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Barco RigiFlex

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Seamless diversity in formats

The Belgian manufacturer „for networked visualization solutions", Barco, has equipped the Museum of the Future in Dubai with a 21-metre-wide RigiFlex rear projection screen. This curved solution meets the highest demands in projection with a total of 14 Barco projectors.

Original text: Dominik Roenneke | Images: Barco, Atelier Brückner, Dominik Roenneke

Projection, as we know, is based on an imaging projector and a projection surface. The overall result depends on the qualities of both components. Barco is not only a leading manufacturer of projectors, but also a developer and producer of individual projection screens and complete visualization systems for a wide range of uses and installations, from steel constructions or substructures to the projection screen itself. For projection screens, the optical

Photo: Atelier Brückner/Giovanni Emilio Galanello

specifications in terms of contrast, opacity/transmission, viewing angle and stray light behavior are crucial. Customer-specific parameters are added: size specifications, shaping, image resolution and viewing situation. The integration of an optimal projection surface is anything but trivial.

It all depends on the coating

A projection screen basically consists of a carrier material, a substrate layer, and the coating which determines the optical properties. In the case of rear projections, the transmission of the material is of course decisive for quality. With this type of projection, there is also the "hot-spot" effect, which should be suppressed as best as possible or even avoided entirely. With inhomogeneous rear projection surfaces, the image area in the zone of the projection optics appears brighter than the average brightness of the surrounding image area. This is the visible hot spot. These light/dark gradients disturb the great viewing experience. For multi-channel projections, hot-spot effects occur in the corresponding number of projectors. The hot-spot itself also depends on several parameters: such as the optical focal length, the viewing angle and the contrast (gain). Barco, with its projection expertise, has been producing rear projection screens made of glass, acrylic and, since 2018, rollable screens under the patented product name „RigiFlex" in its own production line since 2012. ➔

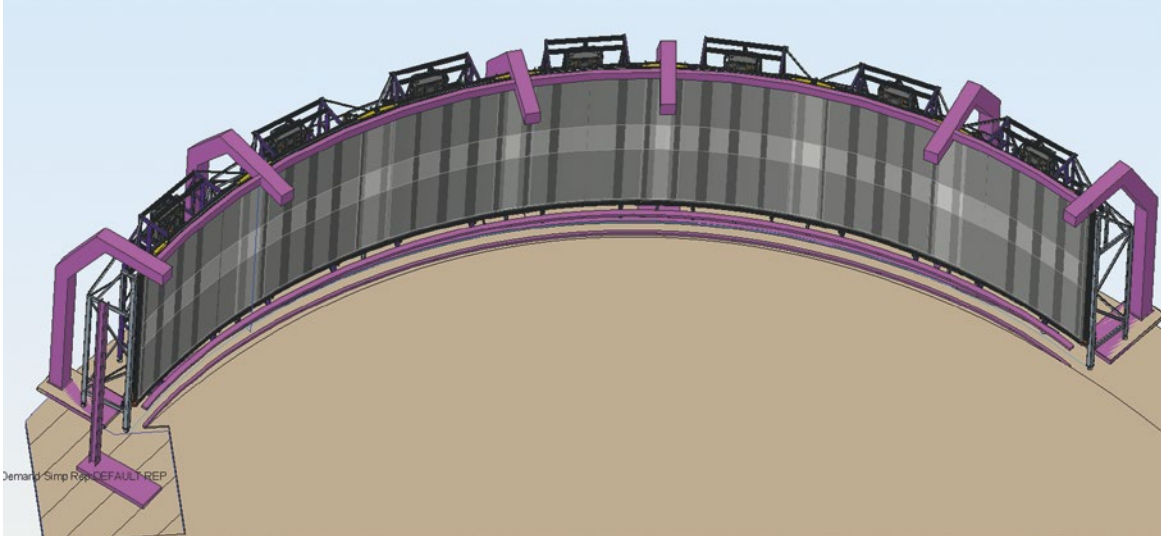

Illustration: Barco

Patented

Barco RigiFlex is a complete system with its own patented steel construction.

