

PROCESSING AND DISPOSAL OF RESIDUES COMPRISING NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM)

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ABSTRACT

Through mining/processing of Rare-Earths and further commodities like Uranium, Tantalum etc. NORM residues accumulate, posing radiological hazards and affecting the operational efficiency.

If all possibilities for minimization are exhausted, managing those requires a well-considered sequence of safe processing. NORM residues need to be (radiologically) characterised, optionally decontaminated and treated/ conditioned, and finally disposed of in licensed facilities.

Regulators require well-planned measures as precondition for permitting. Moreover, a good management of NORM residues helps to avoid liability risks.

Removal of radionuclides from equipment and facilities (e.g. pipework for in-situ-leaching, other processing installations etc.) through decontamination leads to dose reduction for staff and public and prevents from any contamination spreading. In a technical view the huge advantage of removing radioactive contamination is:

- 1) Waste volume reduction, essential e.g. in the course of decommissioning: by decontamination only a residual fraction, then containing the separated radionuclides, requires further treatment as NORM waste while the largest part becomes eligible for disposal as cheaper conventional waste
- 2) Re-usability of spent equipment (which otherwise would have to be disposed of), thus minimizing the equipment consumption

Manual preparation and water-jetting are relatively mild and usually allow re-use of decontaminated equipment. By contrast, as chemical decontamination can employ reagents like phosphoric acid the opportunity for equipment re-use here needs to be verified specifically. Abrasive blasting with sand does usually not allow reuse due to the caused loss in material thickness. In general, all decontamination technologies can be conducted manually or are automated for higher throughput.

Important objectives of optional treatment, if indicated, are volume reduction and foremost fixation/immobilisation of radionuclides to prevent from spreading. For various residue types, different treatment or sequence of treatment options apply like radionuclide extraction, purification (of waste water), incineration or high-force compaction etc.

In the case this becomes necessary NORM residues are ready for final disposal, if treatment is accomplished. Often the state is assumed to be responsible for actual disposal, i.e. operations only deliver (treated) residues to licensed disposal facilities. However, e.g. in case of high volume it can be justified that operations have an own onsite disposal facility. Anyway, several disposal options are given, like backfill in mined-out underground voids or open pits, reinjection into original deposit (of flowable residues), surface/near-surface disposal (e.g. landfill) or underground disposal (e.g. co-disposal with radioactive waste).

Which option will be realized depends both on technical/radiological properties and on country-specific regulatory requirements.

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