

BAMBOO

BOOSTING INDUSTRIAL FLEXIBILITY

CAN HEAVY INDUSTRY BECOME MORE SUSTAINABLE?

Innovative technologies to increase the industrial competitiveness through the flexibility of processes

Due to its significant resource use, its waste and emissions, heavy industry has for many years been seen as an obstacle to sustainable development. But this is not the full story. Today the resource energy intensive industries (REII) must adapt their current consumption and production patterns to a higher share of renewable energy supply. In this new scenario, industrial plants

need access to better information and new technologies to enable higher flexibility on electricity supply while decreasing the consumption and dependence on fossil fuels. BAMBOO is a EU-funded project developing new technologies for energy and resource efficiency challenges in four intensive industries. These technologies will be adapted, tested and validated under real production

conditions and focus on three main innovation pillars: waste heat recovery, electrical flexibility and waste streams valorisation. BAMBOO will provide the industries with the information they currently lack for the adaptation of their processes to new and more advanced industrial demand response schemes to help them taking better decisions and to increase their competitiveness.



EXPECTED IMPACTS

BAMBOO is expected to demonstrate energy and materials demand management concepts in highly intensive industries relying on the valorisation and reuse of waste streams. BAMBOO solutions will make REII more sustainable as they will improve the energy efficiency of the processes while enabling a better management of the energy sources. Overall, BAMBOO technologies will save

costs, reduce emissions and improve energy efficiency in the four REII. Moreover, it must be considered that BAMBOO will enable the recovery and reuse of waste streams currently underused, which will become valuable by-products instead of residual streams, which will also influence the environmental impact of the REII.

-23%
costs of the
process

+18%
energy efficiency
of the process

-5%
CO₂ emissions

-35%
NO_x emissions

-15%
environmental
impact

FIELD DEMONSTRATION



STEEL

BAMBOO will test innovative solutions in the Spanish demo site of Avilés managed by the local **ArcelorMittal** company. Steel is the world's most popular construction material because of its unique combination of durability, workability and cost. We'll add the sustainability.



MINERALS

In the northern part of Greece, the **Grecian Magnesite** company is a pioneer in the mining sector, committed to environmentally sound mining practices. BAMBOO will reduce the dependence on fossil fuels, cut CO₂ and NO_x emissions and improve the flexibility.



PAPER & PULP

The Paper & Pulp demonstration will take place at **UPM** plant, in Germany. The main waste stream tackled in BAMBOO is bio-sludge industrial wastewater treatment after recycled fibre production process. The project will work on reducing wastes and emissions while improving the production processes.



PETROCHEMICAL

BAMBOO demonstration activities will take place in the **Tupras** petrochemical site, in Turkey. The objective is to generate electricity from waste heat source and reducing carbon emissions

INNOVATION PILLARS



WASTE HEAT RECOVERY

Waste streams usually have a valuable energy content associated to its exhaust temperature that is wasted in most cases. Hence the goal is to develop technologies to valorise this energy content and use it where it is required within the process. BAMBOO will study relevant streams in terms of waste heat recovery potential and its different uses, thus contributing to increase the flexibility options of the plant.



