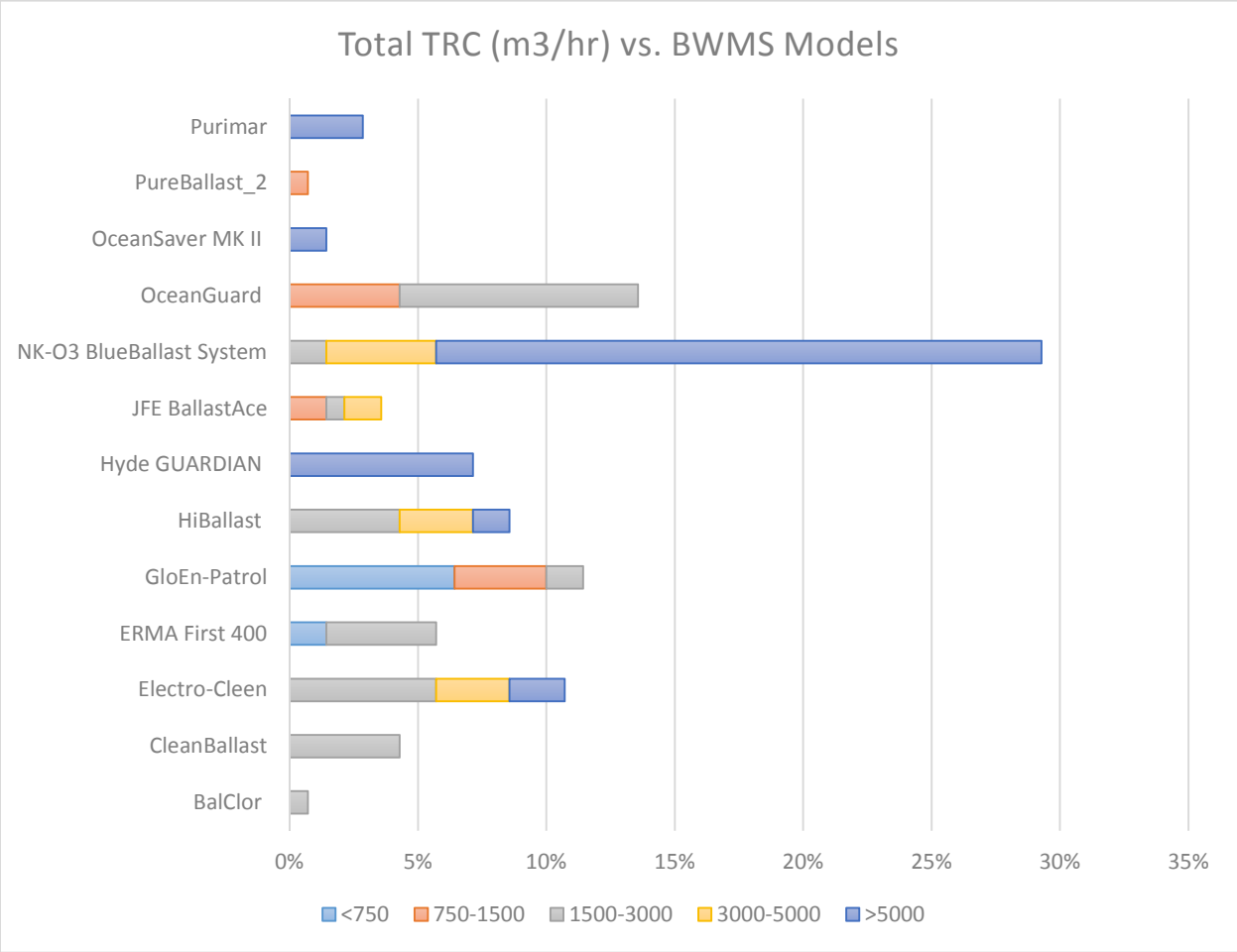

Vessel Delivery Year
2017
2016
2015
2014
2013
2012
2011
7%
33%
34%
14%
6%
2%
4%
0%
5%
10%
15%
20%
25%
30%
35%
40%

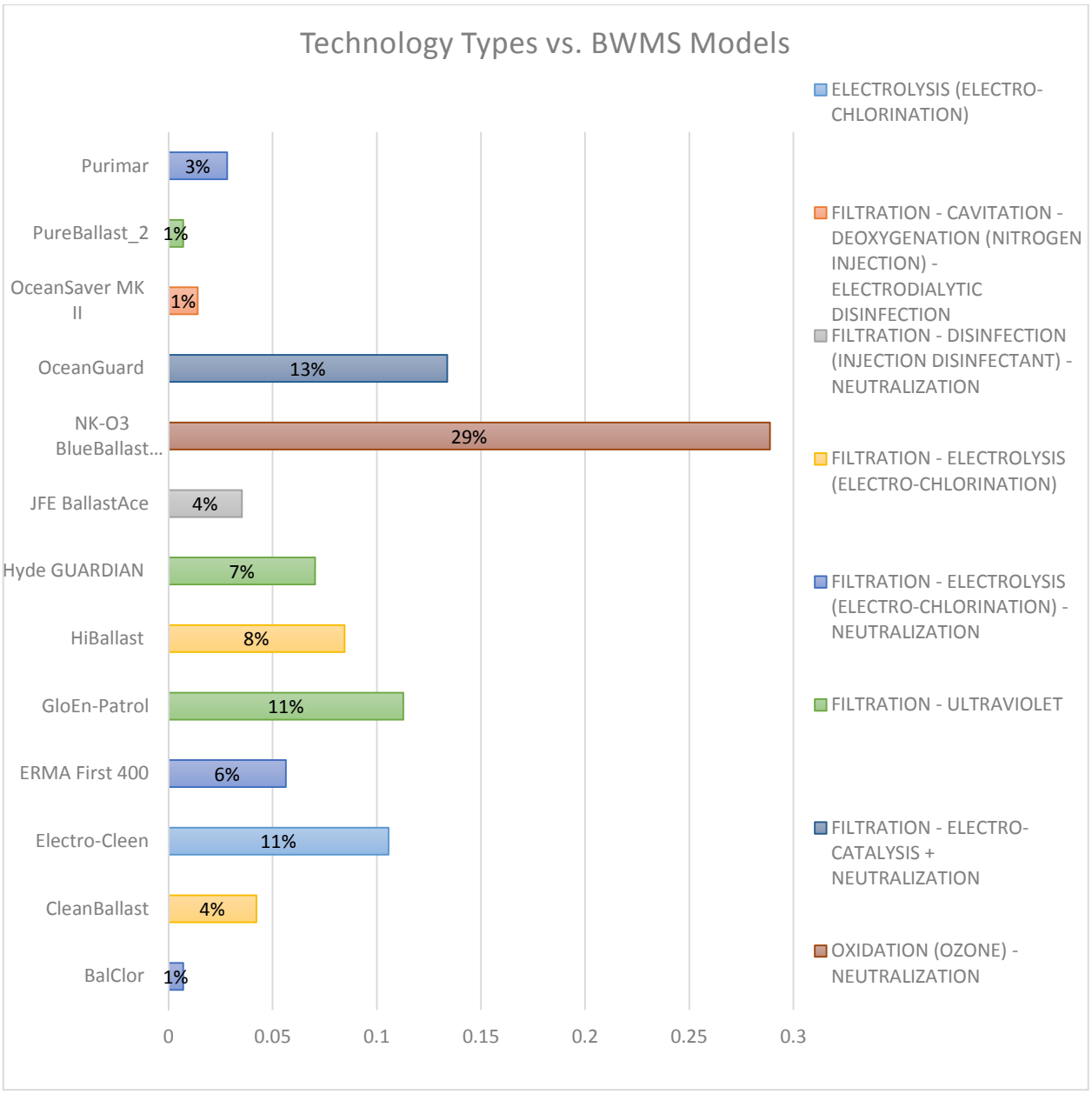

BWMS Models vs. Vessel Delivery Year
Purimar
PureBallast_2
OceanSaver MK II
OceanGuard
NK-O3 BlueBallast System
JFE BallastAce
Hyde GUARDIAN
HiBallast
GloEn-Patrol
ERMA First 400
Electro-Cleen
CleanBallast
BalClor
0%
5%
10%
15%
20%
25%
30%
35%
2011
2012
2013
2014
2015
2016
2017