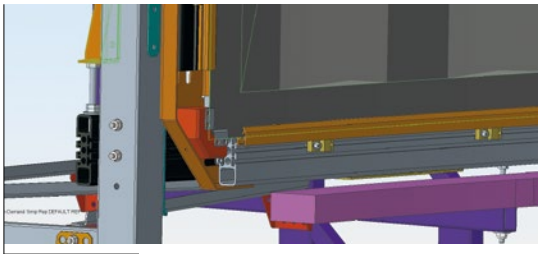

Illustration: Barco

Tensioning

The metal frame ensures perfect tension of the projection surface and is adjusted to the defined tension on site.

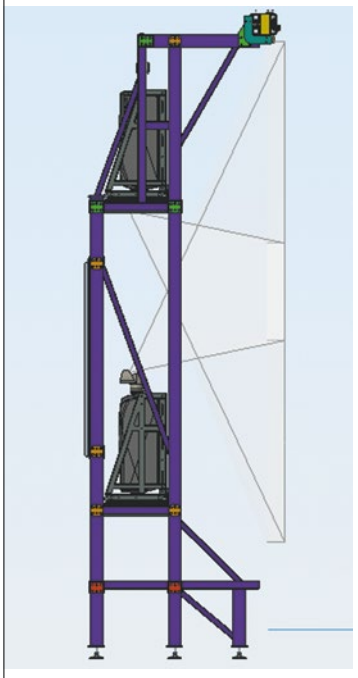

Illustration: Barco

Space-saving

The special arrangement of the projectors minimizes the projection distance in the two-row setup

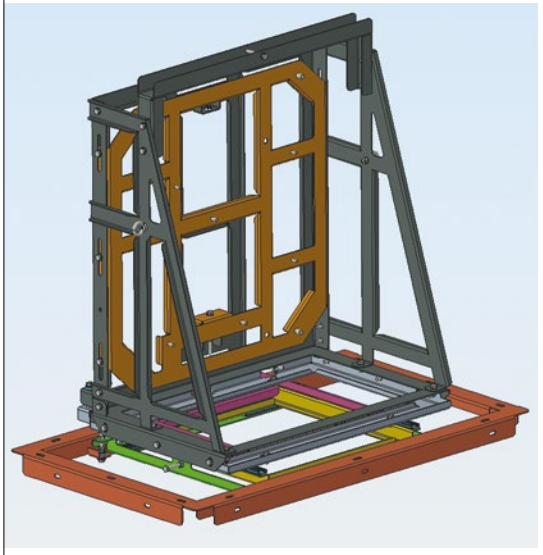

Illustration: Barco

Down to the last detail

The Barco projector frame allows optimal adjustment in all movement axes.

Portfolio

Barco produces transparent glass-based screens in sizes up to 11 × 3.2 meters. The maximum sizes are limited by the industrial glass production of international factories. In addition, as the size of the installation increases, another size issue arises: Can the desired projection surface even be brought to its place of use in the building with its large transport dimensions?

Concentrated expertise

Know-how is required to ensure that the manufactured projection screens made of glass, acrylic or a wrap-around mesh achieve the desired image qualities. Barco has grown its experience over many years to produce the right coating and apply it by machine. But this knowledge alone is not enough to produce individual large projection screens in perfect quality with the defined specifications. So Barco developed and built the appropriate production line itself at its Belgian production site in Kuurne. The masterpiece is the single-step coating process of the 4.5 x 11.5 meters surface.

The coating space for this customized special format is an enclosed space with suitable environmental conditions for error-free and clean application of the substrates and coatings. The untreated surfaces are carefully balanced in a horizontal position. During the subsequent coating process, a program-controlled spray head is moved over the surface, for even and smooth application.

Drying takes place directly on the spot in the enclosed space. So no transportation needed. First, the substrate is sprayed on as a carrier layer. After initial drying, the desired coating is applied in the next production step. After final drying, the surface quality of the produced projection surface is checked. For this purpose, a camera is attached to the spray head, which captures the entire surface in a scanning process in order to identify possible deviations. In the next step, registered areas are visually inspected.

The dried projection surface is then set up in the test lab. Here, the properties and qualities of the freshly produced material can be checked in a projection under real operating conditions. In this laboratory, a final factory acceptance test, the so-called Factory Acceptance Test (FAT), takes place together with the client at the customer's request.

