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| PETROBRAS | **TECHNICAL SPECIFICATION** | Nr: **I-ET-3010.2E-5336-661-P4X-001** | |
| | **CLIENT:** SRGE | | **SHEET:** 1 of 17 |
| | **JOB:** REFERENCE HULL 01 | | |
| | **AREA:** - | | |
| **SRGE** | **TITLE:** **SLOP TREATMENT UNIT** | | INTERNAL |
| | | | ESUP |

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## INDEX OF REVISIONS

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| DATE | OCT/10/22 | DEC/14/22 | | | | | | | |
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# 1. INTRODUCTION

## 1.1. OBJECTIVE

The purpose of this technical specification is to describe the minimum requirements for the design, manufacturing, assembly, supply, installation and testing of SLOP TREATMENT UNIT (Z-5336501) in conformance with relevant regulations and REFERENCE HULL 01 FPSO design documentation, conceived to treat oily water from Slop Tanks, prior its proper discharge overboard to the sea.

## 1.2. DEFINITIONS

PACKAGE: It is defined as an assembly of equipment supplied interconnected, tested and ready to operate, requiring only the available utilities from the Unit for the Package operation.

PACKAGER: It is defined as the responsible for project, assembly, construction, fabrication, testing and furnishing of the Package.

All definitions are found on I-ET-3010.00-1200-940-P4X-002 – GENERAL TECHNICAL TERMS

## 1.3. ABBREVIATIONS

| | |
|---|---|
| CS | Classification Society |
| FAT | Factory Acceptance Tests |
| FPSO | Floating Production Storage and Offloading Unit |
| SOS | Supervisory and Operation System |
| SOS-HMI | Human Machine Interface of SOS |

# 2. NORMATIVE REFERENCES

## 2.1. INTERNATIONAL CODES, RECOMMENDED PRACTICES AND STANDARDS

The equipment will be designed and manufactured in accordance with the following codes and standards, if not mentioned otherwise.

- ASME B16.5 – Pipe Flanges & Flanged Fittings
- ASME B31.3 – Process Piping
- AWS D1.1 – Structural Welding Code
- ISO International Standard Organization
- VDE / IEC German National Electric Standard Codes / International
- Electric Codes
- MARPOL 73/78 Convention

- IMO Marine Environment Protection Committee 1975
- Resolution IMO MEPC 107 (49) 2003
- Classification Society defined for the Hull scope.

### 2.2. BRAZILIAN CODES AND STANDARDS

- NR – Brazilian Federal Government Regulatory Norms (Normas Regulamentadoras NRs)
- NORMAM-01 – Normas da Autoridade Marítima para Embarcações Empregadas na Navegação em Mar Aberto.
- INMETRO Resolution 115, Mach 21st 2022 (hazardous areas)

### 2.3. CLASS APPROVAL AND CERTIFICATION

The PACKAGE shall be designed, manufactured and tested according to the design reference documents, normative requirements and in accordance with the latest editions of Classification Society Rules, Regulations and Standards.

## 3. REFERENCE DOCUMENTS

### 3.1. REFERENCE HULL 01 FPSO DESIGN

| REF DOC NUMBER | REF DOC NAME |
|---|---|
| **HULL SYSTEMS** | |
| I-DE-3010.2E-5336-944-P4X-005 | SLOP DISCHARGE SYSTEM |
| I-DE-3010.2E-6124-944-P4X-001 | HULL SERVICE AND INSTRUMENT AIR DISTRIBUTION |
| I-DE-3010.2E-5115-944-P4X-003 | FRESH, HOT AND POTABLE WATER SYSTEM DISTRIBUTION |
| I-FD-3010.2E-5336-661-P4X-001 | SLOP TREATMENT CENTRIFUGES |
| I-MD-3010.2E-1200-940-P4X-027 | DESCRIPTIVE MEMORANDUM - HULL SYSTEMS |

