High Performance fluoropolymer film
Unlocking a world of design options in construction
ETFE film offers exciting new design possibilities

From shopping mall roofs or facades and atriums for hotels or restaurants to futuristic sports stadiums, high performance plastic film ethylene tetrafluoroethylene (ETFE) is giving designers and architects a range of new construction options that create a stunning visual impact.

ETFE is often used as a transparent film membrane to achieve maximum flow of natural light into a structure. The use of color, however, can elevate the visual impact of a structure or building while still allowing high levels of natural light to pass through the membrane.
The 150m Euro, 32,500m² Stade Océane is home to Le Havre AC and has a capacity of 25,000 people. The structure is Europe’s first ‘energy positive stadium’ and was designed as a partnership by KSS Design Group and SCAU Architects.

The build was completed in July 2012 and features a striking, pixelated ETFE shell design created using sections of high performance ETFE film colored with varying opacities of blue. Stunning by day, the lighting system causes the stadium exterior to burst into life at night as a bright blue beacon of architectural and construction excellence.

Colored ETFE film envelope in action

There were a number of specific challenges to overcome to create this stunning exterior envelope. These included:

- Installation of a robust and visually appealing framework system
- The material needed to be lightweight yet extremely robust and resistant to most chemicals, fire, adverse climate conditions and UV exposure
- The entire envelope needed to be long life and low maintenance
- The colorant used needed to provide the required opacity and withstand UV exposure to eliminate fading.

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Novum Structures is a global leader in the design, engineering, production and installation of architectural membrane materials. The firm was responsible for the design, fabrication and installation of the ETFE envelope that surrounds the Stade Océane. Novum’s Stressed Skin Membrane System was used to create and shape the single layer ETFE envelope.

The ETFE sections were welded together and stretched around a fully integrated aluminium perimeter clamping and water sealant system. Stainless steel cables were used to provide tension to the patchwork of ETFE sections and form the smooth and seamless curve of the exterior aesthetic.

The ETFE and aluminium components are environmentally friendly, recyclable, and easily dismountable.
With headquarters in Germany, NOWOFOL® is a specialist manufacturer of monoaxially oriented, tensilized polyolefin films and non-oriented flat-die fluoropolymer films. The company’s NOWOFLON® ET film was the perfect material to create the Slade Océane’s high performance envelope.

The ETFE film

Designed specifically for use in membrane construction, NOWOFLON® ET fluoropolymer film provides the following properties:

- Excellent mechanical strength, particularly tear strength and tensile strength
- Light weight - NOWOFLON® ET single layer film weighs 350g/m²
- Excellent weatherability
- High transparency of visible and UV-light
- ‘Self-cleaning’ effect due to low surface tension and extremely smooth surface
- NOWOFLON® ET-Colorshade film can be offered in the full range of RAL or Pantone color grades - Xenontest DIN ISO 4892-2
- Flame retardance - fire classification DIN 4102 B1, Classification by DIN EN 13501-1: B-s1,d0, UL 94: V0
Colorant Chromatics is a producer of high performance fluoropolymer concentrates and compounds with manufacturing plants in Finland, USA and China as well as a distribution center in Limburg, Germany. The company provided the high temperature, high performance colored compounds used to manufacture the different opacities of blue ETFE membrane.

The compounds were designed to optimize pigment dispersion in the final polymer mix in line with the film extrusion process and specially formulated according to the required level of opacity, membrane thickness and extrusion dwell time and processing temperatures. Colorant Chromatics color concentrates and compounds are designed to deliver consistent and uniform dispersion.
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