

A NEW PVC COATING FORMULA CHANGES THE MARKET

MEMBRANE FACADE AND ROOF STRUCTURES ARE THE KEY ELEMENTS OF THE TEXTILE ARCHITECTURE MARKET THAT HAS BEEN STRENGTHENING ITS POSITIONS IN THE SPORTS FACILITY CONSTRUCTION INDUSTRY. THE HIGH-TECH ETFE, PVC, AND PTFE MATERIALS ARE SUCCESSFULLY USED IN THE WORLD, BUT A NEW WAVE OF TECHNOLOGY REVOLUTION MAKES THEM CHANGE QUICKER THAN EVERYBODY CAN EXPECT. THE WORLDWIDE-PATENTED SERGE FERRARI TECHNOLOGY CONFERS UNIQUE PROPERTIES TO THE PRECONSTRAINT COMPOSITE MATERIALS COMPARED TO CONVENTIONAL COATED FABRICS.

Text: Vladimir KOLOSOV



While new membrane technologies in the Russian construction market have been fighting with traditional PVC structures (although, the both materials are considered in the country as innovative ones), the hi-tech world is moving further on. In early 2015, Serge Ferrari started manufacturing a new generation of Précontraint TX30 composite materials in order to match the requirements of the most demanding construction projects.

The new materials are already used in the construction of two French stadiums – Olympic Lyonnais Stadium in Lyon and Allianz Riviera in Nice. Along with France, Précontraint TX30 is in demand in Germany, USA, India, and China. Architects and designers participating in recent conferences and roundtables held in Berlin, Hong Kong, Florida, and Novosibirsk pointed out that the new composite material is optimal for use in large span facilities

HERE IS THE PROBLEM

The world's leading architects spent over 20 years to create the most feasible and firm membrane structures, while real estate developers were searching for alternative materials to substitute for thin steel membranes and PTFE composite coatings, because of their significant drawbacks:

- High production cost of the materials and ready-made products;
- Inability to do local repair works with hard membranes on site;
- Low translucency of the membranes;
- Low feasibility of coatings to make objects look attractive.

On the other hand, PVC fabrics had their own weak points if compared to PTFE materials:

- Durability and longevity (15-20 years vs. 50 years in case with PTFE);
- A relatively thin external lacquer coating layer.

HERE IS THE SOLUTION

Serge Ferrari R&D experts spent five years to solve the existing problem by creating a unique membrane coating with proven design longevity of >30 (actually, up to 60) years. The new generation Précontraint TX30 materials (1,050 to 1,550 g/sq m) have been designed for spatial and cupola structures built in the North climate to stand -60 °C temperature.

Another advantage of TX30 materials concerns their better translucency that ranges from 18% to 42%, which is significantly higher than thin steel, aluminum, and PTFE membranes demonstrate. In particular, the new generation of Précontraint TX30 composite materials has been developed to match the existing requirements of the most demanding projects. The mechanical qualities of Précontraint TX30 directly depend on the coating that protects the yarns. The longevity of the material is served by:

- A CrossLink PVDF surface treatment highly resistant to photo-oxidation;
- A 30-year PVC coating formula engineered to resist erosion generated by weather aggressions (UV, rain, snow);
- A thicker coating at the top of micro-cables.

The new technology demonstrates an outstanding dimensional stability. The polyester micro-cables are tensioned in both directions during the coating process for greater consistency:

- The Précontraint base cloth is therefore more flat and better protected by a high thickness coating at the top of the polyester micro-cables;



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ЭОЛНИТРОМАСБНИ

+7 (383) 210-31-24
E-MAIL: INFO@TEXSTEEL.STYLE
WWW.TEXSTEEL.STYLE

EXPERT COMMENT



DMITRY BUSH,
ARCHITECT, HEAD OF MNIIP
MOSPROJECT-4

My attitude towards innovative materials and technologies is totally positive. Membranes structures and composite materials have been actively used in the construction of sports facilities worldwide. They are energy efficient, beautiful, and modern. Membrane facade and roof structures are the key elements of the world's textile architecture. However, these materials and technologies are hard to install in the Russian construction market because of their producers' ignorance.

I mean to say, they need to spend just 5% more to get all standard-related permissive papers from the local authorities in order to start using their materials in stadia construction to the 2018 FIFA World Cup. If they want to earn millions – they should spend only thousands to obtain the necessary permits – namely, certificates on materials, sanitary and hygiene norms, and fire protection. Everything that the world's leading textile producers submit to us from time to time does not correspond to locally accepted construction standards, especially concerning big arenas designed for 45,000 viewers. The fact is that Russia has a different legislative base on inflammability and fire protection – not in line with German, Polish, or English standards. That is why the global manufacturers need to produce new materials in accordance with the Russian existing norms. Otherwise, those technologies have little to none chances to be used in the 2018 World Cup stadia construction – neither in roofing nor in facades.

