What is Solidification/Stabilization?

• S/S treatment protects human health and the environment by immobilizing hazardous constituents within treated material.

• Involves mixing a binding reagent into contaminated media such as soil, sediment, sludge or industrial waste.

• Physical and chemical changes to the treated material.
Figure 7: Superfund Remedial Actions: Source Control Treatment Projects (FY 1982 - 2002)*

**Ex S itu Technologies (499) 58%**
- Physical Separation (20) 2%
- Incineration (on-site) (43) 5%
- Bioremediation (54) 6%
- Thermal Desorption (69) 8%
- Chemical Treatment (10) 1%
- Incineration (off-site) (104) 12%
- Solidification/Stabilization (157) 18%

**In Situ Technologies (364) 42%**
- Soil Vapor Extraction (213) 25%
- Bioremediation (48) 6%
- Solidification/Stabilization (48) 6%
- Flushing (16) 2%
- Chemical Treatment (12) 1%

Other (ex situ) (42) 5%
- Soil Vapor Extraction (9)
- Neutralization (8)
- Soil Washing (8)
- Mechanical Soil Aeration (5)
- Solvent Extraction (5)
- Open Burn/Open Detonation (3)
- Phytoremediation (2)
- Vitrification (2)

Other (in situ) (27) 3%
- In Situ Thermal Treatment (8)
- Multi-Phase Extraction (8)
- Neutralization (4)
- Phytoremediation (4)
- Vitrification (2)
- Electrical Separation (1)
Example S/S Projects

- *Every Remediation Project is Unique*
  - Hazardous Constituents
  - Contaminated Media
  - Performance Standards
  - Mix Design
  - Treatment/Mixing Methods
Collection & settling basin for refinery storm water and oily sludge

- 2.4 ha
- 84,000 m$^3$ of oily sludge and soil
- 1-2 meters of fluid over 3 meters of oily sludge
- Heavy metals eg. As, Pb
- Organics: volatiles, semi-volatiles
- Oil and grease 12%
RCRA Closure Plan

- Sheet pile and cement-bentonite slurry wall
- S/S of sludge and soil
  - In-situ auger & backhoe mixing
- RCRA cap
- Post closure monitoring
Post-Closure Monitoring

- Closure finished in 1992
- Regulations require post closure monitoring
- Groundwater monitoring (14 yrs)
- Performance based time frame
- Monitoring condition of cap and sheet pile cement-bentonite wall
- Indiana Dept of Environmental Management reports no known issues (2006)
Benefits

- Protective of human health and the environment
- Generator maintained control of disposed waste
- In-place closure minimized risk to workers and community
- In-place closure: $9 million
  - vs. $40 million for off-site disposal
  - S/S Treatment portion $46/m³
NY/NJ Harbor Sediment

- In-situ Blender Mixing
- Marine Sediment
- 8% Addition of Portland Cement
- Reuse as Engineered Fill
- Millions of cubic meters
- Engineered fill placed and compacted over old municipal landfill
- Area paved and used as parking lot
- Jersey Gardens Mall redevelopment earned EPA Brownfield Phoenix Award
NY/NJ Harbor Dredge: Bayonne Golf Course

- NY/NJ Dredged Sediment
- Cement treatment
- Permanent Pug Mill
- Re-use as engineered fill
New Bedford Harbor Area D Bulkhead Project

- Creation of 2 acres of land
- Industrial grade waterfront bulkhead
- <50 ppm PCB
- Reuse as fill within bulkhead
Treated Dredge San Diego

- CDF Not Available
- Disposal in MSWL
- Contaminants below regulatory limits: Cu, Zn, Pb, PCBs, pesticides.
- 12,500 m$^3$
- In-Barge Mixing
- 2% to 5% Cement Addition
- 12,600 m$^3$
- 27 Barges in 30 days
- MSW Landfill disposal avoiding Haz-waste landfill
- Tidally Influenced Canal
- Polycyclic aromatic hydrocarbon (PAH) and creosote contaminated sediment treated in-place
- Top 2 feet treated in-place creating cap
- S/S treated material less permeable than a sand cap
- Maintained depths for barge operation
NCBC Gulfport, MS

- Herbicide contaminated ditch & wetland sediment
- Dioxin
- 79,000 metric tons
- 79,000 metric tons
- Re-use as pavement base
Westside Former MGP Site, Milwaukee, WI
Sydney Tar Ponds, Sydney, NS
STP Cooling Pond

- Rec’d wastewater from cooling process in steelmaking
- Contaminants incl. Steel scale, oil, grease, from steel rolling process.
- Exceedences- TPH, Toluene, Antimony, Copper, Lead & Tin
- Sediment 50,000 tons
- Surface water 20,000 m³
Additional Information

- www.cement.org/waste
  - PCA publications on principles and projects
  - EPA publications
  - ACOE publications
  - Sign-up for our newsletters
- www.cement.ca
- CDROM
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