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Application of FLOW© to the Transportable Vitrification System (TVS) Demonstration Program at the Oak Ridge Reservation (ORR)

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This paper describes transportable vitrification being demonstrated in Oak Ridge and the engineering assessment tools used to evaluate it.

Abstract:
This paper describes the Transportable Vitrification System (TVS), currently being demonstrated at the Oak Ridge Reservation (ORR) with low level radioactive waste and describes the engineering assessment tools used to evaluate it. The U.S. Department of Energy (DOE EM-30/50) needs to develop and test alternative thermal treatment technologies. In this case, the TVS was developed to treat predominantly inorganic mixed low-level waste streams (MLLW) from DOE's many wastewater treatment facilities. To meet this need, the TVS demonstration is to establish rigorous performance, costs, and risks benchmarks for this emerging thermal treatment technology. This requires a thorough engineering assessment because these results will establish the efficacy of such vitrification technologies and establish the bases for their future design modifications to the current TVS configuration. For the required process scale, the TVS was too large to be transported in one self-contained, "over-the-road" unit. Therefore, a modular approach was adopted. Where feasible, entire subsystems are contained in single-sealed units. However, the sealed melter module can be broken down into several sections that are bolted together on the demonstration site to form a single unit. Also, the off-gas emissions control train is assembled from three skids. Altogether, it takes 11 low-boy trailers to move the TVS from site-to-site. The principal TVS modules are the (1) emission control module, (2) joule-heated melter module, (3) waste and additive material processing module, and (4) control and services module. FLOW©, a proprietary process simulation system developed at the Oak Ridge National Laboratory (ORNL), was applied to develop a simulation of the TVS. This TVS model was used in developing the test and sampling plans for this demonstration project to ensure a comprehensive and accurate evaluation of this emerging thermal waste treatment process. Therefore, this engineering assessment of the TVS will one of the first and most thorough benchmarks for such a non-combustion thermal treatment technologies.

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