interiors
RAILWAY INTERIORS INTERNATIONAL SHOW ISSUE 2011

Classic cars

Carriages from the 1960s are being refurbished for a new contender on the Hamburg-Cologne route

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How to make money and please your passengers

Comfort drive
Behind the scenes with SNCF's research team

Andrew Muirhead

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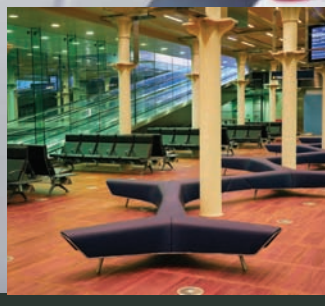

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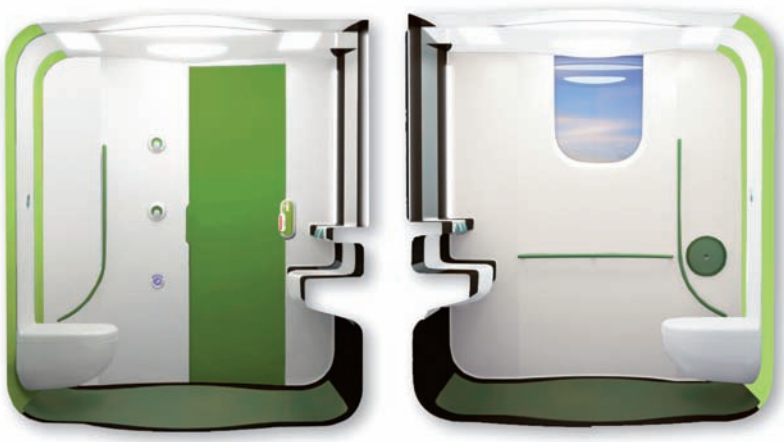

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All (rail) roads lead to Cologne, it would appear from looking through these pages. At least they certainly do for Germany's Hamburg-Köln-Express, featured on our cover and from page 16. The new operator is preparing to launch its eponymous service, with a single route linking the two cities.

The way it's going about it is very interesting – instead of buying new trains, it has acquired three six-car trains originally built in the 1960s. With the help of design firm müller romca and brand strategy expert boy, the interiors are being refurbished, adding modern surfaces and design flourishes while retaining much of the original structural elements and fittings. The result benefits from the best of both worlds: the sleekness of the new and the generous proportions and historic ambience of the old.

It's a pity the new service won't be launched in time for you to try it out on your way to Railway Interiors Expo. Thousands of industry visitors are expected to flock to Cologne for the show on 15-17 November 2011. We've set out the product and technology highlights in our preview (*page 38*), and caught up with the cream of a very strong crop of speakers from the free-to-attend Design & Technology Forum.

You can also get a taste of some of the case studies from the forum elsewhere in the magazine. For example, see page 6 for a look at BMW Group DesignworksUSA's designs for BART's trains in San Francisco, USA; page 8 for an insight into SNCF's comfort research; and pages 54, 66 and 77 for news from some of the technical experts lined up to speak.

We hope the magazine will supplement your show experience and enable you to make the most of a very busy three days in one of Germany's most vibrant cities.

Izzy Kington, Editor

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FLOORING SYSTEMS

Flight **of fancy**

Design firm Priestmangoode has unveiled a new idea to make the journey between airport and city centres more comfortable, practical and useful, and make for a speedier journey through the airport.

LoungeLink has a staggered layout inspired by airline business-class cabins. "Our experience has shown us that a staggered layout is an efficient way to utilise a small space, maximise seat numbers, provide privacy and improve passenger comfort," says Luke Hawes, a director at Priestmangoode.

To facilitate working, there are single workstations with sliding partitions for optional privacy. "These would provide an ergonomic working environment in which to prepare for meetings or access files before boarding a flight," says Hawes.

The workstations integrate individual work/task lamps, document and bag/briefcase storage, a drink holder, and power and data ports. "We have been working in the airline and transport sector for over 15 years now and understand the needs of passengers. Presently, business travellers may be out of contact with their office or clients for the entire duration of their travel, from leaving the city centre until they reach their final destination," comments Hawes. "LoungeLink would provide the opportunity to effectively use the transit train as a moving office, downloading files and emails ahead of boarding flights and upon arriving at their destination."

The emphasis is on a lounge-like atmosphere, incorporating furniture and design details more in keeping with passengers' homes – including generous leather armchairs with padded and sculpted foams and cushions, textured surfaces and the use of soft ambient light spills. The chairs would sit on swivel bases, allowing for a flexible layout, whereby passengers can create a more sociable space when travelling in groups. Adjacent to this are aisle-facing sofas with a refreshment zone.

