



SANITARYWARE PRODUCTION

use of waste glass for saving energy and resources

Layman's Report

2013-2017

www.sanitser.eu



SANITSER use of waste glass for saving energy and resources

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1. The sanitary ware production: facts, figures & challenges

The European Vitreous Sanitary ware (VSW) ceramic sector is well acknowledged at international level for its exceptional quality. The sector is characterized by a concentration of large, multinational groups, as well as by the vertical integration of highly competitive small and medium enterprises. Throughout the years, the sector has started a **path toward sustainability**, not only to

chase cost reduction goals but also to address pragmatic efforts to control production processes efficiency and environmental performances. Particular care is always devoted to raw materials selection and to water and energy use optimization during the process, probably representing the most relevant hot spots from an environmental life cycle assessment point of view.

Sanitary ware production



Environmental challenges

SAVING OF VIRGIN RAW MATERIALS
and transports optimization from quarries



ENERGY SAVING
during sanitary ware production processes



GREENHOUSE GASES EMISSIONS REDUCTION



2. An innovative idea

SANITSER wants to contribute to the VSW ceramic sector innovation by replacing large amounts of virgin raw materials with glass cullet from urban solid waste recycling, resulting in energy intensity decrease during the production process.

Waste glass recycling from urban areas has in fact an interesting additional potential.

Usually, the remaining scrap after the first industrial waste glass separation is still land-filled; thanks to an advanced separation process, SANITSER gives new life and value to this secondary material, providing an extra amount of useful glass to generate new products.

In sanitary ware vitreous-china formulation waste glass, granite and ceramic production scraps were introduced



The glass cullet for vitreous sanitary ware production

3. The SANITSER project

Objectives

SANITSER is a LIFE project designed to support the European sanitaryware industry to increase efficiency while achieving a more responsible and environmentally-friendly way of operating.

More in detail, the project had two main goals:

1. to introduce a **significant percentage of recycled materials** into the ceram-

ic blend; thus, contributing to a **urban waste** reduction while lowering industry's procurement costs;

2. to improve the **environmental performances** of the overall ceramic production process, through energy saving and reduction in CO₂ emissions.

Partners

MINERALI INDUSTRIALI

produces and sales raw materials for glass, tiles, and sanitary production



GE.MI.CA.

produces ceramic glazes for ceramic industry such as vitreous china sanitary ware, fire clay shower floors, tableware of soft earthenware and porcelain



SE.TE.C.

is specialized in technologies for sanitary ware, tableware and other ceramic articles production



LIFE CYCLE ENGINEERING

provides environmental consulting services, offering professional solutions and tools for Life Cycle Assessment (LCA), eco-design, environmental communication and regulatory compliance



Reduction
of firing temperature
of about 100°C

Reduced costs
for primary raw materials
and their transport

CO₂
emission
reduction

REDUCTION
OF INDUSTRIAL
PRODUCTION
COSTS

REDUCTION
OF THE
ENVIRONMENTAL
IMPACTS

The process

The vitreous sanitary ware (VSW) production typically implies the use of two different ceramic blends, for the ceramic body and for the glaze; the introduction of glass cullet in these blends **reduces virgin raw materials use**. The use of recycled materials in VSW formulations in place of feldspar and quartz permits **to reduce the firing temperature of**

the ceramic body from 1250°C to 1170°C. The firing curve obtained for the SANITSER slip is of about 17 hours, compared to the conventional 19-22 hours. A new glaze that can be used with the new slip formulation and processed with the new firing cycle was realized **with a recycled content of nearly 20%**.

Virgin materials storage



Substitute raw materials

RECYCLED GLASS

The glass cullet adopted in SANITSER originates from an advanced treatment process of glass scraps discarded after the primary urban waste separation process. This glass, which is mixed with impurities, dirt and other materials, corresponds to around 200,000 tons/year, which can thus be recovered.



OTHER RAW MATERIALS

Besides glass scraps, other recycled raw materials are used to produce the SANITSER ceramic body. These include ceramic scraps, sand and minerals deriving from the recovery of historical white granite quarries. Moreover, different types of special glasses were introduced into the ceramic glaze formulation, such as boric glass and white cullet glass.



