Karachaganak

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TITLE: **Functional Specification for the Multiphase Pump at RMS-H**

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Classification (UNRESTRICTED)

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Revision History

Revision	Changes
R1	Issued for Review
A1	Issued for Quotation
A2	Issued for Quotation- Strainer filtration level 400 microns, Pump package shall be installed under a shelter with rigid foundation, fire protection, winterization, hoist excluded from pump vendor's scope. Skid dynamic analysis requirement deleted since the pump shall be mounted on a rigid foundation. Area classification is Zone 2, Gas Group IIA, IIB, Temperature Class T3

HOLDS

Number	Description
1	Net Positive Inlet Pressure available (NPIPa)
2	Settle Out Pressure

Document Verification

RACIE Record

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TABLE OF CONTENTS

REVISION HISTORY 2

HOLDS 2

DOCUMENT VERIFICATION 3

RACIE RECORD 3

1.0 INTRODUCTION 5
1.1 Project Background 5
1.2 Purpose and Scope 5
1.3 Definitions 5
1.4 Acronyms and Abbreviations 6
1.5 Order of Precedence 7
1.6 Reference Documents 7
1.6.1 Project Documents 7
1.6.2 COMPANY Standards 7
1.6.3 International Standards 8
1.7 Republic of Kazakhstan Codes & Standards 8
1.8 Language 9

2.0 SUPPLIER REQUIREMENTS 10
2.1 Supply Requirements 10
2.2 Supplier Responsibility 10
2.3 Supplier Experience 10
2.4 Statutory Requirements 10

3.0 SCOPE OF SUPPLY 11
3.1 Basic Design Data and Specifications 11
3.2 Scope of Supply 14
3.3 Exclusions 16
3.4 Battery Limits 17
3.5 Assembly Degree 17

4.0 TECHNICAL REQUIREMENTS 18
4.1 Design Requirement 18
4.2 Process Description 18
4.3 Mechanical Description and Requirements 18
4.4 Material Requirements 19
4.5 Piping and Layout 19
4.6 Pressure Vessels 19
4.7 Air-Cooled Heat Exchangers 19
4.8 Structures 19
4.9 Instrumentation Requirements 19
4.10 Electrical Requirements 20
4.11 Technical Safety Requirements 20
4.12 Painting and Coating 21
4.13 Insulation 21

5.0 SUPPLIER DATA REQUIREMENTS LIST (SDRL) 22

1.0 INTRODUCTION

1.1 Project Background

Several initiatives to improve liquid production were studied as part of the COMPANY Wells & Gathering Network Strategy. One of the outcomes identified the use of Multiphase Pumps at the remote manifold stations (RMS). This project builds on opportunity to increase production by lowering selected RMS operating pressure; thus, reducing backpressure on individual wells. As a result, the RMS low-pressure well fluids will require additional pressure boost into the gathering network, units and plant inlet manifolds.

The use of Multiphase pumps has been proposed to deliver this boosting requirement and it is intended to deliver RMS Multiphase Pump installation which can be safely operated and integrated into COMPANY operations framework.

Multiphase pumping technology allows to draw down the flowing wellhead pressure while at the same time boosting the pressure to overcome the downstream backpressure. Low pressure wells and previously shut-in wells can be brought back to production without separation, flaring or venting.

It is essential to COMPANY ongoing business strategy to modify these low production/shut-in wells to overcome network pressure and maintain ongoing future production.

1.2 Purpose and Scope

The purpose of this Functional Specification, in conjunction with all referenced documents, is to define the minimum requirements for the design, materials, fabrication, assembly, inspection, testing, painting and supply of the Multiphase Pump for KPO as part of the Project "***Multiphase Pump at RMS-H***".

MAIN ITEM	SERVICE
1H-1300-PB-01	Multiphase Pump (MPP) at RMS-H

1.3 Definitions

The following definitions are generic to the PROJECT and MAY not be referred to in this document:

COMPANY	Karachaganak Petroleum Operating (KPO) B.V.
CONTRACTOR	The CONTRACTOR is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation/maintenance of a facility.
SUPPLIER	Organization supplying equipment, materials or services.
CONTRACT	The agreement by and between COMPANY and CONTRACTOR constituted by the contract documents

WORK	All the activities, accessories and equipment, necessary to cover the CONTRACTOR's scope of work
MAY	Is used to indicate alternatives, which are equally acceptable, at CONTRACTOR discretion.
SHOULD	Is used to indicate that the provision is preferred.
SHALL	Is used to indicate a mandatory requirement

