NIWE - New Induction Wireless manufacturing

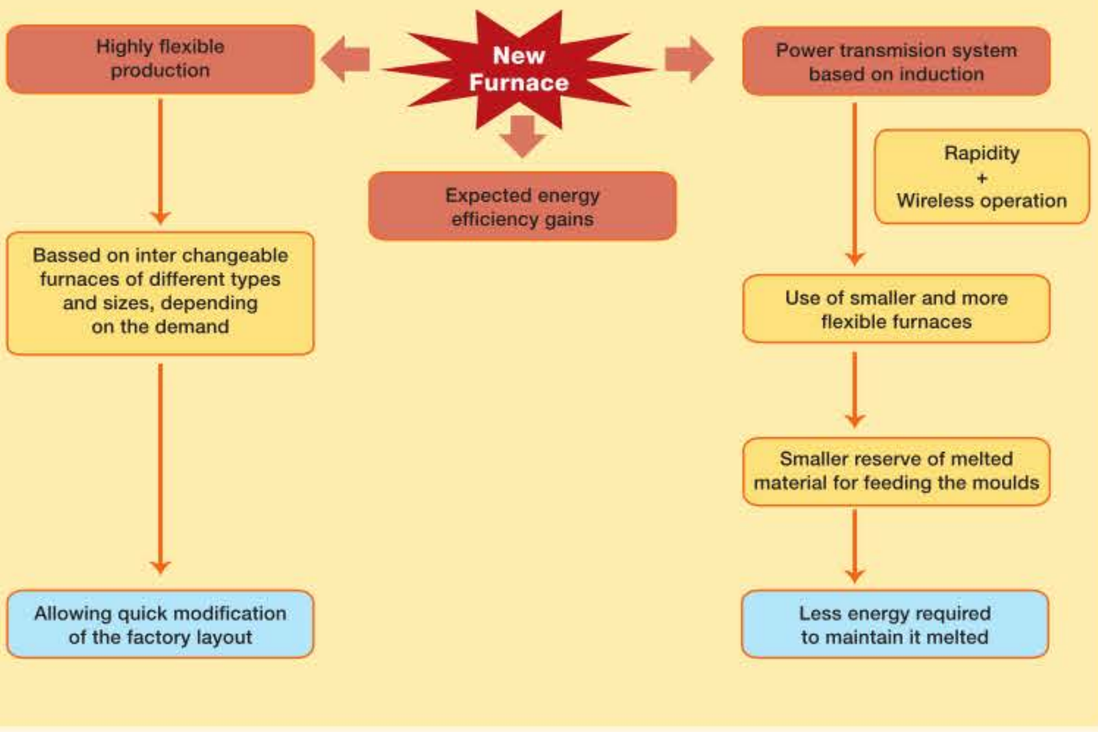
Efficient process for energy intensive industries

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement n.º 296624

Project Budget: 11,09 M€
European Union funding: 6,69 M€

Objectives

Demonstration of a new production process able to decrease the embodied energy of the foundry products by over 25%, reducing drastically its carbon footprint



Expected Results

- Recommendations for new processes and equipment.
- New integral design of processes, materials and equipment for aluminium, steel and iron demonstrators through simulation.
- New detailed concept and methodology for manufacturing processes in the metallurgical industry.
- Three furnaces prototypes to be tested including NIWE concept.
- Operation guides for the new processes and equipment.
- Definition of new production models.

Sectors tackled: Energy Intensive Industries from the Aluminium, Iron, Steel sectors

The processes involved in these Energy Intensive Industries (EII) share a common step where raw materials are heated in industrial furnaces to obtain a subsequently treated product

Traditional furnaces were initially designed and manufactured to be heated by coal or coke and the concept evolution has driven the newest furnaces to mostly be heated by gas or electricity resources such as: electrical arc, induction, reverberatory and crucible furnaces. However, these furnaces are still very high resources and energy demanding, as it is shown in Table 1.

Most of the energy consumed by these furnaces is used to heat the raw materials up to the corresponding melting points (from ~700°C for an aluminium furnace to ~1450°C for Iron furnace and 1650°C for Steel furnace).

From this energy used during the heating process, up to 50% is lost via heat transfers and gas waste.

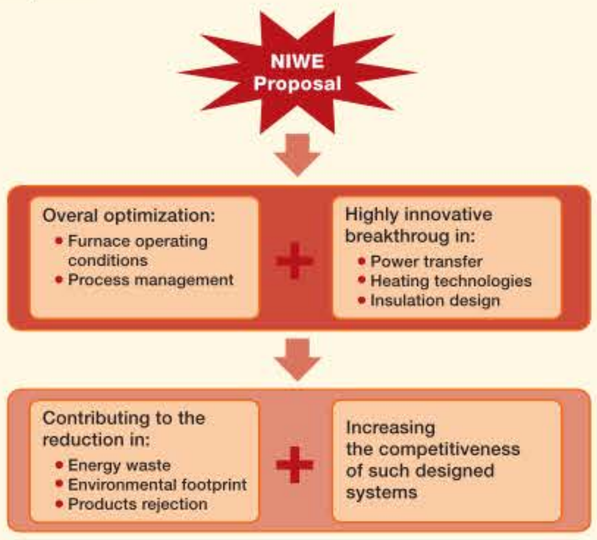
NIWE targeted sectors (EU)	Aluminium	Steel casting	Iron
Production (Mio ton/ year)	2,85	0,91	9,9
Turnover (billion €)	23,83	1,25	13,6
Energy intensity for melting (KWh/ton)	1.100	722	700
CO2 intensity (tco2/t)*	2,3	1,5	1,1
Total energy (GWh/year)	3.135	657	6.915
NIWE estimated energy SAVINGS up to 25% in the whole foundry process			
Embodied energy saving per tone of product kWh per tone	275	180,5	175
Estimated CO_2 reduction (Mio ton of CO_2 per year)	1,64	0,34	2,7

