



Leading the Ocean & Beyond

BWTS Retrofit Proposal

Buyer's selection service, custom-made

stx Heavy Industries

BWTS Retrofit Proposal (Seller's Market to Buyer's Market)

Leading the Ocean & Beyond

We proved the eco-friendly solution of BWTS retrofit with Competitive price, Efficient operation, and User-friendly service.

What customers concern about BWTS retrofit of STX Heavy Industries

- Reliability : Proven solution through 106 deliveries from 2015 with no trouble case has been reported.

(Nov. 2020)















NO	SHIP TYPE	CONTRACTED	COMPLETED
1	TANKER	35	30
2	LNG & LPG	17	17
3	CARRIER	33	28
4	VLCC & VLOC	8	8
5	GENERAL CARGO	12	11
6	CONTAINER	14	8
7	ETC.	3	3
TOTAL		122	105

*Global new leader
for clean
environment*

stx Heavy Industries

Buyer's selection the retrofit scope

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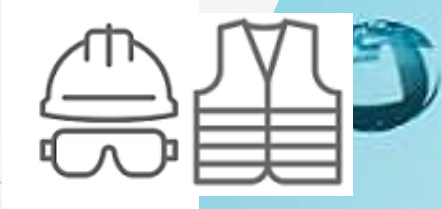
Scope	Package A	Package B	Package C	Total Turn-key
Feasibility study (Engineering support, application the retrofit)				
On-board survey and Evaluation report				
Basic Engineering -. Based on the 3D scanning, issue the basic DWG				
Design Engineering -. Manufacturing, Installation DWG and procurement of fabrication material				
Installation & Commissioning -. Supervision -. Training the system application				

BUSINESS FIELD

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We have good partnerships with major BWMS makers around the world. If you consider to select from our partners, it would be **the best choice to do engineering with us**. With STX Heavy Industries Co.,Ltd you will find one-stop solution for retrofit market.

BWMS RETROFIT



1. 3D Scanning
2. Design Engineering
3. Retrofit Material
4. Installation
5. Supervision
6. Inspection
7. Delivery

BWMS A/S & COMMISSIONING



1. BWMS A/S
2. BWMS Commissioning
3. Training vessel crews
4. Program update

SPARE PARTS



1. BWMS Spares
2. Spares for other equipment on vessel

Why STX Heavy Industries Co.,Ltd.

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Retrofit team : Thirty main engineers (work experience on over 10-20 years)

Design team : Ten designers (work experience over 10-15 years)

Achievement as of Nov. 2020,

1. BWMS Commissioning : 136 Ships

2. BWMS A/S : 390 Ships

3. BWMS Retrofit : 122 Ships

01

EXPERIENCE

Over 10 years experiences from BWMS field



02

EXPERTISE

Specialized in BWMS retrofit with lot of knowledge from many cases



03

EFFECTIVE

Work by the most time & cost effective way



01
UV TYPE

- 1. PANASIA (KOREA)
- 2. SK CENTURY (KOREA)
- 3. MIURA (JAPAN)
- 4. ALFA LAVAL (DENMARK)
- 5. LEES GREEN (CHINA)



02
ELECTROLYSIS
TYPE

- 1. TECHCROSS (KOREA)
- 2. SUNRUI (CHINA)
- 3. HEADWAY T/C (CHINA)
- 4. ERMA FIRST (GREECE)
- 5. HI-BALLAST (KOREA)
- 6. PURIMAR (KOREA)





03
OZONE
TYPE

- 1. NK (KOREA)