1.4 Acronyms and Abbreviations

ALARP	As Low As Reasonably Practical
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BL	Battery Limits
BS	British Standard
CW	Cooling Water
EAC	Eurasian Customs
EN	European Norm
ESD	Emergency Shutdown System
FEED	Front-End Engineering Design
FERA	Fire, Explosion & Radiation Assessment
F&G	Fire and Gas Systems
GOST	Gosudarstvennyy Standart
HAZID	Hazard Identification
HAZOP	Hazard and Operability study
HMI	Human Machine Interface
HSE	Health, Safety and Environment
HVAC	Heating, Ventilation & Air-Conditioning
KPC	Karachaganak Processing Complex
KPO	Karachaganak Petroleum Operating B.V.
ICCS	Integrated Control and Safety System
IDS	Inspection Data Sheet
IEC	International Electrotechnical Commission
LCP	Local Control Panel
LV	Low Voltage
MMS	Machine Monitoring System
MCC	Motor Control Centre
MPP	Multiphase Pump
MV	Medium Voltage
NACE	National Association of Corrosion Engineers
NDE	Non-Destructive Examination
NFPA	National Fire Protection Association
NPIPa	Net Positive Inlet Pressure available
O&M	Operation & Maintenance
PDT	Pressure Differential Transmitter
PFP	Passive Fire Protection
PLC	Programmable Logic Controller
P&ID	Piping and Instrumentation Diagram
PMI	Positive Material Identification
PQR	Procedure Qualification Record
PSV	Pressure Safety Valve
PTU	Permit to Use

PWHT	Post Weld Heat Treatment
RoK	Republic of Kazakhstan
SDRL	Supplier Document Requirements List
SDV	Shutdown Valve
RDDS	Required Document Data Sheet
SIL	Safety Integrity Level
SIS	Safety Instrumented System
SLD	Single Line Diagram
SOW	Scope of Work
TDS	Technical Data Sheet / Mechanical Data Sheet
TR CU	Technical Regulation of Customs Union
UCP	Unit Control Panel
UPS	Uninterrupted Power Supply
VFD	Variable Frequency Drive

1.5 Order of Precedence

The order of precedence applicable for use of the Codes, Standards, Specifications and Regulatory requirements in the event of an inconsistency, conflict or discrepancy between any of the Standards, Specifications and Regulations for this project is as follows:

- Legislation and Regulatory Requirements of the Republic of Kazakhstan
- Republic of Kazakhstan Code and Standards (RoK)
- Project Functional Specification
- Project Data Sheets
- Project Specifications
- COMPANY Specifications and Standards
- International Codes and Standards

In the event of an inconsistency, conflict or discrepancy between any of the Standards, Specifications and Regulations, the most stringent and safest requirement applicable to the project SHALL prevail to the extent of the inconsistency, conflict or discrepancy. Any inconsistencies critical to the design SHALL be brought to the attention of the COMPANY for resolution. In all instances, the latest version of each standard SHALL be used.

1.6 Reference Documents

1.6.1 Project Documents

Ref. No.	Doc. Number	Document Title
Ref 1	TBD	Mechanical Data Sheet for Multiphase Pump (MPP) at RMS-H item 1H-1300-PB-01 Document will follow on next project phase

1.6.2 COMPANY Standards

The COMPANY Standards library is mentioned in the following document.

COMPANY Std.	Title
As referenced in this document	

1.6.3 International Standards

The main applicable International Standards are the following.

International Standard	Title
ASME BPVC VIII Div 1	Rules for Construction of Pressure Vessels Division 1
ASME B.16 series	Standards for Piping
ASME B.31 series	Pressure Piping
NACE MR0175 / ISO 15156	Materials for use in H_2S-containing environments in oil and gas production
API 520	Pressure Relief Systems
API 521	Pressure Relief and Depressurizing Systems
API 526	Flanged Safety Relief Valves
API 614	Lubrication, Shaft-Sealing, and Control-Oil Systems and Auxiliaries
VDI 3836	Measurement and Evaluation of Mechanical Vibration of Screw Type Compressors and Roots Blowers
API 670	Machinery Protection Systems
API 671	Special Purpose Couplings
API 676	Positive Displacement Pumps - Rotary
API 682	Pumps – Shaft Sealing Systems for Centrifugal and Rotary Pumps
ANSI B73	Specification for Horizontal End Suction Pump
ISO 9000	Quality management systems
ISO 10816 Series	Mechanical Vibration – Evaluation of machine vibration by measurements on non-rotating parts.
ISO 10474	Steel and steel products — Inspection documents
EN 10204	Metallic products
IEC60529	Degrees of Protection Provided by Enclosures
ISO 3746	Acoustics – Determination of sound power levels of noise sources using sound pressure

1.7 Republic of Kazakhstan Codes & Standards

The design, construction and installation of the package shall comply with the relevant RoK Codes and Standards. Where applicable RoK standards do not exist or cannot be applied, other industry recognized international standard and recommended practice, such as those from ASME, API or ISO, may be used following appropriate approval process.