- Special creative additives for surface protecting lacquers (based on the CrossLink technology) generally increase longevity of the material and make it more elastic and soft, even if it is used in hard membranes of >120 meters.

A number of membrane coating tests conducted in German independent labs showed a huge potential of TX30 to use in tensioned membrane coatings of dome-shaped, saddle-shaped or spatial sports facilities, concert halls or even chapiteau circuses.

IN LINE WITH RUSSIA'S SPECIAL WAY

Given that Russia has become a global leader in the field of sports facility construction, the country should be more progressive in using new technologies and materials as well. However, one should keep in mind that any deviation from globally accepted norms in Russia is typically justified by its historic special way of development. That is why innovative material developers have no choice but follow the country together with its special features if they really want to enter the local market. Many Russian norms and standards are different from American and European ones.



EXPERT COMMENT



ALEXANDER SMIRNOV,
PROGRAM DIRECTOR, SERGE
FERRARI SAS (FRANCE), RUSSIA
AND CIS. MEMBER OF TEX+STEEL
ASSOCIATION

Based on a request from the Moscow-based CNIIPromzdaniy Institute that is engaged in design and development of large sports venues in Russia, Serge Ferrari conducted a voluntary certification work concerning its TX30 (type 4) material.

As a result, a five-year certificate has been issued by a Research Center accredited by Russia's Ministry of Construction. The document fully corresponds to all existing Russian norms, requirements, and standards. Our composite materials are now recommended in Russia for the use in manufacturing membrane (tensioned and transformable) coatings of football arenas built to host the 2018 World Cup.

TX30 is the first PVC-coated material with a corresponding Russian technical certification. Our company spent 3-5 months and a total of 40,000-50,000 euros to cover all certification-related expenses. Before Russia, we certified our latest composite materials in France, Germany, Switzerland, USA, China, India, Australia, as well as in some Latin American countries. Serge Ferrari's top managers understand the importance of human health and safety – especially after a tragedy in India, where a canvas chapiteau circus burnt to the ground killing 300 children and adults.

Actually, the company never saved on safety issues before and after this tragedy, because we pay much attention to every aspect of safe maintenance of our membrane coatings.

Attempts to apply new textile materials in Russia are often stopped by local authorities afraid to accept risks of decision-making while wanting guaranteed results only.

That is why before approaching local state officials in Russia, it is highly

BASIC TECHNICAL CHARACTERISTICS OF TX30

Technical specification	TX30 - II	TX30 - III	TX30 - IV	TX30 - V	Standard
Application	Roofs and static and permanent structures – tropical climates				
Surface coating	CrossLink PVDF				
Life expectancy	> 30 years				
Welding	Weldable after abrasion				
HT Polyester cables	1100 Dtex	1100/1670 Dtex	1100/2200 Dtex	1670/2200 Dtex	
Weight	1050 g/sqm	1050 g/sqm	1350 g/sqm	1500 g/sqm	EN ISO 2286-2
Width	178 cm	178 cm	178 cm	178 cm	(-1 mm/ +1 mm)
Total thickness	0,78 mm	0,78 mm	1,02 mm	1,02 mm	
Tensile strength (warp/weft)	430/430 daN/5 cm	560/700 daN/5 cm	800/700 daN/5 cm	1000/800 daN/5cm	EN ISO 1421
Tear strength (warp/weft)	55/50 daN	80/65 daN	120/110 daN	160/140 daN	DIN 53.363
Adhesion	12 daN/ 5 cm	12 daN/ 5 cm	13 daN/ 5 cm	15 daN/ 5 cm	EN ISO 2411
Temperature	-30°C/+70°C	-30°C/+70°C			
Quality management system	ISO 9001				
Guarantee	12 years	15 years			
Micro organism resistance	Degree 0, Excellent				EN ISO 846 Method A
The technical data here above are average values with a +/-5% tolerance					
Dimensional stability					
Elongation 24h - 10 daN/5 cm (warp/weft)	<1%/<1%	<1%/<1%	<1%/<1%	<1%/<1%	EN15977
Residual elongation	<0.4%/<0.4%	<0.4%/<0.4%	<0.4%/<0.4%	<0.4%/<0.4%	EN15977
Solar optical values					
Solar transmittance (Ts)	10	9	7	6	EN 410
Solar reflectance (Rs)	75	75	76	76	
Solar factor (g)	14	13	11.5	10.5	
Visible light transmittance (Ts)	8%	7,5%	5,5%	5%	
Visible light reflectance (Rv)	84	84	85	85	
UV transmission	T-UV 0%	T-UV 0%	T-UV 0%	T-UV 0%	
Thermal and acoustic performances					
Thermal conductivity (vertical/ horizontal)	ca. U=5.6 / 6.4 W/sqm/°C				Calculated
Weakening index	ca. 14dBA	ca. 14dBA	ca. 15dBA	ca. 16dBA	ISO 140-3 & ISO 717-1
LEED Heat island effect					
Solar reflectance index	SRI > 90%	SRI > 90%	SRI > 90%	SRI > 90%	SSc 7.2/7.1 (Roof/Non Roof)