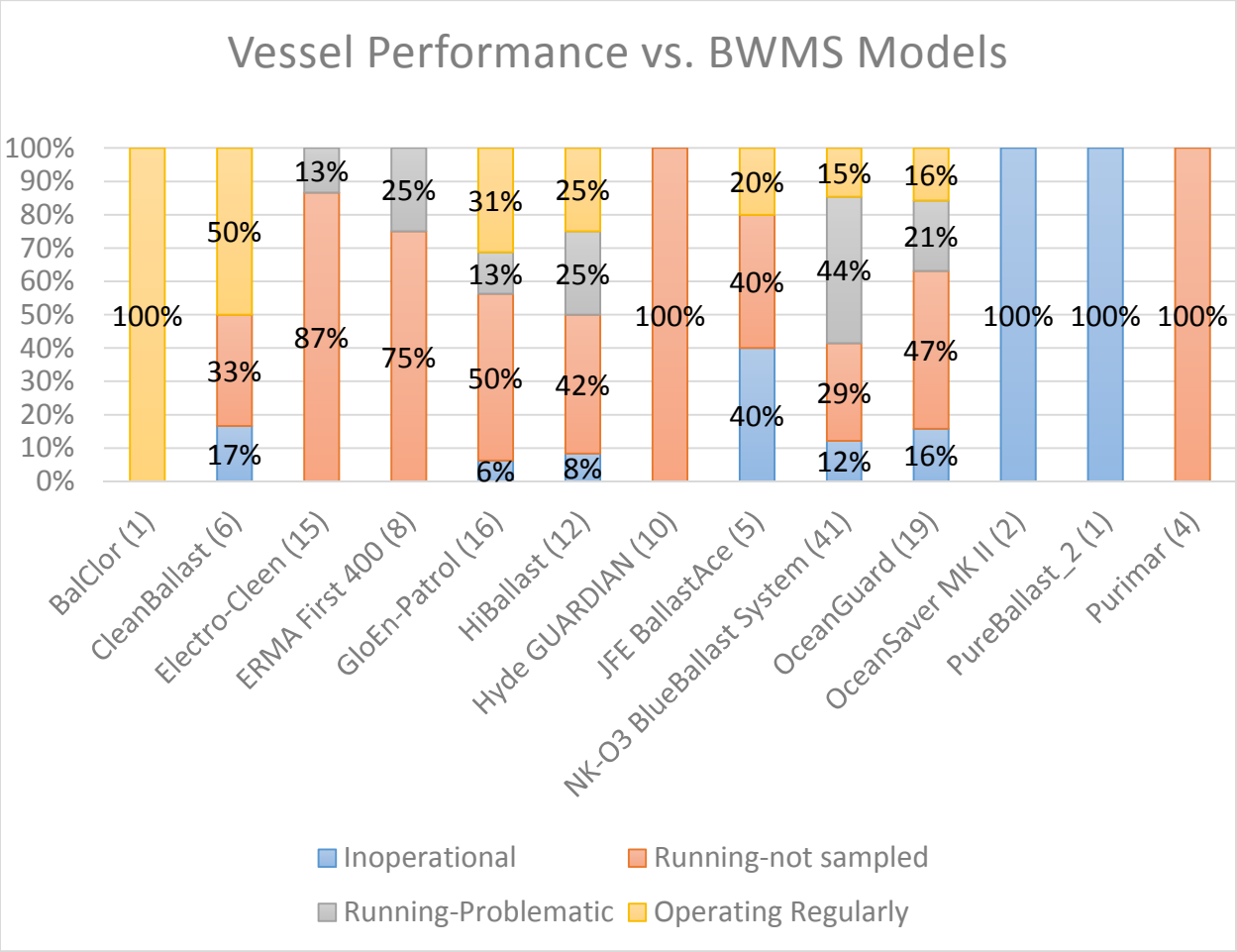

Vessel Types
17%
18%
56%
3%
6%
Bulk Carrier
Container
Gas Carrier
LNG
Tanker


Vessel Types vs. BWMS Models
Purimar
PureBallast_2
OceanSaver MK II
OceanGuard
NK-O3 BlueBallast System
JFE BallastAce
Hyde GUARDIAN
HiBallast
GloEn-Patrol
ERMA First 400
Electro-Cleen
CleanBallast
BalClor
0%
5%
10%
15%
20%
25%
30%
35%
Bulk Carrier
Container
Gas Carrier
LNG
Tanker


Total TRC (m3/hr)
>5000
3000-5000
1500-3000
750-1500
<750
39%
11%
32%
10%
8%
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%

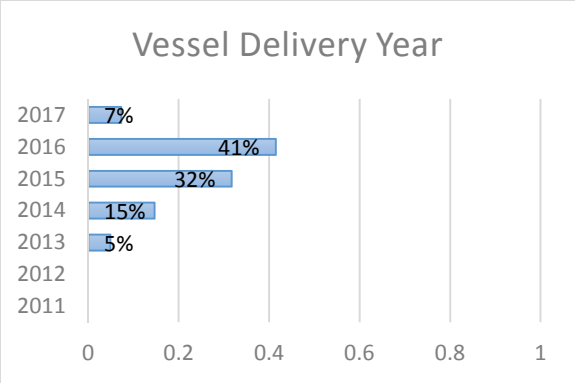

Total TRC (m3/hr) vs. BWMS Models
Purimar
PureBallast_2
OceanSaver MK II
OceanGuard
NK-O3 BlueBallast System
JFE BallastAce
Hyde GUARDIAN
HiBallast
GloEn-Patrol
ERMA First 400
Electro-Cleen
CleanBallast
BalClor
0%
5%
10%
15%
20%
25%
30%
35%
<750
750-1500
1500-3000
3000-5000
>5000

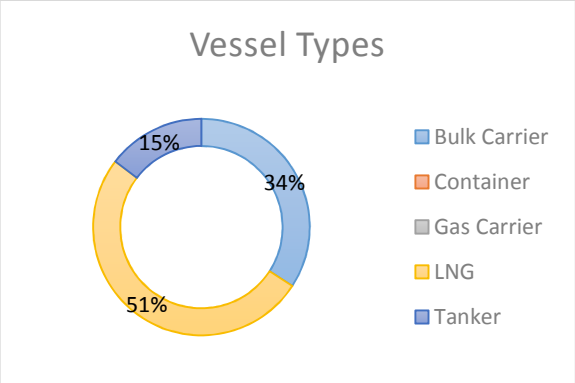

Technology Types vs. BWMS Models
Purimar
PureBallast_2
OceanSaver MK II
OceanGuard
NK-O3 BlueBallast...
JFE BallastAce
Hyde GUARDIAN
HiBallast
GloEn-Patrol
ERMA First 400
Electro-Cleen
CleanBallast
BalClor
3%
1%
1%
13%
29%
4%
7%
8%
11%
6%
11%
4%
1%
0
0.05
0.1
0.15
0.2
0.25
0.3
ELECTROLYSIS (ELECTRO-CHLORINATION)
FILTRATION - CAVITATION - DEOXYGENATION (NITROGEN INJECTION) - ELECTRODIALYTIC DISINFECTION
FILTRATION - DISINFECTION (INJECTION DISINFECTANT) - NEUTRALIZATION
FILTRATION - ELECTROLYSIS (ELECTRO-CHLORINATION)
FILTRATION - ELECTROLYSIS (ELECTRO-CHLORINATION) - NEUTRALIZATION
FILTRATION - ULTRAVIOLET
FILTRATION - ELECTRO-CATALYSIS + NEUTRALIZATION
OXIDATION (OZONE) - NEUTRALIZATION