Latest revisions of the current Eurasian Customs Union Technical Regulations are mandatory and shall apply, but are not limited to the following regulations, where applicable:

TR CU 004	Low Voltage
TR CU 010	Machinery Safety
TR CU 012	Safety of Equipment for use within explosive atmospheres
TR CU 020	Electromagnetic Compatibility
TR CU 032	Pressure Equipment

Equipment or design requirements not covered by the TR CU Regulations shall continue to comply with the remaining applicable GOST regulations.

1.8 Language

English and Russian language SHALL be used for all documents and drawings.

2.0 SUPPLIER REQUIREMENTS

2.1 Supply Requirements

The description and the requirements contained in this specification are inevitably concise and cannot cover all the details relating to the supply. It is, however, understood that the supply SHALL include all the necessary accessories required for an industrial continuous operation according to the criteria of good engineering, strictly adhering to the requirements. All items listed in Section 3 SHALL be supplied by SUPPLIER, unless it is specifically reported under the section "Exclusions from the Supply" (section 3.3).

2.2 Supplier Responsibility

The SUPPLIER SHALL have the sole responsibility for complete scope of supply including all auxiliaries. The goods SHALL be designed (including provision of information and guidance related to preservation, lifting, handling, transportation, installation, pre-commissioning, commissioning, start up, maintenance and repair), manufactured, assembled, inspected, tested, certified, preserved and supplied in compliance with all the attached and referenced documentation, and with the Codes, Standards and Specifications to which they refer. Compliance with this condition SHALL not relieve the SUPPLIER of the responsibility to supply goods which are safe, reliable and fit for the intended purpose.

2.3 Supplier Experience

SUPPLIER SHALL have proven experience of supplying machines and systems for use in similar applications performing satisfactorily. To qualify, the SUPPLIER must have manufactured at least three comparable units:

- similar type, size and specific loading
- comparable design pressure and flowrate
- minimum ambient design temperature -45°C.

2.4 Statutory Requirements

SUPPLIER is required to be fully compliant with the local legislations.

SUPPLIER's requirements to meet specific internationally accepted codes are listed under the appropriate sections of this specification. The SUPPLIER's proposal SHOULD list other codes and standards to which their proposed equipment complies.

3.0 SCOPE OF SUPPLY

3.1 Basic Design Data and Specifications

No	Parameter	Description
1	Functional requirement	Pump multiphase fluid (oil, gas & water) from the well production to the gathering system or plant destination
2	Pump type	Twin screw pump with external timing gears as per API 676
3	Driver	Electric motor with VFD
4	Tag Number	1H-1300-PB-01
5	No. required	One (1)
6	Site	KPO RMS-H
7	Location	*Outdoor. The pump package shall be housed in a shelter with climate control (PURCHASER 's Scope).*
8	Winterization	*(By PURCHASER)*
9	Range of ambient temperature	+ 42.3°C to - 43.6°C
10	Climatic conditions	Refer to KPO-00-ENG-PHL-00009
11	Unusual contaminants	Dust, Trace amounts of H2S, SO2, CO, NO and HC
12	Instrument air	Not available on site (Vendor to include the instrument air package if required)
13	Cooling water	Not available.
14	Electrical power	6 kV / 3 phase / 50 Hz Tolerance on voltage and frequency +6 % / -10 / +/ - 5 % Hz
15	Ingress protection for motor	IP 56 – Electrical motor to be suitable for VFD application
16	VFD Application	Yes
17	Hazardous Area Classification (HAC)	- *Pump package in Zone 2, Gas Group IIA, IIB, Temperature Class T3* - Control cabin in non-Hazardous area
18	Duty cycle	Continuous
19	Pumped Fluid	Mixture of oil, gas and water with CO2, H2S, chlorides and solids
20	Process fluid contaminants and corrosion agents	- H2S Content % wt.: 1.58 – 2.2; average 1.9 - Chloride Content mg/l: 1500 – 3200; average 2857.76 - CO2 Content % wt: 1.08 – 1.22; average 1.12 - Wax present - Possibility of slugs.
21	Maximum solids in suspension that pump can handle	Vendor to advice (% by volume)
22	Maximum size of flowing particles that pump can handle	Vendor to advice (microns)
23	Maximum Suction Actual Volume Flow	5000 Am3/h (VTC)
24	Oil Flow rate	3828 to 5964 m3/d
25	Gas flow rate	6.36 to 7.129 MSm3/d
26	Density	Oil/Condensate: 709.4 to 728; Gas: 0.8773 to 0.8736;

