

**ENGINEERING SERVICES DEPARTMENT**



**PLATE HEAT EXCHANGER H1504 SPECIFICATION SHEET**

<b>Project</b>	NW PlasGas and WOPG	<b>Unit Tag Number</b>	H1504
<b>Datasheet Document No.</b>	ENS-NWPVR-SPE-24022	<b>Revision</b>	3
<b>Description</b>	KOH Heat Exchanger - removes heat generated due to chemical reaction in the scrubber S1501		
<b>Plant Location</b>	Merged NW PlasGas and WOPG Demonstration Facility <sup>Note 1</sup>		
<b>Equipment Location</b>	Recycle loop of the scrubber S1501 (inside Building V-H2, Laboratory 150)		
<b>Safety Classification</b>	SC-3(N) and SC-2(C)		
<b>Quality Classification</b>	QC-3(N) and QC-2(C)		
<b>Duty</b>	63,06 kW <sup>[1] Note 2</sup>		

**FLOW MEDIA**

	UNITS	HOT MEDIUM		COLD MEDIUM
		NW PlasGas	WOPG	
<b>Media</b>		Scrubbing solution (aqueous 30% (w/w) KOH) <sup>Note 3</sup>		Demineralised water
<b>Inlet temperature</b>	°C	56 <sup>[1]</sup>	49,53 <sup>[6]</sup>	30 <sup>[1]</sup>
<b>Outlet temperature</b>	°C	35 <sup>[1]</sup>	35 <sup>[6]</sup>	40 <sup>[1]</sup>
<b>Design Temperature</b>	°C	100	100	100
<b>Flow rate</b>	kg/s	1,11 <sup>[1]</sup>	1,23 <sup>[5]</sup>	1,51 <sup>[1]</sup>
<b>Maximum operating pressure</b>	kPa(g)	600		600
<b>Permissible pressure drop</b>	kPa	70		70
<b>Calculated pressure drop</b>	kPa	Supplier to advise		Supplier to advise
<b>Design pressure</b>	kPa	2000		2000

**FLUID PROPERTIES (at average temperature)**

<b>Density</b>	kg/m <sup>3</sup>	1288 - 1268 <sup>[2]</sup>	996 - 998 <sup>[3]</sup>
<b>Specific heat</b>	kJ/kg.K	2,7 <sup>[2]</sup>	4,18 <sup>[2]</sup>
<b>Thermal conductivity</b>	W/m.K	0,608	0,622 <sup>[3]</sup>
<b>Viscosity</b>	kg/m.s	1,4E-03 <sup>[4]</sup>	7,03E-04 <sup>[3]</sup>
<b>Corrosive</b>		Yes	No
<b>Erosive</b>		Yes	No
<b>Abrasive</b>		No	No
<b>Toxic</b>		Yes	No
<b>Presence of solids</b>		Possible undissolved UO <sub>3</sub> , KCl, KF and/or KOH	No
<b>Presence of uranic material</b>		Yes, small amounts of UO <sub>3</sub>	No

**DESIGN DATA**

<b>Plate heat exchanger type</b>		Supplier to advise	
<b>Design duty (calculated)</b>	kW	Supplier to advise	
<b>Frame type</b>		Supplier to advise	
<b>Frame size (height, width, thickness)</b>	mm	Supplier to advise	
<b>Number of plates</b>		Supplier to advise	
<b>Maximum number of plates allowed</b>		Supplier to advise	
<b>Total active heat transfer area</b>	m <sup>2</sup>	Supplier to advise	
<b>Nominal plate gap</b>	mm	Supplier to advise	
<b>Flow arrangement</b>		Supplier to advise	Supplier to advise
<b>Packed size</b>	mm	Supplier to advise	
<b>Mass of empty unit</b>	kg	Supplier to advise	
<b>Volume of fluid in exchanger</b>	m <sup>3</sup>	Supplier to advise	Supplier to advise

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**MECHANICAL PROPERTIES**

<b>Process connections</b>	<b>Pipe size</b>	25 NB, Sch. 40	<b>Pipe size</b>	25 NB, Sch.40
	<b>Type</b>	Raised Flanged (RF)	<b>Type</b>	Raised Flanged (RF)
	<b>Material</b>	304L Stainless Steel	<b>Material</b>	304L Stainless Steel
<b>Material of Construction</b>	<b>Casing</b>	Carbon Steel	<b>Plates</b>	304L Stainless Steel
<b>Surface Finish</b>	<b>Casing</b>	Supplier to advise	<b>Plates</b>	Supplier to advise
<b>Surface Protection</b>	<b>Casing</b>	Supplier to advise	<b>Plates</b>	Supplier to advise
<b>Corrosion Allowance</b>	<b>Casing</b>	0.00"	<b>Plates</b>	0.00"
<b>Pressure Rating</b>	<b>Casing</b>	150 lb	<b>Plates</b>	150 lb

**SITE CONDITIONS**

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

**REFERENCE DRAWINGS AND DOCUMENTS**

- [1] ENS-NWPVR-CLC-24012: Energy Balance Calculations for NW PlasGas Demonstration Facility
- [2] ENS-NWPVR-REP-24017: Energy Balance Report for NW PlasGas Demonstration Facility
- [3] www.engineeringtoolbox.com
- [4] ENS-NWPVR-CLC-24015: Scrubber Design for the Low-Level Waste Plasma Gasification (NW PlasGas) Demonstration System
- [5] ENS-OWPVR-CLC-24006: Scrubber Design for the Uranium Contaminated Waste Oil Plasma Gasification Project
- [6] ENS-OWPVR-CLC-24002: Mass & Energy Balance Calculations for the Basic Engineering Design of the Uranium Contaminated Waste Oil Plasma Gasification Project

**NOTES**

Note 1: The NW PlasGas and WOPG facilities will not be operated simultaneously. Therefore this heat exchanger will only be servicing one of the facilities at a time.

Note 2: The duty for the NW PlasGas facility is the enveloping duty. The duty for WOPG is lower (48,16 kW [6]).

Note 3: The sump tank of scrubber S1501 will be charged with a batch of aqueous 30% KOH solution at the start and this solution will then be recirculated through the heat exchanger H1504 during the scrubbing process. The scrubber solution composition will change over time due to the chemical reactions taking place in the scrubber. The scrubbing process is divided into three phases. The composition at the end of each phase for the facilities are given in the table below as weight percentages:

	NW PlasGas [4]				WOPG [5]			
	Start	End Phase 1	End Phase 2	End Phase 3	Start	End Phase 1	End Phase 2	End Phase 3
KOH	30%	0%	0%	0%	30%	0%	0%	0%
Water	70%	68,01%	59,63%	63,81%	70%	67,22%	60,22%	65,34%
KF	-	-	-	-	0%	0,004%	0,007%	0,016%
KCl	0%	1,05%	1,81%	4,35%	0%	0,014%	0,024%	0,061%
K <sub>2</sub> CO <sub>3</sub>	0%	30,93%	0%	0%	0%	32,76%	0%	0%
KHCO <sub>3</sub>	0%	0%	38,54%	31,84%	0%	0%	39,75%	34,58%

Note 4: The heat exchanger shall be fully drainable in situ, with the drainage mechanism normally closed.

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	<b>Name</b>	<b>Signature</b>	<b>Date</b>
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