WASHINGTON SAVANNAH RIVER COMPANY
INTEROFFICE MEMORANDUM

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FROM: R. H. Spires, 766-H

Management Summary of Enhanced Chemical Cleaning Conceptual Design

Summary:

The AREVA conceptual design for Enhanced Chemical Cleaning (ECC) was reviewed on September 24 and 25, 2008. The ECC system consists of 3 distinct process steps: dissolution, oxalic acid decomposition, and solid/liquid separation. Responsibilities for specific functions in each of these process steps are divided between WSRC and AREVA. The focus of this review was on the seven modules that make up the vendor conceptual design. The seven vendor supplied modules include the 1) de-ionizing water makeup module, 2) oxalic acid makeup module, 3) ECC process module, 4) ozone generation module, 5) evaporator module, 6) cooling water module, 7) ventilation module.

The design met the intent of the scope of work. The process chemistry is somewhat complex; however, several of the unit operations are well within the experience base of WSRC, including evaporation and oxalic acid (OA) makeup and dissolution. Control of the OA decomposition reaction chemistry is a fundamental skill set of AREVA. The handling of ozone will be a new activity for both companies and will require some extra attention. Other areas of concern identified in the design review include management of the flowrate through the ECC module, the size and weight of the evaporator, and identification of a path to handle the reject water from the water makeup module.

Several opportunities were also identified to streamline the design. Use of plant utilities including steam and cooling water could reduce the size of the modules. Washing the sludge to limit the Cs concentration and shielding requirements could reduce the weight issues with the evaporator. Rearranging the equipment could reduce the footprint, increase functionality and reduce transfer lengths.

Discussion:

The seven vendor supplied modules include the 1) de-ionizing water makeup module, 2) oxalic acid makeup module, 3) ECC process module, 4) ozone generation module, 5) evaporator module, 6) cooling water module, 7) ventilation module. The units are sized to process a 5000 gallon sludge heel within 6 months. The water makeup module and the oxalic acid makeup module are part of the dissolution process step. The ECC process module and the ozone generation module support the oxalic acid decomposition step. Both of these modules contain 2 process lines each capable of processing 2500 gallons of dissolved waste per day. The evaporator module accomplishes the solid/liquid separation. The evaporator module also consists of 2 units each capable of processing 2500 gallons per day. The cooling water module and ventilation modules support all three of these process steps. Each one of these process steps are run in batch mode and are somewhat independent of one another.

Waste is dissolved with 1 wt% oxalic acid and transferred in 2500 gallon batches to the oxalic acid decomposition step (Figure 1). Ozone and UV are used to oxidize the oxalic acid. As the oxalic acid is decomposed, a dilute slurry is formed. This dilute slurry is re-circulated in the decomposition loop until the oxalic acid concentration falls below 100 ppm. When the oxalic acid concentration is low enough, the decomposition loop is stopped and the dilute slurry is fed to the evaporator. Solids in the slurry are concentrated in the evaporator and transferred to a type III waste tank. The overheads are collected to make up the next batch of oxalic acid. This process is repeated until the tank sludge heel has been removed.