27	Heat Capacity	Oil/Condensate: 2.103 to 2.125; Gas: 2.398 to 2.430;
28	Water cut	0 to 20 % max
29	GVF	*100 % liquid to 97% GVF*
30	NPIPa	**HOLD**
31	Suction pressure	60 barg
32	Discharge pressure	87 barg
33	Differential pressure	27 barg
34	Settle out pressure	**HOLD Note 19**
35	Pumping temperature	28 to 36°C
36	Discharge temperature	*40^0 C Pump design temperature 95 ^{0}C*
37	Pressure rating	**1500#** Suction shall be rated the same as discharge
38	Pump performance testing tolerances	As per API 676
39	Suction Strainer	Duplex basket type strainer with PDT and auto–changeover valves. *Strainer shall be 400 microns*
40	Mechanical seals	Type ES – Cartridge Dual mechanical seals as per API sealing plan 53/54 complete with closed loop seal oil system.
41	Lube Oil	Closed loop lube oil system with tank and heater
42	Vibration monitoring system	Hardware as per BN Orbit 60 Bently Nevada
43	Pulsation and Vibration Control Requirements for Multiphase Pump Skids	*Assessment of any small- bore piping. Refer note-12*
44	Shelter with climate control	*Excluded from scope of supply (By PURCHASER)*
45	Pressure Safety Valve	PSV routed to suction of the pump
46	Coupling	Special purpose coupling with non-sparking coupling guard.
47	Balancing class for rotors and coupling	ISO 1940 Grade 2.5
48	Shut Down Valves	Fire safe inlet and outlet SDV's ball valve type (failed closed) Bypass quick opening SDV (from discharge to suction) – failed open
49	Liquid re-cycle	For slug flow possibility. Refer note-17
50	Pump materials	- Min metal design temperature: -45°C - Pump casing Low Temperature Carbon Steel - Pump shaft ASTM A 564 Grade 630 - Screws Alloy 625 Silicon carbide coating - Replaceable liner ASTM A439 Silicon carbide coating - Elastomers Elasto-O-Lion 101 (James Walker)
51	Timing Gears	AGMA class 11 with a minimum SF of 2
52	Piping Specifications	F11 ref. KPO-00-PIP-SPC-00003-E "Piping Material Classes" Note that a transition spool must be provided at the MPP suction and discharge since the MPP is only 1500# rated and F11 pipe spec is a 2500# spec.
53	Make of mechanical seal	John Crane / Eagle Burgmann / Flowserve
54	Make of Coupling	John Crane / Flender Graffenstaden

55	Instrumentation	Including and not limited to: Industry Standard Segregated Control & Safety PLCs, Operator LCP/HMI, Control and Safety Field Instrumentation and F&G detection as required to operate the Package in a safe and efficient manner. The instrumentation will include two (2) pressure transmitters on the pump suction and discharge configured in voting logic of 1oo2. Hardwired and Industry Standard Serial Interfaces shall be provided connect into the existing plant ICSS. See section 4.9 for further information.
56	Pump Testing at works	- Witnessed mechanical running test with 95 % gas for 4 hrs. - Witnessed dry running test with 100 % gas. - Pump performance test. - Witnessed noise and vibration test. - Functional acceptance test which includes verification of functionality of instrumentation, control, PLC control logic, alarm and shutdown set points. - Manufacturer standard motor and VFD test as per IEC standards. - The pump shall be tested at speeds within five (5) percentage points of 30, 60, 90 and 100 % of rated speed. - High discharge pressure test to test that the pump does not seize under these conditions. - Factory Acceptance Test - Site Acceptance Test
57	Welding	KPO-00-ENG-SPC-00005
58	Material inspection	KPO-00-QAC-SPC-00001
59	Flanges	ASME B16.5
60	Electric Motor	Induction motor suitable for variable speed drive.
61	VFD	Included
62	Lifting devices	Third party certified spreader bar and shackles
63	Control System	MPP operation shall be unmanned and remotely controlled from KPC. Which kind of data interchange between MPP CP and KPC is required
64	Special tools	Nitrogen charging kit for the bladder. Working with process connetcted bladder instead of precharged. Any special tools for maintenance of the package
65	Commissioning Spares	For commissioning of the package.
66	Spare Parts for 2 years operation	Quote to be submitted separately
67	Fire fighting	*Excluded.*
68	Certification	BS EN 10204 3.1 / CU-TR Certification will be acc. DIN EN instead of the British version BS EN
69	Preservation during Transportation and Storage	KPO-00-LGT-SPC-00001

