

ENGINEERING SERVICES DEPARTMENT



SCRUBBER S1501 SPECIFICATION SHEET

Project		NW PlasGas Project		Unit Tag Number		S1501	
Datasheet Document No.		ENS-NWPVR-SPE-24020		Revision		R2,0	
Description		Shared KOH Scrubber for the Low-Level Waste Plasma Gasification (NW PlasGas) and the Uranium Contaminated Waste Oil Plasma Gasification (CWOPG) Demonstration Facilities					
Plant		Merged NW PlasGas and CWOPG Facilities					
Plant Location		Building V-H2, Laboratory 150 (scrubber housed inside a secondary enclosure Y1410)					
Safety Classification		SC-2(C) and SC-3(N)					
Quality Classification		QC-2(C) and QC-3(N)					
FLUID PROPERTY DATA							
		UNITS	NW PLASGAS			CWOPG	
			GAS	LIQUID FROM QUENCH	LIQUID FROM RECYCLE	GAS	SCRUBBING LIQUID
Fluid Description			CO ₂ , HCl, H ₂ O, O ₂ , N ₂ ^{Note 1}	H ₂ O, KOH, KCl, K ₂ CO ₃ , KHCO ₃ ^{Note 2}		CO ₂ , HCl, HF, H ₂ O, O ₂ , N ₂ ^{Note 3}	H ₂ O, KOH, KF, KCl, K ₂ CO ₃ , KHCO ₃ ^{Note 4}
Density (at average temperature)		kg/m ³	0,893	1274,8		0,833	1274,8
Viscosity		cP	0,02	1,6		0,02	1,6
Operating Temperature	Minimum	°C	25	25		25	25
	Normal inlet	°C	80	75	35	90	35
	Normal outlet	°C	35	56,1 (Combined)		35	49,53
	Maximum	°C	80	80		90	80
Flow rate (feed to the scrubber) ^{Note 6}		kg/h	58,66	1013	2960	57,92	4429
		m ³ /h ^{Note 5}	44,14	0,79	3,58	45,39	5,02
Operating Pressure	Minimum	kPa(a)	77	77	317,7	77	413,0 ^{Note 8}
	Normal	kPa(a)	82	82	320,1	171	416,1 ^{Note 8}
	Maximum	kPa(a)	87	87	337,5	200	438,8 ^{Note 8}
Permissible pressure drop over packed bed		kPa	1,5				
Design pressure drop over packed bed		kPa	Supplier to advise				
Design temperature		°C	90				
Design pressure		kPa(a)	750				
CAPACITY DATA							
Column diameter		Inner diameter 290.6 mm, based on a 355 mm Polypropylene pipe					
Bed height		2 m					
Type of packing		Pall rings					
Packing material		Polypropylene					
Packing size		16 mm					
Sump volume		2 m ³					
Sump dimensions		Supplier to advise					
Instrumentation		Ultra guided radar level indicator transmitter on the scrubber sump, more information available in the purchase specification					
Accessories		Liquid redistribution every 1.45 m (maximum); supplier to advise optimal position					
		Demister inside scrubber between top of packed bed and on gas outlet					
		Spray nozzles above packed bed for introduction of recycled scrubbing liquid					
		Liquid distribution manifold for proper distribution of scrubbing liquid through the diameter of the packed column.					
		Packing support					
Operating hours		6 hours per day, plus 1 hour for startup and 1 hour for shutdown, 5 days per week					
MECHANICAL SECTION							
Process exposed material		Polypropylene (scrubber sump and column)					
Process connections ^{Note 7}		Flanged (150 lb rated), details available in Purchase specification document					

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SITE CONDITIONS

Altitude	m	1300
Site location		Pelindaba East, H-Building
Atmospheric Pressure (min./max.)	kPa(a)	Min: 87,4; Max: 88,3
Ambient Temperature (min./max.)	°C	Min: 2; Max: 32

REFERENCE DRAWINGS AND DOCUMENTS

- [1] ENS-NWPVR-CLC-24015: Scrubber Design for the Low-Level Waste Plasma Gasification (NW PlasGas) Demonstration System
- [2] ENS-OWPVR-CLC-24006: Scrubber Design for the Uranium Contaminated Waste Oil Plasma Gasification Project
- [3] ENS-NWPVR-PID-24002: P&ID Diagram: NW PlasGas Demonstration Plant Subsystem 15
- [4] ENS-NWPVR-SPE-24019: Purchase Specification for the Wet Scrubber in the Combined NW PlasGas/Waste Oil Demonstration Facility

NOTES

Note 1: For the PlasGas Facility, the composition of the gas entering the scrubber is (w/w) : 56.97% CO₂, 2.98% HCl, 18.82% H₂O, 11.17% O₂, and 10.06% N₂. The stream will include 1013 kg/h scrubbing liquid used for quenching purposes with the composition of Note 2.

Note 2: For the PlasGas Facility, the scrubber solution composition will change over time due to the chemical reactions taking place in the scrubber. At the end of phase 1, the composition (w/w) will be 67.67% water, 1.05% KCl, and 30.78% K₂CO₃. At the end of phase 2, the composition will be 58.87% water, 1.79% KCl, and 38.04% KHCO₃. At the end of the final phase, the composition will be 62.52% water, 4.26% KCl, and 31.20% KHCO₃.

Note 3: For the CWOPG Facility, the composition of the gas entering the scrubber is (w/w) : 53.68% CO₂, 0.04% HCl, 0.01% HF, 22.82% H₂O, 14.83% O₂, and 8.63% N₂.

Note 4: For the CWOPG Facility, the scrubber solution composition will change over time due to the chemical reactions taking place in the scrubber. At the end of phase 1, the composition (w/w) will be 67.22% water, 0.014% KCl, 0.004% KF, and 32.76% K₂CO₃. At the end of phase 2, the composition will be 60.22% water, 0.024% KCl, 0.007% KF, and 39.75% KHCO₃. At the end of the final phase, the composition will be 65.34% water, 0.061% KCl, 0.016% KF, and 34.5814% KHCO₃.

Note 5: Gas flow rate given at normal conditions: 20°C and 101.325 kPa

Note 6: Gas entering the scrubber may be two-phase flow, since reactions will already be taking place in the quench (NW PlasGas) and the liquid ring pump (CWOPG).

Note 7: Detailed information on number and position of connections available in the Purchase Specification, Table 8

Note 8: Estimated pressure since pump has not yet been sized

	Name	Signature	Date
Compiled by	M Correia (Senior Process Engineer)		
Checked by	SM Mngoma (Chief Mechanical Engineer)		
Checked by	W Ludwick (Senior Process Engineer)		
Checked by	G Manuel (Chief C&I Engineer)		
Checked by	B Khumalo (Senior Process Engineer)		
Checked by	W van den Berg (Chief Electrical Engineer)		
Approved by	K Moodley (Chief Process Engineer)		