



CRYOGENIC FLARE STACK DATA SHEET

1 CLIENT DEVON

2 PROJECT DEVON FERRIER ITEM NO. 003-FS-09-0350

3 FABR SPEC. _____ SERVICE Hydrocarbon (Gas)

4 MANUFACTURER MACTRONIC REV C TYPE Cryogenic NO. REQ'D 1

PROCESS DESIGN (Note-7)				
		Case I (Note-4)		
AVG MOLECULAR WT (Note-2)	MW	Normal: 19.38	Max: 36.94	NOTED
FLOW NORMAL/MAXIMUM	kg / hr	/	106155	/ 106305.6
	MMSCFD	/	110	110 MMSCFD
DENSITY	kg / m ³	5.01	Note-2	NOTED
TEMPERATURE	Min./Normal/Design °C	-117 / -72	/ -128	/ NOTED /
PRESSURE	Min./Max./Design kPa(g)	25 / 140	/ 350	/ /
Cp/Cv		1.33		
Z Factor		0.9619		
Sour Service	Yes \ No	No		NOTED
EXIT VELOCITY	(m / sec) / MACH No.	161.9 /	0.5	/
Discharge	Continuous \ Non-Continuous	Non-Continuous		NOTED
	MW	TEMP (°C)	PRESSURE kPa(g)	FLOW (std m ³ / min)
PURGE GAS	16.8	20-30	UNKNOWN	.112
PILOT GAS	16.8	20-30	69	.030
IGNITOR GAS	16.8	20-30	69	.030
LOWER HEATING VALUE	kJ / kg 43,540 - 47,800			
TIP PRESSURE DROP	kPa	ALLOWABLE	Note-10	CALCULATED 21.81 TIP PLUS SEAL
SEAL PRESSURE DROP	kPa	ALLOWABLE	Note-10	CALCULATED SEE ABOVE, (ONLY)
STACK PRESSURE DROP	kPa	ALLOWABLE	Note-10	CALCULATED 38.33

SITE CONDITIONS AND UTILITIES				
AMBIENT TEMP (°C)	MAXIMUM 40	MINIMUM -40		
WIND VELOCITY (km / h)	Peak Continuous 100	Max Continuous 72	WIND Pressure (kPa) 0.26 - 0.5	DIRECTION Northwest
SITE ELEVATION (m ASL)	1020-1030 m	ATM PRESS. (kPa(a)) 89.55	EARTHQUAKE ZONE NBC 2009	Seismic Acceleration Value 0.02
INSTRUMENT AIR (kPa(g))	1035	POWER (volt / ph) 208 / 120 V / 1 / 60		

DESIGN DATA (Note-10)				
STACK				
DIAMETER (mm)	457	RADIOGRAPHY 100% ON PROCESS GAS	STACK MAT'L (ASTM)	SA-316L, SA240-316L
HEIGHT (m)	39.6	ALLOW FLUX @ BASE (W / m ²) 1321 solar not incl	BASE PL MAT'L (ASTM)	SA-516-70N
MIN THICK (mm)	12.7	CORROSION ALLOW (mm) 3.2	BASE PLATE SIZE (mm)	812.8
<input type="checkbox"/> FREE STANDING	NO	<input type="checkbox"/> GUYED	ANCHOR BOLT QTY / DIA	12, 32mm
<input type="checkbox"/> GUY WIRES	YES	<input type="checkbox"/> SHACKLES	<input type="checkbox"/> TURNBUCKLES (6)	1-1/4" X 24"

FLARE TIP				
TIP SIZE (dia x length) (mm x mm)	457 X 3,750	TIP MATERIAL	SS-310 / SS 316	TURNDOWN Purge rate to Max.
<input type="checkbox"/> SMOKELESS	<input checked="" type="checkbox"/> NEAR SMOKELESS (%)	YES, Ringlemann < 1	<input type="checkbox"/> WIND SHROUD	YES

CONNECTIONS					
FLARE HEADER SIZE (mm)	457	INLET NOZZLE ANGLE (deg)	45 deg.	PILOT GAS CONNECT (mm)	25.4 150#
INLET NOZZLE SIZE (mm)	457	INLET NOZZLE RATING (ANSI)	150#	IGNITOR GAS CONNECT (mm)	AS ABOVE
STEAM CONN SIZE (mm)	NA	STEAM CONN RATING (ANSI)	NA	TEST CONNECT (mm / RATING)	

SEAL				
TYPE	PURGE SEAL	SIZE (dia x length) (mm)	457 DIAM.	

BLOWER				
TYPE	NONE	MOTOR POWER (kW)	ENCLOSURE	
VOLUME (std m ³ / min)		POWER (volt / ph / hz)		

PILOTS AND IGNITION SYSTEM				
PILOT MFG	MACTRONIC	TYPE/MODEL NO.	850-TC, ELECTRONIC	
PILOT QTY	TWO (2)	IGNITION TYPE	Auto/Man inter. Spark	IGNITION MONITOR SYS Yes TC's
FLAME FAIL ALARM (TC)	YES, EACH PILOT	TC TYPE	dual element	THERMOCOUPLE QTY one per pilot
IGNITOR MFG	MACTRONIC	IGNITOR TYPE	Elec spark	IGNITOR POWER (volt / ph / hz) 120/1/60
<input checked="" type="checkbox"/> AUTO RE-IGNITION	<input checked="" type="checkbox"/> MANUAL RE-IGNITION	<input checked="" type="checkbox"/> CONTINUOUS SPARKING		

