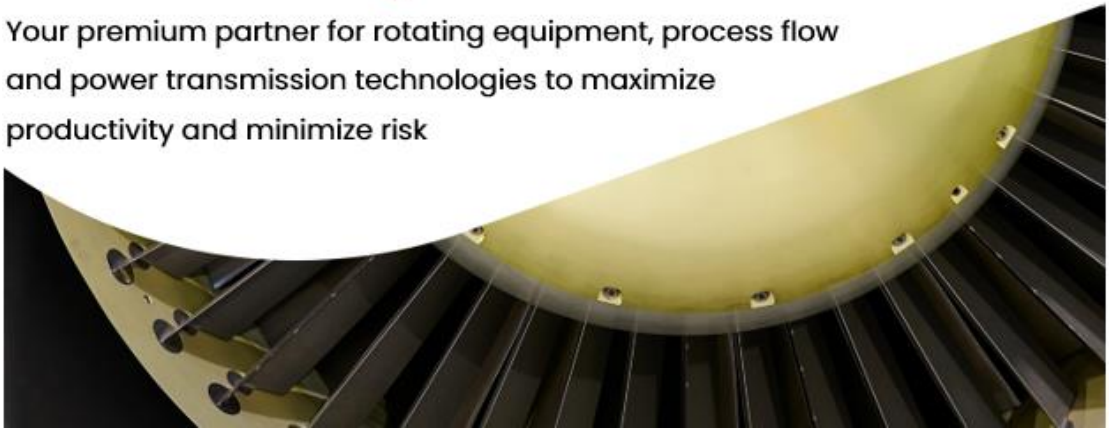
Baker Hughes

Turbomachinery & Process Solutions

Your premium partner for rotating equipment, process flow and power transmission technologies to maximize productivity and minimize risk



Technical Proposal - Budgetary

Customer: ENI

Proposal Reference Number: 2164556

Date issued: November 13, 2023

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1. Proposal Highlights

This section defines the basis of BAKER HUGHES technical offer for the supply of Mechanical Drive train(s) complete with relevant auxiliaries.

During the development of this technical offer, we have made the greatest effort to match your requirements, exploiting the experience that BAKER HUGHES has gained in the Electrical Motor Mechanical Drive market studying the best technical solutions to:

- Ensure delivery time for the plant.;
- Optimize the operating conditions of the plant regarding both its reliability and performances;
- Maximize the overall efficiency;
- Minimize the life cycle costs;
- Ensure the greatest operating flexibility.

Our proposal has been prepared in response to your application requirements and has selected the following BAKER HUGHES products to meet your needs:

No. 2 2HE/1-1 Reciprocating Compressors train(s)

Each of the proposed units consists of:

Reciprocating Compressor

Auxiliaries and BoP equipment.

The mechanical design of proposed units relies on several years of BH experience in providing reliable equipment, for continuous operation under their design prescriptions.
The Motocompressor package will be engineered, manufactured and tested at BAKER HUGHES workshops, under the supervision and the responsibility of one Project Manager, who will act as a single contact for the Client.
BAKER HUGHES engineers and QC specialists will monitor the whole production cycle of these items with scheduled inspections, to ensure that all the design, manufacturing, procedures specified, NDT controls and any other requirement of ISO 9001-2000 are met.
All testing activities supplied will be carried out in Florence or Massa workshops and Electric Motor sub-suppliers workshops, as applicable.

2. Scope of Supply & Exclusions

Main Item Description

2.1 Compressor

Reciprocating compressor 2HE/1-1 equipped with DOUBLE compartment distance piece and cylinders with lubrication system LUBE type. The compressor is suitable for installation On Foundation

2.2 Driver

Electric motor Induction type with power of 1600 Kw, 16 poles, 370 rpm, suitable for installation On Foundation

2.3 Lube Oil System

Frame lube oil system, one each unit, according to API Std. 618 including:

Oil reservoir in the compressor sump

The main oil pump is driven by the compressor shaft

The auxiliary oil pump is driven by an electric motor

Single shell & tube cooler

Duplex oil filter

Piping, valves, and instrumentation

The oil system is assembled on Separated Console Skid

2.4 Cylinder Lubrication System

Cylinder / Packing lubrication system with mechanical lubricator driven by Compressor shaft and equipped with stainless steel piping, level sight glass and electric heater (if required)

2.5 Cooling System

No.1 system common for all units, assembled on console, including cooling water heat exchanger (shell and tube type) and two water pumps driven by an electric motor

2.6 Process Gas System

Process gas system is complete of the following equipment (vessel designed according to ASME VIII div.1):

Each stage, Suction Pulsation Suppression in Stainless Stell material and each Discharge Pulsation Suppression in Carbon Steel material

2.7 Instrumentation & Control

Local instrumentation, wired up to junction boxes

2.8 Spare Parts

Pre-commissioning and start-up spare parts

2.9 Miscellania

One set of special tools

Foundation bolts

Flywheel

Flexible Coupling

Pneumatic barring device

Standard BAKER HUGHES NP export shipment packing

Standard painting according to BAKER HUGHES NP painting specification

Instruction manual for maintenance and operation

Certifications, calculations and job documentation

2.10 Test

Factory tests, inspection and certification according to BAKER HUGHES Quality Control Books

Mechanical running test

Functional test of Lube oil system

2.11 Exclusions

Equipment and service not listed in the scope of supply are the responsibility of the Purchaser.