Barco RigiFlex

Among the three material versions, glass, acrylic and mesh, RigiFlex is the flexible and rollable

variant in Barco's rear projection screens. Because of its roll-up capability, RigiFlex is the preferred solution for many large-format implementations, as it can be transported to the site and installed as a „handy" roll rather than as fixed a surface. As with the glass and acrylic versions, RigiFlex also meets the highest demands for high-resolution and homogeneous rear projection capabilities. There is also the factor of dimensional accuracy. For this purpose, Barco has developed and patented a metal mounting system that prevents vibrations of the material. A fully adjusted projection must not be altered by changes to the alignment and focus plane. Otherwise, it would hardly be possible to provide a permanently high-quality projection. Especially when using ultra-short throw projectors, a variable projection distance would not be tolerable. Because with the coated solutions, the stability of the surface is crucial. Any movement by airflow would cause movement of the overlapping pixels, resulting in blurred and unacceptable mixed zones. In multi-row projector setups, even four overlaps are possible, making this requirement even more critical.

Photo: Dominik Roenneke

Spray coating
The individual layers are applied to the substrate in several production steps.

The permanent tension is the decisive factor for the flatness of the rear projection surface. The development of RigiFlex is based on high dimensional accuracy of the material and, in particular, sufficient tension in the suspension. The latter is achieved with RigiFlex via the patented construction of the frame. This means that rear projection screens can not only be optimally spanned in a flat design, but also curved.

The „proof": Museum of the Future

In 2019, Barco received a request for very large screens as part of the media technology planning for the „Museum of the Future" in Dubai. Atelier Brückner commissioned „medienprojekt p2" from Stuttgart to implement the AV design on several floors of the Museum of the Future, including a very large-format image to be created with a Barco projection surface. The plan? A curved rear projection screen of 21 meters wide and 4 meters high.

The question arose as to the stability and dimensi- ➔

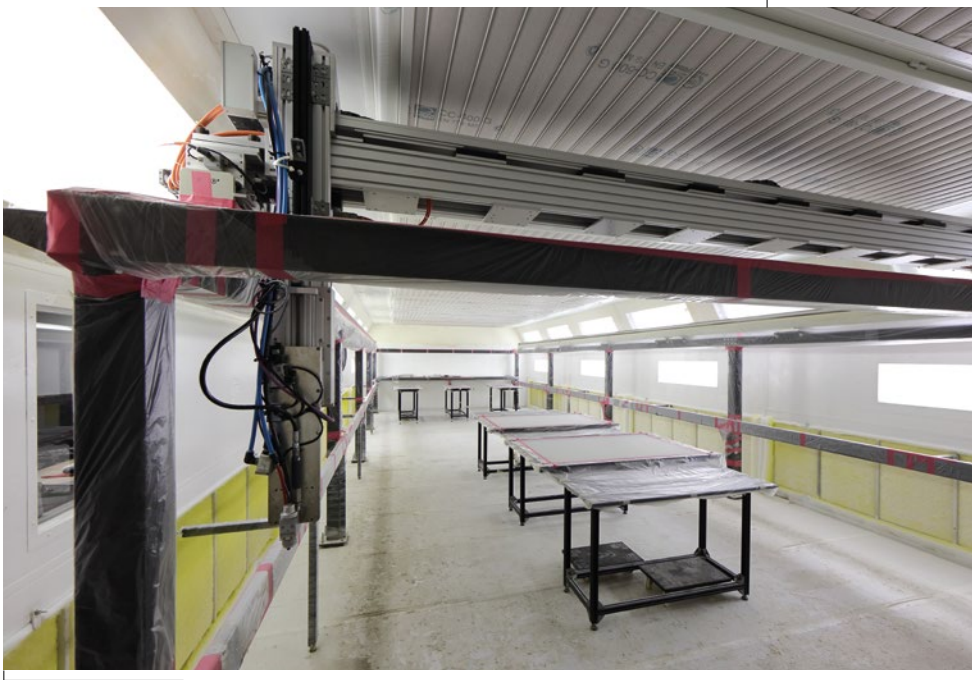

Photo: Dominik Roenneke

Production line
Here, all custom Barco projection screens are made of glass, acrylic or flexible RigiFlex.

