

مشخصات فنی و اطلاعات

شرح کار فنی و الزامات ساخت Dry Gas Seal :

۱- استانداردهای مرجع به شرح زیر می باشد:

API 617

ASME SEC V

ASTM

NACE

۲- Inspection Test Plan می بایست توسط شرکت سازنده ارائه و قبل از شروع به کار به تایید کارفرما برسد.

۳- ارائه کلیه گواهینامه های معتبر آنالیز شیمیایی، خواص مکانیکی، عملیات حرارتی، سختی سنجی، ضریب ثابت فنر و پوشش و ضخامت آن و نیز تستهای غیر مخرب و همچنین کلیه الزامات استانداردهای مربوطه مطابق نقشه های ارسالی الزامیست .

۴- خواص متریالهای فلزی می بایست مطابق با الزامات NACE MR0175 باشند.

۵- کلیه مراحل مونتاژ و نیز تستهای استاتیکی و دینامیکی (SPIN TEST) تحت نظارت و هماهنگی کارشناسان کارفرما صورت پذیرد.

۶- کلیه هزینه های استقرار کارشناسان این امور بر عهده برنده مناقصه (تامین یا تولید کننده) خواهد بود.

۵- کلیه مدارک زیر می بایست در قالب FINAL BOOK در سه سری به صورت هارد کپی و یک نسخه الکترونیکی ارائه گردد:

FIANL AS BUILT DRAWINGS

MATERIAL TEST CERTIFICATE RECORD

RECORD OF N.D.T INSPECTION

HEAT TREATMENT CERTIFICATE

HARDNESS TEST RECORD

STATIC&DYNAMIC TEST RECORD

RECORD OF DIMENSIONAL CHECK

   SAZEH شرکت طراحی و ساختمان نفت 中国石化工程建设公司 SIL DESIGN & CONSTRUCTION CO. SINOPEC ENGINEERING INCORPORATION	Shazand Arak Refinery Expansion and Upgrading Project	 NIOEC
	Dry Gas Seal Inspection and Test procedure	
Originator Project No. : 9801	Project No : 2260	
Document No. : PM-3-0-0012-0-SP-073		Page 1 of 6

Dry Gas Seal Inspection and Test Procedure

1	Add EETC Shop Condition	Dec. 5, '08	K. Tangawa	K. Eto	SEED	
00	Issued for Approval	Aug. 4, '08	K. Tangawa	K. Eto	SLD	
Rev.	Description	Date	Prepared	Checked	Approved	AC
	1-Approved (Released for Manufacturing)	OEC Code : 9801	Unit : 15			
	2-Approved as Noted for Fabrication (Fabrication may Proceed)	Vendor Job No. : R07T0075	Item No. : C-1561			
	3-Approved as Noted for Re-Issue (Fabrication shall not Proceed)	Designation : Wet Gas Compressor (Eq. Service, If applicable)				
	4-Rejected	Vendor Doc. No. : ARKWG-8211-2023				
	5-Not Returned	Requisition No. : 2260-IR-PM-3-0-0012-0				
Date :	Sign :	Model/Equip. : 70M71 / 2SNV-6		POD:	POI:	IFA Status:

TITLE Dry Gas Seal Inspection and Test
Procedure

DOC. No. ARKWG-8211-2023
PM-3-0-0012-0-SP-073

REV. /

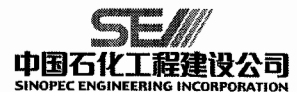
CUSTOMER	Sinopec Engineering Incorporation	COMPLETE IN WITH COVER	5	SHEETS
FINAL USER	National Iranian Oil Engineering and Construction Company			
PROJECT	Shazand Arak Refinery Expansion and Upgrading Project in Iran	SERVICE	Wet Gas Compressor	
JOB No.	2260	EBARA SER. No.	R07T0075	
ITEM No.	C-1561	MODEL/ EQUIP.	70M7I / 2SNV-6	SET 1

NATIONAL IRANIAN OIL ENGINEERING & CONSTRUCTION COMPANY

**NATIONAL IRANIAN OIL
ENGINEERING & CONSTRUCTION CO.
SHAZAND ARAK REFINERY EXPANSION
AND UPGRADING PROJECT**



CONTRACTOR:



OE Code :	9801	Unit :	15
Vendor Job No. :	R07T0075	Vendor Doc. No. :	ARKWG-8211-2023
Item No. :	C-1561	Designation :	Wet Gas Compressor
NIOEC PROJ No. :	2260	Requisition No. :	2260-IR-PM-3-0-0012-0

☐ FOR APPROVAL

AVOID DELAY TO MAINTAIN
SHIPPING PROMISE.
ONE APPROVED PRINT MUST BE
RETURNED BY:

BY: DATE:

☒ FOR RECORD

ANY REQUESTED CHANGE OF THIS
EQUIPMENT WILL RESULT IN:
1.CONTRACT PRICE ADJUSTMENT
2.EXTENDED SHIPPING PROMISE
AS THIS CONTRACT IS IN
MANUFACTURING PROCESS.

BY: K. E DATE: Dec. 11 '08

TO	SET	TO	SET
CUST.	E+4C	(SED)	
OMER			
EETC			
813	E+1C	821-4	
813E		850	
821-1	E	袖MTS	
822-1			
821-2		OIL	
281-1		DGS	
831		PNL	
811-1		822-2	
811-2		813ME	
811-3			
806			
816-1		4	
816-3		3	
817		2	
812-1		1	3
812-2	REV.	PAGE	DATE

ISSUED BY EETC 821-1

APPROVED BY Shin Aug. 7 '08
CHECKED BY K. Eto Aug. 7 '08
PREPARED BY K. Tsugawa Aug. 4 '08



Document. No. AG2340. 01

Dry Running Gas Seal Test Specification

John Crane Japan, Inc.
*Engineered Sealing Systems*2222 Kamitoyama, Ritto-City
Shiga-Pref., 520-3084 Japan

Tel: 81 (0)77-558-3211

Fax: 81 (0)77-558-0707 Page 1 of 4

John Crane Seal Type 28XP Tandem	Drawing Number MI-28-2751 / MI-28-2752	For Elliott Ebara Turbomachinery Corporation Compressor Model 70M71
Seal Size 8.875 inches	Test Procedure Number AG2340	

Project Name : SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT
Contractor : SINOPEC ENGINEERING INCORPORATION (SEI)
End User : NATIONAL IRANIAN OIL ENGINEERING AND CONSTRUCTION COMPANY (NIOEC)
Compressor Manufacturer / Model : Elliott Ebara Turbomachinery Corporation / 70M71
Application / Item No. : WET GAS COMPRESSOR / C-1561
Order No. : R07T007502
John Crane Japan Ref. : GSA804-03

Customer

Approved by: _____

Date: _____

For

Elliott Ebara Turbomachinery Corporation

Prepared: _____

Gas Seals Engineering Department

Checked: _____

Gas Seals Engineering Department

Checked: _____

Manufacturing Department

Date: _____

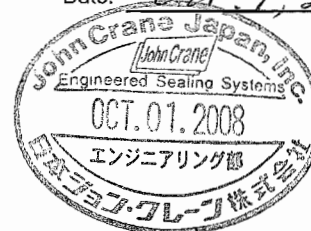
Oct. 1, 2008

Date: _____

Oct. 1, 2008

Date: _____

Oct. 1, 2008



Issue	Remarks	Date
.00	Original	June 12, 2008
.01	EETC Comments	October 01, 2008



Document. No. AG2340. 01

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John Crane Japan, Inc.
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Page 2 of 4

John Crane Seal Type 28XP Tandem	Drawing Number MI-28-2751 / MI-28-2752	For Elliott Ebara Turbomachinery Corporation Compressor Model 70M71
Seal Size 8.875 inches	Test Procedure Number AG2340	

1. SCOPE

- 1.1. The purpose of the test is to verify that the seal operates within acceptable levels to qualify John Crane Type 28XP Tandem dry running gas seals.

2. NOTES

- 2.1. Once initial approval has been received, no revisions will be effective without the written agreement of all approval parties.
- 2.2. The gas seal rotor assembly is balanced to
☐ ISO 1940 5th edition G2.5
☒ API 617 7th edition (N= 4889 rpm)
- 2.3. Rotating mating rings are spin tested to a minimum of MCS (= 4889 rpm) $\times 1.1 \times 1.225$.
(Spin test speed is $N \geq 6588$ rpm for a duration of 3 minutes.)
- 2.4. Material certificates will be provided.
- 2.5. Dimensional records for interface dimensions will be provided.
- 2.6. The above notes 2.2. and 2.3. are standard procedure during gas seal production.
- 2.7. The above notes 2.2. through 2.5. do not constitute part of the following test procedure and / or witness test.
- 2.8. The customer shall confirm the parties attending the witness test in advance.
- 2.9. The witness test shall be at the testing facilities of John Crane Japan, Inc., Ritto, Shiga, Japan.

3. TEST ENVIRONMENT

- 3.1. Test gas shall be 100% N₂.
- 3.2. Maximum test temperature will be less than 180 °C.
- 3.3. Maximum test pressure shall be the following:
Static 16.3 barG
Dynamic 7.9 barG
- 3.4. Maximum test speed shall be 5378 rpm.



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John Crane Seal Type 28XP Tandem	Drawing Number MI-28-2751 / MI-28-2752	For Elliott Ebara Turbomachinery Corporation
Seal Size 8.875 inches	Test Procedure Number AG2340	Compressor Model 70M71

3.5. Seal leakage criteria shall be as follows for inboard seal:

Seal Pressure	1.6	barG
Speed	4889	rpm
Expected	5	std.ltr. / min.
Guaranteed	10	std.ltr. / min.

Those values apply to the process gas as well at the ideal environment.

3.6. Other

3.6.1. No sudden change of leakage rate.

3.6.2. After testing, minor surface marks on the carbon face following rotation of the seal, which determined by John Crane, will not affect the performance or longevity of the seal are tolerated.

3.6.3. Inspection and test records

Inspection and test records will be provided.

4. REQUIRED TEST DATA

- 4.1. Speed
- 4.2. Pressure
- 4.3. Test pod gas temperature
- 4.4. Static torque : for JC's use for reference
- 4.5. Dynamic power consumption (motor load) : for JC's use for reference
- 4.6. Leakage flow rate

5. TEST PROCEDURE

The test procedure will be in accordance with the attached "Test Process Sheet" specification number AG2340.01.

