



PRODUCT STANDARD
TURBINES AND COMPRESSORS
HYDERABAD

TC-6-2631

REV No.: **00**

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JOB SPECIFICATION OF DRY GAS SEAL

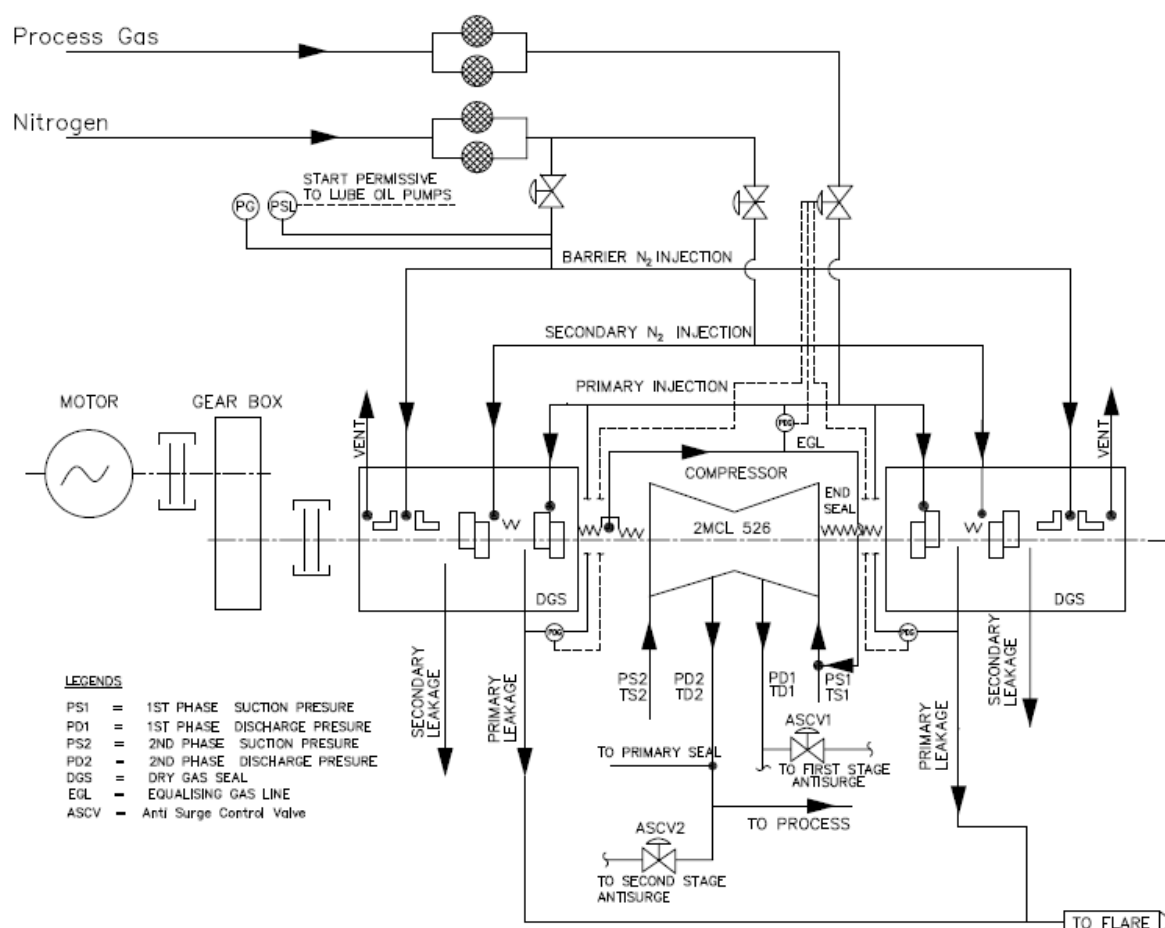
Project: M/s RCF THAL AMMONIA REFRIGERATION

1. GENERAL SPECIFICATION:

For general details of dry gas seals, please refer General Specification No.TC52357

For Seal Shaft and Housing Dimensions, please refer Specification No.TC52508

2. SCHEMATIC OF GAS SEAL SYSTEM (vary with respect to project requirement)



For a detailed scheme, refer to Seal gas P&ID as provided in Dry Gas Seal skid specification

