TITLE							ITEM/TAG No.	DOCUMENT No.	
PROCESS DATASHEET- HYDRAULIC CNG BOOSTER COMPRESSOR PACKAGE (DBS)							**Refer Note-17**	**16017-P-DS-0109**	
PROJECT DESCRIPTION							PROJECT No.	SHEET	REVISION
CONSTRUCTION OF CITY GAS STATION CUM CNG MOTHER STATIONS & DAUGHTER BOOSTER STATIONS							**KIP-16017**	**1 OF 3**	**A**
EPCM CONSULTANT				CLIENT CONTRACT NO			REQUISITION No.	SPECIFICATION No.	
KAVIN				**-**			**-**	**-**	
CLIENT NAME	REV No.	BY	DATE	CKD	DATE	APP	DATE	DESCRIPTION	
GODAVARI GAS PRIVATE LIMITED(GGPL)	A	SS	16-Nov-16	NK/TKV	16-Nov-16	MRM/BSK	16-Nov-16	ISSUED FOR REVIEW	
CLIENT'S REF:									
-									
ORIGINATOR / ORIG. DATE									
SS / **15-Nov-16**									

DESIGN BASIS

GENERAL:

Godavari Gas Private Limited (GGPL) is a Joint Venture of Andhra Pradesh Gas Distribution Corporation Limited (APGDC) and Hindustan Petroleum Corporation Limited (HPCL). GGPL has been set up to develop City Gas Distribution Projects including CNG Stations in East and West Godavari Districts. GGPL requires five (5) numbers of Hydraulic Booster Compressor for setting up CNG Daughter Booster Stations at 5 different locations in East and West Godavari Districts.

FEED GAS CONDITION:

Feed gas process conditions are as follows,

Pressure	30-210	kg/cm^2g
Temperature	39	°C
Flowrate	250	SCMH

STANDARDS / CODES

1. PNGRB standards
2. Published standards
3. Indian standards
4. Oil India Safety Directorate (OISD)
5. API-11P, Second edition, API 618
6. International standards : ANSI, ASME, ASTM, API, SA, NACE, ISO, DIN, EN, etc

SCOPE OF SUPPLY FOR EACH COMPRESSOR PACKAGE

1. Each compressor Package shall be complete with:

a). Offered package shall be complete with compressor, electric motor, hydraulic pump and piping, cooling system, suction and discharge filters, control panel safety and control devices and other accessories required for automatic and safe operation of the system.

b). Cooling system shall be of closed circuit type. Ultimate cooling shall be by air only.

c). The compressor package control system shall be designed for unattended safe operation in automatic mode and shall unload, start, load, stop safely. The compressor shall start in auto in case high bank pressure in dispenser fall below 210 kg/cm^2g and stop once the pressure in all three banks reaches 255 kg/cm^2g.

d). Compressor shall be suitable for continuously variable suction pressure from 210 kg/cm^2g to 30 kg/cm^2g, supplied through LCV mounted CNG storage cascade.

e). The ingress of oil into CNG adversely effects vehicle emission and storage system. Hence in case of lubricated cylinders, vendor shall supply a proven, maintenance free oil removal system with automatic and manual drain after after-cooler to remove oil from removal system shall restrict the oil less compressed gas. The offered oil mist that 5 PPM in discharge of compressor.

f). For metering of natural gas, 1 No. Coriolis type Mass Flowmeter shall be provided at the inlet of Compressor Package.

g). Instrument Air Compressor as required for operation of complete package.

h). Suitable Priority Fill System with compressor top-up facility inclusive of regulating valves, by pass valve & liquid filled pressure gauges as specified in technical specifications.

i). Inter-stage and discharge gas, air cooled heat exchangers as required.

j). Y- type strainers, valves, sight flow indicators, check valves, manual drain/traps etc. as required for various auxiliary systems i.e. lubrication system, cooling water systems etc.

k). Single Acoustic enclosure for both Compressor and electric motor as specified.

l). CO_2 extinguishing system consisting of two cylinders, piping and valves.

m). Inlet and outlet manual isolating valves.

