

ADVANCED REMEDIATION TECHNOLOGIES PROJECT: Fluidized Bed Steam Reforming of Hanford Waste

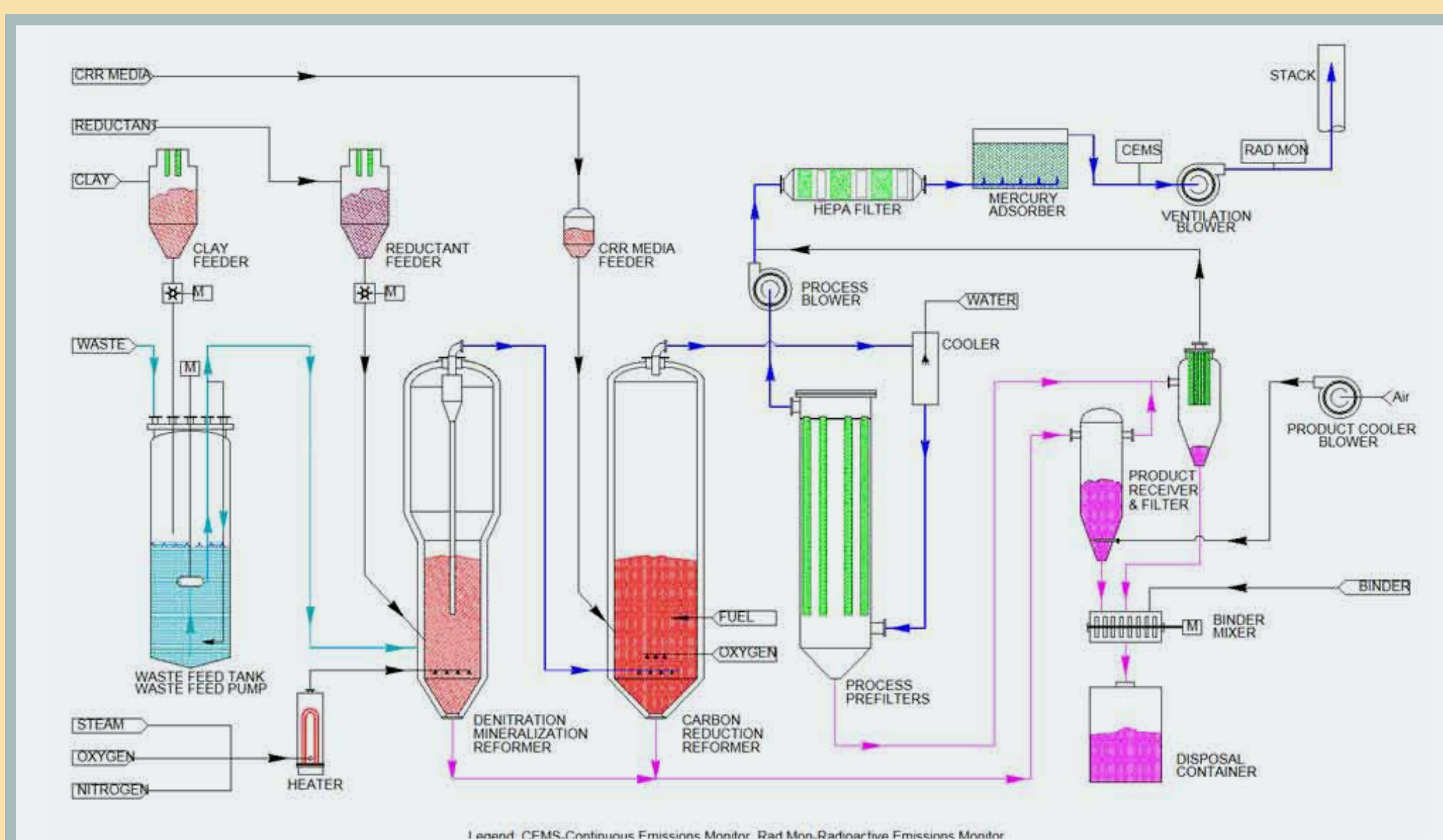
HANFORD CHALLENGES

In 1996, DOE-ORP initiated a project to design, build, and commission the Hanford Tank Waste Treatment and Immobilization Plant (WTP) to treat 53 million gallons of waste, constituting 190 million curies of radiation in 177 tanks. The WTP will separate the tank waste into a small volume, high-level waste (HLW) fraction and a large-volume, low-activity waste (LAW) fraction. In the overall site waste balance, challenges remain:

- LAW waste, to be disposed of on site, contains listed and characteristic hazardous waste constituents.
- Hanford wastes are corrosive with high pH and contain arsenic, barium, cadmium, cesium, iodine, lead, mercury, selenium, silver, and technetium as well as organic constituents.
- State and federal regulations preclude the waste from land disposal without treatment.
- Recycle waste (liquid waste from WTP's vitrification operations) include concentrations of Cl, F, Tc, SO₄ making processing and disposal problematic.