Authorized partners

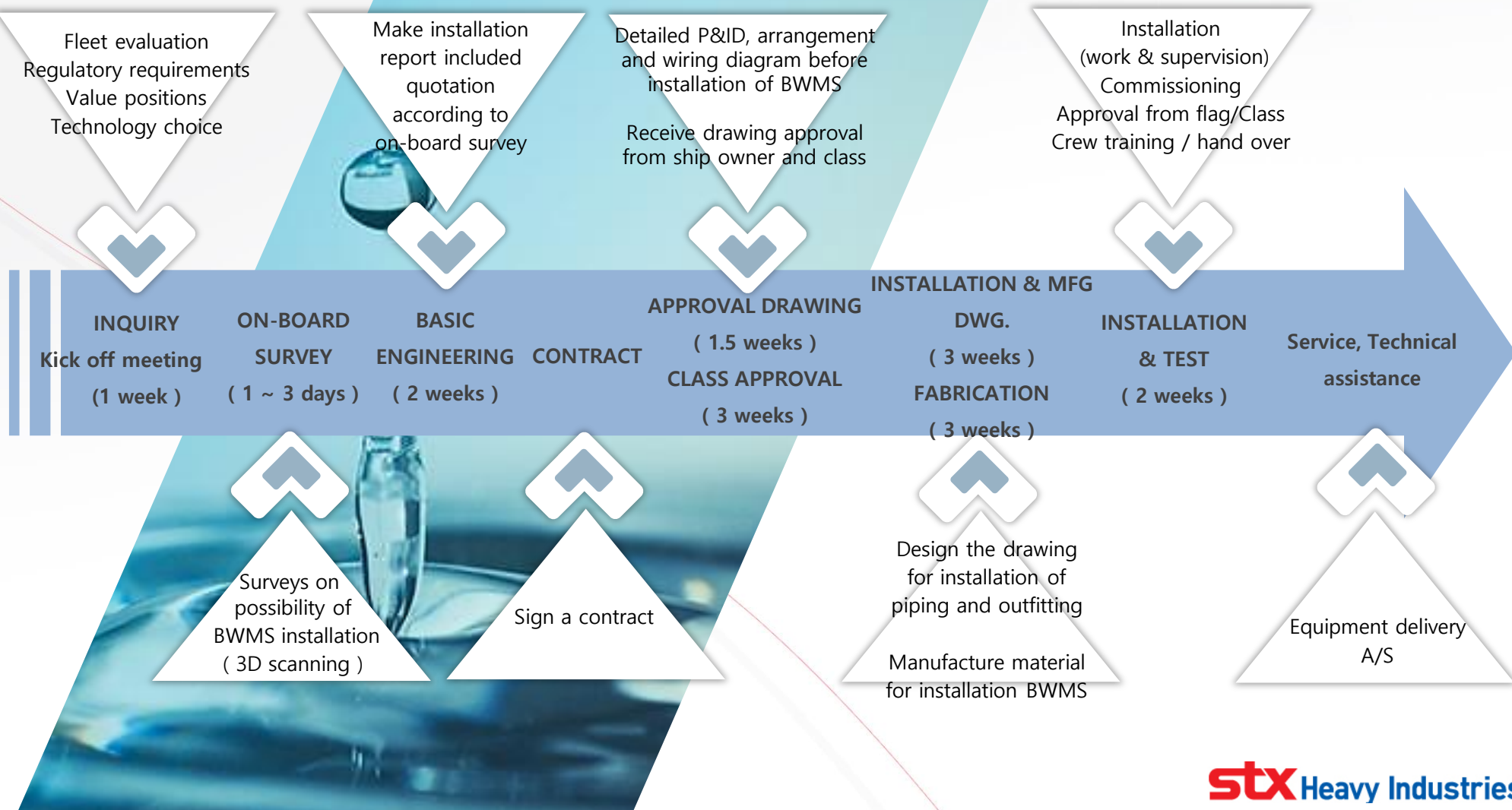
Advantage of Early Retrofit

	ITEM	Before bottleneck (2018 ~ 2020)	During bottleneck (2021 ~)
COMPARISON	Price	Lower price	Extremely high engineering price
	Service	<ul style="list-style-type: none"> 1) Guarantee extension 2) Additional spare parts 3) Good quality crew training 4) Easy available for repair shipyard 	<ul style="list-style-type: none"> 1) No guarantee extension 2) No spare parts 3) Normal crew training 4) No construction place
	Equipment Management	<ul style="list-style-type: none"> 1) Enough equipment education 2) Sufficient being skilled engineers 	<ul style="list-style-type: none"> 1) Minimum equipment education 2) Lack of being skilled engineers
	CONCLUSION	 Time ticking	 STX HI is the solution

Retrofit schedule (overview of BWTS retrofit, Turnkey process)

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Total around 20 weeks after kick-off meeting
About 14 weeks after contract



3D Scanning & Modeling

2. Installation Proposal – S/G Room

The reason why it is impossible to install NK system in E/R

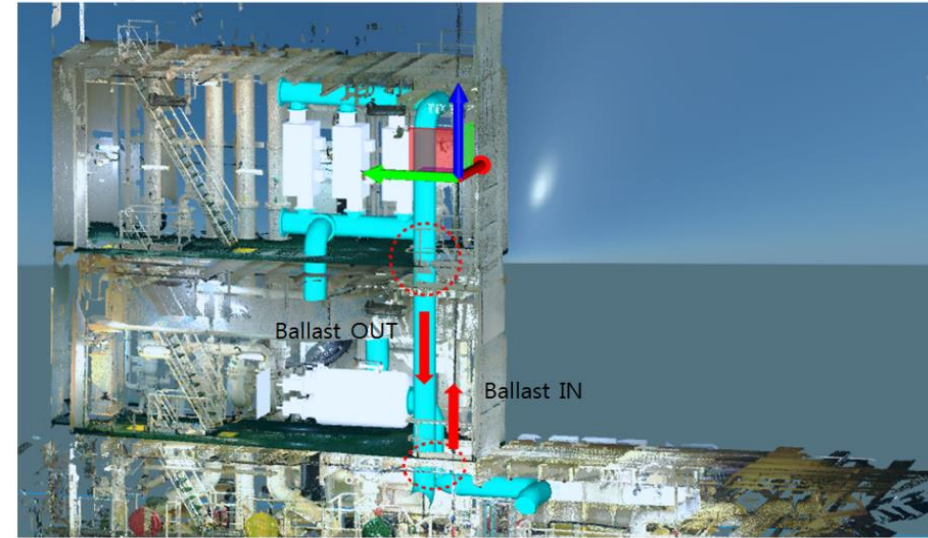
4. Not easy to maintain and operate -> It would be easier to install at S/G Room

Moving the rope and chemical drum location makes possible to design + install for maintaining and operating as one stop.

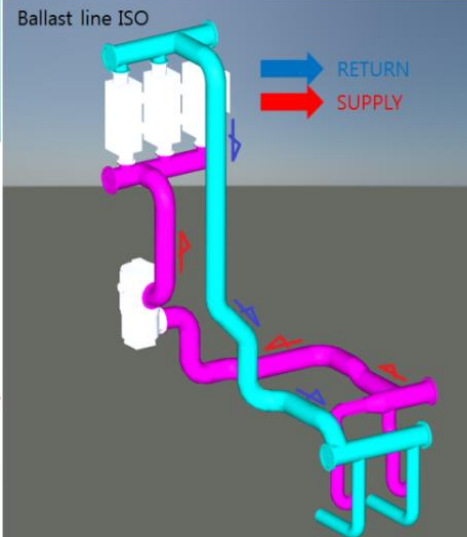


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Concept for P/R Piping part -1



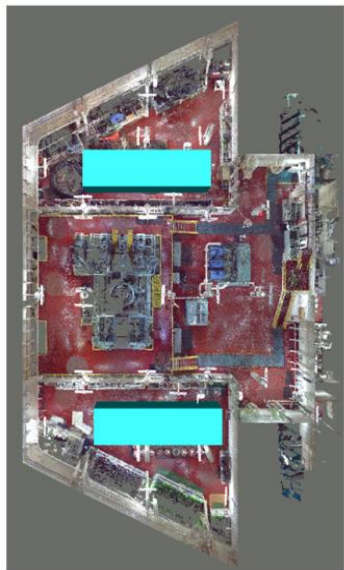
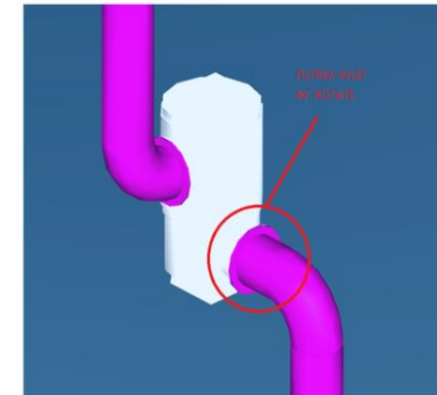
Concept for P/R Piping part -2



