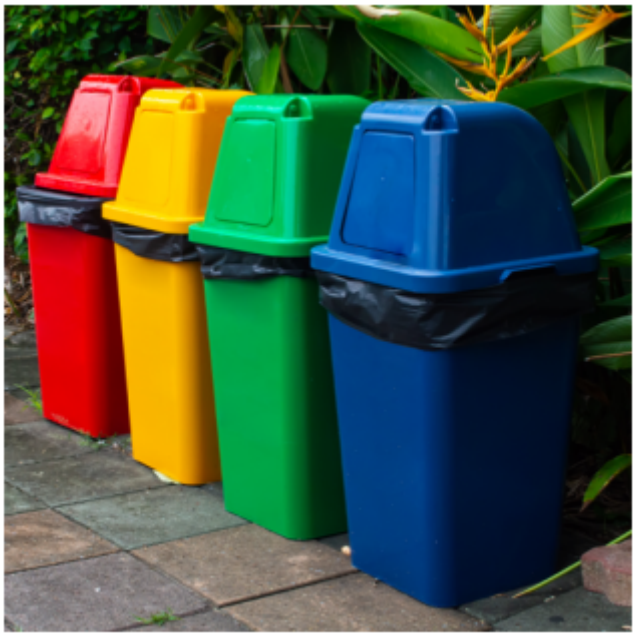
W-LAP Project

Waste eliminating and water-free new revolutionary technology for surface treatment of marbles, stones and tiles

waste management

PROJECT DESCRIPTION



The ceramic tile industry requires extremely high volume of water, associated with the various functions that water is called to perform (raw material, cooling, sanding, polishing, washing, etc.). The main environmental problem of traditional sanding techniques is the generation of sludge composed of abraded and abrasive particles deriving from the instrumentation used. This heterogeneous composition makes the sanding sludge a difficult waste to be disposed of which is then temporarily stored outdoor at the ceramic plants, with great environmental risks, or alternatively, it is transferred in smaller quantities to third parties - with considerable costs – for the disposal in landfills. The **W-LAP project**, implemented by Ceramica Fondovalle S.p.A., Iride S.r.l. with the technical support of the Chemical Engineering Department of the University of Padua, has developed an alternative manufacturing process for industrial ceramics with limited environmental impact thanks to the introduction of an innovative **additive polishing** technology to replace traditional sanding.

Thanks to the innovation introduced, the W-LAP project made it possible to reduce the environmental impact of the production process, by:

- avoiding high water consumption,
- reducing energy consumption,
- eliminating the production of sanding sludge and scrap material deriving from traditional production.

The usefulness of the new process developed becomes evident when considering that some 800 liters of water are needed to polish one square meter of tiles and that the water used, despite being completely recovered and reused, constitutes 30% by weight of the sanding sludge. In other words, in the traditional manufacturing process, up to 0,6 kg of sludge is produced per square meter of tiles, which means that there are 0,18 liters of water to be disposed of per square meter of tiles.

OBJECTIVES

The main objective of W-LAP was to drastically reduce water consumption and cancel the production of sanding sludge during the surface finishing operations of ceramic tiles, by introducing an innovative polishing technique with simultaneous sealing of any porosity. Another objective of the project was to improve the quality of ceramic tiles by making them easier to clean and less subject to bacterial proliferation.

PROJECT PHASES

The production methodology developed within the project consists of nine main processing stages:

- **study and identification of polymers or co-polymers** with water-based precursors prepared in solid, liquid or viscose form, which have characteristics of transparency and resistance;
- **development of techniques for applying** homogeneously the polymer precursors on the surface of the ceramic tiles, i.e. painting / brushing in case of solid precursors or spraying at low pressure in case of viscous liquids;
- **definition of the optimal polymer application parameters** and of the ultraviolet polymerization cycle;
- **quality check** of the final surfaces in terms of durability, aesthetic quality and better cleaning;
- **setup of a demonstration line** for the treatment of ceramic tiles by the innovative additive polishing;
- **realization of demonstration sets** of ceramic tiles for indoor and outdoor, floor and wall use, and evaluation of the possible degradation phenomena during use;
- **definition of cleaning and maintenance procedures** for the end user;
- **assessment of the mass/ energy balance** of the new process and comparison with the present state of the art;
- **definition of environmental indicators and quantification of the real -** direct (during the production phase) and indirect (during use and at the end of life) - **environmental benefits**.

As part of the project, a prototype line was designed capable of treating 100 square meters of product per day, in order to test the effectiveness of the application process of the polymer solution by means of dispensers that allow the entire surface of the tile to be completely and homogeneously covered thanks to a specific sensor which detects the tile. After the application of the additive layer, the water contained in the polymers is removed thermally, and it gets fixed by ultraviolet rays. The process ends with polishing which gives to the tile its final appearance.

Finally an analysis – based on LCA methodology - was performed on the mass and energy balance of the prototype demonstration line to quantify the environmental impacts of the new process.

PROJECT RESULTS

The main result was the creation of a **pilot line** capable of solving the problem of sludge disposal, and reducing, at the same time, the energy and water consumption to a minimum, maintaining a high product quality.