6. AMENDMENTS / ADDITIONAL REQUIREMENTS

- 6.1. Test Procedure as API 617 7th Edition Annex - 1D.
- 6.2. Start up test at 7.9 barG to be incorporated.
- ◇ 6.3. EETC Shop Test conditions

Test Process Sheet

Spec. No.: AG 2340.01

Ref. No. : GS A804-03

S T E P	I/B Seal	O/B Seal	Speed	Temp.	Hold Time	Record						Remarks	API617 ANNEX 1D	
	Pressure	Pressure				S P E E D	P R E S S U R E	T E M P E R A T U R E	T O R Q U E	P O W E R	L E A K A G E			
														I / B
	barG	barG	rpm	°C	min									
1	0.0	0.0	0	AMB.	1	○	○	○	○				2. a.	
2	16.3	0.0	0	AMB.	10	○	○	○	○		Record every 5 min.			
3	12.2	0.0	0	AMB.	1	○	○	○	○					
4	8.2	0.0	0	AMB.	1	○	○	○	○					
5	4.1	0.0	0	AMB.	1	○	○	○	○					
6	≧ 16.3	16.3	0	AMB.	10		○	○	○		○	Record every 5 min.	2. b.	
7	≧ 12.2	12.2	0	AMB.	1		○	○	○		○			
8	≧ 8.2	8.2	0	AMB.	1		○	○	○		○			
9	≧ 4.1	4.1	0	AMB.	1		○	○	○		○			
10	1.6	0.0	4889	<180	15	○	○		○		○	○	Record every 5 min.	3. a.
11	1.6	0.0	5378	<180	15	○	○		○		○	○	Record every 5 min.	3. b.
12	1.6	0.0	4889	<180	60	○	○		○		○	○	Record every 5 min.	3. c.
13	≧ 0.7	0.7	4889	<180	15	○		○	○		○		Record every 5 min.	3. d.
14	≧ 1.6	1.6	4889	<180	15	○		○	○		○		Record every 5 min.	3. e.
15	0.0	0.0	0	<180	1		○		○	○		○		3. f.
16	1.6	0.0	4889	<180	1	○			○		○			
17	0.0	0.0	0	<180	1		○		○	○		○		
18	1.6	0.0	4889	<180	1	○	○		○		○	○		
19	0.0	0.0	0	<180	1		○		○	○		○		
20	1.6	0.0	4889	<180	1	○	○		○		○	○		
21	1.6	0.0	5378	<180	2	○	○		○		○	○	Record 2 sets of data.	
22	1.6	0.0	4889	<180	5	○	○		○		○	○		3. g.
23	1.6	0.0	0	<180	4		○		○	○		○	Record 2 sets of data.	
24	7.9	0.0	4889	<180	2	○	○		○		○	○	Start-up Test	
◇25	1.7	0.0	4889	<180	2	○	○		○		○	○	EETC Shop Test	
◇26	0.5	0.0	2780	<180	2	○	○		○		○	○	EETC Shop Test	
27	Visual Inspection & Match-marked Check (4. b. Tabulate condition on "prepared form" and make it part of the summary report.)												4	
28	0.0	0.0	0	AMB.	1		○		○	○		○		5. (2. a.)
29	16.3	0.0	0	AMB.	10		○		○	○		○	Record every 5 min.	
30	12.2	0.0	0	AMB.	1		○		○	○		○		
31	8.2	0.0	0	AMB.	1		○		○	○		○		
32	4.1	0.0	0	AMB.	1		○		○	○		○		
33	≧ 16.3	16.3	0	AMB.	10			○	○	○		○	Record every 5 min.	5. (2. b.)
34	≧ 12.2	12.2	0	AMB.	1			○	○	○		○		
35	≧ 8.2	8.2	0	AMB.	1			○	○	○		○		
36	≧ 4.1	4.1	0	AMB.	1			○	○	○		○		

NOTE : I/B = INBOARD (Primary Seal) O/B = OUTBOARD (Secondary Seal)



John Crane Japan, Inc. (1/2)
Engineered Sealing System
2222 Kamitoyama, Ritto,
Shiga,
520-3084 Japan

John Crane Dry Running Gas Seals

Application Data Sheet

Date: 29 July 2008
Doc. No.: DSA804-03
Rev.: 03

1. Application Identification

Project Name	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT
Contractor	SINOPEC ENGINEERING INCORPORATION (SEI)
End User	NATIONAL IRANIAN OIL ENGINEERING AND CONSTRUCTION COMPANY (NIOEC)
Compressor Manufacturer / Model	Elliott Ebara Turbomachinery Corporation / 70M71
Application / Item No.	WET GAS COMPRESSOR / C-1561
Order No.	R07T007502

2. Operating Condition

Process Gas	32.49% CH ₄ , 28.82% H ₂ , 10.97% C ₂ H ₆ , 8.53% N ₂ , 3.27% H ₂ S & others
Shaft Speed	4889 rpm MCR / 5378 rpm TRIP
Temperature	Min.: -28°C Nor.: - Max.: 232°C
Max. Static Pressure	16.32 barG
Max. Operating Pressure	1.61 barG
Seal (Buffer) Gas	Filtered Process Gas (2µm Abs. Coalescing)

3. Seal Application

Seal Type	John Crane Type 28XP Tandem with Intermediate Labyrinth
Seal Size / Shaft Size	8.875 inches / 188 mm
JCJ Drawing No.	MI-28-2751 / MI-28-2752
Design Pressure	27.58 barG
Design Temperature	-28 to 232°C
Allowable Axial Movement	±2.54 mm Including Installation Variance
Allowable Radial Movement	±0.21 mm (Labyrinth / Radial Gap Min. = 0.23 mm)
Seal Rotor Balancing	API 617 7th (N= 4889 rpm)
Spin Test Speed	≥ 6588 rpm [4889 rpm x 1.1 x 1.225] on Mating Rings
Test Specification	API 617 7th Edition Annex - 1D
JCJ Test Specification No.	AG 2340 (Test Gas: 100% N ₂)
NACE Specification	Applicable for Metal Components
Secondary Seal	POLYMER SEAL
Power Consumption	Less than 1.5 kW per Seal Unit

4. Leakage Rates per Seal End

Speed [rpm]	Buffer Gas Pressure [barG]	Inboard Seal Expected Leakage Rate [std.ltr./min]
0	16.3	9
4889	1.6	5

Note: 1. The above leakage values apply to "Expected Rate".

Guaranteed Leakage Rate is 10 std. ltr./min,

based upon 4889 rpm speed with pressure 1.6 barG at Inboard seal.

Checked by : Gas Seals Engineering Department

Prepared by : Gas Seals Engineering Department

John Crane Japan, Inc.





John Crane Japan, Inc. (1/2)
Engineered Sealing System
2222 Kamitoyama, Ritto,
Shiga,
520-3084 Japan

John Crane Dry Running Gas Seals

Application Data Sheet

Date: 29 July 2008
Doc. No.: DSA804-03
Rev.: 03

1. Application Identification

Project Name	SHAZAND ARAK REFINERY EXPANSION AND UPGRADING PROJECT
Contractor	SINOPEC ENGINEERING INCORPORATION (SEI)
End User	NATIONAL IRANIAN OIL ENGINEERING AND CONSTRUCTION COMPANY (NIOEC)
Compressor Manufacturer / Model	Elliott Ebara Turbomachinery Corporation / 70M71
Application / Item No.	WET GAS COMPRESSOR / C-1561
Order No.	R07T007502

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Note: 1. The above leakage values apply to "Expected Rate".

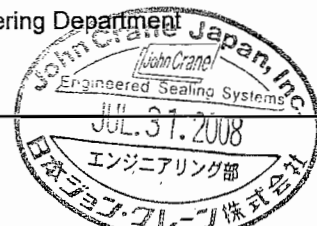
Guaranteed Leakage Rate is 10 std. ltr./min,

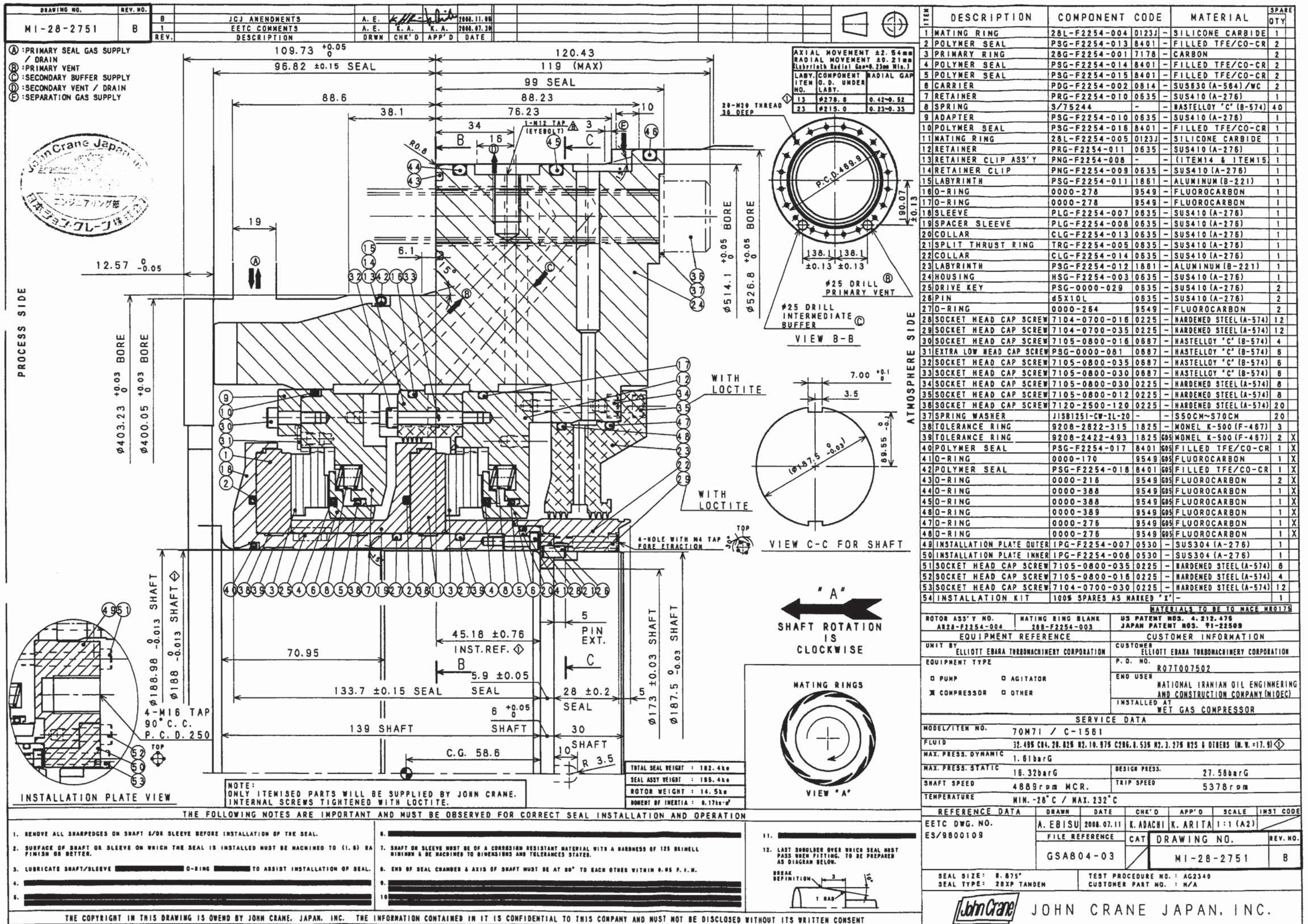
based upon 4889 rpm speed with pressure 1.6 barG at Inboard seal.

