

Transforming Contaminated Sediment into Construction-Grade Cement – An Innovative Technology

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Cement-Lock[®] Technology – An Advanced Solution

- **A Patented technology**
- **Developed by the Gas Technology Institute (GTI) and its wholly-owned subsidiary ENDESCO Services, Inc.**

The Driver Is . . .

- **Cement-Lock[®] Technology that transforms wastes into resources**
- **Conserves natural resources**
- **Improves the environment**
- **Optimizes land use**
- **Creates a sustainable industry**

The Goal . . .

To transform
all types of wastes
into
construction-grade cement and power

Cement Consumption and Import

- In Year 2000:
 - US Consumed 115.9 million tons of cement
 - **US imported 31.6 million tons of cement**
 - Michigan consumed 3.9 million tons of cement
 - **Michigan imported 1.8 million tons of cement**
- **Portland cement price in Detroit area is \$89/ton**
- Cement is imported from as far away as China
- Cement-Lock Technology can reduce this import

Technology Development Support

- Gas Research Institute
- Michigan Dept of Environmental Quality
- U.S. EPA Region 5/GLNPO
- U.S. EPA Region 2
- Brookhaven National Laboratory
- New Jersey Office of Maritime Resources
- U.S. Army Corps of Engineers (NYD)
- Snell Environmental Group
- Unitel Technologies, Inc.

**What is
Cement-Lock[®]
Technology?**

Cement-Lock[®] Technology

- A Patented technology
- An advanced thermo-chemical manufacturing process for decontaminating wastes
- Organic contaminants are destroyed with DREs > 99%
- Heavy metals are immobilized in the cement matrix exceeding TCLP requirements
- Waste residue is transformed into construction-grade cement
- Waste heat is transformed into power

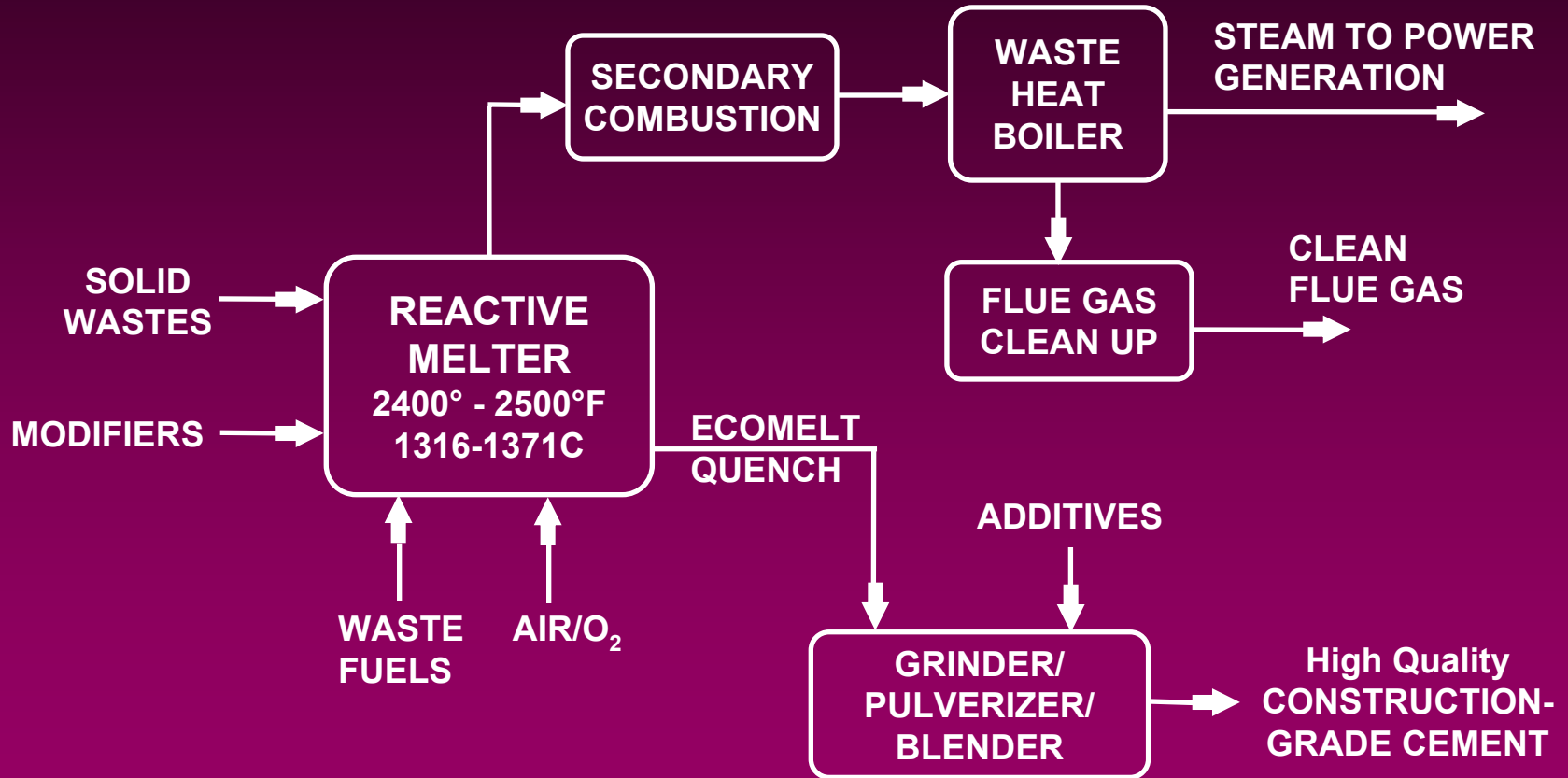
Cement-Lock[®] Technology

- Extremely diverse types of wastes, such as contaminated soils and sediments, oil sludges, and brownfield debris can be processed together or separately
- All organic contaminants are destroyed
- All heavy metals are immobilized within the cement matrix
- No limitation on type of wastes processed
- No secondary wastes produced
- No wastewater generated
- No pollutants discharged into the atmosphere
- Fully compliant with United States Clean Air Act