Notes:

1) The pump shall be capable of start-up at settle out conditions.
2) Vendor shall furnish filled in API 676 data sheets. Please provide project related form including necessary customer information like process conditions, site conditions, etc.
3) The suction and discharge of the pump shall be designed for the same rating. All connection for auxiliaries shall be suitable for the Max allowable working pressure.
4) The pump vent connection may be omitted if the pump is made self-venting by the arrangement of nozzles.

5) Replaceable liners shall be provided for the pump.
6) The rotor stiffness shall be adequate to prevent contact between the rotor bodies, the casing and gear timed rotor bodies at all the specified conditions.
7) The maximum seal leakage rates for the mechanical seal shall be provided.
8) The pressure lubrication system for lube oil shall conform to API 614.
9) Reduced hardness materials shall be provided for pressure casing, shafting, pressure retaining seal components (excluding seal faces) and wet bolting.
10) ASME BPVC Section VIII Division 1 shall apply for impact-testing requirements.
11) The skid baseplate shall be designed to facilitate the use of optical, laser- based instrument for accurate levelling in the field.
12) Small bore piping shall be gusseted in two orthogonal planes to increase the rigidity of the piped connection.
13) Fit-up and assembly of machine mounted piping shall be completed in the vendor's shop prior to shipment.
14) Air cooler shall be manufacturer standard however the fans shall be in 2 x 100 % configuration.
15) Uptime factor for the pump shall be 0.9 with 25 days field turnaround applied once every 3 years.
16) *The equipment, its auxiliaries and the driven equipment shall be provided to meet the required level of 85 dB(A).* The sound level of this size of pump skid will be at appr. 95 dB(A)
17) Re-cycle line shall be provided which shall be connected back to suction.
18) Clamp type piping supports shall be used within the pump package.
19) As per the average of discharge high pressure trip (150 barg) and suction high pressure trip (100 barg), the settle out pressure is estimated to be 125 barg. Bidder to check and revert back if this causes un-necessary oversizing of the pump driver and integrity issues for pump mechanical seals. This requirement cannot be fullfilled as with the current valid operation condition this well lead into a maximum differential pressure of 90 bar instead of the normal differential pressure. The pump cannot handle the 90 bar differential pressure.
20) *Pump vendor shall indicate the NPSHr for the selected model.*
21) *Strainer upstream of the pump may require steam-out typically 1 bara and 160 °C. 2" nozzle shall be provided at the base of the vessel for utility connection.*

3.2 Scope of Supply

The Multiphase Pump package scope of supply SHALL mainly consist of, but not limited to:

- 1 (one) multiphase twin screw pump type according to API 676.
- MPP electric motor.
- Variable frequency drive system (VFD).
- Flexible coupling with non-sparking guard.
- Lube oil system as common lubrication system for pump and electric motor.

  - One main shaft-driven oil pump.
  - One auxiliary electric motor-driven oil pump.
  - One low voltage electric motor for auxiliary oil pump.
  - One lube oil electric heater.
  - Lube oil air cooler.
  - One oil twin filter with separate transfer valves.
  - One PCV in Lube Oil console, which control outlet pressure by bypassing extra flow back to the crankcase.
- Vents and drains piped up to skid edge, provided with valves and flanges.
- 316L stainless-steel lube oil piping upstream and downstream oil filters.
- Suction strainer in duplex configuration with spool pieces.
- Mechanical Seal System.
- Lube Oil System for multiphase pump bearings.
- One common baseplate for multiphase pump, motor and lubricating system with drip pan including a flanged and valved drain, anchor bolts design and template, shim packs for vertical alignment or vertical jack screws for the installation.
- Separate baseplate for piping skid. Suction and Discharge Piping to the skid edge, including:
  - FSC (Fail Safe Close) Shut Down Ball Valves with spring return electro / hydraulic actuators.
  - Pressure Safety Valve
  - Check Valve in the discharge piping.
  - Monitoring and Control Instrumentations including wiring to the junction boxes on the skid.
- The counter-flanges on the battery limits with the existing facilities shall match 2500# class.
- Process and auxiliaries interconnecting piping between the equipment inside the skid and any auxiliary skids, including thermal expansion joints, valves, supports and brackets, etc.
- Bulk materials necessary for the complete installation at site of the equipment, including but not limited to manual valves, fittings, flanges & blind flanges, gaskets, bolts and tie rods, vents & drain assemblies, supports, fixing systems during transport.
- All the necessary instrumentation with vibration monitoring.
- Electrical components.
- Electrical Cables and Instrument Cables inside the skid until the junction box within the machinery/equipment battery limits.

