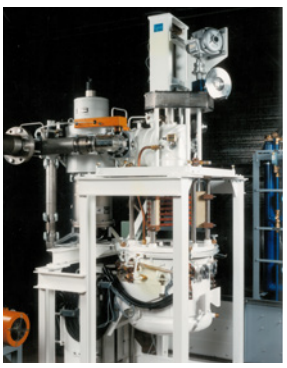
INDUCTION FURNACE



The elaboration and fusion of high added value materials or the improvement of the materials' physical properties all take place in vacuum or controlled atmosphere furnaces.

The following technologies can be used:

- Cold crucible (crucible with cooled copper or stainless steel parts);
- Hot crucible (graphite or other);
- Susceptor or muffle radiating (on the heated material);
- Plasma solutions.

TYPES OF APPLICATION

Elaboration and fusion of materials
titanium, Inconel®, zirconium, uranium, steel, aluminum, copper, cobalt, nickel, glass, enamel, ceramic, silicon, high added-value alloys

Improving the materials' physical properties
In addition to the previous materials: graphite, carbon*carbon , aluminum, stainless steel, steel

ADVANTAGES

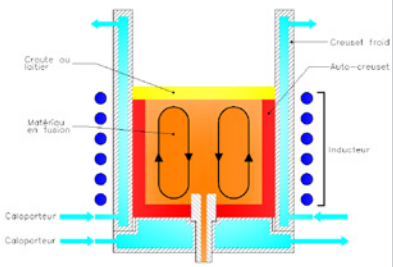
- Complex processes at high temperature (3,000 °C)
- Quick temperature increases (from 30 °C/s to 600 °C/s)
- Can be used in complex environments like explosive atmospheres, corrosive or nuclear environments (uranium, zirconium, glass…)
- Reproducible, robust induction system requiring few consumables
- Guarantee of the purity of the material produced in a cold crucible (titanium, Inconel®…)

TECHNOLOGIES

HOT CRUCIBLE

Conventional furnaces typically use graphite, refractory, porcelain or metallic crucibles depending on the requirements of the process being developed.
The capacities can range from a few kilograms to a few tons for R&D or industrial uses.

COLD CRUCIBLE



This technology can be used to attain high temperature requirements (3,000 °C), to melt highly reactive materials at high temperatures (oxides, titanium and others) or to obtain a high level of purity.

Capacity from one kg to several hundred kg (e.g. 500 kg of oxides at 3,000 °C)

Examples of titanium-based specifications

Titane 1,800 °C	1 kg	8 kg	20 kg	50 kg	100 kg
Generator (kW)	200	400	600	900	1,300

(Ti+Nb) 2,100 °C	0,5 kg	3 kg	9 kg	22 kg	46 kg
Generator(kW)	200	400	600	900	1,300

POTENTIAL MODULARITY

Our furnaces are also designed to be flexible and modular, meaning that they are also designed to facilitate the development of new materials and to allow the integration of various technical improvements resulting from R&D programs.

Laboratory furnace
Hot crucible and cold crucible with a multi-sampling system

Gravity casting
The alternative to traditional tilting casting

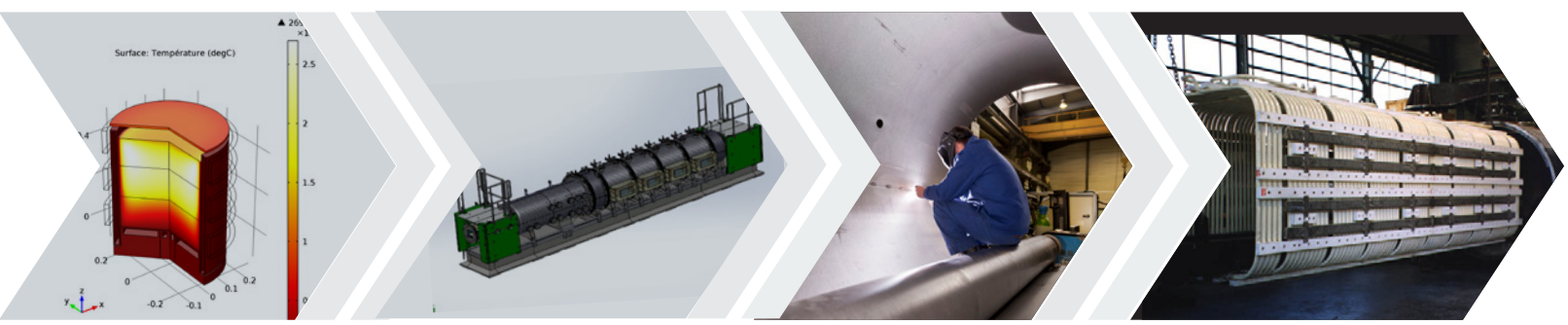
Preheating cell
Under air, neutral gases and vacuum up to 1,200 °C

DEVELOPMENT OF PROCESSES

ECM Technologies works closely with its partners from the initial R&D stage right up to the delivery of a turnkey solution, as well as throughout the equipment manufacturing process carried out in a workshop of 8,400 m² (90,000 sq. ft.).
Furthermore, ECM Technologies has demonstrated its expertise in complex processes (in a nuclear environment, in an explosive atmosphere, under high pressure and high temperature) and their associated instrumentation.

Numerical process

ECM Technologies works in close collaboration with its partners during the design and manufacturing of induction heating furnaces. The first phase of multiphysical 2D/3D numerical simulation (electromagnetism, heat transfer, fluid mechanics, and mechanics) allows the process to be studied in detail to optimize the design of the equipment and to guarantee its performance.



numerical simulation | 3D engineering design | manufacturing | Turnkey products

COMPLEX ENVIRONMENT AND MANAGEMENT

ECM Technologies is an ISO 9001:2008 certified company. Its managerial and qualitative structure guarantees the successful outcome of turnkey projects in complex environments.

In the nuclear division, the company boasts the services of :

- one competent person in radiation protection
- six people directly assigned to work under ionizing radiation including on-site project managers and commissioning engineers.

References :
Areva FBFC, Areva Melox, CEA Saclay, CEA Cadarache, CEA Marcoule, CEA Atalante

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