

Prosolve370e on Architectural Skins

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Abstract. Currently, one of the biggest problems we have in the world is pollution, which causes many health problems for the population. Architecture is largely part of this great problem, because construction emits a lot of pollution and due to poor urban or architectural design of spaces that causes fouling to grow exponentially. As architects they must take this into account to start designing the projects, they must start designing to avoid and control contamination, either with the materials we use, the construction process or the way of designing so that users emit less amount of impurity. The objective of the architects must be to improve the quality of life of the user. It was this idea that allowed us to create this project and choose the Prosolve 37e as the main material of the project, based on the fact that we must involve sustainable alternatives to improve the quality of life of users.

Keywords: Prosolve 370e, architectural skin, pollution, module, skin.

1.1.1 Situation of the property

The city of Monterrey, Nuevo León, México, is known for the rapid growth of its population, as well as the levels of pollution that are in the air due to the number of population and the industry that exists in that area. Much of the air pollution is caused by the number of cars in the city and the surrounding municipalities, since many of the inhabitants have to travel long distances daily to reach their destination. According to data obtained from the National Institute of Public Health, in Mexico there are 20,000 deaths caused by poor air quality. Air pollution is ranked ninth among the causes that produce diseases and deaths in the country. Some of the diseases caused by poor air quality are related to lung problems, heart problems and in severe cases cancer. These figures are highly alarming because it is a problem that, if not addressed, can worsen in the coming years [1]. Due to the need that has been generated in the city of Monterrey to use the car indispensable for the transfer between places, reducing the number of cars and their circulation would not be the best option so that it would be the only proposal for improving quality of the air or improvement of the so great problem that one has of the contamination.

The project below is located in San Pedro Garza García, a Municipality part of Monterrey's Metropolitan area. Monterrey is the capital state of Nuevo León. It is a baseball stadium that achieves some type of urban regeneration providing multipurpose and good accessibility, the previously mentioned data was key for the design and Project planning, the way in which the city has grown is worrying, because the increase has been shocking, both in society and in pollution, we know that the development of the city will continue to increase, however, our awareness is of the utmost importance. to have in it. Well, for any city, the inhabitants are key to its development and improvement, since we are the ones who can do something to generate an impact on pollution.[11]

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There have been a few other options that have stood out internationally to avoid this problem, which have helped to improve air quality, some of them are: postpone gardening work in which tools that require gasoline are needed, in days of high ozone level, avoid using paints, solvents and oils on days with high ozone concentration, try to reduce the electricity consumed in order to reduce emissions of SO₂, NO_x, VOC among others [15]; light wood with an electric lighter and no longer with liquid fuel and finally try to consume less [1]. As you can see, the measures help each one in its own way, but none directly provides what is needed, which is to abate all that pollution, the only thing they do is reduce and decrease the production of pollution in the air.

It is known that there are many cares and ways to act in a sustainable way, however there is something that people have in their hands every day and do not realize the great potential that can be taken from them, we talk about technology and its great potential in it, technology has developed in an impressive way and we firmly believe that it is one of the few things that can generate radical change. Taking advantage of inventions with great potential is what people should support and even contribute.

Therefore, in search of achieving a radical change making the most of technology, it was decided to use a new alternative that today we can find in construction materials that can surprisingly combat airborne pollution, all thanks to the properties found in its materials. Although it is not well known yet, this new mechanism for Prosolve 370e has a high potential as the material used in various constructions around Mexico and around the world.

1.1.2 Case study

The specialty tower, Manuel Gea Gonzalez hospital. This is the perfect case study that can be used to choose the envelope characteristics for the current semester project. There are several points that this tower and the stadium project have in common. Probably the most important thing is that they are both located in the same country, Mexico. The Manuel Gea Gonzalez hospital (Figure 1) is located in Mexico city and is on a very busy avenue called San Fernando in the state of Tlalpan located in the southern neighborhood of the city; as we know in Mexico City pollution in the air caused by factories and automobiles is an important problem, which we must give importance and what better way to do it than by eliminating it with the architecture and its envelope, which in turn is decorative [2].



Fig. 1. Manuel Gea Gonzalez Hospital in Mexico City.

This project was financed by the Ministry of Health, it was part of a three-year investment of twenty billion (20,000,000) in which it was invested to improve the health infrastructure in Mexico. It was built in April 2013, it has a total

area of 35,000m² and the facade of the tower's Prosolve modules is 2,500m², the volume of the hospital is a rectangular prism, and its envelope is simply a 100-meter curved screen long, made up of the modules of Prosolve 370e [2].

