



Questions and answers on photocatalytic products

1) What is TX Active®?

It is the active principle, with photocatalytic properties, developed by Italcementi. The products containing TX Active® are able to abate air noxious organic and inorganic substances and they preserve over time the aesthetic quality of the finished products. TX Active® is an environmental friendly product for mortars, paints, precast elements and pavements plasters.

TX Active®, with its self-cleaning and depolluting properties, is the seal of quality for photoactive cementitious products.

2) What does Italcementi's TX Active® product line consist of?

TX Aria® - Linea Ambiente (Environment Line), with its depolluting effect, is the specific binder for paints, mortars and "rasanti" (leveling compounds), plasters & coatings, and concrete for photoactive building elements. TX Aria® can effectively abate the airborne harmful pollutants that are produced by human activities (industry, transport and residential heating units). TX Aria® can be used for both horizontal and vertical structures as well as tunnels, where air quality and safety conditions are eventually improved. TX Aria® is the first active way in battle against store of substances coming from smog.

TX Arca® - Linea Architettura, with its self-cleaning effect, it the cement complying with the requirements set forth in European Standard EN 197/1 and is specifically designed for building prestigious architectural works.

The aesthetic qualities of the final concrete elements, regardless of whether they are prefabricated or cast on site, are enhanced and preserved for years. TX Arca® cement is the cement for striking, high-end architectural works, in which quality of the construction material used and final appearance are equally important and significant. Concrete made with TX Arca® cement has the same physical & mechanical properties as traditional concrete. On top of that, it offers a self-cleaning benefit and extraordinary brilliance so that original beauty is retained for years.

3) What have the main applications been so far?

Among the main applications of photocatalytic materials produced by TX Active® let us recall:

- The self-locking block pavement laid in Borgo Palazzo Street, Bergamo. Tests results highlighted **an abatement of pollution between 30% and 40%**.
- The self-locking block pavement laid in Settemetri Street, Rome;
- The self-locking block pavement laid at the Cardinal Lambruschini School in Rome;
- The self-locking block pavement laid at the Maharishi Sathyananda Yoga Academy in Brescia;



- The self-locking block pavement laid at the Montichiarello Sports Center in Montichiari (Brescia);
- Indoor painting of the gym facility at the Scuola Media Statale, Ribolle Street, in Forlì.
- Reconstruction of a concrete footbridge by Mazzano (Brescia)
- Painting of tunnel Umberto I in Rome

4) What are the main architectural works accomplished with TX Aria®?

There are many outstanding architectural works, the beauty of which is preserved thanks to the self-cleaning effect of TX Active®: the Dives in Misericordia church in Rome, the new headquarters of Air France at Charles de Gaulle airport in Paris, the Cité de la Musique et des Beaux-Arts in Chambéry, the Hôtel de Police in Bordeaux, the Saint John's Court Montecarlo Bay residence in the Principality of Monaco.

5) Where are TX Active® products marketed?

The TX Active® range of products is already being marketed in Italy and France, Belgium, Spain, United States and Canada. In the next months, it will be officially presented in Greece and Turkey and subsequently in Morocco.

6) Where are Italcementi TX Active® cements produced?

The first cement from the TX range was manufactured in Italy at the Rezzato cement plant (province of Brescia). Currently, the plant of the subsidiary Socli in Izaourt, in France, in the High Pyrenees region, is meeting the needs of Italy and France but, given the likelihood of a rapid expansion of TX Active®, two new plants in Italy are at an advanced stage of planning.

7) What is the current production of Italcementi TX Active® cement?

TX Active®, due to its innovative characteristics, requires more time to be established, particularly considering the conservative sector like the building one. Since the product launch, in Italy 400.000 m² of photocatalytic surfaces have been produced, equivalent to 56 football fields.

8) How much does it cost to use TX Active®?

Talking about the cost of producing structural elements made of photocatalytic cement means little since what reaches the market is the finished product: the paint, the plaster, or the manufactured block. Given that the part which interacts with the atmosphere is only the surface, the photocatalytic principle is not used in structural applications, but only where it is possible to maintain limited thicknesses, say from centimeters to a few millimeters. If, therefore, the cost of Italcementi cement containing TX Active® is around 1 Euro/kg, the most significant figure is the cost per square meter of the photocatalytic surface. And so the cost incidence is remarkably low as can be seen from a few examples. To transform the façade of a 5-storey building into a photocatalytic surface, it is enough to add around 100 Euro to the cost of a traditional paint or plaster. Paving in photocatalytic blocks costs on average between 10 - 20% more than traditional paving.



9) What has Italcementi discovered?

The application of the TX Active® principle to cementitious products enables the use of light energy to decompose, through oxidization, the organic and inorganic substances present in the atmosphere. Therefore, the use of Italcementi cements in the TX range, which contain the TX Active® principle, actively contributes to mitigating air pollution in cities and to keeping the surface of built elements clean.