- Cable tray, conduit, and Junction Boxes with interface terminal strips inside the skid. Junction boxes SHALL be segregated in function of signal type and working voltages and located at skid battery limits.
- *Certified spreader bar with slings for lifting of the heavy components.*
- Unit Control Panel (UCP); Type P3 PLC-based, redundant type, included in a dedicated Container, complying with KPO-00-INS-SPC-00017-E – Instrument Cabinet Specification section 5.
- Complete Machine Monitoring System (MMS) and relevant probe(s) for detection and monitoring of vibration/temperature for the pump and motor bearings and for winding temperature, compliant with KPO-00-INS-SPC-00016-E – Machine Condition Monitoring System Specification.
- Stair, ladders and service platform for cabinet access (if required).
- provision for heat tracing installation on supplied items.
- Special tools and wrenches.
- Certified Lifting lugs.
- Painting of piping / equipment / steel structure.
- Commissioning and Start Up spare parts (included).
- Two (2) years spare parts (listed)
- Capital spare parts (listed)
- Engineering services as required in the relevant paragraphs;
- Technical documentation as per dedicated section of this document.
- Inspection and test as per dedicated section of this document.
- Packing, preparation for shipment and transportation
- Anchor bolts and packing for all foundation Connections.
- Template for Anchor bolt-holes.
- Equipment tagging and colour coding.

3.3 Exclusions

The followings are excluded from SUPPLIER scope of supply:

- Motor Control Centre (MCC)
- Civil works
- Foundations
- Pipe-work between package edge flanges and any separately installed equipment
- External piping outside package defined boundary.
- External power cables outside package defined boundary
- Erection and Installation.

- Shelter with climate control.
- *Active fire protection.*

3.4 Battery Limits

For piping, the battery limit will be limited to the extension of the skid's baseplate.

The SUPPLIER SHALL include in its bid an outline drawing showing the battery limits of the supply in its scope. Minor adjustments of the battery limits during the PROJECT engineering phase SHALL not affect the supply. Any adjustments of the battery limits SHALL be, in any case, subject to COMPANY Approval and SHALL not affect the scope of supply.

Piping connection at the battery limit of the skid SHALL be in accordance with PROJECT Piping Material Class Specification KPO-00-PIP-SPC-00003-E.

3.5 Assembly Degree

The equipment SHALL be delivered pre-assembled to the maximum extent possible, ready for installation at the interface flanges. In case of more skids, the pipes between them SHALL be supplied in prefabricated spools duly tagged.

Finish coats, where required, SHALL be applied at the workshop before shipment.

4.0 TECHNICAL REQUIREMENTS

4.1 Design Requirement

The equipment SHALL be designed for reliability, maintainability and operating life as specified in this document.