The main specific results are:

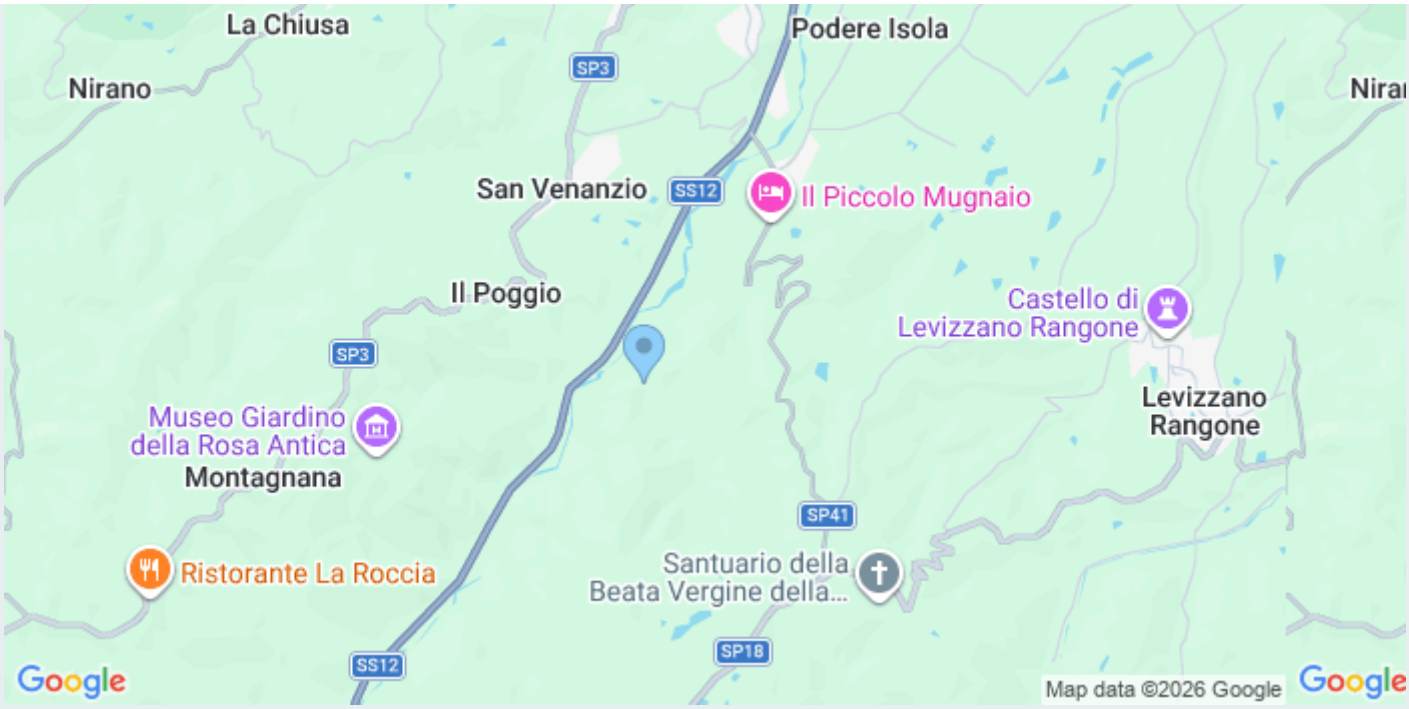
- **Complete elimination of sanding sludge**: thanks to the new process, it is no longer necessary the removal of material from the tile's surface, therefore the innovative tested technique does not create sanding sludge.
- **Reduction of energy consumption**: thanks to the lower energy requirement for the application of the additive layer, compared to the abrasion of the ceramic surface (traditional processing), the reduction in energy consumption is equal to 25 %.
- **Reduction of water consumption**: in the surface finishing phase of ceramic tiles with the traditional manufacturing process 0,8 cubic meters of water per square meter of tiles is required; with the new technique it is possible to use less than **0,0007 m3 water / m2 tiles** (in case of spraying) or **0.0003 m3/ m2** (in case of painting / brushing) achieving a **99%** decrease in the water use.

- **Reduction in the number of broken tiles**: during sanding it's frequent the generation of production scarps due to the pressure required for the process, while the application of the additive layer requires much less pressure.

- **Reduction of production losses**: no overspraying neither of water (as it happens in conventional polishing plants) nor of the polymeric precursors ensures an optimal and simultaneous sealing of any porosity that may be present on the tile's surface. This process has reduced production losses and improved working conditions.

- **Reduction of the use of cleaning agents**: the use of the permanent sanding additive (at least 10 years on wall tiles) allows to reduce the use of cleaning agents in indoor and outdoor installations and the use of water for cleaning the surfaces, ensuring also greater resistance to bacterial proliferation.

Regarding dissemination, a video https://www.youtube.com/watch?v=ek8_r-5Wbpg (in Italian and English) and the Laymans' report were produced.



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Acronym
W-LAP

Number of reference
LIFE 11 ENV/IT/000110

Reference Programme
LIFE

Beneficiary Coordinator
Ceramica Fondo Valle S.p.A.

Contacts
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EU contribution
969.821,00

Call Year
2011

Start Year
2012

End Year
2014

Beneficiary headquarters

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Region
Emilia-Romagna

Description

Emilia Romagna