10) What is photocatalysis?

It is a natural phenomenon whereby a substance, called a photocatalyst, alters the speed of a chemical reaction through the action of light. By exploiting the energy of light, photocatalysts induce the formation of strongly oxidizing reagents which can decompose some organic and inorganic substances present in the atmosphere. Photocatalysis is, therefore, an accelerator for oxidization processes that already exist in nature. Indeed, it promotes faster decomposition of pollutants and prevents them from accumulating on the surfaces. The worsening of the level of pollution in urban areas has recently driven research towards the application of the capability of removing harmful substances present in the atmosphere. Photocatalysis, therefore, makes an effective contribution to improving air quality.

11) Why does TX Active® need a cement-based support?

Cement makes a significant contribution to the TX Active® principle. It enhances its qualities for the very reason that cement has excellent pollutant absorption capacities. Cement is also the most commonly used material in the construction industry.

12) What is the contribution of photocatalytic cements to fighting pollution?

Structures made or covered with materials containing the TX Active® principle enable the reduction of various pollutants in the atmosphere. Among these are particulate matter, polycondensed aromatic hydrocarbons, nitrogen oxides, carbon monoxide and sulfur monoxide which in urban settings are mainly emitted from cars and air heating units.

13) What patents are there for TX Active®?

Since 1996 Italcementi has filed 9 patents on photocatalysis applied to cementitious materials. The patents concern a photocatalytic hydraulic binder and a series of specific applications in construction (self-locking blocks, cladding elements in general, plasters & renders, leveling compounds, lime & cement-based paints, concrete pavements).

14) Investments

About 5 million Euro have been pledged to the TX Active® research project. Another 5 million Euro came from the EU within the framework of on-going research and innovation programs. Every year we invest some 25 million Euro in Research, Development and Innovation; indeed, a huge financial commitment for a sector like ours that, however distinguishes, us from our competitors.



15) What were the main stages in the research?

Throughout the research period, various applications for TX Active[®] were completed, such as high-strength photocatalytic white and grey concretes. During the test stage, the ability to reduce pollutants present in the atmosphere was confirmed by the laboratories of Italcementi and of universities and by various research bodies. It was subsequently proven that the degradation of the organic and inorganic material on the surface of the cement-based element enables preservation of the appearance of constructions even after prolonged exposure to the external environment, thus preserving the initial conditions in terms of brightness.

16) Does photocatalysis always work: what about indoor spaces? Or when it rains?

Photocatalysis is also possible for indoor structures treated with photocatalytic TX Active[®] cementitious materials, provided that diffuse solar radiation or artificial light is present. Also when it rains a TX Active[®] product maintains its photocatalytic effect.

17) Can the principle be used up?

The mechanical durability of TX Active[®] cement-based applications is the same as that for similar applications with standard cements. The photocatalytic principle is not subject to consumption and therefore cannot be used up.

18) What were the most important experimental applications undertaken?

In 2002, a first test on a photocatalytic TX Active[®] mortar was used to cover the asphalt surface of a section of Via Morandi in Segrate (province of Milan); a road which is 230m long and 10m wide, and which everyday sees traffic flow of around 1,000 vehicles/hour. Monitoring proved a reduction in nitrogen oxides on this urban road of around 60%.

In 2003, TX Active[®] self-locking blocks were laid over 8,000 m² on an industrial site in the province of Bergamo. The test showed that in the area covered by the TX Active[®] blocks the concentration of nitrogen oxides measured was clearly lower than in a comparable area. The reduction calculated on the basis of the average values recorded is around 45%.

19) What is the Italcementi Group?

The Italcementi Group is one of the largest cement producers in the world and the biggest in the Mediterranean area. With 2006 annual sales amounting to about 5,854 million Euro, Italcementi Group's companies combine the expertise, know-how and cultures of 19 countries. With a staff of over 22,850, the Group boasts a production capacity of around 70 million tons of cement.

Within the expansion program towards the Mediterranean rim, during 2005 the Group has furthered developed its presence in Egypt, becoming market leader.

In 2006 in India the total control of the activities has been acquired and in Kazakhstan an agreement for new important developments has been signed. In June 2007, the Group has entered the Chinese market.



20) What is the CTG?

The CTG - *Centro Tecnico di Gruppo* (Italcementi Group Technical Center) - is one of the most important cement research centers in Europe. The CTG is located in Bergamo (Italy) and has a secondary base in Guerville, France, and numbers 400 employees, of whom 60 are researchers.

21) Where can I find more information?

On the Italcementi website – www.italcementi.it – there is a section entirely dedicated to TX Active®, the range of TX products, the main tests, the most recent applications and our commercial partners who are authorized to make products bearing the TX Active® brand.

September, 2007

