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2. PROPONENT'S UNIT DESCRIPTION

2.1 Unit Dimensions and Weight

Total unit dimensions and weight, including skid, engine (or motor), compressor and cooler.  
Width (feet): 14.5 Length (feet): 75, Height (feet) 13.5  
Weight (lbs.): 200,000

2.2 Component Information

- 2.2.1
Cooler or fin fan (Must be: FF type)
Yes
Manufacturer
ACE (Alfa Laval)
Model
T102-3-32
Width (feet)
13.2
Length (feet)
34.1
Height (feet)
12.6
Maximum Fan Hp
120
- 2.2.2
Control Panel (Electronic)
PLC
A/B Control Logix, Panelview Plus 7 Performance 15"
- 2.2.3
Starting Air/Gas Requirements (Starting Air / Starting Gas Supplied at 150 psig)
Starter Manufacturer
Waukesha TDI
Model
T112V
Required Flow:
148 air / 192 gas SCFM at
150 psig
- 2.2.4
Scrubber
Suction
Type
Vane
Manufacturer
AG Equipment (ASME code shop)
Diameter
36"
Height
70"
Liq. KO Cap.
K 0.65
- 2.2.5
Exhaust Silencer (Must be: Hospital Grade / Vertical Type with Flashback Arrest or and catalytic converter if required )
Type
Vertical (Hospital grade)
Manufacturer
Mimotech
35-40 dBA @
3
feet from unit

Description of emission control system:

ADEM IV for Caterpillar Engine and ESM for Waukesha Engine ESM2

Vendor shall include all necessary equipment, to not exceed maximum limits values specified.



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2.3 Proponent's Equipment Performance Guarantee

2.3.1 Engine fuel consumption (BTU/HP-Hr): 7085 (LHV) 7837 (HHV)

BTU/BHP-Hr at design suction pressure, design discharge pressure and design volume specified in paragraph 1.2, Design Operating Range, and other design data.

2.3.2 Compressor performance (BHP/MMSCFD): 49.98

BHP/MMSCFD at design suction pressure and design discharge pressure specified in paragraph 1.2, Design Operating Range, and other design data.

2.3.3 Isentropic efficiency (percent): Ariel does not calculate this

The isentropic head rise divided by the real head rise at the design suction pressure and design discharge pressure as specified in Paragraph 1.2.

2.3.4 The Proponent shall provide with the quotation a Compressor Performance Curve for the Design Operating Range. Attached

2.4 Engine and Compressor Data Sheet

Proponent shall submit with the quotation the engine and compressor technical data sheet.

Attached.



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## 1. FUEL GAS AND STARTING GAS SYSTEMS

### Include

- 1.1 Fuel gas connection at the end of the compressor skid. Piping will be designed and rated at ANSI #150. YPFB TRANSPORTE S.A. will supply gas at 150 psig.
- 1.2 Starting gas connection at the end of the compressor skid, minimum with 2" ANSI # 150 flange connection.
- 1.3 First-cut fuel gas regulator, steel body, set @ 50 psig.
- 1.4 First-cut fuel gas relief valve, steel body, set @ 60'psig.
- 1.5 Three-way fuel gas shut off and vent valve, steel body.
- 1.6 Engine fuel gas regulator and relief system, as per manufacturer's standard.
- 1.7 Starting gas quick opening valve, actuated and controlled from the panel with 24VDC solenoid control.
- 1.8 Starting gas system strainer, steel body.
- 1.9 Starting gas system engine, turbine type.
- 1.10 Instrument gas supply with filter and shut off valve, from the fuel gas system.
- 1.11 All gas regulator vents and pilot operated relief valve vents, tube with 3/8" steel tubing, to a point outside of the cooler flashing, on units to be installed in a building.
- 1.12 Coalescent filter in the fuel gas line.

