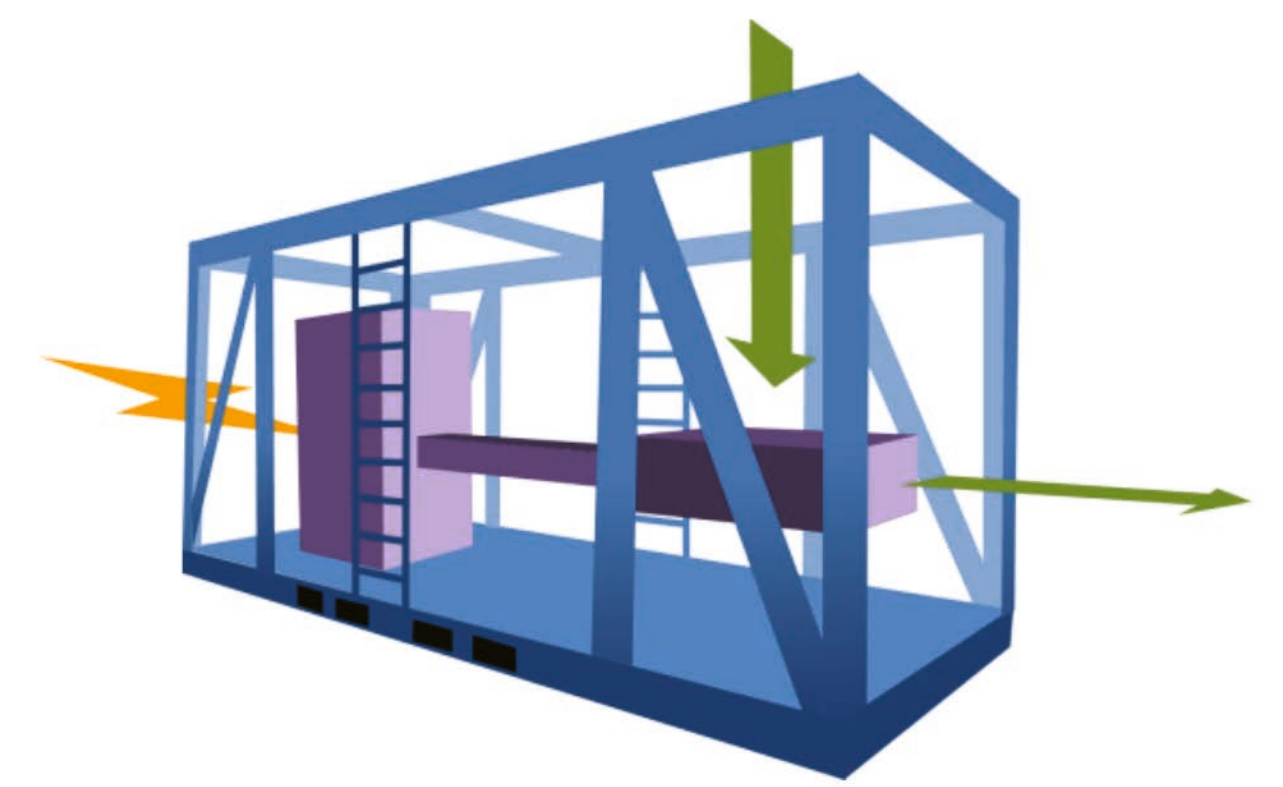




Development of an Efficient Microwave System for Material Transformation in energy INTensive processes for an improved Yield

THE PROJECT

The DESTINY project aims to realize a functional, green and energy saving, scalable and replicable solution, employing microwave energy for continuous material processing in energy-intensive industries. The target is to develop and demonstrate a new concept of firing for granular feedstock to realize material transformation using full microwave heating as alternative energy source and complement to the existing conventional production. The DESTINY system is conceived as cellular kilns in a mobile modular plant, with significant advantages in terms of resource and energy efficiency, flexibility, replicability, scalability, and a reduced environmental footprint. Availing of the DESTINY solution's capability to enhance process stability and efficiency, and given the characteristics of the used raw materials, DESTINY project will investigate intermediate/sub/final products to improve the performance of processes within 3 industrial sectors (Cement, Ceramics and Steel). New heating technologies, monitoring systems and numerical simulation tools will be used to drive the design of large-scale applicators and excel in the outcome.



OBJECTIVES

The DESTINY project aspires to introduce a “first-of-a-kind” high-temperature microwave processing system at industrial level, offering vital benefits to energy-intensive sectors: reduced energy consumption, lower lifetime operating costs, and an enhanced sustainability profile. The DESTINY system is designed to cover the “material feedstock-firing-product storage” process in a unique, clean, modular system with increased production flexibility, which will allow working with throughputs ranging from 10% to 100% capacity without any major loss in the overall process performance. The main objectives of the project focus on the improvement of efficiency ratios in the following areas:

- Improvement in energy efficiency by a minimum of 30% (depending on different industry and product applications).
- Decrease in SO_x, NO_x, CO₂ and CO emissions by 40% (without considering the electricity generation at steady state).
- Decreased OPEX and CAPEX by at least 15%.
- Delivery of a portable “ready-to-use” container-size microwave pilot plant, tested at industrial level.

DESTINY PILOT PLANT

Advances in the pilot plant of DESTINY have demonstrated the possibility of application to the industries of ceramic, cement and steel, obtaining products with similar or very close quality to the matured best available technologies obtained using conventional energy.

The microwave pilot plant modules installed in CEINNMAT facilities are being transferred to KERABEN facilities. Furthermore, the modules will be upgraded with the participation of the consortium. This will lead to a DESTINY demo plant of microwave firing to be used for more intensive production, optimizing the process to obtain the final, more ecologically sound products with marketable quality.

DESTINY results will be used to demonstrate the competitiveness of a lower-consumption and fully-electric technology.

TECHNOLOGY

The aim of DESTINY is applying non-conventional energy sources to energy-intensive industrial processes. The use of systems based on electricity – like the MW considered in the project – is a true alternative to fossil energy sources (natural gas consumption). The DESTINY module will be fully integrable within renewable electricity grids' fluctuations and thus provide significant advantages in terms of resource/energy efficiency and operational flexibility. An extensive list of innovations regarding various system aspects will be put in place to demonstrate an operational prototype of the new process at industrial scale related to:

- **Reactor, feeding system, plant integration**
- **Microwave technology**
- **Concept of application**
- **Monitoring and control**
- **Industrial use**



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