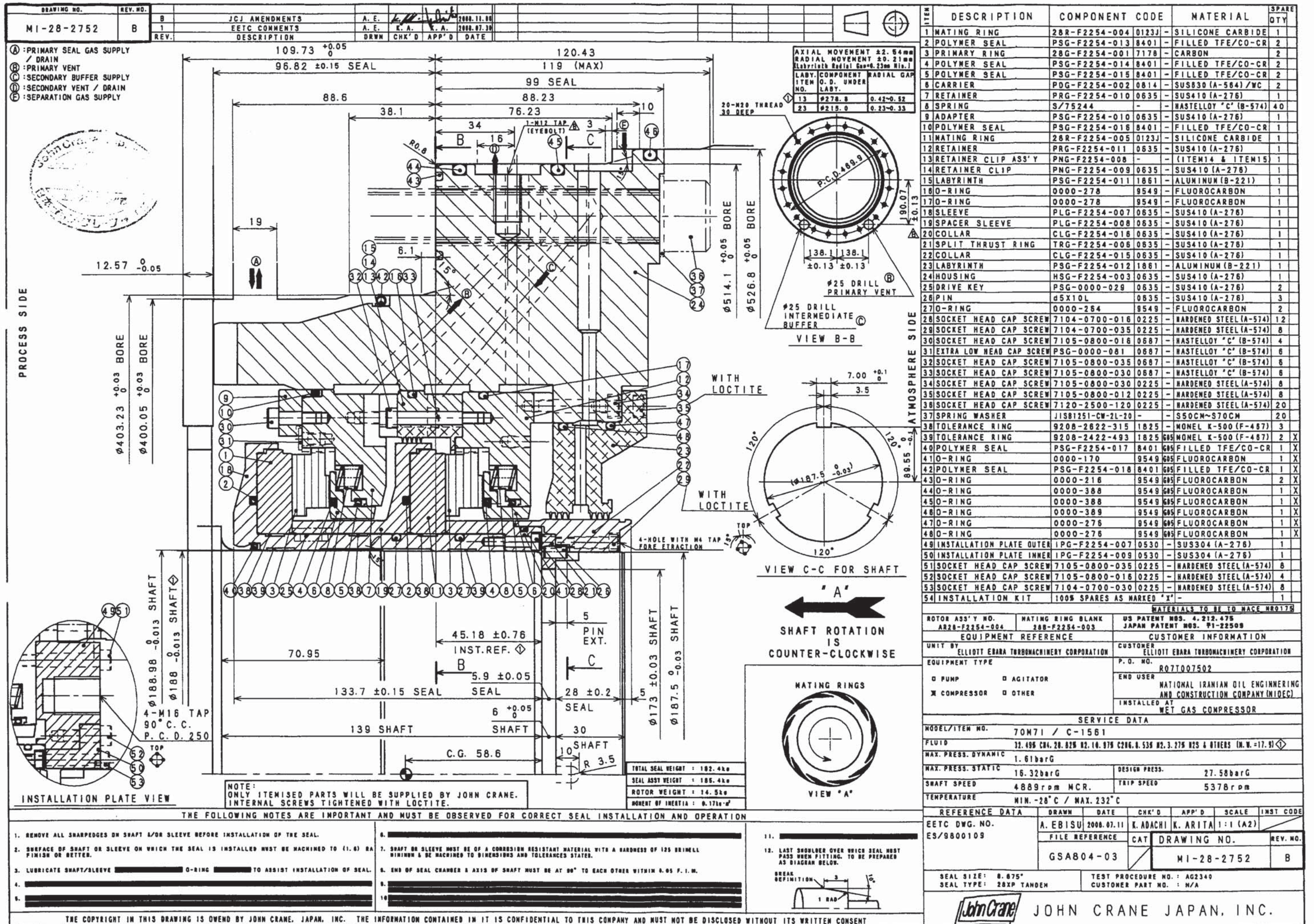
Checked by : Gas Seals Engineering Department

Prepared by : Gas Seals Engineering Department

John Crane Japan, Inc.







   SAZEH شرکت طراحی و مهندسی نفت 中国石化工程建设公司 SINOPEC ENGINEERING CORPORATION	Shazand Arak Refinery Expansion and Upgrading Project		 NIOEC
	Data Sheet for C-1561 (Wet Gas Compressor)		
Originator Project No.: 19801-01	Residue Fluid Catalytic Cracking Unit		Project No. : 2260
Document No. : DS-43-15-023-2			Page 1 of 17

**Data Sheet
for C-1561
(Wet Gas Compressor)
Residue Fluid Catalytic Cracking Unit**

02	Issued for Approval	19-Jun-2007	Li Jianchang	Cai Hongqing	Zhong J/W	
01	Issued for Approval	31-May-2007	Li Jianchang	Cai Hongqing	Zhong J/W	C
00	Issued for Approval	9-Feb-2007	Cai Hongqing	Mei Qinghong	Zhong Jingwe	C
Rev	Description	Date	Prepared	Checked	Approved	AC
				POD:	POI:	Status:

#NAME?

		Shazand Arak Refinery Expansion and Upgrading Project			
Data Sheet for C-1561 A/B (Wet Gas Compressor)		Residue Fluid Catalytic Cracking Unit		Project No. : 2260	
Originator Project No. : 19801-01		Document No. : DS-43-15-023-2		Rev. : 2 Page: 2 of 17	

1	APPLICABLE TO ☐ PROPOSAL ☐ PURCHASE ☐ AS-BUILT	UNIT	RFCC UNIT	REV.	
2	FOR <u>Shazand Arak Refinery Expansion and Upgrading Project</u>	SERIAL NO.	<u>R077007502</u>		
3	SITE <u>Shazand Arak</u>	NO. REQUIRED	<u>1 (one)</u>		
4	SERVICE <u>Wet Gas Compressor</u>	DRIVER TYPE (1-3.1.1)	<u>Condensing Steam Turbine</u>		
5	MANUFACTURER <u>ELLIOTT / EBARA</u>	DRIVER ITEM NO.	<u>C-1561-ST</u>		
6	MODEL <u>70M7I</u>				
7					
8	INFORMATION TO BE COMPLETED: ☐ BY PURCHASER ☐ BY MANUFACTURER	OPERATING CONDITIONS <u>REFER TO ATTACHED SHEET</u>			
9					
10	(ALL DATA ON PER UNIT BASIS)				
11					
12					
13	☒ GAS HANDLED (ALSO SEE PAGE)	H₂, N₂, H₂O, CO, CO₂, H₂S and Hydrocarbon			
14	☒ GAS PROPERTIES (1-2.1.1.4)				
15	☒ M ³ /H (1.013 BAR & 0°C DRY)	125694	107611*	150834	129133*
16	☒ WEIGHT FLOW, KG/H (WET)(DRY)	217248	169046*	260698	202855*
17	INLET CONDITIONS				
18	☒ PRESSURE (BARA)	1.53	5.14*	1.4	5.11*
19	☒ TEMPERATURE (°C)	40	40	40	40
20	☐ RELATIVE HUMIDITY %				
21	☒ MOLECULAR WEIGHT	38.74	35.21*	38.74	35.21*
22	☒ C _p /C _v (K ₁) OR (K _{AVG})	1.141*	1.154*	1.141*	1.154*
23	☒ COMPRESSIBILITY (Z ₁) OR (Z _{AVG})	0.99*	0.97*	0.99*	0.97*
24	☒ INLET VOLUM, (M ³ /H) (WET/DRY)	94520*	23601*	123956*	28487*
25	DISCHARGE CONDITIONS				
26	☒ PRESSURE (BARA)	5.97*	16.58	6.29*	17.14
27	☒ TEMPERATURE (°C)	110*	106*	118*	108*
28	☒ C _p /C _v (K ₂) OR (K _{AVG}) (NOTE 1)	1.121*	1.134*	1.121*	1.134*
29	☒ COMPRESSIBILITY (Z ₂) OR (Z _{AVG}) (NOTE 1)	0.97*	0.94*	0.97*	0.94*
30	☐ GAS KW REQUIRED				
31	☐ TRAIN KW REQUIRED				
32	☒ KW REQUIRED AT DRIVER INCL. EXT. LOSSES (GEAR, ETC.)	12777*		16443*	16294*
33	☐ SPEED (RPM)				
34	☐ TURNDOWN (%)				
35	☒ POLYTROPIC HEAD (N.M/KG)	10128*	9289*	11295*	9631*
36	☐ POLYTROPIC EFFICIENCY (%)				
37	☒ CERTIFIED POINT	X	X		
38	☐ PERFORMANCE CURVE NUMBER				
39	PROCESS CONTROL (1-3.4.2.1)				
40	METHOD ☐ SUCTION THROTTLING ☐ VARIABLE INLET ☒ SPEED VARIATION ☐ DISCHARGE ☐ COOLED BYPASS				
41	FROM _____ BARA ☐ GUIDE VANES FROM _____				
42	TO _____ BARA (2-3.4.2.2) TO _____ % BLOWOFF TO _____				
43	SIGNAL ☒ SOURCE (1-3.4.2.1)				
44	TYPE ☒ ELECTRONIC ☐ PNEUMATIC ☐ OTHER				
45	RANGE <u>4~20</u> MA _____ BARA				
46					
47	☒ ANTI-SURGE SYSTEM (1-3.4.2.2) <u>See UOP 931100-692</u>				
48	REMARKS				
49	1. Interstage pressure shall be determine by vendor.				
50	2. The maximum differential pressure across the intermediate diaphragm between 1st and 2nd stages shall be 6.9 bar. Vendor to advise the proper material to suit this differential pressure.				
51	3. The Vendor shall submit a reference list for the proposed design.				
52	4. All data have been marked with * are estimated value ,and should be verified by vendor.				
53	5. Insrument data sheet see UOP data sheet (Total two pages) after the Compressor data sheet				
54					



CENTRIFUGAL AND AXIAL COMPRESSOR
DATA SHEET (API 617 - 7TH Chapter 2)
SI UNITS

JOB NO. 2260 ITEM NO. C-1561
 PURCHASE ORDER NO. _____
 INQUIRY NO. _____
 REVISION NO. _____ DATE 13th-Dec-2007
 PAGE 2A OF _____ BY _____ K.T.

1 APPLICABLE TO: ☐ PROPOSAL ☒ PURCHASE ☐ AS-BUILT

2 FOR Shazand Arak Refinery Expansion and Upgrading Project

UNIT _____

3 SITE Shazand Arak

SERIAL NO. R07T007502

4 SERVICE Wet Gas Compressor

NO. REQ'D. 1

5 MANUFACTURER Elliott/Ebara

DRIVER TYPE (1-3.1.1) Steam Turbine

6 MODEL 70M71

DRIVER ITEM NO. CT-1561

8 INFORMATION TO BE COMPLETED BY: ☐ PURCHASER ☒ MANUFACTURER ☐ MUTUAL AGREEMENT (Prior to Purchase)

OPERATING CONDITIONS

COMPRESSOR TYPE:

(ALL DATA ON PER UNIT BASIS)

☐ GAS HANDLED (ALSO SEE PAGE _____)

☒ GAS PROPERTIES (1-2.1.1.4)

☐ m^3/h (1.013 bar & 0°C DRY)

☐ WEIGHT FLOW, kg/h (WET)

INLET CONDITIONS

☐ PRESSURE (bar A)

☐ TEMPERATURE (°C)

☐ RELATIVE HUMIDITY %

☐ MOLECULAR WEIGHT

☐ C_p/C_v (K_1)

☐ COMPRESSIBILITY (Z_1)

☐ INLET VOLUME, (m^3/h) (WET)

DISCHARGE CONDITIONS

☐ PRESSURE (bar A)

☐ TEMPERATURE (°C)

☐ C_p/C_v (K_2)

☐ COMPRESSIBILITY (Z_2)

☐ GAS POWER REQUIRED (kW)

☐ TRAIN POWER REQUIRED (kW)

☐ BkW REQ'D. AT DRIVER Incl. Ext. Losses (Gear, etc.)

