

SOLID RADIOACTIVE WASTE PROCESSING SYSTEM FOR LIGHT WATER COOLED REACTOR PLANTS AN UPDATE ON ANS-55.1

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ABSTRACT

The 1979 version of the Standard was redrafted to reflect improvements in technology and design practices experienced over the last decade. The redrafted Standard has completed initial NUPSCO review and the Standard Rewrite Committee is incorporating NUPSCO comments for submittal to the American Nuclear Society for final approval. If accepted as final the Standard will be issued in 1991.

The Standard establishes minimum requirements and provides recommendations and guidelines for the design, construction and performance with due consideration for operation of solid radioactive waste processing systems for commercial nuclear power reactors. Design requirements and recommendations as well as quality requirements are presented. Various process steps and alternate methods of handling and disposing of solid radioactive waste are discussed along with input quantities, sizing, capacity, arrangements, and redundancy of the system. Instrumentation and control requirements are also provided, as well as operating guidance, to assure that the performance, safety, and operational objectives of this Standard are met.

SIGNIFICANT CHANGES

This standard is being updated to reflect changes in design practices as well as increasing emphasis on ALARA and economics. Additionally, the redraft addresses regulatory changes that have occurred the past 10 years.

General terms have been added to the Glossary Section including: ALARA, hazardous waste, high integrity container, mixed waste, Process Control Program, radioactive waste, stability, and treatment.

The Standard objectives have been modified to include provisions for sufficient on-site radioactive storage in order to address NRC guidelines established in NUREG 0800.

In the System Requirements section, Fig. 1, the process flow diagram was updated to remove urea formaldehyde as a usable solidification media, and to add incineration and shredding as two possible treatment options for the volume reduction of dry active wastes. Additionally, this section now clarifies the processing, packaging and disposal requirements to limit free liquid content of the packaged radioactive waste.

In the Equipment Requirements and Recommendations section, a requirement was added for level alarms to prevent the introduction of tank contents into ventilation systems. Several suggestions were added for mixing slurries in tanks to ensure proper processing and to mitigate against extra maintenance. A requirement was added concerning the care needed in the design of resin tank discharge piping to ensure that resins can readily flow from the tank to transfer pump suction.

Regarding valves and piping, detailed guidance is provided for the maintenance of valves and connections based

on operational plant experience. Teflon was deleted as a suggestion for valve packing. A sub-section was added concerning instrument connections. Guidance was added for instrument connections, flushing, heat tracing and oil filled sensing systems.

Waste Extruder Evaporators System requirements were modified to provide more detailed guidance for an asphalt/waste extruder-evaporator system. Gaseous waste treatment was added to require the capability to remove particulates and iodines prior to release to building and ventilation exhaust systems. A suggestion for routing distillate to a holdup tank for sampling prior to return to the liquid radwaste system was also added.

A storage requirement was added to the Solidification Agent and Handling System sub-section. It is suggested, based on the NUREG-800 NRC Standard Review Plan, July 1981, that a 30 day minimum storage capacity be provided for the solidification agent, to permit continuing operations. To prevent localized solidification of asphalt solidification agents, steam heat tracing is suggested.

The Mixing/Packaging sub-section was changed to the Processing/packaging sub-section, and a requirement was added that when filling a container with waste, void spaces should be minimized within the container.

A dewatering sub-section was added to emphasize and provide guidance for dewatering systems which are in widespread use today as a volume reduction method. Also fire protection requirements were added to the processing/packaging sub-section due to potential fire hazard if combustible solidification agents are used.

An adjustment was made to require remote handling and monitoring of highly radioactive packaged waste, such

