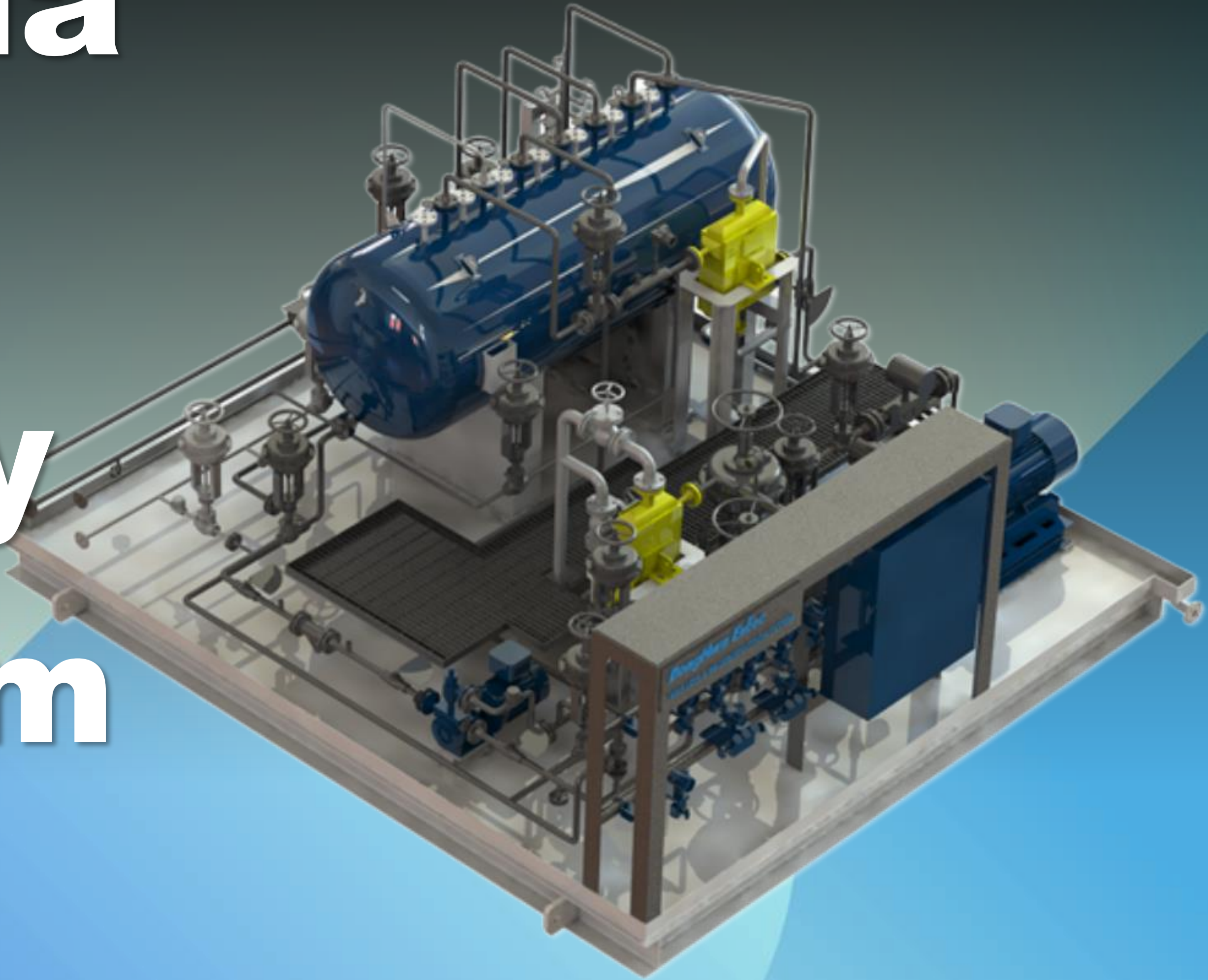
