CO2 PRODUCT.JSC	**CO2 PRODUCT JSC**
PROJECT	**CO2 PRODUCTION PLANT**
PACKAGE	**ENGINEERING, PROCUREMENT, CONSTRUCTION AND INSTALLATION**

TECHNICAL REQUISITION DOCUMENT FOR

CENTRIFUGAL PUMPS

						
B1	11/Jun/26	Issue For Bidding	NHK	PAD	DVB	VLT
A1	08/May/26	Issue For Review	NHK	PAD	DVB	VLT
Rev	Date	Purpose	Prepared	Checked	Reviewed	Approved

EPC CONTRACTOR: PTSC THANH HÓA

PTSC THANH HOA

Document No:
CO2-PTH-MEC-TRD-013

REVISION RECORD SHEET

No	Content of Revision	Rev	Date (dd/mm/yyyy)
1	Issue For Review	A1	08/May/26
2	Issue For Bidding	B1	11/Jun/26

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1. INTRODUCTION

1.1. PROJECT BACKGROUND

Project	CO2 PRODUCTION PLANT
Owner	CO2 PRODUCT JSC
EPC	PTSC THANH HÓA

CO2 PRODUCT Joint Stock Company has selected a production capacity of approximately 100.000 tons/ 300 day of high-purity liquid CO_2 and 2,000 tons per year of CO_2 dry ice.

The products of the project include high-purity liquid CO_2 (≥ 99.995%) for use in the food and beverage industry, as well as the electronics sector (such as beverage production, semiconductor manufacturing, and electronic device fabrication). CO_2 dry ice is produced for applications in food preservation, healthcare, household goods manufacturing, and various industrial fields.

All impurity components of the products comply with ISBT (International Society of Beverage Technologists) standards, as shown in the following table:

Table 1.1: International Society and Beverage Technologists (ISBT Standard)

No.	Quality Parameter	Guideline Impurity Limit
1	Moisture (H2O)	≤ 20ppm v/v
2	Oxygen	≤ 30 ppm v/v
3	CO	≤ 10 ppm v/v
4	Oxides of Nitrogen (NO_x)	≤ 5,0 ppm v/v
5	Nitrogen Monoxide (NO)	≤ 2,5 ppm v/v
6	Nitrogen Dioxide (NO_2)	≤ 2,5 ppm v/v
7	Non-volatile Residue (NRV)	≤ 10 ppm w/w
8	Non-volatile Organic Residue (NVOR)	≤ 5,0 ppm w/w
9	Methanol (CH_3OH)	≤ 10 ppm v/v
10	Total Hydrocarbon (as Methane)	≤ 50,0 ppm *(includes 20,0 ppm total non-methane hydrocarbon)*
11	Ammonia (NH_3)	≤ 2,5 ppm v/v
12	Acetaldehyde (C_2H_4O or AA)	≤ 0,2 ppm v/v
13	Aromatic Hydrocarbon (C_6H_6 – Benzene)	≤ 20,0 ppb (0,020 ppm)
14	Total Sulfur – TS (Total sulfur impurities excluding SO_2)	≤ 0,1 ppm v/v
15	Sulfur Dioxide (SO_2)	≤ 1 ppm v/v

1.2. PURPOSE

The scope of this document is limited to the supply of a Centrifugal Pump, including all activities related to design, procurement, fabrication, and completion of Centrifugal Pump system, ensuring the equipment is ready for installation and operation.

1.3. LANGUAGES

All official project documentation shall be submitted in English or in bilingual format English.

2. SCOPE OF SUPPLY AND WORK

2.1. ITEM AND QUANTITIES

The items and quantities shall be as specified in the Attachment #1.

2.2. SCOPE OF SUPPLY AND SERVICE

No.	Description	Unit	Q'ty
1	Supply Centrifugal Pump package (P101)	Set	2
2	Supply Centrifugal Pump package (P401)	Set	2
3	Documentation as per VENDOR Data Document requirement List (VDRL)	Lot	1

2.3. SCOPE OF WORK

The BIDDER / MANUFACTURER shall use proven or standard designs to meet the requirements of the specifications, data sheets, and attachments. The scope includes design, manufacture, testing, painting, supply, packing, and delivery of all items in Attachment #1, as well as supervision for erection, testing, commissioning, and performance testing when required.

2.4. OUT OF SCOPE

Installation work is excluded from the SUPPLIER/ BIDDER's scope of work.

2.5. DELIVERY TIME

The Vendor will ensure delivery to the Contractor within a maximum of 112 days from the date of Purchase Order (PO) issuance. In any case, the delivery date shall **not be later than 25 October 2026.**

3. OPERATING CONDITIONS

Operating conditions will be attached in Attachment #2 - Technical Support Document.

4. MANDATORY PERFORMANCE REQUIREMENTS

Centrifugal Pumps shall meet the following minimum performance requirements under all specified operating conditions. Compliance with these requirements is mandatory and shall be demonstrated by the Vendor.

Refer to Attachment #2 - Technical Support Document.

5. CODES AND STANDARDS

The Centrifugal Pump package shall be designed, manufactured, inspected and tested in accordance with the latest editions of the following standards:

- GB/T 3215 – Refinery, Petrochemical and Process Industry Centrifugal Pumps
- GB/T 5656 – Technical Specifications for Centrifugal Pumps
- GB/T 3216 – Acceptance Tests of Rotodynamic Pumps

Reference standard:

- API 610 – Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries

Any deviation from the specified standards shall be clearly identified in the quotation and submitted for Company approval.

6. GENERAL TECHNICAL REQUIREMENTS

The material supply shall be strictly in accordance with data sheets, drawings, specifications, codes, and standards specified.

6.1. DESIGN LIFE, AVAILABILITY AND RELIABILITY

The design life of the facility and all associated material and components is minimum 20 years.

6.2. PREPARATION FOR SHIPMENT

Material shall be prepared for export shipment and shall be provided with maximum protection during shipment and extended outdoor storage.

The VENDOR shall submit loading instructions and diagrams for PURCHASER or its authorized representative, approval for all pipes shipped by rail, truck or vessel. However, approval of these documents shall not relieve the VENDOR of its responsibility for damage during shipment.

7. INSPECTION AND TEST

Inspection and tests shall be conducted by VENDOR in accordance with:

[X] Test & Inspection should be carried out according to the applicable project documents and applicable codes and standards

[X] Manufacturer's standard plan & procedure as approved by PURCHASER

[X] Local regulation, if any

The COMPANY and/or PURCHASER inspector shall hold the right to be present at any manufacturing stage of materials.

The VENDOR shall state the inspection method, acceptance criteria and the inspection items with "Witness" or "Not witness" in his inspection and test procedure.

8. WARRANTY AND GUARANTEE

The BIDDER shall guarantee the quality, integrity, and performance of the Canned Motor Pump supplied under this Specification.

The BIDDER shall, at its own cost, repair, replace, or rectify any defects arising from design, material, fabrication, or workmanship within the warranty period.

Warranty Conditions: The warranty period shall be twenty-four (24) months from the date of delivery or eighteen (18) months from successful commissioning, whichever occurs first.

During the warranty period, the Vendor shall, at its own cost, repair or replace any defective components and restore the equipment to comply with the specified performance requirements.

9. DOCUMENTATION REQUIRED

The Vendor shall complete and submit Attachment #3 – Technical Bid Proposal (TBP) together with the quotation. Failure to provide the requested technical information may result in the bid being considered non-compliant.

The Vendor shall submit all required documents, drawings, calculations, certificates, and reports in accordance with Attachment #4 – Vendor Data Requirement List (VDRL).

Any deviation from this TRD shall be clearly identified and included in the quotation for Company review and approval.