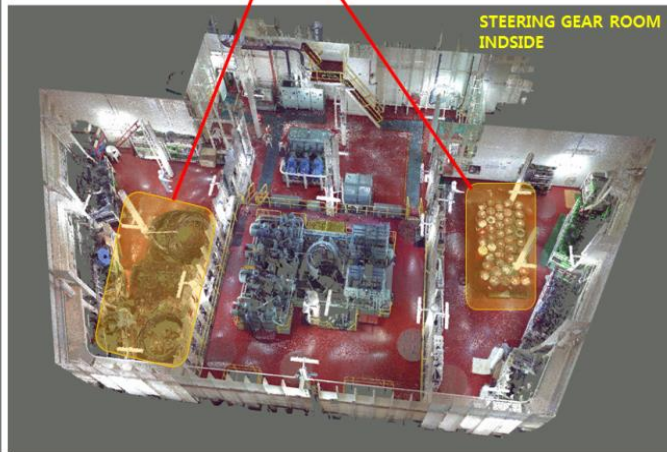
Filterx

- Ballast main line will be installed without problem in p/r

*Filterx inlet connection should be rotated 90°



WIRE, ROPE, OIL DRUM should be removed

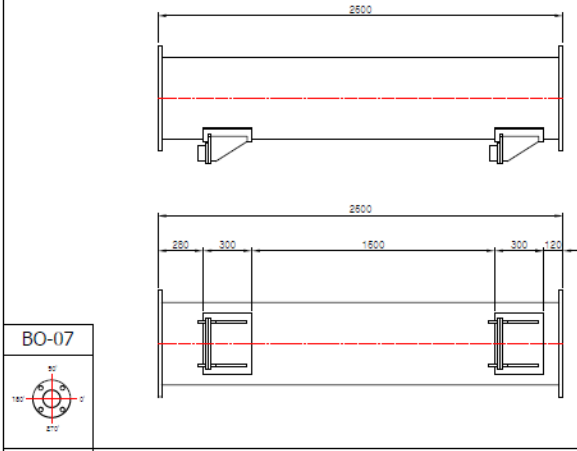
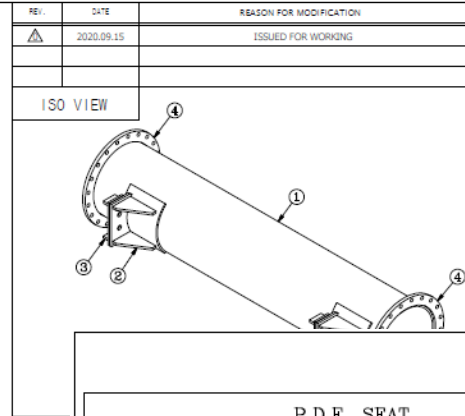
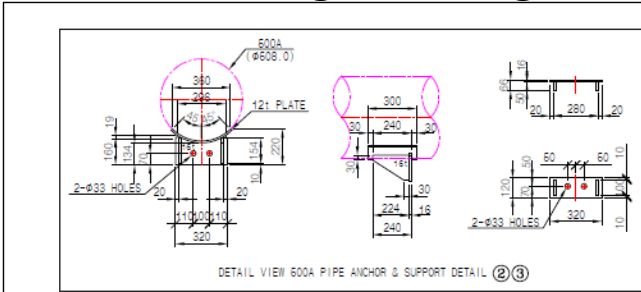


STEERING GEAR ROOM INSIDE

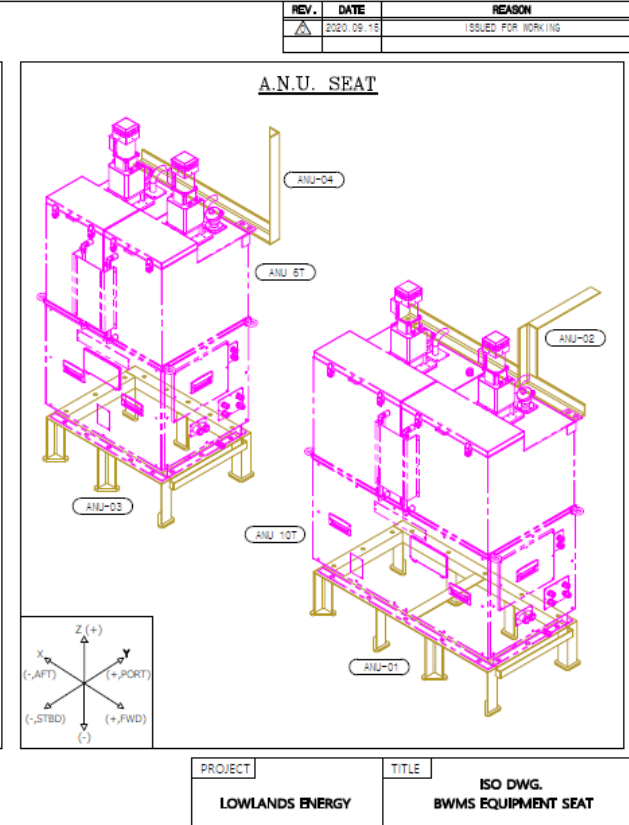
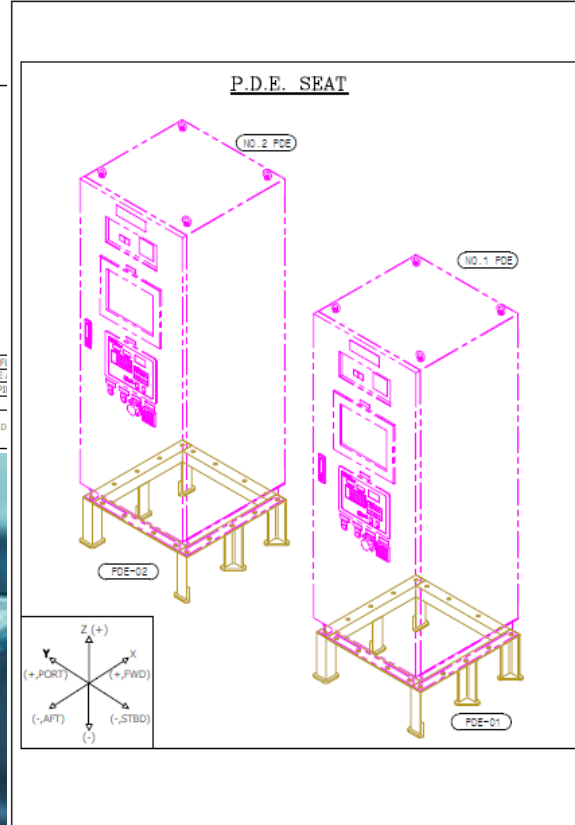
Drawing (with 3D)