Other LoungeLink features include a flight information display and a dedicated monitor for airport check in – all of which are designed to facilitate a speedier journey through the airport for the traveller.

www.priestmangoode.com

BELOW AND RIGHT: Individual workstations would enable business travellers to stay productive

Access all areas

German operator ViP Verkehrsbetrieb Potsdam has begun operating its first Variobahn tram from Stadler Pankow. "With the new Variobahn trams, we are taking an important step in converting our fleet of trams to low-floored vehicles," said Martin Griessner, director at ViP. "Using 100% low-floored vehicles increases the usability of our trams for all passengers. Furthermore, it is particularly important to us to increase comfort for people with limited mobility and for families with children."

With a carriage width of 2.3m, the interior of the Potsdam Variobahn includes large areas for wheelchair users, bicycles, prams and bulky luggage. "We are now able to carry two wheelchair users instead of just one," commented Griessner. "Furthermore, two mechanical folding ramps make boarding easier."

The tram, which is fully air-conditioned, features a strongly contrasting colour scheme and clear, simple structures for ease of use. There are two touchscreen ticket machines, and passengers can pay with notes or debit cards.

"Alongside the high degree of functionality, we are delighted by the design of the Variobahn, which reflects both the company and the city of Potsdam," said Griessner. "The external colour scheme, with its striking corners, represents ViP; Potsdam is represented by the design of the seat covers."

"We are very proud that Stadler Variobahn trams are now operating in the metropolitan area of Berlin/Brandenburg," said Michael Daum, director of Stadler Pankow. "Thanks to excellent teamwork, the trams could be manufactured and certificated on time and will now start passenger service as planned."

Potsdam's first Variobahn has been in regular service since 18 September 2011. Two further trams are currently being used for training tram drivers. ViP has ordered a total of 14 Variobahn trams from Stadler Pankow, with an option on four more. "The Variobahn trams should successively replace the Tatra trams," said Griessner.

www.stadlerrail.com

Vox populi

ABOVE: Concept A for BART's new train cars updates the original 1972 design

BMW Group DesignworksUSA has started an ambitious urban transit project in collaboration with Bay Area Rapid Transit (BART) of San Francisco, USA, to create a new generation of train cars. BART, which began picking up passengers in 1972, presently operates the oldest fleet of train cars in the USA. The new ones are scheduled to enter service by 2017.

BMW Group DesignworksUSA's scope of work for BART includes the railcars' exterior and interior. It has already created three concepts.

"A significant factor impacting the design of all three concepts is the projected growth in passenger numbers," comments Adrian Corry of BMW Group DesignworksUSA. "Currently BART carries around 350,000 customers each working day, with high-density loading during rush hours. In the years ahead, BART's daily ridership is projected to exceed 500,000. The new railcar must accommodate this increase in capacity pressure with a design that is safe, spacious, comfortable and flexible."

BELOW: Concept B is geared towards social interaction

BOTTOM: Concept C centres on reflecting the community

Concept A takes the characteristics and thinking behind the 1972 design and evolves it into a 21st century concept. The practical design at its foundation is enriched with an elegant lighting and stanchion concept. Concept B gives passengers the option of engaging in a social, lounge-like setting or in a more individual-oriented zone. Finally, Concept C is built around an artistic expression of the Bay Area, focusing on community engagement.

The riding public has been heavily involved in the design process, for many months. Considerable emphasis was placed on getting input around seat preferences and a travelling seat lab was used to physically demonstrate options to customers. An online questionnaire (including a video) generated thousands of responses to the three concepts. In addition, display exhibits and questionnaires were used at community centres and BART stations, inviting feedback from passengers.

For BMW Group DesignworksUSA, the feedback has been very illuminating. "We've actually been quite surprised as the more innovative options we presented have been chosen," says Corry.

BART is in the process of selecting one winning concept for further design development. "However, successful elements and aspects from the two less-preferred overall designs may also be brought into the final design package," says Corry.

www.designworksusa.com

NEWS IN BRIEF

Chiltern Railways unveils service geared at business travellers

Two years in the making, the UK's Chiltern Railways has launched a new mainline service. Journey times between London and the West Midlands have been slashed by 30 minutes on the fastest services, and the company has changed the onboard offer.

"Created in response to the needs of business travellers and commuters travelling between our first and second cities, we have been working to ensure Mainline allows them to become more efficient and productive," said Adrian Shooter, chairman of Chiltern Railways.

