HILTCRC

Australian Government
Department of Industry, Science and Resources
AusIndustry
Cooperative Research Centres Program

PROJECT SUMMARY

RP1.011: THE UPGRADING OF IRON ORE FOR DRI PRODUCTION USING PRODUCTS FROM SEAWATER RO BRINES

OVERVIEW

To produce iron ore for direct reduction or direct smelting, a high-grade material is required. In addition, to minimise Scope 3 emissions associated with direct shipping of ores and their subsequent processing by iron-making clients, the iron ores should be upgraded as far as is feasible. Physical (mineral processing) unit operations are limited by liberation constraints as well as poor selectivity and recovery at finer particle sizes. These two factors actually work against each other as higher liberation, but poorer mineral processing selectivity and recovery, is obtained at finer grinds. Hydrometallurgical technologies require exposure (but not necessarily liberation) of the contaminant/gangue minerals. Alkaline leaching of impurities using seawater RO brines, under appropriate operating conditions, offer a combination of selectivity, high potential recovery, as iron dissolution is suppressed, and the potential to produce useful by-products.

PROJECT LEADER

- Professor Jacques Eksteen, Curtin University

INDUSTRIES

- Iron & Steel

TOTAL PROJECT VALUE

- $622,000 (cash and in kind)

COMMENCED

01 August 2023

PROJECT DETAILS

As the iron-ore producing regions in Australia, such as the Pilbara, are arid, and iron ore must be shipped via ports, the utilisation of the proximity of the ore to the ocean can be used to upgrade the iron ore. The Pilbara has the benefit of both high sun and wind potential for renewables (with energy storage). Sea water provides an exceedingly large source of reagents and potential by-products, once concentrated into a brine e.g., through Reverse Osmosis (RO). The project provides a benign and circular economy approach to upgrade iron ores with the potential to generate additional by-product revenue to offset some of the hydrometallurgical beneficiation costs.

IDENTIFIED PATHWAYS

Low-carbon iron exports from Pilbara ores.

OUTCOMES

The expected outcomes from this project include:

- A process to upgrade low grade iron ore (assuming the gangue minerals and contaminant species are sufficiently exposed at the particle size of interest) for use in either direct shipping or domestic production of DRI, HBI or direct smelting routes
- A circular economy process that utilises natural resources directly available and reuses various by-products from the process or process them towards repurposing
- A process that utilises an environmentally problematic waste (Seawater RO Brines) and reuse this material as a source of processing chemicals
- A process that potentially delivers useful by-products (lithium salts, fertiliser, silica and alumina) without creating a tailings problem
- An assessment of the techno-economic viability and ESG credentials of the proposed process
- Trained human resources that would enable to support the design and operation of the proposed process plant.