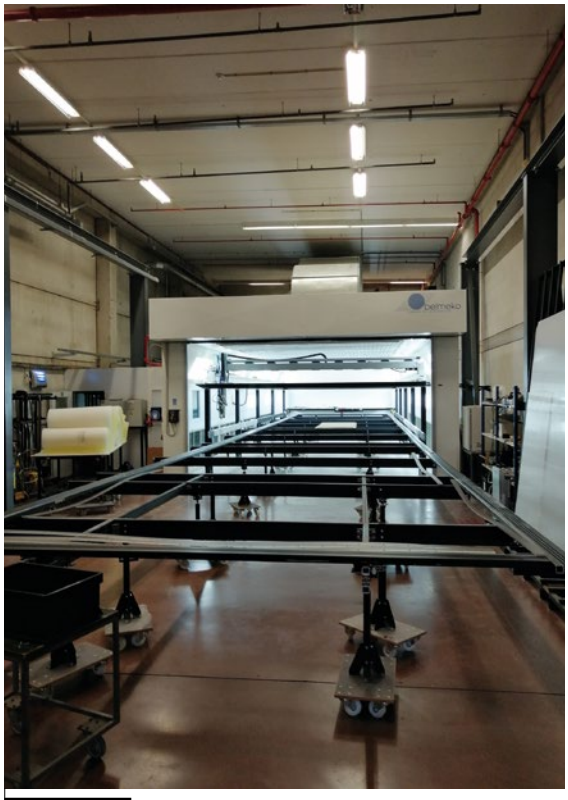

Photo: Barco

Oversized

The RigiFlex projection surface for the Museum of the Future exceeded the size of the projection line during manufacturing and was coated in two passes.

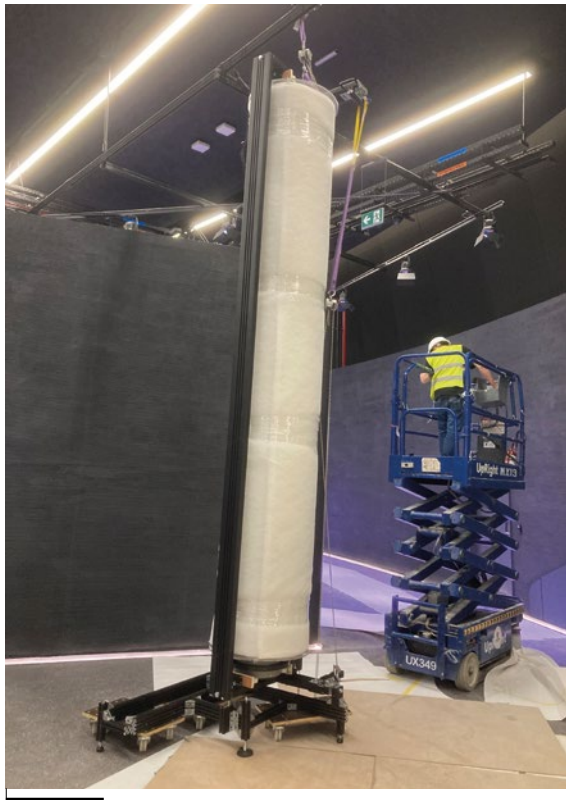

Photo: Barco

Roll up

A projection screen of the dimensions for the Museum of the Future can only be handled when rolled up. The unwinding construction was also a special design by Barco.

onal accuracy of the planned projection screen. For Barco, the question of the appropriate production process arose in view of a 21-metre-long seamless image surface. Barco was able to provide the answers: with an endurance test of the RigiFlex rear projection screen and with a special coating process in two production steps.

Barco carried out the endurance test with its RigiFlex projection screen in the exact centre of a tennis court in combination with a Barco UDX-4K32 projector. On the court, Yanina Wickmayer, who was ranked twelfth in the world at the time, competed against the 6-meter wide and 3.75-meter high screen. The projection survived this stress test with flying colors. This convinced the customer of the stability and dimensional consistency as well as its outstanding projection properties of the RigiFlex projection material.

