PLANT ITEM MATERIAL SELECTION DATA SHEET

R10672005

ISSUED BY
RPP-WTP PDC

PWD-BRKPT-00015 & PWD-BRKPT-00016 (PTF)
Acidic/Alkaline Effluent Breakpots

- Design Temperature (°F)(max/min): 368/40
- 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

Options Considered:

- Breakpot will transfer acidic wash.
- Breakpot will transfer alkaline wash.

Materials Considered:

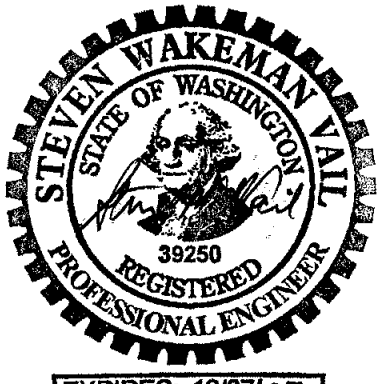
Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00	X	
316L (S31603)	1.18	X	
6% Mo (N08367/N08926)	7.64	X	
Alloy 22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1		X

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 rinsing/flushing procedure for acid or water.



4/18/06

EXPIRES: 12/07/07

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This bound document contains a total of 7 sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
1	4/18/06	Issued for Permitting Use			
0	2/17/04	Issued for Permitting Use	DLA	JRD	APR

PLANT ITEM MATERIAL SELECTION DATA SHEET

Corrosion Considerations:

PWD-BRKPT-00015 routinely receives alkaline cleaning effluent from UFP-VSL-00002A/B and non-routinely may receive acidic cleaning effluent from UFP-VSL-00002A/B. PWD-BRKPT-00016 routinely receives acidic cleaning effluent from UFP-VSL-00002A/B and non-routinely may receive alkaline cleaning effluent from UFP-VSL-00002A/B or plant wash from PWD-VSL-00044.

a General Corrosion
Hamner's data (1981), 304 (and 304L) lists a corrosion rate in NaOH of less than 20 mpy (500 μm/y) at 77°F and over 20 mpy at 122°F. He shows 316 (and 316L) has a rate of less than 2 mpy up to 122°F and 50% NaOH. Dillon (2000) and Sedriks (1996) both state that the 300 series are acceptable in up to 50% NaOH at temperatures up to about 122°F or slightly above. Divine's work (1986) with simulated-radwaste evaporators, six months at 140°F, showed 304L was slightly more resistant to corrosion (<0.2 mpy) than was 316L (<0.6 mpy). Zapp (1998) notes that the Savannah River evaporator vessels, operating at about 300°F, are made of 304L and have suffered no failures in about 30 years; 304L heat transfer surfaces have failed however after about 10 years.

Because the solution is expected to be ≤2M HNO_3, 304L stainless steel is an excellent choice for the material of construction. Corrosion rates of ≤1 mpy are expected.

Conclusion:
At the stated operating conditions, 304L is expected to be sufficiently resistant with a probable general corrosion rate of less than 1 mpy.

b Pitting Corrosion
The vessels are shown to have no chlorides or fluorides under normal operation. Under the stated no-halide conditions, 304L is expected to be satisfactory. It is assumed, however, that the fluids will not be stagnant nor will there be deposits.

Conclusion
At these temperatures and concentrations, pitting is not anticipated and 304L is acceptable.

c End Grain Corrosion
End grain corrosion only occurs in metal with exposed end grains and in highly oxidizing acid conditions.

Conclusion:
Not applicable to this system.

d Stress Corrosion Cracking
If the vessel is halide free, 304L will be satisfactory.

Conclusion:
The use of 304L is expected to be acceptable for chloride free conditions.

e Crevice Corrosion
See Pitting.

Conclusion:
See Pitting

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

Conclusion:
Weld corrosion is not considered a problem for this system.

g Microbiologically Induced Corrosion (MIC)
The proposed operating temperatures are generally acceptable for MIC but the location of the system in the process suggests little chance of the introduction of microbes.

Conclusion:
MIC is not expected to be a problem.

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

Conclusions
Not expected to be a concern.

i Vapor Phase Corrosion
Not considered to be a concern.

Conclusion:
Not a problem.

j Erosion
Velocities 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 considered 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:
Not applicable.

