ENVIRONMENT AND CIRCULAR ECONOMY

The case of a possible synergy

The Waelz process. If this system did not exist, steel mill fumes would not be transformed into new raw material. And the mines would be grateful.

In the current context, in which the transition towards sustainable production models represents a strategic priority at a global level, the circular economy is emerging as a fundamental paradigm to reconcile industrial development and environmental protection.

In this scenario, companies are called to rethink their processes with a view to resource regeneration, waste reduction and the valorization of materials throughout the entire life cycle.

“The activity of Pontenossa Spa,” confirms Claudio Cerioli, CEO of the company, “fully falls within the Circular Economy, recovering strategic metals from a waste deriving from steel production, and then restoring their value by reintroducing them into the industrial production cycle. Pontenossa therefore plays a dual role: that of an actor of circularity and of environmental protection, reducing the amount of waste sent to landfill.”

The more raw materials are recovered, in the case Pontenossa zinc from steel mill dust, the fewer virgin materials are extracted from mines. “The recovery process used by Pontenossa in turn generates residues which are, however, in smaller quantities than those received.” But the challenge of circularity does not end here.

“These residues are themselves the subject of an internal research project, aimed at identifying possible fields of application, for example in cement and bituminous uses, as a substitute for natural aggregates such as sand and gravel extracted from quarries.”

From scrap comes steel, from the residues of this process come strategic metals, and from the waste of this latter process come secondary raw materials that avoid the extraction of new natural materials.

In summary, this is the closing of the virtuous loop that Pontenossa Spa is working towards.

Ecological impacts

The impact of the Waelz process, as the one implemented by Pontenossa is called, is not and cannot be zero. “However,” states Fabrizio Panella, Chief Operating Officer, “reducing environmental impact is for Pontenossa a comprehensive commitment across the territory and involves control of water, emitted air and CO_2 footprint through systems for the abatement of metals and pollutants applied to water and air emissions from the plant, investments in renewable energy, developments based on AI to maximize the recovery of metals from treated waste and at the same time reduce both the consumption of reagents

required for the process and the volume of residues generated by the process itself." Measurements of impacts are carried out both by the internal laboratory and by third parties.

"All parameters that may have an impact on the environment," continues Panella, "are subject to continuous monitoring by the internal laboratory, with the involvement of supervisory authorities and with the support of academic professionals and qualified external laboratories. Incoming waste, reagents used in the process and production residues are controlled and analyzed.

Air monitoring is carried out through abatement systems operating continuously and verified through annual air quality monitoring campaigns in neighboring municipalities.

A similar process is applied to water discharged from the industrial process, and annual checks are carried out on the biological health of the Riso stream, monitoring the status of fish fauna."

Energy sources

Pontenossa is able to self-produce over 30% of its electricity needs. Investments in innovation and process have also made it possible to reduce unit methane consumption by more than 20%.

"Finally," concludes Panella, "the evolution towards sophisticated digital twin systems has enabled better control of the production process, with positive effects on extraction efficiency, reagent use, and the quality and quantity of both the final product and production residues."

The company supporting the territory and communities

Monitored impact

The natural environment in which the Pontenossa plant is located requires additional attention to the impact the company has on the territory. "We want to be an industrial activity," says Panella, "that considers the territory as an ecosystem to be protected and enhanced." It is within this perspective that Pontenossa Spa's commitment is framed, integrating production development and environmental responsibility for the benefit of the local community.

The recovery of hazardous waste is a pillar of the company's action and contributes to reducing waste to be disposed of and the impact on the territory. "Incoming materials and residues are selected and analyzed, while emissions are continuously monitored. Control is supported by periodic campaigns to verify air quality in neighboring municipalities and by biological monitoring of the Riso stream.

Our commitment goes beyond regulatory obligations, based on prevention, transparency and continuous improvement, in support of the environment and quality of life."

Renewable energy from sun and water

Sustainability

Pontenossa Spa generates renewable energy from a hydroelectric plant and from a photovoltaic system that will become operational during 2026, managing the contribution of these two sources depending on weather conditions in order to maximize their use within the plant.

The photovoltaic system, capable of supplying the entire electricity demand during solar irradiation hours, uses state-of-the-art technology.

The hydroelectric plant, among the first installed in Val Seriana at the beginning of the 20th century by Royal Decree, can cover approximately 50% of total plant consumption and can be remotely managed depending on needs.

In addition to environmental benefits, the use of renewable sources also provides greater independence from energy cost fluctuations due to geopolitical context.

More efficiency through intelligent process

Optimization

Pontenossa uses the Waelz process, developed at the beginning of the 20th century and improved over time to the point that it is now considered the "Best Available Technique" for zinc recovery from steel mill dust.

"The process," explains Luca Re, Production Manager, "takes place inside a rotary kiln over 60 meters long, where dust is mixed with reducing agents reaching temperatures above 1,300°C, at which zinc becomes gaseous and can be extracted as oxide."

Thermodynamics, mass balances, reaction kinetics and heat exchange are complex phenomena that combine within the kiln and are strongly influenced by the chemical composition of dust and reagents.

"The innovation introduced by our company," continues Re, "consists of physical-mathematical modeling of the phenomena inside the kiln and the introduction of AI-based learning techniques that correlate plant sensor data with material analysis."

The Waelz process has therefore evolved into a data-driven and digitally optimized system capable of providing operators with recommendations on optimal operating parameters.

This ensures more stable operation, reduced CO2 footprint, lower reagent consumption and higher zinc recovery yields.

“These results,” concludes Re, “are the outcome of the contribution of Pontenossa’s people and internal know-how.” The technological evolution has been supported by operator experience and collaborative process improvements.

“Waelz zinc oxide, reintroduced into the zinc production cycle, is the evidence of Pontenossa’s commitment to circularity and sustainability.”

The value of zinc in modern industry

Applications

Zinc is one of the most widely used metals in modern industry.

It is mainly used in steel galvanizing, protecting structures, bridges, vehicles and infrastructure from corrosion. It is also used in alloy production, especially brass, for plumbing components, valves, musical instruments and everyday objects.

It is important in batteries, especially alkaline ones and emerging energy storage technologies. Its compounds, especially zinc oxide, are used in rubber, tire and paint industries.

It is also widely used in dermatology for its protective, antibacterial and soothing properties, in creams, ointments and sunscreens.

Its use is also growing in fertilizers and agriculture, where zinc is a micronutrient, as well as in electronics and nanotechnology applications.