Yes  
Yes  
Yes  
Yes  
Yes  
Yes  
Yes  
Yes  
Yes  
Yes  
Yes  
Yes

## 2. MAIN GAS SYSTEM

### Include

- 2.1 Scrubbers designed and stamped in accordance with ASME Section VIII, latest edition. Max. pressure drop 2 psi under all conditions shown in Section II. Scrubbers include items as follows.
  - 2.1.1 Suction scrubber, vertical vane type, capable of removing 99% of all particles over 5 microns over specified flow range.
  - 2.1.2 Pressure Safety Relief Valve PSV with block valves upstream and downstream
  - 2.1.3 Bleed Ring upstream the Pressure Safety Relief Valve PSV

Yes  
Yes  
Yes

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2.1.4	Liquid level reflex gauge with safety and drain valves.	<u>Yes</u>	
2.1.5	Liquid level controller, internal float w/quieting chamber.	<u>Yes</u>	
2.1.6	Automatic steel body dump valve (sized for specific liquids).	<u>Yes</u>	
2.1.7	Isolate automatic dump valve with two steel body valves and a check valve.	<u>Yes</u>	
2.1.8	Manual steel body drain valve.	<u>Yes</u>	
2.1.9	High liquid level engine shutdown but not combined with 2.1.5 above, internal float w/quieting chamber.	<u>Yes</u>	
2.1.10	Scrubber mounting to be on skid, to either end of the skid (i.e., not to the side where it might interfere with engine or compressor maintenance.)	<u>Yes</u>	
2.2	Volume bottles designed per ASME VIII code w/ 1/16" C.A. and PWHT	<u>Yes</u>	
2.3	Spacers of 1/8" thick carbon steel installed in each nozzle and the inlet or outlet of all pulsation bottles.	<u>Yes</u>	
2.4	Compressor cylinders hydrostatically tested at 1,5 times the maximum allowable working pressure and held for two (2) hours. Test certification to be supplied with unit data.	<u>Yes</u>	PWHT if required by code.
2.5	Compressor discharge modulating pilot operated relief valve(s) sized for maximum available compressor flow rate at top of suction pressure range. Valve(s) installed between compressor and fin-fan (one for each stage) with a set pressure at the lower of either piping design pressure or compressor cylinder (MOP). Relief Valve must have block valves upstream and downstream.	<u>Yes</u>	
2.6	Unit bypass (downstream of cooler) with automatic PCV recycle valve Fisher or Masoneilan brand. Bypass size 1/2 the suction line diameter but not exceeding the discharge line size (minimum 2-3/8" O.D.).	<u>Yes</u>	
2.7	Gas suction and discharge piping designed for a maximum of 1/4 psi pressure per 100 foot drop or a maximum velocity of 33 ft/sec under all conditions specified in Section II.	<u>Yes</u>	
2.8	Blowdown Valve with Electric/Pneumatic Actuator, a flanged blowdown connection supplied at the compressor end of skid.	<u>Yes</u>	



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3. FIN FAN COOLER			
			<u>Include</u>
3.1	Fin-fan cooler for cooling gas and water (cooler width not to exceed 15 feet unless approved otherwise by the Project Engineer).		<u>Yes</u>
3.2	Cooler should be run from a jack shaft		<u>Yes</u>
3.3	Fin-fan cooler in accordance with ASME Section VIII (Gas section)		<u>Yes</u>
3.4	Gas cooling sections equipped with automatic louvers with pneumatic controllers and actuators (fail open). Manual louvers on water sections. (Cooler louvers should be installed in such a way that once the air flows through the louvers, air discharges away from the driver).		<u>Yes</u>
3.5	Separate Cooling Sections for		
	Gas.		<u>Yes</u>
	Jacket water for engine.		<u>Yes</u>
	Water for auxiliary cooling.		<u>Yes</u>
3.6	Bugs screens / Lint screens, galvanized or aluminum		<u>Yes</u>
3.7	Fan guards		<u>Yes</u>
3.8	FF Type cooler: Tubes parallel to longitudinal skid axis (F type)		<u>Yes</u>
3.9	Gas sections ASME code designed and stamped with the design pressure the same as the piping design pressure.		<u>Yes</u>
3.10	Corrosion allowance included.		<u>Yes</u>
3.11	Cooler Fan Drive:		<u>Yes</u>
	[ X ] Belt drive from engine.		
	[ ] Electric motor drive.		
	[ ] Hydraulic drive from engine.		
3.12	Manual variable pitch fan blades.		<u>Yes</u>
4. JACKET AND AUXILIARY COOLING WATER SYSTEMS			
			<u>Include</u> (Yes)
4.1	Separate jacket and auxiliary water pumps A/R.		<u>Yes</u>
	Water pump drive: [ X ] Belt drive from engine		
	[ ] Electric motor drive		