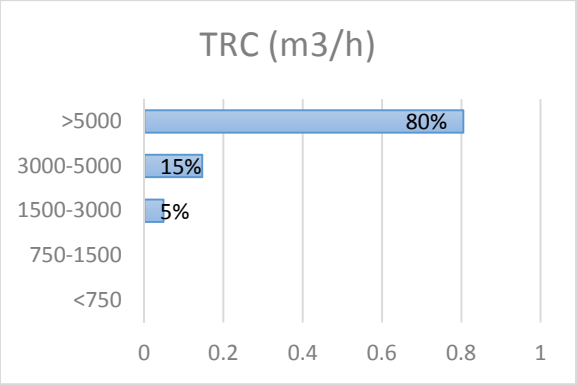


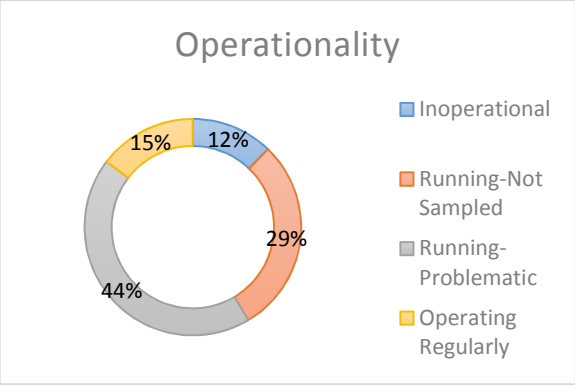
1.1 OXIDATION (OZONE) – NEUTRALIZATION

1.1.1 NK-O3 BLUEBALLAST SYSTEM (41)









Hardware Failure

- Defective parts: ozone detector, ozone generator, oxygen sensors, oxygen detector, TRO analyzer, TRO display, TRO sensors, TRO condition indicators, injection pump, valves, sampling pumps, sampling system, drain pump, chiller, air dryer, mixing thermostatic valve, side stream valve actuator
- After-peak tank line circulating (#3 Pump) local control defective
- Low oxygen pressure and high dew point
- System couldn't operate in high ambient temperature in the steering gear room and producing high temperature alarm
- Coupling between actuator and valve failed-Pressure switch of Chiller malfunctioning and 3-way valve leaking
- Neutralizer valve stuck with product inside
- Ballast water flow meter that controls the ozone injection failed and the ozone injection control is now on manual mode
- Oxygen and ozone sensors calibration failed
- Braker trips do not allow system starts
- Dew Point setting cannot be reached to start operation

Software Failure

- Inaccurate output of log files (csv files)
- Ozone and oxygen detectors tripping
- During ballasting system thinks as deballasting therefore activates TRO sampling pump
- Heavy water hammering during startup of BWTS due to absence of delay between starting of the recirculation pumps and opening of the recirculation outlet valve
- During Ballasting Auto-start mode could not perform Initial leakage test
- PLC failure in BWTS Room therefore fail to produce O3 in auto mode
- Auto sequence in de-ballasting mode is not operational
- Ballasting operation sequence not working
- System in de-ballasting mode failed to read that ballast pump was running
- Sequence problems do not allow starting of BWTS
- Injection pump signal is not available
- Wrong settings on HMI, alarms are set for a different model

Human error

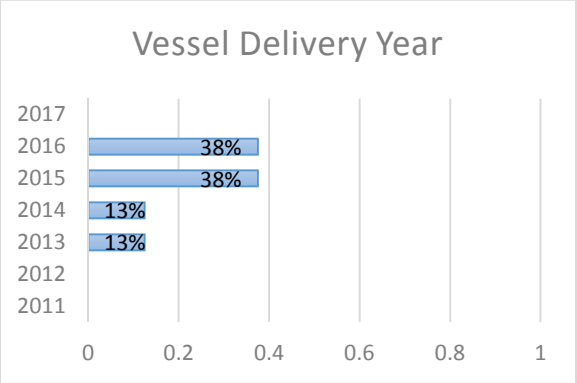
- Nil

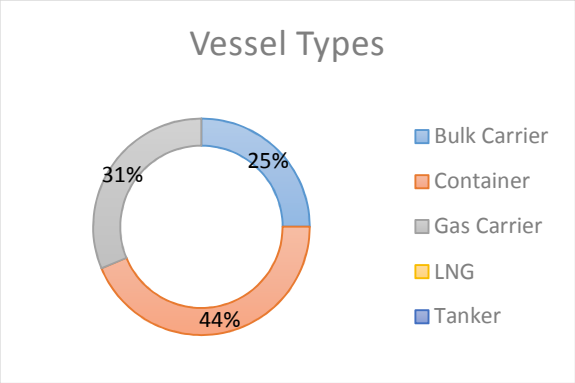
Other issues

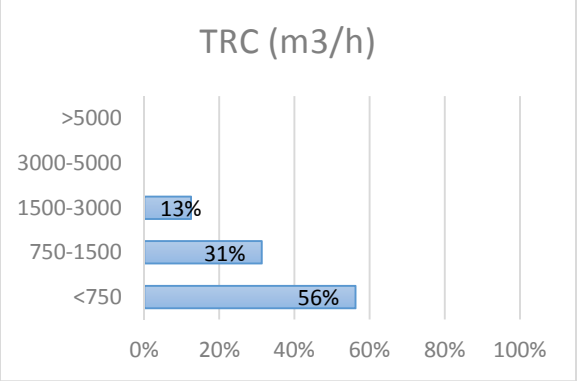
- Software updates
- Reagent limited lifetime, and constant usage
- Limited supply network
- Manual not vessel specific, troubleshooting procedures are very scant and requires service engineer
- Maker has difficulty to provide services and replacements
- Chemical agent for TRO analyzers is constantly required

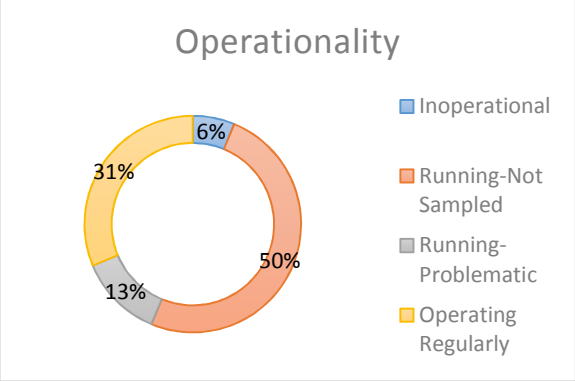
1.2 FILTRATION – ULTRAVIOLET

1.2.1 GLOEN-PATROL (16)









Hardware Failure

- Flow meter cartridge (LCD fail)
- Frequent burning of UV lamps
- Back-flush filter pressure switch broken
- UV intensity meter sensor failure
- Frequent cleaning of UV lamps required
- Wrong operation of valves, especially “manually operated valves”
- Some minor components (plastic switches etc.) defective