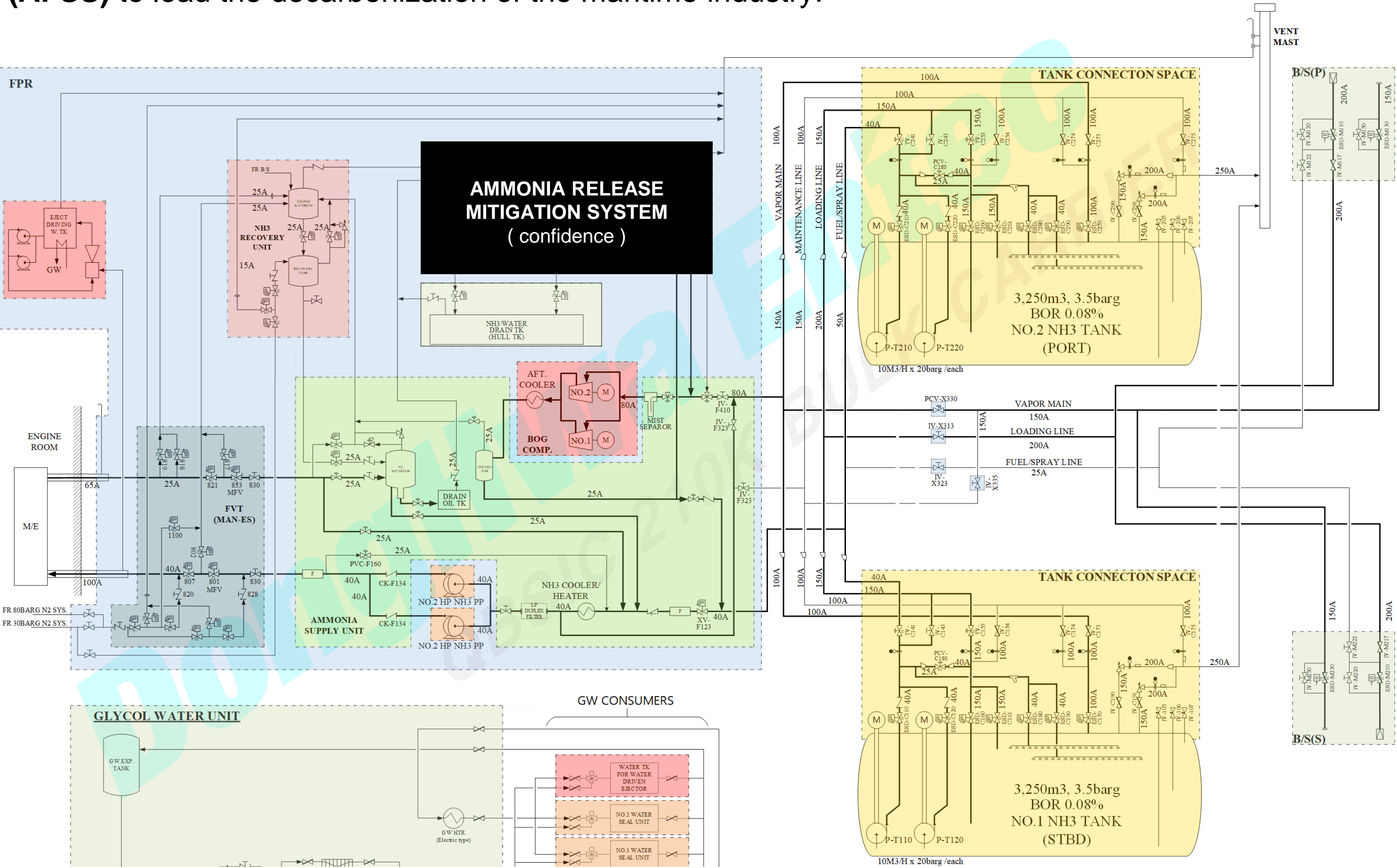


