COATED TEXTILES - THINKING OUTSIDE THE BOX

DIPL. ING. KATJA BERNERT, ARCHITECT *

* Mehler Texnologies GmbH, Rheinstrasse 11, 41836 Hückelhoven
Phone +49 (0) 2433 4 59-154, Mobile +49 (0) 173 145 5010
e-mail: k.bernert@mehler-texnologies.com – web: www.mehler-texnologies.com

Key words: Textile Composites, Fabrics in Architecture, Frei Otto, material development, Tensile projects.

Summary. This document provides a comparing overview about the development of schemes and design methods in tensile architecture and the steady evolution in materials. It focusses on the correlation of the two aspects and the question of the driving force behind the advances.

1 TENSILE THINKING OUTSIDE THE BOX

Thinking of a dwelling in the original sense of the word, a house comes into our mind: basically a box with a roof.

Of course all of us know the starting point of nearly all presentations on textile architecture: yes, we used to be living in tents when we were still hairy (… and didn’t have any cosy cave at hand) and yes, knights in the middle ages used beautiful coloured tents for tournaments and yes – the Sioux and Apaches did elaborate tensile structures – nomads all over the world still do. But: asking a child to draw a shelter, you’ll certainly get a roofed box; and this is still the archetype of housing. And most likely this will last forever – even after the 100th Conference on Structural Membranes in the year 2090.
The main harasses to this archetype can be found in the last century: the two which will get a smaller and broader focus in this paper have German roots. Take Mies van der Rohe as an example for all modernist architects: with the means of engineering that was originally meant for industrial applications he managed to free the walls from their supporting function. Where steel columns hold the roof there does not necessarily have to be a solid wall. Whereas light and air could only enter pre modernist houses by small openings, there’s now much more scope for having more openness than solidity. Having new and (fairly!) effective means for sealing flat roofs there was no need any more for sloped roofs. This should only be a short focus on what happened in the first half of last century in terms of architectural milestones. And: no architectural stream was more addicted to the box as the Bauhaus movement. Open and airy spaces – but still boxes.

The second stream which is of course far more interesting and exciting for the tensile world was originated in Stuttgart: The first to be thinking outside the box was most certainly Frei Otto. In the year of his death and of his acquisition of the Pritzker price this deserves a renewed focus on the consequences of his thinking for today’s way of designing.
Whereas Mies was definitely still thinking in boxes with elegant flat roofs, Otto was the first to introduce a more humane approach to design. His references to bionics are well known. Looking as him on the merits of what nature can tell us, it’s only logical to leave all right angles behind. In this Frei Otto managed to introduce even more light and air into architecture as his predecessors in Dessau or Weimar.

Of course it was not Otto alone framing the future of tensile architecture. Him being an initiator could only function with people at hand - most of them interestingly in Stuttgart – who were capable and visionary enough to implement these revolutionary thoughts.

Why is it that Mies had such a big impact on the way we design today and Otto comparingly little? Is it because the lobbying of the concrete industry is so much stronger than that of tensile industry or is it that Otto’s ideas lack feasibility? The answer to the first question is most certainly yes. Answering the second is more difficult: If it was ‘no’ that would leave the whole tensile community as a lot of incapable engineers. As this is obviously not the case, there are other factors which explain why the success story of tensile architecture is yet to be accomplished.

First it is most obvious that a tensile layer is not capable of bearing the loads or functioning of a floor slab. Imagine people sitting at their desks on a cloud of white Type V material! Even if the prestressing could bear the load of some clerks and their folders it would probably be very uncomfortable to go from one desk to the other.

The second problem is the insulation factor. Whereas the glass industry for example has managed to provide for multi layered systems filled with gas in order to provide reasonable u-values there’s next to nothing in the tensile industry. Here of course is a soft spot of all material producers and manufacturers: is there not enough enthusiasm or do we have to account for the 500 year’s material evolution in glass industry and therefore predict an insulated translucent tensile roof for the year 2515?