☐ SPEED (RPM)

☐ TURNDOWN (%)

☐ POLYTROPIC HEAD (N-m/kg)

☐ POLYTROPIC EFFICIENCY (%)

☐ CERTIFIED POINT

☐ PERFORMANCE CURVE NUMBER

PROCESS CONTROL (1-3.4.2.1)

METHOD ☐ SUCTION THROTTLING ☐ VARIABLE INLET ☒ SPEED VARIATION ☐ DISCHARGE ☐ COOLED BYPASS

FROM _____ bar a

GUIDE VANES

FROM 70 %

BLOWOFF

FROM _____

TO _____ bar a

(2-3.4.2.2)

TO 105 %

TO _____

TO _____

SIGNAL ☒ SOURCE (1-3.4.2.1)

TYPE ☒ ELECTRONIC

☐ PNEUMATIC

☐ OTHER _____

RANGE _____ MA

_____ bar g

☐ ANTI-SURGE SYSTEM (1-3.4.2.2)

☐ MANUAL

☐ AUTOMATIC

☐ NONE

REMARKS:

1st. Sec.	2nd. Sec.	1st. Sec.	2nd. Sec.	1st. Sec.	2nd. Sec.	
Normal		Rated		LMW		
BWR						
217248	171176	260698	210273	230164	186219	
1.53	5.12	1.40	4.81	1.40	4.92	
40.0	40.0	40.0	40.0	40.0	40.0	
38.72	35.51	38.72	35.88	35.04	32.14	
1.150	1.184	1.149	1.181	1.156	1.188	
0.983	0.957	0.985	0.959	0.988	0.967	
93899	24037	123322	31006	120622	30285	
5.95	16.58	5.99	17.14	6.10	17.14	
105.7	107.8	112.8	114.0	116.1	115.3	
1.141	1.182	1.137	1.178	1.142	1.177	
0.968	0.932	0.970	0.933	0.976	0.951	
13248	17911	17427				
4113	4514	4656				
99266	90127	107363	97510	121175	108535	
81.9	75.2	79.1	73.0	80.9	74.2	
YES						



CENTRIFUGAL AND AXIAL COMPRESSOR
DATA SHEET (API 617 - 7TH Chapter 2)
SI UNITS

JOB NO. _____ ITEM NO. C-1561
 PURCHASE ORDER NO. _____
 INQUIRY NO. _____
 REVISION NO. _____ DATE 13th-Sep-2007
 PAGE 2B OF _____ BY _____

1	APPLICABLE TO: ☒ PROPOSAL ☐ PURCHASE ☐ AS-BUILT	
2	FOR Shazand Arak Refinery Expansion and Upgrading Project	UNIT _____
3	SITE Shazand Arak	SERIAL NO. _____
4	SERVICE Wet Gas Compressor	NO. REQ'D. 1
5	MANUFACTURER Elliott/Ebara	DRIVER TYPE (1-3.1.1) Steam Turbine
6	MODEL 70M71	DRIVER ITEM NO. _____
7		
8	INFORMATION TO BE COMPLETED BY: ☐ PURCHASER ☒ MANUFACTURER ☒ MUTUAL AGREEMENT (Prior to Purchase)	
9	OPERATING CONDITIONS	
10	COMPRESSOR TYPE: Centrifugal	
11		1st. Sec. 2nd. Sec. _____
12	(ALL DATA ON PER UNIT BASIS)	Start-up FOR REFERENCE
13	☐ GAS HANDLED (ALSO SEE PAGE _____)	
14	☒ GAS PROPERTIES (1-2.1.1.4)	BWR
15	☐ m ³ /h (1.013 bar & 0°C DRY)	
16	☐ WEIGHT FLOW, kg/h (WET)	77000 38000
17	INLET CONDITIONS	
18	☐ PRESSURE (bar A)	1.53 2.45
19	☐ TEMPERATURE (°C)	40.0 40.0
20	☐ RELATIVE HUMIDITY %	
21	☐ MOLECULAR WEIGHT	17.2 17.2
22	☐ C _p /C _v (K ₁)	1.264 1.266
23	☐ COMPRESSIBILITY (Z ₁)	0.998 0.997
24	☐ INLET VOLUME, (m ³ /h) (WET)	76059 24418
25	DISCHARGE CONDITIONS	
26	☐ PRESSURE (bar A)	3.28 4.43
27	☐ TEMPERATURE (°C)	103.7 95.8
28	☐ C _p /C _v (K ₂)	1.239 1.244
29	☐ COMPRESSIBILITY (Z ₂)	0.998 0.997
30	☐ GAS POWER REQUIRED (kW)	
31	☐ TRAIN POWER REQUIRED (kW)	
32	☐ BkW REQ'D. AT DRIVER Incl. Ext. Losses (Gear, etc.)	5006
33	☐ SPEED (RPM)	4656
34	☐ TURNDOWN (%)	
35	☐ POLYTROPIC HEAD (N-m/kg)	126941 97069
36	☐ POLYTROPIC EFFICIENCY (%)	80.5 70.6
37	☐ CERTIFIED POINT	
38	☐ PERFORMANCE CURVE NUMBER	
39	PROCESS CONTROL (1-3.4.2.1)	
40	METHOD ☐ SUCTION THROTTLING ☐ VARIABLE INLET ☒ SPEED VARIATION ☐ DISCHARGE ☐ COOLED BYPASS	
41	FROM _____ bar A GUIDE VANES FROM 70 % BLOWOFF FROM _____	
42	TO _____ bar A (2-3.4.2.2) TO 105 % TO _____ TO _____	
43	SIGNAL ☒ SOURCE (1-3.4.2.1)	
44	TYPE ☒ ELECTRONIC ☐ PNEUMATIC ☐ OTHER _____	
45	RANGE 4-20 MA _____ bar g	
46	☒ ANTI-SURGE SYSTEM (1-3.4.2.2) ☐ MANUAL ☐ AUTOMATIC ☐ NONE	
47	REMARKS: _____	
48	_____	
49	_____	

  		Shazand Arak Refinery Expansion and Upgrading Project			
		Data Sheet for C-1561 A/B (Wet Gas Compressor)			
Originator Project No. : 19801-01		Residue Fluid Catalytic Cracking Unit		Project No. : 2260	
Document No. : DS-43-15-023-2		Rev. : 2		Page: 3 of 17	

1	APPLICABLE TO : ☐ PROPOSAL ☐ PURCHASE ☐ AS-BUILT	REV.
2	FOR _____ UNIT _____	
3	SITE _____ SERIAL NO. _____	
4	SERVICE _____ NO. REQUIRED _____	
5	MANUFACTURER _____ DRIVER TYPE (1-3.1.1) _____	
6	MODEL _____ DRIVER ITEM NO. _____	
7		
8	INFORMATION TO BE COMPLETED: ☐ BY PURCHASER ☐ BY MANUFACTURER ☐ MUTUAL AGREEMENT (PRIOR TO PURCHASE)	
9	OPERATING CONDITIONS (SINGLE-COOLED CONFIGURATION)	
10		
11	(ALL DATA ON PER UNIT BASIS)	
12		
13	☐ GAS HANDLED (ALSO SEE PAGE _____)	
14	☐ GAS PROPERTIES (1-2.1.1.4)	
15	☐ M ³ /H (1.013 BAR & 0°C DRY)	
16	☐ WEIGHT FLOW, KG/H (WET/DRY)	
17	INLET CONDITIONS	
18	☐ PRESSURE (BARA)	
19	☐ TEMPERATURE (°C)	
20	☐ RELATIVE HUMIDITY %	
21	☐ MOLECULAR WEIGHT	
22	☐ C _p /C _v (K ₁) OR (K _{AVG})	
23	☐ COMPRESSIBILITY (Z ₁) OR (Z _{AVG})	
24	☐ INLET VOLUM, (M ³ /H) (WET/DRY)	
25	DISCHARGE CONDITIONS	
26	☐ PRESSURE (BARA)	
27	☐ TEMPERATURE (°C)	
28	☐ C _p /C _v (K ₂) OR (K _{AVG}) (NOTE 1)	
29	☐ COMPRESSIBILITY (Z ₂) OR (Z _{AVG}) (NOTE 1)	
30	☐ GAS KW REQUIRED	
31	☐ TRAIN KW REQUIRED	
32	☐ KW REQUIRED AT DRIVER INCL. EXT. LOSSES (GEAR, ETC.)	
33	☐ SPEED (RPM)	
34	☐ TURNDOWN (%)	
35	☐ POLYTROPIC HEAD (N.M/KG)	
36	☐ POLYTROPIC EFFICIENCY (%)	
37	☐ CERTIFIED POINT	
38	☐ PERFORMANCE CURVE NUMBER	
39	PROCESS CONTROL (1-3.4.2.1)	
40	METHOD ☐ SUCTION THROTTLING ☐ VARIABLE INLET ☐ SPEED VARIATION ☐ DISCHARGE ☐ COOLED BYPASS	
41	FROM _____ BARA GUIDE VANES FROM _____ % BLOWOFF FROM _____	
42	TO _____ BARA (2-3.4.2.2) TO _____ % TO _____ TO _____	
43	SIGNAL ☐ SOURCE (1-3.4.2.1)	
44	TYPE ☐ ELECTRONIC ☐ PNEUMATIC ☐ OTHER	
45	RANGE _____ MA _____ BARA	
46		
47	☐ ANTI-SURGE SYSTEM (1-3.4.2.2)	
48	REMARKS :	
49		
50		
51		
52		
53		
54		

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		Shazand Arak Refinery Expansion and Upgrading Project Data Sheet for C-1561 A/B (Wet Gas Compressor) Residue Fluid Catalytic Cracking Unit			
Originator Project No. : 19801-01		Project No. : 2260			
Document No. : DS-43-15-023-2		Rev. : 2		Page: 4 of 17	