Extraordinary special solution

The client had deliberately opted for a projection solution for its cinematic space capsule on the "OSS Hope space station" in the Museum of the Future, instead of an LED video wall. The reasons for this were, on the one hand, the undesirable heat radiation on the part of the viewers when using an LED wall and, on the other hand, the lowest possible power consumption of the image reproduction technology in the new museum building, which was planned as a "zero-energy building". Rear projection, as an alternative to front projection, was preferred because neither the noise of the projectors seemed to be a problem nor the view of the technical-looking devices affected the interior design. And so a 21 × 4 meters rear projection screen was provided.

Barco has already produced custom RigiFlex solutions for many projects, but the 21-metre image width for this museum project can be described as a technological challenge. The two-phase coating process required an interim rotation of by 180° in the coating process, so that both halves of the material could be processed equally one after the other in the system. This was not only time-consuming, but also costly in view of the 21-metre dimension when „turning" with the necessary intermediate winding.

On the construction side, the patented mounting sys-

tem could easily be scaled to the dimensions of the screen. With RigiFlex, the clamping of the projection surface onto the metal mounting system is not based on individual fixing points, but on a circumferential rail profile with a precisely adjustable clamping device. This prevents any wrinkling and stops vibrations in the image plane, for example due to draughts or thermal changes in the room. Furthermore, this technique is very suitable for curved solutions because the material runs perfectly over the entire curved distance in the desired shape of the metal holder under tension. The tension is set to a value of 10 N/cm (ten Newtons per centimeter). For the screen with a width of 21 meters, the tension →

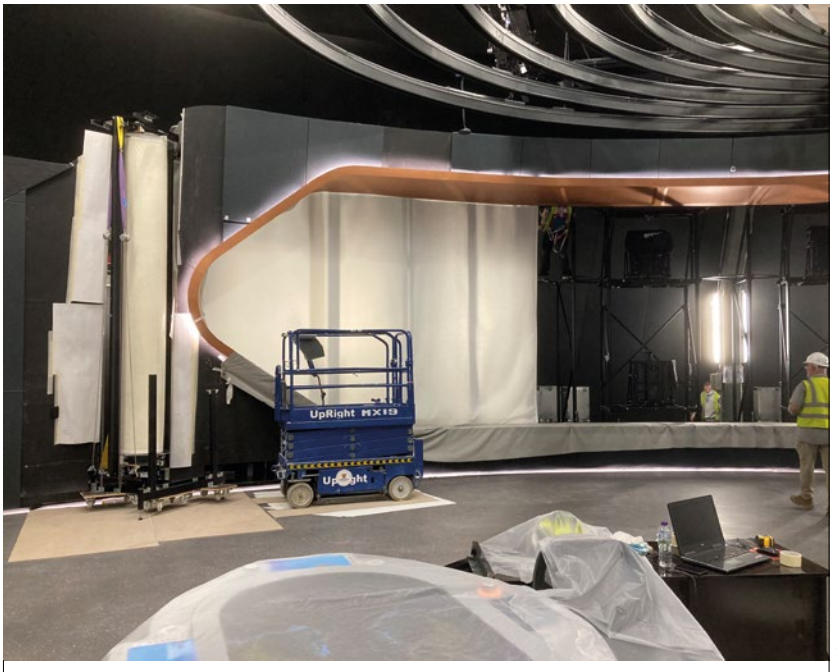

Photo: Barco

Unwound

The projection screen was unwound directly from the roll in the museum during installation and threaded into the guide of the retaining structure.

Photo: Barco

Test lab

The finished image surfaces can be tested in the test lab with projection under optimal operating conditions.

Journey of the Pioneers – Museum of the Future

The Museum of the Future is one of Dubai's new attractions and on the global museum map. In an iconic building (Architecture: Killa Design) it invites you to set off together on a path to the future and to take responsibility. Atelier Brückner designed the exhibition „Journey of the Pioneers" as an immersive experience over three floors and 3,000 square meters of exhibition space. Each floor is designed like a cinematic setting with expressive, strong spatial images and focuses on a vision of the future: life in space, bioengineering and regeneration of damaged ecosystems, as well as individual well-being. In addition, the Future Heroes exhibition has been designed on an area of 1,200 square meters, with a playful and intuitive approach aimed at children up to the age of 12. It occupies the first floor of the museum.