A monia
F uel
S upply
S ystem



DongHwa Entec (DHE) is a global leader in providing solutions for LNG Fuel Gas Supply Systems (FGSS) across numerous vessels. We are now developing the Ammonia Fuel Supply System (AFSS) to lead the decarbonization of the maritime industry.

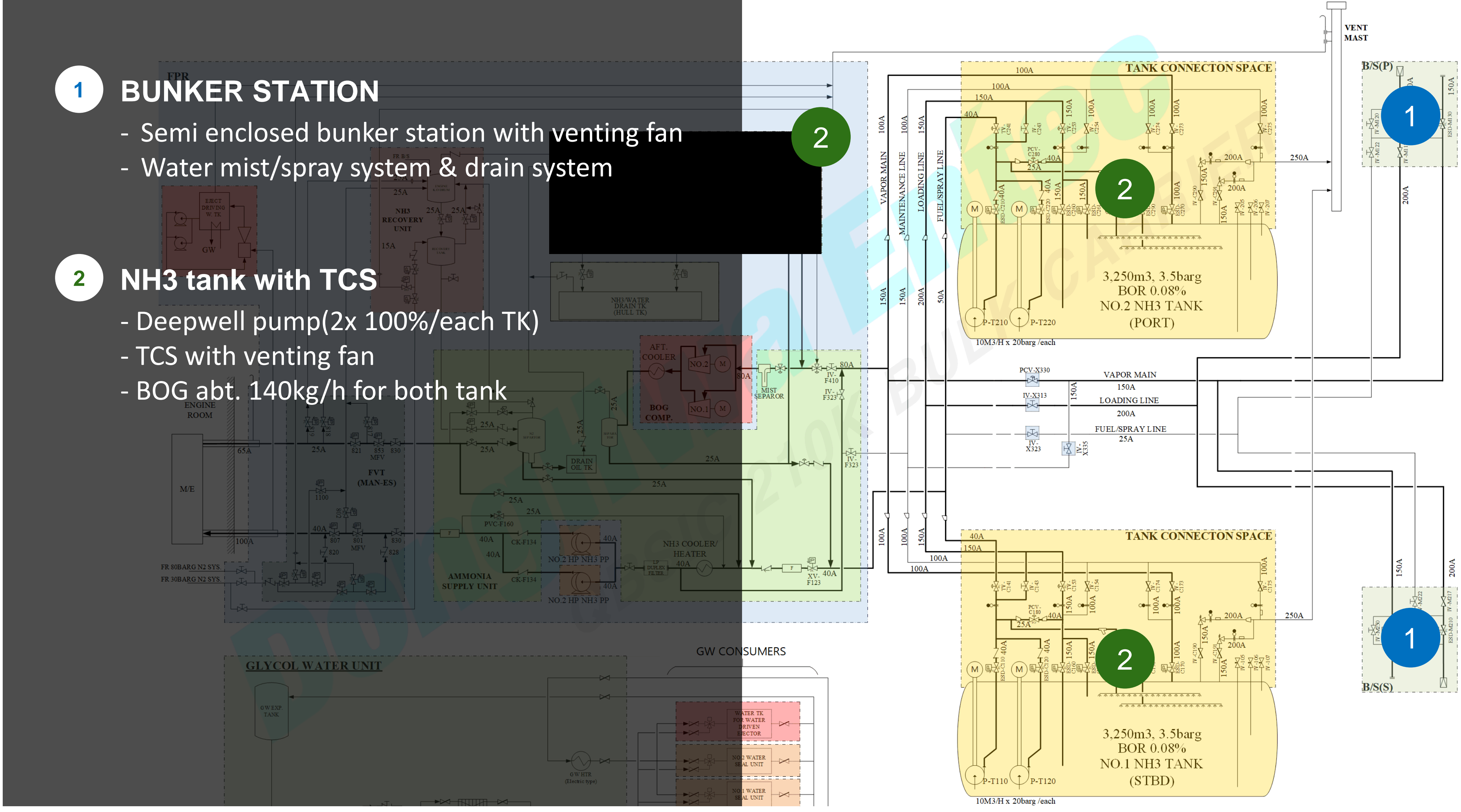


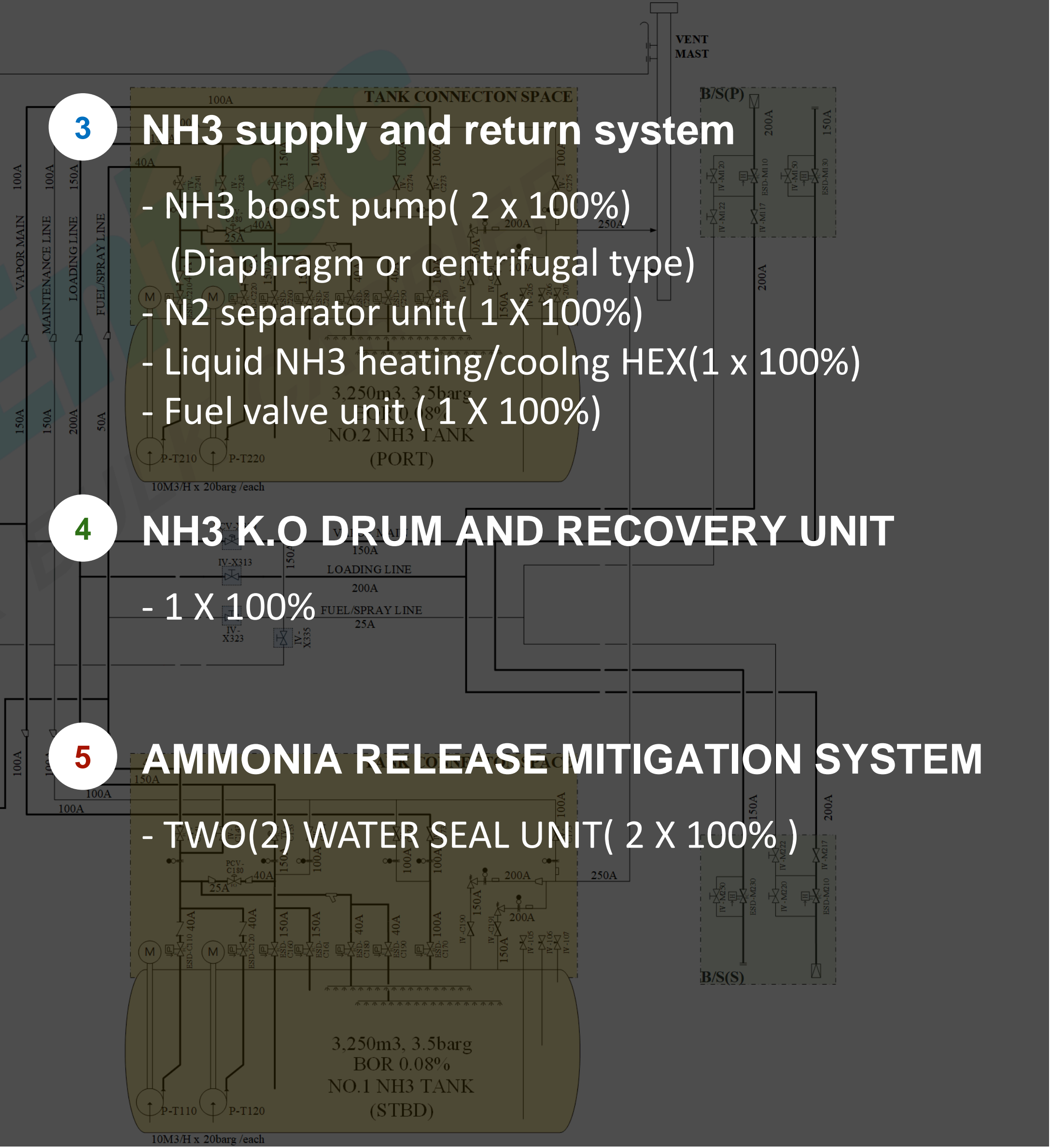
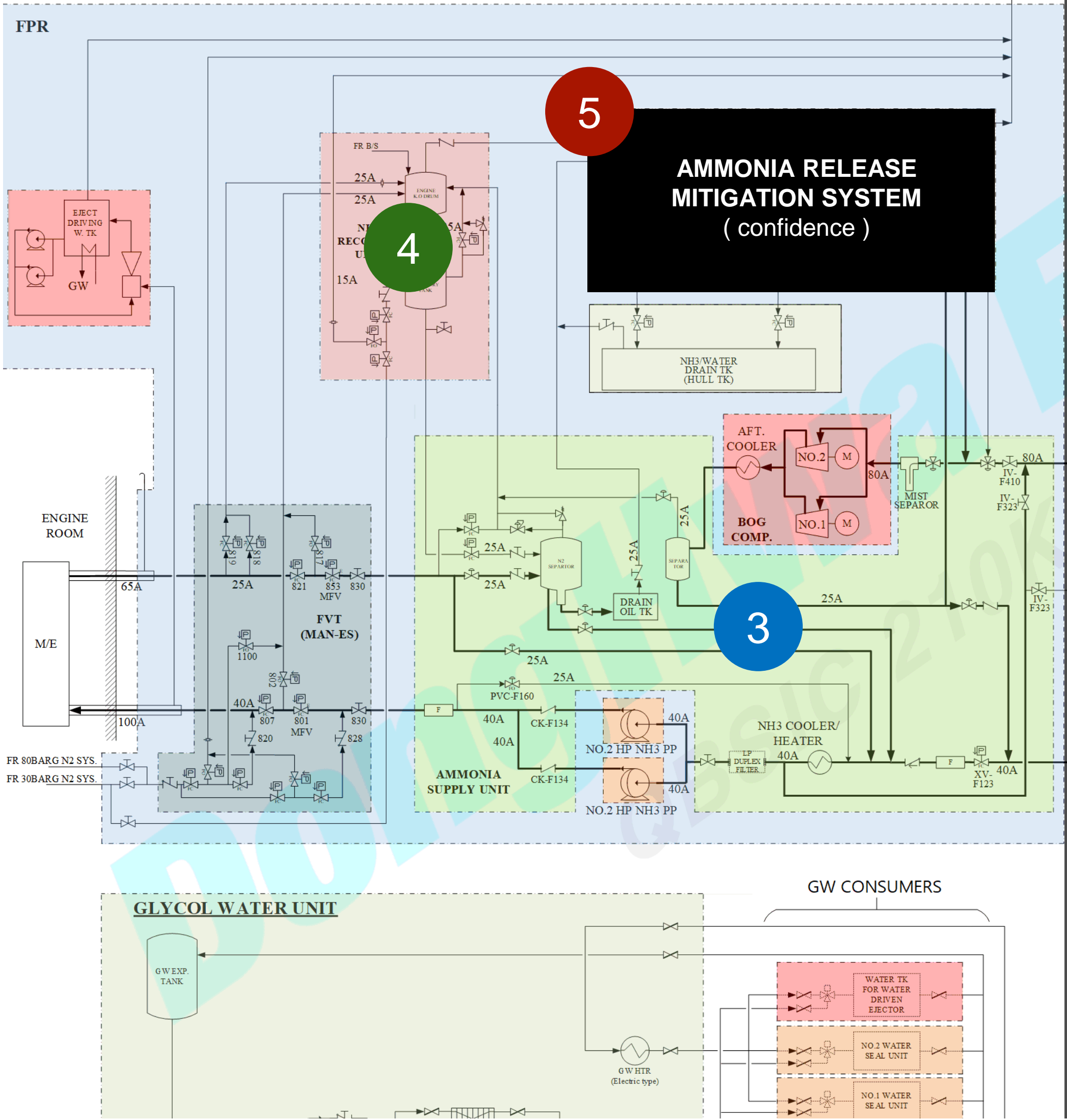
1 BUNKER STATION