Software Failure

- GPS Communication Failure
- Upgrades

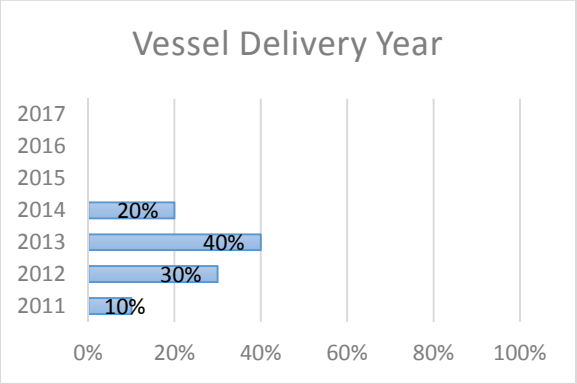
Human error

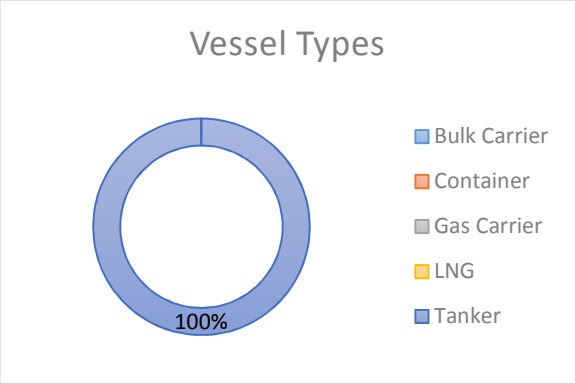
- Nil

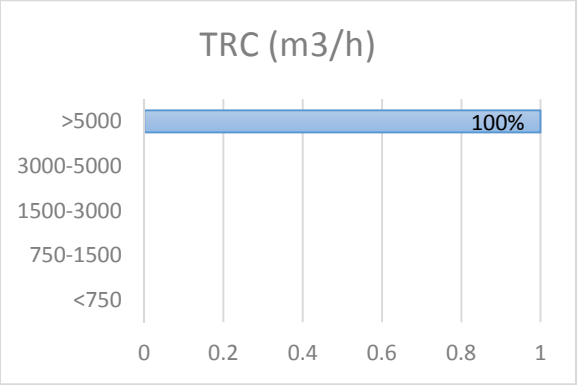
Other issues

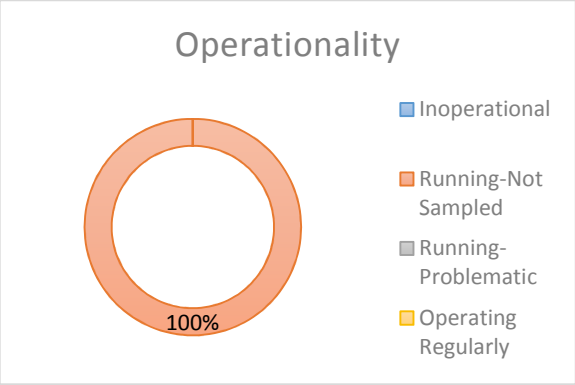
- UV low dosage
- Filter cleaning required
- Short circuits due to broken lamps/water leakage from sleeves
- Additional manpower required to operate manually operated valves
- Additional equipment needed for calibration or alternative sensor makers

1.2.2 HYDE GUARDIAN (10)









Hardware Failure

- Reactors flooding due to defective seals, valves not operating due to scale developed

Software Failure

- Nil

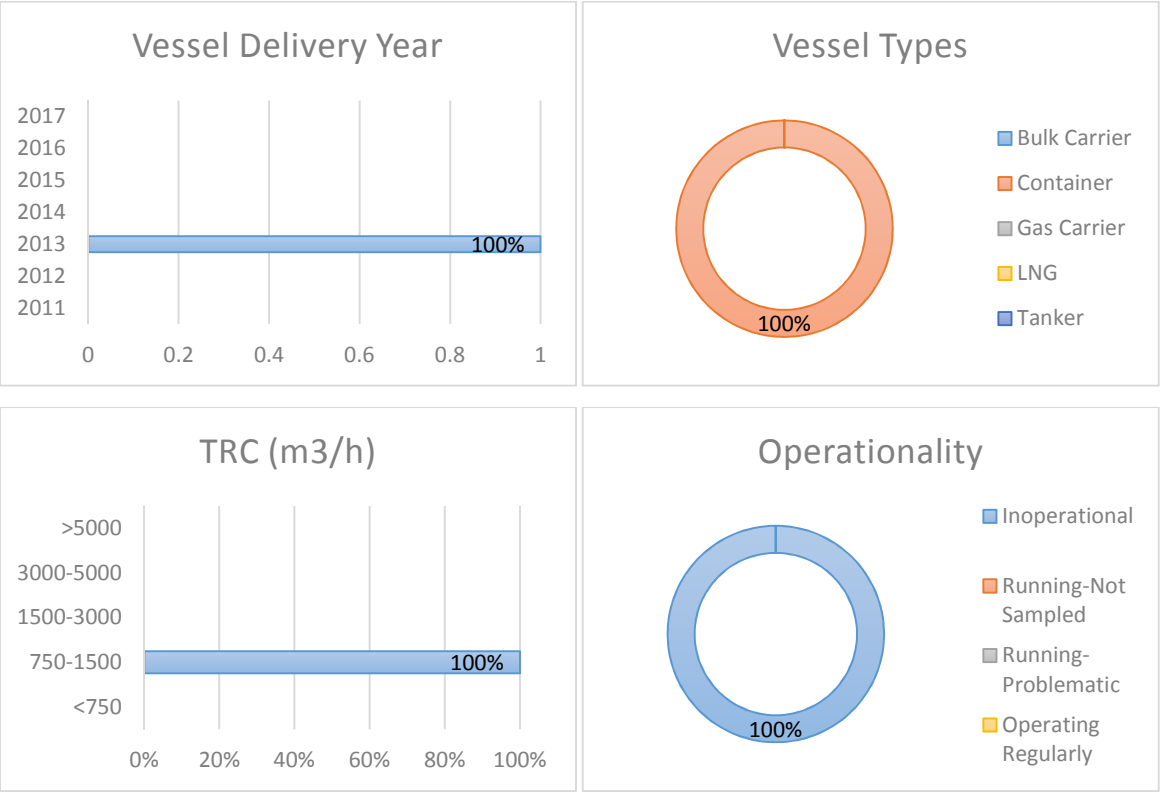
Human error

- Broken lamps due to waterfall effects

Other issues

- Several damages (corrosion, holes etc.) on the associated pipes, not necessarily related to the function of the system
- Expensive spare parts (UV lamps)
- The most vulnerable parts seem to be the UV sensors, the purge units and the lamp wipers

1.2.3 PUREBALLAST_2 (1)



Hardware Failure

- Control panel hard disk failure

Software Failure

- Software requires update
- Control panel malfunction with old software

Human error

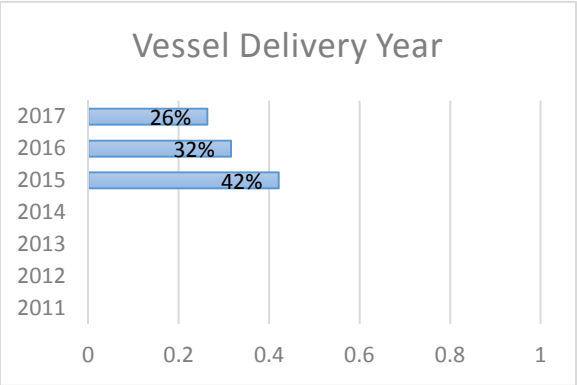
- Nil

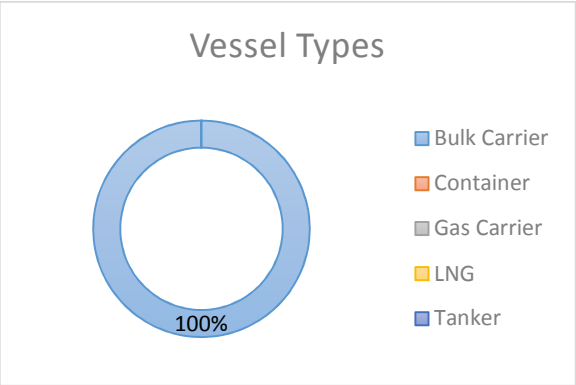
Other issues

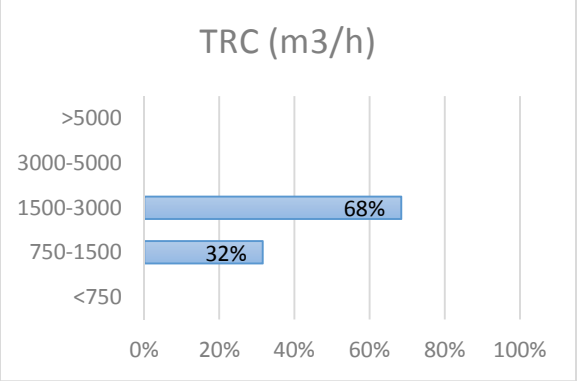
- Software update difficult due to high cost and inconvenient port calls, also not covered by maker.
- Availability is good, however troubleshooting required for software malfunctions were very time-consuming

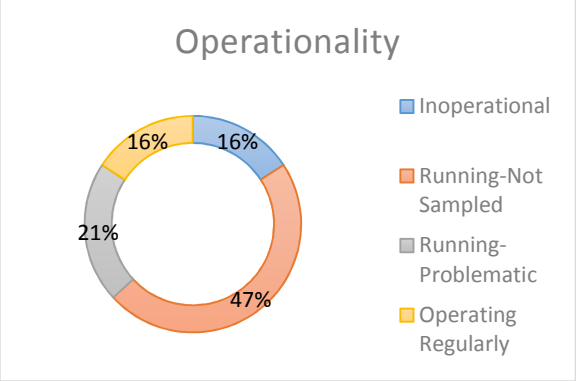
1.3 FILTRATION + ELECTRO-CATALYSIS + NEUTRALIZATION

1.3.1 OCEANGUARD (19)









Hardware Failure

- EUT fail
- Electromagnetic valve on Monitor Unit
- High differential pressure before and after filers