TARGETED APPLICATIONS

- LAW Stream at the Hanford Site.
- LAW Recycle streams from WTP melters.



THOR® Process Hanford Tank Waste Flowsheet

PROJECT PHASES

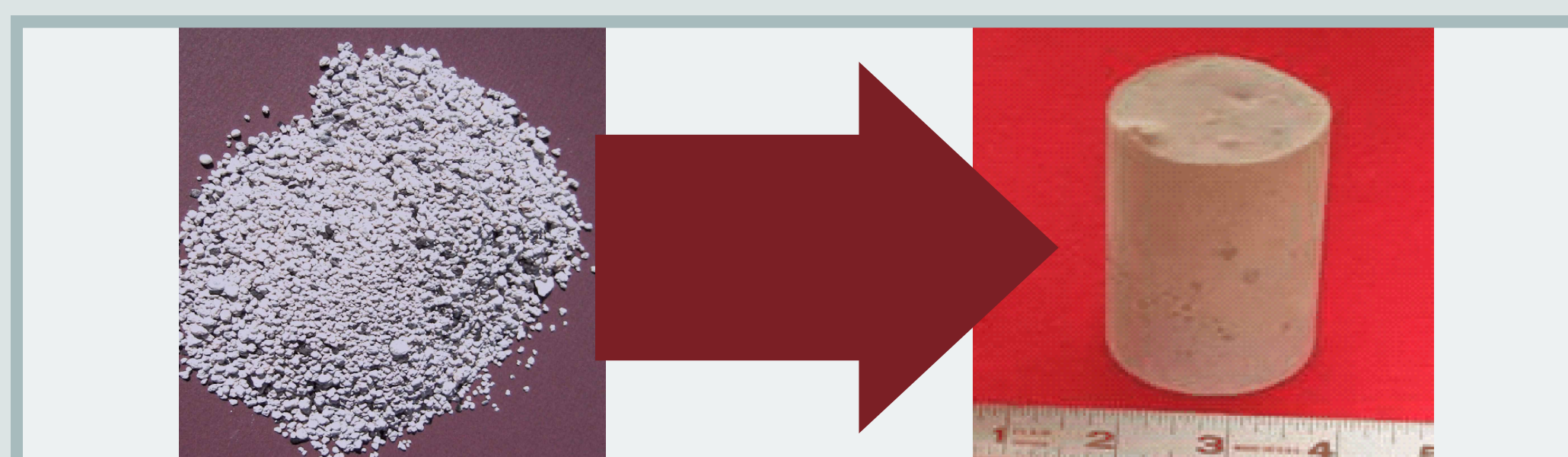
- Engineering Scale Technology Demonstration (ESTD) using LAW and LAW recycle waste simulant at Hazen Research in Golden, CO.
- Radioactive Bench Scale Reformer (BSR) Test using simulated LAW or LAW recycle waste at Savannah River National Laboratory (SRNL).

Hazen Facility ESTD Equipment



OVERALL SCOPE

- Conduct parametric scoping tests to identify optimum process conditions and simulant to clay ratios.
- Conduct an extended production run of simulated LAW and LAW recycle to demonstrate long term system operability and generate product for monolith testing.
- Produce waste product monoliths using various binders and waste loadings, and select best performers.
- Demonstrate capability to process simulated radioactive LAW and LAW recycle into a final monolithic waste product.



LAW Mineral Product Converted to a Ceramic Monolith

PROJECT PROGRESS TO DATE

- Demonstrated long-term steady-state pilot plant operation of the integrated fluidized bed steam reforming process with LAW and LAWR simulants.
- Confirmed with ESTD results that the final process off-gas complies with applicable environmental regulations in pilot plant operations.
- Confirmed that DMR process chemistry and product quality are consistent with that observed during previous mineralizing pilot plant and ESTD operations.

CURRENT PROJECT WORK IN PROGRESS



Characterization and durability testing of LAW and LAWR monolith product



Bench Scale Reformer (BSR) at SRNL is being used to demonstrate on a laboratory scale the processing of a radioactive simulated LAW or LAW Recycle