The reason why Prosolve 370e is used for the architectural skin of the Baseball field project, which is located in an industrial zone of San Pedro Garza García, was mainly because it is made up of a decontaminating material that counteracts the contamination located in the air, and as this is an industrial area, there is talk of a worrying number in terms of contamination [11]. It does when light rays hit the modules. In addition, the shape it has and additionally the view that is made by joining the modules gives us a very aesthetic and creative visual result. Before the modules were installed, prototypes were made and tested and installed at the thermoforming factory in Ulm one year before the tower was built. A 1:1 scale patch was installed, composed of 4 mega panels of groups of 3 to 6 modules, currently this prototype is in the upper left corner of the hospital facade. These prototypes were installed in a steel structure made up of steel verticals (Figure 2). This process was carried out mainly to test the way in which the parts were to be assembled and to calculate the installation times of all the modules. [7].

The opportunities and results obtained in the Manuel Gea hospital thanks to the Prosolve 370e system are similar to those sought for the baseball stadium, working with these modules in a project that stands out within the area was seen as an area of enormous opportunity, since the objective of generating a positive impact on urban improvement is achieved thanks to these high-tech modules.

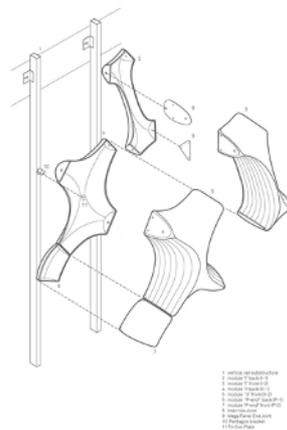


Fig. 2. Prosolve 370e module.

Studies have been carried out that reveal that the façade of the Manuel Gea Gonzalez hospital reduces the pollution caused by 8,750 cars every day. This occurs when the sun touches the Prosolve pieces [2].

The case study in Mexico is very helpful since it provided us with the necessary information to get the most out of the project and use it correctly, mainly because of the permits to bring this coating, also because of the price since comparing the dimension of the projects and note that both are of the same characteristics and dimensions, which tells us that the price of these modules can be a realistic idea, also because it was installed on a very polluting territory, Mexico City, so much so that its façade is known as "The facade that eats pollution" [12], because they achieved an ecologically sustainable project, this thanks to the appropriate choice of materials and their choice for processes that respect the environment, all this seeking to reduce energy consumption and generating an adequate connection with the environment. For this reason, highly beneficial results were obtained, the same results that were sought in the baseball stadium in our city.

1.1.3 Form and function

These 370e Prosolve modules were designed by Allison Dring and Daniel Schwagg and manufactured by a German company located in the city of Berlin called Elegant Embellishments in 2009 [9]. The most important feature of this material is that it reduces contamination thanks to the material from which it is made. The way this happens is as follows. The modules are coated with white paint that contains titanium dioxide, a pigment used to protect the objects on which it is applied from the sun's rays. At the moment in which the ultraviolet rays reach the modules, this carbon dioxide reacts and a chemical process is generated that helps reduce the polluting gases found in the air, one of these gases being nitrogen monoxide (NO_x) [4].

Basically what it causes is that the polluting particles are divided into smaller particles with less toxic chemical compounds, but titanium dioxide is not affected during these chemical processes so it can continue with its process of cleaning the polluted air [8]. It is important that the modules are placed near main roads or streets, or else places where there is contamination so that the modules can be really effective. In this way, not only the people who are within the project where this architectural skin is located benefit, but also the people who circulate around it. Another advantage of the Prosolve modules is that the screen of this group filters sunlight and thanks to its double layer the temperature is reduced inside the project, which in turn also provides savings in the air conditioning that is generated and its polluting emissions [4].

The design of these modules is similar to the voronoi system and can also resemble a honeycomb network but without the hexagons (Figure 3). The voronoi system consists of placing points in a space, then the space is divided by regions depending on the location of the points, that is, the space that is closest to each point and not to any other is assigned. Subsequently, the spaces formed are given a curved offset with a specific thickness depending on the measurements to be achieved. And this is how the voronoi system is achieved with the branches that will allow the modules to join each other [6].