Software Failure

- Back-up battery supply run automatically in case of black out
- Emergency switch button for BWTS malfunction

Human error

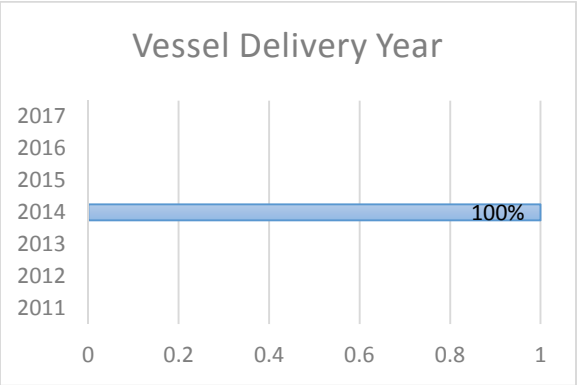
- Nil

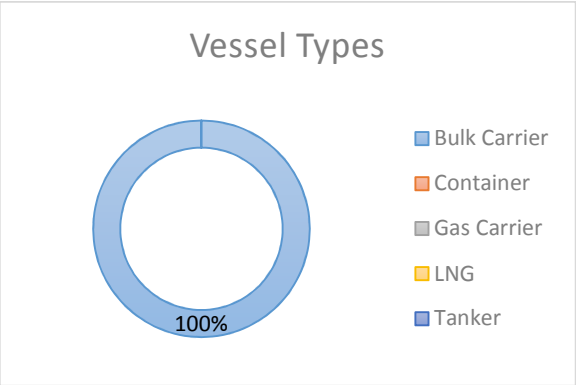
Other issues

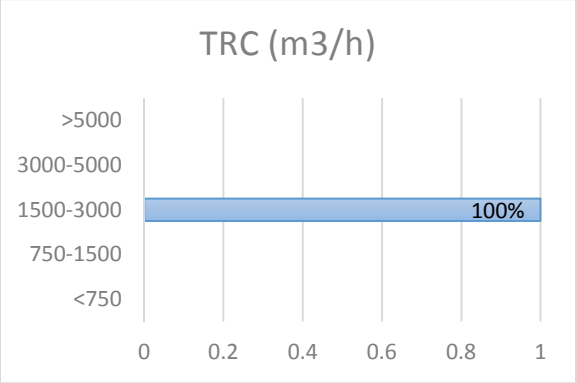
- Nil

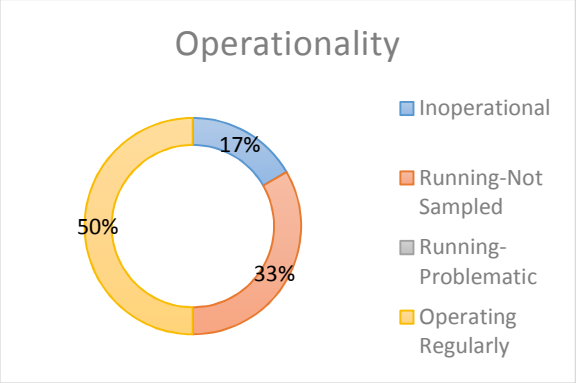
1.4 FILTRATION - ELECTROLYSIS (ELECTRO-CHLORINATION)

1.4.1 CLEANBALLAST (6)









Hardware Failure

- Sensor on transmitter replaced

Software Failure

- Nil

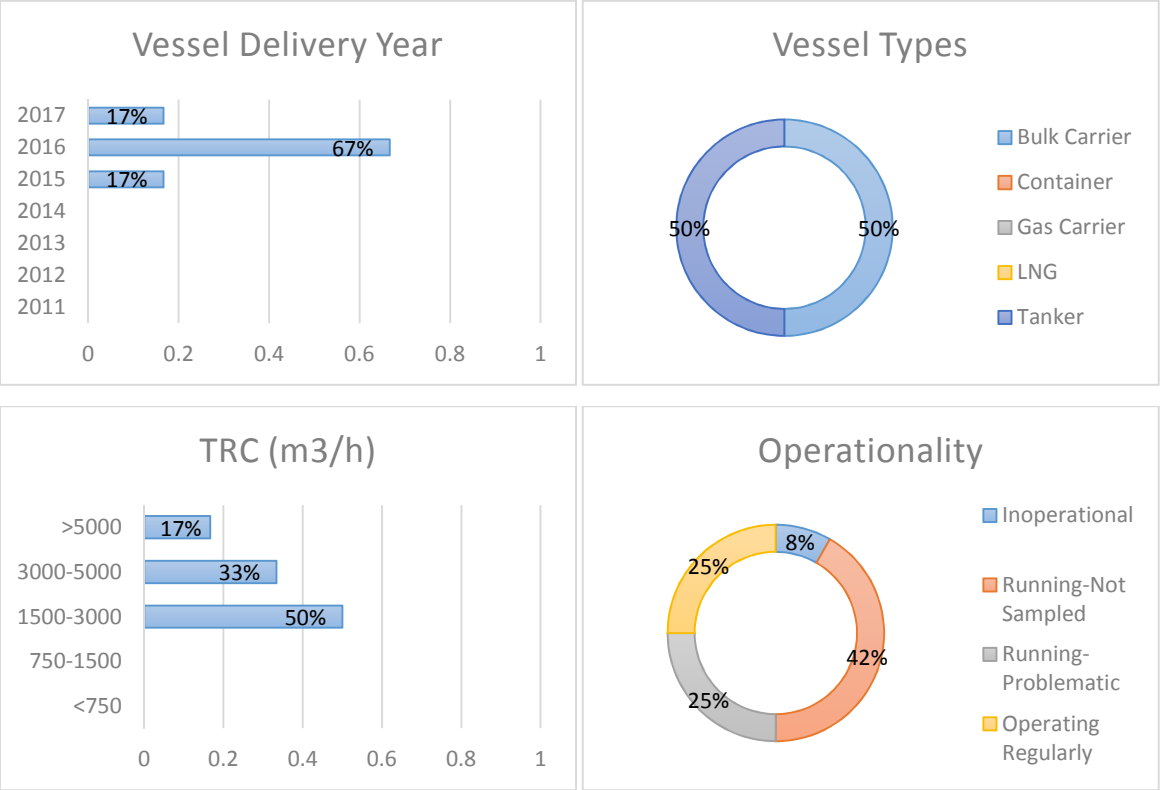
Human error

- Nil

Other issues

- Apart the neutralization no other consumables required

1.4.2 HIBALLAST (12)



Hardware Failure

- Low meter faulty low reading that cause alarm unreasonably
- Malfunction of TRO sensors
- Circuit breaker of blower is defective and causes H_2 release during electrolysis and blower to exhaust the gas out
- NU pumps failure

Software Failure

- During first testing of the system there were problems with the operation of the sensors and the system controlling the neutralization process resulting in waste of a substantial amount of neutralizing agent
- Time delay settings (default) very often not enough to bring the treated water to acceptable limits which causes system shutdown
- During deballasting the TRO sensor giving alarm (malfunction) for short period. In few seconds the sensor is operational again (sensor checked chemical level)-the alarm is not shutting down the system
- The main computer requires regular restarts (before operation)

