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Studsvik launches inDRUM Waste Treatment Demonstration Facility

Studsvik AB has completed construction of the new inDRUM Demonstration Facility outside of Nykoping, Sweden. We can now demonstrate how the inDRUM technology will process a wide range of problematic and legacy wastes through the removal of all liquids, organics and other materials, resulting in a stable and reduced volume product that can be disposed of in a suitable repository.

Legacy, Problematic and Operational Wastes

Figure 1. inDRUM Demonstration facility at Studsvik for simulated waste (left) and a drum being loaded into the container treatment unit (right)

Often, there are characteristics of wastes that are not suitable for disposal, or the exact content of legacy waste is unknown, making it unsuitable for disposal. The common practice has been to store this waste in 55-gallon drums (200L) while exploring alternative solutions, or in larger vessels. In most countries with historical nuclear programs, legacy waste poses significant challenges due to the presence of non-disposable materials such as:

- Liquids including oils, and/or acidic and caustic solutions
- Sealed containers (e.g.paint and aerosol cans)
- Organics (e.g.volatile organic compounds and cellulose)
- Plastics (e.g. PPE and wrappings)
- Spent Ion Exchange Resin
- Reactive metals
- Mixed waste

Likewise, mixed waste arises from operational environments which requires treatment prior to disposal. This can lead to the requirement to sort and segregate this waste prior to treatment. Utilizing the Studsvik inDRUM technology, the materials defined above can be safely treated, without the need for any sorting, and can also have a significantly reduced volume in preparation for final disposal.

Safe Treatment of Wastes

Another significant consideration for waste owners is the volume-based disposal costs. For waste types like Spent Ion Exchange Resins (SIER), the conventional approach of grouting can increase disposal volume by a factor of three. In contrast, using inDRUM technology for SIER, not only destroys the resin (required for some countries disposal) unlike some drying technologies, but has the potential to reduce disposal volume by a factor of ten, offering significant cost savings in final disposal.

The inDRUM waste treatment technology can be used to effectively manage operational risks and minimize costs by:

- Removing waste characteristics that are unacceptable for shipping, long-term storage, and direct disposal.
- Volume reduction (Can be up to 90% depending on the waste form).
- No sorting or segregation of wastes is required prior to treatment which removes any risk to operators during these processes.

Treatment Results

In this following section, we have provided two separate sets of results from recent trials of simulated waste from the inDRUM Demonstration facility.

Mixed Organic Waste

The inDRUM technology is suited to treating individual waste forms (e.g., SIER) and also is equally adept at treating mixed waste forms. In Figure 2 below, the mixed waste drum contains several waste types typical operational and decommissioning waste forms for nuclear facility. The simulated waste contains a variety of materials including rubber boots, bitumen, aerosol spray paint can, metal shavings, cardboard, fabric, as well as a cellulose mixed with soluble ammonium nitrate. The picture on the right shows what remains to the simulated waste after the inDRUM treatment, clearly showing the 96.7% volume reduction, a factor of 30!

Figure 2. Simulated waste before treatment and after

Ion Exchange Resin (IER)

Unlike incineration, or resin drying, the inDRUM process can destroy the IER resulting in a carbon char product. The treatment of IER has been successfully tested at the demonstration facility and has seen positive results in both stabilisation and volume reduction. In Figure 3, three zones or phases of pyrolysis are clearly identified:

- Zone A: All water is gone, and pyrolysis is complete. Note the significant destruction of the resin beads.
- Zone B: Water content is gone and beginning of pyrolysis, and
- Zone C: Interstitial water is still present in the IER, and pyrolysis has not begun.

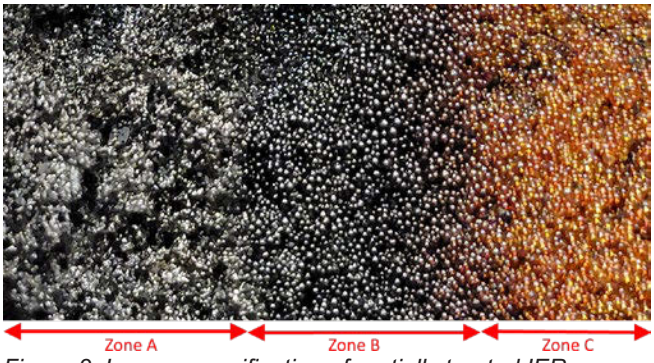

Figure 3. Larger magnification of partially treated IER

The patented inDRUM technology applies a unique approach to achieve optimal volume reduction and stabilization of SIER. Once the process is complete, the char is reduced to residuals like what is shown in Figure 4. The primary limiting factor for volume reduction is the mineral and metallic material captured within the SIER.

Figure 4. Treated Ion Exchange Resin residuals

Conclusion

By using Studsvik's patented inDRUM technology, your wastes can be stabilized and the resulting disposal volume can be significantly reduced in preparation for the final disposal location. This full-scale demonstration facility is available to trial your simulant waste, with a view to gather any necessary data for the future waste treatment using inDRUM. inDRUM can be deployed on your site, or have your waste sent to an inDRUM facility and the resulting waste product returned to you for final disposal. Reach out to your Studsvik representative to arrange a tour of the facility and discuss how an inDRUM system could reduce the risks associated with your site's wastes as well as your site's cost of disposal. The inDRUM Demonstration Facility is available for testing simulated waste.

To learn more about Studsvik's inDRUM technology, visit www.studsvik.com

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