	1 APPLICABLE TO : ☐ PROPOSAL ☐ PURCHASE ☐ AS-BUILT	REV.
2	FOR _____	UNIT _____
3	SITE _____	SERIAL NO _____
4	SERVICE _____	NO. REQUIRED _____
5	MANUFACTURER _____	DRIVER TYPE (1-3.1.1) _____
6	MODEL _____	DRIVER ITEM NO _____
7		
8	INFORMATION TO BE COMPLETE: ☐ BY PURCHASER ☐ BY MANUFACTURER ☐ MUTUAL AGREEMENT (PRIOR TO PURCHASE)	
9	OPERATING CONDITIONS (COMPRESSORS WITH TWO SIDESTREAMS)	
10	EQUIP. FLNG COND. SHOWN IN DBL-WALLED CELLS	CONDITIONS (1-2.1.1.2)
11	(ALL DATA ON PER UNIT BASIS)	SECTION 1 SS1 SECTION 2 SS2 SECTION 3
12		
13	☐ GAS HANDLED (ALSO SEE PAGE _____)	
14	☐ GAS PROPERTIES (1-2.1.1.4)	
15	☐ M ³ /H (1.013 BAR & 0°C DRY)	
16	☐ WEIGHT FLOW, KG/H (WET/DRY)	
17	INLET CONDITIONS	
18	☐ PRESSURE (BARA)	
19	☐ TEMPERATURE (°C)	
20	☐ RELATIVE HUMIDITY %	
21	☐ MOLECULAR WEIGHT	
22	☐ C _p /C _v (K ₁) OR (K _{AVG})	
23	☐ COMPRESSIBILITY (Z ₁) OR (Z _{AVG})	
24	☐ INLET VOLUM, (M ³ /H) (WET/DRY)	
25	DISCHARGE CONDITIONS	
26	☐ PRESSURE (BARA)	
27	☐ TEMPERATURE (°C)	
28	☐ C _p /C _v (K ₂) OR (K _{AVG}) (NOTE 1)	
29	☐ COMPRESSIBILITY (Z ₂) OR (Z _{AVG}) (NOTE 1)	
30	☐ GAS KW REQUIRED	
31	☐ TRAIN KW REQUIRED	
32	☐ KW REQUIRED AT DRIVER INCL. EXT. LOSSES (GEAR, ETC.)	
33	☐ SPEED (RPM)	
34	☐ TURNDOWN (%)	
35	☐ POLYTROPIC HEAD (N.M/KG)	
36	☐ POLYTROPIC EFFICIENCY (%)	
37	☐ CERTIFIED POINT	
38	☐ PERFORMANCE CURVE NUMBER	
39	PROCESS CONTROL (1-3.4.2.1)	
40	METHOD ☐ SUCTION THROTTLING ☐ VARIABLE INLET ☐ SPEED VARIATION ☐ DISCHARGE ☐ COOLED BYPASS	
41	FROM _____ BARA GUIDE VANES FROM _____ % BLOWOFF FROM _____	
42	TO _____ BARA (2-3.4.2.2) TO _____ % TO _____ TO _____	
43	SIGNAL ☐ SOURCE (1-3.4.2.1)	
44	TYPE ☐ ELECTRONIC ☐ PNEUMATIC ☐ OTHER	
45	RANGE _____ MA _____ BARA	
46		
47	☐ ANTI-SURGE SYSTEM (1-3.4.2.2)	
48	REMARKS .	
49		
50		
51		
52		
53		
54		

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		Shazand Arak Refinery Expansion and Upgrading Project					
Data Sheet for C-1561 A/B (Wet Gas Compressor)		Project No. : 2260					
Residue Fluid Catalytic Cracking Unit		Project No. : 2260					
Originator Project No. : 19801-01		Document No. : DS-43-15-023-2				Rev. : 2 Page: 5 of 17	

OPERATING CONDITIONS (Continued) (1-2.1.1.1) (1-3.1.2) (1-3.1.3)								REV.
GAS ANALYSIS :		EVERY CONDITIONS (see remark)						
● MOL % ○		NORMAL		RATED		LWM		REMARKS :
		1st	2nd	1st	2nd	1st	2nd	
5	AIR	28.966						
6	OXYGEN	32.000						
7	NITROGEN	28.016	3.87	4.53*	3.87	4.53*	3.27	3.74*
8	WATER VAPOR	18.016	4.72	1.39*	4.72	1.39*	4.71	1.38*
9	CARBON MONOXIDE	28.010	0.21	0.25*	0.21	0.25*	0.18	0.21*
10	CARBON DIOXIDE	44.01	0.75	0.87*	0.75	0.87*	0.64	0.72* (1-2.2.1.6)
11	HYDROGEN SULFIDE	34.076	1.58	1.81*	1.58	1.81*	1.34	1.51* (1-2.2.1.9)
12	HYDROGEN	2.016	13.06	15.29*	13.06	15.29*	2.91	26.23*
13	METHANE	16.042	14.88				2.53	14.3*
14	ETHYLENE	28.052	5.18				37	4.95*
15	ETHANE	30.068	4.72				3.99	4.5*
16	PROPYLENE	42.078	11.99	13.37*		10.63	11.71*	
17	PROPANE	44.094	4.56	5.05*	4.56	5.05*	4.02	4.4*
18	I-BUTANE	58.120	5.01	5.21*	5.01	5.21*	4.37	4.53*
19	N-BUTANE	58.120	1.78	1.77*	1.78	1.77*	1.56	1.57*
20	I-PENTANE	72.146	3.38	2.83*	3.38	2.83*	3.14	2.71*
21	N-PENTANE	72.146	0.53	0.41*	0.53	0.41*	0.49	0.39*
22	HEXANE PLUS		7.74	3.44*	7.74	3.44*	7.48	3.57*
23	CORROSIVE AGENTS - BUTYLENE		10.03	10.07*	10.03	10.07*	8.79	8.86* (1-2.2.1.3)
24	PENTYLENE		6.01	4.92*	6.01	4.92*	5.58	4.72*
25	TOTAL		100	100	100	100	100	
26	AVG. MOL. WT.		38.74	35.21*	38.74	35.21	35.11	31.7*

27 LOCATION : (1-2.1.8)

28 ☐ INDOOR ☒ OUTDOOR ☐ GRADE

29 ☐ HEATED ☒ UNDER ROOF ☒ MEZZANINE

30 ☐ UNHEATED ☐ PARTIAL SIDES ☒ WINTERIZATION

31 ELEC. AREA CLASSIFICATION (1-2.1.14) CL 1 GR B,C DIV II

32 SITE DATA (1-2.1.8) 0.82

33 ELEVATION 1878 M BAROMETER 1 BARA

34 RANGE OF AMBIENT TEMPS :

	DRY BULB	WET BULB
36 NORMAL (°C)		
37 MAXIMUM (°C)	43	
38 MINIMUM (°C)	-25	

40 UNUSUAL CONDITIONS : ☐ DUST ☐ FUMES

41 (°C)

42 ☐ OTHER (1-2.1.3)

43

44 ☐ COPPER AND COPPER ALLOYS PROHIBITED (1-2.2.1.1.14)

45 COATING : (1-2.2.1.16)

46 ☐ ROTATING COMPONENTS

47 ☒ STATIONARY COMPONENTS

48

NOISE SPECIFICATIONS : (1-2.1.9)

● APPLICABLE TO MACHINE : SP-2260-47-10

SEE SPECIFICATION

● APPLICABLE TO NEIGHBORHOOD : SEE SPECIFICATION

ACOUSTIC HOUSING : ☐ YES ☐ NO

APPLICABLE SPECIFICATIONS : API 617, 7TH CHAPTER 1 & 3

● VENDOR HAVING UNIT RESPONSIBILITY (1-1.5.53) (1-1.8) (1-2.1.3)

● GOVERNING SPECIFICATION (IF DIFFERENT) See UOP Standard Specification 5-15-5, SP-2260-46-006 and SP-2260-46-008.

PAINTING :

☐ MANUFACTURER'S STD.

● OTHER SP-2260-80-002

SHIPMENT : (4.4)

☐ DOMESTIC ☒ EXPORT ☒ EXPORT BOXING REQ'D.

● OUTDOOR STORAGE MORE THAN 6 MONTHS (1-4.4.1) 12 MO

SPARE ROTOR ASSEMBLY PACKAGE (1-4.4.3.10)

● HORIZONTAL STORAGE ☐ VERTICAL STORAGE

49 REMARKS: All data have been marked with * are estimated value ,and should be verified by vendor.

50

51

52

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54



CENTRIFUGAL AND AXIAL COMPRESSOR

DATA SHEET (API 617 - 7TH Chapter 2)

SI UNITS

JOB NO. _____ ITEM NO. _____

PURCHASE ORDER NO. _____

INQUIRY NO. _____

REVISION NO. _____ DATE _____

PAGE 2 OF 7 BY

OPERATING CONDITIONS (Continued) (1-2.1.1.1) (1-3.1.2) (1-3.1.3)									
GAS ANALYSIS		Normal		Rated		LMW			
○ MOL % ○		1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	REMARKS	
AIR	28.966								
OXYGEN	32.000								
NITROGEN	28.016	3.870	4.500	3.870	4.440	3.270	3.700		
WATER VAPOR	18.016	4.720	1.390	4.720	1.460	4.710	1.390		
CARBON MONOXIDE	28.010	0.210	0.240	0.210	0.240	0.180	0.200		
CARBON DIOXIDE	44.010	0.750	0.870	0.750	0.860	0.640	0.720		
HYDROGEN SULFIDE	34.076	1.580	1.800	1.580	1.790	1.340	1.500		
HYDROGEN	2.016	13.060	15.190	13.060	14.990	22.910	25.950		(1-2.2.1.6)
METHANE	16.042	14.880	17.260	14.880	17.040	12.530	14.170		(1-2.2.1.9)
ETHYLENE	28.052	5.180	5.960	5.180	5.890	4.370	4.910		
ETHANE	30.068	4.720	5.400	4.720	5.340	3.990	4.460		
PROPYLENE	42.078	11.990	13.340	11.990	13.260	10.630	11.640		
PROPANE	44.094	4.560	5.040	4.560	5.010	4.020	4.380		
I-BUTANE	58.120	5.010	5.200	5.010	5.220	4.370	4.530		
n-BUTANE	58.120	1.780	1.760	1.780	1.780	1.560	1.560		
I-PENTANE	72.146	3.380	2.830	3.380	2.910	3.140	2.730		
n-PENTANE	72.146	0.530	0.410	0.530	0.430	0.490	0.400		
HEXANE PLUS									
CORROSIVE AGENTS									
N-HEXANE	86.178	7.740	3.650	7.740	3.950	7.480	3.970		(1-2.2.1.3)
1-BUTENE	56.108	10.030	10.230	10.030	10.290	8.790	8.990		
1-PENTENE	70.135	6.010	4.940	6.010	5.100	5.580	4.790		
TOTAL		100	100.01	100	100	100	99.99		
AVG. MOL. WT.		38.74	35.51	38.74	35.88	35.11	32.14		
LOCATION: (1-2.1.8)									
☐ INDOOR ☐ OUTDOOR ☐ GRADE ☐ HEATED ☐ UNDER ROOF ☐ MEZZANINE ☐ UNHEATED ☐ PARTIAL SIDES ☐ _____ ☐ ELEC. AREA CL.(1-2.1.14) CL _____ GR _____ DIV _____									
SITE DATA (1-2.1.8)									
☐ ELEVATION _____ m BAROMETER _____ bar a ☐ RANGE OF AMBIENT TEMPS:									
_____ DRY BULB _____ WET BULB NORMAL (°C) _____ MAXIMUM (°C) _____ MINIMUM (°C) _____ _____ (°C) _____									
UNUSUAL CONDITIONS: ☐ DUST ☐ FUMES									
_____ (°C) _____ ☐ OTHER (1-2.1.8) _____ ☐ COPPER & COPPER ALLOYS PROHIBITED (1-2.2.1.14)									
COATING: (1-2.2.1.16)									
☐ ROTATING COMPONENTS _____ ☐ STATIONARY COMPONENTS _____									
REMARKS: _____									
NOISE SPECIFICATIONS: (1-2.1.9)									
☐ APPLICABLE TO MACHINE: SEE SPECIFICATION _____ ☐ APPLICABLE TO NEIGHBORHOOD: SEE SPECIFICATION _____									
ACOUSTIC HOUSING: ☐ YES ☐ NO									
APPLICABLE SPECIFICATIONS: _____									
API 617, 7TH CHAPTER 1&2									
☐ VENDOR HAVING UNIT RESPONSIBILITY (1-1.5.52)(1-1.8)(1-2.1.3) ☐ GOVERNING SPECIFICATION (IF DIFFERENT) _____ _____									
PAINTING:									
☐ MANUFACTURER'S STD. ☐ OTHER: _____									
SHIPMENT: (4.4)									
☐ DOMESTIC ☐ EXPORT ☐ EXPORT BOXING REQ'D. ☐ OUTDOOR STORAGE MORE THAN 6 MONTHS (1-4.4.1) _____ MO. SPARE ROTOR ASSEMBLY PACKAGE (1-4.4.3.10) ☐ HORIZONTAL STORAGE ☐ VERTICAL STORAGE									