The engineering upgrades include almost 55 miles of new track, which enables the trains to travel at up to 100mph. The interior experience has been improved with the addition of free WiFi and a new business zone. The operator is marketing the latter as a more cost-efficient alternative to first class, while also offering many of the key benefits designed to improve passengers' productivity. The new carriages provide plug points at every seat and more tables.

www.chilternrailways.co.uk

Bombardier plans surfer-friendly trams for new line in Australia

The GoldLinQ consortium has been awarded a contract by the Queensland Government in Australia to design, build, finance, operate and maintain the first stage of the Gold Coast Rapid Transit light rail system in an 18-year public-private-partnership.

Bombardier will design and supply the system-wide electrical and mechanical elements, including 14 45m-long Flexity 2 light rail vehicles (LRVs), plus signalling and control systems, communication systems, electrification including traction power supply substations and overhead line equipment as well as providing project management, systems engineering and integration, testing and commissioning.

Following on from the 16 five-module Flexity 2 trams ordered by the launch customer in Blackpool, UK, the Gold Coast system is Bombardier's first order for the seven-module Flexity 2 tram. The luggage racks for the new trams have been designed to accommodate surfboards, to support the Gold Coast's most popular sport.

GoldLinQ has in-built capacity to cater for up to 75,000 passengers a day. Commercial services are scheduled to start in 2014.

www.bombardier.com

Comfort zone

Behind the scenes with the researchers heading up SNCF's comfort lab

Railcar interior images: SNCF/Christophe Recoura

"Our methodology starts and ends with passengers' needs – this is different from the usual approach"

MAIN IMAGE: An SNCF TGV car renovated in 2008

FAR LEFT: Dr Cedric Gallais

LEFT: Dr Corinne Talotte

The researchers at French rail operator SNCF take a very broad view of comfort. "Comfort is an all-round perception," explains Dr Corinne Talotte, team leader on the company's 10-year-old Projet Confort. "When passengers make a judgement about comfort, they include their state of mind, frequency and purpose of travel, sensuous components such as acoustics, vibrations, temperature, draughts and ambient lighting."

Talotte brings hard science to the task of making journeys as comfortable as possible. Technical leader of the project for seven years and head for two years, she did her doctorate in fluid mechanics before specialising in aerodynamics and acoustics.

The role of the SNCF comfort project is a background one but highly influential within the company. Answerable chiefly to the marketing department, its main job is to develop original ideas that can be rolled out across the network.

"My motivation is to come up with innovations for the marketing department that can easily be turned into concrete results," says Talotte. In short, the project deals in highly practical solutions that go directly to the bottom line. However scientific its work may be, the team invariably starts with passengers' views. "We deal in people's perception of comfort," says Talotte.

People watching

Dr Cedric Gallais, the project's specialist in seating, acoustics and dynamic comfort, says that the research team quickly realised that passengers have the best idea of what makes them comfortable. "Our methodology starts and ends with passengers' needs – this is different from the usual approach," he points out. "Engineers usually start from the physics and tend to work at great expense to reduce what could be sources of annoyance, such as noise and vibration, perhaps without factoring in what the impact could be on the overall comfort perceived by passengers." Gallais certainly doesn't exclude noise from his calculations, but for example, SNCF's research shows that passengers don't generally find a train's noise annoying – it's noise from other passengers that irritates them.

That's why Gallais throws everything even remotely relevant into the mix. Human anatomy; reading, sleeping and working habits

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A CLEAN BREAK

The design of toilets on trains has traditionally been based on the practicalities. Until now, that is. SNCF's comfort researchers deduced from questionnaires and other information that passengers had strong views on toilets. So they incorporated their findings into mock-ups, got real people to try them out, debriefed them and modified the mock-ups accordingly.

Once the project findings had been analysed, detailed specifications were drawn up and handed to SNCF's marketing and rolling stock departments for the next generation of TGV trains.

A big departure from current versions, the new toilet module features a washbasin located as far as possible from the toilet and lighting designed to give a sense of space despite tight dimensions. Materials were chosen to give a sense of cleanliness and hygiene. Curves were favoured over angles to make maintenance easier, and the window has been enlarged to allow in more natural light.

"In reality, people behave in various ways and perform different activities associated with different postures"

ABOVE AND LEFT: The new toilet module

– they are all considered important in the design of comfortable seats.

