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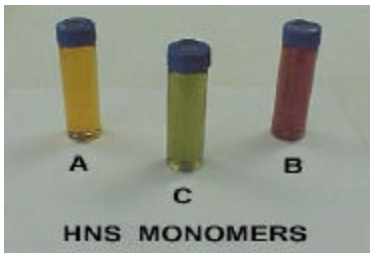
Radiation Proof Polymer

Hanford Nuclear Services, Inc. (HNS) is proposing to offer environmental services and to apply existing R&D of the advanced technologies of HNS and its affiliates to safeguard the United States from terrorist acts or weapons of mass destruction in the wake of the events of September 11, 2001.

HNS' Radiation Proof Polymer



HNS' President, Dr. R. Soundararajan, has developed a polymer that has many applications in the nuclear and radioactive waste industry. HNS Polymer is a binary liquid system, when combined with Depleted Uranium 238 (DU), creates a very effective radiation shielding material. By adding a third component, curing times can be varied from 3 minutes to 18 hours.

Uses of HNS' Polymer and DU/Polymer composites include:

- Bricks, tiles, or other construction materials to shield facilities that store radioactive material.
- Use at nuclear power plants (i.e. use to shield reactor cores, spent fuel pools).
- Corrosion protection for container surfaces used for transporting spent nuclear fuel (SNF).
- Primary radiation shielding for transportation containers of SNF and/or High-Level Radioactive Waste (HLW).

- Shielding for Transuranic (TRU) and radioactive mixed waste storage.
- Broad area applications by spraying or grouting to immobilize radioactive material.
- Encapsulation of weapons grade plutonium and/or uranium making them impossible for terrorists to extract.
- Protection from a radiation release at a nuclear facility (due to an accident or terrorist activity) by distribution through a sprinkler system.
- Electronic equipment protection from electromagnetic pulses, radio wave effects, and solar radiation interference when directly applied to the electronic equipment or component.

HNS' polymer has been tested at Pacific Northwest National Laboratory and Argonne National Laboratory and proven to be *"radiation proof," non-biodegradable, non-toxic, non-combustible, virtually non-leachable, and has an unconfined compressive strength of ~6000psi.*

Benefits

The key benefits of HNS' Polymer are:

- Ease of application.
- Low cost alternative to other technologies (i.e. concrete entombment, vitrification)
- Radiation proof, non-biodegradable, non-toxic, non-combustible, virtually non-leachable, and has an unconfined compressive strength of ~6000psi.
- Exhibits a 1-3% volume reduction after curing. Conventional grouting techniques typically have a 15-20% volume increase. (Resulting in smaller landfill requirements)
- Immobilization of airborne radionuclides in the event of fallout or a "dirty bomb."
- Long-term stability for containment of radioactive materials.
- Can be combined with "waste" materials (depleted uranium) to make a radiation shielding product.

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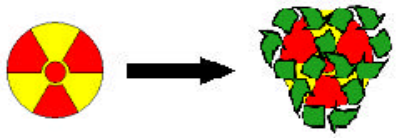
Financial Savings

The financial savings reach into the multi-billion dollar range. Major areas where cost savings will occur include:

- Use of depleted uranium oxide (currently stored as DUF_6) to make a polymer composite for radiation shielding will have cost savings in several categories:
  - The depleted uranium will be used to make transportation/storage containers, thus negating the need for disposal.
  - The process makes a waste product into a viable asset.
  - Transportation of the depleted uranium to an off-site storage facility will not be necessary.
  - Use of DU is considered resource recovery/recycling.



- If the current proposed Yucca Mountain site is not approved, the alternatives would cost $51.98-$57.229 billion dollars for the first 100 years, then $0.425 billion each year for the next 9,900 years[1].

  DOE assumes the on-site radioactive storage containers will need replaced every 100 years due to degradation by radioactive waste. Using HNS' Polymer and Polymer Composites, tank replacement would be every 200 years, thus reducing costs (tank cost, management, security, etc.) by $0.212 billion per year for 9,900 years - a total savings of $2.1 trillion.

Summary

HNS' Polymer has been proven to be an excellent material for use in the nuclear industry. Immobilization and stabilization of radioactive wastes can be achieved cheaper and faster by utilizing HNS' Polymer to encapsulate, spray, or grout both high-level and low-level radioactive waste.

Please contact us if you would like more information regarding HNS' Polymer and its applications.

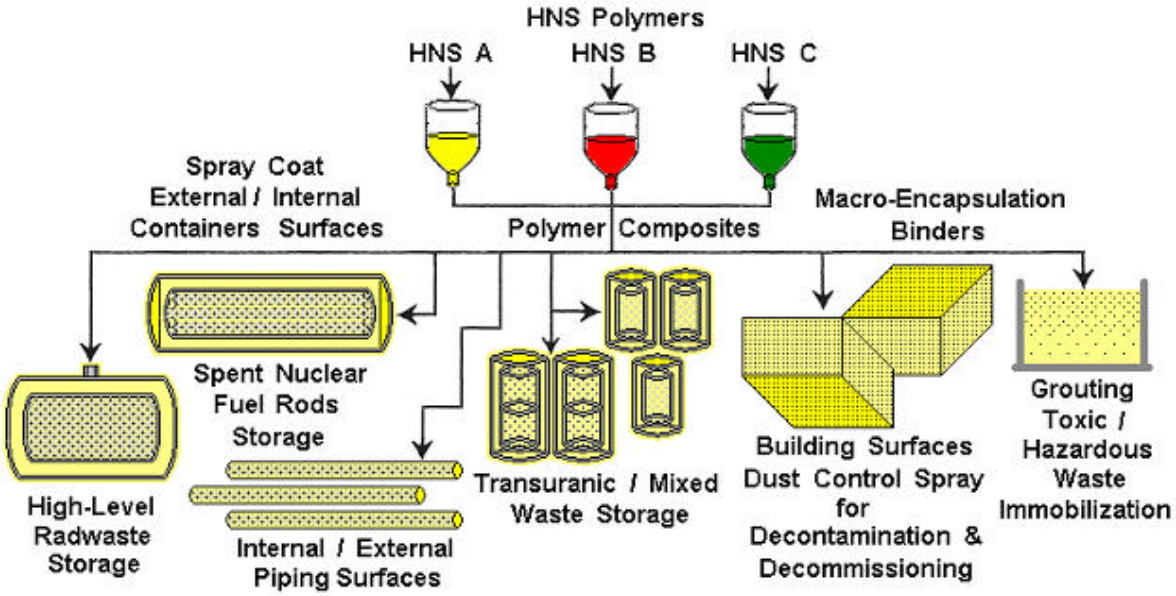


Diagram of Potential Uses for HNS' Polymer and HNS' Polymer Composites

[1] source – Draft EIS for the Yucca Mountain Geologic Repository (DOE/EIS-0250D)