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<p style="text-align: center;">[ ] Hydraulic drive from engine</p>			
4.2	3-way water temp. Control valve for jacket water.	<u>Yes</u>	
4.3	Jacket water and auxiliary water surge tank(s) with sight gauge, fill and vent connections and vent lines. Fill line down the side of cooler w/valves	<u>Yes</u>	
4.4	Engine Jacket Water Heater. Even though environmental conditions at site are given, it must be consider water heaters.	<u>Yes</u>	
4.6	Engine Jacket and Auxiliary Water Pressure Gauges	<u>Yes</u>	
<p>5. LUBRICATION</p> <p style="text-align: right;"><u>Include</u></p>			
5.1	Two (2) Separate Lube oil storage tanks for engine and compressor (55 gal.) ,with pyrex sight gauge (with guard), shut off valve, and fire safe valve (pipe to engine and compressor and direct fill). Mounted on top end side of the compressor and engine, with fill lines and valves.	<u>Yes</u>	
5.2	<u>Engine</u>		
5.2.1	Lubrication system including a full-flow, free-standing, skid- mounted, oil filter with differential pressure gauge, micro spin filter, lube oil pump, pre and post lube pneumatic pump , pressure relief valve, lube oil heater, temperature control, oil strainer downstream of oil filter and related piping.	<u>Yes</u>	
5.2.2	Shell and tube lube oil cooler designed for a minimum of 130°F using a 50/50% water/glycol mixture cooling medium.	<u>Yes</u>	
5.2.3	Oil level controller, w/firesafe valve and integral sight gauge of pyrex glass capable of pressure up to 20 psig.	<u>Yes</u>	
5.2.4	Slow flow meter, Ren or equal with full flow strainer on the inlet. Capable of handling a pressure of up to 20 psig.		
5.2.5	Lube oil heater ( Kim Hotstart external type). Even though environmental conditions at site are given, it must be consider engine lube oil heater.	<u>Yes</u>	
5.2.6.	Oil sample bleeder	<u>Yes</u>	
5.3	<u>Compressor Frame</u>		
5.3.1	The lubrication system including a full flow oil filter with differential pressure gauge, lube oil pump, pre-lube pneumatic pump , pressure relief valve, rupture disc, full flow oil strainer		



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	downstream of filter, lube oil cooler, lube oil heater, temperature control and related piping.	Yes	
5.3.2	Lube oil Cooler: Shell and tube type cooler designed for 50/50% water/glycol mixture and a water temperature of 130°F.	Yes	
5.3.3	Oil level controller, w/firesafe valves and integral sight gauge on pyrex glass. Capable of handling a pressure of 20 psig.	Yes	
5.3.4	Pre-lube pneumatic pump and related piping.	Yes	
5.3.5	Compressor Lube Oil Heater Kim Hotstart type. Even though environmental conditions at site are given, it must be consider compressor lube oil heater.	Yes	
5.4	<u>Compressor Cylinders</u>	Include	
5.4.1	Force feed lubrication system (programmable)	Yes And Std.	
5.4.2	Lubricator no flow shutdown to each master lubricator block.	Yes	
5.4.3	Oil drop accouter. liquid cristal display; have to be able of daily checking hour by hour set alarm (Pro Flo Type).	Yes	
6.	<b>PIPING - GENERAL</b>	Include	
6.1	Piping materials, design, fabrication and testing for all systems including main gas, fuel and starting gas, lubrication, water cooling and control piping in accordance with Section V. (Piping provided as standard equipment with the engine in the lubrication or cooling is exempt; rubber and brass lube oil lines are not allowed).	Yes	
6.2	Gas piping over 2-3/8" O.D. butt welded. Piping 2-3/8" O.D. and smaller socket or butt welded for high pressure systems. Piping 2-3/8" O.D. and smaller threaded (NPT) for low pressure systems.	Yes	
6.3	100% Welds on gas piping 2-3/8" O.D. and greater radiographed and acceptability verified in accordance with API-1104.	Yes	
6.4	All gas piping tested to a minimum of 1-1/2 times the design pressure for two (2) Hours in accordance with Section V.	Yes	

