

TX Aria® in Paris receives “Les Rocs d’or” award

October 2007

The use of TX Aria® in a south Paris street has won **Ciment Calcia** the “**Les Rocs d’or**” award at the 12th Fimbacte Festival, an event that promotes innovation and sustainable development in construction materials for the “*Projects and Realizations*” sector.

Under a program to reduce urban atmospheric pollution, the Haute Seine General Council set up a six-month trial - from April to October 2007 - to pave a road with TX Aria® cement. The trial is an important step in the fight against urban pollution: not only as the first initiative of its kind in Paris, but also because another goal was to limit the impact of transport-related pollution.



Every day approximately 13,000 vehicles use the Rue Jean Bleuzen in Vanves (south Paris). The road is a departmental thoroughway with sufficient exposure to sunlight, and has buildings on both sides acting as cross-wind barriers. These atmospheric and logistic conditions ensure optimal performance of the Italcementi patented titanium dioxide active principle in TX Aria®, which eliminates pollutants.



In the presence of coverings treated with the **TX Active®** active principle, atmospheric pollutants decompose as a result of photocatalysis, a natural phenomenon whereby a substance known as a photocatalyzer exploits natural or artificial light to induce a powerful oxidizing process that transforms harmful organic and inorganic substances (nitric oxides, fine particles, volatile organic compounds, carbon monoxide and ozone) into absolutely innocuous substances.

The trial divided the road into two sections. An experimental section paved with cement “treated” with TX Aria®, and a section paved with “untreated” cement. This enabled the reduction in pollutants by TX Aria® to be measured. The example offered by Vanves could be followed by many other towns to promote urban development policies that take account of the need to safeguard the quality of life in the city.

The photocatalytic cements are patented products based on ten years of research by the Italcementi Group Technical Center.



Questions and answers on photocatalytic products

1) What is TX Active®?

It is the active principle, with photocatalytic properties, developed by Italcementi. TX Active®-branded products can reduce the harmful substances present in the air and preserve the finished surface of buildings over time.

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

2) 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.

3) 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.

4) 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.

5) 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.



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6) 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).

7) 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.

8) 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 its appearance of the final works even after prolonged exposure to the external environment, thus preserving the initial conditions in terms of brightness.

9) 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.

10) 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.

11) What were the most important experimental applications undertaken?

- 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%.
- 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%.

12) 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



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Pyrenees, 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.

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

During 2005 the experimental and testing stage was completed with on-site applications. During the year, the main effort was on consolidating partnership arrangements with the leading operators in the various sectors (paint, plaster, prefab materials); this choice enabled the sale of approximately 1,000 tons of the product which was then transformed into photocatalytic material used in various locations in Italy and abroad. In 2006, a significant increase in production is planned.

14) 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.

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

TX Aria® - Linea Ambiente, with its pollution-reducing 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 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.

16) What have the main applications been so far?

Among the main applications of photocatalytic materials produced by TX Active Partners let us recall here

- The self-locking block pavement laid in Borgo Palazzo Street, Bergamo;



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- 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;
- Indoor painting of the gym facility at the Scuola Media Statale, Ribolle Street, in Forlì.

17) What are the main works accomplished with TX Active® products?

Today 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 which will soon be inaugurated.

18) Where are TX Active® products marketed?

The TX Active® range of products is already being marketed in Italy and France. By the end of 2006, it will be officially presented to the US market and subsequently in the other countries where the Group operates worldwide.

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 2005 annual sales amounting to about 5 million Euro, Italcementi Group's companies combine the expertise, know-how and cultures of 19 countries. With a staff of over 20,000, the Group boasts a production capacity of around 70 million tons of cement through an industrial network of 62 cement plants, 152 aggregates quarries and 570 concrete batching units.

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 and has a secondary base in Guerville, France, and numbers 400 employees, of whom 60 are researchers.

CTG's main activities include:

- Research and development into materials, products and processes;
- Designing and building industrial plants and machinery ;
- Modernization and optimization of production processes;
- Checking technical and economic performance for plants;
- Specialist technical assistance.

The TX Active® principle was created from its R&D activities.

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.



