

# Sustainable Solutions for Iron Ore Tailing/Slime Processing

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# Executive Summary

Iron ore mining is of great importance for economic development, however, it generates several billions of tons of mine tailings annually worldwide.

The tailings are ultra-fines or slimes, having a diameter of less than 150 microns. Slime particles can pose challenges in mineral processing due to their small size and the difficulty in effectively separating them from the valuable minerals.

With the increasing focus on sustainable and efficient use of natural resources, there has been a growing interest in finding ways to utilize iron ore slime.

Dive into our whitepaper to explore cutting-edge techniques and their role in transforming mine tailings into wealth.

**“Do you know that India generates as high as 18 million tonnes of tailings annually.”**





# Introduction

Iron ore mining is a cornerstone of economic development, but its impact is far-reaching, transforming landscapes with massive amounts of mine tailings generated worldwide each year. In Australia, a staggering 632 million tons of iron ore tailings are generated annually and India's annual generation of iron ore tailings is around 3% of Australia's iron ore tailings.

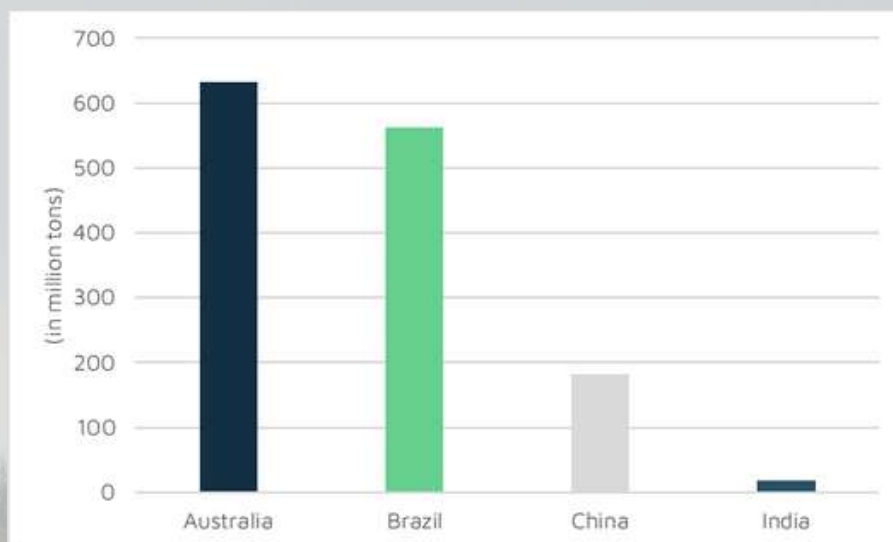


Figure 1: Annual iron ore tailings generation in different countries.

Figure 2 explains the application of Iron ore tailings and it can be observed that most of the patent applications of iron ore tailings focus on reprocessing material to recover the iron from the iron ore tailings.

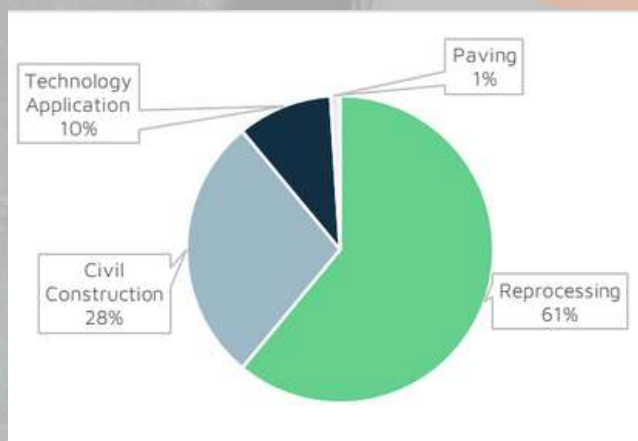
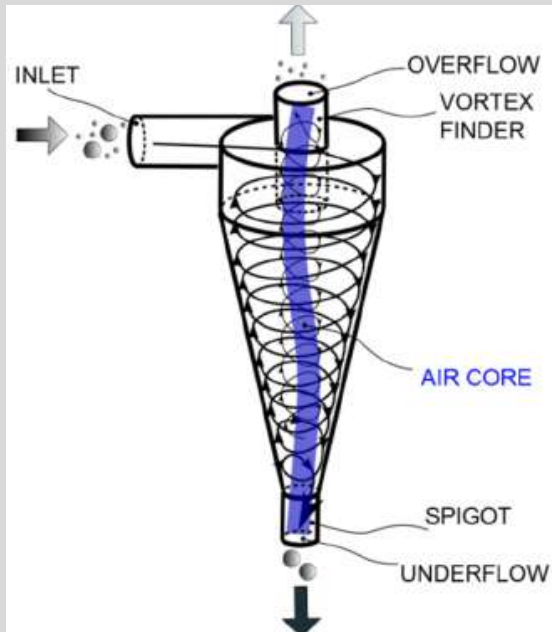


Figure 2: Application of Iron Ore Tailings

The depletion of high-grade ore deposits accelerates, prompting the exploration of alternative sources like low-grade ores. Additionally, the substantial accumulation of slimes in tailing ponds at mining sites presents a significant environmental challenge. The processing of Iron ore slime involves various techniques aimed at recovering iron values while minimizing environmental impacts.

