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 specialized mechanical equipment for the iron & steel industry:

- Blast Furnaces & Auxiliary Plants
- Coke Making Plants
- Direct Reduction Plants
- Environmental Protection Technologies
- Special Steelworks Equipment / Systems
- the non-ferrous and ferro-alloys industry:
  - Equipment and Processes for Pyrometallurgy
  - Equipment and Processes for Electrometallurgy
  - Solutions for Residue Treatment

Recycling Technologies

RedSmelt™/ RedIron™/ Primus®/ i-Meltor™/ PLD
**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 recycling processes so as to be able today to propose a comprehensive range of solutions for processing residues from the iron, steel and non-ferrous industry.

**RedSmelt™**

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

This new technology has been developed to meet the growing demand for a low-cost and environment-friendly ironmaking alternative to the traditional blast furnace route. This process reaches a production capacity of 0.3 -1.0 mtpy of hot metal and may be used to treat the widest range of fine iron ores and steelmaking residues.

**RedIron™**

RedIron is a direct reduction process using a 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 located in the Lucchini steelworks in Piombino, Italy. Developed and built by Paul Wurth, the plant was commissioned in May 2010. The plant is designed to recycle 60 000 tpy of residues and to produce 40 000 tpy of DRI that are briquetted and charged into the BF. The treated materials are BF and BOF dusts, BF sludge, mill scales and pellet fines.

**Primus®**

The Primus process is well adapted for processing dust, which contains more than 5 % of zinc and is typically generated by EAF mini-mills. When fed with EAF dust, Primus produces hot metal of a quality similar to the one produced by a blast furnace, zinc oxide concentrate (more than 55 % Zn) and an inert slag which can be used for road construction.

The Primus process is a two-step process: drying/heating/pre-reduction and final reduction/melting, combining a Multiple Hearth Furnace (MHF) and a specially designed Electrical Arc Furnace to recover valuable metal contents from steelmaking by-products.
The Primus process has been industrially implemented first in 2003 in Luxembourg (for recycling 60 000 tpy of EAF dust) and in 2009 in Taiwan (for processing 100 000 tpy of EAF dust mixed with residues from an integrated mill). The high flexibility of the Primus® process allows the joint processing of dust, sludge and scales.

**i-Meltor™**

i-Meltor is a specially designed Electrical Arc Furnace, combined either with a MHF (Primus), with a RHF (RedSmelt), or applied alone. 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,...). The main characteristics of an i-Meltor furnace are:

- central charging (between three electrodes),
- high power rate (more than 1 MW/m²),
- variable bottom stirring allowing both rapid smelting/refining and smooth settling.

**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. The process uses a specifically designed MHF which allows intimate mixing of oily materials with a specific lime and a slow oxidation of oil. The output is a dry fluid iron oxide with a remaining oil content of less than 0.1%.

With 6 hearths and 4m diameter, the PLD MHF is typically configured for treating around 25 000 tpy of oily materials. The design can be adapted to bigger volumes (up to 75 000 tpy).

While the main purpose of the PLD technology is to process oily sludge generated by rolling mills, it also provides an efficient answer for treating any type of oil polluted materials or soils.
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  - Equipment and Processes for Pyrometallurgy
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**Engineering & Technology worldwide**