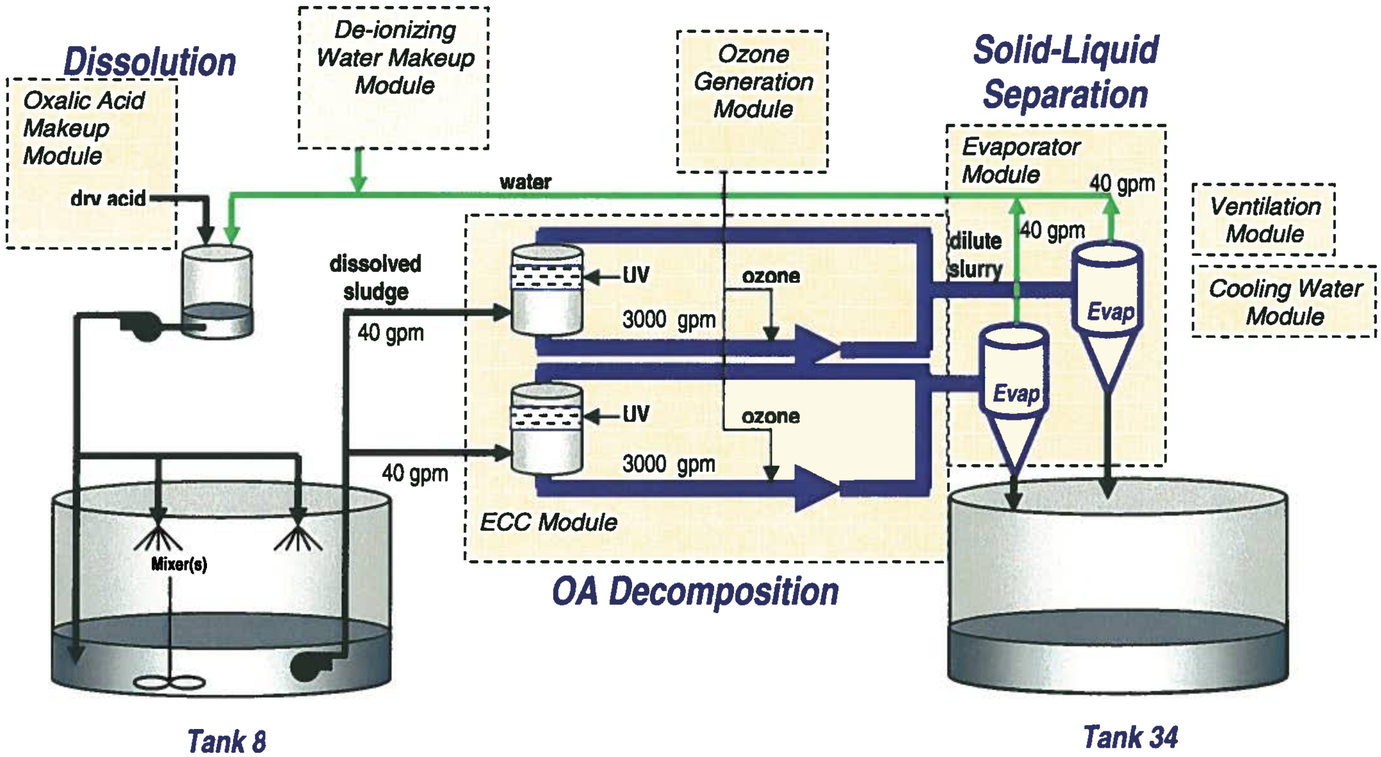

Figure 1. ECC Process Diagram

Although the review is still in progress, several concerns and opportunities were identified. A proposed resolution to each is discussed below:

<u>Concerns</u>

- *Managing the high flowrate through the ECC module.*
  Simulant testing is planned to incorporate the hazardous components of the sludge. This testing will include OA decomposition and evaporation. Identification of an appropriate scaled flow rate to be tested will be incorporated into the test planning.

- *Managing the size and weight of the evaporator.*
  Some of the size and weight concerns are impacts from shielding requirements. The inputs to the shielding calculations will be reviewed. The project currently carries an action to make sure that the tank heel sludge is washed to limit the Cs concentration. The flowsheet will be reviewed to look for opportunities to reduce the size of the unit operations. The desired result is to gravity feed the evaporator concentrate into the type III tank.

- *Identifying the path for reject water from the water makeup system.*
  Well water from SRS is processed through a de-ionizing water system to improve the purity. The reject stream must be incorporated into another water stream at SRS.

- *Managing the ozone*
  While managing ozone is a new activity in LWO, ozone/UV systems exist in industry to purify wastewater. Lessons learned from industry visits and studies will be incorporated into the project.

<u>Opportunities</u>

- *Use plant steam instead of a package boiler and use plant cooling water instead of using project installed cooling systems.*
  These opportunities will be investigated between conceptual and detailed design.

- *Wash the sludge to limit the Cs concentration and shielding requirements.*
  The project currently has an open action item to coordinate the washing of tank sludge heels to reduce the Cs concentration.

- *Rearrange the equipment to locate evaporator overheads equipment by the evaporator.*
  A change to the equipment arrangement is already in progress. The team is confident that additional optimization is possible and these possibilities will be investigated between conceptual and detailed design. The team will be investigating the potential to reduce the footprint by consolidating equipment on a single module.

These tasks will be added to the project action database or schedule for closure.

Conclusion:

The design met the intent of the scope of work and the process will accomplish the goal of removing the tank sludge heel within 6 months. Opportunities to streamline and simplify the system will be worked within the project schedule. The project team intends to use expert resources and testing in the areas where experience is limited.

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