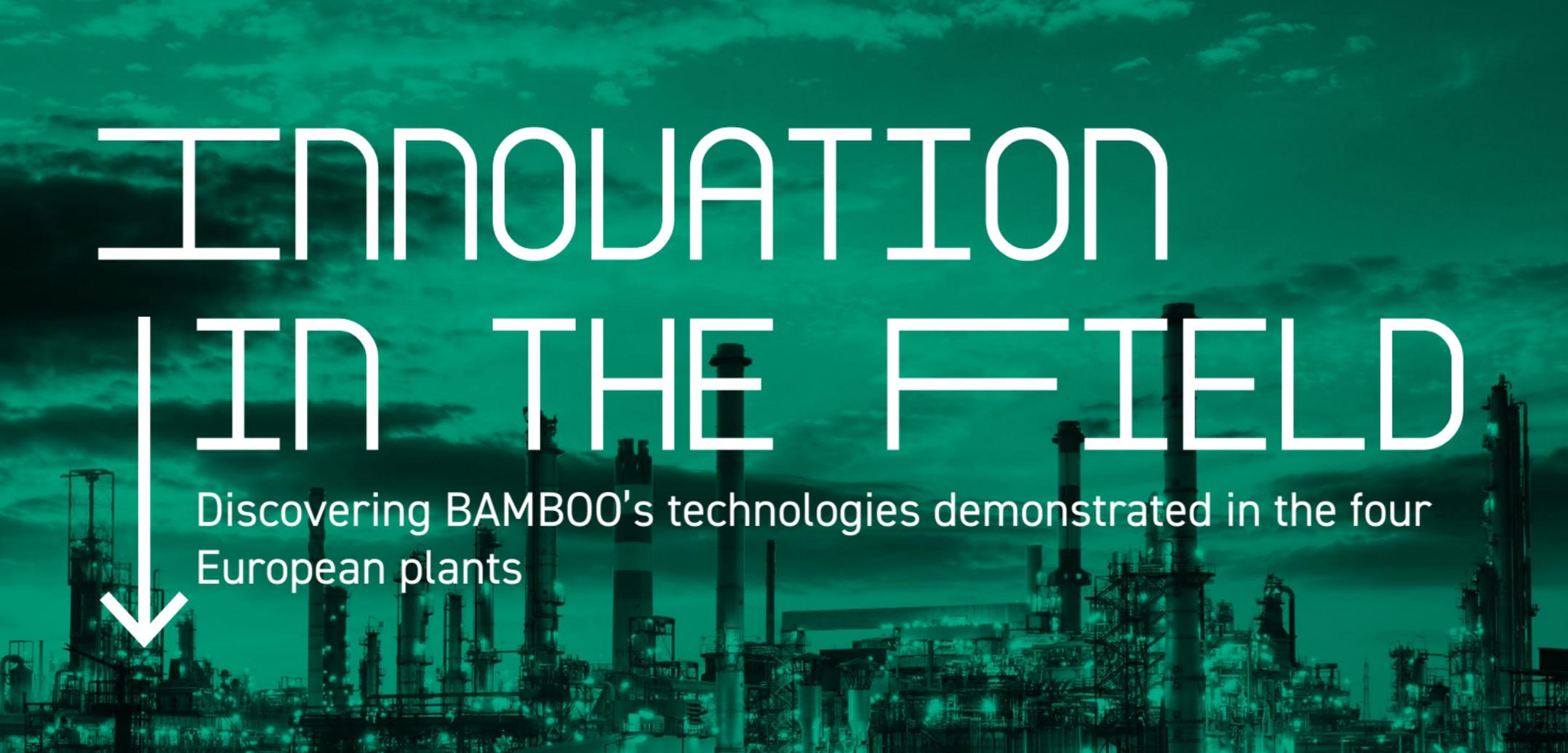
ELECTRICAL FLEXIBILITY

Flexibility in electricity consumption offers industries the possibility to benefit from lower electricity prices and potentially provide grid services, as well as enabling the potential integration of renewable energies. BAMBOO will develop an innovative hybrid process for sludge drying to allow the plant to consume electricity according to the grid conditions, provide grid services and facilitate the integration of renewable energy.



WASTE STREAMS VALORISATION

Many waste streams have a valuable calorific content and can be valorised as fuels for other processes, thus being a potential revenue stream for the industries. Therefore, BAMBOO will deploy technologies and processes that allow the upgrading of these streams and their valorisation (through improved combustion monitoring systems that enable the replacement of fossil fuels by off-gases).



