

SAFETY EVALUATION REPORT

Report Number: ATC-8019-P
Report Title: ATCOR AVRS-80 Volume Reduction Process System
Originating Organization: ATCOR Engineering Systems Inc, Avon, CN
Reviewed by: EG&G Idaho, Inc., Idaho Falls, ID; and
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NRR

1.0 INTRODUCTION

In October 1981, the U.S. Nuclear Regulatory Commission (NRC) established a policy regarding the volume reduction of low-level radioactive waste. The policy statement addressed the need for volume reduction policy and the need for waste generators to minimize the quantity of waste produced. The ATCOR Volume Reduction Process System (ATCOR System) is one of a number of means available in the nuclear industry by which licensees can achieve volume reduction of radioactive waste.

The ATCOR System employs an intensive dryer/mixer to reduce radioactive waste volume and a solidification system to solidify dehydrated radioactive waste. The system is designed to process evaporator concentrates, spent bead and powdered ion exchange resins, filter sludges, chemical and floor drain wastes, laundry waste, and decontamination solution to form a homogenous solid matrix

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(absent of free water) for offsite shipment to a licensed burial facility. During operation of the system, "wet" solid wastes are evaporated and dehydrated in a twin screw intensive dryer/mixer under a slight negative pressure. The dried waste mixture produced in the mixer is discharged with a solidification agent into a shipping liner where it solidifies.

The review of the ATCOR System, which was conducted in accordance with Section 11.4 of the Standard Review Plan (SRP), included piping and instrumentation diagram, descriptive information on the system operation, equipment description, process control program, quality assurance program, typical layout arrangement, and radiological consequences of postulated accident. The capabilities of the ATCOR System to process the types and volumes of wastes expected during normal operation and anticipated operational occurrences in accordance with General Design Criteria 60 of Appendix A to 10 CFR Part 50 were also reviewed.

The ATCOR has not provided in the topical report the compliance program to demonstrate that the ATCOR solidified products meet the criteria set forth in Section 61.56 of 10 CFR Part 61 and the NRC Branch Technical Position on Waste Form. The users will be required to demonstrate that the users' solidified products meet these criteria and the staff will evaluate it for each individual.

2.0 EVALUATION

The design and operation of the ATCOR System are described in detail in the ATCOR Topical Report, ATC-8019-P and in the ATCOR responses dated April 24,

1984 to the NRC licensing review question. In the staff's evaluation of the ATCOR System, the staff considered:

- (1) The system design criteria and design bases.
- (2) The process capacity in comparison with design basis for volumes expected during normal plant operation including anticipated operation occurrences.
- (3) The quality group classification and quality assurance program for the design, fabrication and testing of the system.
- (4) Design provisions incorporated in the equipment and system design to reduce leakage from the ATCOR System, and to control and monitor releases of radioactive effluents to the environment.
- (5) Process control program to assure complete solidification of "wet" solid radwaste.
- (6) Typical interfaces with the plant.
- (7) Radiation Protection design features to reduce the operator radiation exposure as low as is reasonably achievable.

The ATCOR System is designed to be permanently installed at a nuclear power plant. The system consists of all the equipment needed to store and transfer cement and various chemical additives, to process "wet" solid radwastes, and to solidify the dehydrated product in suitable containers. The processing system is fully instrumented and is monitored and controlled from a central control panel.

The "wet" radwaste from the plant is charged into the waste conditioning tank where it is isolated, thoroughly mixed, sampled, and chemically pretreated based on the sample analysis in accordance with the ATCOR process control

program. The conditioned waste is then fed into either an evaporator (optional) and/or intensive dryer/mixer depending upon solid contents in the "wet" waste streams.

The evaporator removes excess water from the waste stream and the dryer/mixer dehydrates "wet" slurry waste. Dehydrated residue moves directly from the drying section of the dryer/mixer to the water cooled mixing section into which the cement or other solidifying agents are added to achieve complete mixing and solidification in the waste container. The waste containers are capped, checked for radioactive contamination and placed in temporary storage. Water vapor from the evaporator is condensed, collected, filtered and returned to the plant's liquid radwaste system.

The system is capable of solidifying spent bead resins, filter sludges, spent powdered resin, laundry waste, decontamination solution, and evaporator concentrates. The report establishes the various processing steps, controls, and process parameters with boundary conditions within which the ATCOR System should be operated to reasonably assure complete solidification of process radwastes.

The system design also provides appropriate instrumentation and wet waste sampling capability necessary for users to successfully develop and implement a plant specific process control program. Operating nuclear power stations utilizing the ATCOR cement solidification system have successfully developed and implemented their process control program with process information provided by ATCOR and they have demonstrated reasonable assurance that they have achieved complete solidification of wet radwastes.

The staff considers, therefore, that ATCOR has provided in the topical report, adequate information and system design features for users to develop and implement a process control program to reasonably assure complete solidification of the variety of constituents expected to be present in the process wastes and the absence of free water in the solidified products.