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Manufacturing drawing designed with 3D in order to improve the efficiency of retrofit



NO.	D.
1	PI
2	PI
3	PI
4	PI

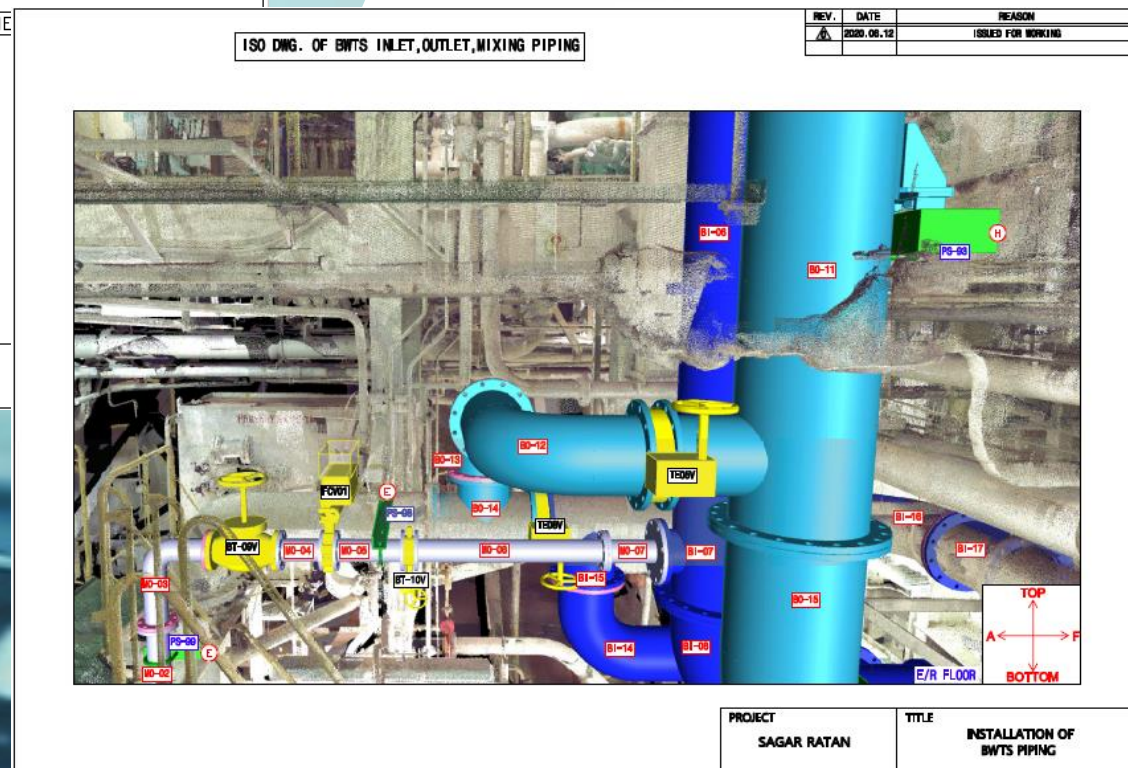
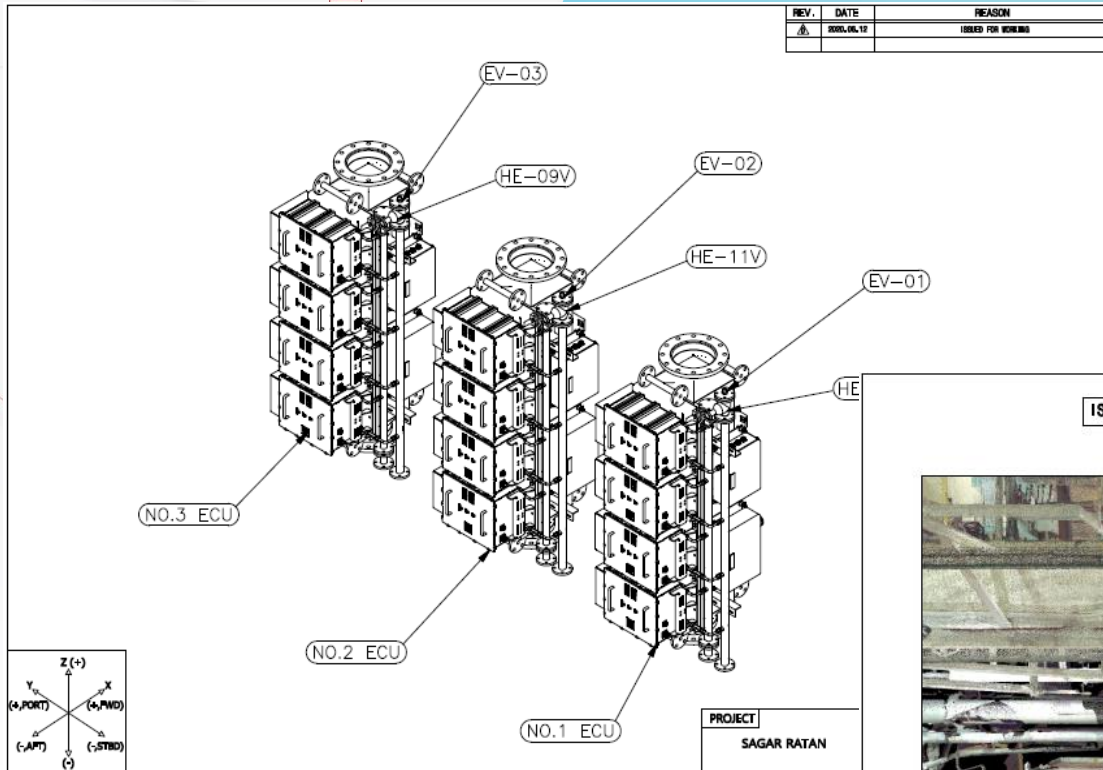


PROJECT	TITLE
LOWLANDS ENERGY	ISO DWG. BWMS EQUIPMENT SEAT

Drawing (with 3D)

Leading the Ocean & Beyond

Installation drawing designed with 3D in order to improve the efficiency of retrofit

