PLANT ITEM MATERIAL SELECTION DATA SHEET

R10666998

ISSUED BY
RPP-WTP PDC

CNP-BRKPT-00002 (PTF)
Cs Eluate Breakpot

- Design Temperature (°F) (max/min): 372/40
- Design Pressure (psig) (internal/external): 15/FV
- Location: incell

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on attached Process Corrosion Data Sheet

Operating Modes Considered:

- The breakpot is normally empty and at ambient temperature.
- Operation at temperatures approaching the maximum design temperature is expected to be of short duration.

Materials Considered:

Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00	X	
316L (S31603)	1.18	X	
6% Mo (N08367/N08926)	7.64	X	
Alloy 22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1		X

Recommended Material: 304 (max 0.030% C; dual certified)

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

- Develop procedure to flush thoroughly with water after use with alkaline solution.

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EXPIRES: 12/07/07

This bound document contains a total of 6 sheets.

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Corrosion Considerations:

During the elution cycle the eluate comes from CXP-IXC-00001/2/3/4 to CNP-BRKPT-00002 and then to CNP-VSL-00001. The elution cycle is 15 hrs and is normally at an ambient temperature of 77 °F. The maximum operating temperature of 140 °F is attributed to circumstances where neutralized Cs concentrate (approx pH 14) could be transferred from CNP-VSL-00003 (the contingency vessel) to CNP-BRKPT-00002. However, this is not a likely route for transfer and for the purposes of this evaluation are considered infrequent. The breakpot could also see steam temperatures during transfer. These high-temperature conditions are assumed to be of short duration. This evaluation is based on a nominal operating temperature of 77 °F.

a General Corrosion
At the expected pH, little specific information was found for the general/uniform corrosion of stainless steels or other material in the given waste. Typically, the austenitic and higher alloy steels are expected to have corrosion rates of less than about 4 mpy in HNO_3 at the maximum temperature. This lack of data is not critical because the alloys needed for the system typically fail by pitting, crevice corrosion, or cracking.

Hamner (1981) lists the corrosion rate for both 304L and 316L as < 2 mpy at temperatures up to 150°F. Based on estimates from Cole (1974), corrosion rates for all of the concentrations <4 M and at temperatures to boiling are expected to be less than 1 mpy.

Conclusion:
Under the stated conditions, 304L is expected to be sufficiently resistant to the waste solution with a probable general corrosion rate of less than 1 mpy at up to 150°F.

b Pitting Corrosion
With the stated conditions, 304L will be adequate.

Conclusion:
The data from the flowsheets suggest there are insufficient halides to cause pitting in 304L.

c End Grain Corrosion
Not believed to be applicable to this system.

Conclusion:
Not applicable to this system.

d Stress Corrosion Cracking
The exact amount of chloride required to stress corrosion crack stainless steel is unknown. In part this is because the amount varies with temperature, metal sensitization, and the environment. But it is also unknown because chloride tends to concentrate under heat transfer conditions, by evaporation, and electrochemically during a corrosion process. Hence, even as little as a few ppm can lead to cracking under some conditions. Generally, as seen in Sedriks (1996) and Davis (1981), stress corrosion cracking does not usually occur below about 140°F. Further, the use of "L" grade stainless reduces the opportunity for cracking.

Conclusion:
The use of 304L is recommended.

e Crevice Corrosion
See Pitting.

Conclusion:
See Pitting.

f Corrosion at Welds
Corrosion at welds is not a problem in the proposed environment.

Conclusion:
Weld corrosion is not considered a problem.

g Microbiologically Induced Corrosion (MIC)
The proposed operating conditions are not suitable for MIC.

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Corrosion fatigue is not expected to be a concern.

Conclusions
Not believed to be a concern.

PLANT ITEM MATERIAL SELECTION DATA SHEET

i Vapor Phase Corrosion
Vapor phase corrosion is not expected to be a concern. Further, the presence of wash rings indicates deposits can be prevented.

Conclusion:
Not expected to be a concern.

j Erosion
Velocities within the vessel are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not expected to be a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
Not applicable.

m Galvanic Corrosion
No dissimilar metals are present.