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- **Destroys organic contaminants, such as,**
 - Oil and Grease
 - PAHs
 - Pesticides
 - PCBs
 - Insecticides
 - Dioxins/Furans
- **Immobilizes heavy metals, including**
 - Cadmium
 - Chromium
 - Copper
 - Lead
 - Selenium
 - Silver
- **Mercury is volatilized and captured by Activated Carbon Bed**

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Target Applications

- Harbor & river sediments
- Petroleum sludges, tank bottoms
- Brownfield sites
- Spent catalysts
- Municipal sewage sludges & solid wastes
- Industrial wastes

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- Wastes Tested

- Dredged estuarine sediments
- Dredged river sediments
- Oil-contaminated soil (refinery-type)
- Coal fly ash
- Contaminated concrete (DOE-type waste)
- Coal bottom ash
- Municipal solid waste
- MSW incinerator ash
- PCB-contaminated soils
- U-containing wastes (DOE-type waste)

Technology Development Status for Dredged Sediment

- **Bench-Scale Data**

- Newtown Creek (NY) sediment - WRDA (ACOE / EPA-2 / BNL)
- Black Lagoon (Detroit River) sediment - MI-DEQ / Snell

- **Pilot-Scale (1-ton/day) Data**

- Newtown Creek sediment and contaminated soil - WRDA (ACOE / EPA-2 / BNL), private sector

Technology Development Status for Dredged Sediment

- Demo plant for estuarine sediment from NY/NJ harbor - WRDA (ACOE/ EPA-2/BNL), NJ-MR, private sector
- Demo plant for Detroit River sediment (Black Lagoon) - MDEQ, EPA-5/GLNPO, private sector
- Preliminary engineering completed for 100,000 yd³/year plant module and 500,000 yd³/year plant

Environmental Impact Summary

- **Air**

- SO_x, NO_x, HCl controlled to below regulatory limits
- Particulates below regulatory limits

- **Water**

- No wastewater produced
- No water discharged

- **Treated Wastes**

- Salable product
- No long-term monitoring required

Independent Data Collection and Verification

- **Organic Contaminant Destruction**
 - EPA-Certified Lab: Triangle Laboratories, Durham, NC
- **Metals Immobilization**
 - EPA-Certified Lab: Triangle Laboratories, Durham, NC
- **Air Sampling Data**
 - EPA-Certified Lab: AirNova, Pennsauken, NJ

Cement Quality: Certification & Testing

- Construction Technology Laboratories, Inc. (CTL, Skokie, IL, subsidiary of Portland Cement Association)
- Prairie Cement Group (Chicago, IL, cement manufacturer)
- New Jersey Department of Transportation (NJ-DOT, public project applications)
- Sor Testing Laboratories (Cedar Grove, NJ, cement/concrete testing services for NJ/NY area)

Commercial Readiness

- Equipment for technology is conventional and readily available
- Plant engineering and construction utilize conventional methods
- Equipment can be manufactured locally
- Various vendors willing to provide turnkey production plants have been identified
- Pilot plant data is sufficient for detailed design and construction
- Large-scale demo plant scheduled to start in early Spring 2003; will process contaminated sediments from NY/NJ harbor and Detroit River

Logistical & Regulatory Requirements

- **Permit requirements** - similar to those for manufacturing process plants
- **Air permit** - Required
- **Process water discharge permit** – No
(Process is a Net water user)
- **Large-scale plant (> 500,000 tons/yr)**
incorporates engineered transportation and logistics system



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Demonstration Plant

OBJECTIVES

- Demonstrate integrated, sustained operation of the Cement-Lock process with contaminated dredged sediment from NY/NJ harbor as well as with contaminated dredged sediment from Detroit River
- Utilize construction-grade cement produced from the plant in selected beneficial use projects in the NY/NJ and Michigan areas

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Demonstration Plant

- Demo Plant capacity up to 30,000 tons per year of harbor sediment
- Plant under construction in NY/NJ harbor area
- Plant equipped with computer-based data acquisition and control system, and a continuous emission monitoring system (CEMS)
- Plant scheduled for startup in early Spring 2003
- Significant public input has already been incorporated into this project based on numerous public outreach meetings

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Demonstration in Michigan

- After completion of the NJ Project, the demo plant will be moved to Michigan (Detroit Area)
- Black Lagoon area in the Trenton Channel of the Detroit River has been identified as priority site for implementation of sediment and habitat remedial measures
- About 2,000 cu yd of sediment from Black Lagoon will be processed in the plant
- Cement produced from the plant will be used in selected beneficial use projects in Michigan

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Benefits

Cement-Lock® Technology Implementation Will ...

- Create a sustainable industry and help grow allied industries
- Create new jobs
- Increase local GDP

Potential Local New Job Impact for Each Installation

<u>Industry</u>	<u>New Jobs</u>
Cement-Lock plant	100
Engineering & construction	140
General construction	280
Waste industry	40
Transportation	20
Retail	<u>70</u>
Total	650

Summary

Cement-Lock[®] Technology is --

- **A novel method for managing all types of wastes in all nations**
- **It has the ability to transform wastes into resources, thereby conserving natural resources**
- **It is an environmentally “green” technology**
- **Its implementation creates a sustainable industry in the much needed cement and power sectors of the economy**
- **It is an economically viable proposition**

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Thank you for your attention!