

Electrochemical Decontamination & Waste Processing

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January 2006

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Cooperative Development Program

**TVA - Browns Ferry
Radiological Solutions, Inc.
Fin-Tech, Inc.**

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Electrochemical Decontamination

- Browns Ferry Unit 1 Restart Program
- Program Goals:
 - Refurbish or Replace All Plant Components Possible to:
 - Minimize Recontamination Upon Startup
 - Minimize Source Term(s) for Future Contamination

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Electrochemical Decontamination

- For New Components:
 - Surface Preconditioning
 - Stabilized Chromium Process (SCrP) Where Possible
 - Mechanical & Electro-polishing
 - Chromium Application
 - Stabilization
 - Electropolish & Preoxidize
 - Inaccessible Areas or Impractical w.r.t. Geometry for SCrP Such As:
 - Heat Exchangers
 - Large Bore Piping
 - Multiple Bends
 - Complex Geometries

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Electrochemical Decontamination

- For Existing Components:
 - Aggressive Decontamination
 - Improve Surface Characteristics
- Electrochemical Decontamination or "Electropolishing" Effectively Accomplishes These Goals
 - Complete Crud Removal
 - Huge True Surface Area Reduction
 - Microsmooth Surface Finish

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Electrochemical Decontamination

- Main Issue With Electropolishing Has Been Waste Handling/Disposal
 - If Considered "Hazardous" and Contaminated, It Is Mixed Waste
 - If Not Hazardous, Can Be Disposed Of By Conventional Radioactive Waste Handling Processes

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The US EPA “Mixed Waste” Definition:

“Mixed waste is waste that contains a hazardous waste component and a radioactive material component. A hazardous waste is either listed under 40 CFR Part 261, Subpart D, and/or exhibits a characteristic described in 40 CFR Part 261, Subpart C. Radioactive material must be classified as source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954 (AEA) (42 U.S.C. Section 201 et seq.)”

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Electrochemical Decontamination

Processing Steps:

- Conventionally Electropolish Surface Using Traditional and Proprietary Electrolyte
 - Typically Mixture of Phosphoric and Sulfuric Acids
- Electrolyte is Mixed With Aluminum/Caustic In Specially Designed Nozzle
- Products are Dry Neutral Solid and Water
 - Solid Can be Handled Directly or Pelletized
 - Exothermic Reaction is Heat Source for Rapid Evaporation of Water

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Electrochemical Decontamination

Surrogate Testing:

- Typical Stainless Steel Component Electropolished
- Waste Electrolyte & Caustic Mixed
- Both Dry Solid (powder) and Pelletized Waste Product Sent to Certified EPA Laboratory for Toxicity Characteristics Leachate Procedure (TCLP) Analyses

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Typical TCLP Analysis Surrogate (Pelletized) Waste [SW846, Method 1311]

Sample No.:	1	Sample ID:	FT-121604-1 Pelletized samples For TCLP			
Test	Result	Units	Det. Limit	Method	Date	Tested By
Copper	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Iron	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Nickel	0.120	Mg/L	0.0500	6010	12/22/2004	PW
TCLP METAL						
Arsenic	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Barium	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Cadmium	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Chromium	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Lead	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Mercury	<0.0002	Mg/L	0.0002	7470	12/22/2004	JC
Selenium	<0.050	Mg/L	0.0500	6010	12/22/2004	PW
Silver	<0.050	Mg/L	0.0500	6010	12/22/2004	PW

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Electrochemical Decontamination

- Waste Disposal Sites
 - Envirocare of Utah, Waste Acceptance Criteria (WAC) Must be Satisfied For Either Bulk Waste Facility or Containerized Waste Facility*
 - Class A Waste Only
 - Do Have Mixed Waste Handling Capabilities
 - Barnwell Not Yet Contacted

• Dan Davis, TVA Site Rep & Berton Pinkham, Client Service Mgr
Envirocare & J. Newey at Rancho Seco, Oct 2005

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Electrochemical Decontamination

- Next Step:
 - Demonstrate Process Capabilities on Actual Plant Component
 - Either at Browns Ferry or Muscle Shoals
 - Pelletized Waste Will be Sent to Envirocare Utah Approved Laboratory for WAC

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