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TX Active®: Italcementi's active photocatalytic principle

Cementitious products featuring photocatalytic activity have been developed through a decade of study and research by CTG, the Group's Technical Center.

Photocatalysis is a natural phenomenon whereby a substance called a photocatalyst uses either natural or artificial light to activate a strong oxidizing process that breaks down some noxious organic and inorganic substances -- e.g. nitric oxide, nitrogen dioxide, sulfur dioxide, suspended organic particulate matter, volatile organic compounds, aromatic hydrocarbons, carbon monoxide, etc. -- into harmless compounds.

The first application of photocatalytic cementitious materials dates back to 1996, when Italcementi served as the main technical sponsor of Richard Meier's Dives in Misericordia Church project in Rome. The project by Meier - winner of the international competition "50 Churches for Rome 2000" conducted by the Vicariate of Rome - envisaged the construction of three huge, totally white sails made with precast concrete blocks. Such a highly prestigious and symbolic structure demanded the use of an extraordinary concrete type which, in addition to being highly strong and durable, would ensure unparalleled and time-enduring white to the built elements thanks to the self-cleaning properties of the final surfaces. This was the first time the photocatalytic principle enabled by **TX Active®** was ever applied.

Over this 10-year research period, CTG has conducted a number of studies as well as lab and site tests in collaboration with ARPA -- the Regional Agency for Environment Protection, CNR -- specifically its Air Pollution Institute, and CCR -- the Ispra-based Common Research Center. Findings always indicated that photocatalytic cementitious materials are really eco-sustainable in that they can actively fight pollution by abating harmful airborne pollutants.

The laboratory tests actually showed that 3 minutes of light irradiation are sufficient to abate pollutants by 75%. Tests performed on a larger scale have confirmed that even greater abatement percentages can be obtained.

The **TX Active®** photocatalytic principle is being used for manufacturing a wide range of cementitious products - from paints to mortars and precast elements - with which pavements, plasters & renders and any type of horizontal and vertical structure and coatings can be made.

After the Church in Rome, photocatalytic cements have been used in other prestigious architectural projects such as the Air France Headquarters at the Roissy-Charles de Gaulle International Airport in Paris, the Cité de la Musique in Chambéry, the Hôtel de Police in Bordeaux, as well as residential and commercial buildings in Casablanca and Ostend.

To find out more information about photocatalysis and related scientific publications and view the photo gallery, please visit our website at www.italcementi.it.



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PICADA project go-head for cement that cleans the air

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PICADA project (Photocatalytic Innovative Coverings Applications for Depollution Assessment), part of the European "Competitive and Sustainable Growth" research program, certify that photocatalytic cement building materials and coverings absorb and eliminate from 20 to 80% of air pollutants, depending on atmospheric conditions and the level of sunlight that triggers photocatalysis. The recently completed PICADA project, which began in 2002, was a joint effort involving a number of European private and public bodies and the continent's leading research centers – CNR (Italy), CSTB (France) and NCSR Democritos and AUT (Greece) – together with four industrial partners – Italcementi Group (Italy), GTM Construction (France), DBT (Denmark), Millennium Chemicals (United Kingdom). "Architects and materials for the cities of the future", a conference organized as part of the "Italcementi day" at the 10. International Architecture Biennale in Venice, provided an insight, in the form of the results of the PICADA project, into the way photoactive cements can help improve the quality of urban life. The project researchers conducted laboratory and full-scale tests to determine the ability of varying strengths of titanium dioxide to remove pollutants (NO_x and aromatic compounds), and consequently assess the substance's potential for use in building construction materials, such as wall facings. After completing four years of research into photoactive processes, the EU researchers have certified that the new materials offer a significant contribution to reduction of air pollutants. Italcementi – whose laboratories patented the TX Active photoactive principle for cement products – worked with the PICADA project researchers on developing and executing, in a laboratory environment, test procedures to study photoactive removal of organic and nonorganic substances in the concentrations normally found in outdoor urban environments. The experiments conducted by the ITC CNR labs were of fundamental importance in measuring emissions of volatile organic compounds (VOC) from building materials, in particular in monitoring the techniques developed over the last few years to re-create and verify atmospheres with a predetermined trace VOC content. The commitment to innovation geared to Sustainable Development and the results of the PICADA project led to the Venice conference featuring Italcementi and Vema, the city of the future being shown in the Italian Pavilion. During the conference, speakers presented data and analyses on photocatalysts, discussed their new applications in urban areas and illustrated prospects for their use in cities. The effectiveness of the depolluting properties of TX Active cements has already been tested in other practical applications organized by the Italcementi researchers. In Bergamo, for example, a road has been paved with blocks made from cement containing TX Active. Using a mathematical model and the lab data obtained with the blocks, it was demonstrated that on a 500-meter road with two-way traffic and 400 vehicles an hour, pollution was reduced to the equivalent produced by 150 vehicles. In Segrate, in the province of Milan, a TX Active photocatalytic mortar was used to resurface a section of via Morandi, with daily traffic of approximately 1,000 vehicles/hour; the test certified a reduction of around 60% in nitrous oxide. Photoactive materials have been used on countless projects in many Italian cities, including Brescia, Forlì, Florence and Rome. Major works of architecture built with TX Active products include the Dives in Misericordia church in Rome and, in France, the new Air France building at Charles de Gaulle airport in Paris, the Cité de la Musique et des Beaux Arts in Chambéry and the Hotel de Police in Bordeaux.