Scope of supply of supporting seal gas system (along with filter skid) is covered under a separate specification vide TC55450

Rev. No.	Revisions	Prepared	Approved	Date
00	Refer to record of revisions	KVS	YVRL	07.06.018

TD-106-1 Rev. 5	Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS HYDERABAD	TC-6-2631 REV No.: 00 PAGE 2 OF 6									
3. SEAL PROCUREMENT DETAILS 3.1 DRY GAS SEAL CONFIGURATION SINGLE [] DOUBLE [] TANDEM [X] TRIPLE [] 3.2 DRY GAS SEAL TYPE: UNIDIRECTIONAL [] BIDIRECTIONAL [X] 3.3 INTERMEDIATE LABYRINTH: Yes / No 3.4 BARRIER SEAL: CARBON RING TERTIARY [X] LABYRINTH SEAL [] 3.5 SEAL CODE DESCRIPTION: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Var</th> <th style="width: 50%;">Description</th> <th style="width: 40%;">BHEL Material code</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">01</td> <td>Tandem type Bi directional Dry Gas Seal (Φ160) with Barrier seal</td> <td>TC9762631013</td> </tr> <tr> <td style="text-align: center;">02</td> <td>DGS Assy/Dis Assy. Fixture (Φ160)</td> <td>TC9762631021</td> </tr> </tbody> </table> 4. SEAL HOUSING & SHAFT DIMENSIONS Please refer TC52508 Var No.17 (DGS DIA 160 MCL 500 SERIES) for Seal housing and shaft dimensions. All the interface assembly parts including outer closing cover with its pin, "O" rings, tolerance strips (as applicable), keys, locating/ anti-rotation pins, circlips etc. are in vendor scope. The outer closing cover shall be provided with the milled projections as shown in the sketch to facilitate free oil drain. The dimensions indicated in the sketch shall be strictly adhered to.					Var	Description	BHEL Material code	01	Tandem type Bi directional Dry Gas Seal (Φ160) with Barrier seal	TC9762631013	02	DGS Assy/Dis Assy. Fixture (Φ160)	TC9762631021
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5. SEAL DESIGN INPUTS

5.1. DATA FOR SEAL DESIGN

OPERATING CONDITION		RATED	NORMAL	MINIMUM	NORMAL DOL	MINIMUM DOL			
PARAMETER DESCRIPTION									
Gas Composition									
Average Mol. wt.		17.03	17.03	17.03	17.03	17.03			
Suction Pressure (kg/cm2-a) 1 st Phase		4.0	4.0	4.0	3.71	3.36			
Discharge Pressure (kg/cm2-a) 2 nd Phase		17.5	17.5	17.5	17.5	17.5			
Suction Temp. (°C) 1 st Phase		0	0	0	0	0			
Discharge Temp. (°C) 2 nd Phase		102.4	102.3	103.8	106.4	112.8			
Pressure in Primary Injection Line (Kg/cm2-a) Differential pressure of 0.3 kg/cm2 is considered with respect to balance line Pressure. Vendor to recommend if any change is required		4.3	4.3	4.3	4.01	3.66			
Temperature in Primary Injection Line (°C)		87.25	87.14	88.87	91.39	98.12			
Total clean gas leaking into Compr. through end labyrinth seals (both ends)	NOR (Kg/hr)	115	115	114	110	104			
	NOR (Am3/hr)	50	50	50	52	54			
	Max (Kg/hr)	146	146	146	140	132			
	Max (Am3/hr)	75	75	75	78	82			
Shaft Speed(rpm)		9745	9437	9012	9745	9745			
System settling out press.(kg/cm2-g)		Approx. 10.0							
Rated Speed (rpm)		9745							
Min. mechanical design pressure for DGS		25.0 kg/cm2-g							
Mechanical design temperature for DGS		Min → -46 °C Max → 170 °C							
Back Pressure in Primary vent		Nor → 0.1kg/cm2-g / Max → 1.7kg/cm2-g							