## 8.2 Off Skid Exhaust Silencer Support.



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8.3	Compressor cylinder indicator connections on crank end and head end of each cylinder. 1/2" connections with Kiene or approved equal valves with plug.	<u>Yes</u>	
8.4	Complete set of compressor special tools.	<u>Yes</u>	
8.5	Sandblasting, cleaning, and painting of the units as per Section V  Color: RAL 7030 – Stone Gray	<u>Yes</u>	
8.6	Exhaust pipe protected with insulation blankets	<u>Yes</u>	
8.7	Thermocouple to indicate temperature of each cylinder and a single point for exhaust.	<u>Yes</u>	
8.8	Engine and compressor leveling jackscrew type	<u>Yes</u>	
9.	<b>PANEL AND CONTROLS</b>	<u>Include</u>	
9.1	PLC control panel location shall be out of skid (100 feet away)	<u>Yes</u>	
9.2	The panel enclosure shall be NEMA Type 4	<u>Yes</u>	
9.3	Electronic Control Panel. Panel and electronic components suitable for use in a Class 1, Zone 2, AEx IIA T6 hazardous area.	<u>Yes</u>	
9.4	Package & process instrumentation / transmitters / switches:		
9.4.1	Suction Pressure Gauge and transmitter	<u>Yes</u>	
9.4.2	Discharge Pressure Gauge and transmitter	<u>Yes</u>	
9.4.3	Engine Oil Pressure Gauge and transmitter	<u>Yes</u>	
9.4.4	Compressor Oil Pressure Gauge and transmitter	<u>Yes</u>	
9.4.5	Suction Temperature Thermocouple	<u>Yes</u>	
9.4.6	Discharge Temperature Thermocouple (Down-stream of gas cooler)	<u>Yes</u>	
9.4.7	Compressor Cylinder Discharge Temperature Thermocouple (One on each compressor cylinder)	<u>Yes</u>	
9.4.8	Engine Jacket Water Temperature Transmitter	<u>Yes</u>	
9.4.9	Engine Oil Temperature Thermocouple	<u>Yes</u>	

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9.4.10	Engine air inlet manifold Pressure Transmitter	<u>Yes</u>	
9.4.11	Engine air inlet manifold Temperature Transmitter	<u>Yes</u>	
9.4.12	Compressor Oil Pre lube Pressure Transmitter	<u>Yes</u>	
9.4.13	Engine Oil Pre-post lube Pressure Transmitter	<u>Yes</u>	
9.4.14	Compressor Lubricator no-flow Transmitter	<u>Yes</u>	
9.4.15	Compressor, Engine and Cooler Vibration Transmitters (Accelerometer type) For Cooler, it's necessary install rowlock at each support point of the system, at the axis wherever can have transmission movement, from the crankshaft pulley.	<u>Yes</u>	
9.4.16	Engine Oil Level Switch	<u>Yes</u>	
9.4.17	Compressor Oil Level Switch	<u>Yes</u>	
9.4.18	Engine Jacket Water and Auxiliary Water Level Switch	<u>Yes</u>	
9.4.19	Scrubber Liquid Level Switch	<u>Yes</u>	
9.4.20	Engine Vacuum Gauge w/Selector Valve	<u>Yes</u>	
9.4.21	Recycle (bypass) Control Valve, I/P transducer w/position transmitter. Fisher brand	<u>Yes</u>	
9.4.22	Engine Speed Control, I/P transducer	<u>Yes</u>	
9.4.23	Digital electronic tachometer, integral w/PLC annunciator	<u>Yes</u>	
9.4.24	Solenoid valves for fuel gas, start gas, auxiliary lube, crank valve	<u>Yes</u>	
9.4.25	ESD maintained pushbutton monted on panel	<u>Yes</u>	
9.4.26	Relay Outputs for Remote Shutdown and Status	<u>Yes</u>	
9.4.27	Engine instrumentation should be connected to the panel	<u>Yes</u>	
9.4.28	Engine emissions control System (NOx y CO)	<u>Yes</u>	
Note: All these instruments, shall have access available for maintenance and have to be placed where there's no affection from vibration and temperature effects caused by equipment surrounded.			
9.5	Required Shutdowns to be Announced:		
9.5.1	Plant ESD(customer means for plant ESD and remote control).	<u>Yes</u>	
9.5.2	Engine Overspeed.	<u>Yes</u>	

Note: Some function will be via Engine  
ESM.