3. Budget Compressor Datasheet

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RECIPROCATING COMPRESSOR DATA SHEET

CUSTOMER: **ENI** LOCATION **Italy**

SERVICE: **Makeup and Hysomerization**

MODEL: **2HE/1-1** Q.TY: **2** ITEM: **k-001**

CYLINDER Construction: ● **LUBE** ❍ **NO LUBE**

OPERATING CONDITIONS (FOR EACH MACHINE)

-SERVICE No.		**1**	**2**
-CASE		DESIGN	DESIGN
-STAGE		**1**	**1**
-GAS HANDLED		Next Page	Next Page
-MOLECULAR WEIGHT		2.03	2.47
-SUCTION PRESSURE (at cyl.flange)	Bar A	30.73	31.85
-SUCTION TEMPERATURE	°C	40	51
-DISCHARGE PRESSURE (at cyl.flange)	Bar A	47.01	55.61
-EXPECT. DISCHARGE TEMP.	°C	86	111
-MFR CAPACITY (*)	Kg/h	3,028	3,715
	Nm3/h	33,395	33,769
-SHAFT POWER	kW	1,367	---->
-RATED SPEED	RPM	370	---->
-RECOMM. DRIVER POWER	kW	1,550	---->

(*) MFR Capacity=Required Capacity/0,97 as per API 618 (on suction side dry basis)

CYLINDER DATA

-SERVICE / STAGE		**1 / 1**	**2 / 1**
-N° OF CYL. PER STAGE		**1**	**1**
-SINGLE/DOUBLE ACTING		DA	DA
-BORE	mm	380	390
-STROKE	mm	290	290
-PISTON ROD DIAMETER	mm	90	90
-PISTON DISPLACEMENT	m3/h	1,419.3	1,497.2
-VOL. EFFICIENCY	%		
-N° OF IN/OUT VALVE PER END			
-VALVE TYPE		RINGS	RINGS
-PISTON SPEED	m/s	3.58	3.58
-ACTUAL OPER. PRESSURE (at cyl. flange)	Bar G	46.1	54.7
-RELIEF VALVE SETTING	Bar G	50.8	60.2
-MAX. ALLOW. WORK. PRESS.	Bar G	51.8	61.2
-MAX. ALLOW. WORK. TEMP.	°C	200	200
-HYDROSTATIC TEST PRESS.	Bar G	77.7	91.8
-MAX ALL. COMB.WRIST PIN LOAD COMPR.	daN	53,300	53,300
-MAX ALL. COMB.WRIST PIN LOAD TENSION	daN	49,000	49,000
-COMB.WRIST PIN LOAD, COMPR.	daN	25,036	34,054
-COMB.WRIST PIN LOAD, TENSION	daN	19,057	27,356

MATERIALS (ASTM or EQUIVALENT)

Cylinder	NCI	NCI
Liner	CI	CI
Piston rings / wear bands / packing rings	Filled PTFE	Filled PTFE
Piston rod	SS	SS

KEY: CI= cast iron - NCI= nodular iron - CS= cast steel - FS= forged steel
AS=alloy steel - SS= stainless steel

NOTES:
This machine selection and above data are preliminary.

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RECIPROCATING COMPRESSOR DATA SHEET

CUSTOMER: **ENI** LOCATION **Italy**

SERVICE: **Makeup and Hysomerization**

MODEL: **2HE/1-1** Q.TY: **2** ITEM: **k-001**

Gas Composition

			Serv 1	Serv 2	Serv 3
HYDROGEN - H2	2.016	99.90	99.07	0.00
OXYGEN - O2	32	0.00	0.00	0.00
NITROGEN - N2	28.016	0.02	0.02	0.00
CARBON MONOXIDE - CO	28.01	0.00	0.00	0.00
CARBON DIOXIDE - CO2	44.01	0.00	0.00	0.00
WATER - H2O	18.016	0.00	0.00	0.00
AMMONIA - NH3	17.032	0.00	0.00	0.00
SULFUR DIOXIDE - SO2	64.06	0.00	0.00	0.00
HYDROGEN SULFIDE - H2S	34.076	0.00	0.00	0.00
AIR	28.966	0.00	0.00	0.00
METHANE - CH4	16.042	0.08	0.14	0.00
ACETYLENE - C2H2	26.036	0.00	0.00	0.00
ETHYLENE - C2H4	28.054	0.00	0.00	0.00
ETHANE - C2H6	30.068	0.00	0.08	0.00
PROPYLENE - C3H6	42.078	0.00	0.00	0.00
PROPANE - C3H8	44.094	0.00	0.21	0.00
1-BUTENE - 1-C4H8	56.108	0.00	0.00	0.00
ISOBUTYLENE - C4H8	56.104	0.00	0.00	0.00
I-BUTANE - C4H10	58.12	0.00	0.22	0.00
N-BUTANE - C4H10	58.12	0.00	0.13	0.00
I-PENTANE - C5H12	72.146	0.00	0.07	0.00
N-PENTANE - C5H12	72.146	0.00	0.05	0.00
CYCLOPENTANE - C-C5H10	70.134	0.00	0.00	0.00
NEOPENTANE - C5H12	72.146	0.00	0.00	0.00
BENZENE - C6H6	78.108	0.00	0.00	0.00
N-HEXANE - C6H14	86.172	0.00	0.04	0.00
CYCLOHEXANE - C-C6H12	84.162	0.00	0.00	0.00
N-HEPTANE - C7H16	100.198	0.00	0.00	0.00
N-OCTANE - C8H18	114.232	0.00	0.00	0.00
N-NONANE - C9H20	128.259	0.00	0.00	0.00
N-DECANE - C10H22	142.286	0.00	0.00	0.00
UNDECANE - C11H24	156.313	0.00	0.00	0.00
DODECANE - C12H26	170.34	0.00	0.00	0.00
	TOTAL	100	99.998	0
	MW	2.032221	2.451749	0