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Results of four years of research into innovative building materials that eliminate air pollution presented at the Venice Architecture Biennale

EUROPEAN PICADA PROJECT GO-HEAD FOR CEMENT THAT CLEANS THE AIR

**Italcementi applies certified research to Vema, the city of the future:
TX Active[®] cuts hazardous pollutants by half**

Venice, October 26, 2006 – What will tomorrow’s homes be built from? Can we look forward to anti-smog streets and houses? To what extent can innovation and research improve the quality of life in the cities of the future?

“Architects and materials for the cities of the future”, a conference organized as part of the “Italcementi day” at the 10. International Architecture Biennale in Venice, provided an insight, in the form of the results of the PICADA project, into the way photoactive cements can help improve the quality of urban life.

The findings of the PICADA project (Photocatalytic Innovative Coverings Applications for Depollution Assessment), part of the European “Competitive and Sustainable Growth” research program, certify that photocatalytic cement building materials and coverings absorb and eliminate from 20 to 80% of air pollutants, depending on atmospheric conditions and the level of sunlight that triggers photocatalysis.

The results of the experimental tests conducted for the project have enabled researchers to identify and select the products with the most effective depolluting and self-cleaning properties. The recently completed PICADA project, which began in 2002, was a joint effort involving a number of European private and public bodies and the continent’s leading research centers – CNR (Italy), CSTB (France) and NCSR Democritos and AUT (Greece) – together with four industrial partners – Italcementi Group (Italy), GTM Construction (France), DBT (Denmark), Millennium Chemicals (United Kingdom).

The project researchers conducted laboratory and full-scale tests to determine the ability of varying strengths of titanium dioxide to remove pollutants (NOx and aromatic compounds), and consequently assess the substance’s potential for use in building construction materials, such as wall facings.

The innovative building materials examined by the PICADA project could bring a “revolution” in the management of air pollution as part of the drive for competitive and sustainable growth. After completing four years of research into photoactive processes, the EU researchers have certified that the new materials offer a significant contribution to reduction of air pollutants.

Italcementi – whose laboratories patented the TX Active[®] photoactive principle for cement products – worked with the PICADA project researchers on developing and executing, in a laboratory environment, test procedures to study photoactive removal of organic and non-organic substances in the concentrations normally found in outdoor urban environments.

The experiments conducted by the ITC CNR labs were of fundamental importance in measuring emissions of volatile organic compounds (VOC) from building materials, in particular in monitoring the techniques developed over the last few years to re-create and verify atmospheres with a predetermined trace VOC content.