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9.5.3	High Jacket Water Temperature.	<u>Yes</u>	
9.5.4	High Engine Lube Oil Temperature. Set at 10°F over maximum normal operating temperature.	<u>Yes</u>	
9.5.5	High Cylinder Discharge Gas Temperature (One on each compressor cylinder).	<u>Yes</u>	
9.5.6	High Discharge Gas Temperature (Down-stream of gas cooler).	<u>Yes</u>	
9.5.7	High Discharge Gas Pressure (Down-stream gas cooler).	<u>Yes</u>	
9.5.8.	High Scrubber Liquid Level (each scrubber).	<u>Yes</u>	
9.5.9.	Low Jacket/Auxiliary Water Level.	<u>Yes</u>	
9.5.10.	Low Suction Gas Pressure .	<u>Yes</u>	
9.5.11.	Low Jacket Water Pressure.	<u>Yes</u>	
9.5.12	Low Engine Lube Oil Pressure.	<u>Yes</u>	
9.5.13	Low Compressor Lube Oil Pressure.	<u>Yes</u>	
9.5.14	Lubricator No-flow.	<u>Yes</u>	
9.5.15	High Engine Vibration.	<u>Yes</u>	
9.5.16	High Compressor Vibration.	<u>Yes</u>	
9.5.17	High Cooler Vibration.	<u>Yes</u>	
9.5.18	Engine Overload.	<u>Yes</u>	
9.6	PLC Panel Mounted: [ ] On Skid, [ X ] Off-Skid	<u>Yes</u>	
9.7	Steel tubing on skid and inside control panel	<u>Yes N/A for panel</u>	
9.8	The PLC based compressor control panel shall have all the following Compressor Control Loop options :		
9.8.1	Automatic Mode : Suction Pressure Control	<u>Yes</u>	
9.8.2	Automatic Mode : Discharge Pressure Control	<u>Yes</u>	
9.8.3	Manual Mode : RPM Control	<u>Yes</u>	
9.8.4	Manual Mode : Recycle Valve Control	<u>Yes</u>	
Note: Unit Operation Philosophy, will be defined together among Vendor and YPFB TRANSPORTE S.A.; during execution stage.			

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- 9.9 The PLC based compressor control panel shall have all the following Compressor Sequences options :

9.9.1 Start Sequence

Yes

9.9.2 Normal Stop Sequence

Yes

9.9.3 Emergency Stop Sequence

Yes

9.9.4 Load Sequence

Yes

9.9.5 Unload Sequence

Yes

Note: Unit Operation Philosophy, will be defined together among Vendor and YPFB TRANSPORTE S.A.; during execution stage.

- 9.10 Engine and Compressor parameters like (BHP, rpm, temperature, pressures, fail codes, etc) shall be displayed at the Operation Screen.

Yes

- 9.11 Automatic valves signals (Discharge, Suction and Loading) shall be included in the PLC control.

Yes

- 9.12 The instruments brands shall be Rosemount, Fisher, Kenko, Murphy, Yokogawa (all instruments shall be designed for high vibration environment)

Yes

- 9.13 Panels: Rittal Type, The panel shall included on the front door independent buttons (reset, start, stop, acknowledgement, on / off) and the panel view display.

Yes

- 9.14 All terminal shall be designed intrinsically safety

Yes for IS signals

- 9.15 Visual interfases such as panel view shall comply: color interfases, touch screen panel (Allen Bradley brand, 15" type), with FTV (Factory Talk View). Panelview shall be protected by a shielded glass window, which must count personnel protection construction code.

Yes

- 9.16 All Power supplies shall be independent. Site available power supply is 380VAC/3Ph/50Hz (220VAC/1Ph/50Hz)

Yes

- 9.17 Control Logix v. 20.04 Allen Bradley PLC, minimum requirement: DC power supply 24 V, Ethernet communications ports for customer connection

Yes

- 9.18 The PCV recycle valve brand shall be Fisher or Masoneilan, linear response and soft seal type

Yes

- 9.19 Panel dimension 80 Inches (Height) x 40 Inches (Width) x 32 Inches (Depth)

60x60x18"  
w 18" legs

- 9.20 The panel shall have an internal light and 220VAC electric outlet (all protections include), and also emergency light indicator at external top side.

Yes