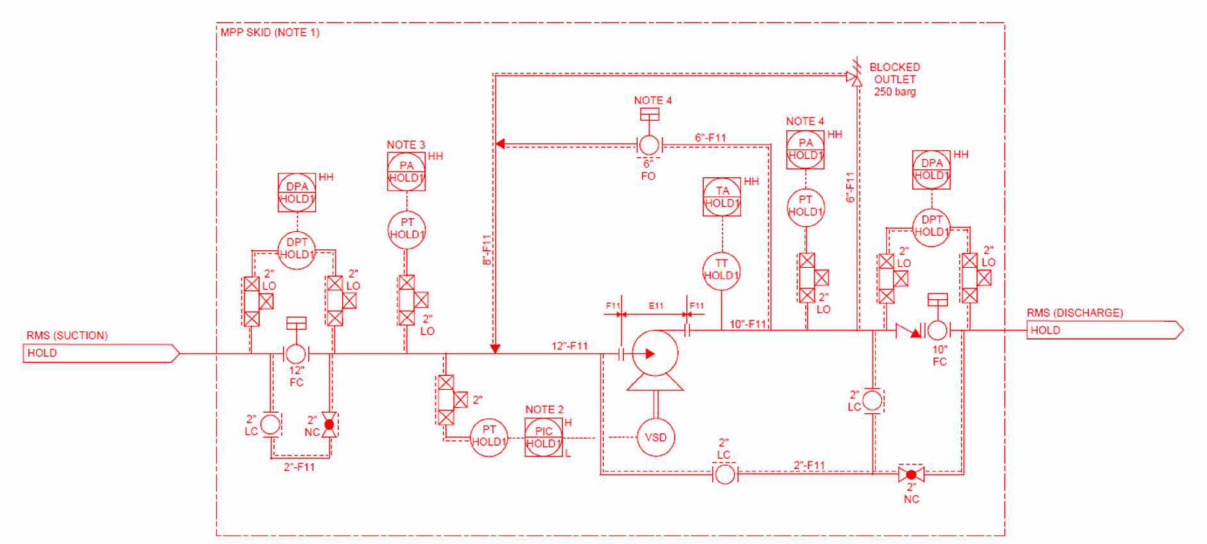
Package design SHALL be able to guarantee its continued integrity and ability to perform its required functions effectively and efficiently to achieve the business objectives, whilst safeguarding people, the environment and the COMPANY reputation for the entire lifecycle.

4.2 Process Description

Process description is detailed in section 3.1 “Basic Design Data and Specifications”.

Process Engineering Design Criteria (KPO-00-ENG-PHL-00010) must be adhered to for MPP design.

Below is the preliminary P&ID of MPP for informational purposes only.



NOTES:
1. MPP SKID (BETWEEN THE SUCTION AND DISCHARGE XVs MUST BE SHELTERED TO ENSURE THERMAL EXPANSION IS NOT A CREDIBLE CASE FOR MPP OVERPRESSURE.
2. SUCTION PIC CONTROLS THE SUCTION PRESSURE BY ADJUSTING THE MPP SPEED.
3. MPP SUCTION PAHH PREVENTS THE MPP TO START SHOULD THE PRESSURE EXCEED 100 BARG (HOLD) TO ENSURE THE BACKPRESSURE ON THE MPP DISCHARGE RELIEF VALVE DOES NOT EXCEED 40% OF THE RELIEF VALVE SET PRESSURE TO ENSURE THE RELIEF VALVE CAN ADEQUATELY RELIEF IF REQUIRED.
4. MPP DISCHARGE PAHH ACTIVATES THE OPENING OF THE MPP BYPASS XV ALLOWING TO QUICKLY DISCHARGE THE MPP DISCHARGE BACK INTO THE SUCTION.

4.3 Mechanical Description and Requirements

The equipment SHALL meet the design parameters as stated in the section 3.1 “Basic Design Data and Specifications” and COMPANY Technical Standard.

Auxiliary piping carrying external services and drains SHALL terminate at the package skid-edge. A common terminal point complete with block valve SHALL be provided for each type of service.

All equipment SHALL be designed to withstand the external forces and moments. Equipment nozzle loading and connecting piping stress requirements SHALL be in accordance with Piping Stress Analysis Procedure KPO-00-PIP-PRO-00001-ER.

Pumps within the MPP package shall be as per ANSI B73.1.

4.4 Material Requirements

The pump will operate in an H_2S environment.

Materials selection shall be made based on the reference list relating to machines manufactured and operating under identical or similar services.

Minimum requirements have been set in the Section 3.1 "Basic Design Data and Specifications".

4.5 Piping and Layout

For piping design, requirements refer to Piping Design and Plant Layout Specification KPO-00-ENG-SPC-00031-E.

4.6 Pressure Vessels

Design, fabrication and testing of vessels and columns shall be in accordance with ASME VIII Div. 1 as amended by COMPANY document KPO-00-MVE-SPC-00001-E "Pressure Vessels". SUPPLIER shall determine pressure vessel maximum allowable working pressure (MAWP) by calculation in accordance with ASME VIII Div. 1 Para. UG-98. The MAWP at design temperature shall be shown on the pressure vessel nameplate.

4.7 Air-Cooled Heat Exchangers

All air-cooled heat exchangers shall be designed, fabricated and tested by the SUPPLIER to manufacturer standard.

4.8 Structures

The Supplier SHALL provide all necessary structural steel (e.g., base frames) and all necessary platforms, handrails, and ladders to facilitate operation and maintenance, in accordance with the requirements of the following specifications:

- "Specification. Basic Civil Engineering Design Data", doc. nr. KPO-00-CVS-SPC-00006, to be used as basic civil and structural design criteria and input data;
- Specification for Materials, Fabrication & Erection of Structural Steelwork doc. nr. KPO-00-CVS-SPC-00005-ER.