10. ATTACHMENT

No	Attachment	Document name	Remark
1.	Attachment #1	Scope of Work & Supply	
2.	Attachment #2	Technical Support Document	
3.	Attachment #3	Technical Bid Proposal	
4.	Attachment #4	Vendor Data Requirement List	
5.	Attachment #5	Project Schedule	

ATTACHMENT #1

SCOPE OF WORK & SUPPLY

SCOPE OF WORK

Project: **HIGH TECHNOLOGY CO2 PRODUCTION PLANT**

TRD no. **TRD - 013**

Date: 6/12/2026

SCOPE OF WORK

No	Description	Remark
1	Supply of Centrifugal Pump packages: Design, engineering, procurement, fabrication, assembly, testing, inspection, painting, packing and delivery of **2 sets of Centrifugal Pumps (Tag No. P101)** and **2 sets of Centrifugal Pumps (Tag No. P401)** in accordance with the Technical Requisition Document (TRD), data sheets, specifications and applicable project documents.	*Completed set (4 units)*
2	Preservation, handling, storage, transportation, and preparation for installation shall be in accordance with the Manufacturer's recommendations and procedures.	
3	The Vendor will ensure delivery to the Contractor within a maximum of 112 days from the date of Purchase Order (PO) issuance. In any case, the delivery date shall not be later than 25 October 2026.	
4	Supervision: Providing technical supervision / assistance during erection, testing and commissioning (if required by Purchaser).	
5	Training: Providing technical training for operation & maintenance to the Owner's personnel.	
6	Warranty: The warranty period shall be twenty-four (24) months from the date of delivery or eighteen (18) months from successful commissioning, whichever occurs first.	
7	Spare part: Providing spare parts for the commissioning and initial start-up phases.	
8	Recomment Spare part List For 2 years of operation	
9	Documents to be provided: The Vendor shall provide the documents as per VRDL.	*Refer to Attachment #4*

SCOPE OF SUPPLY

Project: HIGH TECHNOLOGY CO2 PRODUCTION PLANT

TRD no. TRD - 013

Date: 6/11/2026

SCOPE OF SUPPLY

No	Tag#	Scope of Supply	Description	Material	Unit	QTY	Remark
1	***P101***	**Completed set**	**Centrifugal Pump package for liquid CO_2 service**	**VTA (Suitable for low temperature CO_2 service)**	**set**	**2**	
1.1	*VTA*	*Completed set*	*Centrifugal Pump (Horizontal / Vertical as per datasheet) - Capacity: 25 m3/h - Differential Head: 24m - Comply with GB/T 3215 or equivalent - Include motor, baseplate, coupling, guard, instrumentation*	*Liquid: water*	*set*	*2*	*Refer to TRD and datasheet*
1.2	*VTA*		*Accessories & Instrumentation (Temperature sensors - RTD, vibration sensors if applicable, leak detection if required)*	*VTA*	*lot*	*2*	
1.3	*VTA*		*Special tools for maintenance (if any)*	*VTA*	*lot*	*VTA*	
1.4	*VTA*		*Spare parts for commissioning & initial start-up*	*VTA*	*lot*	*VTA*	
2	***P401***	**Completed set**	**Centrifugal Pump package for liquid CO_2 service**	**VTA (Suitable for low temperature CO_2 service)**	**set**	**2**	
2.1	*VTA*	*Completed set*	*Centrifugal Pump (Horizontal / Vertical as per datasheet) - Capacity: 450 m3/h - Differential Head: 30m - Comply with GB/T 3215 or equivalent - Include motor, baseplate, coupling, guard, instrumentation*	*Liquid: water*	*set*	*2*	*Refer to TRD and datasheet*
2.2	*VTA*		*Accessories & Instrumentation (Temperature sensors - RTD, vibration sensors if applicable, leak detection if required)*	*VTA*	*lot*	*2*	
2.3	*VTA*		*Special tools for maintenance (if any)*	*VTA*	*lot*	*VTA*	
2.4	*VTA*		*Spare parts for commissioning & initial start-up*	*VTA*	*lot*	*VTA*	
3	***VTA***	**Completed set**	**Recommended spare parts list for 2 years operation**	***VTA***	**lot**	**VTA**	*Refer to VDRL*

Note:

VTA: Vendor to Advise

ATTACHMENT #2

TECHNICAL SUPPORT DOCUMENT

CO2 PRODUCT.JSC	**CO2 PRODUCT JSC**
PROJECT	**CO2 PRODUCTION PLANT**
PACKAGE	**ENGINEERING, PROCUREMENT, CONSTRUCTION AND INSTALLATION**

MECHANICAL DATASHEET FOR CENTRIFUGAL PUMP

B1	11/Jun/26	Issued for Bidding	NHK	PAD	ĐVB	VLT
A1	8/May/26	Issued for Review	NHK	PAD	ĐVB	VLT
Rev.	Date	Purpose	Prepared	Checked	Reviewed	Approved

PTSC THANH HOA **PTSC THANH HOA**	**Document No:** **CO2-PTH-MEC-DTS-003** **Total of pages: 8** **(Including this pages)**

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DATASHEET FOR CENTRIFUGAL PUMP PACKAGE

REVISION HISTORY

No.	Page	Concent	Revision Date	Revision No.	Note
1	All	Issued for Review	5/May/26	A1	
2	All	Issued for Bidding	11/Jun/26	B1	

CO2 PRODUCT.JSC	**HIGH TECHNOLOGY CO2 PRODUCTION PLANT**	PTSC THANH HOA
	MECHANICAL DATASHEET FOR CENTRIFUGAL PUMP	**Document No.:** CO2-PTH-MEC-DTS-003 **Revision No.:** B1

DATASHEET FOR WATER PUMPS

Tag No.:	P101A/B	**Plant Location:**	Khánh Phú, Yên Khánh, Ninh Bình
Service:	Water	**Supplier:**	VTA
P & ID No.:	CO2-JIA-PRC-PID-001	**Purchase Order No.:**	VTA
Calculation Ref.:	-	**No. of Units:**	2 (Two)

Service Description: Condensing Washing System

1	APPLICABLE TO:	● PROPOSAL	○ PURCHASE	○ AS BUILT		
2	UNIT	**CENTRIFUGAL PUMP**				
3	NO. OF PUMPS REQUIRED	**2 (Two) x 100%**				
4	SERVICE	**WATER**	TYPE	**HORIZONTAL (VTA)**		
5	MANUFACTURER	*	SIZE	*		
6	MODEL	*	SERIAL NO.	*		
7	INFORMATION TO BE COMPLETED	○ BY PURCHASER	□ BY MANUFACTURER	○ BY PURCHASER OR MANUFACTURER		
8	**GENERAL**					
9	Number of Motor Driven	**2 (Two)**	Number of Turbine Driven	**VTA**	Gearbox Required	**VTA**
10	Motor Item Number	**TBA**	Turbine Item Number	**VTA**	Gearbox Item Number	**VTA**
11	Motor Provided by	**VTA**	Turbine Provided by	**VTA**	Gearbox Provided by	**VTA**
12	Motor Mounted by	**VTA**	Turbine Mounted by	**VTA**	Gearbox Mounted by	**VTA**

	OPERATING CONDITIONS				
13					
14		Rated	Max	Norm	Min
15	Capacity (m^3/h) **(Note 4)**	**25**			
16	Recirculation Flow (m^3/h)**(Note 4)**	**25**			
17	Suction Press (MPag)	**0**			
18	Discharge Press (MPag)	**0.24**			
19	Differential Press (MPag)	**0.24**			
20	Differential Head (m)	**24**			
21	Hydraulic Power (kW)	**5.5 (VTA)**			
22	Operating Time (hr./yr.)	*			
23	NPSH Available (m)	**1 (Hold)**			
24	**System Design**				
25	● Stand Alone Operation	○ Parallel Operation			
26	○ Series Operation with Item Number				
27	**Service**				
28	○ Continuous	● Intermittent (Starts/day)			
29	**System Control Method**				
30	○ Speed	○ Flow	○ Level	○ Temperature	
31	○ Pressure	○ Pipe Friction Resistance Only			
32	**Open valve start-up**	● Yes	○ No		

	PERFORMANCE				
	■ Performance Curve Number	*			
	■ Speed	*	(rpm)		
	Measured at Capacity	Rated	Max	Normal	Min
	■ NPSH Req'd (m)	*	*	*	*
	■ NPSH Margin **(Note 3)**	*	*	*	*
	■ Max Head @ Rated Impeller	*	(m)		
	■ Max Head @ Maximum Impeller	*	(m)		
	■ Minimum Continuous Flow				
	Thermal , Stable	*	(m^3/h)		
	■ Allowable Operating Region	* to *	(m^3/h)		
	■ Best Efficiency Point for Rated Impeller	*	(m^3/h)		
	■ Suction Specific Speed	*	(US units)		
	■ Impeller Diameter Rated	* , Max * , Min *	(mm.)		
	■ Pump Rated Power (kW)	* , Efficiency *	(%)		
	■ Max Power @ Rated Impeller	* **(Note 9)**	(kW)		
	Rotation (Viewed from Coupling End)	○ CW	○ CCW		
	Case Pressure Rating				
	■ Max Allowable Working Pressure	*	(barg)		
	■ Hydrostatic Test Pressure	*	(barg)		

	PUMPED FLUID			
33				
34	Pumped Fluid	**Service Water**		
35		Rated	Maximum	Minimum
36	Pumping Temp (°C)	**10**		
37	Density (kg/m3)	**1000**		
38	Vapor Press (MPa)	**0.001195**		
39	Viscosity (cP)	**1.3**		
40	Sp Heat (kJ/kg.°K)	**NA**		
41	Initial Boiling Point	(°C) @	(bara)	
42	**Liquid** ○ Hazardous	○ Flammable	○ Other	
43	Corrosion / Erosion caused by			
44	% Solids	Max Particle Size	(mm.)	

