

A ROOF OVER OUR HEADS

PS&AM quizzed stadium roofing experts about the latest developments in the sector. Katja Bernert, Architect, Textile Architecture Expert at Mehler Texnologies; Ed Bosco, PE, ME Engineers; Dirk Kestner, PE, Director of Sustainable Design Walter P Moore; Steven Sorrentino, Sr. Director of Specialty Films & VDI, Madico, Inc. answered the questions.

When talking to architects currently designing or refurbishing a stadium, which questions arise most commonly?



EB: Projects that involve the refurbishment of existing stadiums need to close the gap between the building that exists and the building that the Owner would like to have. Some roofs are installed to eliminate rain interruptions, some provide shading during periods of high solar gain, temperature, and humidity, and some allow for building use during colder weather or snow conditions. After the operating modes of the roof are understood, the focus turns to the structural capacity of the existing building, the performance of the existing thermal envelope and the seasons when the building will be occupied for events. The balance of the Owner's goals, the facility limitations and the project budget will determine what retrofit opportunities can be considered.



KB: When talking to architects at an initial design stage it is obviously most important to find the right material for the specific application. In Textile Architecture, that's to say building with coated fabrics, the membrane for a stadium cover is very often a customised solution mirroring the exact loads, a specific translucency and a finish that facilitates maintenance.

All along the process of choosing the right material, there is the need to find a sustainable solution for the specified material. Nowadays it is not enough to provide a material matching the specification, at best delivering a long-lasting performance.

We appreciate very much the architects' demands for more sustainability in the built environment and Mehler Texnologies is proud to offer the only membrane within the Textile Architecture range that has a fabric which is made of 100% upcycled PET bottles.

What new roofing materials are being used in sports facilities?



KB: Whereas the venues built around the end of the last century were still dominated by opaque roofs, mostly made of heavy materials like metal or even concrete, we've seen a development towards more lightness in stadia architecture – particularly stadia roofs.

As a supplier of technical textiles this is of course something we absolutely appreciate – the lighter the better: a VALMEX membrane for example weighs less than 1.5 kg/m² and needs only a couple of steel ropes and arches as sub-construction.

Particularly within the last decade we've seen a tendency towards even more lightness – which is basically mirrored by a maximised translucency. Mehler Texnologies provides an HTL (highly translucent) version for the architectural fabrics used in stadia construction.



SS: In addition to incumbent materials such as ETFE and PTFE a new material in the marketplace is ViewScape. This innovative material is a transparent membrane that has many superior attributes. It has superior thermal control properties that allow for greater levels of heat rejection with no frit. Better thermal properties can result in lower HVAC system costs.

ViewScape is also multiple times stronger than other materials allowing for larger spans with less supporting secondary structures. This drops the overall system costs of the roof while allowing for a more open design. ViewScape allows architects and owners to achieve real-world results that will more closely match their renderings.



EB: Fabric roofing materials are becoming more common as a sports facility roof material. Advancements in multi-layer insulated roofing materials are creating new options for buildings in a variety of environments. Roofing materials that can be deployed in pillows expand the flexibility for building design

and operation and allow for improved energy performance.

Strategic fritting of roofing materials can provide shade in the summer and allow for more solar transmission in cooler periods where solar gain reaching the patrons can improve space comfort. Hybrid roofs that combine opaque and translucent areas can be optimised to provide the best balance of thermal insulation and natural light.

What recent innovations in materials and development allow for sustainable structural solutions?



DK: Material suppliers are reformulating their materials to use novel combinations of existing technologies that allow membranes to span farther, providing increased transparency while maintaining thermal performance.

They are also studying their supply chains and processes to better understand the impacts associated with making their products and conveying them to specifiers through "Environmental Product Declarations" or EPDs. This trend is likely to accelerate since the Inflation Reduction Act contains \$250 million to develop and standardise EPDs for construction materials.



KB: When it comes to the building sector's contribution to climate change, the figures are alarming. The fact that a United Nations report attributes around 40% of global CO2 emissions to the construction sector prompts the industry to take radical action. In the last decades the respective action dissolved in offering options of recycling membrane material after use. Unfortunately, these options were only very rarely taken. That's why Mehler Technologies decided to start at the beginning of the value chain. We now offer an architectural fabric which is made of 100 % upcycled PET bottles. Not needing new polyester for weaving the fabric is the sustainable solution in structural membranes.



SS: ViewScape's innovative construction allows for a significantly lower solar heat gain coefficient which allows for more thermal energy to be reflected away from the roof. This results in lower cooling costs and potentially a small HVAC design. All of this is achieved with no frit that allows for a clear material that is see-through with superior thermal properties.



>> **EB:** Improvements in material insulating performance allow for the construction of buildings that operate with less energy. Building with operable roofs tend to have a large number of hours of operation in the open roof condition, which results in a significant energy savings when compared to a building with a permanent fixed roof that must be conditioned during all hours of occupancy. Fabric roofing materials weigh less than traditional roofing materials like steel and glass. This reduces the load that must be carried by the structure and the weight of the structure itself.

Understanding that sustainability is a key consideration, how do you think textile architecture can contribute to lowering a venue's ecological footprint?



EB: Buildings with operable roofs tend to have a large number of occupied hours in the open roof condition. This results in a significant energy savings when compared to a building with a fixed roof that requires mechanical cooling or heating during all occupied periods. Advancements in Textile Architecture increase the performance and durability of roofing materials and reduce the cost, which makes the use of fabric more common.



DK: The Textile Architecture allows teams to use less secondary support structure than conventional rigid construction.

This “dematerialization” can be combined with using lower impact materials, or even carbon sequestering materials, to achieve the lowest impact construction.



KB: Textile Architecture as an ultra-lightweight construction method can in itself lower the venue's ecological footprint – following the mantra: the material which is not needed in the first place is the most sustainable.

Less than 1.5 kg/m2 membrane for the cover and a lightweight sub-construction alone have an enormous potential for lowering a stadium's footprint when it comes to material consumption. Given the long-lasting performance, with little maintenance, this further reduces the eco-footprint in the long run.

Especially in regions of the world which have a set percentage of recycling materials in new constructions, it is an absolute added value to use recycling fabrics such as Mehler Technologies Eco F alternatives from their VALMEX range for architectural fabrics. In this respect all clients can easily lower their venue's ecological footprint.



SS: Material selection within the Textile Architecture is a key factor in lowering the ecological footprint. Depending on the properties of the materials selected you could see improvements in the solar performance and strength. Transparent membranes can provide a lower solar heat gain coefficient (SHGC), the lower the number the more IR (heat energy) is reflected away from the roof resulting in lower heating and cooling costs. Material strength is also a key factor. The stronger the material the longer spans it can carry resulting in less secondary steel and erection times. New roofing materials like ViewScope offers the best SHGC and strength in the industry which will provide the venue's lower heating and cooling costs while lowering the tons of steel and cables needed. All of this is with a clear material that gives the effect of being outside.

Taking lightweight architecture as a sustainable way to cover vast spaces - as there obviously are in stadia constructions - is there more to a membrane than protecting the fans on the grandstands from rain or sun?



KB: The use of fabrics in stadia construction dates back to the sails known as “velarium” in the Roman Colosseum. Then the main purpose

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