



## Upgrading of low-quality iron ores and mill scale with low carbon technologies

Research for novel technological approaches



## Unlocking the Potential of Low-Quality Iron Ores: BFI's Key Role in the TransZeroWaste Project

The TransZeroWaste project is tackling one of the most pressing challenges in the steel sector: how to upgrade low-quality iron ores and mill scale using low-carbon, sustainable technologies. At the heart of this initiative lies a pan-European consortium of 12 specialized partners—ranging from steel producers and plant builders to universities and research institutes—united by a shared mission to decarbonise and circularise the iron and steel value chain.

One of the project's leading research partners is VDEh-Betriebsforschungsinstitut GmbH (BFI), based in Germany, with a legacy of over 50 years in applied research for the steel industry. With a team of approximately 100 experts across 8 scientific departments, BFI brings deep expertise in circular economy, decarbonisation, digitalisation, and process optimisation—all critical pillars of the TransZeroWaste vision.



*BFI building*



*BFI team*

## **BFI's Contributions to TransZeroWaste**

Within the project framework, BFI is spearheading experimental and technological advancements in three main areas, all designed to increase the metallurgical value of secondary raw materials while reducing environmental impact:

### **1.Cold Pelletisation & Briquetting**

BFI is conducting lab and field trials on cold pelletisation and briquetting of low-quality iron ores. By working with operational samples from CELSA and Dillinger Hütte, and using innovative binders, the goal is to create input materials suitable for both existing and future low-emission steelmaking processes.

### **2.Microwave-Based Hot Pelletisation**

In collaboration with CEINNMAT and the University of Valencia, BFI supports the development of low-CO<sub>2</sub> microwave technologies for hot pelletisation. This approach aims to enhance iron metallisation rates, increase the valorisation of poor-quality ores, and enable zinc separation—a major step forward in making these resources industrially viable.

### **3.Hydrometallurgical Treatment of Oily Residues**

BFI is also developing methods to remove organic impurities like oil from iron-rich waste streams, such as oily fine scale, which currently pose significant reuse challenges. By employing a modified magnetic separation technique, BFI's

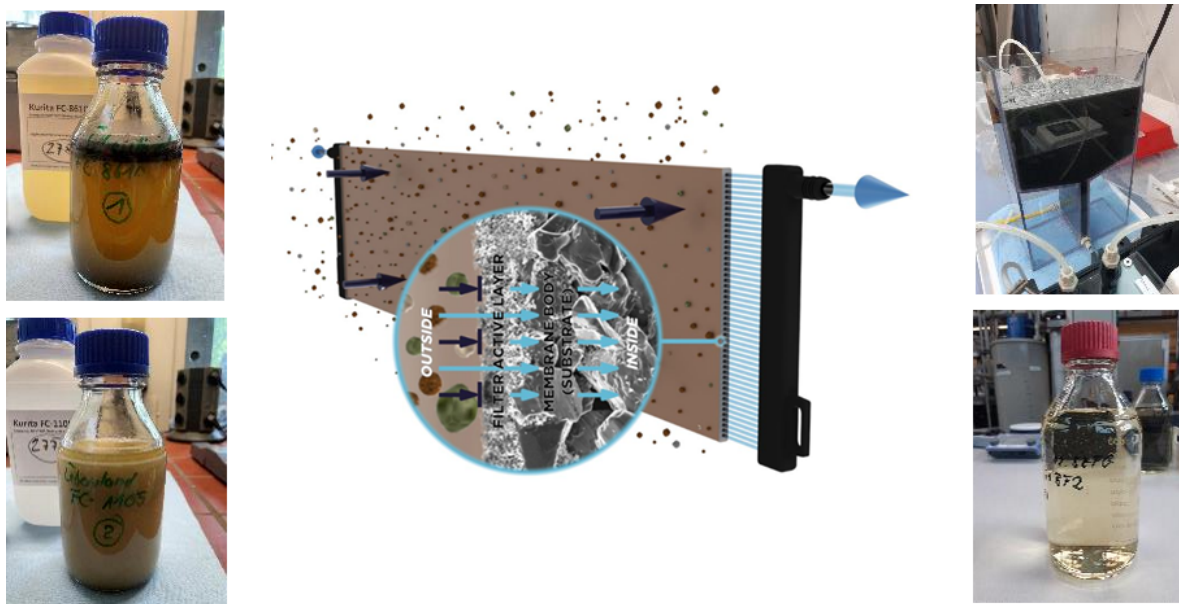
approach allows selective recovery of iron materials while also reclaiming the cleaning agent, thus contributing to both material recovery and environmental compliance.

At the current state, lab trials of the different mentioned subjects are reaching the final stage. Exemplary lab trial set-ups are shown in the pictures below.



*Briquetting lab trials*

*Pelletising lab trials*



*Cleaning agent recovery from oil and solid loaded cleaning solution by means of ceramic flat sheet filtration*

Based on the lab trial results, field trials with the microwave and the hydrometallurgical treatment are in preparation in deep exchange with the industrial partners and technology developers, to demonstrate the processes under operational conditions.

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