Gained experiences concerning the treatment of radioactive metal scrap from German NPP´s

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GNS Gesellschaft für Nuklear-Service mbH
www.gns.de

International Symposium
Recycling of Metals

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General Information about GNS

Spent Fuel and HLW from Reprocessing
Treatment, Packaging, Transport, Interim Storage, Preparation for Final Disposal

We take care of ... (i.e. Competence and Responsibility of GNS)
Treatment, Packaging, Transport, Interim Storage, Preparation for Final Disposal

Management of Operational and Decommissioning waste (LLW/ILW)

All German NPPs
Final Repository HLW (exploration phase)
Responsibility for exploration, construction and operation:
Federal Republic of Germany
Final Repository „Konrad“ LLW/ILW (construction phase)
General Information about GNS

GNS-Group: Employees ≈ 600

- Administration
- Blue Collar Workers
- Scientists
- Engineers
- Technicians

plus subsidiary

DBE/DBE TEC employees ≈ 800

Employees of GNS Group: ≈ 600

The entire process

Metal origin:
D&D projects and maintenance during down time periods

Objective:
Maximize the recovery of recyclable material while minimizing the radioactive waste amount at the same time
The metal scrap

To achieve the objective

- a sorting process
- a specific activity calculation
- a detailed documentation

have to set up prior to the transport

Establishing a proper pre-treatment

- lowering the need for further pre-treatment
- impact on the processing time, results and cost factor effects

→ Major role in the treatment outcome
Metal scrap – suitable?
Metal scrap – suitable?
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Metal scrap – suitable?
Metal scrap – suitable?
The transport

When shipping metals, following must be observed:

- Dangerous goods regulations (ADR/RID, IMDG-Code)
- Guidelines for cargo securing (CTU, VDI)
- Transport permission - if needed
- Export-specific legal regulation

Further recommendations:

- Optimized loading
- Sufficient transport batch sizes
- Standardized transport logistics with CTU
Optimized loading and tie-down?
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Summary:

- 396 transports with 1186 standard 20-feet container in total
- 20 transports per year with an average of 3,25 container per shipment
- Approx. 14,2 Mg per container
The melting

Advantages of the treatment process

- High volume reduction factor
- Secure handling of treatment products
- Separation of the radioactive nuclides
- Lower efforts for radiological and chemical characterization
- Chemically inert and dry final product
- Simplified verification onto the compliance of the clearance regulations

Minimizing the radioactive waste amount while maximizing the recovery of recyclable material
The melting

Summary

- In total 17.707 Mg of metals melted over three plants
- Resulting share of releaseable material about \(~ 16.000 \text{ Mg (89\%)}\)
- Barely 2.000 Mg (11\%) remaining as radioactive waste
Clearance

... based on respective applicable legal regulations and ordinances and its settled limit values.

Fractions of approx. 16.000 Mg of releasable material are distributed among individual release and recycling channels.
Treatment of radioactive waste

Further treatment of process residues by GNS:

- Super compaction
- Vacuum drying
- Radiological characterization
- Verification of chemical stability
- Packing in a cask for interim/final storage
- Documentation, including consideration of the radiological and water law relevant limits

**Waste packages holding high quality in terms of the German requirements within the interim/final storage**
Treatment of radioactive waste

...one of many possible solutions

Process Waste

Super Compaction

Pellet

Dried pellets in Drums

Drums in Container

Concrete pouring
Conclusion

The entire metal melting process represents a highly efficient and future-oriented way of treatment offered as a "care-free package" by GNS and its subcontractors... not only for German customers!
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