

A photograph of a large industrial ceramic production facility. The scene shows a long, multi-tiered conveyor system with various mechanical components, including rollers and support structures. The facility is housed in a large, modern building with a high ceiling and industrial lighting. The overall atmosphere is one of a busy, high-tech manufacturing environment.

RAPID DRYING OF CERAMICS REDUCING ENERGY CONSUMPTION AND CO₂ EMISSIONS WHILE PRESERVING PRODUCT QUALITY

RAPID DRY CHAMBER DRYER AND NEW SLIPS FORMULATIONS

SHORT DESCRIPTION

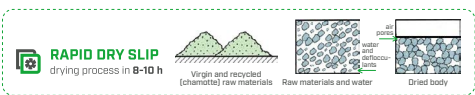
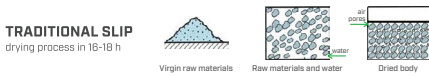
The EU Life Rapid Dry project, started in July 2020, is led by the Italian company SE.TE.C.. The project aims to optimise the drying process of ceramic manufacturing, reducing energy and raw materials consumption, and CO₂ emissions while preserving product quality. This will be achieved through the development of an innovative chamber dryer and rigorously modified ceramic bodies (fire clay and vitreous china).

The dryer developed by the project can be used in the production process of sanitaryware, tableware, refractory ceramics and ornamental ceramics, therefore almost all ceramic sectors except from tiles. The Rapid Dry slips formulations are instead only addressed to the sanitaryware sector.

TECHNOLOGICAL SOLUTIONS

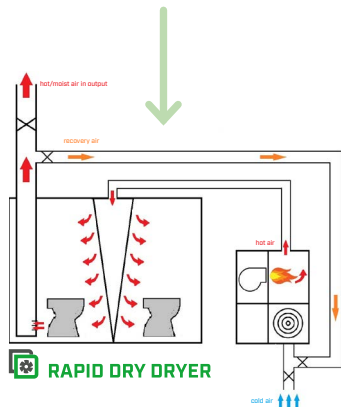
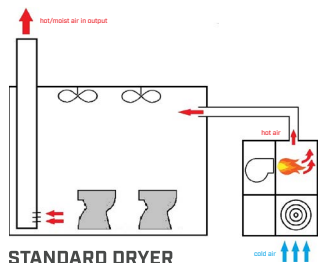
Condition of powders and part during:
(1) preparation of raw materials
(2) shaping of slip
(3) drying

CERAMIC BODIES



-3-8%
COST
RAW MATERIALS

CERAMIC DRYER



- 34%**
THERMAL ENERGY
- 21%**
ELECTRIC ENERGY
- 39%**
CO₂ PRODUCTION

CERAMIC PRODUCTION PROCESS ISSUES ADDRESSED

Drying is a critical stage in ceramic manufacture because it needs to be done slowly, to prevent warping and cracking of the body pieces. If a piece is not completely dry before the firing, it will crack, warp or even explode, risking ruining also other pieces in the kiln. On the other hand, if the body has been dried too quickly in a drying chamber, cracks will form and the piece will likely be destroyed during firing in the kiln.

Yet, ceramic manufacturing companies need to minimize time for this process for efficient production and reduced energy consumption. Moreover, the high levels of energy consumption represents also a an environmental problem, due to the GHG emissions caused.

INNOVATIVE FEATURES

SETEC's 1st novelty regards a chamber dryer and consists in an optimisation of currently available techniques in a very cost-effective way so to be easily accessible for the sanitaryware industry, and leading to a much higher energy saving than instead of then currently achievable.

Among the innovative aspects of the Rapid Dry dryer there are:

- A PLC system that optimizes recirculation and extraction, through the automatic control of the circuits, of humidity and of temperature within the dryer. This allows to obtain a better control and reduce consumption
- The installation of fans (cones). These particular air-circulating units will be inserted to improve the mixing of fresh hot air and recirculating air and ensure uniform air flow through the dryer chamber
- Rotating cones inside allow the correct movement of air, providing for a high turbulence and guaranteeing a homogeneous distribution of the air on the pieces to be dried.

SETEC's 2nd novelty consists in a rigorous modification of the ceramic body, to obtain bodies with an 8-10 hour drying curve though preserving excellent performances in quality and resistance.

This result will be obtained by addition of chamotte (derived from grinded broken ceramic pieces), combined with changes to the rheology and to the grain size distribution. Optimising plasticity and granulometry distribution will allow to reduce drying time and simultaneously increase the bending resistance of the bodies. Moreover, the use of recycled raw materials will allow to reduce the consumption of virgin ones and the amount of ceramic waste sent to landfill.

PROJECT DESCRIPTION

Rapid Dry project will develop an innovative fully automated chamber dryer that reduces energy consumption, and new slips formulations (fire clay and vitreous china) to optimise the drying curve and to include the use of recycled raw materials, reducing resource consumption. The combined application of the proposed technologies has the potential to significantly reduce production costs.

The ceramic body's drying process is used for sanitaryware, refractory ceramics and smaller production of tableware. Usually, water is used for a thorough mixing of raw materials and shaping of ceramic bodies, and must then be evaporated in dryers before placement in the firing kiln.

A close relationship exists between drying, the particle size of the body and the mineralogical composition. One of the best ways to optimise drying is to modify the slips, and this is why the project focuses not only on the development of an innovative dryer but also on the optimization of slips formulations.

Ceramic non-tiles production includes about 60-70% of the entire ceramic manufacturing and accounts for about 25-30% of CO₂ emissions. Thus, the implementation of the proposed technology would have a transformative effect on the sustainability of the European ceramic sector.

CONTACT

SE.T.E.C. (project coordinator)

tel **+39 0761540606**

email **info@setecsrl.it**

PARTNERS