4. Project achievements

Industrial results

SANITSER ceramic slip and glaze formulation

Several laboratory tests were carried out to identify the best-performing formulations of SANITSER ceramic slip and glaze. The final SANITSER slip formulation contains **more than 40% of recycled materials and the content of quartz is extremely reduced**. This achievement is of the utmost importance from a social point of view, since the exposition to quartz is one of the main safety issues in this sector. The final SANITSER glaze formulation, fitting with the ceramic body, was created containing nearly 20% of recycled glass. It was realized in different colours and using also special antibacterial additives.

Pilot Plants and Industrial tests

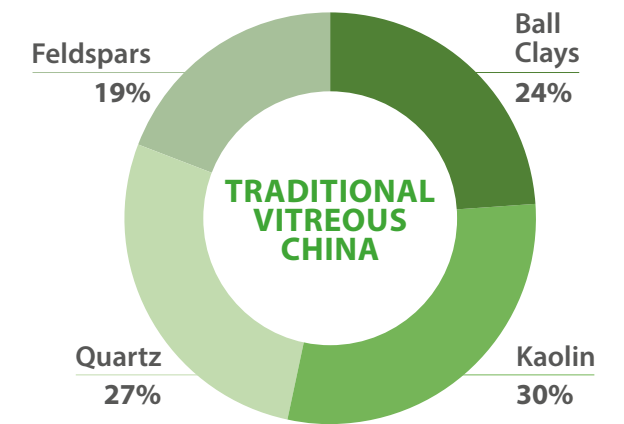
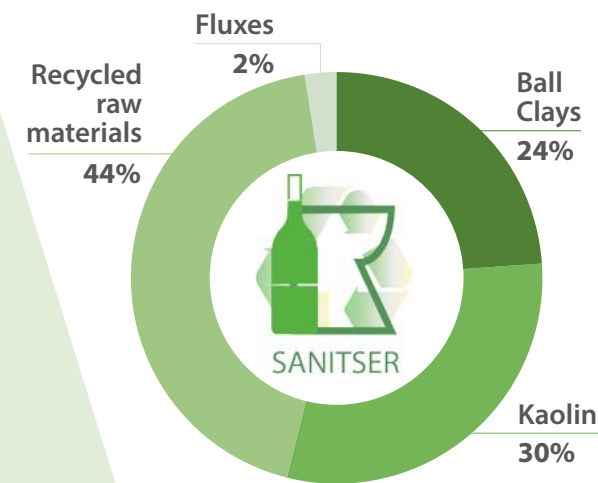
Three pilot plants were realized during the project: the first for the preparation and treatment of SLG waste (assembled at Minerali Industriali), the second to develop the new glaze formulation (assembled at Ge.mi.ca) and the third to perform the whole sanitary ware production process (assembled at SETEC). After the conclusion of the internal pilot production and optimization phase, 4 ceramic manufacturers (Kerasan, Alice Ceramica, Scarabeo and Ceramica Amerina) have been involved to test SANITSER innovations at pre-industrial and industrial scale. **They led to the production of about 2000 sanitary ware pieces.**