The objective that was sought when designing the modules in this way was not directly aesthetics, which, although it does meet that point thanks to its good design, goes beyond the way it looks. The Prosolve 370e modules were designed in this way with a greater capacity to receive and scatter ultraviolet light and thus achieve a greater amount of pollution reduction, pollution in all directions and not only towards the same face. Depending on the amount of light that reflects off the material, it is the amount of contamination that is reduced. That is why the design was thought so that the light will touch the largest possible surface of the modules, because the more light is received, the more pollutants accumulate and decompose [4].

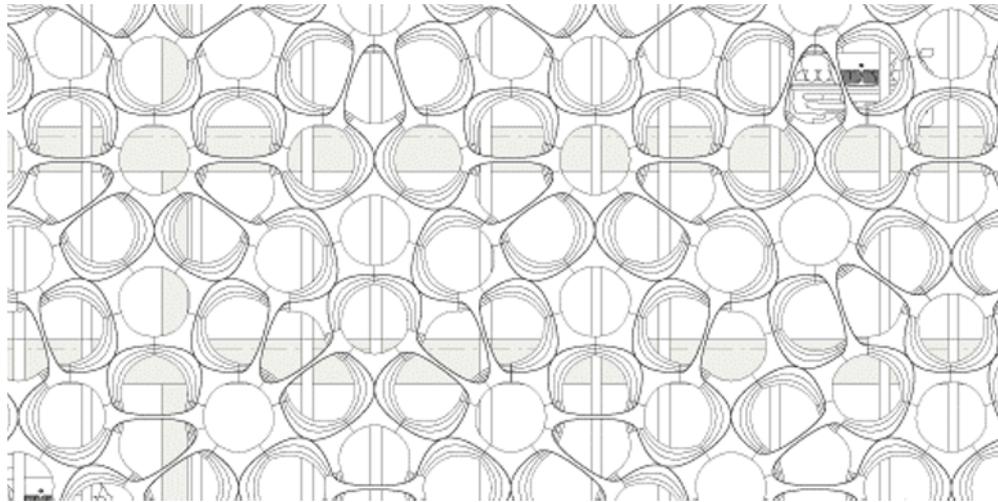


Fig. 3.
Módulos

Diseño de
Prosolve e370.

1.1.4 Sustainability on the skin

As mentioned before, the 2 biggest problems that we have in the city of Monterrey and its metropolitan area, are the high levels of pollution in the air and the strong heat waves that are suffered on a daily basis. To explain a little better, Nuevo León is characterized by being a workers' state full of factories in almost the entire area. But especially for the municipality of San Pedro it is an area in which the prevailing winds bring the polluting gases that San Nicolás and Apodaca produce and therefore it is the area that receives the most polluting gases, focusing on this problem, [11] Air filtration and the decomposition of polluting residues in the air that Prosolve 370e gives us will be an important game in the sustainable scope of our project.

The tile design is generated to maximize coating technology, achieving new levels of surface area and complexity, capturing omni-directional light where light is dense or sparse. Sculptural surfaces maintain an inherent synergy between design form and molecular technology. Thanks to the material Prosolve 370e, our main problem will be solved and our second problem will also be porous material. We can control the entry of natural light as this continues to allow the entry of natural light but in a controlled way [3].

In the baseball stadium, the Prosolve 370e modules were used and placed in a strategic way, since the modules can be viewed on each of their facades, making them work with the air they will be receiving daily, in addition to providing the users who will surround the project with a better air quality. However, the modules provide quality and a very peculiar set of lights that we can appreciate throughout the day while the sun changes its position.

We seek to raise people's awareness of the enormous possibilities we have to contribute to the environment, in this case it is shown that despite the fact that the city grows impressively every day, it is important to recognize that it can be done something about. Take full advantage of technological advances and put them to impactful use. As it is in the case of the CDMX that only 3000mts² purifies what 1,000 cars produce daily [10] [13] .; In this particular case as architects we must begin to open our minds and create with our hearts, being aware of what surrounds us. Technology and science can be the perfect combination to change our future and achieve a green city. Starting to design with innovative methods such as our case where the Prosolve 370e modules were present, we seek to encourage architects and us to take advantage of them and adapt them to a good design, since the number of uses that can be given to this is incredible. , either in facades, structures,

envelopes and even merely decorative ones. We firmly believe that great harmony can be achieved in terms of design with a strategy having a particular goal that is capable of changing significant numbers for the welfare of the world.

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