### 3.2. TYPICAL DOCUMENTS

| REF DOC NUMBER | REF DOC NAME |
|---|---|
| **GENERAL** | |
| I-ET-3000.00-0000-940-P4X-002 | SYMBOLS FOR PRODUCTION UNITS DESIGN |
| I-ET-3010.00-1200-940-P4X-002 | GENERAL TECHNICAL TERMS |
| I-ET-3000.00-1200-940-P4X-001 | TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN |
| I-ET-3010.00-1200-588-P4X-001 | SAMPLE CONNECTIONS |
| **CONSTRUCTION** | |
| I-ET-3010.00-1200-955-P4X-001 | WELDING |
| I-ET-3010.00-1000-970-P4X-002 | REQUIREMENTS FOR NDT |
| I-ET-3010.00-1200-955-P4X-002 | REQUIREMENTS FOR WELDING INSPECTION |
| I-ET-3010.00-0000-970-P4X-001 | REQUIREMENTS FOR PROCEDURES AND PERSONNEL QUALIFICATION AND CERTIFICATION |
| **MECHANICAL** | |
| I-ET-3010.00-1200-300-P4X-001 | NOISE AND VIBRATION CONTROL REQUIREMENTS |
| **PAINTING** | |
| I-ET-3010.00-1200-956-P4X-002 | GENERAL PAINTING |
| DR-ENGP-I-1.15 | COLOR CODING |
| **SAFETY** | |
| I-ET-3010.00-5400-947-P4X-002 | SAFETY SIGNALING |
| DR-ENGP-M-I-1.3 | SAFETY ENGINEERING |
| **PIPING** | |
| I-ET-3010.00-1200-251-P4X-001 | REQUIREMENTS FOR BOLTING MATERIALS |

| | |
|---|---|
| I-ET-3010.00-1200-200-P4X-115 | REQUIREMENTS FOR PIPING FABRICATION AND COMMISSIONING |
| I-ET-3010.2E-1200-200-P4X-001 | PIPING SPECIFICATION FOR HULL |
| **ELECTRICAL** | |
| I-DE-3010.00-5140-700-P4X-003 | GROUNDING INSTALLATION TYPICAL DETAILS |
| I-ET-3010.00-5140-700-P4X-001 | SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS |
| I-ET-3010.00-5140-700-P4X-002 | SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS |
| I-ET-3010.00-5140-700-P4X-003 | ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS |
| I-ET-3010.00-5140-712-P4X-001 | LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS |
| **INSTRUMENTATION AND AUTOMATION** | |
| I-ET-3010.00-1200-800-P4X-002 | AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS |
| I-ET-3010.00-1200-800-P4X-013 | GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS |
| I-ET-3010.00-5520-888-P4X-001 | AUTOMATION PANELS |
| I-ET-3010.00-1200-800-P4X-015 | REQUIREMENTS FOR TUBING AND FITTING (ALIGNED TO IOGP-JIP33 S-716) |

### 3.3. SPECIFIC PROJECT DOCUMENTS

| REF DOC NUMBER | REF DOC NAME |
|---|---|
| **GENERAL** | |
| I-DE- GENERAL ARRANGEMENT | GENERAL ARRANGEMENT |
| I-DE- AREA CLASSIFICATION – GENERAL | AREA CLASSIFICATION – GENERAL |

| | |
|---|---|
| I-ET- AUTOMATION INTERFACE OF PACKAGE UNITS | AUTOMATION INTERFACE OF PACKAGE UNITS |
| I-ET- METOCEAN DATA | METOCEAN DATA |
| I-RL- GENERAL SPECIFICATION FOR AVAILABLE UTILITIES | GENERAL SPECIFICATION FOR AVAILABLE UTILITIES |
| I-RL- MOTION ANALYSIS | MOTION ANALYSIS |
| I-ET- FIELD INSTRUMENTATION | FIELD INSTRUMENTATION |
| I-ET- INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS | INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS |
| I-DE- GENERAL NOTES | GENERAL NOTES |

Table 1 – Reference Documents

Note: for these above item 3.3 documents, title and number may vary slightly from one project to another. Project's document list shall be consulted to verify the correct document number and title.

## 4. DESIGN REQUIREMENTS

### 4.1. DESIGN CONDITIONS

4.1.1. PACKAGE Equipment shall be designed for a 30-year life in a corrosive offshore environment without the need for replacement of any major component due to wear, corrosion, fatigue, or material failure.

4.1.2. PACKAGER shall design the equipment for the full range of operational conditions as specified in this technical specification.

4.1.3. PACKAGE Equipment shall be designed with the compliance of the normative and design requirements as stated in this specification and complying with the technical parameters stated on the above item 3 with the REFERENCE HULL 01 FPSO basic design reference documents.

4.1.4. Where applicable on a FPSO, the whole slop treatment unit Package and its components must observe specific international regulations such as Resolution IMO MEPC 107 (49) 2003, and the correlates IMO Marine Environment Protection Committee 1975 and MARPOL 73/78 Convention.