MISCELLANEOUS				
<input checked="" type="checkbox"/> AIRCRAFT WARNING BEACON	<input type="checkbox"/> LADDER c/w CAGE	<input type="checkbox"/> PAINTER'S TROLLEY	<input type="checkbox"/> INTEGRAL	
<input type="checkbox"/> M.O.T. PAINTING	<input type="checkbox"/> PLATFORM	<input checked="" type="checkbox"/> LIFTING LUGS	<input type="checkbox"/> KNOCKOUT DRUM	
<input type="checkbox"/> ONE (1) PIECE STACK	<input checked="" type="checkbox"/> TWO (2) PIECE STACK	<input checked="" type="checkbox"/> TAILING LUGS	SIZE _____	
<input checked="" type="checkbox"/> FLANGED SECTIONS	<input type="checkbox"/> WELDED SECTIONS	<input type="checkbox"/> VENDOR FIELD ASSEMBLE		
INSULATION SPEC	None, discontinued	PAINTING SPEC	Carbon steel only	ERECTION WT (kg) 7,031
ERECTION BY	others	SHIPPING BY	others, loading Mactronic	TOTAL WEIGHT (kg) 7,031

63 **REMARKS:**

64 See Sheet 2 & 3

	PROJECT No.: DEVON 01-00348.01	REV	DATE	MECH	PROC	CHKD	APPR
	PROJECT No.: WP 407014-00120	A	19-Mar-13		A.Ostovar	H.Amin	F.Shan
	WP DS NO.:						



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8 **FLOW NORMAL/MAXIMUM**

- 9 _____
- 10 1. Radiation maps with the following isopleths: 1.58, 3.16, 4.73, 6.31, 9.46 Kw/m2 (500, 1000, 1500, 2000, 3000 BTU/hr*ft2)
- 11 2. Utility requirements (Fuel Gas for Purge, Pilots,...,Air, Electricity,...) for Design Capacities and during the ignition of the flares(smokeless medium, etc.)
- 12 3. Noise profiles at full flaring.
- 13 4. Length and Height of flame without wind and at design wind velocity
- 14 5. Supplier shall supply list of power consumers to be installed on emergency power generator.
- 15 6. Pressure Drop Profile in the Flare (stack, tip, ...)
- 16 7. Curves of pressure at stack base and Mach number vs. Relief rates to be provided.
- 17 8. Estimated amount of unburnt hydrocarbons at full flaring flowrate.
- 18 9. Service life of the flares tips in case of a continuous flaring.
- 19 10. Emissivities assumed for each case.
- 20 11. Supplier shall inform about calculation method used (API, Mixed, etc...)
- 21 12. Supplier shall design the system taking into account: Maximum wind velocity in every direction and General environmental properties
- 22 13. Supplier shall design the system to meet DEVON specification Steal Flare Stacks GS-3810-Rev 0

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34 **Performance Guarantees**

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- 36 1. Good and safe operation of the flare for the conditions described hereabove, and for the worst climatic conditions.
- 37 2. Maximum radiation values in conjunction with specified flare heights.
- 38 3. Utility Consumptions
- 39 4. Pilot stability and reignition of the flares even for the worst climatic conditions
- 40 5. Pressure drop through the system
- 41 6. Noise Levels
- 42 7. Service life of the flares tips in case of a continuous flaring.
- 43 8. Smokeless operation per ERCB Directive 60

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- 6 **Notes:**
- 7
- 8 1. Conditions at atmospheric pressure.
- 9 2. Normal average molecular weight will range from 16.81 to 19.38 Max.
Molecular weight based on blowdown from NGL bullet. Density to range from 1.52-11.57kg/m3
- 10 3. Supplier to provide dynamic seal to prevent air ingress into the flare stack.
- 11 4. Cryogenic gas will be gathered from NGL bullets as well as Deep Cut Unit(C2+ Recovery)
- 12 5. DELETED
- 13 6. Instrument Air Conditions;

Operation Conditions						Design Conditions	
Pressure (kPag)			Temperature (°C)			Pressure	Temperature
Max.	Norm.	Min.	Max.	Norm.	Min.	(kPag)	(°C)
910	830	550	45	25	20	1035	60

19 7. Gas Composition to be confirmed by TDE

	Mole Fraction		
	Composition 1	Composition 2	Composition 3
21 Nitrogen	0.0051	0.0045	0.0000
22 CO2	0.0130	0.0154	0.0298
23 Methane	0.9577	0.8317	0.0041
24 Ethane	0.0238	0.1026	0.5939
25 Propane	0.0005	0.0378	0.2933
26 i-Butane	0.0000	0.0030	0.0265
27 n-Butane	0.0000	0.0043	0.0412
28 i-Pentane	0.0000	0.0005	0.0063
29 n-Pentane	0.0000	0.0003	0.0035
30 n-Hexane	0.0000	0.0000	0.0011
31 n-Heptane	0.0000	0.0000	0.0003
32 n-Octane	0.0000	0.0000	0.0000
33 H2O	0.0000	0.0000	0.0000

NOTE: Composition #3 corresponds to blowdown from NGL bullet.
Relief rate will not exceed 73,591 kg/hr

- 34 8. DELETED
- 35 9. Accommodate the maximum flow of waste gases and minimum flow of purge or assist gases without producing significant amount of smoke.
- 36 10. To be defined/confirmed by Cryogenic Flare Stack Vendor.