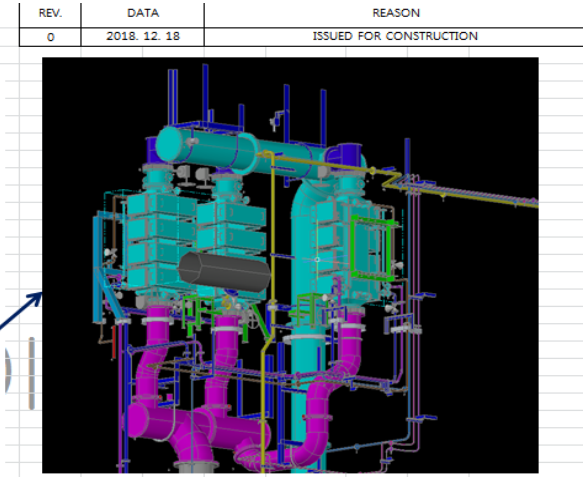
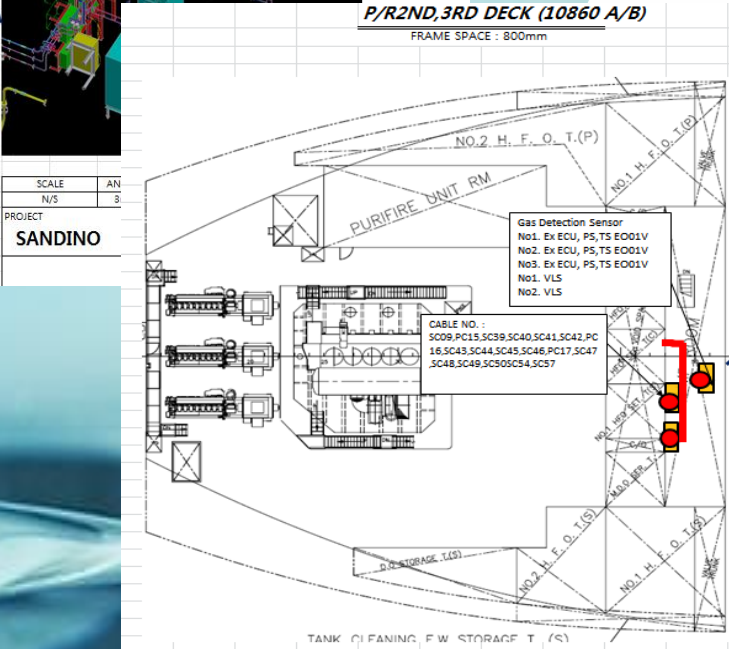
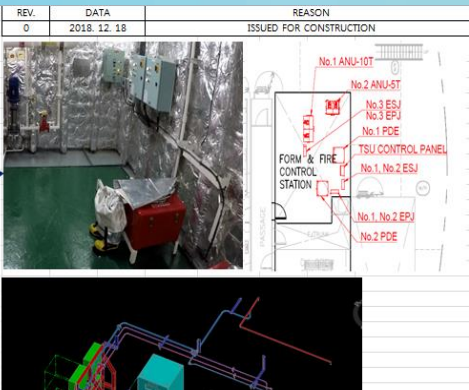
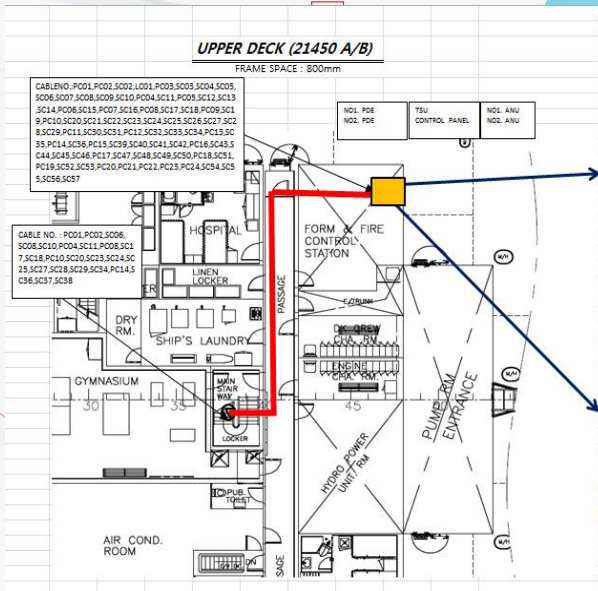


Drawing (with 3D)

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Cable Installation drawing with 3D in order to improve the efficiency of retrofit

STX Heavy Industries Co., Ltd.



< NOTE >
 * The Installation of cables usually used the existing cable trays.
 * For the installation of cables, workers should break the existing cable coaming OR make new cable coaming.
 * After cables are installed, workers should fill compound into the coaming.
 * 15 cables must be separated from power cables.

SCALE AN
N/S 8

PROJECT
SANDINO

Cable No SC54 will be installed in 2nd deck (15360A/B) : NO1. VLS (From No1 ESJ To NO1. VLS)

< NOTE >
 * The Installation of cables usually used the existing cable trays.
 * For the installation of cables, workers should break the existing cable coaming Or make new cable coaming.
 * After cables are installed, workers should fill compound into the coaming.
 * 15 Cables must be separated from power cables.

SCALE	ANGLE	UNIT	DATE	DRAWN	CHK'D	APP'D
N/S	3rd	mm	2018. 12. 18	J.H.KANG	S.H.HA	J.M.YOO
PROJECT SANDINO			TITLE DRAWING AND GUIDE OF CABLE INSTALLATION (P/R3RD DECK-PR)			
DWG NO.			PAGE : 07/08			

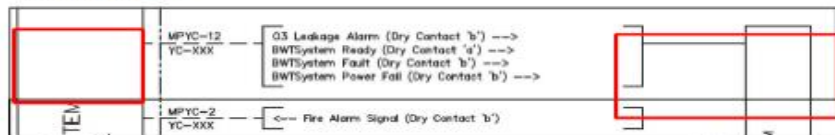
Drawing (Interface with AMS, GPS)

Interface with AMS

3. A.M.S

NK System need to the some alarm signal for abnormal function

1) Wiring diagram



NK -BULE BALLAST SYSTEM
MAIN CONTROL PANEL
(Position : Steering Gear Room)

AMS MAIN MONITOR
ALARM BUS
(Position : ECR AND BESIDE TO

2) Screen shot for AMS

AMS Main monitor located in ECR
BWTS any alarm check and see to main monitor



AMS MAKER : SAMSUNG

BWTS alarm appear to the main monitor.