	SITE CONDITIONS				
	Location	○ Indoor	● Outdoor	○ Heated	● Unheated
	Altitude	**TBA**	(m.)		
	Range of Ambient Temperatures Max/Min	* / *	(°C)		
	Electrical Classification				
	● Non Hazardous				
	○ Zone	Gas Group	Temp. Class		
	Unusual Condition				
	● Tropicalization required	○ Winterization required			
	○ Dust	○ Fumes			
	● Other :	**Tropical Environment**			

	NOTES:
45	
46	REFER TO PAGE 5 OF 8
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CO2 PRODUCT.JSC	**HIGH TECHNOLOGY CO2 PRODUCTION PLANT**	PTSC THANH HOA
	MECHANICAL DATASHEET FOR CENTRIFUGAL PUMP	**Document No.:** CO2-PTH-MEC-DTS-003 **Revision No.:** B1

DATASHEET FOR WATER PUMPS

Tag No.:	P101A/B	**Plant Location:**	Khánh Phú, Yên Khánh, Ninh Bình
Service:	Water	**Supplier:**	VTA
P & ID No.:	CO2-JIA-PRC-PID-001	**Purchase Order No.:**	VTA
Calculation Ref.:	-	**No. of Units:**	2 (Two)

Service Description: Condensing Washing System

MECHANICAL DATA

Pump Design Code: (*)
Other : -

Impeller Type
- ■ Closed
- □ Open
- □ Semi-Open
- □ Other

Casing Mounting
- □ Foot
- ■ Centerline
- □ Vertical In-Line
- □ Close-Coupled
- □ Other :

Bearings
- ■ Bearing Manufacturer *
- ■ Radial Bearing Type * Qty *
- ■ Thrust Bearing Type * Qty *
- □ Bearing Isolators

Lubrication
- ● Oil ○ Pure Mist ○ Shielded (Grease)
- ○ Grease ○ Purge Mist ○ Sealed (Grease)
- ■ Constant Level Oiler
- ○ Housing Vent Required
- □ Magnetic Drain Plug in Housing Required
- ○ Oil Cooler Required
- □ Seal Spray Guard Required
- ■ Oil Viscosity ISO Grade *
- □ Other

CONNECTIONS

	Size	Rating	Facing	Location	Finish
Suction	**DN 80 (VTC)**	**150 #**	**RF**	**SIDE**	
Discharge	**DN 50 (VTC)**	**150 #**	**RF**	**SIDE**	

Auxiliary Connections ● Drain; □ Size * (mm)
○ Threaded ● Welded & Flanged

MATERIALS

Casing	**Cast Iron (VTC)**
Impeller	**Cast Iron (VTC)**
Cover	**Cast Iron (VTC)**
Shaft	*
Shaft Sleeve	*
Baseplate / support pedestal	**Carbon Steel**
Casing Gasket	*
Impeller Gasket	*
Casing Fasteners	*
Bearing Housing	*
Bearing Housing Adapter	*
Bearing Housing End Seals	*
Coupling Guard	* **(Non-sparking)**
Mechanical Seal Gland	*
Mechanical Seal Gland Fasteners	*

VENDOR DATA REQUIREMENTS

- ● For Vendor Data Requirements Refer to :
- -
- ○ Other :

DRIVER

Power Rating * (kW); Speed * (rpm)
Driver Size Selected for Max SG of
and Max Visc of (cP)
Manufacturer: * ● Horizontal ○ Vertical
Type: **VTA** Insulation: * Temp Rise: *
Volts / Phase / Hertz : 380 V / 3 phase / 50 Hz
Service Factor :
Starting Method : VTA
Speed : ● **Constant Speed** ○ **Variable Speed**
Ingress Protection : **IP 55**

COUPLING DRIVER TO PUMP

Manufacturer *
Type *
Size *
Model *
Spacer Length * (mm)

Coupling Guard Type
- ○ Manufacturer Standard ○ Baseplate Mounted
- ● Non-Sparking Coupling Guard
- ● Other **min. service factor 1.5**

BASEPLATE / SUPPORT PEDESTAL

Type ● Grouted ○ Free Standing
□ Centerline of Pump to Stilt Bottom **NA** (mm)
Design ○ Manufacturer Standard
● Other : -

Remarks:

PAINT AND SHIPMENT PREPARATION

Pump
- ○ Manufacturer Standard
- ● Other **Note 10**

Baseplate
- ○ Manufacturer Standard
- ● Other **Note 10**

Shipment
- ○ Domestic ● Export ● Export Boxing Required
- ● Number of Months of Storage **MIN. 6 MONTHS**

Total Weight (kg.)

INSPECTION AND TESTING

Test	Non-Wit	Witness	Certificate
Hydrostatic	●	○	●
Performance	●	○	●
NPSHR **(Note 3)**	●	○	●
Vibration	●	○	○
Other **NOISE (reading only)**	●	○	○

- ● Final Shop Inspection ○ Days for Notification
- ○ Dismantle and Inspect After Test
- ● Casing Repair Procedure Approval Required

Material Certification (Note 7)
- ● Casing ○ Cover ● Impeller ● Shaft
- ○ Other

Inspection for Connection Welds
- ● Manufacturer Standard ● Visual Inspection

Inspection for Castings
- ● Manufacturer Standard ● Visual Inspection
- ○ Other

NOTE

REFER TO PAGE 5 OF 8

CO2 PRODUCT.JSC	HIGH TECHNOLOGY CO2 PRODUCTION PLANT	PTSC THANH HOA
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		Revision No.: B1

DATASHEET FOR WATER PUMPS

Tag No.:	P101A/B	**Plant Location:**	Khánh Phú, Yên Khánh, Ninh Bình
Service:	Water	**Supplier:**	VTA
P & ID No.:	CO2-JIA-PRC-PID-001	**Purchase Order No.:**	VTA
Calculation Ref.:	-	**No. of Units:**	2 (Two)

Service Description: Condensing Washing System

MECHANICAL SEAL

Supplied by ● Pump VENDOR ○ PURCHASER

Mounted by ● Pump VENDOR ○ PURCHASER

● Seal Code *

■ Manufacturer *

■ Model *

■ Manufacturer's Code *

Seal Type ○ Cartridge-Semi ◊ Component ● Cartridge

Seal Design ● Single ○ Dual ○ Dry Gas

○ Pressurized ● Unpressurized

Seal Chamber ○ Taper Bore ● Cylindrical Bore

Chamber Size ○ Oversize ● Standard

● Sleeve Material *

● Pumping Ring Required *

Throat Bushing Required; ● Material *

Remarks :

BARRIER / BUFFER FLUSH SYSTEM (N/A)

Barrier Flush Plan

◊ Barrier Flush Fluid

◊ Supply Temp - Max/Min / (ºC)

◊ Specific Gravity

◊ Specific Heat (kJ/kg.ºC)

◊ Vapor Pressure (bara) @ (ºC)

□ Pressure Req'd - Max/Min / (barg)

□ MAWP of Secondary Seal System (barg)

□ Temperature Req'd - Max/Min / (ºC)

Secondary Seal Flush Piping

○ Tubing ○ Pipe ○ Other

Material

○ 316SS ○ Carbon Steel ○ Other

Piping / Tubing Size (mm)

Piping Assembly ○ Threaded ○ Tube Type Fittings ○ Unions ○ Socket Welded ○ Flanged

SEAL GLAND

Taps Required ○ Quench ○ Flush ○ Drain ○ Other

Throttle Bushing Required; ○ Material

SEAL SYSTEM INSTRUMENTATION (N/A)

Primary Seals	Gauges	Switches
Flow	◊	○
Temperature	◊	○
Pressure	○	○
Secondary Seals		
Flow	○	○
Pressure	○	○
Level	○	○

SEAL FLUSHING

Primary Flush Plan 11

■ Flush Fluid **Pumping Liquid**

□ Supply Temp - Max/Min / (ºC)

