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Industrial Management and the Environment: The Path Toward a Sustainable Balance

Val Rogno: Drones, Geotechnical Analysis and Water Monitoring Supporting the Evolution of the Storage Facility. Several important land restoration projects have already been completed within the area.

Pontenossa S.p.A., one of only two companies in Italy specializing in the treatment of Electric Arc Furnace Dust (EAFD), has been supporting the national steel industry since 1994.

In addition to collecting and recovering these residues, Pontenossa plays a key role in preventing their disposal in landfills, transforming what is considered hazardous waste into a new resource for industry.

Through the **Waelz process**—a technology developed at the beginning of the twentieth century and continuously improved over time to the point that it is still considered the industry's **Best Available Technique (BAT)**—industrial dusts, combined with reducing agents, are treated at high temperatures inside a rotary kiln. This process produces **Waelz Zinc Oxide (WZO)**, a secondary raw material that is subsequently reintroduced into the production cycles of various industrial sectors.

The Storage Facility

While the process enables the recovery of zinc contained in steel mill dust in the form of zinc oxide—a grey powder used in sectors such as automotive, cosmetics, and metallurgy—it also generates a residue known as **Waelz slag**.

This sand-like material, although classified as non-hazardous because it consists mainly of iron oxide and lime with only trace amounts of zinc and lead, still requires controlled management.

The material is deposited within Pontenossa's storage facility located in **Val Rogno**, behind the company's operating site and situated in the basin between the municipalities of **Gorno** and **Premolo**.

Covering more than **100,000 square meters**, the facility provides storage capacity sufficient for many years at current production rates.

At the same time, Pontenossa has long been conducting laboratory research aimed at the partial—and ultimately total—recovery of Waelz residue, with the objective of fully closing the circular economy loop.

“We have always worked with a clear vision: to manage the facility according to the highest safety standards while progressively reducing the need for storage,” explains Pontenossa CEO **Claudio Cerioli**.

“Our role is to govern a complex process that requires constant control, maintenance, and continuous evolution, while maintaining great attention toward the environment and local communities.”

This vision is reflected in infrastructure designed according to rigorous safety and environmental protection standards, with particular consideration for the mountainous environment of the Seriana Valley.

The facility is equipped with multi-layer waterproofing and drainage systems connected to collection networks and inspection structures that allow continuous monitoring of water and internal flows.

Collected water is conveyed to a treatment plant, where advanced technological processes improve water quality and ensure compliance with environmental standards before it is returned to the natural water cycle.

Water originating outside the storage area follows separate pathways in order to preserve the natural hydraulic balance of both the area and the **Riso Stream**.

Inspections and Monitoring

Monitoring of the storage facility is continuous and multi-layered.

It is managed by internal personnel and supported by independent third-party organizations and professionals responsible for periodically verifying compliance with the company's **Integrated Environmental Authorization (AIA)**.

The facility incorporates multiple protection barriers supported by state-of-the-art monitoring and detection systems capable of identifying and reporting potential ground movements.

These activities are complemented by periodic surveys and three-dimensional analysis technologies that ensure continuous assessment of site conditions and measurement of volumetric changes over time.

“Every phase is continuously monitored. We are talking about controls on surface water and groundwater, stability assessments of the terrain, and ongoing analysis of environmental parameters,” emphasizes **Fabrizio Panella**, Chief Operating Officer of Pontenossa.

“The management of the facility is supported by advanced technologies and operational procedures that allow us to maintain high safety standards and intervene proactively whenever necessary.”

The robustness and reliability of the system are regularly verified through multi-level inspections involving environmental authorities and the municipalities affected by the facility.

Monitoring activities include environmental controls, dedicated analyses, and field surveys aimed at ensuring site safety, protecting environmental matrices, and preserving the ecological balance of the surrounding area.

A Network of Experts Working for Site Safety

Behind the management of the Val Rogno storage facility lies not only industrial activity, but also an extensive system of technical and environmental controls supporting the site's long-term evolution.

Alongside routine maintenance and the deployment of advanced preventive technologies, specialized technicians, analytical laboratories, and external professionals continuously assess site conditions.

“The safety of a facility like this begins with continuous geotechnical and hydrogeological control,” notes geologist **Sergio Santambrogio**.

“Groundwater monitoring, terrain stability verification, and continuous analysis of technical parameters allow us to track the site's evolution over time and ensure safe and controlled management conditions.”

Activities include:

- Periodic analytical campaigns
- Drone-based three-dimensional surveys
- Technical modeling of the landfill body
- Monitoring systems capable of evaluating the hydrogeological evolution of the entire area

“Over the years we have invested heavily in the quality of management,” adds Fabrizio Panella.

“Scheduled maintenance and continuous monitoring are fundamental elements of our work. Operating responsibly means protecting the environment and maintaining a relationship of attention and respect toward those who live here.”

In areas already completed, located on the slopes of the storage facility, environmental restoration activities have long been finalized. Older deposited material has been covered with gravel and clay and subsequently revegetated, restoring a natural appearance that blends into the surrounding mountain landscape.

Closing the Circular Economy Loop

Alongside site management and monitoring activities, research efforts focused on environmental sustainability and Waelz residue recovery continue.

Within this framework, the **Project Caronte** initiative has been developed in collaboration with private partners and universities to investigate potential applications of Waelz residue in cementitious and bituminous products, replacing natural aggregates such as sand and gravel.

The project aims to determine whether appropriately treated residues generated by the industrial process can be reused as partial substitutes for aggregates traditionally extracted from quarries.

The objective is twofold:

- Reduce the consumption of natural resources
- Minimize the amount of material requiring final disposal within the storage facility

“The analyses carried out have shown that, after appropriate treatment, the slag develops mechanical and chemical characteristics potentially suitable for these applications,” explains Fabrizio Panella.

“We are currently conducting pilot-scale tests and intend to expand their scope in order to obtain the necessary authorizations and achieve End-of-Waste certification for our residue, allowing us to place it directly on the market, ideally in its entirety.”

“Our goal is to move toward a model in which the quantity of residue sent to storage becomes increasingly limited, favoring reuse and valorization instead: the complete closure of the circular economy loop,” concludes Claudio Cerioli.

Renewable Energy Supporting Circularity

In addition to material recovery, Pontenossa integrates renewable energy into its operations.

The company self-generates well over **30% of its electricity demand** through:

- A photovoltaic plant capable of covering the entire electrical demand during daylight hours
- A hydroelectric power plant

These investments contribute both to environmental sustainability and to greater independence from energy price fluctuations driven by geopolitical factors.