- Semi enclosed bunker station with venting fan
- Water mist/spray system & drain system

2 NH3 tank with TCS

- Deepwell pump(2x 100%/each TK)
- TCS with venting fan
- BOG abt. 140kg/h for both tank





5 AMMONIA RELEASE MITIGATION SYSTEM (confidence)

4 NH3 K.O DRUM AND RECOVERY UNIT

3 AMMONIA SUPPLY UNIT

3 NH3 supply and return system

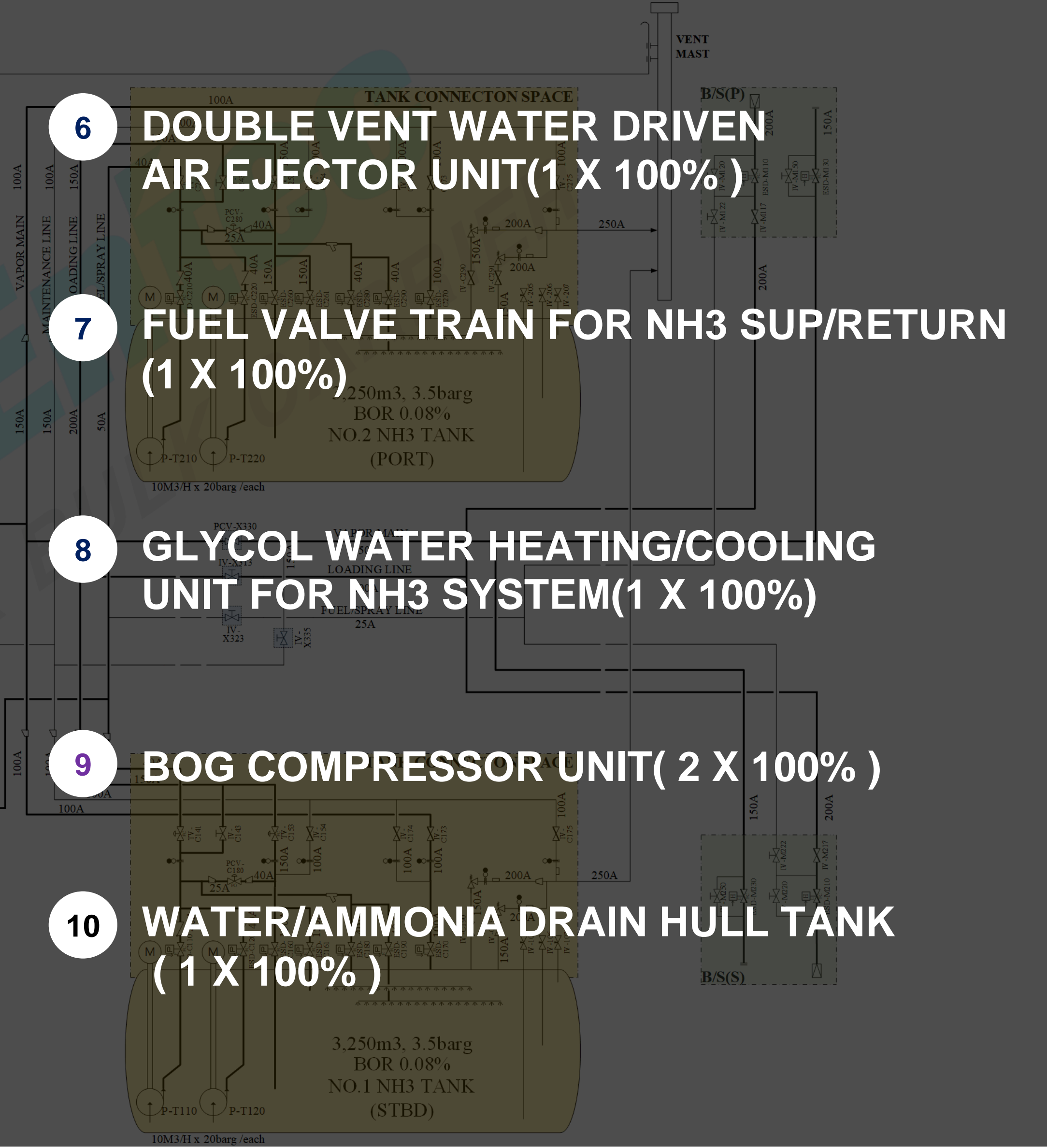
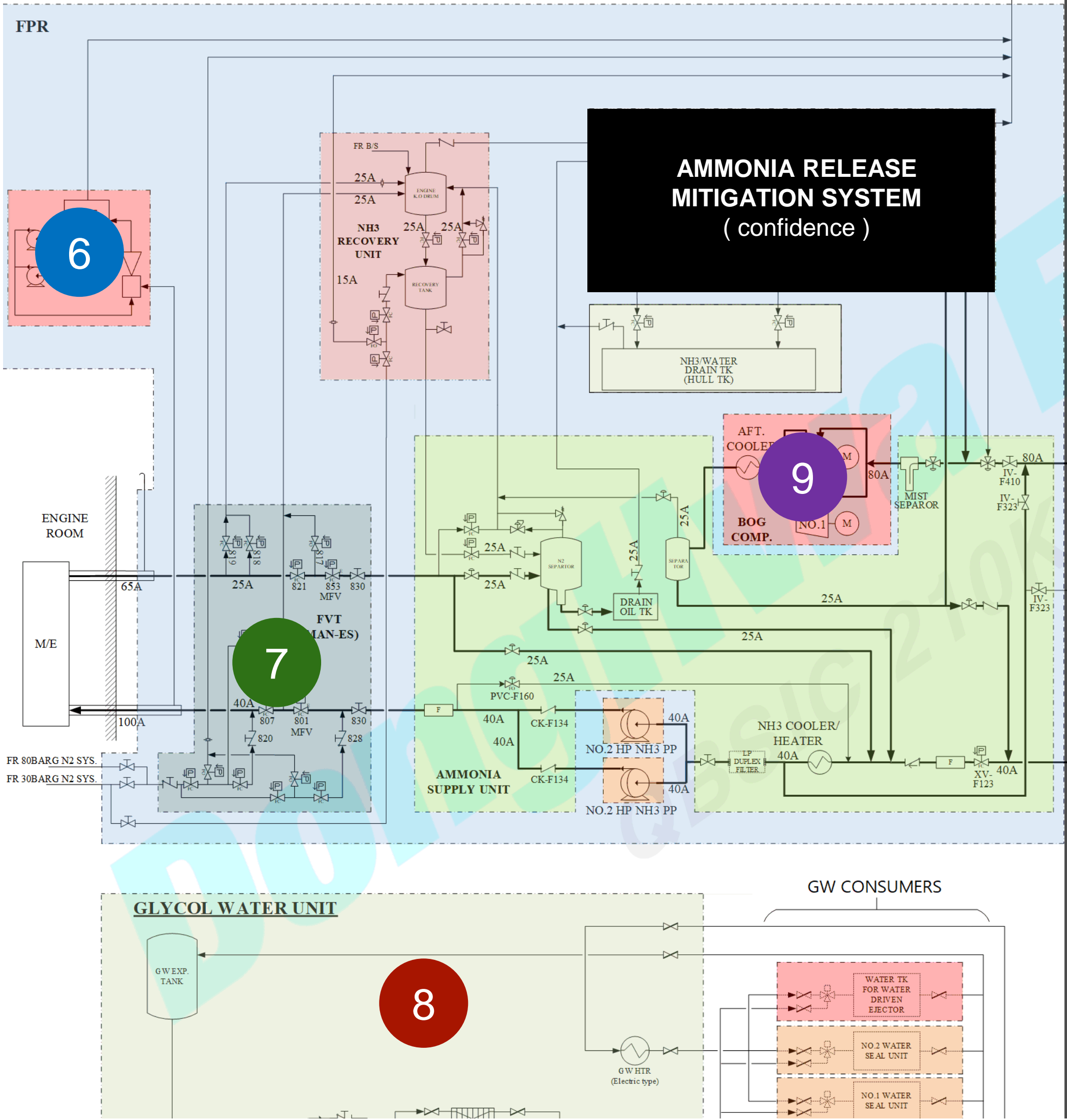
- NH3 boost pump(2 x 100%)
- N2 separator unit(1 X 100%)
- Liquid NH3 heating/cooling HEX(1 x 100%)
- Fuel valve unit (1 X 100%)

