5. Research and development activities

Steel for Construction Italy business unit
Feralpi Siderurgica S.p.A.

The following R&D projects started in previous years continued during the year.

Coralis

Coralis project, co-funded through the Horizon 2020 European Funding Programme. In the financial year, the phase of defining processes for reclaiming slag and other residues by producing ferro-alloys and charging materials was completed. The tests then continued at an external pilot plant for the recovery of metal fractions through oxide reduction. Additionally, this process entailed outlining the optimal by-product combinations for recovery, selecting their compaction methods, and preparing the most appropriate size for treatment as by-products. The project also included activities in cooperation with other partners related to technical-economic feasibility analyses, environmental impact assessments, scenario studies, and dissemination.

"Steel Zero Waste"

"Steel Zero Waste" project, co-funded by the Ministry of Economic Development (MISE), launched in 2023, aims to study solutions for improving the environmental sustainability of the steel-making process through the implementation of innovative technologies for eliminating waste and significantly reducing emissions. Project activities included the completion of billet heating via electrical induction, and the development of the production sludge dewatering system. Efforts also continued in reclaiming slag for use in Construction materials and in testing plastic materials as substitutes for existing polymers and fossil-derived carbon in EAF. Analyses of the performance of the scrap shredding machine continued with the aim of achieving improved melt performance and possible reuse of the oxides in other reduction processes.

ModHeaTec

ModHeaTec Project, in 2024 the ModHeaTec project "*Modular HEATing Technology through renewable resources for steel production*" continued for the Feralpi Siderurgica site in cooperation with other production sites and research bodies within the framework of the European R&S Horizon-Twin Transition co-financing call. The aim of the project is to promote, realise and test the introduction of alternative heating systems to the use of gas through the use of electrical sources in order to drastically reduce CO_2 emissions in steel production. Applications are evaluated at two production sites. Within the project, Feralpi Siderurgica collaborates with ESF Elbe-Stahlwerke Feralpi GmbH to conduct tests and experiments on its billet samples as well as to assess potential applications in its plant configuration. In the year in question, preliminary studies and evaluations were carried out to identify the possible small-scale experimental pilot solution to be implemented.

Modiplant

Project Modiplant, the project "*MODular hybrId technology in the Steel PLANT production*" (MODIPLANT) continued in the year 2024 for the Feralpi Siderurgica site with the participation of ESF Elbe-Stahlwerke Feralpi GmbH within the European funding programme for research RFCS-2022-CSP-Big Tickets for Steel. Within the project, Feralpi Siderurgica aims to develop an innovative method of billet heating by electricity as an alternative to induction, leading to the implementation of an actual industrial-scale demonstration of the system. During the year, studies, and simulations were carried out to define the plant solution to be adopted. The design of the system and the selection of the expert supplier to whom the activity was commissioned were carried out. For the plant under study, the phase of component construction and material acquisition, as well as the relevant site preparation, was initiated.

Sunshine

Project Sunshine, in the year 2024, the Sunshine project ("*SUstainable New casting and rolling process monitoring / sensing approach aimed at proper surface quality and SHape IN flat and long products, enabling Energy savings and smart management in the casting*") was initiated, dedicated to improving the quality of the billet semi-product through the implementation: an integrated system comprising advanced continuous casting sensors, AI criteria for identifying defect origins, and process modelling applied online. The project's specific aim is to enhance the billet shape quality, thereby boosting performance not only during the casting process but also in the subsequent rolling process.

Steel for Construction Germany business unit
ESF - Elbe Stahlwerke Feralpi GmbH

ModHeaTec

ModHeaTec Project - ESF Elbe-Stahlwerke Feralpi GmbH is in charge of supporting Feralpi Siderurgica in evaluating the configuration of the pilot plant to be built and in assessing any potentially useful experimentation in order to also consider the production process and layout of ESF Elbe-Stahlwerke Feralpi GmbH. Testing will be conducted with billet samples from ESF Elbe-Stahlwerke Feralpi GmbH to evaluate both the effects on the products and the technical-economic and scalability aspects of the proposed solutions. Project started in 2023.

Modiplant

Project Modiplant ESF Elbe-Stahlwerke Feralpi GmbH carried out the necessary activities to study the plant engineering solution for innovative electric billet heating. ESF Elbe-Stahlwerke Feralpi GmbH is specifically tasked with assisting Feralpi Siderurgica in assessing the industrial implementation of the innovative electric billet reheating plant solution and overseeing the testing phase. This was carried out with the aim of evaluating the repeatability at the specific site, considering both the expertise gained and the limitations imposed by one's own plant, by exploring various installation configurations within the rolling department. Project started in 2023.

FlexHybHeat

FlexHybHeat Project. This project involves simulating heating options using various energy sources such as electricity, hydrogen, or natural gas, and others like ammonia, along with assessing all potential combinations to determine which technological mix and level of flexibility are suited for a future billet heating concept. The second part of the project focuses on developing a new type of heating control system with integrated CO_2 emissions calculation and real-time cost analysis, also considering the stability of the electricity grid and the fluctuations of market prices on a quarterly basis.

Specialties Business Unit
Acciaierie di Calvisano S.p.A.

iSlag

The **iSlag Project**, ended in 2024 with the activities related to the implementation of online slag monitoring systems and process simulators. In particular, systems for monitoring the condition of the raw materials and their transition from furnace to ladle were evaluated. Furthermore, to complete the activity, real-time process simulators for the furnace and out-of-furnace areas were developed alongside the associated Decision Support System, to obtain the best corrective recommendations for the entire process and downstream slag management.

MultisensEAF

MultisensEAF project, during the 2024 financial year, new sensors for managing the EAF process were assessed, and initial tests were performed on the following: a novel sensor for detecting steel levels in the EAF, an acoustic system for monitoring electric arc coverage, water flow sensors in the panels, and an OES system for online detection of slag composition. To complement the sensor systems and support the optimisation of the melting process, a dynamic furnace simulator is being developed that digitally replicates the state of the scrap melting.

Biorecast

Biorecast Project, throughout the 2024 financial year, the project advanced with the objective of assessing Biocoal and polymers as replacement materials for fossil coal introduced into EAF, aiming to enhance slag foaming and arc coverage in the special steel industry. For this purpose, the Acciaierie di Calvisano project has implemented a new EAF material storage and propulsion system, with which it has already conducted initial operational tests and analysed the results.

Arlenico S.p.A.

DeepQuality

DeepQuality Project, is aimed at the implementation of an advanced sensor system and a monitoring system for process parameters in order to identify process anomalies and the relevant quality standards. To achieve the project results, a predictive model was developed that considers quality and process parameters by monitoring mechanical strength as the main KPI. In 2024, the project concluded with the deployment of these systems and the associated testing and validation of the adopted technological guidelines, maximising system reliability and the consequent benefits.

LEGEND

Environmental Commitment

Industrial Commitment