□ Specific Gravity

□ Specific Heat (kJ/kg.ºK)

□ Vapor Pressure (bara) @ (ºC)

□ Flow Rate - Max/Min / (m^3/h)

□ Pressure Req'd - Max/Min / (barg)

□ Temperature Req'd - Max/Min / (ºC)

Primary Seal Flush Piping

● Tubing ● Pipe ○ Other

Material

● 316SS ○ Carbon Steel

○ Other

Piping / Tubing Size *

Piping Assembly ○ Threaded ○ Tube Type Fittings ○ Unions ● Butt Welded ○ Flanged

COOLING AND HEATING PIPING PLANS (N/A)

	Cooling	Heating
Piping Plan		
Name of Fluid		
Inlet Temperature (°C)		
Outlet Temperature (°C)		
Rated Flow (m^3/h)		
Supply / MAWP (barg)		
Max Allowable DP (bar)		
Galvanized Pipe		
Stainless Steel Tubing		
Outlet Shutoff Valve		
Sight Flow Indicator		

NOTES

1) VENDOR to fill in fields marked with * and other applicable fields, VTC - Vendor to confirm.
2) *Delete*
3) Refer to COMPANY specification Centrifugal Pump Specification.
   NPSH Test is required if NPSHa - NPSHr < 0.6m.
4) 25 m3/h is design capacity of forward flow . Vendor to indicate recycle flow required by pump.
5) Refer to P&ID for Service CO2 System.
6) VENDOR to verify the pump material, mechanical seal material and construction and seal flushing plan.
7) Certified Material Test Report (CMTR) shall be provided by VENDOR. Pressure retaining components type 3.1, others type 2.2 to EN 10204.
8) *Delete*
9) The motors shall be sized for the end of curve for the rated impeller, and shall take into account power requirements for maximum viscosity and maximum specific gravity.
10) Painting shall be complied with Project Painting Specification

CO2 PRODUCT.JSC	HIGH TECHNOLOGY CO2 PRODUCTION PLANT	PTSC THANH HOA
	MECHANICAL DATASHEET FOR CENTRIFUGAL PUMP	Document No.: CO2-PTH-MEC-DTS-003
		Revision No.: B1

DATASHEET FOR COOLING CIRCULATING WATER PUMPS

Tag No.:	P401A/B	**Plant Location:**	Khánh Phú, Yên Khánh, Ninh Bình
Service:	Water	**Supplier:**	VTA
P & ID No.:	CO2-JIA-PRC-PID-008	**Purchase Order No.:**	VTA
Calculation Ref.:	-	**No. of Units:**	2 (Two)

Service Description: Utilities System

1	APPLICABLE TO:	● PROPOSAL	○ PURCHASE	○ AS BUILT		
2	UNIT	**CENTRIFUGAL PUMP**				
3	NO. OF PUMPS REQUIRED	**2 (Two) x 100%**				
4	SERVICE	**WATER**	TYPE	**HORIZONTAL (VTA)**		
5	MANUFACTURER	*	SIZE	*		
6	MODEL	*	SERIAL NO.	*		
7	INFORMATION TO BE COMPLETED	○ BY PURCHASER	▭ BY MANUFACTURER	○ BY PURCHASER OR MANUFACTURER		
8	**GENERAL**					
9	Number of Motor Driven	**2 (Two)**	Number of Turbine Driven	**VTA**	Gearbox Required	**VTA**
10	Motor Item Number	**TBA**	Turbine Item Number	**VTA**	Gearbox Item Number	**VTA**
11	Motor Provided by	**VTA**	Turbine Provided by	**VTA**	Gearbox Provided by	**VTA**
12	Motor Mounted by	**VTA**	Turbine Mounted by	**VTA**	Gearbox Mounted by	**VTA**

	OPERATING CONDITIONS					**PERFORMANCE**				
14		Rated	Max	Norm	Min	▮ Performance Curve Number *				
15	Capacity (m^3/h) **(Note 4)**	**450**				▮ Speed * (rpm)				
16	Recirculation Flow (m^3/h)**(Note 4)**	**450**				**Measured at Capacity**	Rated	Max	Normal	Min
17	Suction Press (MPag)	**0**				▮ NPSH Req'd (m)	*	*	*	*
18	Discharge Press (MPag)	**0.3**				▮ NPSH Margin **(Note 3)**	*	*	*	*
19	Differential Press (MPag)	**0.3**				▮ Max Head @ Rated Impeller * (m)				
20	Differential Head (m)	**30**				▮ Max Head @ Maximum Impeller * (m)				
21	Hydraulic Power (kW)	**55 (VTA)**				▮ Minimum Continuous Flow				
22	Operating Time (hr./yr.)	*				Thermal , Stable * (m^3/h)				
23	NPSH Available (m)	**1 (Hold)**				▮ Allowable Operating Region * to * (m^3/h)				
24	**System Design**					▮ Best Efficiency Point for Rated Impeller * (m^3/h)				
25	● Stand Alone Operation	○ Parallel Operation				▮ Suction Specific Speed *** (max 11000)** (US units)				
26	○ Series Operation with Item Number					▮ Impeller Diameter Rated * , Max * , Min * (mm.)				
27	**Service**					▮ Pump Rated Power (kW) * , Efficiency * (%)				
28	○ Continuous	● Intermittent (Starts/day)				▮ Max Power @ Rated Impeller *** (Note 9)** (kW)				
29	**System Control Method**					**Rotation** (Viewed from Coupling End) ○ CW ○ CCW				
30	○ Speed ○ Flow	○ Level ○ Temperature				**Case Pressure Rating**				
31	○ Pressure ○ Pipe Friction Resistance Only					▮ Max Allowable Working Pressure * (barg)				
32	**Open valve start-up**	● Yes ○ No				▮ Hydrostatic Test Pressure * (barg)				

	PUMPED FLUID				**SITE CONDITIONS**
34	Pumped Fluid	**Service Water**			Location ○ Indoor ● Outdoor ○ Heated ● Unheated
35		Rated	Maximum	Minimum	Altitude **TBA** (m.)
36	Pumping Temp (°C)	**10**			Range of Ambient Temperatures Max/Min * / * (ºC)
37	Density (kg/m3)	**1000**			
38	Vapor Press (MPa)	**0.001195**			Electrical Classification
39	Viscosity (cP)	**1.0**			● Non Hazardous
40	Sp Heat (kJ/kg.ºK)	**NA**			○ Zone Gas Group Temp. Class
41	Initial Boiling Point	(ºC) @		(bara)	Unusual Condition
42	**Liquid** ○ Hazardous	○ Flammable	○ Other		● Tropicalization required ○ Winterization required
43	Corrosion / Erosion caused by				○ Dust ○ Fumes
44	% Solids	Max Particle Size		(mm.)	● Other : **Tropical Environment**
45	**NOTES:**				
46	REFER TO PAGE 8 OF 8				
47					
48					

CO2 PRODUCT.JSC	HIGH TECHNOLOGY CO2 PRODUCTION PLANT	PTSC THANH HOA
	MECHANICAL DATASHEET FOR CENTRIFUGAL PUMP	Document No.: CO2-PTH-MEC-DTS-003 Revision No.: B1

DATASHEET FOR COOLING CIRCULATING WATER PUMPS

Tag No.:	P401A/B	**Plant Location:**	Khánh Phú, Yên Khánh, Ninh Bình
Service:	Water	**Supplier:**	VTA
P & ID No.:	CO2-JIA-PRC-PID-008	**Purchase Order No.:**	VTA
Calculation Ref.:	-	**No. of Units:**	2 (Two)

Service Description: Utilities System

MECHANICAL DATA

Pump Design Code: (*)
Other : -

Impeller Type
■ Closed ☐ Open
☐ Semi-Open ☐ Other

Casing Mounting
☐ Foot ■ Centerline
☐ Vertical In-Line ☐ Close-Coupled
☐ Other :

Bearings
■ Bearing Manufacturer *
■ Radial Bearing Type * Qty *
■ Thrust Bearing Type * Qty *
☐ Bearing Isolators

Lubrication
● Oil ⬭ Pure Mist ○ Shielded (Grease)
○ Grease ⬭ Purge Mist ○ Sealed (Grease)
■ Constant Level Oiler
○ Housing Vent Required
☐ Magnetic Drain Plug in Housing Required
○ Oil Cooler Required
☐ Seal Spray Guard Required
■ Oil Viscosity ISO Grade *
☐ Other