2. UTILITIES

a). Air compressor along with 1.5 KW electric motor having discharge pressure of 7 kg/cm^2g with dryer shall be supplied by the vendor. Air receiver of 100 water liter capacities shall be provided. Air dryer suitable for automatic operation shall also be supplied along with all accessories. Air compressor, drier and air receiver for instrument air, shall be kept off the package in safe area or client's building. Manual drains and automatic moisture traps shall be provided in the system. Air receiver shall be provided with SRV, pressure switch, pressure gauge and drains. Pressure switch and pressure gauge shall have isolation valve. Air dryer shall be with bypass arrangement.

b). Cooling water is not available as utility and the package shall be provided with self sufficient cooling water system for Compressor, as required, with makeup tank. However cooling water for makeup tank is available. All the electrical equipments in this system shall be suitable for area classification of Hazardous area CLASS-1, DIVISION-1, GROUP-D of NFPA.

c). CO2 FLOODING SYSTEM:
The package shall be protected by automatically operated CO2 flooding system designed as per NFPA-12, which should have minimum following features: -

i). Minimum One No. Gas Detector IR type which have self check function to generate fault alarm and have 4 to 20 MA transmitter for 0 to 100% LEL shall be provided.

ii). Minimum One No. Flame Detector (UV-IR type) with self-check function and transmitter, alarm on detection of flame shall be provided. Package should have at least one no. flame detectors.

iii). CO_2 flooding system shall consist of 2 Nos. equally sized CO_2 Cylinders, size of the cylinder shall be as per compressor enclosure size. One cylinder will act as main cylinder & other as stand by, which shall have identical arrangement and connected to the system. The cylinders shall be protected from weather and direct sunrays as per Gas Cylinder Rules, 2004.
Cylinders shall be fitted with actuated Valves, Solenoid valves etc. for automatic actuation. Control philosophy shall be such that in case main cylinder fails the standby cylinder shall discharge automatically. For this the vendor shall provide suitable device such as pressure switch to detect the failure of main cylinders failure. One manual switch / call point shall be provided to operate the CO_2 cylinder from remote control room. Pull down lever/ Manual Valve shall be provided for manual operation of CO_2 System shall be provided.

3. All vents (i.e. Relief valve, distance piece and packing) shall be manifolded and terminated at skid edge outside the enclosure and vented to safe height of 2.5m at package roof with proper support.
4. All drains from different process equipment, distance piece and packing shall be manifolded and terminated as single point for customer interface duly flanged with isolation valve.
5. All controls shall operate in fail-safe mode i.e. failure of any control shall not lead to running of equipment in unsafe condition. Fail-safe control shall be available through hardware for all trips and also in software if PLC is used for controlling.
7. The compressor system shall be designed to prevent air ingress in the system during startup, operation and shutdown. Necessary instrumentation shall be provided.
8. Package enclosures shall have one IR-L.E.L detectors and one Ultra Violet (UV/IR) fire detectors in each enclosure to cover the enclosures effectively.
10. All material used in the package shall be flame retardant.
11. Relief Valves shall be provided at suction and discharge of compressor with setting as per cl. 7.20.3 of API – 11P with R.V. venting as per Cl. 7.20.4 of API-11P. All vented to common relief valve header.
12. Modular type DCP fire extinguisher (10Kg Capacity) shall be provided with compressor package.
13. Emergency shut down (ESD) System is also in scope of vendor. A fail-safe system shall be designed and incorporated to isolate cascades storage from dispensers, stop compressor isolate the compressor suction and cut off power supply on activation of ESD switch. This ESD switch shall have to be manually reset to restart the compressor package again. To isolate dispensers actuators of dispensers may be used.
14. Vendor shall supply a suitable priority fill system with compressor top-up facility inclusive of regulating valves, by pass valve & liquid filled pressure gauges all mounted in a stainless steel structural. The Priority fill system shall ensure that vehicle filling takes precedence over cascade filling.
15. All gas piping/ tubing, valves, fittings etc. from Suction of the 1st stage (right from interface) through final discharge from the compressor (upto interface) shall be SS-316 material with double compression ferrule fittings.
16. Compressor package shall be provided with following instruments:
    a). All tripping shall be with lamp indication and annunciation.
    b). Temperature indicaton: 1st, 2nd stage discharge and after- after cooler.
    c). Pressure indication: 2nd stage discharge, high & medium bank; Pressure switch 2nd stage discharge, high & medium bank.
    d). Hydraulic oil tank: Level switch, temp indication & switch ; Pump Pressure indication.
    e). Coolant: Temp & pr indication & switch and temp indication after cooler.
    f). Hour meter.
    g). One no. Pressure Switch/Transmitter shall be installed in the inlet line to compressor.
    h). One no. Coriolis mass flow meter with integral local display with transmitter shall be installed for metering of gas.
17. Five (5) Hydraulic CNG Booster compressor package tag number shall be 1020, 2020, 3020, 4020 and 5020 accordingly.
18. Tag sequence number shall be 1000-6000 for Five (5) Hydraulic CNG Booster compressor package .