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Attachment No. 11 (SARP-MOM-1B/3061, KOM in Beijing)

Revision
Indication



UOP Ltd • Liongate, Ladymead • Guildford, Surrey GU1 1AT • England

ENGINEERING DESIGN INFORMATION

Project : 931096-A.4

SHEET 33

REV	DATE	BY	APVD	REV	DATE	BY	APVD
0	9 Aug 04	MRB	NCH				
1	16Aug04	MRB	MRB				
2	04Nov04	MRB	MRB				

BASIC ENGINEERING DESIGN QUESTIONNAIRE

b. Fuel Gas Composition

for startup case

Composition (Volume %)	Operation Mode		
	Normal (Gas 1)	RFCC S'D (Gas 2)	Start-up (Gas 3)
H ₂ O	Nil	Nil	Nil
O ₂			
N ₂	5.75	3.00	5.23
CO			
CO ₂	0.05	1.10	2.00
H ₂ S	< 107 vol ppm	< 107 vol ppm	< 0.2vppm
H ₂	38.41	24.19	0.00
C ₁	30.90	57.22	86.77
C ₂ =	7.08	0.01	0.00
C ₂	10.55	6.88	4.10
C ₃ =	1.08	0.00	0.00
C ₃	2.85	3.80	1.18
C ₄ =	0.15	0.00	0.00
iC ₄	0.74	0.93	0.22
nC ₄	1.07	1.41	0.28
C ₅ =	0.14	0.00	0.00
iC ₅	0.83	0.93	0.10
nC ₅	0.16	0.24	0.06
C ₆ +	0.24	0.29	0.06
Mercaptan	0.00	0.00	< 0.6vppm
Total	100.00	100.00	100.0

c. Fuel Gas System Requirements

The UOP Schedule A includes a specification for a fuel gas preparation system. UOP considers this system essential to good long term performance with low NOx burners. The system minimizes the potential of coke formation and scale plugging of burning tips and subsequent performance and burner maintenance problems.

The UOP system consists of a liquid knockout drum followed by basket strainers, a fuel gas coalescer, and a fuel gas heater. In the UOP specification, the detailed engineering of this system is left to the contractor, since the details will depend on the geographical placement of heaters relative to each other and the potential existence of existing fuel gas preparation facilities which could be extended to serve the new or revamped units.

** Default selection

Form E01-02-13

NOTE: The information in this document is confidential and the property of UOP Ltd and must not be disclosed to others or reproduced in any manner or used for any purpose whatsoever without its written permission.

T.4

		Shazand Arak Refinery Expansion and Upgrading Project			
		Data Sheet for C-1561 A/B (Wet Gas Compressor) Residue Fluid Catalytic Cracking Unit			
Originator Project No. : 19801-01				Project No. : 2260	
Document No. : DS-43-15-023-2		Rev. : 0		Page: 6 of 17	

REV.	CONSTRUCTION FEATURES
1	SPEEDS : <u>4889</u> <u>5378</u>
2	MAX. CONT. <u>105%</u> RPM TRIP <u>115.5%</u> RPM
3	MAX. TIP SPEEDS : <u>See Remark</u> MPS @ 100% SPEED
4	<u>283.9</u> <u>298.1</u> MPS @ MAX. CONT. SPEED
5	☐ LATERAL CRITICAL SPEEDS (DAMPED) <u>Per API-617</u>
6	FIRST CRITICAL <u>2500</u> RPM <u>BENDING</u> MODE
7	SECOND CRITICAL <u>7200</u> RPM <u>BENDING</u> MODE
8	THIRD CRITICAL _____ RPM _____ MODE
9	FOURTH CRITICAL _____ RPM _____ MODE
10	☐ LATERAL ANALYSIS ADDITIONAL REQUIREMENTS (1-2.6.2.1)
11	☐ TRAIN LATERAL ANALYSIS REQUIRED (1-2.6.2.6)
12	☒ TRAIN TORSIONAL ANALYSIS REQUIRED (1-2.6.7.1)
13	TORSIONAL CRITICAL SPEEDS: <u>Per API-617</u>
14	FIRST CRITICAL <u>827</u> RPM
15	SECOND CRITICAL <u>11841</u> RPM
16	THIRD CRITICAL _____ RPM
17	FOURTH CRITICAL _____ RPM
18	☒ LIST OF TRAIN UNDESIRABLE SPEEDS (1-2.6.1.4)
19	☒ STABILITY ANALYSIS (1-2.6.5) <u>AS PER EETC CRITERIA</u>
20	☐ VIBRATION:
21	ALLOWABLE TEST LEVEL <u>25.4</u> μ
22	(PEAK TO PEAK)
23	NAMEPLATE (2-2.11.2)
24	☐ US CUSTOMARY ☒ METRIC
25	☒ ROTATION, VIEWED FROM DRIVEN END ☐ CW ☒ CCW
26	☒ MATERIALS INSPECTION REQUIREMENTS (1-4.2.2.1)
27	☒ RADIOGRAPHY REQUIRED FOR <u>BY SPEC</u>
28	☒ ULTRASONIC REQUIRED FOR <u>BY SPEC</u>
29	☒ MAGNETIC PARTICLE REQUIRED FOR <u>BY SPEC</u>
30	☒ LIQUID PENETRANT REQUIRED FOR <u>BY SPEC</u>
31	☒ LOW TEMPERATURE (1-2.2.1.15.3)
32	MIN DESIGN METAL TEMPERATURE <u>-28</u>
33	AT CONCURRENT PRESSURE
34	☐ OTHER TRAIN COMPONENTS (1-2.2.1.15.2)
35	CASING: <u>70M71</u>
36	MODEL <u>Horizontal, Two Stages, Re-entry Type Casing</u>
37	CASING SPLIT <u>Axial</u> <u>(METAL-TO-METAL WITH O-RINGS)</u>
38	MATERIAL <u>Carbon Steel</u>
39	THICKNESS (MM) _____ CORR. ALLOW. (MM) <u>3.2</u>
40	MAX. ALLOWABLE PRESS <u>20.9</u> <u>See Remarks</u> BARG
41	TEST PRESS (BARG): HELIUM <u>20.9</u> HYDRO <u>30.6</u>
42	MAX. ALLOWABLE TEMPERATURE $^{\circ}$ C <u>177</u>
43	MAX. OPER. TEMP. <u>177</u> $^{\circ}$ C MIN. OPER. TEMP. <u>-28</u> $^{\circ}$ C
44	MAX. CASING CAPACITY (M ³ /H)
45	☐ SYSTEM RELIEF VALVE SET PT. (2-2.3.1.1) _____ BARG
46	☐ Q.C. OF INACCESSIBLE WELDS (1-2.3.1.11.2)
47	☒ DIAPHRAGMS: <u>JIS SS400 (ASTM A36 FR.)</u>
48	MATERIAL <u>SEE REMARKS, SHEET 2</u>
49	AXIALLY SPLIT ☒ YES ☐ NO (2-2.4.8)
50	☐ INTERMEDIATE MAIN PROCESS CONNECTIONS (2-2.4.5)
51	DISCH. PRESSURE (BARG) MAX _____ MIN _____
52	INLET PRESSURE (BARG) MAX _____ MIN _____
53	☒ GUIDE VANES
54	MATERIAL <u>N/A</u>
55	NUMBER OF AXIAL BLADE ROWS _____
56	NUMBER OF ADJUSTIBLE ROWS _____
57	NO. VANES GUIDE VANE _____
58	☒ IMPELLERS:
59	NO. <u>7</u> DIAMETERS <u>1165x3, 1013x4</u>
60	NO. VANES EA. IMPELLER <u>17, 15, 15, 13, 13, 13, 13</u>
61	TYPE (OPEN, ENCLOSED, ETC.) <u>Enclosed</u>
62	TYPE FABRICATION <u>WELDED</u>
63	MATERIAL <u>AISI 4130 or equal</u> <u>*1</u>
64	MIN. YIELD STRENGTH (KPA) <u>BAR</u> <u>8896</u> <u>*1</u>
65	HARDNESS: <u>HB</u> (BRINNEL) MAX <u>*1</u> MIN <u>*1</u>
66	SMALLEST TIP INTERNAL WIDTH (MM) <u>17.4</u>
67	MAX. MACH. NO. @ IMPELLER EYE <u>0.60</u> <u>*2</u>
68	MAX. IMPELLER HEAD @ 100% SPD (N.M/KG) <u>3411</u> <u>*2</u>
69	☒ SHAFT: <u>*2 @ Normal Case</u>
70	☒ ONE PIECE ☐ BUILT UP
71	MATERIAL <u>Forged Alloy Steel AISI 4340</u>
72	DIA @ IMPELLERS (MM) <u>118/364</u> DIA @ COUPLING (MM) <u>140</u>
73	SHAFT END: ☒ TAPERED ☐ CYLINDRICAL
74	☐ SPLINED ☐ INTEGRAL FLANGE
75	MIN. YIELD STRENGTH (KPA) <u>BAR</u> <u>8896</u> <u>7929</u>
76	SHAFT HARDNESS (BNH) <u>269-321</u>
77	MAX TORQUE CAPABILITY (N.M)
78	☒ BALANCE PISTON:
79	MATERIAL <u>AISI 4140</u> AREA <u>1759080</u> (MM ²)
80	FIXATION METHOD <u>SHRINK FIT</u>
81	NORMAL CLEARANCE (MM) <u>0.373</u>
82	FLOW WITH NORMAL CLEARANCE (M ³ /H) <u>1782</u>
83	FLOW WITH 2x NORMAL CLEARANCE (M ³ /H)
84	☐ PRESS. CONN. BAL LINE DOWNSTREAM (2-2.5.4.3)
85	☒ SHAFT SLEEVES:
86	AT INTERSTG. CLOSE MAT'L <u>SS</u>
87	CLEARANCE POINTS
88	AT SHAFT SEALS MAT'L <u>SS</u>
89	☐ ACCESSIBLE (2-2.8.3)
90	ROTOR
91	☐ DISASSEMBLY AND REASSEMBLY (2-2.6.8.2.1.1)
92	☐ AT SPEED BALANCING (1-2.6.8.3)
93	☐ SEQUENTIAL LOW SPEED BAL. PREC. AT SPEED BAL. (1-2.6.8.6)
94	☒ RESIDUAL BALANCE CHECK (1-2.6.8.7) <u>FOR REFERENCE</u>
95	☒ LABYRINTHS: <u>STATIONARY</u> <u>Al alloy @ 1ST - 3RD</u>
96	INTERSTAGE <u>ABRADABLE</u> <u>Ni-Gr @ 4TH - 7TH</u>
97	TYPE <u>ABRADABLE</u> MATERIAL <u>Al alloy or SS</u>
98	BALANCE PISTON <u>ABRADABLE</u> MATERIAL <u>Al alloy or SS</u>
99	TYPE _____ MATERIAL _____
100	REMARKS: 1. The Contractor and Vendor shall verify the compressor casing maximum design pressure, based on the maximum developed pressure at surge using the following parameters: compressor operating with the maximum suction pressure base on the relief valve setting of the interstage drum; highest molecular weight gas; steam turbine running at trip speed.
101	2. The impellers shall be designed to limit the maximum stress at maximum continuous speed to a value of 70% of the material yield strength