CONNECTIONS

	Size	Rating	Facing	Location	Finish
Suction	**DN 250 (VTC)**	**150 #**	**RF**	**SIDE**	
Discharge	**DN 200 (VTC)**	**150 #**	**RF**	**SIDE**	

Auxiliary Connections ● Drain; ☐ Size * (mm)
○ Threaded ● Welded & Flanged

MATERIALS

Casing	**Cast Iron (VTC)**
Impeller	**Cast Iron (VTC)**
Cover	**Cast Iron (VTC)**
Shaft	*
Shaft Sleeve	*
Baseplate / support pedestal	**Carbon Steel**
Casing Gasket	*
Impeller Gasket	*
Casing Fasteners	*
Bearing Housing	*
Bearing Housing Adapter	*
Bearing Housing End Seals	*
Coupling Guard	* **(Non-sparking)**
Mechanical Seal Gland	*
Mechanical Seal Gland Fasteners	*

VENDOR DATA REQUIREMENTS

■ For Vendor Data Requirements Refer to :
-
○ Other :

DRIVER

Power Rating * (kW); Speed * (rpm)
Driver Size Selected for Max SG of
and Max Visc of (cP)
Manufacturer: * ● Horizontal ○ Vertical
Type: **VTA** Insulation: * Temp Rise: *
Volts / Phase / Hertz : 380 V / 3 phase / 50 Hz
Service Factor :
Starting Method :
Speed : ● **Constant Speed** ○ **Variable Speed**
Ingress Protection : **IP 55**

COUPLING DRIVER TO PUMP

Manufacturer *
Type *
Size *
Model *
Spacer Length * (mm)

Coupling Guard Type
⬭ Manufacturer Standard ○ Baseplate Mounted
● Non-Sparking Coupling Guard
● Other **min. service factor 1.5**

BASEPLATE / SUPPORT PEDESTAL

Type ● Grouted ○ Free Standing
☐ Centerline of Pump to Stilt Bottom **NA** (mm)
Design ○ Manufacturer Standard
● Other : -
Remarks:

PAINT AND SHIPMENT PREPARATION

Pump	**Baseplate**
⬭ Manufacturer Standard	⬭ Manufacturer Standard
● Other **Note 10**	● Other **Note 10**

Shipment
⬭ Domestic ● Export ● Export Boxing Required
● Number of Months of Storage **MIN. 6 MONTHS**
Total Weight (kg.)

INSPECTION AND TESTING

Test	Non-Wit	Witness	Certificate
Hydrostatic	●	○	●
Performance	●	○	●
NPSHR **(Note 3)**	●	○	●
Vibration	●	○	○
Other **NOISE (reading only)**	●	○	○

● Final Shop Inspection ○ Days for Notification
⬭ Dismantle and Inspect After Test
● Casing Repair Procedure Approval Required

Material Certification (Note 7)
● Casing ● Cover ● Impeller ● Shaft
○ Other

Inspection for Connection Welds
● Manufacturer Standard ● Visual Inspection

Inspection for Castings
● Manufacturer Standard ● Visual Inspection
○ Other

NOTE

REFER TO PAGE 8 OF 8

CO2 PRODUCT JSC	**HIGH TECHNOLOGY CO2 PRODUCTION PLANT**	PTSC THANH HOA
	MECHANICAL DATASHEET FOR CENTRIFUGAL PUMP	**Document No.:** CO2-PTH-MEC-DTS-003
		Revision No.: B1

DATASHEET FOR COOLING CIRCULATING WATER PUMPS

Tag No.:	P401A/B	**Plant Location:**	Khánh Phú, Yên Khánh, Ninh Bình
Service:	Water	**Supplier:**	VTA
P & ID No.:	CO2-JIA-PRC-PID-008	**Purchase Order No.:**	VTA
Calculation Ref.:	-	**No. of Units:**	2 (Two)

Service Description: Utilities System

MECHANICAL SEAL

Supplied by ● Pump VENDOR ○ PURCHASER

Mounted by ● Pump VENDOR ○ PURCHASER

▮ Seal Code *

▮ Manufacturer *

▮ Model *

▮ Manufacturer's Code *

Seal Type ○ Cartridge-Semi ○ Component ● Cartridge

Seal Design ● Single ○ Dual ○ Dry Gas

○ Pressurized ● Unpressurized

Seal Chamber ○ Taper Bore ● Cylindrical Bore

Chamber Size ○ Oversize ● Standard

● Sleeve Material *

● Pumping Ring Required *

Throat Bushing Required; ● Material *

Remarks :

BARRIER / BUFFER FLUSH SYSTEM (N/A)

Barrier Flush Plan

○ Barrier Flush Fluid

○ Supply Temp - Max/Min / (ºC)

○ Specific Gravity

○ Specific Heat (kJ/kg.ºC)

○ Vapor Pressure (bara) @ (ºC)

▯ Pressure Req'd - Max/Min / (barg)

▯ MAWP of Secondary Seal System (barg)

▯ Temperature Req'd - Max/Min / (ºC)

Secondary Seal Flush Piping

○ Tubing ○ Pipe ○ Other

Material

○ 316SS ○ Carbon Steel ○ Other

Piping / Tubing Size (mm)

Piping Assembly ○ Threaded ○ Tube Type Fittings ○ Unions ○ Socket Welded ○ Flanged

SEAL GLAND

Taps Required ○ Quench ○ Flush ○ Drain ○ Other

Throttle Bushing Required; ○ Material

SEAL SYSTEM INSTRUMENTATION (N/A)

Primary Seals	Gauges	Switches
Flow	○	◯
Temperature	○	◯
Pressure	◯	◯
Secondary Seals		
Flow	◯	◯
Pressure	◯	◯
Level	◯	◯

SEAL FLUSHING

Primary Flush Plan VTA

▮ Flush Fluid **Pumping Liquid**

▯ Supply Temp - Max/Min / (ºC)

▯ Specific Gravity

▯ Specific Heat (kJ/kg.ºK)

▯ Vapor Pressure (bara) @ (ºC)

▯ Flow Rate - Max/Min / (m^3/h)

▯ Pressure Req'd - Max/Min / (barg)

▯ Temperature Req'd - Max/Min / (ºC)

Primary Seal Flush Piping

● Tubing ● Pipe ○ Other

Material

▮ 316SS ○ Carbon Steel

○ Other

Piping / Tubing Size *

Piping Assembly ○ Threaded ○ Tube Type Fittings ○ Unions ● Butt Welded ○ Flanged

COOLING AND HEATING PIPING PLANS (N/A)

	Cooling	Heating
Piping Plan		
Name of Fluid		
Inlet Temperature (°C)		
Outlet Temperature (°C)		
Rated Flow (m^3/h)		
Supply / MAWP (barg)		
Max Allowable DP (bar)		
Galvanized Pipe		
Stainless Steel Tubing		
Outlet Shutoff Valve		
Sight Flow Indicator		

NOTES

1) VENDOR to fill in fields marked with * and other applicable fields, VTC - Vendor to confirm.
2) *Delete*
3) Refer to COMPANY specification Centrifugal Pump Specification.
   NPSH Test is required if NPSHa - NPSHr < 0.6m.
4) 450 m3/h is design capacity of forward flow . Vendor to indicate recycle flow required by pump.
5) Refer to P&ID for Service CO2 System.
6) VENDOR to verify the pump material, mechanical seal material and construction and seal flushing plan.
7) Certified Material Test Report (CMTR) shall be provided by VENDOR. Pressure retaining components type 3.1, others type 2.2 to EN 10204.
8) *Delete*
9) The motors shall be sized for the end of curve for the rated impeller, and shall take into account power requirements for maximum viscosity and maximum specific gravity.
10) Painting shall be complied with Project Painting Specification
11) Pumps shall be provided in duty/standby configuration. One pump operates continuously, the other serves as standby.