4.9 Instrumentation Requirements

Instrumentation, Control and safeguarding SHALL be in accordance with C&I Specifications and philosophies KPO-00-INS-SPC-00009-E, KPO-00-INS-PHL-00002 & KPO-00-INS-PHL-00003 and documents cross-referenced therein. The Package type shall be classified as P3 in accordance with KPO-00-INS-SPC-00015-E and related specifications cross-referenced therein. The package shall be provided with its own separate control and SIL rated safety

systems capable of performing all control and safeguarding of the package to facilitate start, running, stop and emergency shutdown functions. The Package Safeguarding and F&G Functions shall be implemented in accordance with IEC 61511/61508. The package control and safety systems shall provide hardwired and serial interfaces to allow connection to the main plant DCS, ESD and F&G Systems. An HMI and controls shall be provided in the package container to allow local operation when required. A local/remote switch shall be provided to allow for switching between local and remote operation.

For additional safeguarding, refer to the following table:

S No	Machine Parameter	Alarm	Trip
1	Discharge Pressure	High	High High (2oo2 voting logic)
2	Suction Pressure	Low	Low Low (2oo2 voting logic)
3	Discharge temperature	High	High High (2oo2 voting logic)
4	Pressure Differential across the suction strainer	High	
5	Pressure Differential across the suction SDV	High	High High
6	Pressure Differential across the discharge SDV	High	High High
7	Pump and Motor High Radial Vibration	High	High High
8	Pump and Motor Bearing Temperature	High	
9	Pump Casing Temperature	High	
10	Loss of Barrier Pressure for API Plan 53/54	High	
11	Lube Oil Pressure for pump and Motor	Low	
12	Lube Oil Tank Temperature	High	
13	Lube Oil Tank Level	Low	
14	Motor Winding Temperature	High	
15	Seal Oil Tank Level	Low	
16	Seal Oil Pressure	Low	
17	Fin-Fan Cooler Vibration	High	High High
18	Fire and Gas detection	X	X

4.10 Electrical Requirements

For electrical requirements, refer to Technical Specification for electrical plants included in package supplies, Doc. No KPO-00-ELT-SPC-00018 and to Electrical Design Criteria, Doc. No. KPO-00-ELT-BOD-00001.

4.11 Technical Safety Requirements

For safety requirements, refer to Loss Prevention Basis of Design (KPO-00-ENG-PHL-00012-E Rev A2). Any TSE deliverable produced shall be in accordance with KPO Risk Management Requirements (RMR) and shall be discussed and approved by the PED TSE Lead.

The SUPPLIER SHALL participate in a HAZOP and SIL studies for the equipment within their scope. The study will be conducted in accordance with KPO procedures.

The SUPPLIER is responsible for resolving / implementing ACTIONS resulting from the workshop relating to equipment in their scope. A follow-up review SHALL be performed to verify satisfactory completion.

4.12 Painting and Coating

Piping, equipment and structures SHALL be prepared, primed and finish painted in accordance with COMPANY Painting & Coating Specification, doc no. KPO-00-ENG-SPC-00035.

4.13 Insulation

Insulation SHALL be provided in accordance with COMPANY Hot & Cold Insulation Specifications: KPO-00-PIP-SPC-00019 Specification for Cold Service Insulation and KPO-00-PIP-SPC-00020 Hot Insulation for Piping, Tanks, Vessels and Equipment

Personnel protection SHALL be provided for any surfaces that exceed 60°C. Where this is not reasonably practical it SHALL be identified to COMPANY during detailed engineering for approval.

5.0 SUPPLIER DATA REQUIREMENTS LIST (SDRL)

SUPPLIER is requested to submit the following document list with bid.

a) Filled in API 676 data sheet and torque-speed curves.
b) Motor and VFD Data Sheet
c) Noise Data Sheet
d) Suction strainer data sheet and specifications.
e) General Arrangement drawing with equipment weights including MTO list.
f) Interface and Connection Schedule
g) Utility / Effluent / Chemical Consumption List
h) Flow diagram or sample P&ID
i) Fabrication/Production Schedule
j) Typical Quality Plan
k) Spare Parts List
l) Sub-vendor list
m) List of exclusions
n) Standard deviation list to international standards
o) Experience list where three (3) similar units have been supplied and operating satisfactorily.