INNOVATION

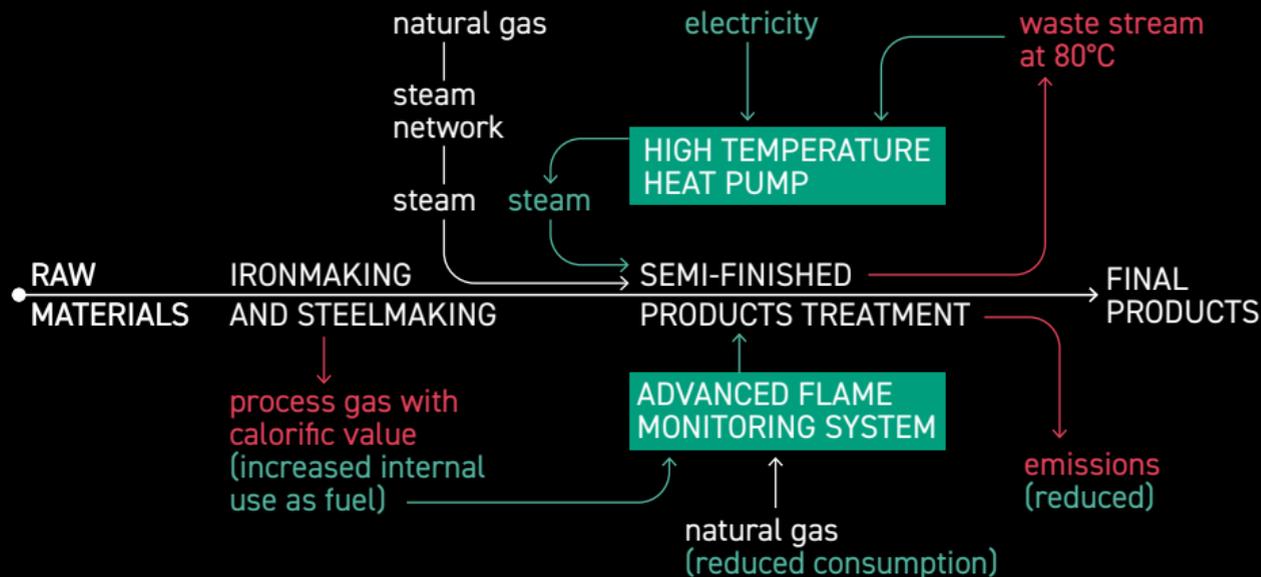
IN THE FIELD

Discovering BAMBOO's technologies demonstrated in the four European plants



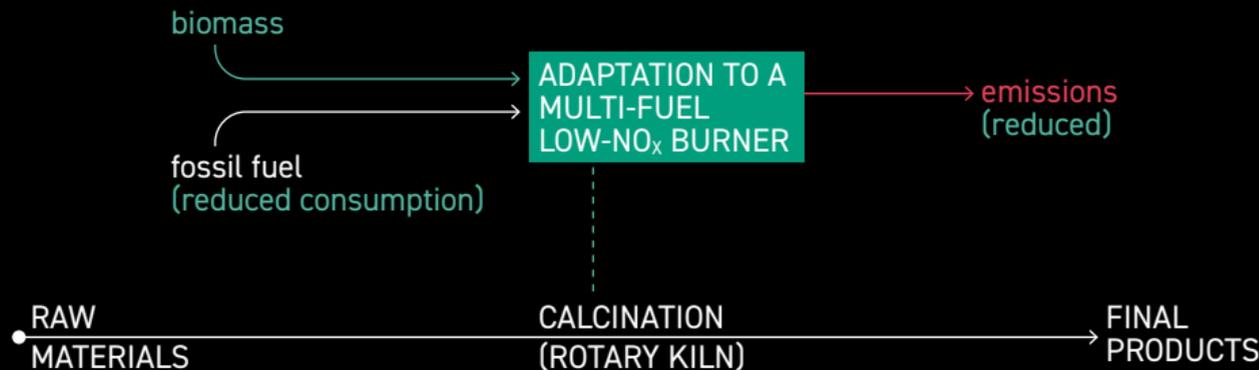
ADVANCED FLAME MONITORING SYSTEM AND HEAT PUMP FOR WASTE HEAT RECOVERY

A fraction of process gases generated in the iron- and steel-making process is currently wasted due mainly to some difficulties in the combustion control of these gases. The advanced flame monitoring system will contribute to a safe, efficient and low-emissions combustion in order to increase the internal use of this fuel and reduce natural gas consumption. Cold Rolling of strips consumes steam and generates a waste stream at 80°C. The heat pump will valorize this waste to generate steam, which will allow to reduce the consumption of natural gas and its emissions.



ADAPTATION OF CURRENT BURNER TO MULTI-FUEL LOW-NO_x BURNER

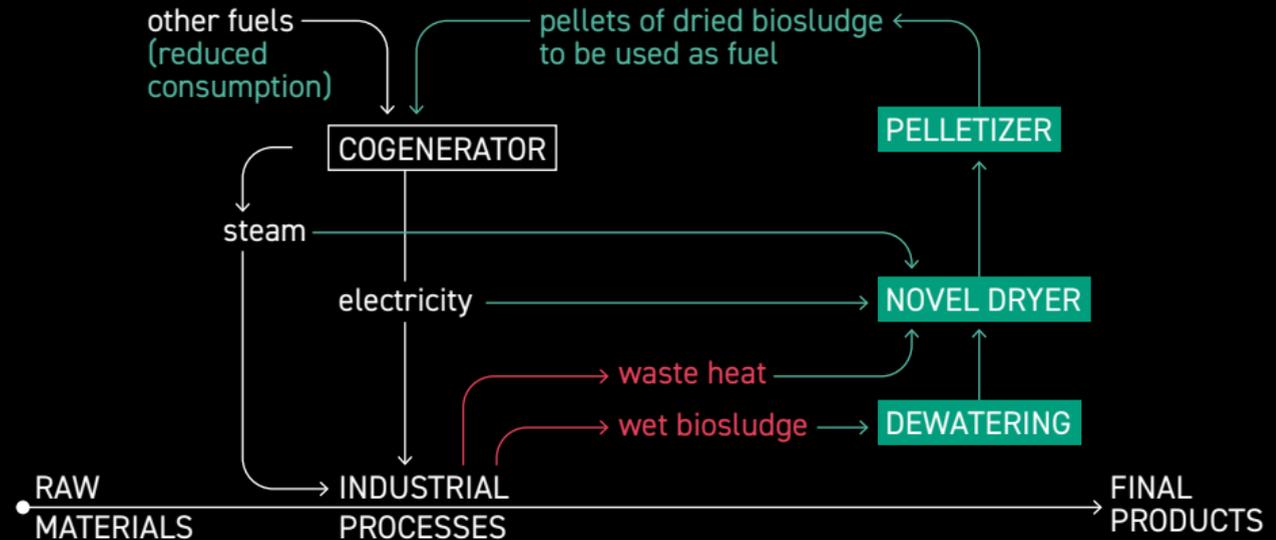
Calcination in the magnesium oxides manufacturing consumes very large amounts of fossil fuels, thus generating large CO₂ emissions. The adaptation of current burner at Grecian Magnesite will allow to improve the process: Firstly by introducing biomass as alternative fuel, thus contributing to a reduction in CO₂ emissions associated to fossil fuels; Secondly by reducing the nitrogen oxides (NO_x) emissions.