ATTACHMENT #3

TECHNICAL BID PROPOSAL

FORM T1 - TECHNICAL PROPOSAL (UNPRICE)

Project: HIGH TECHNOLOGY CO2 PRODUCTION PLANT

TRD no. TRD - 013

Date: 6/11/2026

SCOPE OF SUPPLY							
No	**Tag#**	**Scope of Supply**	**Description**	**Material**	**Unit**	**QTY**	**Remark**
1	***P101***	**Completed set**	**Centrifugal Pump package for liquid CO_2 service**	**VTA (Suitable for low temperature CO_2 service)**	**set**	**2**	
1.1	*VTA*	*Completed set*	*Centrifugal Pump (Horizontal / Vertical as per datasheet) - Capacity: 25 m3/h - Differential Head: 24m - Comply with GB/T 3215 or equivalent - Include motor, baseplate, coupling, guard, instrumentation*	*Liquid: water*	*set*	*2*	*Refer to TRD and datasheet*
1.2	*VTA*		*Accessories & Instrumentation (Temperature sensors - RTD, vibration sensors if applicable, leak detection if required)*	*VTA*	*lot*	*2*	
1.3	*VTA*		*Special tools for maintenance (if any)*	*VTA*	*lot*	*VTA*	
1.4	*VTA*		*Spare parts for commissioning & initial start-up*	*VTA*	*lot*	*VTA*	
2	***P401***	**Completed set**	**Centrifugal Pump package for liquid CO_2 service**	**VTA (Suitable for low temperature CO_2 service)**	**set**	**2**	
2.1	*VTA*	*Completed set*	*Centrifugal Pump (Horizontal / Vertical as per datasheet) - Capacity: 450 m3/h - Differential Head: 30m - Comply with GB/T 3215 or equivalent - Include motor, baseplate, coupling, guard, instrumentation*	*Liquid: water*	*set*	*2*	*Refer to TRD and datasheet*
2.2	*VTA*		*Accessories & Instrumentation (Temperature sensors - RTD, vibration sensors if applicable, leak detection if required)*	*VTA*	*lot*	*2*	
2.3	*VTA*		*Special tools for maintenance (if any)*	*VTA*	*lot*	*VTA*	
2.4	*VTA*		*Spare parts for commissioning & initial start-up*	*VTA*	*lot*	*VTA*	
3	**VTA**	**Completed set**	**Recommended spare parts list for 2 years operation**	***VTA***	**lot**	**VTA**	*Refer to VDRL*

Note: *VTA: Vendor to Advise*

UNPRICED SCHEDULE OF PRICES						
Description	**Brand**	**Model**	**Origin**	**Unit**	**Q'ty**	**Remark**
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	set	2	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	set	2	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	2	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	VTA	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	VTA	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	set	2	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	set	2	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	2	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	VTA	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	VTA	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	lot	VTA	
BIDDER to specify	BIDDER to specify	BIDDER to specify	BIDDER to specify	0	0	

Form T2 Deviation from Purchaser's Specification	**Project**	HIGH TECHNOLOGY CO2 PRODUCTION PLANT	**Vendor**			
	PTSC Project No.		**Vendor Project No.**			
	Item No		**Contract No.**			
	Service					

Spec. No.	Paragraph No.	Deviation	PTSC Justification	Client Conclusion	Remarks	Cost Effect When Deviation is Applied

Form T3 - LIST OF SUBCONTRACTOR(S) AND COUNTRY OF ORIGIN

No.	Material/ Equipment/ Component / Activities	Supplier /Manufacturer/ Subcontractor	Location / Country of Origin
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
10			
11			
12			
13			

[*Depending on the nature of the Goods, Buyer to list out the material / equipment / major components / activities that require Bidder to advise the details of suppliers / manufacturer / sub-contractor and location / country of origin*]

FORM T4 SPARE PARTS LIST FOR INSTALLATION, COMMISSIONING	**Project**	HIGH TECHNOLOGY CO2 PRODUCTION PLANT	**Vendor**						
	PTSC Project No.		**Vendor Project No.**						
	Item No.		**Contract No.**						
	Service								

Item no.	Part name	Drawing no.	Part no.	Spec (material)	Installed Q'ty per unit	Recommended Q'ty	Sketch	Unit price	Total price

FORM T5 SPECIAL TOOL LIST	**Project**	HIGH TECHNOLOGY CO2 PRODUCTION PLANT	**Vendor**		
	PTSC Project No.		**Vendor Project No.**		
	Item No.		**Contract No.**		
	Service				

No.	Tool name	Q'ty	Sketch	Unit price	Total price

Project:	**CO2 Plant project**	**TBC No.:**	
Tag No.:	**P101A/B & P401A/B**	**Date of Issued:**	
Bidder Name:		**Date of Response:**	
Bidder Signature:			

Note:
BIDDER shall CONFIRM COMPLIANCE to all requirements in these Technical Bid Clarifications (TBC). If BIDDER is unable to meet any requirements, BIDDER shall provide sufficient reasoning for NOT COMPLYING to the requirements. BIDDER may provide COST or SCHEDULE IMPACT if any for meeting requirements (BIDDER to furnish additional details wherever required). BIDDER shall NOT use replies like "O.K", "FOLLOW", etc.
Where the cost impact is involved, the price information shall be submitted after all clarifications closed and upon receipt of Buyer's request.

ITEM NO.	Classify	Title	TECHNICAL QUERY_M	BIDDER'S CONFIRMATION / CLARIFICATION	COST IMPACT (YES/NO)	SCHEDULE IMPACT (YES/NO)	STATUS (OPEN/CLOSED)
GE- GENERAL							
G001							
G002							
PRO - PROCESS							
PRO1							
PRO2							
PRO3							
PRO4							
PRO5							
IN - INSTRUMENT							
INS000							
INS001							
INS002							
INS003							
INS004							
INS005							
PP - PIPING & LAYOUT							
PP1							
PP2							
PP3							
PP4							
PP5							
ELE - ELECTRICAL							
ELE1							
ELE2							
STR - STRUCTURE							
STR1							
STR2							
PRE - PRECOMMISSIONING AND COMMISSIONING							
PRE1							
PRE2							
QC - QUALITY CONTROL							
QC1							
QC2							
QC3							
OTHER							
OT1							
OT2							
OT3							

ATTACHMENT #4

VENDOR DATA REQUIREMENT LIST

VENDOR DATA REQUIREMENT LIST (VDRL)

No.	Document	Submit with Tender	Submit after PO	Remarks
1	Manufacturer company profile & reference list	x	x	Pump & Motor manufacturer qualification
2	Completed Pump & Motor Data Sheet	x	x	**Importantly, it must be complete.**
3	Performance Curves (Head-Flow, Power, Efficiency, NPSHr)	x	x	At rated & operating range
4	General Arrangement (GA) Drawing	x	x	Include dimensions, weights, nozzle orientation
5	Cross Sectional / Exploded View Drawing with Bill of Materials	x	x	Detail all parts, materials
6	Foundation / Anchor Bolt Plan & Loading Data		x	
7	P&ID for Pump Unit (include circulation loop)	x	x	
8	Electrical Schematic, Wiring Diagram & Motor Data	x	x	Terminal box, protection devices
9	Instrument List & Hook-up Drawings (RTD, vibration, leak detection if any)		x	
10	Hydraulic & Thrust Balance Calculation		x	
11	Rotor Dynamics & Critical Speed Analysis		x	
12	Heat Balance & Cooling / Lubrication Calculation		x	Minimum flow for cooling, circulation plan
13	Material Selection Report & Corrosion Study (wetted parts for CO_2)		x	Low temperature compatibility
14	Welding Procedure (WPS / PQR / WPQ)		x	If applicable
15	Inspection & Test Plan (ITP)		x	Include FAT, electrical insulation, stator integrity, leak tightness
16	NDT Plan (if applicable)		x	RT/UT/PT for pressure containing parts
17	Hydrostatic / Pressure Test Procedure		x	
18	Material Certificates (Mill Test Certificates - Type 3.1)		x	All wetted & pressure parts
19	Performance / Factory Acceptance Test (FAT) Procedure		x	Witness if required
20	Vibration & Noise Test Procedure & Report		x	
21	Hazardous Area Certification (ATEX/IECEx if required)	x	x	
22	Painting / Coating Specification & Report	x	x	
23	Nameplate & Stamping Details		x	
24	Operation & Maintenance Manual (IOM)		x	Include troubleshooting, spare parts
25	Recommended Spare Parts List (SPIR)	x	x	2 years operation + commissioning
26	As-Built Drawings & Documents		x	Final after FAT
27	Certificate of Conformity (CO/CQ)		x	
28	Third Party Inspection Certificate (if required)		x	BV/DNV/TPI
29	Progress Report & Manufacturing Schedule		x	Bi-weekly as per TRD 9.3
30	Deviation List (if any)	x	x	**Must be submitted with bid**