Sanitary ware pieces

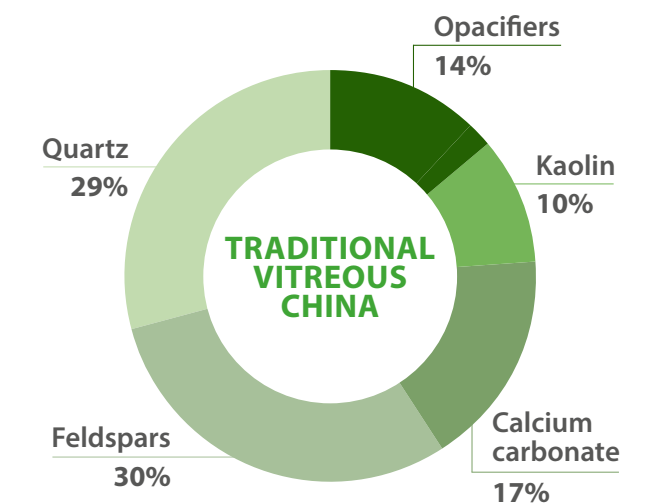
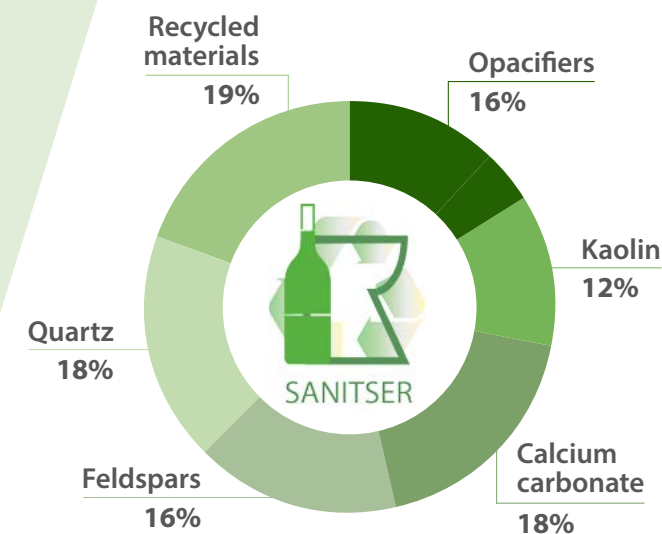


Body and glaze composition

BODY



GLAZE





Minerali Industriali pilot plant



Setec pilot plant



Gemica pilot plant

Economic achievements

Compared to the traditional technology, SANITSER process allows significant savings of costs related to raw materials and energy consumption.

The comparison has been performed using Life Cycle Costing (LCC), a methodology based on ISO 15686-5.

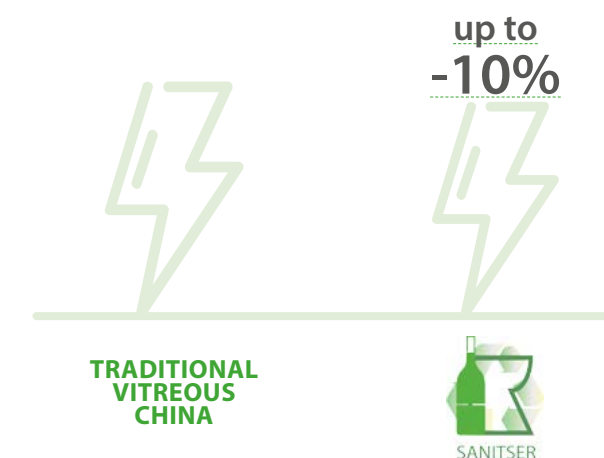
COST SAVING

Results are referred to 1 kg of sanitary ware product

RAW MATERIALS



ENERGY CONSUMPTION



Social achievements

Social aspects related to the new SANITSER process are assessed throughout the Social Life Cycle Assessment (SLCA), a quali-

quantitative recognized approach along the whole life cycle based on UNEP-SETAC Guidelines.



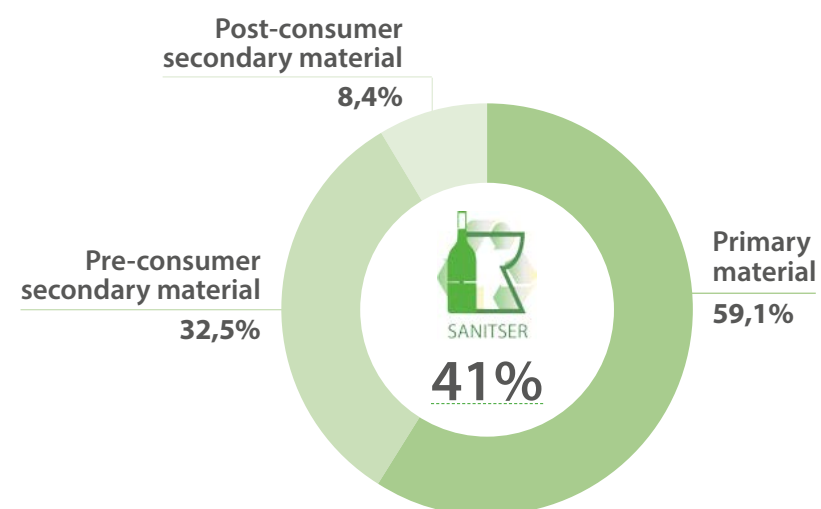
High reduction
of risk from silica
exposure

Environmental achievements

Environmental benefits of SANITSER process respect to traditional technology are quantified through a **Life Cycle Assessment (LCA)**, a scientific and internationally recognized methodology based on ISO 14040 standards.

