

## Presentation 11 – Session 4

# Synroc Waste Treatment Facility for fission-based Molybdenum-99 production

**D.J. Gregg, R.L. Holmes and G Triani**  
ANSTO Synroc Technologies Program,

**Presented by Daniel Gregg**

### Biography

Dan Gregg is a Nuclear Wasteforms Scientist who joined ANSTO in 2010 and has been Manager of the Wasteform Engineering Section of ANSTO Synroc since 2015. His focus is on wasteform design, fabrication, characterisation, and performance assessment, for challenging nuclear wastes. Major projects include developing solutions for molybdenum-99 production wastes and long lived actinide containing wastes, such as impure plutonium residues. Dan is responsible for the delivery of the engineered wasteform that will be produced by the Synroc Waste Treatment Facility and he and his Wasteform Engineering Team support ANSTO Synroc Engineers through the process technology maturation from conceptual wasteform design through to implementation at the waste treatment facility.



### Abstract

ANSTO is currently building a Synroc Waste Treatment facility, a first of a kind plant for the treatment of intermediate-level liquid waste derived from molybdenum-99 production. This industrial scale facility shall deploy ANSTO's Synroc technologies; a wasteform tailored for immobilizing fission products and an automated process designed for remote operation that will include waste and additive mixing, powder production, canister filling and sealing, and hot isostatic pressing (HIP). The HIP represents the last processing step to consolidate the wasteform into a final durable solid compact with the required performance characteristics.

Molybdenum-99 production at ANSTO results in three predominant waste streams, one of which is a highly caustic intermediate-level liquid waste solution of fission products and is the target waste for the Synroc facility. The engineered wastefrom for this caustic waste stream was designed with the key requirements of high waste loading and high aqueous durability whilst incorporating sufficient chemical flexibility to manage the specified variations in the waste chemistry. The tailored wastefrom has the required performance properties suitable for final disposal in a geological repository and achieves substantial waste volume reductions compared to a cementation option.

The technology maturation plan for delivering the Synroc Waste Treatment Facility for the production of the tailored wastefrom is aimed at identifying project and technical risks and mitigating these risks through specific work packages. As part of this strategy, a highly automated inactive engineering demonstrator has been constructed by ANSTO Synroc engineers. The role of this facility is to mitigate a number of the technology risks associated with a first of a kind project by addressing process integration, process operation, process recovery, maintenance, and operator training. Further, the plant is being used to develop the quality assurance framework to ensure that the waste package produced meets the waste acceptance criteria for final disposition.

This presentation shall discuss the wastefrom design for the wastes produced from molybdenum-99 production. It will also outline the various stages of development in realising the final plant design as well as timelines to progress through cold- and hot-commissioning. Once realized, the facility will represent a significant step change in the treatment of intermediate-level waste from molybdenum-99 nuclear medicine production and a major advance in the development pathway for ANSTO's Synroc Technologies.