ATTACHMENT #5

PROJECT SCHEDULE

HIGH-TECHNOLOGY CO2 MANUFACTURING PLAN PROJECT
MASTER SCHEDULE LV3

CO2 PRODUCT.JSC

PTSC THANH HOA

Activity ID	Activity Name	Original Duration	Start	Finish
NHA MAY SAN XUAT CO2 CONG NGHE CAO (PTH - JIANG AN)		240d	04-Mar-26	14-Dec-26
PROJECT MILESTONES		0d	04-Mar-26	04-Mar-26
NB.CO2.JA1860	Contact award	0d	04-Mar-26*	
ENG		48d	04-Mar-26	29-Apr-26
MILESTONES - ENG		33d	20-Mar-26	29-Apr-26
NB.CO2.JA1780	Complete P&ID, HMB for systems	0d		20-Mar-26
NB.CO2.JA1790	Release of Specification/ Datasheet for Equipment & Instrument	0d		20-Mar-26
NB.CO2.JA1800	Release of Equipment list/ Plot plan	0d		20-Mar-26
NB.CO2.JA1810	Release of Final MTO	0d		30-Mar-26
NB.CO2.JA1820	Issued TRD for procurement	0d		31-Mar-26
NB.CO2.JA1830	Approval TBE for procurement by Jiang An	0d		11-Apr-26
NB.CO2.JA1840	PTH signed a contract with the Vendor	0d		16-Apr-26
NB.CO2.JA1850	Detailed Engineering Completion	0d		29-Apr-26
ENG BY JIANG AN		48d	04-Mar-26	29-Apr-26
PROJECT MANAGEMENT		15d	04-Mar-26	20-Mar-26
NB.CO2.JA1010	Project Execution Plan	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1020	Project Coordination Procedure	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1030	Project Quality Plan	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1040	Level III Schedule of Detail Engineering	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1050	Document Management Procedure	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1060	EMDR	15d	04-Mar-26	20-Mar-26
PROCESS		15d	04-Mar-26	20-Mar-26
NB.CO2.JA1070	Process & Utility Basic of Design	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1080	Operating & Control Philosophy	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1090	Process Simulation Report	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1100	PFD & Heat Mass Balance	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1110	P&ID	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1120	Sizing Calculation Reports	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1130	Line list	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1140	Valve List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1150	Equipment List (Weigth, Dimension, Power Consumtion,…)	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1160	Instrument List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1170	Process datasheets for all equipment as Equipment List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1180	Cause & Effect Matrix	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1190	HAZOP/HAZID/SIL Study Report	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1200	IOM procedure	15d	04-Mar-26	20-Mar-26
MECHANICAL		15d	04-Mar-26	20-Mar-26
NB.CO2.JA1000	Equipment Specification	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1210	Mechanical Calculation for all equipment	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1220	Mechanical Datasheets for all equipment	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1230	General Arrangement for all equipment	15d	04-Mar-26	20-Mar-26



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Date	Revision	Checked	Approved
24-Dec-25	Issue for Bidding	V.L.T	V.V.V
25-Feb-26	Issue for PO	V.L.T	V.V.V

HIGH-TECHNOLOGY CO2 MANUFACTURING PLAN PROJECT
MASTER SCHEDULE LV3

CO2 PRODUCT.JSC

PTSC THANH HOA

Activity ID	Activity Name	Original Duration	Start	Finish
NB.CO2.JA1240	Fabrication Drawings, if applicable	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1250	Erection drawings for all equipment	15d	04-Mar-26	20-Mar-26
PIPING		23d	04-Mar-26	30-Mar-26
NB.CO2.JA1260	Plot Plans & Equipment Layouts	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1270	3D Model	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1280	Specification for Special Items/ Manual Valve/ Piping Materials/ Insulation/ Painting and Coating	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1290	Pipe Wall Thickness Calculation Report	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1300	Piping Arrangement and Support Location Drawings	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1310	Pipe Support Details Drawings	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1320	Tie-in Schedule	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1330	Datasheet for Special Items/ Manual Valves	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1340	Fabrication Drawings (Isometric)	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1350	MTO piping,support, fitting & vavle	3d	27-Mar-26	30-Mar-26
ELECTRICAL		23d	04-Mar-26	30-Mar-26
NB.CO2.JA1360	Electrical Design Basis	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1370	Calculation Report	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1380	Electric Load List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1390	Specification for Electrical	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1400	Datasheet for Electrical	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1410	Single Line Diagram & Key Single Line Diagram	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1420	Configuration and Wiring Diagram	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1430	Power Cable Schedule/ Power Cable List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1440	Cable Tray & Conduit Layout	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1450	Layout Drawings	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1460	Earthing Layout Drawing	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1470	MTO for Electrical	3d	27-Mar-26	30-Mar-26
INSTRUMENT & CONTROL		23d	04-Mar-26	30-Mar-26
NB.CO2.JA1480	Control Philosophy	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1490	Datasheet for Instrument	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1500	Specification for Instrument	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1510	I/O List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1520	Fire & Gas Logic	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1530	PLC Design	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1540	Communication List	15d	04-Mar-26	20-Mar-26
NB.CO2.JA1550	Hook-up Drawing	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1560	MTO for Instrument & Control System (bulk items)	3d	27-Mar-26	30-Mar-26
OTHER		19d	07-Apr-26	29-Apr-26
NB.CO2.JA1570	Approval of TBE for PTH to proceed with equipment purchase	5d	07-Apr-26	11-Apr-26
NB.CO2.JA1580	Vendor data incorporation to the engineering drawings	10d	17-Apr-26	29-Apr-26
ENG BY PTH		38d	04-Mar-26	16-Apr-26



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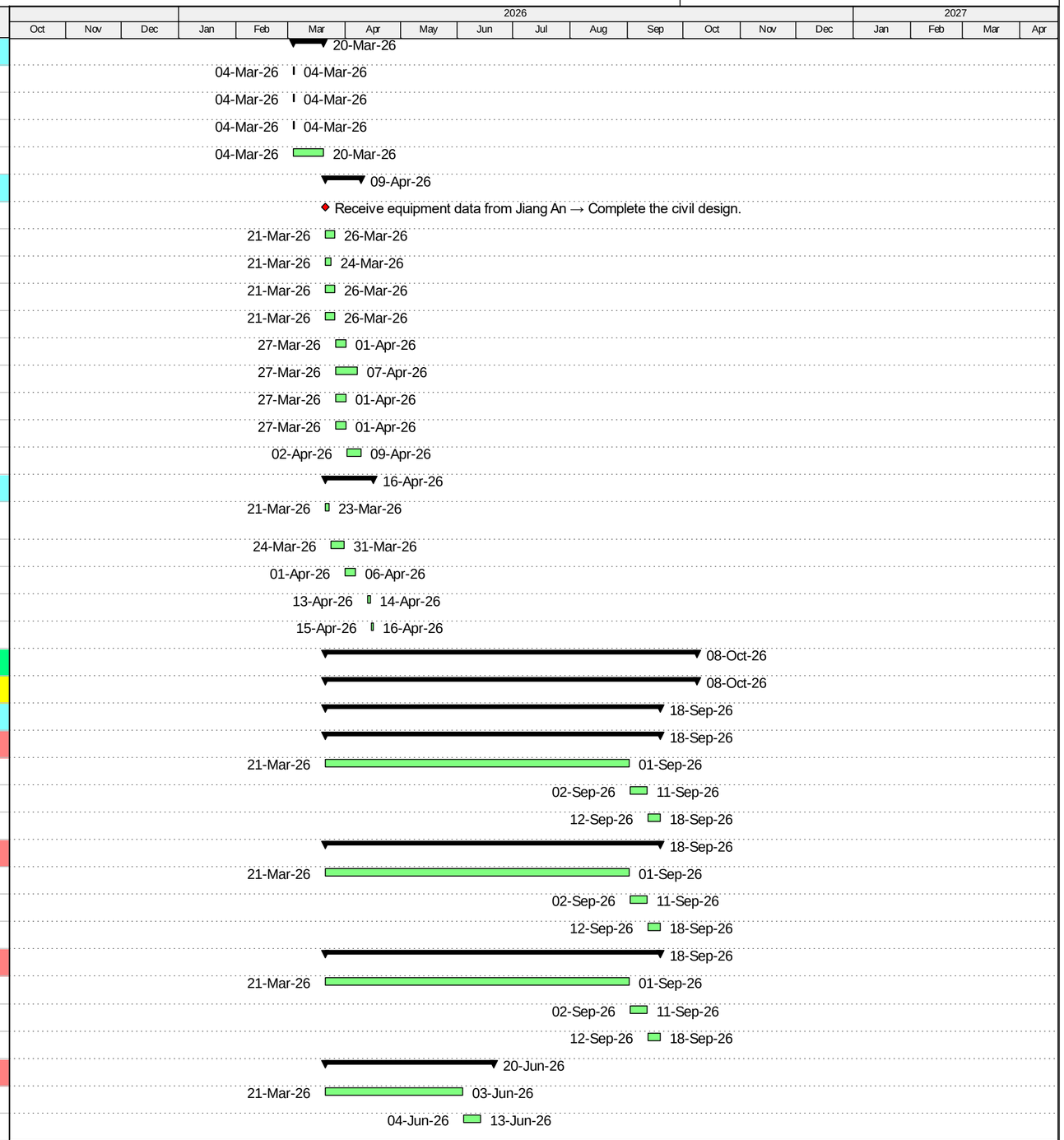
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HIGH-TECHNOLOGY CO2 MANUFACTURING PLAN PROJECT
MASTER SCHEDULE LV3