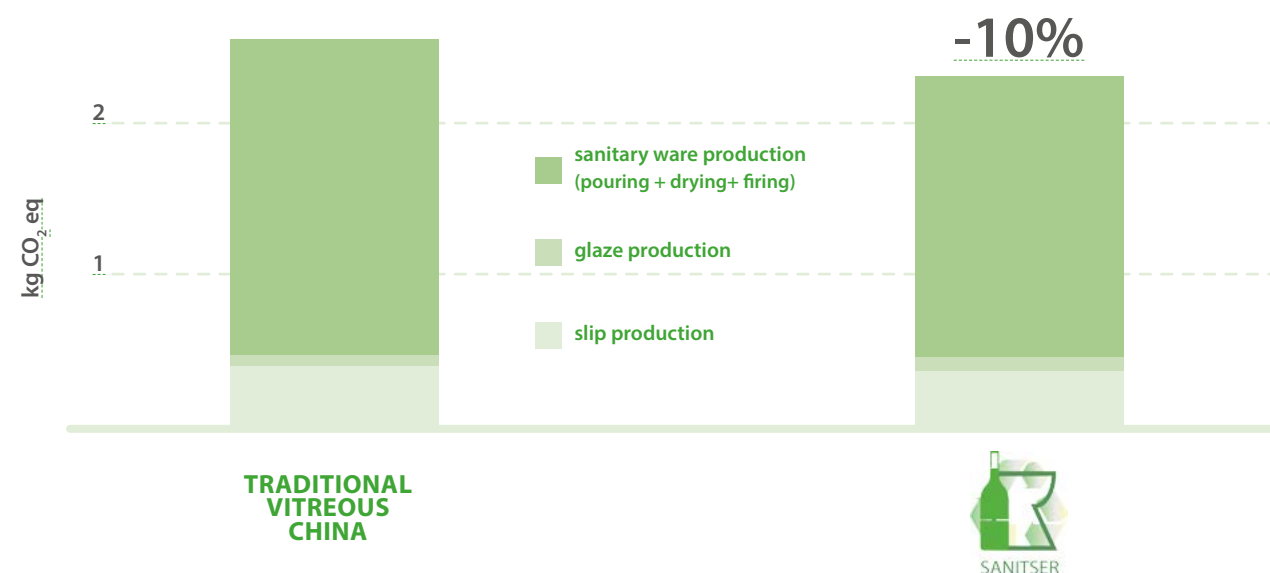
RECYCLED MATERIALS CONTENT

Results are referred to 1 kg of sanitary ware product



TOTAL EMISSION OF CO₂ eq

Results are referred to 1 kg of sanitary ware product



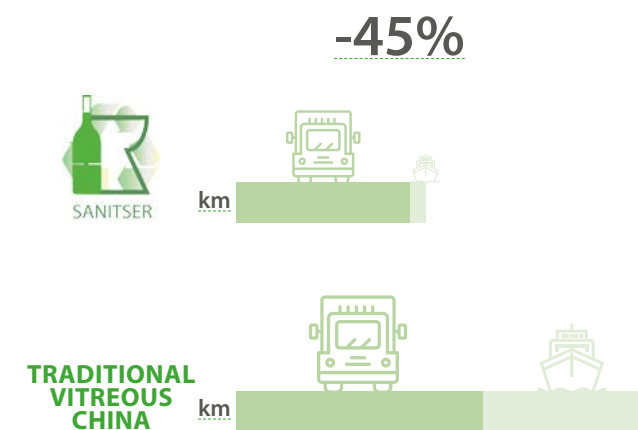
ENERGY CONSUMPTION FOR FIRING

Results are referred to 1 kg of sanitary ware product



DISTANCES FOR RAW MATERIALS SUPPLY

Results are referred to 1 kg of sanitary ware product

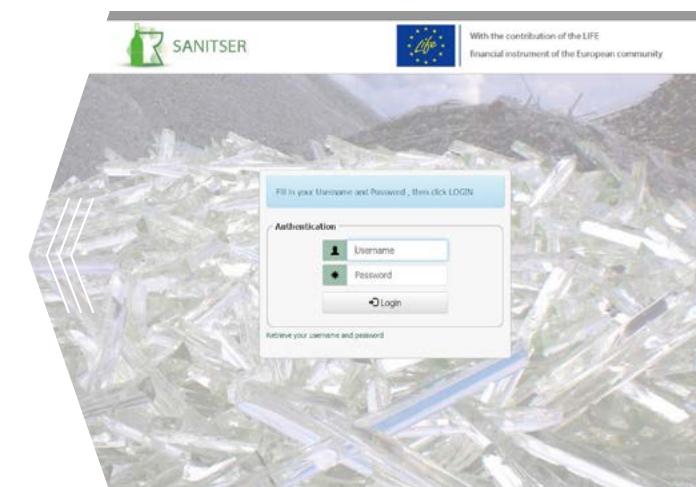


Web based tool

www.sanitser-tool.com

During the project a web based tool was designed and developed to:

- collect quantitative data according to the **Life Cycle Assessment (LCA) approach**;
- calculate the **main environmental indicators for evaluating the performance of the processes** involved at different production level.



5. Dissemination and Networking

Targeted communication and dissemination activities were performed to raise awareness on the project's aims and outcomes.

For more information about dissemination and networking actions please visit website www.sanitser.eu.

PROJECT CONFERENCES



Mid-term conference – presentation of preliminary results

DISSEMINATION AT INTERNATIONAL FAIRS



Project introduction conference



SANITSER presented at Tecnargilla fair 2014

Dissemination at CERAMITECH 2015

NETWORKING MEETINGS



RESULTS

CONSUMPTION

MISSIONS

COSTS

PORT

PROJECT DETAILS



DURATION 42 MONTHS