Inside, visitors can expect a motivating and thrilling experience that will prepare them for the challenges of the future in a triad. The exhibition „Journey of the Pioneers" catapults museum guests into the year 2071 on the space station OSS Hope with a racy elevator ride, staged as a cinematic space capsule. Here, astronauts are recruited to contribute to the success of a fictional, albeit realistically imagined space mission. The aim is to cover humanity's energy needs with solar energy, which will be concentrated in collectors around the moon and transmitted to Earth in a targeted manner. In 2071, the Earth is a habitat that has been sustainably enhanced by many concrete projects: Cairo, for example, is a Green City, as an overlay shows when looking down on Earth from the cockpit of the space station. However, it is also still in danger, for example forest fires threaten the Amazon and the OSS Hope base station there. Visitors gain an overview of the upcoming tasks and projects. You are invited to register as a collaborator and receive the appropriate equipment as pioneers of the future at the media station.

Back on earth, the HEAL Institute on exhibition level 4 motivates the pioneers to contribute to the regeneration of the ecosystem by means of bioengineering. First, they immerse themselves in the beauty of nature. The visitors discover the interrelationships of life in the rain forest. Rain pelts down, insects buzz; pollen rise, and the activity of the crosslinking mycelium becomes vivid. The abstract visual language of the cinematic projection with thousands of dancing dots captivates the visitors.

In the next room, „The Library", the diversity and beauty of the surviving flora and fauna captivates visitors. The room seems mystical, full of magic. 2,400 glass cylinders, each of them 18 cm high and suspended from the ceiling, are arranged as a walk-in room installation into which the visitor enters. The oval shape encloses the visitor in several rows, arranged by species: from mammals to protozoa. Each of the animals is laser engraved in the crystal glass and fascinates with its richness of detail and precision, including 40 different frogs. Equipped with a mobile device, visitors explore the archive and collect gene codes that enable them to create new life in the next room, „The Lab", which contributes to the survival of the ecosystem. The data flows into the film-generated 360-degree image of a forest landscape that, after a fire, begins to blossom anew. Incubators in „The Observatory" room show other research projects that people are working on in the year 2071: Fire-resistant trees have been developed, seed bombs and lipid-rich quinoa are close to completion. The Heal Geoscope offers a summary of projects already implemented in the desert, the Arctic, forests and waters in the form of images and processed data on the opposite wall.

Finally, the exhibition level ALWAHA brings the pioneers into contact with their own selves. It is about experiencing ourselves as human beings through one's senses in order to then go into the future strengthened and fo-

adds up to 2.1 tons, which is absorbed by the rear metal construction on stable beams. At the same time, this statics of the support is achieved completely independent of the surrounding building.

Barco F90 projectors with ultra-short throw lenses (UST lens EN68 4K13) are used for projection. The projectors are integrated into the overall construction of the metal frame of the projection screen. A total of 14 projectors are distributed over the 21 meters in two rows. Interestingly, the units in the upper row project the lower single image fields and those in the lower row project the upper fields. This minimizes the necessary projection distance as well as the space required behind the screen. In the Museum of the Future, a smaller Barco RigiFlex projection is installed elsewhere, which, although not curved, was created as a flat image surface (4.00 meters wide, 4.00 meters high) with a total of two projectors using an identical construction method. The Barco RigiFlex system allows a very wide range of formats and customized designs.

When mounting the projectors in the metal structure, they are first inserted with a cable system and then me-

cused; it is about reflecting on our own well-being in a high-tech environment.

A fountain forms the prelude to the soothingly relaxing ambiance of the room. Warm earth tones and sounds surround the visitor; they draw him into the depths of the room. Inner peace returns. Then it's off to „Movement Therapy". Quite intuitively, you dance into a projected sand bath in harmony with wind and waves. The light captures the dancers; and shimmering circles of sand move with them across the soft floor.

Adjacent treatment rooms open up via round arches: Feeling, Grounding and Connection Therapy. Energy flows tickle the palms and sounds become deep body awareness. Finally, „Connection Therapy" illustrates that only together can a flow of energy be created with which something can be moved. The visitors realize this at an oval, media-filled table by humming together.