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-										
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SS	**15-Nov-16**									

1	**Service**	:	GAS	**Equipment Tag No.**	:	-	
2	**Configuration**	:	1 x100%	**Running**	:	1	**Spare :**
3	**Compressor Type**	:	Hydraulic	**Driver Type**	:	Electric Motor Driven - Hydraulic	
4	**Design Margin**	:	-	**Capacity Control**	:	Automatic (VTA)	
5	**Process Data**	:	For One Compressor	**No of Stages**	:	VTA	
6	**Design Cases**	:	**-**	**No Required**	:	5	
7	**Gas Handled**	:	Compressed Natural Gas (CNG)	**Design Code**	:	API-11P, API 618	

CASE-1

	Parameters	**Units**	**Hydraulic Booster Compressor Package**	**Remarks**
10	Volume Flow	SCMH	250.0	
11	Mass Flow	kg/hr	182.0	Note-12
12	**Inlet Conditions**			
13	Suction Pressure	kg/cm²g	30-210	
14	Suction Temperature	^{0}C	39.0	
15	Molecular Weight	kg/kmol	17.25	Note-12
16	Mass Density	kg/m^3	33.04	Note-12
18	Specific heat ratio		1.429	Note-12
19	Compressibility factor		0.9121	Note-12
20	**Discharge Conditons**			
21	Discharge Pressure	kg/cm²g	255.00	Note-2,4,5
22	Discharge Temperature	^{0}C	55.00	Note-1,6
23	Mass Density	kg/m^3	181.7 (VTC)	Note-12
24	Compressibility factor		0.8719 (VTC)	Note-12
25	Polytropic Efficiency	%	Note-7	
26	Duty	kW	22 (VTC)	Note-8,9
27	Total Power	kW	VTA	

Compositions in Mole %

Components	**Design Case - Gas Composition Range**	**Normal Case**
Methane	82.0 – 99.0	95.21
Ethane	7.5 – 0.9	1.82
Propane	3.5 – 0.0	0.57
i-Butane	0.75 – 0.0	0.20
n-Butane	0.75 – 0.0	0.13
i-Pentane	0.15 – 0.0	0.06
n-Pentane	0.15 – 0.0	0.05
Hexane	0.25 – 0.0	0.21
Carbondioxide	4.9 – 0.0	1.46
Nitrogen	0.08 – 0.0	0.29
H2S	10 ppm	10 ppm

NOTE :

1. Given temperature is hydraulic booster compressor package outlet temperature. However compressor discharge temperature will be provided by vendor in their compressor datasheet.
2. Compressor vendor to confirm the compressor ratio.
3. Compressor vendor shall ensure the suitability of the material of consturction for the Booster compressor for 39 °C suction temperatures & corresponding discharge temperature(s).
4. The discharge pressure provided is the discharge pressure at the end of three stages of compression.
5. The discharge pressure at each stage has to be provided by vendor.
6. The dicharge temperature at each stage has to be provided by vendor.
7. Polytropic efficiency will be provided by compressor vendor.
8. The compressor duty provided is the duty required to compress the gas to 255 kg/cm²g. Compressor duty for each stage will be provided by compressor vendor.
9. The given duty is the Absorbed power of the compressor.
10. Vendor to consider 10% margin on the flowrate to design compressor.
11. Design Life of the compressors shall be minimum 30 years.
12. The given suction and discharge properties is based on Normal Operating case. Also vendor to design compressor suitable for Design case gas composition range as specified above.
13. VTA - Vendor To Advise
14. VTC - Vendor To Confirm
15. Ambient Temperature: 18 °C MIN / 48 °C MAX.