

ENGINEERING SERVICES DEPARTMENT



SPECIFICATION SHEET FOR HOT WATER ELECTRICAL HEATER H1703

Project	Oil Waste PlasGas Demonstration Facility	Unit Tag No.	H1703
Datasheet Document No.	ENS-OWPVR-SPE-25037	Revision	3
Description	Electrical heater (H1703) for the Uranium Contaminated Waste Oil Plasma Gasification (CWOPG) Demonstration Facility is used to initially heat up demineralised water in the Hot Water Supply Tank T1702 from ambient temperature to 80 °C, and thereafter, to maintain the tank's contents at this temperature by heating up the hot demineralised water returning at 70 °C from the oil heater H1005 in the waste oil feed system ^[3] .		
Plant location	NECSA, Pelindaba, North-West Province.		
Equipment location	Oil Waste PlasGas Demonstration Facility - Process area inside Laboratory-150, Building V-H2.		
Safety Classification	Non-classified(N) and SC-3 (C) ^[a] .		
Quality Classification	Non-classified(N) and QC-3 (C) ^[b] .		
Process Fluid	Demineralised water		
Fluid state	Liquid		
Solid content	No		
Corrosive due to	N/A		

DESIGN CONDITIONS

	UNITS	Minimum	Normal	Maximum
Pressure	kPa (abs)		88	
Temperature	°C	25 ^[d]	70 ^[d]	80 ^[d]
Tank T1702 Volume	Litres		50	
Density	kg/m ³	971.799 ^[e]	977.771 ^[e]	997.045 ^[e]
Viscosity	Pa.s	3.46 x 10 ⁻⁴ ^[f]	3.92 x 10 ⁻⁴ ^[f]	7.64 x 10 ⁻⁴ ^[f]
Thermal conductivity	W/m.K	0.614 ^[g]	0.627 ^[g]	0.661 ^[g]
Specific heat capacity (Cp)	kJ/kg.K	4.051 ^[g]	4.180 ^[g]	4.188 ^[g]

ELECTRICAL INTERFACE

Heat load	kW	3 ^[h]	Volt	230
Frequency	Hz	50	Phase	Single
Materials of construction	Wetted	Supplier to Advise.		
	Non-wetted	Supplier to Advise.		

CONNECTION

Size	1½" female NPT threaded to match 1½" male NPT connection of element
Length of heating element	328 mm

MATERIAL OF CONSTRUCTION

Element sheath material	Nickle Plated or Supplier to Advise.
Tubesheet material	Not applicable.
Baffles/element supports	Not applicable.
Terminal box material	Supplier to Advise.
Tubesheet-to-vessel flange bolting material	Not applicable.
Tubesheet-to-vessel flange joint gasket	Not applicable.

GENERAL

Heater type	3000 Watt, 230 Volt Standard Hard Water Screwed-in Immersion Heating Element complete with gasket. (Dimensions: 328 x 30 x 50 mm.) (Similar to geyser type.)
General notes	Factory acceptance test not required.

REFERENCES

- [1] Perry, R. H., & Green, D. W. (1997). Perry's Chemical Engineers Handbook, 7th Edition, McGraw-Hill Company.
- [2] Sinnott, R. K. (2005). Coulson & Richardson's CHEMICAL ENGINEERING, Chemical Engineering Design, Volume 6, 4th Edition.
- [3] ENS-OWPVR-PID-24008 : Uranium Contaminated Waste Oil Plasma Gasification Demonstration Plant, Utilities System P&ID

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NOTES AND ABBREVIATIONS

- [a] SC - Safety Class
- [b] QC - Quality Class
- [c] Supplier to advise on special requirements for installation of the heater.
- [d] The electrical heater will be exposed to a minimum temperature of 25°C. This is the initial temperature of demineralised water sourced from the H-building supply during start up. It will also be exposed to 70°C during operation, due to water returning from the oil heater, and it will be required to increase this water temperature back to 80°C.
- [e] Density was obtained from page 2-92, table 2-28 in [1] at temperature 25 °C, 70 °C and 80 °C.
- [f] Viscosity was estimated from equations in page 1119 in [2] at temperatures 25 °C, 70 °C and 80 °C.
- [g] Thermal conductivities and specific heat capacities were obtained in Table 2-356 at 1 bar pressure and temperatures 25 °C, 70 °C and 80°C.
- [h] The heat duty required during start-up to heat up 50 L demineralised water at 25°C to 80°C.

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NED-SHEQ-TEM-11002 R1

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