3) AMS Method : Dry contact for alarm signal



(Position : Steering Gear Room) (Position : beside to the ECR)

Interface with GPS

4. GPS

NK System need to GPS signal

1) Wiring diagram



NK -BULE BALLAST SYSTEM
MAIN CONTROL PANEL
(Position : Steering Gear Room)

NK REMOTE
CONTROL PANEL
(Position : CCR)

DGPS OUTBUFFER
(Position : Wheel House)

2) Screen shot for GPS

GPS monitor located in wheel house



(Position : Steering Gear Room)
NK -BULE BALLAST SYSTEM
MAIN CONTROL PANEL

(Position : CCR)
NK REMOTE
CONTROL PANEL



BWTS receive from signal of GPS output buff (Position : CCR)
NK REMOTE
CONTROL PANEL

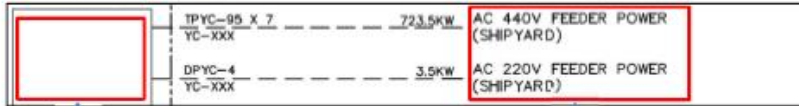
Drawing (Interface with MSBD)

Interface with MSBD for 440V & 220V

1. MAIN SWITCH BOARD (MSBD)

- 1) Main Switch Board located in ECR
 - # NK system need to the 440V & 220V power from main switch board in ECR

2) Wiring diagram for NK



- NK -BULE BALLAST SYSTEM
MAIN CONTROL PANEL
(Position : Steering Gear Room)
 - # NK BWTS system will recive to the 440V for **1180A** (723.5kw)
 - NK BWTS system will recive to the 220V for **16A** (3.5kw)
- 440V FEED PANEL
220V FEED PANEL
(Position : Engine Control Room)

3) Screen shot for MSBD in ECR

- # No 440V spare Circuit Braker for 1200A in ECR



- NO1,2,3 AC440V FEEDER PANEL are not installed for spare C.B for 1200A
- # Need to install new 440V Feed Panel at ECR
 - Scrubber - 630A x 3sets
 - bwts - 1180A x 1set
 - Need new 440V power C.B additionally.
 - Existing feed panel does not have extra C.B.
 - C.B size of newly installed 630A, 1180A is big, so cannot be installed at existing pan



The location of 440V Feed panel which will be newly installed.

220V spare Circuit Braker of 16A used to existing spare C.B in ECR



4) Circuit Breaker Maker : Schneider



- # For new installation of 440V Feed Panel will contact to MSBD Maker with Schneider

4) Cable work process

- # Ship side block out for 2hour or 3hour during connection of power cable with BWTS
From S/G room to ECR by yard

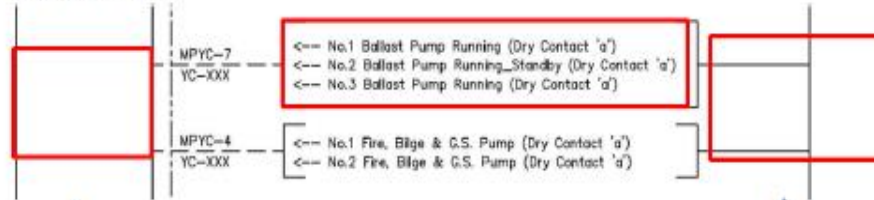
Drawing (Interface with Ballast pump)

Interface with Pump

6. NO1,2,3 Ballast Pump running & NO1,2 Fire GS Pump running

NK system need to the each pump running signal

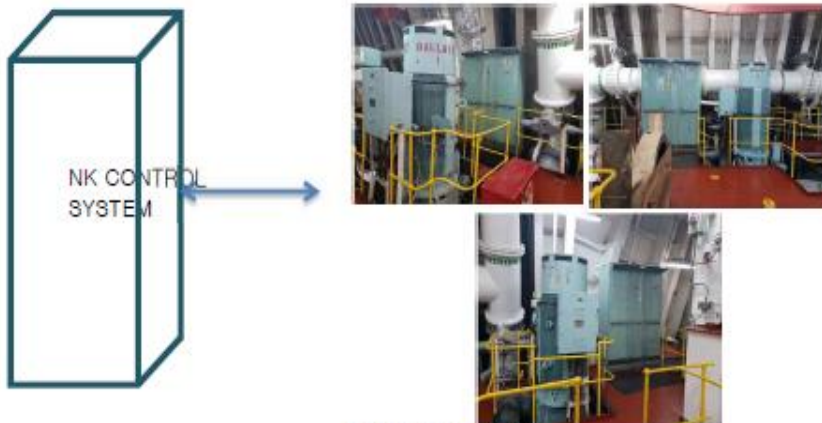
1) Wiring diagram



NK -BULE BALLAST SYSTEM
MAIN CONTROL PANEL
(Position : Steering Gear Room)

Starter of No 1, 2, 3
Ballast Pump
(Position : E/R Floor side)

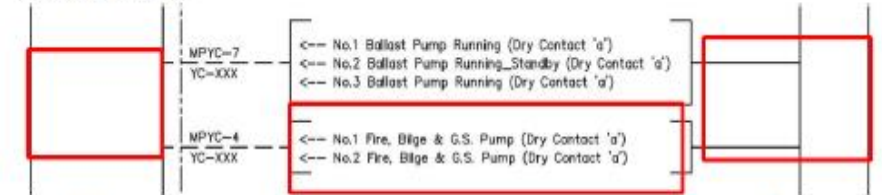
2) Screen shot for VRC in OCR



NO1, 2, 3 Ballast Pump

BWTS system will receive from each starter panel for pump running signal

3) Wiring diagram



NK -BULE BALLAST SYSTEM
MAIN CONTROL PANEL
(Position : Steering Gear Room)

Starter of No 1, 2
Fire, Bilge GS Pump
(Position : ECR)