The report defines (1) the equipment normally furnished by ATCOR as well as optional equipment available, (2) the systems that will interface with the ATCOR System, and (3) the equipment features (interlocks, alarms, monitors, controls, etc.) which are required to be functional before processing of wet radwaste can commence. The ATCOR scope of supply includes the following major components:

- (1) Dryer/mixer complete with vapor condenser, condensate tank, fill pipe, and splatter shield assembly,
- (2) Evaporator (optional),
- (3) HEPA filters (optional),
- (4) Waste conditioning tank complete with dewatering pump and sampling system,
- (5) Chemical addition system,
- (6) Main control panel,
- (7) Waste container handling system,
- (8) Waste container capping device,
- (9) TV camera and radiation monitoring system,
- (10) Solidifying agent handling equipment.

The staff finds the design construction, quality group classification, and quality assurance provisions for the ATCOR System are in accordance with Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Rev. 1, October 1979, and therefore, the staff finds them to be acceptable. The conformance of the seismic design criteria for the building that will house the ATCOR System will be reviewed for each individual application.

The ATCOR System will interface with 1) the plant service water system, 2) plant service air system, 3) plant ventilation system, 4) waste tank overflow connection, 5) dewatering outlet, 6) the liquid radwaste system, and 7) chemical addition lines to the waste tank. The staff finds that ATCOR has provided adequate interface information and requirements in the topical report for users.

The staff estimates the quantities of "wet" solid waste generated from a standard 3400 MWt LWR to be approximately 20,000 cubic feet per year for a BWR with a deep bed condensate polishing system and 10,000 cubic feet per year for a PWR with a precoat condensate polishing system based on our cumulative review of the licensee's semi-annual effluent release reports. The staff estimates that the ATCOR System has process capacity ranging from approximately 10,000 cubic feet per year to 35,000 cubic feet per year based on 8 hours per day and 300 days per year operation. The staff finds the ATCOR System process capacity meets the demands of a standard 3400 MWt LWR.

ATCOR has established a Quality Assurance Program for radioactive waste management system and submitted to NRC for review with ATCOR Topical Report ATC-132A, "ATCOR Radioactive Waste Solidification System." The staff approved the topical report ATC-132A along with its ATCOR Quality Assurance Program Manual on September 4, 1981. This manual serves as the documentation of a Quality Assurance Program for the ATCOR System. The program has been established to conform with Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants" and the applicable portions of Appendix B to 10 CFR 50.

Layout diagrams for a typical ATCOR System installation show an isolated and shielded location for the system control panel. Design and arrangement of the ATCOR System components are based on maintaining the operator radiation exposure as low as is reasonably achievable. The topical report provides a list of specific design and operating features which were incorporated to minimize personnel radiation exposure. All active components are located so they can be easily accessed for maintenance. All tanks, pumps, valves and piping can be flushed prior to inspection and maintenance.

3.0 CONCLUSION

Based on the foregoing evaluation, the staff finds the ATCOR Topical Report, AVRS-80 to be acceptable. The bases for our acceptance is our conclusion that the ATCOR System is designed and can be operated in accordance with current guidance of applicable regulatory guides, standard review plans, branch technical positions, and Federal regulations.

The capability of the plant radioactive waste treatment systems to meet the requirements of Appendix I to 10 CFR Part 50 with to the ATCOR System operation is site dependent and will be evaluated for individual license applications. In addition, the packaging and shipping of all processed wastes including waste classification in accordance with the applicable requirements of 20 CFR Parts 61 and 71, and 49 CFR Parts 170-178, will be determined for individual license applications. The consequences of a liquid radwaste tank, evaporator, and/or mixer/dryer failure releasing radioactive materials to a potable water supply is also site dependent and will be evaluated for individual license applications.

The staff concludes that the ATCOR Topical Report is acceptable for reference in future license applications for light water reactors. Any application incorporating this report by reference should include the following information:

- (1) Any exceptions or deviations from the ATCOR Topical Report Revision 1, dated May, 1983.
- (2) Solidification agents to be used.
- (3) Waste form compliance programs to demonstrate that the solidified products meets the NRC Branch Technical Position, on Waste Form and are in accordance with Section 61.56 of 10 CFR Part 61.
- (4) Waste classification program to demonstrate that the solid waste product is classified in accordance with 10 CFR 61, Section 61.55 and NRC Branch Technical Position on Waste Classification.
- (5) Description of the solid waste product container to be used for ultimate disposal of the ATCOR System solidified product.
- (6) Interfaces between the plant and the ATCOR System.

- (7) Location and arrangement drawings of the ATCOR System in the plant.
- (8) The capability of the plant radioactive waste treatment system to meet the requirements of Appendix I to 10 CFR Part 30 with the ATCOR System in operation.