Innovative recycling solutions

The primary objective of many steelmakers to achieve a residue-free steel production has prompted Paul Wurth to extend its portfolio in recycling technologies. The very specific nature of the products to be treated has encouraged the Paul Wurth R&D teams to develop and combine various pyrometallurgical or hydrometallurgical processes so as to be able to propose a comprehensive range of solutions for recycling residues from the iron, steel and non-ferrous industry.

RedIron™

RedIron is a direct reduction process using a Rotary Hearth Furnace (RHF) to convert steelmaking residues in DRI or HBI to be charged in a BF, BOF or EAF for final melting.

A flagship project for this technology is the industrial RHF plant realised on the Lucchini-Piombino (Italy) site (2010). The plant has been designed to recycle 60 000 tpy of BF and BOF dusts, BF sludge, mill scales and pellet fines and to produce 40 000 tpy of DRI briquettes feeding the BF.

RedSmelt™

RedSmelt is a two-step pre-reduction and smelting process, combining a RHF and an EAF Smelter to convert steelmaking residues or iron ore into pig iron or alloys and slag.

Originally, this technology has been developed to meet the growing demand for a low-cost and environment-friendly ironmaking alternative to the traditional BF route. Its usage has been extended for treating the widest range of fine iron ores and steelmaking residues. Its production capacity ranges between 0.3 and 1.0 mtpy of hot metal.

Primus®

The Primus process is a two-step process:

- drying/heating/pre-reduction in a Multiple Hearth Furnace (MHF) and
- final reduction/melting in a specially designed EAF

The Primus process has been designed for processing dust which contains more than 5% of zinc, typically generated by EAF mini-mills. Primus produces hot metal of a quality similar to the one produced by a BF, zinc oxide concentrate (more than 55% Zn) used as secondary feeding to zinc smelters and inert slag which can be used for road construction.

Primus has been industrially implemented in Luxembourg (2003; 60 000 tpy of EAF dust) and in Taiwan (2009; 100 000 tpy of EAF dust mixed with residues from an integrated mill).
A reliable partner for environmental challenges

**i-Meltor™**

i-Meltor is a specially designed Electrical Arc Furnace, applied alone or combined either with a MHF (Primus) or with a RHF (RedSmelt). When used in a single step process, it allows the recycling of various types of ferrous and non-ferrous metal containing by-products generated by the metallurgical industry (carbon or stainless steel EAF dust and sludge, ferronickel residues, Waelz slag, spent catalysts, copper slag,...). In such a configuration, i-Meltor is well adapted for processing rather small volumes of materials (60 000 – 100 000 tpy). When combined with a MHF or a RHF, i-Meltor is used for final reduction and melting.

**PLD de-oiling**

PLD is a de-oiling process jointly developed by Paul Wurth (engineering & equipment) and Lhoist (lime producer). The PLD process consists in an exothermal chemical reaction controlling oil oxidation at low temperature in a specifically designed MHF. The output is a dry fluid iron oxide with a remaining oil content of less than 0.1% which can easily be recycled at the sinter plant. The PLD MHF is typically configured for treating between 25 000 and 75 000 tpy of oily materials most often generated by rolling mills.

**Ciroval™**

Ciroval is a low temperature selective leaching process designed for extracting the zinc-lead content from BF sludge and returning the “clean” iron-carbon fraction to the BF route (sinter). The concentrated zinc-lead cake produced after leaching and precipitation can be reused by the non-ferrous industry. Ciroval is typically configured for processing 15 000 to 40 000 tpy of dry BF sludge.
The Paul Wurth Group is today one of the world leaders in the design and supply of complete plants, systems and processes as well as specialised mechanical equipment for:

**the iron & steel industry:**
- Blast Furnaces & Auxiliary Plants
- Coke Making Plants
- Agglomeration Plants
- Direct Reduction Plants
- Environmental Protection, Recycling & Energy-Saving Technologies

**other industries:**
- Systems & Equipment for Non-Ferrous Pyrometallurgy, Electrometallurgy & Residue Treatment
- Intralogistics Solutions for Heavy Loads
- Engineering & Project Management for Civil Construction and Infrastructure Projects


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