Human error

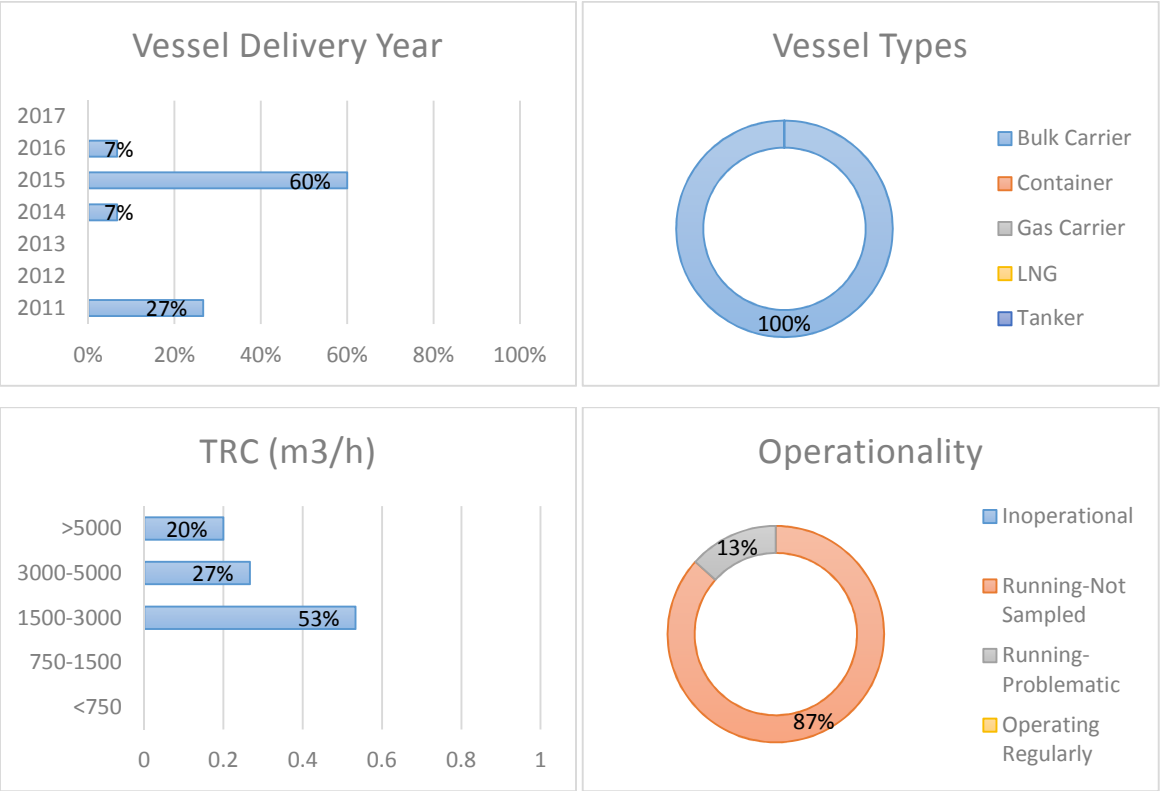
- Nil

Other issues

- TRO unit alarm due to sea water quality with low salinity in port
- TRO chemical line dries up if not operated for long time
- Calibration

1.5 ELECTROLYSIS (ELECTRO-CHLORINATION)

1.5.1 ELECTRO-CLEEN (15)



Hardware Failure

- Leaking and defective gas detector unit alarm is always active in BWMS
- Power Rectifier Unit defective
- Flow meter unit is experiencing high flow rate
- TRO concentration low
- ESJ module failed
- Buster transformer
- TSU (TRU sensor unit)

Software Failure

- Nil

Human error

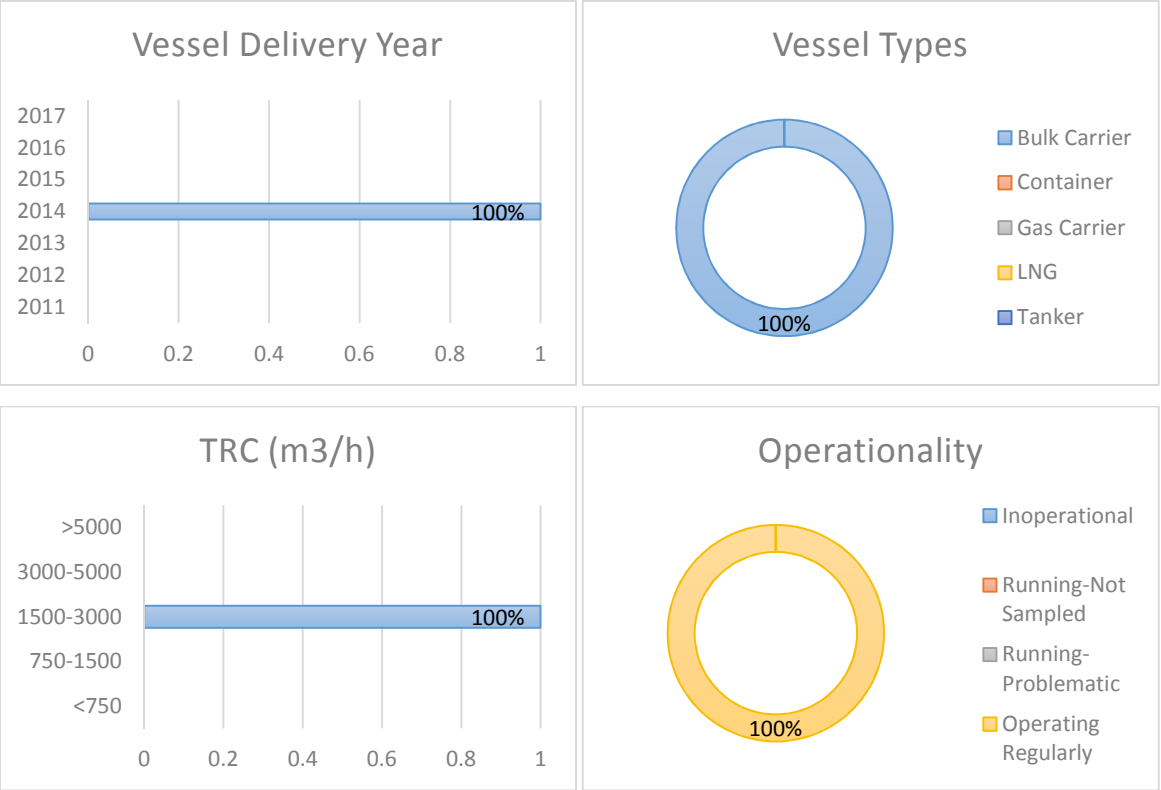
- Nil

Other issues

- Calibration of various sensors
- Service engineers hard to come for repair
- Reagent limited lifetime