Conclusion:
None anticipated.

n Cavitation
None expected.

Conclusion:
Not believed to be of concern.

o Creep
The temperatures are too low to be a concern.

Conclusion:
Not applicable.

p Inadvertent Nitric Acid Addition
Breakpot will see low pH conditions during normal operations.

Conclusion:
Not applicable.

PLANT ITEM MATERIAL SELECTION DATA SHEET

References:

1. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
2. 24590-WTP-RPT-PR-04-0001, Rev. B, *WTP Process Corrosion Data*
3. CCN 130176, Cole, HS, 1974, *Corrosion of Austenitic Stainless Steel Alloys Due to HNO_3 – HF Mixtures*, ICP-1036, Idaho Chemical Programs – Operations Office, Idaho Falls, ID
4. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
5. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX
6. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158

Bibliography:

1. CCN 130171, Ohl, PC to PG Johnson, Internal Memo, Westinghouse Hanford Co, *Technical Bases for Cl- and pH Limits for Liquid Waste Tank Cars*, MA: PCO:90/01, January 16, 1990.
2. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
3. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
4. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158
5. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084
6. Wilding, MW and BE Paige, 1976, *Survey on Corrosion of Metals and Alloys in Solutions Containing Nitric Acid*, ICP-1107, Idaho Chemical Programs, Idaho National Engineering Laboratory, Idaho Falls, ID

PLANT ITEM MATERIAL SELECTION DATA SHEET

24590-WTP-RPT-PR-04-0001, Rev. B
WTP Process Corrosion Data

PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) Cs concentrate breakpot (CNP-BRKPT-00002)
Cs evaporator eluate lute pot (CNP-VSL-00001

Facility PTF

In Black Cell? Yes

Chemicals	Unit[1]	Contract Max		Non-Routine [3]		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l	2.30E-01	2.31E-01			
Chloride	g/l	8.85E-02	1.06E-01			
Fluoride	g/l	1.05E-01	1.26E-01			
Iron	g/l	1.69E-02	1.89E-02			
Nitrate	g/l	1.54E+01	8.61E+00	4.46E-04	4.46E-04	
Nitrite	g/l	4.88E-01	5.83E-01			
Phosphate	g/l	3.53E-01	4.13E-01			
Sulfate	g/l	1.88E-01	2.24E-01			
Mercury	g/l	5.47E-04	1.42E-04			
Carbonate	g/l	6.59E-01	7.24E-01			
Undissolved solids	wt%					
Other (NaMnO4, Pb,...)	g/l					
Other	g/l					
pH	N/A					Assumption 1
Temperature	°F					Note 2

List of Organic Species:

References
System Description: 24590-PTF-3YD-CNP-00001, Rev 0
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: CXP11, CXP12, CNP02
Off Normal Input Stream # (e.g., overflow from other vessels): CNP01 acid charge
P&ID: N/A
PFD: 24590-PTF-M5-V17T-P0014, Rev 1
Technical Reports: N/A

Notes:
1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max.
2. Breakpot: Steam is used for transfer. The breakpot is normally empty and at ambient temperature most of the time.
Vessel: Tnormal operating range 77 °F (eluate) to 140 °F (24590-PTF-M5C-CNP-00001, Rev 0)
3. Nitric acid charge (CNP01)

Assumptions:
1. Stream CXP12 post elution rinse pH approx 0.5. CXP11 elution stream pH approx. 0.3 or more.

24590-WTP-RPT-PR-04-0001, Rev. B
WTP Process Corrosion Data

4.1.2 Cs Concentrate Breakpot (CNP-BRKPT-00002), Cs Evaporator Eluate Lute Pot (CNP-VSL-00001)

Routine Operations

Under normal operations, the eluant from the IX columns goes directly to the Cs concentrate breakpot, CNP-BRKPT-00002. Eluate is then gravity-fed through a lute pot, CNP-VSL-00001, into the separator vessel, CNP-EVAP-00001. CNP-BRKPT-00002 is vented to the vessel vent system and contains wash rings and purge air.

Non-Routine Operations that Could Affect Corrosion/Erosion

None identified.