Opportunities for Rare Earth Element Recovery from Waste Streams

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Keywords: Rare Earth Elements, Innovation, Research & Development

ABSTRACT

Planning for a circular economy allows for previously untapped market opportunities to be explored, resulting in new, innovative revenue generating opportunities, while also reducing environmental impacts. In particular, rare earth elements (REE) are in rising demand as they are key components of over 200 products across a wide range of applications, including renewable energy technologies. There is a geographical disparity in deposits with China being the top producer, generating 70% of global production in 2022. Whilst this single dominating source has created significant supply risks, it has also consequently provided opportunities for other countries to provide rare earth commodities, and is a driver for finding alternative sources, such as mine-influenced water (MIW) and tailings.

In this study, Isle Utilities (Isle) undertook a global horizon scan, for a large mining company, on rare earth element (REE) recovery opportunities from tailings decant water. Previous studies of the tailings decant water had shown potentially significant concentrations of both heavy and light REE, but various challenges such as high flow, very low pH and high concentrations of iron had deterred interest in recovery.

Due to these challenges, Isle focused the assessment on solutions at an early technology readiness level with the assumption that most of the solutions for REE recovery would still be in the development process. Technologies identified that had particular promise include an adsorption based process that has the potential to selectively separate individual REE, and a polymer based selective flocculation technology.