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
Higher chloride contents and higher temperatures usually require higher alloy materials. Nitrate ions inhibit the pitting and crevice corrosion of stainless alloys. Furthermore, nitric acid passivates these alloys; therefore, lower pH values brought about by increases in the nitric acid content of process fluid will not cause higher corrosion rates for these alloys. The upset condition that was most likely to occur is lowering of the pH of the vessel content by inadvertent addition of 0.5 M nitric acid. Lowering of pH may make a chloride-containing solution more likely to cause pitting of stainless alloys. Increasing the nitric acid content of the process fluid adds more of the pitting-inhibiting nitrate ion to the process fluid. In addition, adding the nitric acid solution to the stream will dilute the chloride content of the process fluid.

Conclusion:
The recommended materials will be able to withstand a plausible inadvertent addition of 0.5 M nitric acid for a limited period.

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 130172, Divine, JR, 1986, Letter to A.J. Diliberto, *Reports of Experimentation*, Battelle, Pacific Northwest Laboratories, Richland, WA 99352
4. CCN 130173, Dillon, CP (Nickel Development Institute), Personal Communication to J R Divine (ChemMet, Ltd., PC), 3 Feb 2000.
5. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX 77218
6. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158
7. Zapp, PE, 1998, *Preliminary Assessment of Evaporator Materials of Construction*, BNF—003-98-0029, Rev 0, Westinghouse Savannah River Co., Inc for BNFL Inc.

Bibliography:

1. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
2. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
3. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158

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 #) Acidic/Alkaline effluent breakpot (PWD-BRKPT-00015)

Facility PTF

In Black Cell? Yes

Chemicals	Unit[1]	Contract Maximum		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l					
Chloride	g/l					
Fluoride	g/l					
Iron	g/l					
Nitrate	g/l					
Nitrite	g/l					
Phosphate	g/l					
Sulfate	g/l					
Mercury	g/l					
Carbonate	g/l					
Undissolved solids	wt%					
Other (NaMnO4, Pb,...)	g/l					
Other	g/l					
pH	N/A					
Temperature	°F					Note 2

List of Organic Species:

References

System Description: 24590-PTF-3YD-PWD-00001, Rev 1
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: UFP27,28 cleaning effluents (see section 4.9.5, Routine)
Off Normal Input Stream # (e.g., overflow from other vessels): see section 4.9.5, Non-routine
P&ID: 24590-PTF-M6-PWD-P0003, Rev 0
PFD: 24590-PTF-M5-V17T-P0022001, Rev 0
Technical Reports:

Notes:

1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max.
2. Steam is used for transfer. The breakpot is normally empty and at ambient temperature most of the time.

Assumptions:

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 #) Acidic/alkaline effluent breakpot (PWD-BRKPT-00016)

Facility PTF

In Black Cell? Yes

Chemicals	Unit[1]	Contract Maximum		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l					
Chloride	g/l					
Fluoride	g/l					
Iron	g/l					
Nitrate	g/l					
Nitrite	g/l					
Phosphate	g/l					
Sulfate	g/l					
Mercury	g/l					
Carbonate	g/l					
Undissolved solids	wt%					
Other (NaMnO4, Pb,...)	g/l					
Other	g/l					
pH	N/A					
Temperature	°F					Note 2

List of Organic Species:

References

System Description: 24590-PTF-3YD-PWD-00001, Rev 1
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: See section 4.9.6
Off Normal Input Stream # (e.g., overflow from other vessels): PWD02, cleaning effluent (section 4.9.6)
P&ID: 24590-PTF-M6-PWD-P0003, Rev 0
PFD: 24590-PTF-M5-V17T-P0022001 Rev. 0
Technical Reports:

Notes:

1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max.
2. Steam is used for transfer. The breakpot is normally empty and at ambient temperature most of the time.

Assumptions:

4.9.5 Acidic/Alkaline Effluent Breakpot(PWD-BRKPT-00015)

Routine Operations

Receives alkaline cleaning effluent from UFP-VSL-00002A/B. This breakpot serves as a moisture separator for ejected plant wash from PT vessels. The breakpot does not accumulate any fluid.

Non-Routine Operations that Could Affect Corrosion/Erosion

Receives acidic cleaning effluent from UFP-VSL-00002A/B.

4.9.6 Acidic /Alkaline Effluent Breakpot (PWD-BRKPT-00016)

Routine Operations

Receives acidic cleaning effluent from UFP-VSL-00002A/B.
This breakpot serves as a moisture separator for ejected plant wash from PT vessels. The breakpot does not accumulate any fluid.

Non-Routine Operations that Could Affect Corrosion/Erosion

Receives alkaline cleaning effluent from UFP-VSL-00002A/B. Receives plant wash from PWD-VSL-00044.