1.6 FILTRATION - ELECTROLYSIS (ELECTRO-CHLORINATION) – NEUTRALIZATION

1.6.1 BALCLOR (1)



Hardware Failure

- Sewage pump stuck was repaired
- Burnt, spare motor received and replaced

Software Failure

- Nil

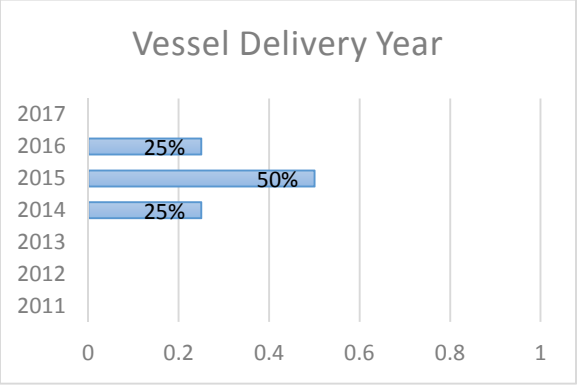
Human error

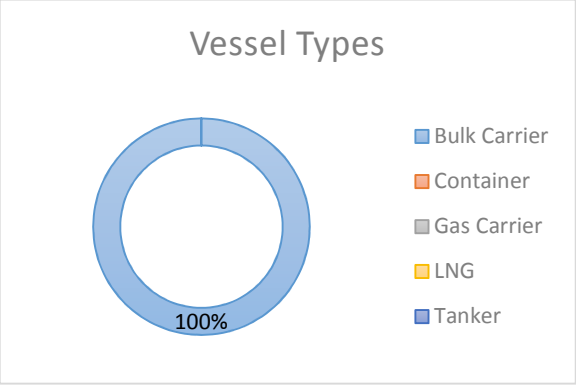
- Nil

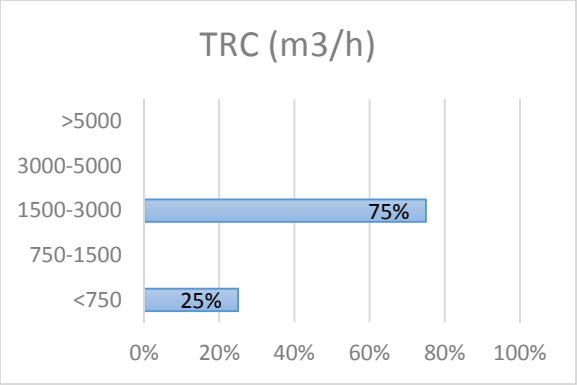
Other issues

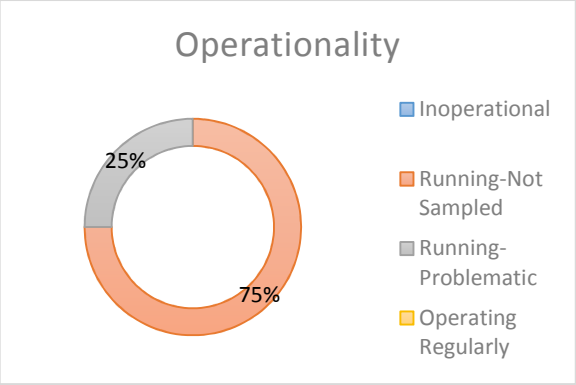
- Exchange method is the primary in BWMP

1.6.2 ERMA FIRST 400 (8)









Hardware Failure

- Nil

Software Failure

- Nil

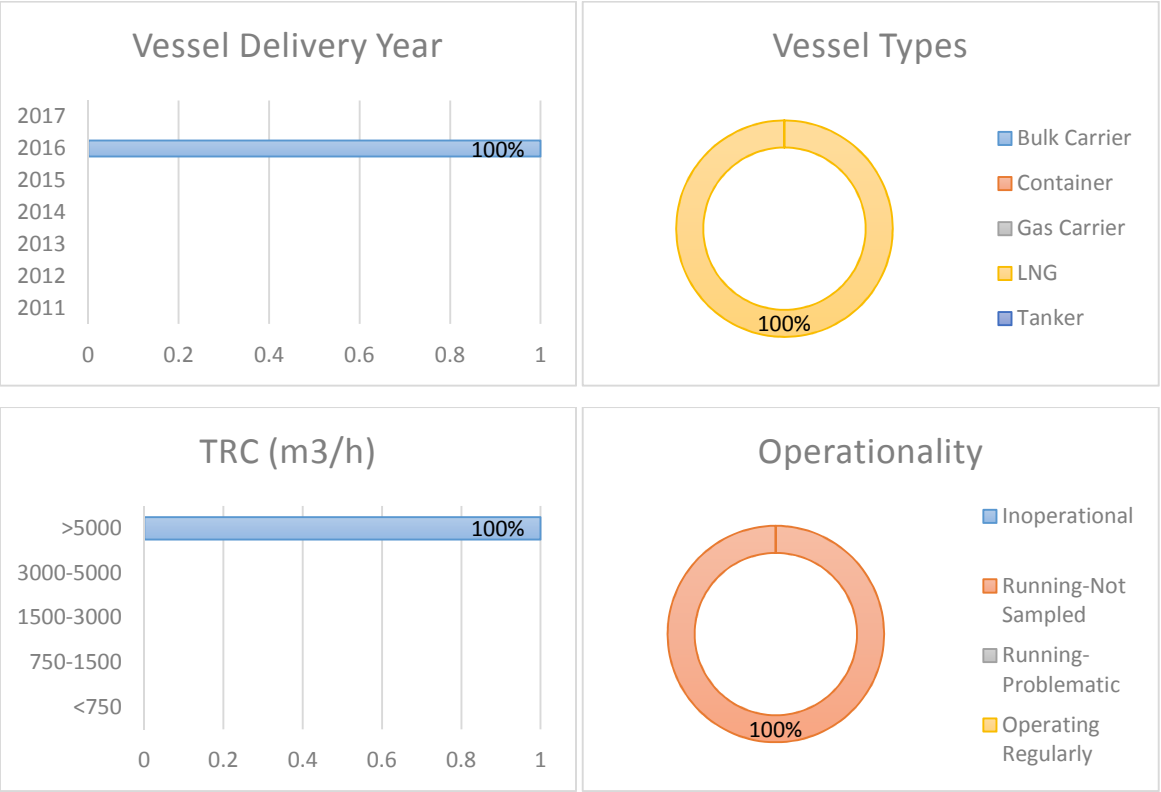
Human error

- Nil

Other issues

- Blocked TRO sampling pipes
- Filters were leaking and needed to be overhauled.
- Adjustment of valves to adjust pressure for hydrocyclone filters to work properly
- Neutralization chemical solidifying due to humidity
- TRO sensors parts require replacement every 6 months

1.6.3 PURIMAR (4)



Hardware Failure

- Ballast pump delivery valves and valves after filter are throttled (automatically controlled by BWTS through IAS) to maintain the flow rate in accordance to BWTS rated capacity. The upper filter plate was distorted. The material was changed from plastic. Maker uses their own proprietary filter hence they do not buy from any sub-suppliers.
- The Upper filter plate was distorted. The material was changed. It is not one of the known sub-suppliers.
- Flow meter fluctuation and TRO sensor trips. The main reason was poor mixture between chlorine and sea water caused by piping arrangement. Electromagnetic type flow meter can be used to accurately measure the flow rate of liquids which has an electrical conductivity. Thus, poor mixture of two different liquids (sea water, NaOCl) may affect accuracy of flow meter. There was installation of new injection pipe and adjust response time of flow meter. Maker improved injection pipe as new one with holes to make mixing well with NaOCl and seawater.
- Electrolysis Flow meter fluctuation while running (this is the flow meter in the electrolysis unit not the flow meter of the ballast water), It was caused by dirty de-mister in cyclone. Dismantled upper part of hydro cyclone which separates H2 gas and chlorine water to ventilate the remained H2 gas in hydro cyclone. Cleaned inside the de-mister and re-assembled it. After that, the electrolysis flow meter was working well.
- Sea water salinity sensor accuracy low. When running port rail salinity around 2.6% and when running Stbd rail indicated salinity around 2.0% in normal sea water condition. It should be around 3% in normal sea water.

- Salinity signal channel, temperature sensor signal channel were interchanged to avoid noise of electrolysis flow meter before reassembling demister.
- TRO sensor sampling valve electromagnetic control valves sensitive to corrosion and sticking. Pasted grease inside valve electric moving parts and also must ensure proper drain inside TRO cabinet as any moisture inside will create corrosion.

Software Failure

- Blower pressure alarm low coming under fan stopped condition (Software). This alarm under fan stopped has been blocked as default. Maker assumes the alarm from IAS.
- BWTS and IAS communication should be specified by 2 different redundant communication channels for redundancy and safety and to avoid time consuming searching of a lost communication channel