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- Performance Guarantee case is ***RATED***
- Rated Speed is 9745 RPM
- Maximum Continuous Speed(MCS) is 10232 RPM
- Minimum Speed is 7796 RPM
- Trip Speed is 10232 RPM
- Slow roll requirement: NA

5.2. AMBIENT CONDITIONS

Temperature	:	Min → 9 °C Max → 45 °C
Relative Humidity	:	Min. 100 % @ 45° C % Nor. % Max. %

5.3. GAS COMPOSITION FOR VARIOUS CONTINUOUS OPERATING CONDITIONS:

Process gas composition:

OPERATING CONDITIONS (Continued)									
GAS ANALYSIS:		Rated / Normal /							
VOL %		Minimum							
	MW	STAGE1	STAGE2						
NITROGEN	28.016								
WATER VAPOR	18.016								
CARBON MONOXIDE	28.010								
CARBON DIOXIDE	44.010								
AMMONIA	17.03	100.000	100.000						
HYDROGEN	2.016								
METHANE	16.042								
ETHYLENE	28.052								
ETHANE	30.068								
PROPYLENE	42.078								
PROPANE	44.094								
I-BUTANE	58.120								
n-BUTANE	58.120								
I-BUTENE	56.108								
I-PENTANE	72.151								
N-PENTANE	72.151								
I-PENTENE	70.135								
HEXANE PLUS									
TOTAL		100.0	100.0						
AVG. MOL. WT.		17.03	17.03						

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5.4. SEALING GAS <table border="1"> <tr> <td rowspan="3">Primary Seal</td> <td>For Normal operation</td> <td colspan="5">Dry and filtered process gas</td> </tr> <tr> <td>For Startup/Settle out/emergency</td> <td colspan="5">NH3 from Seal Gas Booster</td> </tr> <tr> <td>Startup from Settle out</td> <td colspan="5"></td> </tr> <tr> <td colspan="2">Secondary Seal</td> <td colspan="5">Nitrogen / Plugged</td> </tr> <tr> <td colspan="2">Barrier Seal</td> <td colspan="5">Nitrogen / Instrument Air</td> </tr> <tr> <td colspan="7"></td> </tr> <tr> <td>Gas</td> <td>Parameter</td> <td>Min</td> <td>Nor</td> <td>Max</td> <td colspan="2">Mech.Design</td> </tr> <tr> <td rowspan="2">Nitrogen</td> <td>Pressure Kg/Cm² g</td> <td>2.5</td> <td></td> <td>5.0</td> <td colspan="2"></td> </tr> <tr> <td>Temperature °C</td> <td>Amb</td> <td>Amb</td> <td></td> <td colspan="2"></td> </tr> <tr> <td rowspan="2">Sweet Gas</td> <td>Pressure Kg/Cm² g</td> <td colspan="5" rowspan="2">NA</td> </tr> <tr> <td>Temperature °C</td> </tr> <tr> <td rowspan="2">Instrument Air</td> <td>Pressure Kg/Cm² g</td> <td colspan="5" rowspan="2">NA</td> </tr> <tr> <td>Temperature °C</td> </tr> </table>							Primary Seal	For Normal operation	Dry and filtered process gas					For Startup/Settle out/emergency	NH3 from Seal Gas Booster					Startup from Settle out						Secondary Seal		Nitrogen / Plugged					Barrier Seal		Nitrogen / Instrument Air												Gas	Parameter	Min	Nor	Max	Mech.Design		Nitrogen	Pressure Kg/Cm ² g	2.5		5.0			Temperature °C	Amb	Amb				Sweet Gas	Pressure Kg/Cm ² g	NA					Temperature °C	Instrument Air	Pressure Kg/Cm ² g	NA					Temperature °C
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6. Special Notes 1. Process gas is Ammonia. Copper or copper alloys for compressor parts in contact with process gas. 2. <u>Applicable Standards / Codes</u> a. BHEL General Specification No. TC52357 b. BHEL Housing Dimension Specification No. TC52508 Rev08, Var.17 c. API 617 – 7th edition d. API 614 – 5th edition e. Material shall be NACE MR0103 applicable																																																																																		
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RECORD OF REVISIONS

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