		Shazand Arak Refinery Expansion and Upgrading Project			
Data Sheet for C-1561 A/B (Wet Gas Compressor)		Residue Fluid Catalytic Cracking Unit		Project No. : 2260	
Originator Project No. : 19801-01		Document No. : DS-43-15-023-2		Rev. : 2 Page: 7 of 17	

CONSTRUCTION FEATURES (CONTINUED)										REV.	
1											
2	SHAFT SEALS										
3	● SEAL TYPE (1-2.8.1.3)	*1 Dry gas seal See UOP 5-15									
4	● SETTLING OUT PRESSURE (1-2.8.1.1)(BARG)	3.9/7.2 bar g									
5	○ MIN SEALING PRESSURE (BARG)										
6	○ SUPPLEMENTAL DEVICE REQUIRED FOR CONTACT										
7	SEALS (1-2.8.3.4) TYPE	(See Attached Sheet)									
8	● TYPE BUFFER GAS (1-2.8.1.5)	Fuel gas									
9	■ PRESSURE (1-2.8.1.6)	1.79 (BARG)									
10	■ FLOWRATE	306 (M³/H)									
11	■ FILTRATION	2 µm abs									
12	● BUFFER GAS SYSTEM REQUIRED (2-2.8.1.5)										
13	● MANIFOLD (1-3.5.1.4)										
14	● METHOD OF CONTROL (1-2.8.1.3)	ASTM A216 Gr. WCB									
15	AXIAL COMPRESSOR										
16	STAGE	1	2	3	4	5	6	7	8	9	
17	ROTOR										
18	□ BLADE MATERIAL										
19	□ BLADE ROOT TYPE										
20	□ CORD WIDTH (IN.)										
21	□ OUTER DIAMETER (IN.)										
22	□ BLADE HEIGHT (IN.)										
23	□ BLADE QUANTITY										
24	STATOR										
25	□ BLADE MATERIAL										
26	□ TYPE (MOVABLE, FIXED, ADJUSTABLE)										
27	□ CORD WIDTH (IN.)										
28	□ BLADE QUANTITY										
29											
30											
31	STAGE	10	11	12	13	14	15	16	17	18	
32	ROTOR										
33	□ BLADE MATERIAL										
34	□ BLADE ROOT TYPE										
35	□ CORD WIDTH (IN.)										
36	□ OUTER DIAMETER (IN.)										
37	□ BLADE HEIGHT (IN.)										
38	□ BLADE QUANTITY										
39	STATOR										
40	□ BLADE MATERIAL										
41	□ TYPE (MOVABLE, FIXED, ADJUSTABLE)										
42	□ CORD WIDTH (IN.)										
43	□ BLADE QUANTITY										
44											
45											
46	REMARKS:										
47	*1: With Intermediate Laby and N2 Buffering										
48											
49											
50											
51											
52											
53											
54											

Attachment 2

(SARP - MOM - IB /3061, KOM in Beijing)

There are two kind of gases to be used as WGC seal gas in RFCC Unit, one is wet gas discharged from the second stage of WGC outlet, the temperature, pressure and composition of the stream are finalized by WGC vendor; the other is dry gas from Lean Gas Knockout Drum(V-1567), the property of the stream is listed as follows:

Dry gas without desulfurized

P Bar(a)	12.0
T DEG C	45
	VOL.%
H2O	0.64267
N2	8.53178
CO	0.45828
CO2	1.54310
H2S	3.27254
H2	28.82534
C1	32.49209
=C2	10.97335
C2	10.33557
=C3	1.66488
C3	0.38932
=IC4	0.04989
=N1C4	0.04500
=I2C4	0.06701
=C2C4	0.06750
IC4	0.10075
NC4	0.06407
=IC5	0.21618
IC5	0.17314
NC5	0.01321
C6+PROD	0.07434
Total	100.00000

The vendor should finalize which kind of dry gas to be used as WGC seal gas and additional knockout drum is required or not.

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		Shazand Arak Refinery Expansion and Upgrading Project Data Sheet for C-1561 A/B (Wet Gas Compressor) Residue Fluid Catalytic Cracking Unit			
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CONSTRUCTION FEATURES (CONTINUED)							REV.
1 BEARINGS AND BEARING HOUSINGS							
3 ☐ MAGNETIC BEARINGS (2-3.7.1.2)							
4 RADIAL							
		THRUST	NON-THRUST	THRUST	ACTIVE	INACTIVE	
5 ☐ TYPE		Tilting Pad	Tilting Pad	☐ TYPE	Tilting Pad	Tilting Pad	
6 ☐ MANUFACTURER		<i>Daide or EA</i>	<i>→</i>	☐ MANUFACTURER	<i>Daide or EA</i>	<i>→</i>	
7 ☐ LENGTH (MM)		<i>93.5</i>	<i>→</i>	☐ UNIT LOADING (MAX BAR)	<i>15.9</i>	<i>→</i>	<i>1</i>
8 ☐ SHAFT DIA. (MM)		<i>177.8</i>	<i>→</i>	☐ UNIT LOAD (ULT.)(BAR)	<i>55.0</i>	<i>→</i>	
9 ☐ UNIT LOAD (ACT/ALLOW)		<i>14.3/41.4</i>	<i>14.4/41.4</i>	☐ AREA (MM ²)	<i>96852</i>	<i>→</i>	<i>1</i>
10 ☐ BASE MATERIAL		<i>Cu-Cu</i>	<i>→</i>	☐ NO. PADS	<i>6</i>	<i>→</i>	
11 ☐ BABBIT THICKNESS (MM)		<i>0.4-1.0</i>	<i>→</i>	☐ PIVOT: CENTER / OFFSET, %	<i>CTR</i>	<i>→</i>	
12 ☐ NO. PADS		<i>5</i>	<i>→</i>	☐ PAD BASE MATL	<i>C. STEEL</i>	<i>→</i>	
13 ☐ LOAD: BTWN/ON PAD		<i>BTWN</i>	<i>→</i>	☐ COPPER BACKED (2-2.7.3.7)			
14 ☐ PIVOT: CTR/OFFSET, %		<i>CTR</i>	<i>→</i>	☐ FLOODED ☐ DIRECTED (2-2.7.3.6)			
15 PAD MATERIAL ☐ (2-2.7.2.2) ☐ (2-2.7.2.3)		LUBRICATION: ☒ INTEGRAL ☐ REPLACEABLE					
16 ☐ BEARING SPAN <i>3703</i> MM		THRUST COLLAR: ☒ INTEGRAL ☐ REPLACEABLE					
17		MATERIAL: <i>JIS SNCM439 (AISI 4340 F8.)</i>					<i>1</i>
18 BEARING TEMPERATURE DETECTORS (2-3.4.7)		☐ SIZING CRITERIUM (2-3.7.3.3)					
19 ☐ SEE ATTACHED API-670 DATASHEET		VIBRATION DETECTORS: ☐ SEE ATTACHED API-670 DATA SHEET					
20 ☐ THERMOCOUPLES TYPE		☒ TYPE Non Contacting ☒ MODEL <i>DS-1051</i>					<i>1</i>
21 RESISTANCE TEMP DETECTORS		☐ MFR <i>B&K</i>					<i>1</i>
22 ☐ RESISTANCE MATL ☒ PT100 OHMS		☐ NO. AT EA SHAFT BEARING <i>2</i> TOTAL NO. <i>4</i>					
23 ☐ ALARM TEMPERATURE (°C) <i>132</i>		☒ OSCILLATOR-DETECTORS SUPPLIED BY VENDOR					
24 ☐ SHUTDOWN TEMPERATURE (°C) <i>138</i>		☐ MFR ☐ MODEL					
25 ☐ PROVISION FOR LOCAL DISCONNECT (1-2.7.4.6)		MONITOR SUPPLIED BY (2-3.4.7.2)					
26 ☒ LOCATION-JOURNAL BRG		☒ LOCATION <i>REMOTE</i> ENCLOSURE					
27 NO. EA PAD EVERY OTH PAD <i>2</i> PER BRG		☐ MFR <i>B&K</i> ☒ MODEL <i>VC-6000</i>					<i>1</i>
28 OTHER		☐ SCALE RGE <i>0-150</i> ALARM ☐ SET @ <i>76</i> μ					
29 ☒ LOCATION-THRUST BRG		☐ SHTDWN ☐ SET @ <i>102</i> μ ☐ TIME DELAY <i>1</i> SEC.					
30 NO. EA PAD EVERY OTH PAD <i>2</i> PER BRG		☐ CASING VIBRATION TRANSDUCERS (2-3.4.7.5)					
31 OTHER		☐ CASING VIBRATION MONITORS (2-3.4.7.6)					
32 NO. (INACT) EA PAD EVERY OTH PAD <i>2</i> PER BRG		AXIAL POSITION DETECTOR: ☐ SEE ATTACH. API-670 DATASHEET					
33 OTHER		☒ TYPE Non Contacting ☒ MODEL <i>DS-1051</i>					<i>1</i>
34 ☐ LOCAL DISCONNECTION (1-2.7.4.6)		☐ MFR <i>B&K</i> NO. REQUIRED <i>2</i>					<i>1</i>
35 ☒ MONITOR SUPPLIED BY (2-3.4.7.4) VENDOR		☒ OSCILLATOR-DEMODULATOR SUPPLIED BY VENDOR					
36 ☒ LOCATION <i>REMOTE</i> ENCLOSED		☐ MFR ☐ MODEL					<i>1</i>
37 ☐ MFR <i>B&K</i> ☒ MODEL <i>VC-6000</i>		MONITOR SUPPLIED BY (2-3.4.7.2) VENDOR					
38 ☐ SCALE RGE <i>0-150</i> ALARM ☐ SET @ °C <i>132</i>		☒ LOCATION <i>REMOTE</i> ENCLOSURE					
39 ☐ SHTDWN ☐ SET @ <i>138</i> °C ☐ TIME DELAY <i>1</i> SEC.		☐ MFR <i>B&K</i> ☒ MODEL <i>VC-6000</i>					<i>1</i>
40		☐ SCALE RGE <i>0-150</i> ALARM ☐ SET @ <i>50.451</i> μ MM					
41 KEY PHASOR REQUIRED		☐ SHTDWN ☐ SET @ μ ☐ TIME DELAY <i>1</i> SEC.					
42 ☐ COMPRESSOR ☐ GEAR H.S. ☐ GEAR L.S.		<i>± 0.678 RPM</i>					
43 CASING CONNECTIONS (1-2.3.2.2)							
44 CONNECTION	ASME / B16.5, B16.42, B16.47, SERIES A,B, ISO 7005-1,-2, OTHER	☐ FACING ☐ BORE	☒ ORIENTATION	☐ FLANGED OR STUDDED (1-2.3.2.2.1)	☒ MATING FLG & GASKET BY VENDOR (1-2.3.2.2.7)	☐ GAS VELOCITY FT/SEC. (1-2.3.2.2.7)	
45							
46							
47							
48							
49							
50 INLET	<i>28" CL300 #1</i>	<i>RF</i>	<i>DOWN</i>	<i>NONE</i>	IF NON ASME	<i>23.3</i>	
51 DISCHARGE	<i>16" CL300</i>	<i>RF</i>	<i>DOWN</i>	<i>NONE</i>	IF NON ASME	<i>20.6</i>	
52 ISO-DIS.	<i>24" CL300</i>	<i>RF</i>	<i>DOWN</i>	<i>NONE</i>		<i>28.9</i>	
53 ISO-IN.	<i>24" CL300</i>	<i>RF</i>	<i>DOWN</i>	<i>NONE</i>		<i>23.4</i>	
54							
55 ☐ BOROSCOPIC INSPECTION PORTS (2-2.3.2.4)							