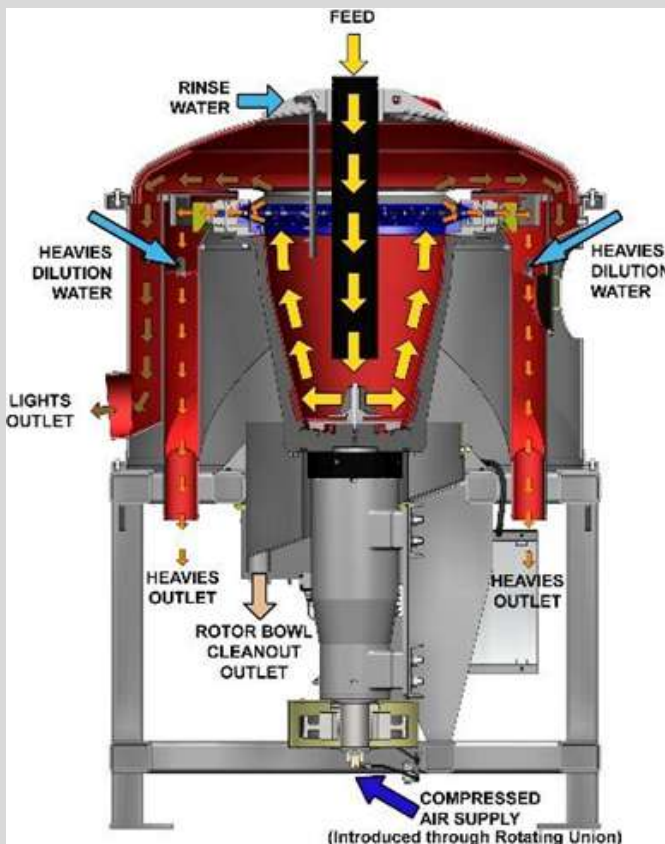
# Mineral Processing Techniques

## 1. Hydro cyclone



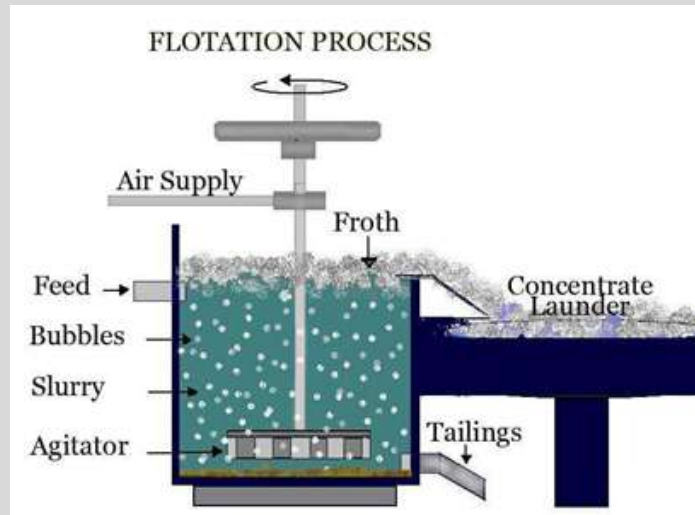
- Hydrocyclones commonly utilized for classification purposes
- Hydro cyclones play a crucial role in slime processing by efficiently separating fine particles from slurry, leading to improved downstream processes and a higher-quality final product.

## 2. Gravity Concentrator



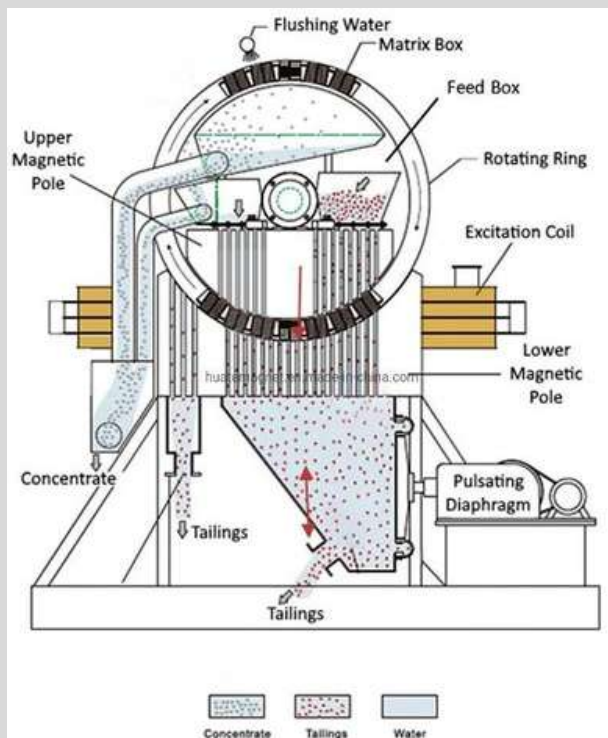
- Gravity concentrators operate at 50 to 600 G force (Gravitational force)
- Gravity concentrators line can recover particles as fine as five microns economically
- Variable lip controlled by air pressure for flexibility
- Can operate in rougher-cleaner or rougher-scavenger configurations