4.1.5. All elements of the PACKAGE shall be of proven design and well within the manufacturer's actual experience.

### 4.2. SAFETY REQUIREMENTS

4.2.1. Personnel safety protection shall be provided according to Brazilian Regulatory Norms (NR) issued by Brazilian Government.

4.2.2. Warning signs in Brazilian Portuguese language shall be provided where risk of personnel injury exist.

4.2.3. Rotating equipment outer parts, such as pulleys, couplings, belts and flywheels, shall have rigid protection, manufactured with aluminum ASTM B211 and shall be capable of being easily removed.

4.2.4. In accordance with the requirements of SOLAS II-1, Regulation 3-5, and MSC.1/Circ. 1379, all equipment and material to be supplied by PACKAGER shall be “asbestos free”.

4.2.5. Safety signaling shall be in full compliance with I-ET-3010.00-5400-947-P4X-002 – SAFETY SIGNALING.

4.2.6. For additional safety requirements refer to DR-ENGP-M-I-1.3 – SAFETY ENGINEERING GUIDELINE.

### 4.3. NOISE AND VIBRATIONS

4.3.1. Noise and vibrations limits shall be in conformance with I-ET-3010.00-1200-300-P4X-001 – NOISE AND VIBRATION CONTROL REQUIREMENTS.

### 4.4. MOTIONS AND ACCELERATION

4.4.1. All equipment shall be able to withstand with the UNIT subjected to 100-year return period environmental conditions.

4.4.2. All equipment shall be able to operate with the UNIT subjected to 1-year return period environmental conditions.

4.4.3. All environmental conditions are defined in I-ET-METOCEAN DATA.

4.4.4. For the Hull loading conditions details and the maximum designed operational trim and heel inclinations refer to I-ET-3010.2E-1350-960-P4X-003 – DESIGN PREMISSES - NAVAL ARCHITECTURE.

4.4.5. For the FPSO displacement and accelerations refer to I-RL–MOTION ANALYSIS.

4.4.6. PACKAGE is also to withstand inertial forces during transportation from construction site to the final offshore location.

## 5. PACKAGE SCOPE OF SUPPLY

### 5.1. SCOPE OF SUPPLY

5.1.1. PACKAGE shall be supplied as the following minimum components:

| Equipment | TAG | Qty |
|---|---|---|

| | | |
|---|---|---|
| SLOP TREATMENT UNIT | Z-5336501 | 1 |

Table 2 – PACKAGE Scope of Supply

5.1.2. Preferably the Slop Treatment Unit shall be provided in a sole Skid. If it is not possible due to space restrictions on main deck or due to Packager limitation, two (2) skids shall be provided, both positioned close to each other on main deck. The following equipment or components shall be supplied by the Slop Treatment Unit Packager, as integral parts of the Package, inside its Skid limits:

- 2 x 100% Slop Treatment Centrifuges (SC-Z-5336501-A; SC-Z-5336501-B), 50m3/h capacity each, driven by electrical induction motors. The centrifuges shall operate isolated (50m3/h capacity) or simultaneously (100m3/h).
- Two (2) slop treatment centrifuges integral Control Panels; one for each centrifuge.
- Two (2) integral centrifuge Sludge Collection Tanks, to collect Sludge (solids and residual water), result of the Slop Treatment Unit, prior its discharge back to Slop Tanks.
- Two (2) integral positive displacement Sludge Pumps to periodically pump the sludge (solids and residual water) from the sludge collection tanks of each Centrifuge to the Slop Tanks.
- Two (2) integral centrifuge devices (or pumps) to forward separated oil to Slop Tanks.
- Two (2) integral centrifuge devices (or pumps) to forward separated water to overboard discharge (treated water) or its return to Slop Tanks (non-treated water).
- Two (2) FIT Flowmeters to measure and totalize treated water directed to overboard discharge.
- Slop Treatment Unit Package Control Valves.
- Two (2) Oil Content Sensor AIT, on Centrifuges unified outlet, commanding via Control Valves, the treated effluent water to overboard discharge or return untreated effluent water to Slop Tanks.
- One (1) Slop Treatment Centrifuges Heater, receiving water from FRESH, HOT AND POTABLE WATER SYSTEM DISTRIBUTION (I-DE-3010.2E-5115-944-P4X-003). Auxiliary systems data are informed on I-RL- GENERAL SPECIFICATION FOR AVAILABLE UTILITIES.