4) Screen shot for VRC in OCR



NO1, 2 Fire Bilge GS Pump

BWTS system will receive from each starter panel for pump running signal

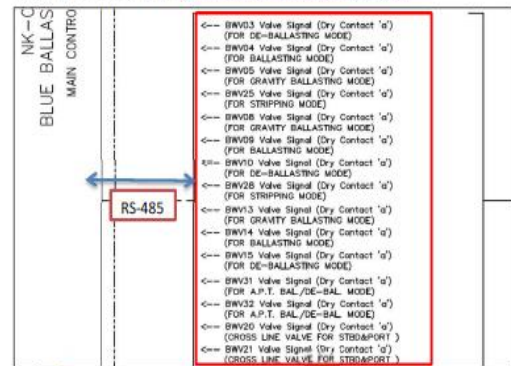
Drawing (Interface with VRC, Fan)

Interface with VRC

2. V.R.C (Valve Remote Control)

NK system need to the Valve signal for operation of BWTS System

1) VRC Method : Communication type (No dry contact)



NK -BULE BALLAST SYSTEM MAIN CONTROL PANEL (Position : Steering Gear Room)
 VRC MAIN MONITOR IAS System (Position : Cargo Control Room)
 # NK BWTS system will receive to the valve signal (open/close)

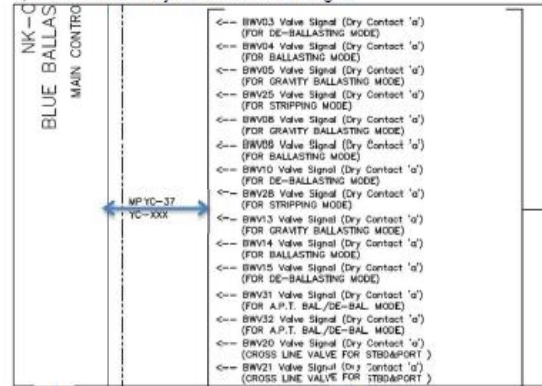
2) Screen shot for VRC in OCR



VRC maker (Samsung) will be upgrad for the vrc system

No mimic board method, VRC System is communication method for valve signal in C

3) VRC Method : Dry contact for valve signal



NK -BULE BALLAST SYSTEM MAIN CONTROL PANEL (Position : Steering Gear Room)
 AMS MAIN MONITOR (Position : Engin Control Room)
 # NK BWTS Valve Signal

4) Screen shot for AMS in ECR



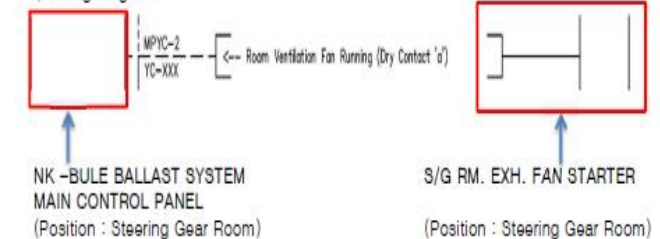
Generally, VRC signal received from AMS System, So BWTS VRC signal will receive the AMS panel Also, signal will receive from alarm bus for connection of cable.

Interface with S/G Room ventilation Fan

5. FAN

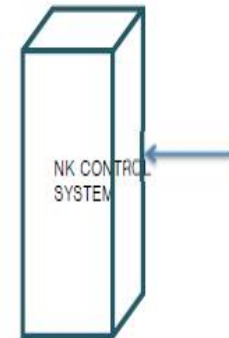
NK System need to the S/R room ventilation fan running signal

1) Wiring diagram



2) Screen shot for FAN

S/G RM. EXH FAN Starter panel located in S/G Room
 BWTS Main system install in S/G Room, so need to the exh fan signal



(Position : Steering Gear Room)
 NK -BULE BALLAST SYSTEM MAIN CONTROL PANEL



(Position : Steering Gear Room)

BWTS system will receive from s/g rm exh fan running signal

Supervisor

The representative of the service team presides the retrofit with proper action and supervising. The daily working report will be submitted everyday.

DAILY WORK REPORT

- SHIP'S NAME : SERI ANGGUN
- INSTALLED EQUIPMENT : ECS 1000B X 6 sets
- DATE : 6th June, 2019
- PROJECT MANAGER : Chris Ha, Jason Yi, Bonnie Kim

CATEGORY	CONTENTS	REMARK
WORK PROGRESS	<ol style="list-style-type: none"> Full welding the adjustable pipes for poly pipe fabrication (2 welder keep welding at night) Electric engineers finished to install the additional circuit breakers on MSBD NO1 and finished connect power cable Install to cable FB in E/R Preparation of power cable for circuit breakers on MSBD NO2 (additional staging would be installed on 7th of June: lack of man power in shipyard) Continue to install BA pipes. (Included for adjust pc's) Small pipes and some of equipment were brought on E/R Check the strainer maintenance under the BA pipe. (possible to open that) Installation of CPC. 	*working day to install additional circuit breaker (ship provide to carry out black out as below) 1) MSBD NO2(PORT) :3set -> 2day (4th~5th_June)-> finished until lunch 2) MSBD NO1(STBD) :1set-> 1days (6th_June)
ALL WORK PROGRESS STATUS	◆ TOTAL : 50 % 1. EQUIPMENT INSTALLATION : 30% 2. MAIN PIPE : 80 % 3. SMALL PIPE : 5 % 4. CABLE PULLING : 55% 5. CABLE CONNECTION : 10 % 6. OUTFITTING INSTALLATION : 30 % 7. SUPPORT INSTALLATION : 50 %	
PENDING ITEMS	<ol style="list-style-type: none"> When the existed pipe take out from butter fly valve (BA025 5k 600A), the rubber that is in valve is damaged. -> Need to repair the rubber from shipyard. One of fire line (50A) need to modify because of touching BA4-16 pipe. (when adjustable 4pc's galvanize fabrication, carry out together) Need to submit the compound powder CERT.(refer to attached files) Some equipment can be brought into E/R by rain 	
NEXT DAY WORKING PLAN	<ol style="list-style-type: none"> Pulling power cable in E/R Weld adjustable pipes as full welding (nightshift-until 7th of June) Put Equipment and install in E/R Connect power cable on circuit breakers (MSBD NO2) Install the small pipes 	
ETC.	ESTIMATED SCHEDULE : 27th May ~ 24th June(include commissioning) DOCK IN : 2nd June (16:00) DOCK OUT : 12th June	

STX Heavy Industries

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 E-mail : matt.kim@stxfac.kr, sales@stxfac.kr

WORK COMPLETION REPORT

- Report title WORK COMPLETION OF BWTS INSTALLATION
- Client Anglo Eastern Group
- Vessel name GEORGE N
- Location Lisnave shipyard, Portugal
- Period 2019.2.4 ~ 2019.2.18

A. BALLAST WATER TREATMENT SYSTEM INSTALLATION

- Please refer to daily work report for details
- All planned work has been completed (Piping system, Electric system, Outfitting system installation)
- If incomplete work is found, additional work will be performed under mutual agreement.

