

Designing and building a sustainable pilot plant to recover waste heat from complex waste gas streams from a steelmaking facility

- The LIFE HI4S project is being funded by European Union, and it aims to extract the most of the waste thermal energy from an Electric Arc Furnace (EAF) in a steelmaking facility, in order to reinsert it into the conventional steelmaking process to decrease the energy consumption of the plant
- One of the project's goals is to install a pilot plant in the facilities of ArcelorMittal in Sestao (Bizkaia), to be able to test it and study the potential benefits and areas of improvement of this technology

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Materials under the classification of “Iron and steel” are the most used metals in the world and the third most produced non-fuel mineral/metal across the globe, just behind sand/gravel and concrete. Nonetheless, despite having evolved during centuries (especially during the XX century) the manufacturing processes carried out within the steelmaking sector demands large amounts of energy, mainly because of the high temperatures that shall be accomplished during the different stages of steel production. It is for this reason that their facilities represent one of the most relevant Energy Intensive Industries or EII (among others such as glass, ceramic, foundries, non-metallic minerals, etc.). This high energy consumption (estimated in about 30 % of the total EU energy demand) directly implies an important generation of CO₂, incremented by some steelmaking processes which uses mineral carbon as a reducing agent of iron ore.

With the aforementioned information in mind, it seems reasonable to focus on the steelmaking plants, as well as others within the EIIs, as a strategic target to invest in enhancing technologies which might directly contribute to the energy consumption reduction and decarbonisation of the industrial sector in a meaningful way.

In this sense and under the umbrella of the EU funded [LIFE HI4S project](#), a cluster of companies led by the research center [CIC energiGUNE](#), and conformed by [ArcelorMittal](#), [SDEA Engineering Solutions](#), [Fivemasa](#), [Enerbasque](#), [LCE](#), and [Azterlan](#), have already accepted the challenge of designing and building a pilot plant within the facilities of a steelmaking plant of [ArcelorMittal](#) located in Sestao, Bizkaia. This pilot plant will be focused on recovering the most of the energy from one of the main and complex sources of waste heat in a steelmaking plant: exhaust gases from an Electric Arc Furnace (EAF).



In current steelmaking operations, these exhaust gases are normally released to the environment previous treatment to reduce the amount of pollutants and their temperature to allowable levels according to the corresponding environmental legislations, so an important amount of energy is wasted during these treatments.

Energy recovery from waste heat streams is not a novel concept and there are currently proven commercial technologies adapted to different industries; however, the [LIFE HI4S project](#) focuses on addressing the next major challenges which are not normally covered by other technologies:

- High dirtiness in the waste heat stream
- Very high temperatures (+400 C) in the waste heat stream
- Self-production of the technology's energy needed to function
- Batching nature of the functioning of an EAF
- Valorisation of solid residues produced by a steelmaking facility

[SDEA Engineering Solutions](#) is the partner responsible of the design of the pilot plant and they have had into account all the before-mentioned challenges to come up with a solution developed in cooperation with the rest of the partners. In a glance, the process designed by [SDEA](#) consisted on the next steps:

- The dirty waste heat stream is taken and re-directed to a high temperature filter (HTF, designed by [Fivemasa](#)), where the solid particles are removed to obtain a hot clean stream
- After that, the hot clean stream can be taken to one or several critical equipment depending on the operation mode:
 - The scrap dryer (SCD, designed by [CIC energigUNE](#)) is the equipment in charge to dry the scrap and increase its temperature. It seeks for decreasing the energy consumption of the EAF since the scrap is used as a raw material for the melting process.
 - The ORC plant (ORC, designed by [Enerbasque](#)) is the equipment aimed to take the clean hot stream through an evaporator (heat exchanger designed by [SDEA](#)) and transform the thermal energy into electric energy to power the pilot plant with the use of a low GWP refrigerant.
 - The thermal energy storage system (TES, designed by [CIC energigUNE and Azterlan](#)) is the equipment in charge of storage the thermal energy by using valorised steel slag from the steelmaking process, in order to be available when needed to overcome the periods of lack of hot clean gases due to the batching nature of the EAF production process.
- After passing for the equipment needed, the resulting cold clean stream is returned to the plant main duct for further treatment before being released to the environment





www.hi4s-life.eu

PRESS RELEASE

The [LIFE HI4S project](http://www.hi4s-life.eu) started over the mid of 2021 and it is currently at the latest stage of the design process. The pilot plant is scheduled to be installed and functioning by 2023, and the piloting tests will continue until 2024. More information about the project as well as the most recent updates can be found in its webpage: <https://www.hi4s-life.eu/>



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About SDEA Engineering Solutions

SDEA Engineering Solutions is a technical consultancy company located in Vigo, Spain, and specialized in providing engineering support to various industries through a broad set of capabilities such as advanced simulation techniques (FEA and CFD); process design; and BIM. SDEA has demonstrated competency on different fields of industry such as Oil & Gas, Energy, Renewables, Maritime, Offshore, Transportation, and Railway electrification.

SDEA is integrated by a high skilled team of engineers deeply committed to develop national and international cutting edge technical projects. SDEA puts day by day its capabilities to the service of our clients for them to deliver high performance products and solutions that are safe, reliable and cost-effective.

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