5.1.3. PACKAGE shall be connected, wired and supplied as a complete unit, ready for installation and operation.

5.1.4. Additionally, all piping interconnections, flanges, valves, control valves, instruments and all other necessary accessories shall be supplied by PACKAGER

in order to ensure the required performance degree of the PACKAGE under safe conditions. All of those items shall be installed within Skid limits.

## 5.2. EQUIPMENT LOCATION

5.2.1. SLOP TREATMENT UNIT shall be installed on Main Deck, a classified area, aft-portside. All applicable hazardous area certificates shall be supplied.

5.2.2. For equipment location both I-DE- GENERAL ARRANGEMENT and I-DE- AREA CLASSIFICATION – GENERAL shall be considered.

# 6. PACKAGE SPECIFICATION

## 6.1. GENERAL

6.1.1. Slop Treatment Unit (Z-5336501) Package has the purpose to treat oily waters received in Slop Tanks TQ-5336506P/S and discharge treated water overboard.

6.1.2. According to Figure 1 bellow, besides the two Slop Treatment Centrifuges SC-Z-5336501 A/B, 50 $m^3$/h capacity each, the skid shall be provided with internal by-pass.

6.1.3. The Skid shall be provided with an Oil Content Sensor AIT to check the oil content of the effluent water after the centrifugation process. If it is less or equal to 15 ppm the discharge (treated effluent water) shall be automatically directed overboard to sea. If the oil content is higher than 15 ppm the discharge (untreated effluent water) shall be automatically returned to the slop tanks.

6.1.4. The Skid shall be provided with control valves to divert the discharge of treated or untreated effluent water automatically. On the treated water overboard discharge line stream, two (2) sequential redundant control valves shall be provided, one of them shall have a “fail close” (FC) actuator and the other “fail let” (FL). The untreated effluent water control valve (slop discharge) shall have a “fail open” (FO) actuator.

6.1.5. According to Figure 1, the slop treatment unit Skid shall be provided with two (2) FIT Flowmeters to indicate and record the amount of treated effluent water discharged overboard. The FIT Flowmeters shall be integrated with FPSO supervisory system in the control room.

6.1.6. A total of two (2) Oil Content Sensor AIT shall be provided as part of the PACKAGE, one (1) installed on the skid, and the other (backup), shall have all its infrastructure (sampling conditioning, probe, cables, etc.) mounted on the skid, but the analyzer itself shall be kept dismounted, in the platform warehouse. The backup AIT sensor is indicated as item (2) on Figure 1. A logic shall be carried out to define which of the two analyzers is operational and, therefore, is commanding the valves.