(*) CO_2 Abatement in the iron adn steel industry 2012; IEA Clean coal centre

Table 1: *Targeted sectors and long-term expected impacts;* Data from the he European Foundry Industry 2012. CAEF (The European Foundry Association).

NIWE proposal

NIWE is proposing an integrated approach to achieve an overall optimisation of the furnace operating conditions and process management along with highly innovative breakthrough in power transfer, heating technologies and insulation designs, significantly contributing to a reduction in the energy waste, the environmental footprint and products rejection while increasing the competitiveness of such designed systems.



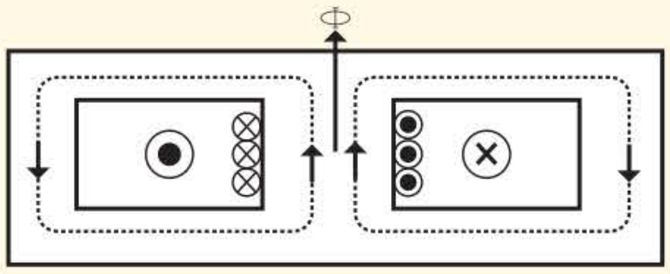
Technical characteristics: Inductive Power Transfer (IPT)

System formed by two coils, electrically islanded from each other, but magnetically coupled either through the air or through a magnetic material. This system is able to transfer electrical power with a high efficiency wireless

The inductive coupling system presented will be used to transfer energy from the source to the final consumption point without wires or physical connections

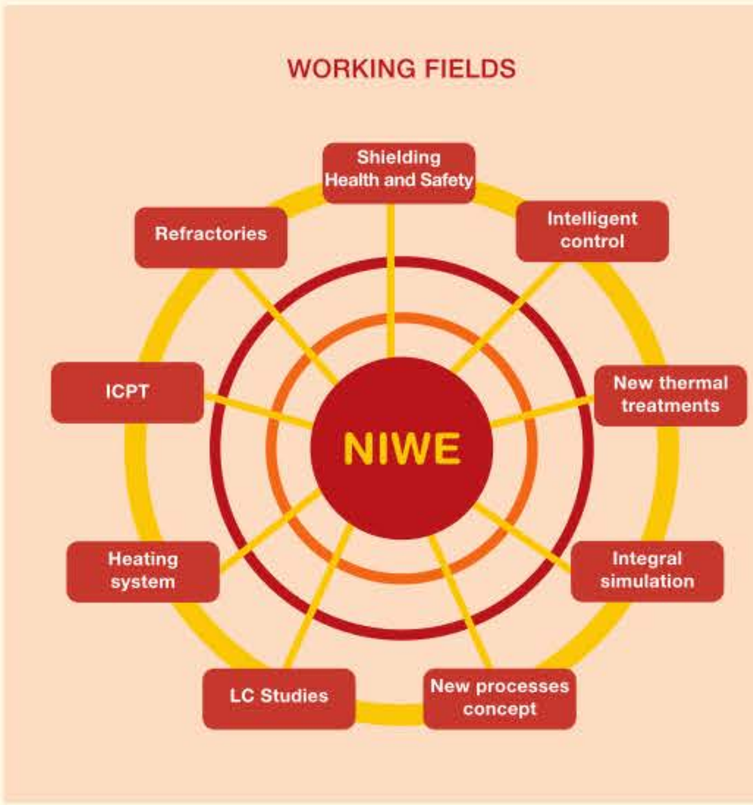
This new concept of induction changes the traditional one of fixed furnaces and moulds in the factory, providing a flexible layout and production for the metallurgy industry, improving the adjustment of the equipment and processes in the casting chain according to the current demand.

The IPT (100kW-900Hz) systems for wireless electrical feeding presents many advantages in relation with the traditional "plugged" systems, because the dirt, dust, water and chemical products do not affect them, while it prevents from electrical contacts and possible short circuits. They can be considered more solid because it doesn't have any mechanical pieces.



Activities

1. Specifications of technical conditions, environmental issues and health and safety aspects.
2. Detailed design of each demonstrator: new processes, materials and equipment.
3. Validation at laboratory scale of the pilots design and simulations, prior to the construction of the demonstrators.
4. Development of the necessary technical documentation prior to the construction of the demonstrators.
5. Construction of the three demonstrators. Test and validation of the new technologies.
6. Monitoring of energy consumptions, GHG emissions, and product quality.



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