4 NH3 K.O DRUM AND RECOVERY UNIT

- 1 X 100%

5 AMMONIA RELEASE MITIGATION SYSTEM

- TWO(2) WATER SEAL UNIT(2 X 100%)



- 6 DOUBLE VENT WATER DRIVEN AIR EJECTOR UNIT(1 X 100%)
- 7 FUEL VALVE TRAIN FOR NH3 SUP/RETURN (1 X 100%)
- 8 GLYCOL WATER HEATING/COOLING UNIT FOR NH3 SYSTEM(1 X 100%)
- 9 BOG COMPRESSOR UNIT(2 X 100%)
- 10 WATER/AMMONIA DRAIN HULL TANK (1 X 100%)

HAZOP STUDY WITH ABS

NH3 LFSS Test Bed Module

HAZOP STUDY REPORT

Prepared for
DongHwa Pneutec Co., Ltd.
by
ABS Group Inc. AUH.

Document N°. 5120997/R001
Rev A
29 August 2023

위험도 대조표 (Risk profile)에서 사용한 대조표를 따라 도출된

Probability	
C	D
Occurred several times a year in operating company	Occurred several times a year in location

Continued

Fail to meet screening criteria

등급 점도 경감

PILOT-SCALE AFSS TEST WITH KOMERI

시험결과 확인서
(Test Results Confirmation)

시험정보 (Test Information)			
접수번호 (Receipt No.)	24T0925	회사명 (Company)	이동화연텍
시험항목 (Test Item)	온도 압력 유량 제어 안정성 평가	시험규격 (Test Standard)	신청자 요구사항
제품명 (Name of Product)	암모니아 연료공급시스템	모델명 (Model)	DHE-Ammonia LFSS
제품번호 (Serial No.)	-	시험기간 (Test Period)	2025. 01. 21.
시험결과 (Test Result)	적합		
상세 시험결과 (Detailed Test Results)			
비고 (Remark)	■ 적합성진단은 KOMERI 의사결정규칙에 따라 측정불확도를 고려하지 않음.		
승인 (Approved)	시험실무자 Test staff 성명 (Name) 이상기 이삼기	기술책임자 Technical manager 성명 (Name) 백세웅 백세웅	

발급일 (Date of issue) : 2025. 01. 22.

(재)한국조선해양기자재연구원 (인)
 The President of Korea Marine Equipment Research Institute (Signature)

KOMERI-Lab-P-78-05(2) 페이지(1) / 총(17)

Approval by Everllence (formerly MAN Energy Solutions)

LNG FGSS

AFSS

MAN Diesel & Turbo	
Info No.: 176686	Item Name: GAS SUPPL
Scale: A4	Product Type:
Date: 20170326	Dis: NKGO Cks: RSL A.C: Z4 DongH
Daewoo Shipbuilding & Marine	
Dong Chan Kim rice1k@dsme.co.kr Energy System R&D Institute, Res Daewoo Shipbuilding & Marine Er 221-17, Nonhyun-Dong, Gangnam Phone: +82(0)2-2129-3743, Fax:	
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DongHwa Entec	
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MAN Energy Solutions

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To: DongHwa Entec	E-mail: kth@dth.co.kr
Att.: Mr. Thomas Kim	
c.c.: -	E-mail: -
Att.: -	
Your ref.: Approved vendors for AFSS – MAN B&W ME- LGIA – 16178-2024	Number of pages: 3 (incl. this page)
Our dept./ref.: ELIX16178-2024	Date: 04 July 2024

Approved vendors for Fuel Supply and Auxiliary Systems for MAN B&W Ammonia engines

MAN ES are in the process of introducing MAN B&W engines that can run on ammonia to the market. Here, safety is of the highest importance. MAN ES have to ensure personnel safety, and safe operation of not only the main engine, but also of the auxiliary systems. MAN ES' focus is to avoid dangerous situations that could lead to personal injury and to avoid the risk of these dangerous situations affecting MAN ES' reputation, whatever the cause of such an incident. Many of our potential customers have expressed the same concern.

