ENGINEERING SERVICES DEPARTMENT

LIQUID RING VACUUM PUMP P1520 SPECIFICATION SHEET

Project	Contaminated Waste Oil Plasma Gasification Project	**Unit Tag Number**	P1520
Datasheet Document No.	ENS-OWPVR-SPE-25028	**Revision**	2
Description	The liquid ring pump P1520 forms part of the scrubbing system in the Contaminated Waste Oil Plasma Gasification (CWOPG) Demonstration Factility. This is a rotating positive displacement pump with liquid under centrifugal force acting as a seal. Its function is to create a vacuum, transferring the process gas stream exiting the Primary Solids Capturing System [6] to the KOH scrubber (S1501) [1]. The liquid ring pump uses Potassium Hydroxide (KOH) solution drawn from the scrubber sump tank as its operating (service) fluid.		
Plant Location	Necsa, Pelindaba, North-West Province		
Equipment Location	CWOPG Facility - Inside the secondary enclosure Y1410 inside Laboratory-150, Building V-H2		
Safety Classification	SC-2(C) and SC-3(N)		
Quality Classification	QC-2(C) and QC-3(N)		

FLUID PROPERTIES

	UNITS	GAS Note 4	LIQUID Note 4
Process fluid		CO_2, HF, H_2O, HCl, O_2, & N_2 Note 1	H_2O, KOH, KF, K_2CO_3, $KHCO_3$ & KCl Note 2
Solids content		Negligible	Negligible
Corrosive due to		HCl, HF	N/A
Operating temperature	**°C**	90 [3]	49,53 [3]
Fluid molecular weight	**kg/kmol**	30,69	56,11 Note3
Fluid density	**kg/m^3**	0,83 [5]	1268 [5]
Viscosity	**cP**	0,017 [5]	0,018 [5]
Liquid vapour pressure	**kPa (a)**	N/A	2,3 Note3

HYDRAULIC PROPERTIES

Mass Flow rate	**kg/hr**	57,94 [3]	Supplier to advise
Volumetric Flow rate	**m^3/hr**	58,40 [3]	Supplier to advise
Suction Presssure	**kPa (a)**	61,5 [5]	79.9 [5]
Discharge Pressure	**kPa (a)**	atmospheric (88,3)	atmospheric (88,3)

MECHANICAL & ELECTRICAL PROPERTIES

Process Connections									
Gas inlet - Suction	**Size**	40 NB	**Rating**	150#	**Flange Spec.**	SS,ASTM A182-F304/304L, ASME B16.5, RF			
KOH inlet - Suction	**Size**	25 NB	**Rating**	150#	**Flange Spec.**	SS,ASTM A182-F304/304L, ASME B16.5, RF			
Discharge	**Size**	40 NB	**Rating**	150#	**Flange Spec.**	SS,ASTM A182-F304/304L, ASME B16.5, RF			
Pump Direction	**Horizontal**	☑	**Vertical**	☐					
Electrical supply[6]	**kW**	Supply to advise	**Volts**	400	**Phase**	3	**Hz**	50	
Noise Criteria	Maximum Allowable sound level at 1m distance not to exceed 85 dBA								
Seal Fluid	Potassium Hydroxide Solution (KOH) [Note 2]								
Material of Construction	**Casing**	Supplier to advise			**Impeller**	Supplier to advise			
	O Ring	Supplier to advise			**Base Frame**	Supplier to advise			
	Shaft	Supplier to advise			**Shaft Seal**	Supplier to advise			

VENDOR DATA REQUIRED WITH TENDER

1 **Pump technical data**
2 **Utility Requirements**
3 **Delivery Schedule**
4 **Pump dimensions with baseplate**

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REFERENCE DRAWINGS AND DOCUMENTS

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

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

[3] ENS-OWPVR-CLC-24002, Mass Balance & Energy Balance Calculations for the Detailed Enginering Design of the Uranium Contaminated Waste Oil Plasma Gasification

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

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

[6] ENS-OWPVR-PID-24004, P&ID - Primary Solids Capturing System

NOTES

Note 1: The composition of the gas entering the liquid ring pump is (w/w) : 53.68% CO_2, 0,04% HCl, 0,01% HF, 22,82% H_2O, 14,83% O_2, and 8,63% N_2.

Note 2: The scubber solution composition will change over time due to the chemical reactions taking place in the scrubber. Scrubbing will commence with an aqueous 30% (w/w) KOH solution. At the end of phase 1, the composition (w/w) will be 67.22% water, 0.014% KCl, 0.004% KF, and 32.76% K_2CO_3. At the end of phase 2, the composition will be 60.22% water, 0.024% KCl, 0.007% KF, and 39.75% $KHCO_3$. At the end of the final phase, the composition will be 65.34% water, 0.061% KCl, 0.016% KF, and 34.58% $KHCO_3$.

Note 3: The composition of scrubber solution changes over time. For the purposes of calculating solution physical properties, the composition at the start of a scrubbing cycle will be used, i.e. aqueous 30% (w/w) KOH solution.

Note 4: The "Gas" is the gas coming from the Primary Solids Capturing System. The "Liquid" is the service liquid which the liquid ring pump draws from the scubber sump tank.

Note 5: Liquid ring vacuum pump to be equipped and driven by a VSD. The VSD must be supplied together with the pump and have the capability to communicate with the PLC.

Note 6: Liquid ring pump should be supplied with an automatic cavitation breaker.

Note 7: The pump should be supplied with a complete set of critical spares.

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