EXPERT COMMENT



ANDREY MOROZ,
CEO, LOMMETA LTD.
CHAIRMAN OF THE TEX+STEEL ASSOCIATION, PHD

We recently visited the Stade des Lumieres construction site in Lyon, France, where we realized that membrane materials seem to be ideal for coating large span sports facilities. This is the latest trend in architecture in line with the world's expertise. The Stade des Lumieres project belongs to POPULOUS architects, and it is an amazingly large-scale facility, that can be characterized by the following features:

- High construction tempo due to the used textile technologies;
- The stadium designed capacity is 60,000;
- Unique maintenance characteristics of TX30 (especially, concerning fire safety and manageable destruction) correspond to the existing requirements to large sports venues.

The key advantages of soft textile structures are lightness, portability, and affordability. Installation works on site are relatively simple, so they do not require heavy machinery. The TEX+STEEL Association is capable of realizing similar construction projects in Russia. Serge Ferrari guarantees the maximum use period of its materials only if a local processing company gets necessary certification documents. To do that, the company should possess a corresponding equipment, hard- and software, and highly qualified personnel to develop, cut, and weld Precontraint TX30.

Many companies of that kind (including LOMMETA) are members of the TEX+STEEL Association. Our company also participates in the Taxyloop program (similar to the Trade-In) when a producer after a guarantee expiration date replaces its products with the same quantity of new ones, on a free basis. In this case, a customer has to spend money on installation works only.

Typically, facilities using textile materials have better characteristics due to lighter subsystems, framework and beam structures, less time needed for installation, less transportation expenses, and no need to use load-lifting equipment. As of today, the Taxyloop program relates to a series of Serge Ferrari materials. All above-mentioned factors help reduce the ecological load as well, so the Taxyloop is a really 'green' program!



EXPERT COMMENT



**MICHAEL KIEFER,
FOUNDER AND CEO OF KIEFER. TEXTILE
ARCHITEKTUR. MEMBER OF TEX+STEEL
ASSOCIATION**

PVDF-PVC/PES materials (PVC coated polyester fabric with PVDF like Ferrari materials) are perfect for sports facilities and have the following advantages:

Large span

Large spans are possible. Due to that, less secondary substructure is necessary. And still, it is super thin.

Weight

The materials are very light. Less weight on the tribune construction. Second, it is an advantage in installation procedure.

Environment

Especially Ferrari's materials are recyclable.

Translucency

PVDF-PVC/PES are translucent. This is important to reduce shadows on the playing field during sunshine. It is much better for TV shooting.

Architectural challenge

Due to the necessity to create double curved surface, a wide range of creative shapes are possible, which cannot be done with any other material.

Prefabrication

All elements can be produced at the factory ready for installation. They also demand less time on site for installation.

recommended to secure yourself against possible breaches of legislation. Any foreign producer should have all necessary documents needed to break through the existing bureaucracy – or, at least, to minimize its effects in theory. As practice shows, the key issues that the Russian local authorities focus on are safety and security of any locally produced or imported composite materials.

**ANDREY MOROZ, CEO OF LOMMETA, VISITS
STADE DES LUMIERES CONSTRUCTION SITE
LYON, FRANCE**



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THE WORLD'S LEADING architects spent over twenty years to create the most feasible and firm membrane structures, while real estate developers were searching for alternative materials to substitute for thin steel membranes and PTFE composite coatings, because of their significant drawbacks.

In early 2015, Serge Ferrari started manufacturing a new generation of Précontraint TX30 composite materials to match the requirements of the most demanding stadia construction projects. A number of membrane coating tests conducted recently in German independent labs showed a huge potential of TX30 to use in tensioned membrane coatings of dome-shaped, saddle-shaped or spatial sports facilities, concert halls or even chapiteau circuses.

The state customers argue that more attempts and efforts should be undertaken in order to proceed with the new technologies in the market. The state official level is exactly the point where many progressive decisions are blocked, if we talk about new stadia projects for the 2018 World Cup.

Serge Ferrari's membrane architecture products have now been used in 40% of the world's most modern stadiums and arenas (especially, in their roofing). However, it gives no guarantee to successfully apply the new technologies to similar Russian sports facilities.

The company's management finally understood that and decided to certify its products in Russia in full accordance with the existing local norms and standards relating to safety and reliability of sports venues. As a result, Serge Ferrari SAS has received technical certificates based on the following criteria:

- Fire safety;
- Ecological, sanitary, and hygiene safety;
- Technical safety (including longevity, maintainability – easiness to operate on site and at the built facility);
- Translucency in line with the existing national and international construction requirements. ■