B. ADDITIONAL INFORMATION

Prepared by

Name James Moon

Designation [Signature]

Date 19th Feb. 2019

Client

Name [Signature]

Designation SR. VESSEL MANAGER

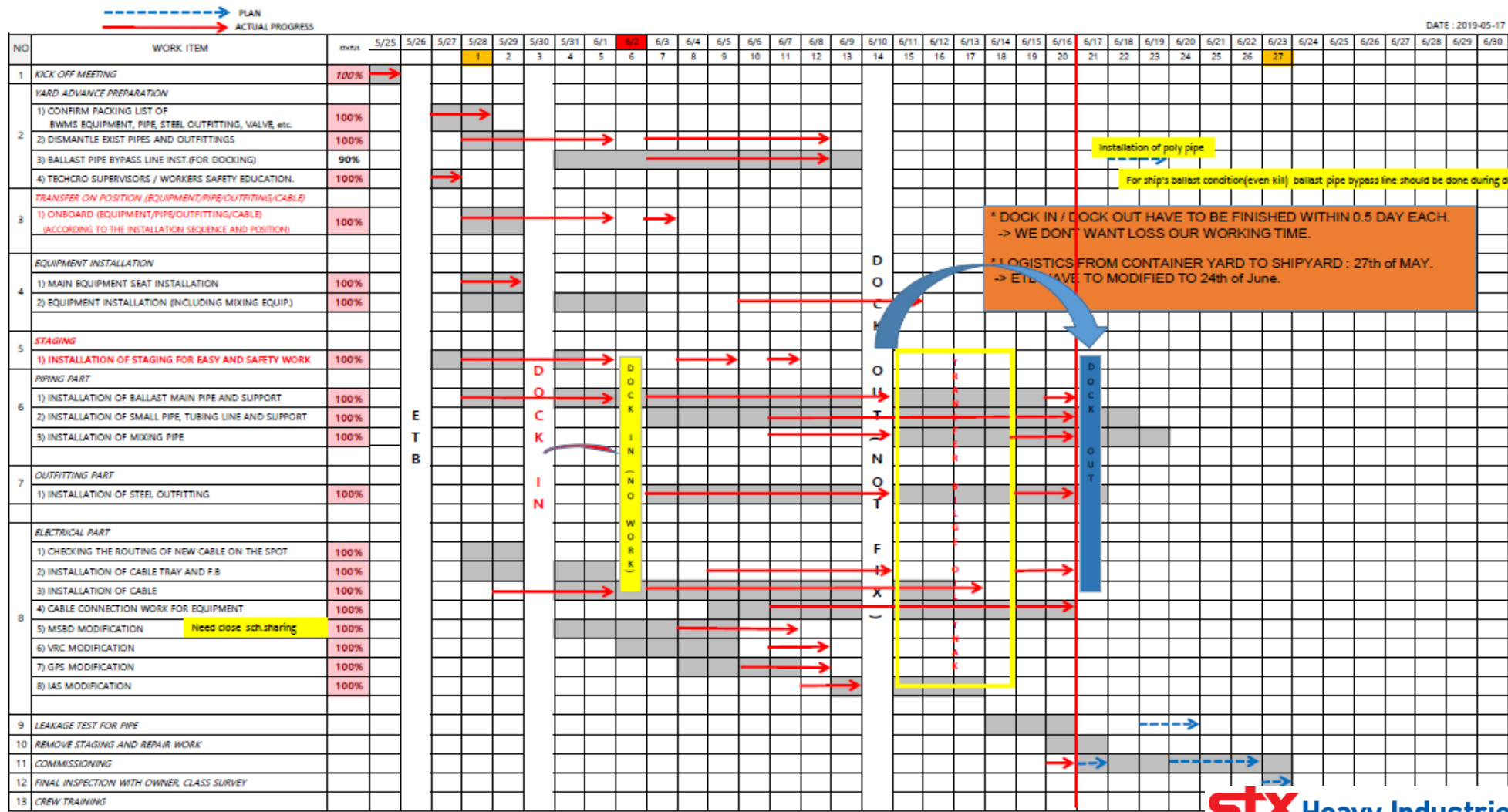
Date 23/02/19.

Supervisor

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The master schedule of the retrofit PJT will be set up and commenced per planning schedule. Based on the accumulated the experience of the service, the precaution with in-site supervision will be provided.

STX Heavy Industries Co., Ltd.



Achievement of retrofit

Electrolysis Type

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- 1) SERI ANGGUN
- 2) LNG JUPITER
- 3) N Series
 - GEORGE N / ERNEST N / TOKYO (JENNY N)
KAROLINE N / FRITZI N
- 4) SERENE SEA
- 5) MANATEE / CALA PAGURO / CALA PINGUINO /
LUCKY MERRY / HAPPY BEE
- 6) HYUNDAI SPLENDOR / HYUDAI GLOBAL
- 7) etc.



Achievement of retrofit

UV Type



- 1) TY Series
 - TY JOY / TY EVER / TY HAPPY
- 2) DAEWON
- 3) MARIGOLD
- 4) BAL STAR
- 5) DONG-A GLAUCOS
- 6) AS OLIVIA
- 7) etc.

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Achievement of retrofit

Ozone & Chemical Type

1) PACIFIC SERIES

- PACIFIC MERCHANTS / PACIFIC WINNER /
PACIFIC MARINER

2) RAYSUT

3) NORD INSPIRATION

4) etc.

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A/S & Commissioning

Leading the Ocean & Beyond



COMMISSIONING & A/S MANAGEMENT

Swift Correspondence & Action
Well-organized teamwork



PROFESSIONALITY

Professional engineers
with plenty of experiences
Expertise in BWTS



WORLDWIDE ENGINEERING SERVICE

Proficient in English
travel most of countries

For materializing and consultant of technical support and service, We, STX HI will provides the competitive solutions consequently bring cost effective reliable operation.

- Email : stx-hi-service@stxhi.com (Technical support – Retrofit, Dry dock, Eco-Friendly solution)
stx-hi-pst@stxhi.com (Parts Sales)

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