In order to ensure a safe operation of ammonia running vessels, MAN ES introduce Fuel Supply and Auxiliary Systems as controlled components, hence, there is a need for Approved Vendors for such systems. We have therefore decided that the equipment, shown in *Figure 1*, must be approved by MAN ES for quality and safety – not functionality, with regards to:

- Quality management system
- Design standards
- Welding standards
- Qualified personnel (welders)
- Manuals existing with focus on safe maintenance
- Risk assessment will be done with participation of MAN ES

MAN ES approval will not include e.g. P&ID, functionality of the systems or check of electrical wiring.



AIP WITH KR



DHE PATENT OF AMMONIA FUEL SUPPLY SYSTEM

특허증
CERTIFICATE OF PATENT

10-2024-0113654

0-2024-0113654
2024년 07월 23일

특허 제 10-2765131 호
Patent Number

출원번호 제 10-2023-0005345 호
Application Number

출원일 2023년 01월 13일
Filing Date

등록일 2025년 02월 04일
Registration Date

발명의 명칭 Title of the Invention
선박용 암모니아 연료공급시스템

특허권자 Patentee
주식회사 동화엔텍(180111-*****)
부산광역시 강서구 녹산산단261로 7 (송정동)

발명자 Inventor
등록사항만에 기재

본 발명은 「특허법」에 따라 특허위원회에 등록되었음을 증명합니다.
This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.

2025년 02월 04일

특허청장
COMMISSIONER,
KOREAN INTELLECTUAL PROPERTY OFFICE

김완기

특허증
CERTIFICATE OF PATENT

공개특허 10-2024-0028375

11) 공개번호 10-2024-0028375
43) 공개일자 2024년 03월 05일

특허 제 10-2707772 호
Patent Number

출원번호 제 10-2024-0020821 호
Application Number

출원일 2024년 02월 14일
Filing Date

등록일 2024년 09월 12일
Registration Date

발명의 명칭 Title of the Invention
선박용 암모니아 처리 및 재생시스템

특허권자 Patentee
주식회사 동화엔텍(180111-*****)
부산광역시 강서구 녹산산단261로 7 (송정동)

발명자 Inventor
등록사항만에 기재

본 발명은 「특허법」에 따라 특허위원회에 등록되었음을 증명합니다.
This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.

2024년 09월 12일

특허청장
COMMISSIONER,
KOREAN INTELLECTUAL PROPERTY OFFICE

김완기

암모니아 및 질소용 각자 공급반이 혼합시키는 혼합탱크는 것으로, 상기 혼합탱크로부터 암모니아 및 질소 혼합 탱크와, 상기 혼합탱크와 용해탱크 사이에

国家知识产权局

100095
北京市海淀区温泉镇高里掌路1号院3号楼 北京铭硕知识产权代理有限公司
王文虹(010-83038188)金海龙(010-83038188)

发文日:
2024年09月29日

申请号: 202411368494.9 发文序号: 2024092900704750

专利申请受理通知书

根据专利法第28条及其实施细则第43条、第44条的规定, 申请人提出的专利申请已由国家知识产权局受理。现将确定的申请号、申请日等信息通知如下:
申请号: 2024113684949
申请日: 2024年09月29日
申请人: 赵诚甲, 李允赫, 徐仁德, 金贞贤
发明创造名称: 船舶用氨处理以及再生系统
经核实, 国家知识产权局确认收到文件如下:
权利要求书 1份 1页, 权利要求项数: 5项
说明书 1份 8页
说明书附图 1份 4页
说明书摘要 1份 1页
专利代理委托书 1份 2页
经证明的在先申请文件副本 1份 1页
发明专利请求书 1份 5页
实质审查请求书 文件份数: 1份
优先权文件数字投入服务(DAS)请求书 文件份数: 1份
申请方案卷号: MSP2409179

提示:
1. 申请人收到专利申请受理通知书之后, 认为其记载的内容与申请人所提交的相应内容不一致时, 可以向国家知识产权局请求更正。
2. 申请人收到专利申请受理通知书之后, 再向国家知识产权局办理各种手续时, 应当写明申请号。

审查员: 自动受理
联系电话: 010-62356655

审查部: 专利审查业务章

2003.01 纸件申请, 即函请查; 100088 北京市海淀区前门内大街6号 国家知识产权局专利局受理处
2023.03 电子申请, 应当通过专利业务办理系统以电子文件形式提交相关文件。除另有规定外, 以纸件等其他形式提交的文件视为未提交。

A monia
F uel
S upply
S ystem