CO2 PRODUCT.JSC

PTSC THANH HOA

Activity ID	Activity Name	Original Duration	Start	Finish
GENERAL		15d	04-Mar-26	20-Mar-26
NB.CO2.JA1590	Document Numbering Procedure	1d	04-Mar-26	04-Mar-26
NB.CO2.JA1600	Project Document Form	1d	04-Mar-26	04-Mar-26
NB.CO2.JA1610	Title Block and Drawing Template	1d	04-Mar-26	04-Mar-26
NB.CO2.JA1620	Engineering Master Document Register – EMDR	15d	04-Mar-26	20-Mar-26
STRUCTURE, CIVIL		17d	21-Mar-26	09-Apr-26
NB.CO2.JA1630	Receive equipment data from Jiang An → Complete the civil design.	0d	21-Mar-26	
NB.CO2.JA1640	Test Pile Calculation Report	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1650	Production Pile Design Calculation Report	3d	21-Mar-26	24-Mar-26
NB.CO2.JA1660	Foundation Design Calculation Report for All Construction Items	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1670	Structural Design Basis	5d	21-Mar-26	26-Mar-26
NB.CO2.JA1680	Structural Calculation Report	5d	27-Mar-26	01-Apr-26
NB.CO2.JA1690	Drawings for Structure & Civil	10d	27-Mar-26	07-Apr-26
NB.CO2.JA1700	Structural Steel Specification	5d	27-Mar-26	01-Apr-26
NB.CO2.JA1710	Painting / Fireproofing Specification	5d	27-Mar-26	01-Apr-26
NB.CO2.JA1720	MTO/ BOQ for Structure & Civil	7d	02-Apr-26	09-Apr-26
OTHER		23d	21-Mar-26	16-Apr-26
NB.CO2.JA1730	Compile Giang An's design documents for issuance of the TRD for supplier sourcing.	2d	21-Mar-26	23-Mar-26
NB.CO2.JA1740	Issue the 1st TRD for supplier sourcing.	7d	24-Mar-26	31-Mar-26
NB.CO2.JA1750	TBE for submission to Giang An for equipment procurement approval.	5d	01-Apr-26	06-Apr-26
NB.CO2.JA1760	ssue the final TRD after the TBE has been approved by Jiang An.	2d	13-Apr-26	14-Apr-26
NB.CO2.JA1770	Sign a contract with the Vendor	2d	15-Apr-26	16-Apr-26
PROCUREMENT		202d	21-Mar-26	08-Oct-26
MECHANICAL		202d	21-Mar-26	08-Oct-26
Supplied by Jiang An		182d	21-Mar-26	18-Sep-26
Condensation and Gas Scrubbing System (Scrubber Tower + Gas–Liquid Separator)		182d	21-Mar-26	18-Sep-26
NB.CO2.JA1870	Fabrication Works	165d	21-Mar-26	01-Sep-26
NB.CO2.JA1880	Delivery Date at the Border Gate	10d	02-Sep-26	11-Sep-26
NB.CO2.JA1890	Delivery Date to Site (by PTH)	7d	12-Sep-26	18-Sep-26
Distillation System (Cold Box)		182d	21-Mar-26	18-Sep-26
NB.CO2.JA1900	Fabrication Works	165d	21-Mar-26	01-Sep-26
NB.CO2.JA1910	Delivery Date at the Border Gate	10d	02-Sep-26	11-Sep-26
NB.CO2.JA1920	Delivery Date to Site (by PTH)	7d	12-Sep-26	18-Sep-26
Desulfurization System (Desulfurization Tower + Activated Carbon Bed)		182d	21-Mar-26	18-Sep-26
NB.CO2.JA1930	Fabrication Works	165d	21-Mar-26	01-Sep-26
NB.CO2.JA1940	Delivery Date at the Border Gate	10d	02-Sep-26	11-Sep-26
NB.CO2.JA1950	Delivery Date to Site (by PTH)	7d	12-Sep-26	18-Sep-26
Cooling System		92d	21-Mar-26	20-Jun-26
CO2.NB2550	Fabrication Works	75d	21-Mar-26	03-Jun-26
CO2.NB2560	Delivery Date at the Border Gate	10d	04-Jun-26	13-Jun-26



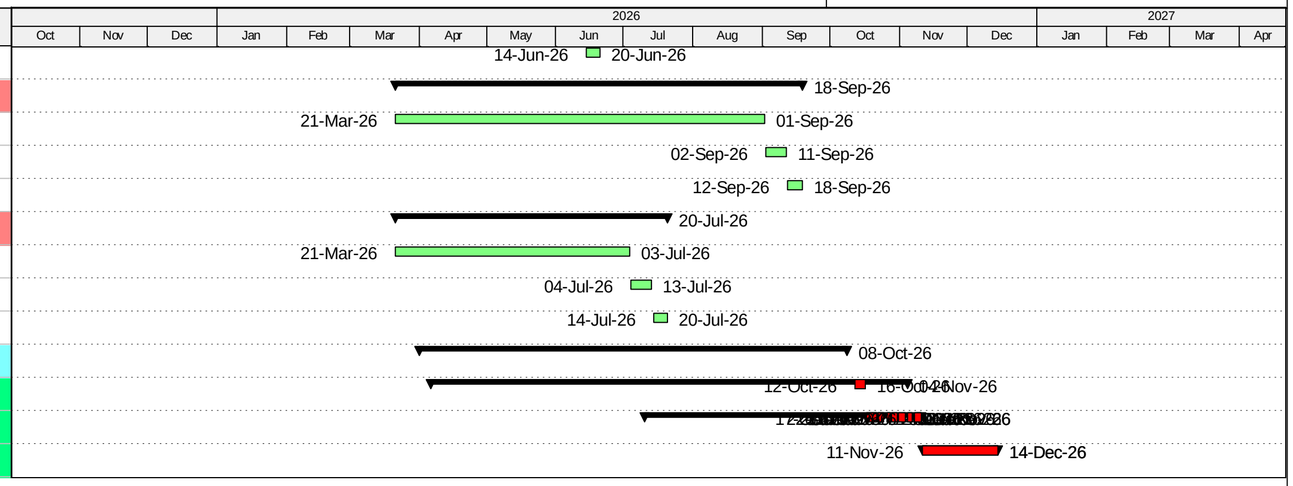
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HIGH-TECHNOLOGY CO2 MANUFACTURING PLAN PROJECT
MASTER SCHEDULE LV3

Activity ID	Activity Name	Original Duration	Start	Finish
CO2.NB2580	Delivery Date to Site (by PTH)	7d	14-Jun-26	20-Jun-26
CO2 Compressorr		182d	21-Mar-26	18-Sep-26
CO2.NB2630	Fabrication Works	165d	21-Mar-26	01-Sep-26
CO2.NB2640	Delivery Date at the Border Gate	10d	02-Sep-26	11-Sep-26
CO2.NB2660	Delivery Date to Site (by PTH)	7d	12-Sep-26	18-Sep-26
CO2 Fan		122d	21-Mar-26	20-Jul-26
CO2.NB2670	Fabrication Works	105d	21-Mar-26	03-Jul-26
CO2.NB2680	Delivery Date at the Border Gate	10d	04-Jul-26	13-Jul-26
CO2.NB2690	Delivery Date to Site (by PTH)	7d	14-Jul-26	20-Jul-26
Supplied by PTH		191d	01-Apr-26	08-Oct-26
CONSTRUCTION WORK		178d	06-Apr-26	04-Nov-26
PRE-COM & COM		104d	10-Jul-26	10-Nov-26
HAND OVER TO CLIENT		29d	11-Nov-26	14-Dec-26



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