### 3. Froth Flotation



- Flotation is effective for separating fine particles
- Widely used in ore processing, even those with slime content
- The hydrophobic nature of certain minerals allows them to selectively attach to air bubbles, facilitating their separation from the aqueous slurry by adding chemical reagents.
- Crucial for obtaining high-purity concentrates from complex ore mixtures

### 4. Wet High Intensity Magnetic Separator



- Designed to separate materials with weak magnetic properties
- Can effectively handle particles as small as 10 microns





## Selection of Mineral Processing Equipment

Selecting the right mineral processing equipment is a key initiative that requires careful assessment of various factors. From the characteristics of the mineral to the desired product specifications, from the dimensions and form of the raw material to the processing volume—each aspect plays a crucial role in determining the equipment's suitability. Figure 3 provides invaluable guidance to ensure informed decision-making on the selection of equipment based on particle size range.

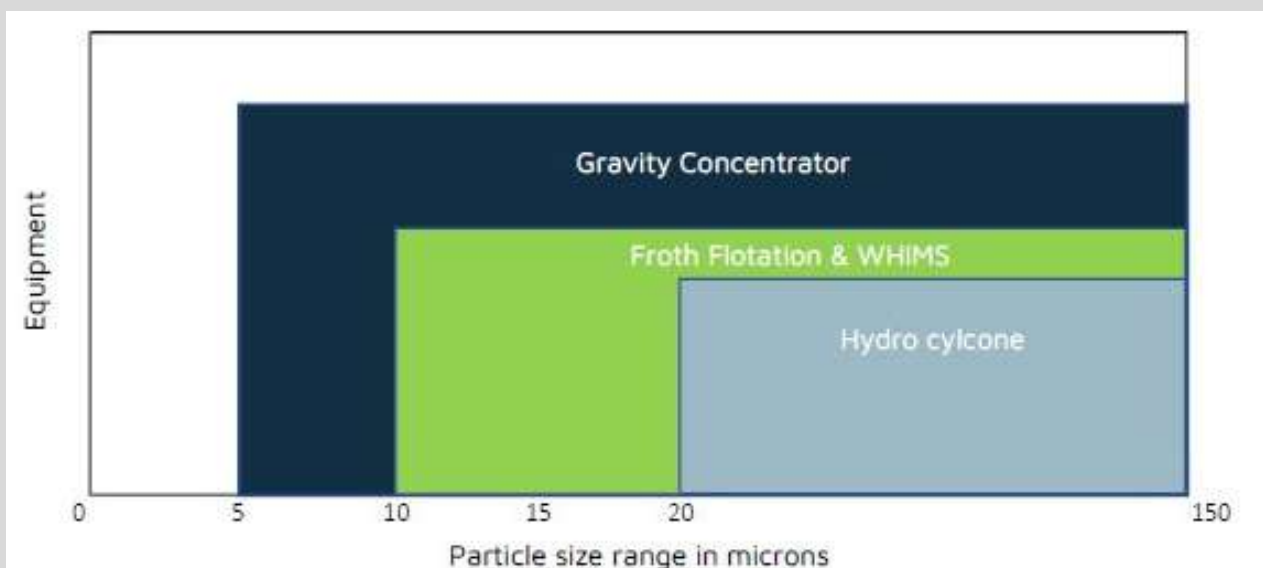


Figure 3: Mineral processing equipment selection by particle size range.

# Conclusion

Processing iron ore slime allows for the utilization of previously discarded material, maximizing resource efficiency. This can contribute to sustainable mining practices and the conservation of mineral resources.

The processing of iron ore slime relies on the chosen methods and technologies, taking into account the objectives and priorities of the processing operation.

Key process techniques, including hydro cyclone, gravity concentrator, froth flotation, & wet high-intensity magnetic separator based on particle size range, are instrumental in effectively managing iron ore slimes and contributing to the recovery of iron minerals from waste. The adoption of these methods is essential for minimizing the environmental impact associated with iron ore processing.

Still, there is more to explore. Selecting the right processing equipment involved careful evaluation, ensuring efficiency and success.

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