

Interoffice Memorandum

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Subject: SALTSTONE FORMULATION GUIDANCE FOR SHIFT ENGINEERING SUPPORT

REFERENCES:

1. Staub, A. V., "Saltstone Formulation Guidance for Shift Engineering Support," SRR-WSE-2009-00115.
2. SRNL-L3100-2012-00089, Rev. 0, "Recommended Saltstone Formulation for Facility Restart after ELAWD Outage," June 2012.
3. SRNL-STI-2012-00286, Rev. 1, "Results for the First Quarter 2012 Tank 50 WAC Slurry Sample: Chemical and Radionuclide Contaminant Results", July 2012.
4. Isom, S. T., "Analysis of Saltstone Water-to-Premix Ratio During Pre-ELAWD Operation," X-CLC-Z-00050, Rev. 0, October 2012.
5. Dixon, D. B., "Saltstone Formulation Guidance for Shift Engineering Support," "SRR-WSE-2013-00043.
6. Staub, A. V., "Impact of Antifoam Usage During Post-ELAWD Saltstone Process Operation," "X-ESR-Z-00029, September 2013.

SUMMARY

The table below defines the approved ranges for Saltstone processing parameters from Tank 50:

Table 1. Saltstone processing parameters from Tank 50

	Range	Units
Dry Feed Rate	30-35	Tons/hr
W/P ratio	0.59	Unitless
Salt Solution Density	Nominally 1.2 (Use Value in most recent SRNL Quarterly Sample Results)	SpG
Total wt% Solids	Nominally 25 % (Use Value in most recent SRNL Quarterly Sample Report)	Wt%
Daratard 17 flowrate	none	gpm
Q2-3183A flowrate	none	gpm

BACKGROUND

Engineering memo SRR-WSE-2009-00115 (Ref. 1) was issued in 2009 to provide some background and direction for Saltstone shift technical engineers when giving grout recipe input information to Saltstone Operations prior to initiation of mixing and transfer system operation. Engineering memo SRR-WSE-2013-00043 was issued in May of 2013 to provide an update to the 2009 memo based on facility upgrades as part of the ELAWD outage (Ref. 5).

In August 2013, an engineering evaluation was done documenting the current demand and effectiveness of antifoam in the Saltstone process (Ref. 6). This evaluation recommended the elimination of antifoam addition until future grout formulation development or process monitoring indicates that it is required for reliable operation.

This memo provides the recommended processing parameters from processing salt solution from Tank 50 after the ELAWD outage, including the recommendation that the antifoam not be used for saltstone processing at this time.

INPUTS

There are five primary inputs provided from Engineering to Saltstone Operations prior to facility startup: dry feed throughput setpoint, w/p ratio, salt solution density, total wt% solids, and addition rate of admixtures. These inputs are considered separately below.

Dry Feed Rate

This parameter defines the overall throughput of the plant for a given process run. All other liquid flow setpoints are a ratio defined by the dry feed rate fed to the mixer. Since an acceptable grout can be produced at theoretically any given feed rate, this input is not a significant contributor to proper mix design and can be selected based on the health of the bulk material handling system. Generally this parameter is expected to be between **30-35 tons/hr**, but processing rates outside this range are tolerable as long as correct liquid flows are achieved.

W/P Ratio

SRNL has recommended a 0.59 w/p ratio based on lab testing (Ref. 2), but it is recognized that this is a nominal value and that some scale-up issues between the lab and the facility may exist which require adjustment of this parameter. Richer mixtures (w/p < 0.60) will tend to produce a more durable grout product, but processability may be more difficult. Lean mixtures (w/p > 0.60) will be more easily processed but may impact long-term grout properties that are important for waste disposal.

The ELAWD project provided additional hopper flush capabilities. An analysis of the initial post-ELAWD operational runs has been performed for comparison with processing performed before the modifications and is documented in Reference 4. This analysis did not identify a significant impact on

the ability of the mixing and transfer system from achieving the target recipe setpoint. However as this is a variable that may be altered based on the requirements of the process, changes to the flushing strategy are reviewed prior to implementation for impact and the performance of the flow control loops are considered when performing routine system health monitoring. If at any time facility performance indicates that target w/p ratio is not acceptable for processability, testing by SRNL may be performed.

The primary indicator that the w/p is too high would be a significant decrease in discharge pressure of the grout pump, decrease in density indication on DI1144, and potentially an increase in bleed water generation. It should be considered that several variables impact these parameters. For example, total system throughput will impact grout pump pressure as well as w/p ratio. Tank 50 chemistry changes can have a much greater impact on bleed water generation than a small increase in w/p ratio. Thus any changes must be evaluated as a system.

Salt Solution Density

The Salt Solution Density is based on the Tank 50 Salt Solution density shown in the latest SRNL Tank 50 quarterly sample results. Reference 3 is an example of such a report. An example of the Tank 50 density is given in Reference 3 Table 3-8. The value can be expected to be nominally 1.2.

It may be necessary to perform short process runs from the Salt Feed Tank when there is a blend of Tank 50 waste and flush water which lowers the SpG below these values. Shift engineers should specify the density indicated from the Salt Feed Tank (DI1053) for short process runs that do not involve the receipt of an interarea transfer from H Tank Farm.

Additionally, it should be noted that the indicated SFT density on DI1053 may be lower than the bulk density of Tank 50 prior to initiation of an interarea transfer from Tank 50. This is due to the bleed/flush water returns from the SDU's which have higher water content. Specifying the Tank 50 density will be slightly conservative on startup as it will calculate a higher flow setpoint than strictly required for the material in the SFT.

Total wt% Solids

The Total wt% Solids in Tank 50 is based on the Tank 50 Total Solids value in the latest SRNL Tank 50 quarterly sample results. An example of the Tank 50 Total Solids wt% is given in Reference 3 Table 3-8. The value can be expected to be nominally 25 wt%. In cases where processing runs are made using the Salt Feed Tank, the wt% solids will be calculated by Engineering.

Admixture Dosage

In August 2013, an engineering evaluation was issued showing that not using antifoam does not present a significant obstacle to Saltstone Operations (Ref. 6). This is due to the robust nature of the hopper design and composition of waste. Therefore, it is recommended that no antifoam addition be done at this time.

In April 2009, SRNL testing recommended removing the Daratard 17 from the flowsheet due to excessive gel times (Ref. 1). The Daratard 17 will not be used as part of Saltstone formulation per SRNL testing for Saltstone formulation after the ELAWD outage documented in SRNL-L3100-2012-00089 (Ref. 2).

CONCLUSION

A series of expected operating ranges has been provided for the parameters that are supplied by Engineering to define mix design prior to facility operation. These parameters are selected to ensure facility reliability, product performance, and minimize operational variability. If there is an indicated need to operate outside of these defined ranges, shift engineers should contact the facility engineering manager for approval prior to giving input to Operations. This memo will be revised as needed based on recipe changes identified by lab testing, Tank 50 composition changes, or facility operation.

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