



Idaho Cleanup Project Calcine Disposition Project Treatment Technologies

Joel Case

Assistant Manager
INTEC Programs

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EM *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

Idaho Cleanup Project

Calcine Disposition Project Update

- Idaho Settlement Agreement: “...calcine ready for disposal outside the State of Idaho by target date of 12/31/2035”
- Site Treatment Plan Milestones
- Record of Decision in 2012 identified Hot Isostatic Pressing (HIP) as preferred approach
- Conducted two separate Analysis of Alternatives (AoA) efforts
 - 2016 Calcine AoA
 - 2020 Calcine AoA to consider impact of changed circumstances



2020 AoA Recommendations

- Dual path forward
 - Cold Crucible Induction Melter (vitrification) technology
 - Commercially available design and sizes
 - Provides the best balance between cost, stakeholder/regulatory acceptance, and risk
 - Best Demonstrated Available Treatment for high level waste (HLW) per Environmental Protection Agency (EPA)
 - Direct disposal
 - HLW interpretation may provide potential disposition alternatives for a limited portion of the calcine
 - Represents highest regulatory and stakeholder risks



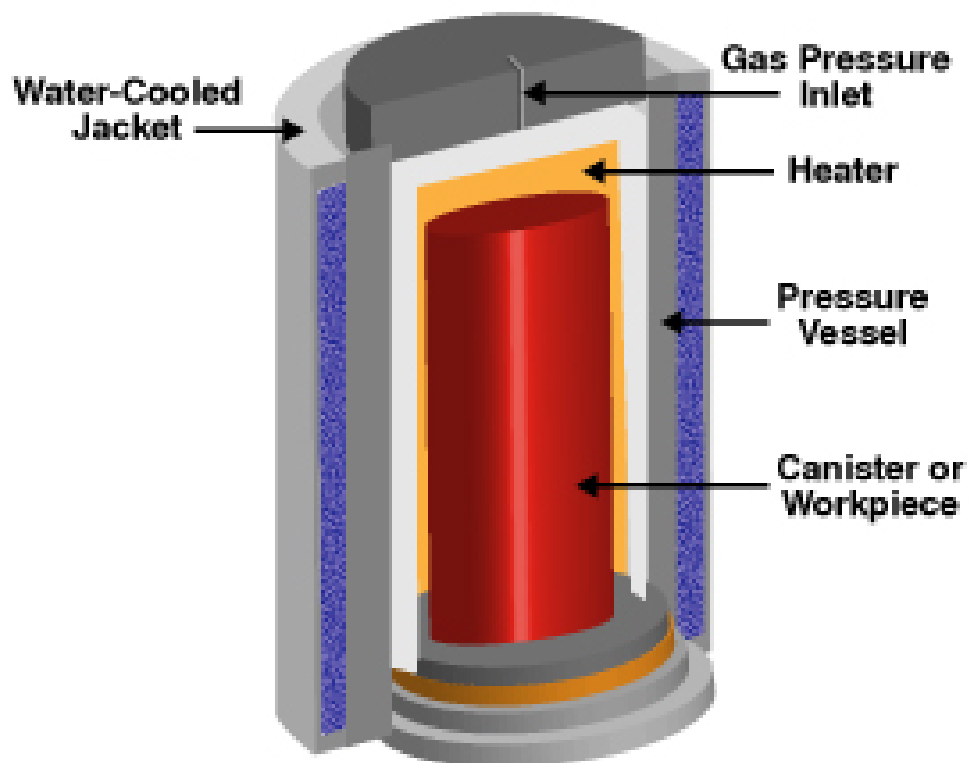
Cold Crucible Induction Melter systems

- CCIM compared to other vitrification methods
 - More flexible melt pool chemistry, crystal tolerance, and operational temperature
 - Less maintenance outages
 - Can be optimized for specific characteristics of the waste
 - Requires some additives and will result in waste volume expansion
- Possible options for CCIM
 - Utilize a private/public partnership facility adjacent to INL site
 - Off-Site commercial treatment
 - DOE-built capability on-site