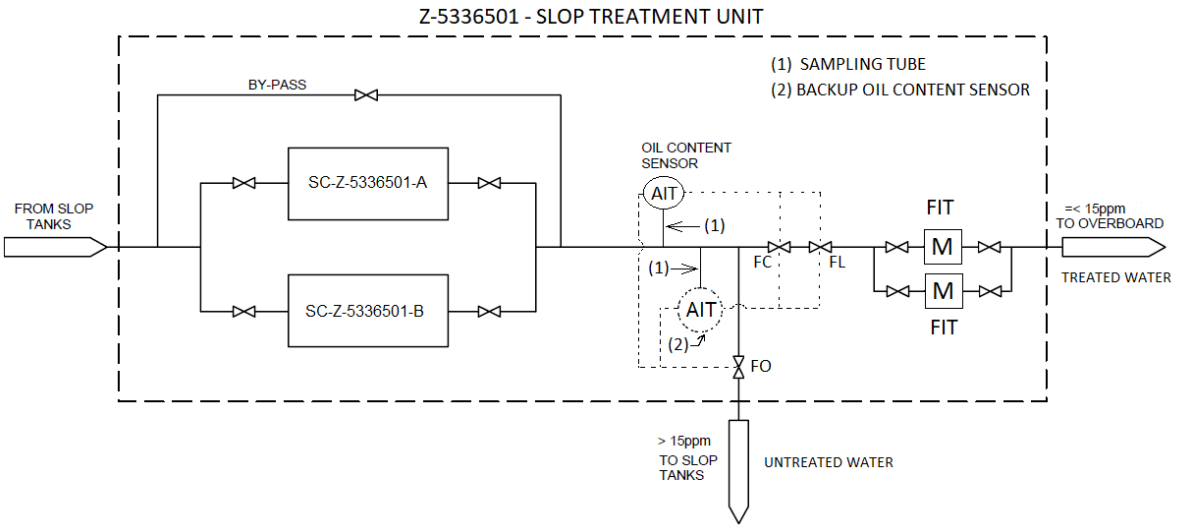


Figure 1 – Slop Treatment Scheme

6.1.7. The skid shall be provided by PACKAGER with protections against oily water inlet low or no-flow or inlet overflow to avoid centrifuges damage. It shall be provided centrifuges integral control valves and FITs (flow indicator and transmitters) to regulate flow through each centrifuge, allowing inlet overflows to be diverted back to slop tanks using a dedicated recirculation line, as indicated in I-DE-3010.2E-5336-944-P4X-005. The detailed design of the recirculation line and flow control is PACKAGER's scope and is not represented in Figure 1. These centrifuges protections shall be able to stop the centrifuges.

6.1.8. The Skid shall be provided with inlet oily water low and high pressure protection to avoid centrifuges damage. These additional protections shall be conceived, despite the centrifugal submerged pumps, feeding the Slop Treatment Unit, own flow and pressure control. These centrifuges protections shall be able to stop the centrifuges.

6.1.9. The main pumps to send oily water from Slop Tanks to the Slop Treatment Unit are the Slop Discharge Pumps B-5336503A/B, 100 $m^3$/h capacity each, one pump in each slop tank. Alternatively, Slop Pumps B-5271501A/B, 450 $m^3$/h capacity each, one in each Slop Tank, could be aligned to this purpose, as back-up pumps.

6.1.10. The Centrifuges shall be self-cleaning, with the skid supplied with a heater, fed from a FRESH, HOT AND POTABLE WATER SYSTEM DISTRIBUTION (I-DE-3010.2E-5115-944-P4X-003) outlet, to allow in-place cleaning procedures.

6.1.11. The sludge (solids and residual water) retained in the Sludge Collection Tanks shall be discharged to Slop Tanks by their respective positive displacement Pumps. These pumps shall have sufficient head to prevent clogging by debris at the line's siphon outlets inside slop tanks, 400 mm above bottom plate, with slop tanks fully loaded and maximum design pressure in each slop tank inert gas atmosphere of 2000 mm H2O (g) - HYDROCARBON AND INERT GAS DISTRIBUTION SYSTEM (I-DE-3010.2E-5241-944-P4X-004).

6.1.12. The positive displacement sludge pumps shall be protected against overpressure. This protection shall be able to stop the positive displacement sludge pumps.

6.1.13. For structural works PACKAGER / MANUFACTURER shall follow requirements of item 8.2 of this technical specification. For bolt and nuts materials apply the requirements of I-ET-3010.00-1200-251-P4X-001 – REQUIREMENTS FOR BOLTING MATERIALS.

6.1.14. For the Centrifuges Low-Voltage Induction Motors, see item 7.1 of this technical specification.

6.1.15. For the Centrifuges Panels, see item 7.1 of this technical specification.

6.1.16. General requirements for instruments, valves and accessories are as the following:

- The level gauges shall be installed in such position that the level indicated in receiver will be easily seen. All level gauges shall have flanged connections, which can be isolated and be complete with vent and drain, valves and connection.

- All valves shall be positioned with the stem pointing upwards. They shall be located in such a way that the hand wheel or actuator will not obstruct walkways, being easily accessible for O&M activities. Where hand operated valves are not easily operable, gear operated valves shall be used.

- Valves, instruments, etc. elevated 1.75 m above the floor, shall have access ladders or platform provided.

- Sampling point / facilities shall be provided complete with necessary fittings and valves, and the design shall reflect nature of the fluids being sampled.

## 6.2. FLOWMETERS AND OIL CONTENT SENSOR SPECIFIC REQUIREMENTS

6.2.1. According to Figure 1 above, the two FIT Flowmeters shall be installed in parallel with their respective isolating valves, constantly measuring the flow of treated effluent water discharged to sea, if the oil content sensor AIT detects the effluent water is adequately treated.

6.2.2. One FIT Flowmeter will measure the treated water flow to overboard, while the second is conceived as installed spare.