NOVEL TRIVALENT DRYER TO VALORIZE BIOSLUDGE AND TO IMPROVE FLEXIBILITY

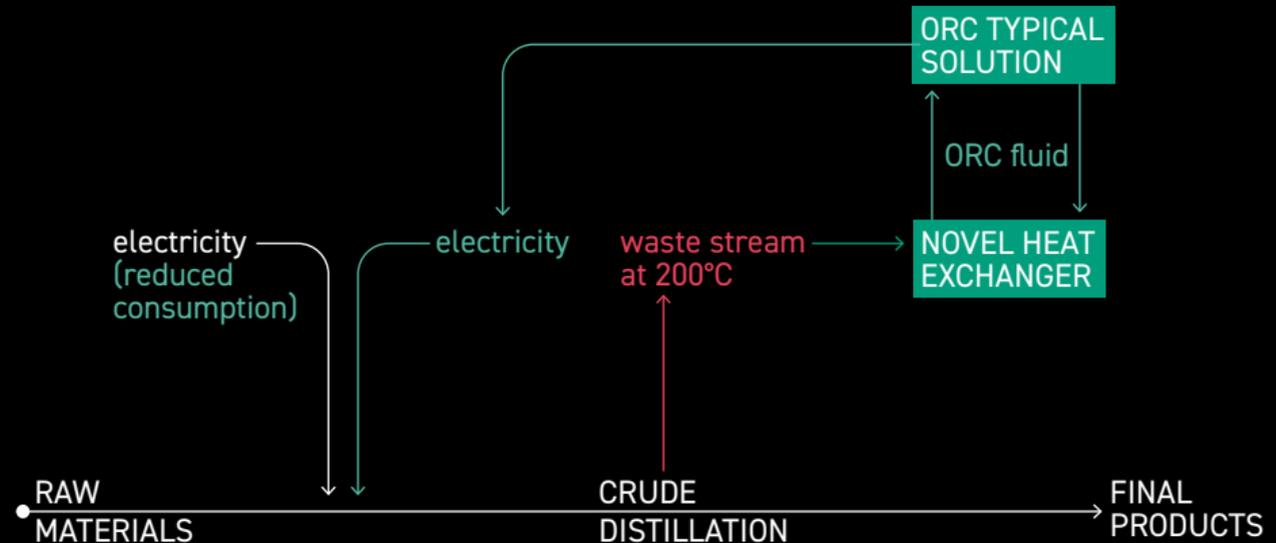
Wet biosludge is currently generated in UPM plant and wasted. This biosludge is expected to be valorised through the implementation of a new process to dry and pelletize it.

This would allow to valorise this stream as a fuel in the cogeneration plant. The novel dryer will be operated either by using steam, waste heat or electricity depending on their availability and prices, allowing to valorise the sludge and improving the flexibility of the system.



WASTE HEAT RECOVERY BY MEANS OF A NOVEL HEAT EXCHANGER FOR AN ORC SYSTEM

Tupras refinery consumes very large amounts of electricity. Currently, there is a waste stream at 200°C generated in the crude distillation unit that is cooled down in a traditional cooler without waste heat recovery. A novel heat exchanger will be developed in order to recover the waste heat in this stream and to generate electricity by means of an Organic Rankine Cycle (ORC) typical solution. This will allow a reduction in the current electricity consumption.



LEGEND:



current industry
element/system/process



element/system/process
implemented by BAMBOO



waste elements and streams

BAMBOO: FLEXIBLE INDUSTRY FOR A MORE SUSTAINABLE FUTURE

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BOOSTING NEW APPROACHES
FOR FLEXIBILITY MANAGEMENT
BY OPTIMIZING PROCESS OFF-GAS
AND WASTE USE

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