#1 SERIES B

 SE شریک طراحی و ساختمان نفت 中国石化工程建设公司 SINOPEC ENGINEERING CORPORATION		Shazand Arak Refinery Expansion and Upgrading Project Data Sheet for C-1561 A/B (Wet Gas Compressor) Residue Fluid Catalytic Cracking Unit		 NIOEC	
Originator Project No. : 19801-01				Project No. : 2260	
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NO.	SERVICE :	NO.	SIZE	TYPE	PRESSURE	TEMPERATURE	SOLVENT INJECTION	PURGE FOR:	REV.
1	☐ OTHER CONNECTIONS								/
2	LUBE-OIL INLET								
3	LUBE-OIL OUTLET								
4	SEAL-OIL INLET								
5	SEAL-OIL OUTLET								
6	SEAL GAS INLET								
7	SEAL GAS OUTLET								
8	CASING DRAINS								
9	STAGE DRAINS								
10	INDIVIDUAL STAGE DRAINS REQUIRED (1-2.3.2.1.7)								
11	☐ VALVED & BLINDED								
12	☒ VALVED & BLINDED & MANIFOLD								
13	LUBRICATION AND SEALING SYSTEMS (1-2.10) (-13.5.1.2)								
14	☒ SEE ATTACHED API 614 DATASHEET								
15	☐ SEPARATE ☒ COMBINED (2-2.10.1)								
16	☐ INTEGRAL OIL RESERVOIR (1-3.3.2.11)								
17	☒ OIL TYPE (2-2.10.2) PER SP-2260-40-202 ISO VG 32								
18	ACCESSORIES								
19	COUPLING AND GUARDS (3.2)								
20	NOTE: SEE ROTATING ELEMENTS - SHAFT ENDS								
21	☐ SEE ATTACHED API 671 DATASHEET ☒ KEYLESS HYDRAULIC ☐ KEYED ☐ FLANGED ☐ OTHER								
22	COUPLING FURNISHED BY Compressor Vendor								
23	MANUFACTURER	EAGLE	TYPE	Profile diaphragm	MODEL	74F416			
24	COUPLING GUARD FURNISHED BY: VENDOR								
25	TYPE	☒ FULLY ENCLOSED	☐ SEMI-OPEN	☐ OTHER					
26	COUPLING DETAILS								
27	☐ MAX O.D.	433.1	MM	☐ PLUG AND RING GAUGES (1-3.2.5)					
28	☐ HUB WEIGHT	16.0 / 33.7	KG	LUBRICATION REQUIREMENTS.					
29	☐ SPACER LENGTH	1142.7	MM	☒ NON-LUBE ☐ CONT. OIL LUBE ☐ OTHER					
30	☐ SPACER WEIGHT	70.8	KG	QUANTITY PER HUB _____ LIT/H					
31	MOUNTING PLATES (1-3.3)								
32	☒ BASEPLATES FURNISHED BY (1-3.3.2.1) Compressor Vendor				☐ SOLEPLATES FURNISHED BY (1-3.3.3.1)				
33	☐ COMPRESSOR ONLY ☐ DRIVER ☐ GEAR				☐ THICKNESS _____ MM				
34	☒ OTHER Compressor and driver SEPARATE				☐ SUBSOLE PLATES REQUIRED (1-3.3.3.1.5)				
35	☒ NONSKID DECKING (1-3.3.2.4) ☐ SLOPED DECK (1-3.3.2.4.1)				☐ STAINLESS STEEL SHIM THICKNESS _____ MM				
36	☒ LEVELING PADS OR TARGETS (1-3.3.2.6)				☐ COMPRESSOR				
37	☐ COLUMN MOUNTING (1-3.3.2.5)				☐ COUNTER BORE ANCHOR BOLT HOLES (1-3.3.3.1.2)				
38	☐ SUB-SOLE PLATES REQUIRED (1-3.3.2.10)								
39	☐ STAINLESS STEEL SHIM THICKNESS 3 MM								
40	☐ MACHINED MOUTING PADS REQUIRED (1-3.3.2.9)								
41	REMARKS:								
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		Shazand Arak Refinery Expansion and Upgrading Project			
Data Sheet for C-1561 A/B (Wet Gas Compressor)		Residue Fluid Catalytic Cracking Unit		Project No. : 2260	
Originator Project No. : 19801-01		Document No. : DS-43-15-023-2		Rev. : 2 Page: 10 of 17	

REV.	REV.
1	UTILITIES
2	UTILITY CONDITIONS :
3	STEAM : MAIN DRIVES
4	INLET MIN 40 BARG 330 °C
5	NORM 40.7 BARG 360 °C
6	MAX 47.2 BARG 390 °C
7	EXHAUST MIN BARG °C
8	NORM BARG °C
9	MAX BARG °C
10	ELECTRICITY :
11	DRIVERS CONTROL SHUTDOWN
12	VOLTAGE 400 230 120
13	HERTZ 50 50
14	PHASE 3 1
15	REDUCED VOLTAGE START (103)
16	NUMBER OF STARTS (1-2.6.7.6.4)
17	INSTRUMENT AIR :
18	MAX PRESS 6.9 BARG MIN PRESS 6.2 BARG
19	
20	SHOP INSPECTION AND TESTS : (1-4.1.4)
21	(SEE INSPECTION CHECKLIST) REQ'D WIT/OBV
22	HYDROSTATIC (1-4.3.2) ● OBV
23	IMPELLER OVERSPEED (1-4.3.3) ●
24	MECHANICAL RUN (1-4.3.6) ●
25	CONTRACT COUPLING ● IDLING ADAPTOR(S) ●
26	CONTRACT PROBES ○ SHOP PROBES ○
27	PURCHASER VIB. EQUIPMENT (2-4.3.1.1.10) ○
28	VARY LUBE & SEAL OIL PRESSURES
29	AND TEMPERATURES (1-4.3.6.1.5) ● OBV
30	POLAR FORM VIB DATA (1-4.3.6.1.2) ○
31	TAPE RECORD VIB DATA (1-4.3.6.1.3) ○
32	SHAFT END SEAL INSP (1-4.3.6.2.2) ○
33	GAS LEAK TEST AT DISCH PRESS (2-4.3.2.3) WITH N2 ● OBV
34	POST TEST INTERNAL INSP (1-4.3.8.5) ○
35	BEFORE GAS LEAKAGE TEST ○
36	AFTER GAS LEAKAGE TEST ○
37	PERFORMANCE TEST (GAS)(AIR)(2-4.3.3.1.1) ○
38	COMPLETE UNIT TEST (2-4.3.3.2) ●
39	TANDEM TEST (2-4.3.3.3) ○
40	GEAR TEST (2-4.3.3.4) ○
41	HELIUM LEAK TEST (1-4.3.8.2) NITROGEN ● OBV
42	SOUND LEVEL TEST (1-4.3.8.3) AT EACH VENDOR'S SHOP ○
43	AUX. EQUIPMENT TEST (1-4.3.8.4) ● OBV
44	FULL LOAD / SPEED / PRESS TEST (1-4.3.8.6) ○
45	HYDRAULIC COUPLING INSP (1-4.3.8.7) ● OBV
46	SPARE PARTS TEST (1-4.3.8.8) ● OBV
47	INSPECTOR'S CHECKLIST COMPLIANCE (1-4.1.6) ● OBV
48	GAS SEAL TEST VENDOR SHOP (1-4.3.5) ● OBV
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51	Notes 1. As per SP-2260-90-262 for details of inspection and test requirement.
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REV.	REV.
1	MANUALS
2	DRAFT MANUAL FOR REVIEW (1-5.3.5.1.2)
3	TECHNICAL DATA MANUAL (1-5.3.5)
4	MISCELLANEOUS :
5	RECOMMENDED STRAIGHT RUN OF PIPE DIAMETERS
6	BEFORE SUCTION Vendor to advise
7	COMPRESSOR TO BE SUITABLE FOR FIELD RUN-IN ON AIR (1-2.1.16)
8	PROVISION FOR LIQUID INJECTION (1-2.1.10)
9	INJECTION MANIFOLD (2-3.5.1.2)
10	VENDOR'S REVIEW & COMMENTS ON PURCHASER'S CONTROL SYSTEMS (1-3.4.1.1)
11	SHOP FITUP OF VENDOR PROCESS PIPING (1-4.4.3.11)
12	WELDING HARDNESS TESTING (-4.2.1.5)
13	VENDOR REVIEW & COMMENTS ON PURCHASER'S PIPING & FOUNDATION.
14	DESIGN AUDIT (1-5.1.4)
15	BALANCE PISTON P (1-5.3.2.15)
16	PROVIDE TAIL END SCHEDULES (1-2.1.13)
17	VENDOR'S REPRESENTATIVE SHALL (2.1.13)
18	OBSERVE FLANGE PSRTING AS PER SUPERVISOR CONTRACT
19	CHECK ALIGNMENT AT TEMPERATURE
20	BE PRESENT AT INITIAL ALIGNMENT
21	WEIGHTS (KG) : (Refer to Compressor Unit Out line) 1
22	COMP. GEAR DRIVER BASE
23	ROTORS : COMPR DRIVER GEAR
24	COMPRESSOR UPPER CASE
25	MAX. FOR MAINTENANCE (IDENTIFY)
26	TOTAL SHIPPING WEIGHT
27	SPACE REQUIREMENTS (MM) : (Refer to "Plot Plan") 1
28	COMPLETE UNIT : L W H
29	REMARKS :
30	1. The vendor shall provide surge line data based on shop tests.
31	2. Anti-surge system see UOP Spec. 931100-692. NOT APPLICABLE
32	3. The compressor vendor shall provide compressor performance curves to the antisurge and process control system vendor for operation with a gas molecular weight of 20. The antisurge system vendor shall use this information to verify the control valve(s) is sized for the short-term, initial start-up operation with the 2nd stage discharge valve closed, using an alternate 20 molecular weight gas.
33	4. Air-cooler is installed in discharge of first stage, see UOP spec 4-13. And tubular cooler is installed backward position of aircooler, see UOP spec 4-11. Air-cooler and tubular cooler are included in vendor's scope.