ENGINEERING SERVICES DEPARTMENT

MOISTURE TRAP Y1511 SPECIFICATION SHEET

Project	NW PlasGas & CWOPG Project	**Unit Tag Number**	Y1511
Datasheet Document No.	ENS-NWPVR-SPE-24004	**Revision**	2
Description	Moisture trap Y1511 is installed on the process off-gas line, downstream of the wet scrubber S1501 for the Low-Level Waste Plasma Gasification (NW PlasGas) and the Uranium Contaminated Waste Oil Plasma Gasification (CWOPG) Demonstration Facilities [1]. Its function is to remove any moisture, either in the form of water or as scrubbing liquid, above the saturation level in the gas.		
Plant location	Necsa, Pelindaba, North-West Province.		
Equipment location	Merged NW PlasGas & CWOPG Facilities - Inside secondary enclosure Y1410 in Laboratory-150, Building V-H2 [Note 6].		
Safety Classification	SC-2(C) and SC-3(N)		
Quality Classification	QC-2(C) and QC-3(N)		
Fluid state	Gas		
Solid content	Possible solid uranium compound particulates.		
Corrosive due to	Hydrogen Chloride (HCl) and Hydrogen Fluoride (HF) gases - produced at maximum rates of 10 g/h [2] and 0,2 g/h [9], respectively.		

FLUID PROPERTY DATA

	Units	NW PLASGAS		CWOPG	
PARAMETERS	**UNITS**	**MINIMUM**	**MAXIMUM**	**MINIMUM**	**MAXIMUM**
Fluid description		Scrubber off-gas containing CO_2 , HCl, O_2 and N_2 [3], with traces of moisture. Note 1		Scrubber off-gas containing CO_2 , HCl, HF O_2 and N_2 [9], with traces of moisture. Note 1	
Operating temperature	**°C**	35 [3]		45[8]	
Operating pressure	**kPa (g)**	-9.3 [10]		-9.7 [11]	
Mass flow rate	**kg/h**	12,63 [2]	48 [2]	15.14 [9]	44,68[9]
Volume flow rate	**m^3/h**	11,08	42,11	12,51	17,9
Moisture content	**kg/h**	0,11 [Note 3]		0,13 [Note3]	
Density	**kg/m^3**	1,14 [5]		1,21	
Viscosity	**cP**	1,73E-04 [Note 5]		1,76E-04 [Note 5]	
Specific heat capacity (C_p)	**kJ/kg.K**	1,96E-01 [Note 4]		1,95E-01 [Note 4]	
Allowable pressure drop	**kPa**	1 [11]			

MECHANICAL & ELECTRICAL PROPERTIES

Pipeline Size	100 NB, SCH 40								
Material of Construction									
Body Material	SS, ASTM A182-F304/304L								
Process Connections									
Inlet	**Size**	4"	**Rating**	150#	**Flange Spec.**	SS, ASTM A182-F304/304L, ASME B16.5			
Outlet	**Size**	4"	**Rating**	150#	**Flange Spec.**	SS, ASTM A182-F304/304L, ASME B16.5			
Moisture Trap Type	Electronically operated								
Electrical Supply	**kW**	Supplier to advise	**Volts**	Supplier to advise	**Phase**	Supplier to advise	**Hz**	Supplier to advise	

REFERENCE DRAWINGS AND DOCUMENTS

[1] ENS-NWPVR-PID-24002, P&ID Diagram - NW PlasGas Demonstration Plant Subsystem 15

[2] ENS-NWPVR-CLC-24011, Mass Balance Calculations for the NW PlasGas Demonstration Facility

[3] ENS-NWPVR-REP-24017, Energy Balance Report for the NW PlasGas Demonstration Facility

[4] ENS-NWPVR-SPE-24020, Scrubber S1501 Specification Seet

[5] ENS-NWPVR-CLC-24005, NW PlasGas Line Sizing Calculations

[6] AC-ENGBKG-SPE-21001: Properties of Liquid and Gas Mixtures

[7] Perry, R.H., & Green, D.W. (1997). Perry's Chemical Engineers Handbook, 7th Edition, McGraw-Hill Company

[8] ENS-OWPVR-CLC-24002, Mass Balance & Energy Balance Calculations for the Basic Engineering Design of the Uranium Contaminated Waste Oil Plasma Gasification.

[9] ENS-OWPVR-CLC-24006, Scrubber Design for the Uranium Contaminated Waste Oil Plasma Gasification Project

[10] ENS-NWPVR-CLC-24018, Pressure Balance across the NW PlasGas Facility

[11] ENS-OWPVR-CLC-25010, Pressure Balance across the Uranium Contaminated Waste Oil Plasma Gasification Demonstration Facility

NOTES

Note 1: The composition of the exhaust scrubber off-gas changes over time due to chemical reactions which take place in the scrubber. For the NW PlasGas Facility, the as composition (% w/w) is 1.35% CO_2, 0.08% HCl, 51,86% O_2 and 46,71% N_2 at the minimum flow rate, and 74,03% CO_2, 0.02% HCl, 13,65% O_2 and 12,3% N_2 at the maximum flow rate. For the CWOPG Facility the, gas composition (%w/w) is 10.3% CO_2, 0.01% HCl, <0.01% HF, 56.7% O_2 and 33.0% N_2 at the start of the process, and 69.6% CO_2, Traces of HCl, Traces of HF, 19.2% O_2 and 11.2% N_2 at the end of the process.

Note 2: Moisture trap to be supplied complete with integrated automatic drain valve, which does not allow release of off-gas during drainage, only moisture.

Note 3: Conservatively estimated to be 1% of water present in feed gas to wet scrubber , taking note that the scrubber also contains an integrated demister to prevent liquid entrainment in the off-gas stream.

Note 4: Mixture specific heat capacity estimated by weighted average calculation. Pure component specific heat capacities estimated from Table 2 in [3].

Note 5: Mixture viscosity estimated using the equation in [6] section 4,2. Pure component viscosities estimated using nomograph given in [7] Fig 2-32, page 2-321, with nomograph cordinates from [7] Table 2-364, page 2-320, (HCl / HF contributions assumed to be negligible).

Note 6: The NW PlasGas and CWOPG Facilities will not be operated simultaneously. Therefore this moisture trap will only be servicing one of the facilities at a time.

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