Human error

- Nil

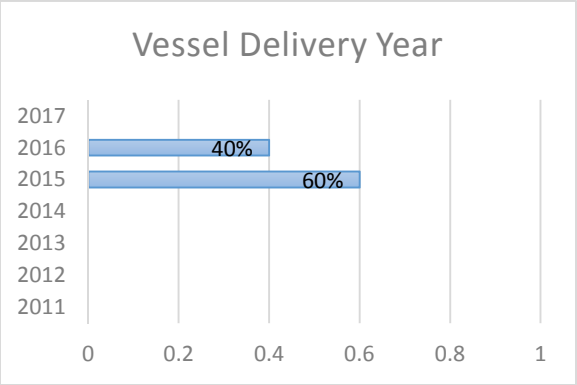
Other issues

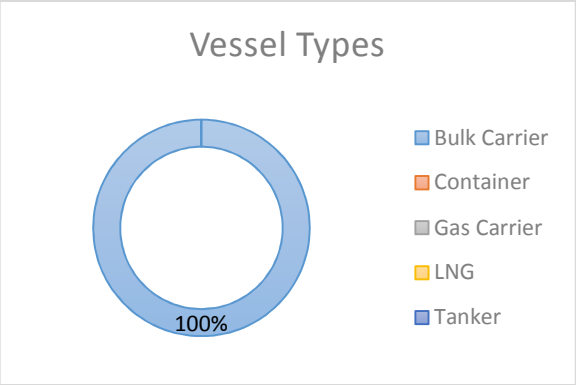
- When de-ballasting with the full ballast tanks, there is a large head pressure due to the filled level of the water in the tanks and the de-ballasting capacity is higher than the nominal capacity of the pumps. That is to say, during the de-ballasting operation (full ballast tanks), high ballast water rates, which are relatively higher than the pumps' nominal rating and the BWTS certified rating could be achieved Such desired capacity could not be reached due to the capacity limitation as indicated in the Type approval certificate.
- When de-ballasting with the full ballast tanks, there is a large head pressure due to the filled level of the water in the tanks and the de-ballasting capacity is higher than the nominal capacity of the pumps. That is to say, during the de-ballasting operation (full ballast tanks), high ballast water rates, which are relatively higher than the pumps' nominal rating and the BWTS certified rating could be achieved Such desired capacity could not be reached due to the capacity limitation as indicated in the Type approval certificate.
- Regulatory bodies and charterer should consider the impact of needing 40 minutes to restart a ballast pump
- Large ballast water rate reductions
- During ballasting or deballasting in order to start or stop a ballast pump it was found that the operation should be stopped and that the BWTS stopped and re-started. In the case of side stream electrolysis, some manufacturer disinfectant dosage is 7-8 ppm whereas others apply 2-3 ppm.
- We wonder why some need 7 ppm to get USCG approval and the others can do it with just 3 ppm?
- There should be a function called "re-circulation" mode where before ballasting the pumps are operated sea to overboard before closing the overboard valve and opening the valve to the ballast tanks. Similarly, in de-ballasting there should be a "re-circulation" mode where the pump is running from sea to overboard and suction from sea is closed and the tanks opened. The reason for re-circulation mode is that ballast pump motors are very large motors that cannot be started and stopped frequently. In addition, frequent starting and stopping of ballast pumps creates harsh impact on valves, pipes, filters, fittings etc. It is a softer way to start and stop ballasting/de-ballasting by going into recirculation mode than by starting and stopping the ballast pumps.
- Operationally, we need much flexibility during topping up of the ballast tanks. From 65% full to 100% full it takes many starting, stopping, re-circulating, waiting, etc. which is also related with cargo operations. We would like the authorities to allow filling of ballast tanks to 95% full with the BWTS running at a slightly increased disinfectant dosage and the final filling from 95% to 100% without BWTS

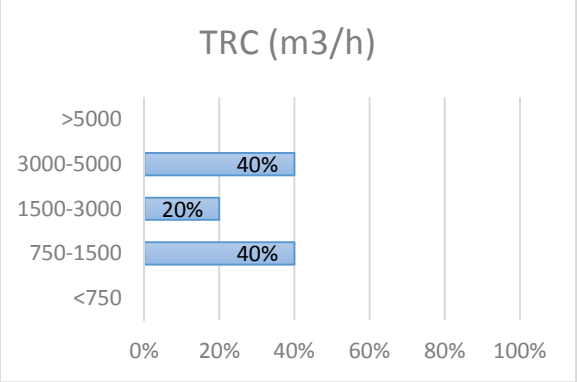
running. This is to allow topping up of the tanks without the starting, stopping and operational sensitivity of the system running. It goes without saying that during deballasting the water will be in compliance with the rule standard and the TRO recorded.

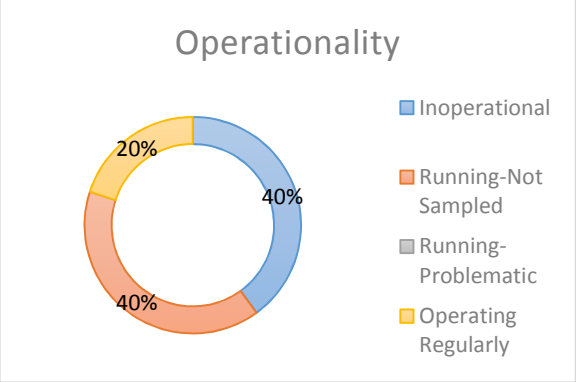
1.7 FILTRATION - DISINFECTION (INJECTION DISINFECTANT) – NEUTRALIZATION

1.7.1 JFE BALLASTACE (5)









Hardware Failure

- Nil

Software Failure

- Nil

Human error

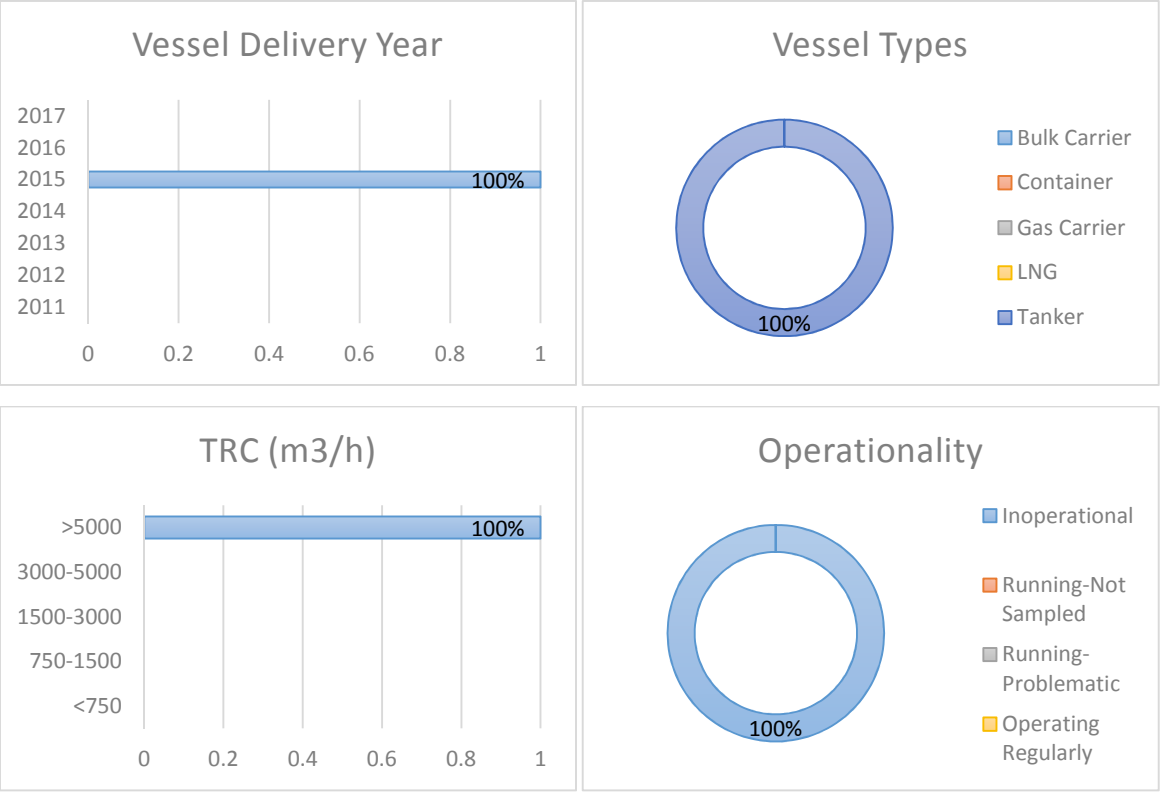
- Nil

Other issues

- Inoperable, contacted seller
- Miss handling issues at first stage
- More support for chemical consumables, TRO supervision units

1.8 FILTRATION - CAVITATION - DEOXYGENATION (NITROGEN INJECTION) - ELECTRODIALYTIC DISINFECTION

1.8.1 OCEANSAVER MK II (2)



Hardware Failure

- Hardware problems and installation mistakes were observed

Software Failure

- Software upgrades required for USCG compliance

Human error

- Complicated system and equipment installed in separate locations are prone to human errors during operation

Other issues

- Chemical used during operation
- Continuous calibration
- Sensors fail
- Maintenance and repair