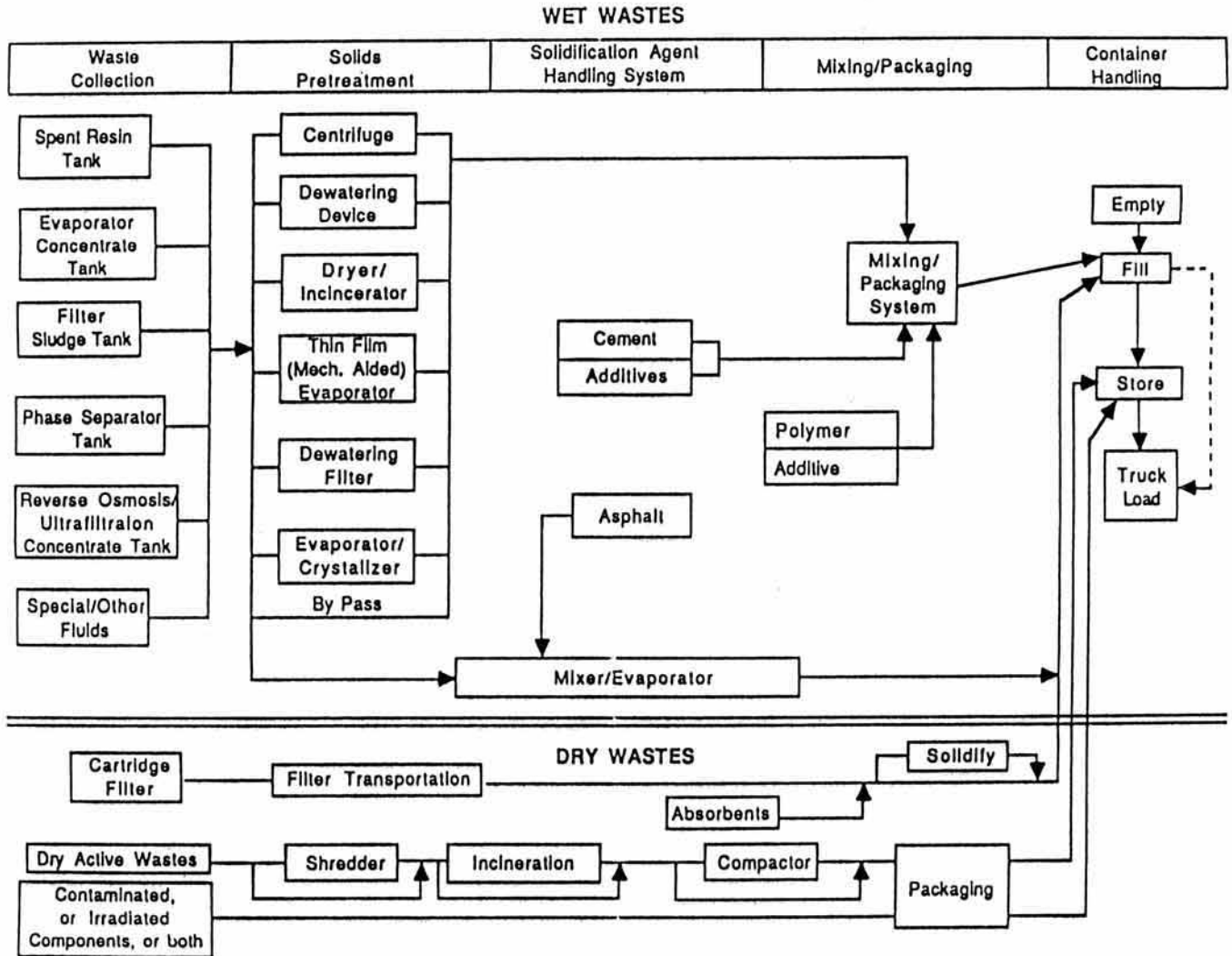


Fig. 1. ANS 55.1 Draft Rev. 3.

as dewatered resins. Remote handling and monitoring is not required for low-level radioactive waste.

The Cartridge Filter Disposal requirements were expanded to discuss filter removal, remote handling, in-plant transfer, and filter dewatering.

For the Dry Solid Waste Compaction section, a compactor radiation monitoring design sub-section was added to require that, in the area of the compactor operation, area and airborne radiation monitors will be included in the design.

High integrity container (HIC) requirements were added to reflect the extensive use of HIC's in the industry.

For the Instrument and Control section, a sub-section was added to suggest, where applicable, that programmable logic controllers (PLC's) be considered for radioactive waste processing systems. There has been increasing use of PLC's in the industry due to operational efficiency considerations.

In the Pipe Runs sub-section of the Physical Arrangement section, a suggestion was added to review the floor and equipment drain circuits to determine if the solidification agent can be processed in the plants radwaste system. If the agent is not compatible with the system, then separate collection and disposal methods should be considered.

For the Insulation and Shielding Removal sub-section, a requirement was added that insulation shall be of non-asbestos containing materials.

The Access sub-section for arrangement for maintenance suggests that components requiring routine maintenance be accessible without the use of temporary scaffolding.

A 30 day storage capacity requirement was also added to the System Capability and Redundancy requirements. The System Inputs discussion was incorporated into the System Capacity Design Basis sub-section.

For the Operation and Maintenance section, the term PCP (Process Control Program) is included. This helps ensure that operation and maintenance of the solid radio-

active waste processing system is properly performed to assure a consistent waste form. A paragraph is also added to state that unexpected chemical reactions can result if the waste is not processed within the bound of the PCP.

Regarding System Output Quality, detailed guidance is added for the processing and packaging of radioactive waste in order to meet current shipping and disposal requirements.

A quality control sub-section is added to suggest that adequate quality control checks and hold points independent from the system operator, be performed.

The Pre-Operational Testing sub-section of the System Construction and Testing section was modified to require that the pre-operational test demonstrate the processing of radioactive waste is in accordance with the Process Control Program.

The ventilation system test requirement was updated to reflect current volume reduction technologies and practices.

For information purposes only, several appendices have been expanded or added. The information relates to state compacts, testing for free liquids, mixed waste, new technology and product quality control.

SUMMARY

Solid radioactive waste system design requirements have been updated in this redraft to reflect current day practices in the area of solid radwaste handling, processing, storage, and transportation. The resulting changes also reflect the economic importance of minimizing increased solid radioactive waste generation and usage of volume reduction techniques in operational nuclear power plants. Disposal of radioactive waste continues to be an area of strong public concern, resulting in increased, regulatory and public focus. Thus, several new sections discussing topics such as quality control, mixed waste, process control programs, and high integrity containers were added to the Standard.