START DATE 01/07/2016
END DATE 31/03/2019



COORDINATOR SETEC Srl
Market leader in services and technologies
for sanitary-ware and table-ware production



BUDGET 1,5 M€



PROJECT CODE
LIFE15 CCM/IT/000104

PARTNERS



www.setec.it

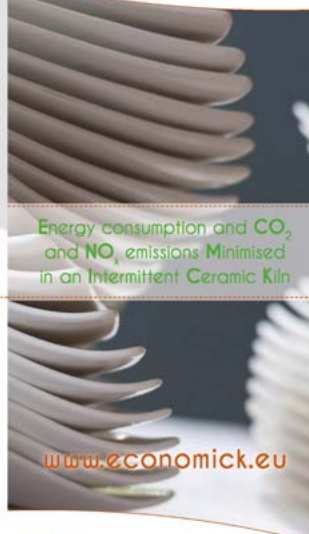


www.lceengineering.eu



www.kerasan.it

ECONOMICK



WITH THE CONTRIBUTION OF THE LIFE
FINANCIAL INSTRUMENT
OF THE EUROPEAN COMMUNITY

Networking meeting with ECONOMICK project

SCIENTIFIC ARTICLES IN SECTORIAL JOURNALS



Ceramic World Review 108/2014



Ceramic World Review 109/2014

6. Partnerships



7. Further information & Contact details

| | |
|----------------------------------|-------------------|
| Project start date | <u>01/07/2013</u> |
| Project end date | <u>31/03/2017</u> |
| Project budget | <u>2,3M€</u> |
| Financial contribution requested | <u>1,1M€</u> |

Contact Details

| | |
|--------------------------|---------------------------------|
| Coordinating Beneficiary | <u>Minerali Industriali Srl</u> |
| Contact person | <u>Daniela Tabacchi</u> |
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| Telephone | <u>+39 015 9517057</u> |
| Project Website | <u>www.sanitser.eu</u> |



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with the contribution of the LIFE
financial instrument
of the European Community
LIFE12 ENV/IT/001095

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