Hot Isostatic Press

HOT ISOSTATIC PRESSING

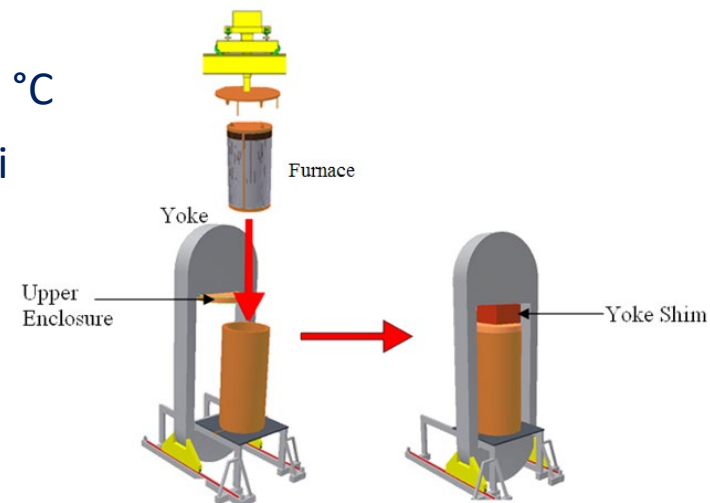


Hot Isostatic Press

- HIP in commercial use since 1951
 - Commercial temperatures to 2,550 °C and pressures to 60,000 psi
 - Technology consists of a pressure vessel containing an electrically heated furnace
 - Components are placed in a sealed can inside the furnace and isostatically pressed with argon gas to maximum density
- Low technology maturity for HLW
 - Temperature range for Calcine treatment 1,050-1,200 °C
 - Pressure range for Calcine treatment 7,200-15,000 psi
 - Produces glass-ceramic waste form
 - Volume reduction is assumed to be 40% to 60%
- Not RCRA treatment standard for HLW



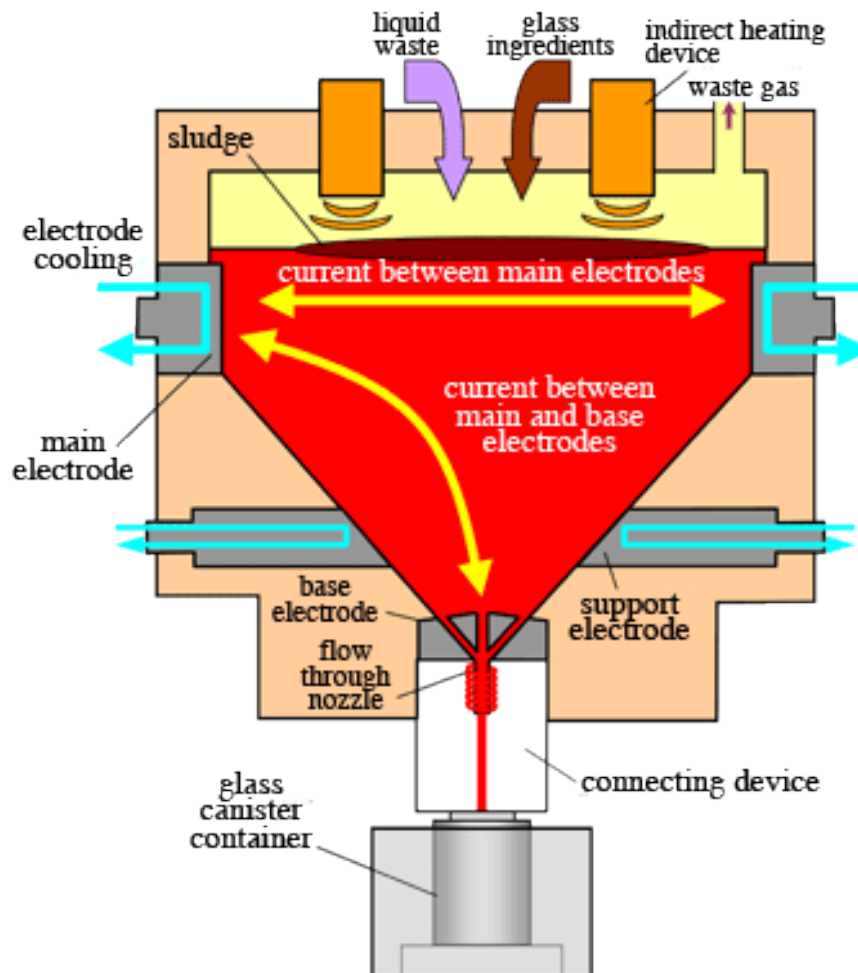
Lab Scale HIP Can Testing
Before and After



HIP Machine Loading Sequence



Vitrification



**High Active Liquid Waste Vitrification Equipment Outline
(Glass Melting Furnace)**



Vitrification

- Mature treatment process
- Years of experience in treatment of High Level and Intermediate Waste
- RCRA treatment standard for HLW
- Waste loading not as high compared to HIP – 30%-40%
- Calcine flowsheet similar to what is in use in France HLW treatment process (calcination pre-treatment)
- Melter temperature range of 1,000-1,200 degrees C



Next Steps

- Continue Calcine Retrieval Demonstration efforts and readiness
- Finalize AoA update and evaluate recommendations regarding treatment