6.2.3. The two FIT Flowmeters shall be of magnetic type and shall comply with I-ET-FIELD INSTRUMENTATION.

6.2.4. The oil content sensors AIT shall be Petrobras type approved. For more details, see I-ET- FIELD INSTRUMENTATION.

6.2.5. The oil content constantly measured by oil content sensor AIT must be indicated in SOS-HMI. In case the oil content sensor AIT detects an oily water

contamination above or equal to 15 ppm, there must be a specific alarm in the Central Control Room.

6.2.6. The oil content sensor AIT sampling tubes (indicated on Figure 1) shall comply with requirements of I-ET-3010.00-1200-588-P4X-001 - SAMPLE CONNECTIONS. A 'SC8 H1' type of sample connection shall be used. The sampling tubes shall be installed in the center of the treated water discharge line, with 90 degrees bending against the discharge flow direction.

6.2.7. The oil content sensors AIT and its sampling tubes shall comply with applicable requirements of I-DE-GENERAL NOTES.

6.2.8. There must be a minimum 3% (three percent) slope between the sampling tubes intrusive point and the AIT instrument itself.

6.2.9. On the respective sampling tube of each oil content sensor AIT (indicated on Figure 1), it shall be installed a flowmeter indicator and transmiter FIT, magnetic or ultrasonic type, in order to measure the flow passing through the AIT sensors. For external analyzers, provided with a sampling tube and an ultrasonic cleaning system, they shall be turned off and kept with water inside or in a full line in case of process plant shutdown. These FITs aren't represented on Figure 1.

- Note: Upstream of each sampling tube shall be installed a manual or automatic flow/pressure adjustment valve (FCV or PCV) to adjust the flow sent to the oil content sensor AIT.

6.2.10. The Centrifuges outlet line, where the oil content sensor AIT and FIT flowmeters are installed, shall be designed to avoid vacuum, leading to these devices malfunction.

6.2.11. The oil content sensors AIT and FIT flowmeters shall be easily accessible for O&M – Operation and Maintenance – purposes, within Skid limits, never inside any tank.

## 6.3. NITROGEN GENERATOR REQUIRED BY CENTRIFUGES INSTALLED IN ZONE 1

6.3.1. To keep the Slop Treatment Unit (Z-5336501) on the main deck (Zone 1) as per Basic Design, PACKAGER shall include a dedicated Nitrogen Generator Unit to supply N2>=98% purity for the Slop Treatment Unit with the following characteristics:

6.3.2. Nitrogen shall be generated through compressed air (non-essential instrument air or service air);

6.3.3. Nitrogen purity shall be >=98%;

6.3.4. Nitrogen generator shall be 2x100% with a cross-over line, so that each N2 generator can be aligned with each one of the centrifuges;

6.3.5. N2 flow and pressure shall be in accordance to the Slop Treatment Unit (Z-5336501) consumption requirements. Slop Treatment Unit PACKAGER shall approve the N2 generators design and interconnections with the Slop Treatment Unit (Z-5336501);

6.3.6. The N2 generator shall be preferably installed in a non-hazardous area, i.e, a non-Ex equipament;

6.3.7. N2 generator unit shall be provided by a field proven vendor with all applicable certificates and suitable for 30 years in the offshore environment;

6.3.8. Compressed air balance and electrical load balance shall be evaluated/updated due to the dedicated nitrogen generators inclusion.

## 7. GENERAL REQUIREMENTS

### 7.1. ELECTRICAL REQUIREMENTS

7.1.1. Electrical equipment and material shall comply with requirements of the following references:

a) I-ET-3010.00-5140-700-P4X-002 – SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

b) I-ET-3010.00-5140-712-P4X-001 – LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS.

c) I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.

d) I-ET-3010.00-5140-700-P4X-001 – SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS

e) I-DE-3010.00-5140-700-P4X-003 – GROUNDING INSTALLATION TYPICAL DETAILS.

### 7.2. INSTRUMENTATION AND AUTOMATION REQUIREMENTS

7.2.1. PACKAGE instrumentation and control design shall fulfill the requirements of the following technical specifications:

a) I-ET-3010.00-1200-800-P4X-002 – AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS.

b) I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

c) I-ET-AUTOMATION INTERFACE OF PACKAGE UNITS.

d) I-ET-3010.00-5520-888-P4X-001 – AUTOMATION PANELS.

## 7.3. PAINTING REQUIREMENTS

7.3.1. Painting and coating in accordance with I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING and DR-ENGP-I-1.15 COLOR CODING.