“The positive results obtained from use of photocatalytic active principles, as attested by the findings of the European PICADA project, are making rapid headway in modern architecture and local government,” said Fabrizio Donegà, Italcementi Deputy Chief Operating Officer and head of business operations in Italy. *“The lab tests on photoactive cements indicated that three minutes of sunlight are sufficient to reduce pollutants by up to 75%. Italcementi’s goal is to provide the architectural community with TX Active[®], a product with a high innovation content based on our R&D work, so that today’s urban projects and the new cities of the future can make the environment and the quality of life their priority.”*

The commitment to innovation geared to Sustainable Development and the results of the PICADA project led to the Venice conference featuring Italcementi and Vema, the city of the future being shown in the Italian Pavilion.

During the conference, speakers presented data and analyses on photocatalysts, discussed their new applications in urban areas and illustrated prospects for their use in cities.

Applications using TX Active[®] photocatalysts achieve maximum effectiveness on large-scale constructions, whose larger surface areas exposed to pollutants and light deliver the best results in reducing harmful pollutants; for example, paving or wall coverings in urban areas with heavy traffic.

Architect Franco Purini, professor of Architectural and Urban Composition at La Sapienza University and the curator of the Italian Pavilion at the 10th International Architecture Biennale commented: *“Vema is a project for a new city in the Po Valley between Verona and Mantua, an ideal city, an innovative city that considers issues such as housing, workplaces, infrastructures, green areas, in an attempt to involve the theme of sustainability as part of a global experiment affecting every aspect of the city design. Vema is also intended as a contrast to the sprawling city, replacing the uncontrolled, anonymous proliferation of housing, warehouses and shopping malls with discrete, recognizable urban entities that foster new relations with the community and simultaneously render explicit the existing potential of the Po Valley area.”*

“Vema is a tangible example of significant technical and aesthetic progress toward the cities of the future,” added Donegà. *“The results of the tests conducted by Italcementi’s researchers showed a 47% reduction in urban pollutants when an innovative city like Vema is built with photocatalytic cement based on the TX Active[®] principle, rather than with standard cement formulations.”*

The effectiveness of the depolluting properties of TX Active[®] cements has already been tested in other practical applications organized by the Italcementi researchers.

In Bergamo, for example, a road has been paved with blocks made from cement containing TX Active[®]. Using a mathematical model and the lab data obtained with the blocks, it was demonstrated that on a 500-meter road with two-way traffic and 400 vehicles an hour, pollution was reduced to the equivalent produced by 150 vehicles. In Segrate, in the province of Milan, a TX Active[®] photocatalytic mortar was used to resurface a section of via Morandi, with daily traffic of approximately 1,000 vehicles/hour; the test certified a reduction of around 60% in nitrous oxide.

Photoactive materials have been used on countless projects in many Italian cities, including Brescia, Forlì, Florence and Rome. Major works of architecture built with TX Active® products include the Dives in Misericordia church in Rome and, in France, the new Air France building at Charles de Gaulle airport in Paris, the Cité de la Musique et des Beaux Arts in Chambéry and the Hotel de Police in Bordeaux.

The “Italcementi day” at the Biennale closed with a lecture by architect Tommaso Valle – “Osaka, Rome, Brussels: the work of the Valle Studio, moving from the past to the future” – for a large group of architecture students from the Iuav University of Venice.

Recent projects by Tommaso Valle, a key figure among modern architects, include the restructuring and extension of the “Résidence Palace” complex in Brussels, which is to house the European Council and the EU Council of Ministers.

Italcementi is one of the partners of the Venice Architecture Biennale. Products containing TX Active® were used for the covering of the “Ellisse” structure in the Italian Pavilion and for the walls and stands in the exhibition areas in the Gardens and at the Arsenal.

www.italcementigroup.com

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Italcementi Group is the fifth largest cement producer in the world and the biggest in the Mediterranean area. With a staff of over 22,300, Italcementi Group's companies combine the expertise, know how and cultures of 19 countries. With 2005 annual sales amounting to about 5 billion Euro (about 2,910 million Euro as at 30.06.06), the Group boasts an industrial network of 62 cement plants (cement + clinker 56.3 Mt), 14 grinding centres, 4 stand alone terminals (one of which is also a grinding centre), 147 aggregates quarries (53.8 Mt) and 575 concrete batching units (21.0 Mm³).