Is insulation the only problem we have to face within the next 500 years? Apart from that we certainly have topics like adaptibility or norming processes which will provide the organization committee with topics for the 500 years in between this inventory now and the actual acceptance of fabrics as the sixth building material in about 450 years.

2 MATERIAL EVOLUTION

This draws attention to material science. Of course there was a rapid evolution in membrane materials within the last 50 years. Whereas Otto’s first built projects were made of cotton fabrics we now use highly elaborate engineered fabrics. People not involved in tensile architecture still think of “real” fabrics when there is talk of textiles in stadia design. This does not take into account that it is now more an industrial product than some garment.
Hence there is a material evolution that is keeping pace with today’s fabric applications. But: keeping pace must not be the goal. Overtaking and setting milestones must be the driving force behind material evolution. Therefore there are uncountable inputs from architects and designers on the one hand and milestones in material science on the other.

One of these steps might have been the decision of Valentin Mehler to use polyester fabrics. That was just after the second world war in Fulda, Germany, and seems to be a little step on the way to fabric stadia architecture. Nonetheless it is one explanation why Mehler has such a profound experience in coating Polyester fabrics with PVC and other materials.

It was again the Research and Development (short: R&D) team of Mehler who initiated first tests with weldable PvdF lacquering in the nineties of last centuries. That was one of the many necessary steps towards a user friendly manufacturing process. Where handling is made easier, newcomers in tensile industry are allowed to contribute their inventions and sometimes unorthodox approaches. Of course tensile industry has to account for optimal quality standards but still there have to be means for new ideas to enter this immaculate circle.

3 CORRELATION

This is where a fruitful correlation comes obvious: innovative R&D resorts of the material industry on the one hand and brilliant designers and engineers on the other who not only adopt the industry’s forgiving but challenge Mehler Texnologies and their likes in order to bring forward their ideas. That is what makes the jobs of all people involved so interesting and joyful. Imagine promoting the newest evolution of a gaseous glass filling, upgrading the u-value for some third decimal place.
3.1 Trigger: Design

The question what was first: the design or the choice for a special material is as difficult to solve as the question if the egg or the hen was first. A wonderful example of how designers can challenge a material supplier is the stadium in Konya, Turkey. The Istanbul architect Bahadir Kul together with the officials of the football club certainly triggered evolutions in material science. Green is the colour of the football team, so green was the chosen colour for the fabric roof and façade. Of course colour in general is not a big challenge in tensile industry. But hitting the right nuance on the one hand on a scale of many thousand square meters and most of all supplying even more of that colour when the initial production was long finished – this is what challenges R&D departments and logistic partners.

![Stadium in Konya](image)

The result is an application of various different fabric materials: not only coloured pieces but as well mesh fabrics that allow transparency for some of the inner parts. In this way Konya is a showpiece of fabric stadia architecture. This iconographic design puts Konya on the map of the global football circus. And this is obviously something that stadia managers all over the world dream of: having a form and overall design which everybody remembers and allocates to a special region or town.

3.2 Trigger: Material

The design of the Indo German exhibition which the Goethe Institute organized at various cities in India is an example of materials triggering a design. Because the architect wanted to use many of the coloured materials he combined them in a basket like design. It is no coincidence that the whole façade seems to be woven – after all the building material was produced in a weaving mill.
4 CONCLUSIONS

- The driving force behind an evolution in fabric architecture is neither only with the designers nor with the industry. The correlation of the two triggers a cross-fertilization that generates exceptional designs on the one hand and fresh materials on the other.

- More material developments are due. Exemplary foci of the future will be thermal insulation and translucency effects.

REFERENCES

[1] This stamp is in the public domain in Germany because it was released by Deutsche Bundespost on behalf of the Federal Minister of Post and Telecommunication and thus is an official work according to German copyright law (§ 5 Abs. 1 UrhG).
[2] bubbles by Frei Otto
[3] Photo by Dr. Paul Wolff, Val. Mehler AG, Fulda
[4] Copyright with Mehler Texnologies GmbH
[5] Copyright with Mehler Texnologies GmbH