7.3.2. All components shall be delivered fully painted/coated, unless otherwise indicated on this specification.

7.3.3. The performed pre-treatment and complete coating shall be in accordance with the paint manufacturer's data sheets.

## 7.4. SKIDS LAYOUT AND FOUNDATION REQUIREMENTS

7.4.1. PACKAGE components detailed on item 6 which are supplied assembled on skids shall follow the below minimum requirements.

7.4.2. PACKAGE skid structure shall be designed to withstand the design conditions mentioned on item 4.4 and to ensure the lifting conditions on manufacturing site and shipyard. Lifting lugs shall be provided according to PACKAGER lifting procedure.

7.4.3. The skid main frame shall be all welded construction. Structural skid welds, including lifting facilities shall be continuous and shall comply with AWS D1.1 (structural welding code) and CS Rules. Skid structure shall be designed to be welded to the supporting structure unless otherwise specified.

7.4.4. PACKAGE skid layout and arrangement shall be designed to provide sufficient access to pumps, instruments, equipment, and control panels to ease the operability and maintenance with safe conditions. Instruments and valves shall be installed on a suitable height to allow safe access for monitoring, operation, and maintenance.

7.4.5. All necessary maintenance davits, monorails, padeyes or trolleys shall be provided to ensure the safe and easy maintenance conditions.

7.4.6. Access ladders, platforms, gratings, and any other access device shall be metallic type and designed according to PACKAGER / MANUFACTURER standard and to the industrial recognized international codes.

## 7.5. NAMEPLATES AND TAG NUMBERING

7.5.1. PACKAGER / MANUFACTURER Equipment shall have nameplates in Brazilian Portuguese language, made of stainless steel AISI 316L, with 3 mm minimum thickness and fixed by stainless steel (AISI 316L) bolts or fasteners on visible and accessible location.

7.5.2. Tagging of all instruments, electrical, mechanical and piping items, including valves, shall be carried out as detailed on I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN

# 8. PACKAGE MANUFACTURING AND DELIVERY REQUIREMENTS

## 8.1. GENERAL

8.1.1. All materials and equipment supplied by PACKAGER / MANUFACTURER shall be brand new (not overhauled), field proven, free from defects and accepted by Owner and the Classification Society.

8.1.2. Materials and equipment shall be manufactured according to internationally recognized standards for the offshore oil drilling and production industries and shall be in conformance with the Basic Design and Agreement specifications and requirements.

8.1.3. Field proven definition: Systems and equipment shall demonstrate satisfactory operation at least in 3 floating offshore installation units, operating under process conditions (pressure, flow, capacity and similar fluids) for a minimum of 24,000 hours. For rotating equipment, they must demonstrate operation with fluid, flow and discharge pressure similar to the design. Unproven designs or prototypes (including components) without offshore service will not be accepted.

## 8.2. WELDING

8.2.1. PACKAGE equipment, structures and piping welding, welding inspection, non-destructive testing (NDT), bolted joints assembly and piping fabrication and commissioning activities shall be performed in compliance with the following technical specifications:

a) I-ET-3010.00-1000-970-P4X-002 – Requirements for NDT.

b) I-ET-3010.00-1000-955-P4X-002 – Requirements for Welding Inspection.

c) I-ET-3010.00-1000-955-P4X-001 – Welding.

d) I-ET-3010.00-1200-200-P4X-001 – Requirements for Bolted Joints Assembly and Management.

e) I-ET-3010.00-1200-200-P4X-115 – Requirements for Piping Fabrication and Commissioning.

## 8.3. DOCUMENTATION

8.3.1. For the PACKAGE documentation and data-book requirements refer to EXHIBIT III – DIRECTIVES FOR ENGINEERING and to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

## 8.4. SPARE PARTS

8.4.1. For the PACKAGE, spare parts, special tools, CS required spare parts and spare parts list recommended for two (2) years of operation refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

## 8.5. INSPECTION AND TESTS

8.5.1. For PACKAGE inspection, tests, factory acceptance test (FAT) and inspection release certificate (IRC), refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

8.5.2. For PACKAGE inspection and test plan (ITP) requirements refer to EXHIBIT VII – DIRECTIVES FOR QUALITY ASSURANCE SYSTEM.

## 8.6. PRESERVATION, PACKING AND TRANSPORTATION

8.6.1. For PACKAGE preservation, packing and transportation requirements refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.