The final piece is an immersive room installation. In the centre of the room, elevated at a height of 4 meters, is a round glass water basin with a diameter of 3 meters. Impulses set the water in motion; light spreads the fleeting lines across the room. The visitors, lying under a 60-square-metre dome, immerse themselves in the sea of waves of light and sound that is constantly being created anew. There is nothing more to do here. It's all about being.

The visitors leave ALWAHA via a time gate. On a water basin embedded in the wall, they leave behind – in a completely analogue way – a wish for the future. Atelier Brückner is responsible for the conception, design and implementation of the exhibition, into which current research and scientific results have been incorporated. Over 20 planning partners and consultants were involved.

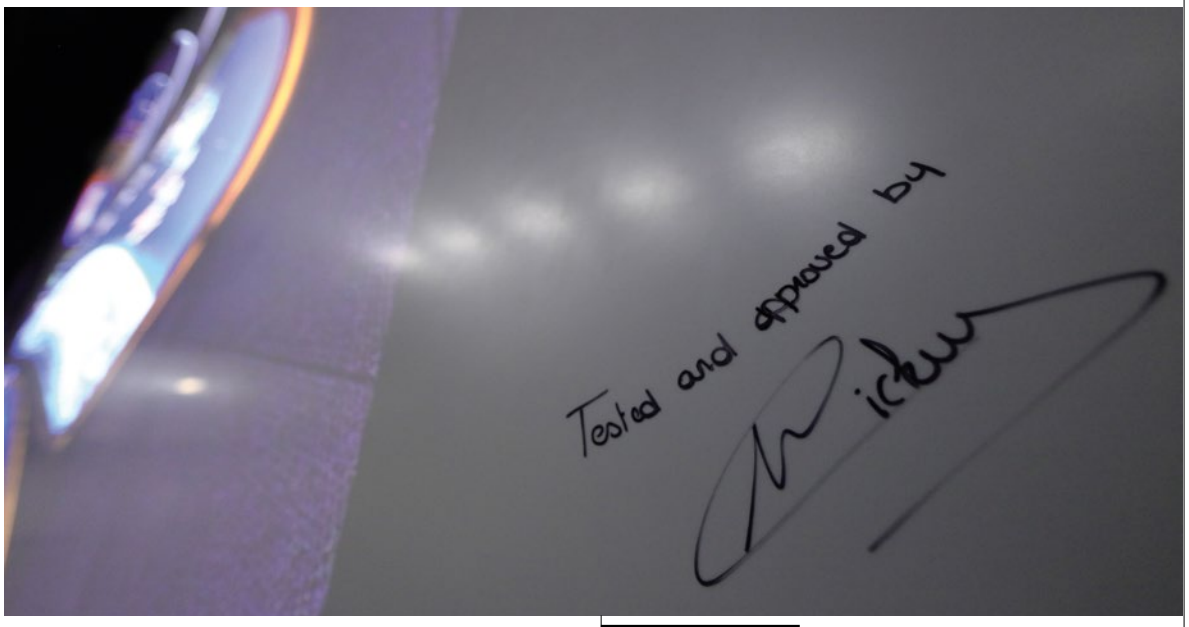

Photo: Dominik Roenneke

chanically positioned in the axes left/right, up/down and forward/back. In all three axes, the rotation can also be adjusted. After the mechanical adjustment, the final electronic adjustment of the projectors with their 14 individual image fields, which project the overall image in a soft-edge arrangement with overlapping areas, took place.

The finished result is a huge seamless projection surface that, with its mechanical implementation, produces a permanently flawless image, without misalignments due to external influences or noticeable heat and noise generation. •

Found to be good

Tennis player Yanina Wickmayer subjected Barco RigiFlex to an endurance test and immortalized the positive outcome directly on the projection screen.

Web links

Barco RigiFlex: www.barco.com/de/product/rigiflex
Video „Endurance Test": www.youtube.com/watch?v=z3m90TkBfts
Barco for the Museum of the Future: www.barco.com/en/customer-stories/2022/q2/museum-of-the-future
Medienprojekt p2: medienprojektp2.de/2022/museum-of-the-future/