SNCF's comfort team has been working away since 2001, sharing advice within the company on noise, vibration, lighting, temperature control, fabrics and other aesthetic issues. Concrete results from this collaborative approach have already emerged. A range of hard-wearing seats will be launched on SNCF's suburban network in Paris in 2012; a new toilet module will be installed on the next-generation TGV; and from 2012, passengers on TGV trains on routes in southeast France will benefit from improved lighting and seats that are adjustable for lumbar support. Next up, the team will start on what promises to be a vast project – how to make France's stations more congenial places to stand and wait.

In practice

The development of the new seats for suburban Paris illustrates how the project works. Most such programmes begin with what is thought to be the ideal posture, but SNCF has found that passengers may adopt very different ones. "In reality, people behave in various ways and perform different activities associated with different postures," says Gallais.

The researchers started by getting passengers to fill out a detailed questionnaire. The responses were then poured over and even subjected to linguistic analysis to establish the subtext behind the wording.

It quickly became clear that one passenger's definition of comfort was very different from another's and their 'dynamic behaviour' varied greatly according to factors such as whether

“Conducting questionnaires and observing passengers’ postures in trains is the best way to assess what postures are actually used”

ABOVE: A Z50000 interior launched in 2009

BELOW: Researching stability at the Institute of Sound and Vibration, a study with the UK’s University of Southampton

BEATING THE RUSH-HOUR CRUSH

The next project for SNCF”s comfort researchers could be their most challenging yet. In 2012, they start on the elusive task of analysing what makes a station a comfortable environment for passengers. “The questionnaire will be different from those used on board trains,” says Dr Corinne Talotte, team leader on SNCF”s Projet Confort. Observational techniques will probably have to be deployed to collect people’s comments when they are on their way from the station entrance to the train platform, passing by shops or waiting areas.

The project will include the nature of stations themselves, which have many different and disparate spaces occupied not only by passengers, but also by people waiting to meet them or shopping. The plan is to start by looking at specific areas where people wait and which are not really designed to be comfortable, like under departure boards, for example.

In the meantime, SNCF has developed its own software tool. Called Fluidi’T, it is designed to simulate people’s actions when entering and leaving carriages, their movement up and down platforms and other ‘dynamic behaviour’. In short, it’s a way of assessing traffic flow with a view to enhancing the travel experience. The tool will be used from 2012 by engineers in SNCF”s rolling stock and station departments to help them to evaluate new projects.

their trip was for leisure or business. “Conducting questionnaires and observing passengers’ postures in trains is the best way to assess what postures are actually used,” says Gallais.

However, the team – which as well as Talotte and Gallais comprises a specialist in thermodynamics and lighting, a designer and two PhD students – did not neglect passengers’ physical makeup. In an exhaustive opening bout of research, no less than 80 people – representing a cross-section of morphological types – were interviewed, x-rayed, photographed and measured at every anatomical point, including for flexibility and curvature of the spine. Eventually, the researchers were able to reduce these 80 to four morphological types. “So now we can test seats on four people, not 80,” reports Gallais with some relief. “It’s much less time-consuming.”

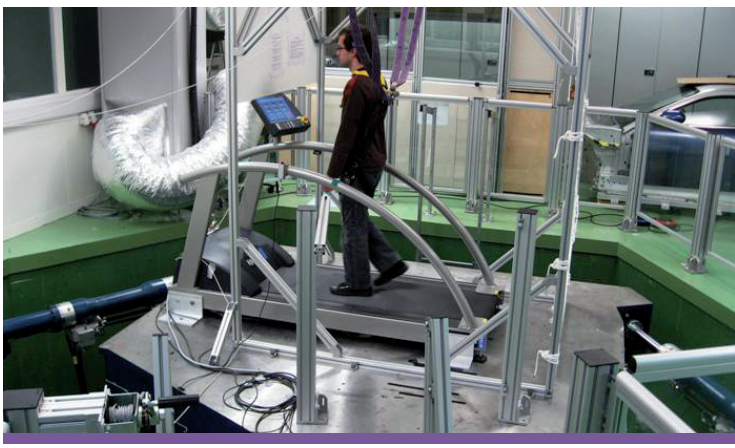
Seat mock-ups were then designed and tested by this cross-section of physical types. Aspects of the project were contracted out to consultants such as French biomechanical expert Cogitobio.

The resulting seat has a curved backrest optimised for different body sizes and shapes. Tests show it is more comfortable while being as vandal-proof as the current ones. The old model is made from a hard surface fabric, silicon and a metallic net, whereas the new one can be fashioned with a softer but equally tough cloth, a mat of cotton fibres and foam.

The toilet project was run along the same principles. “Once again, we worked from passengers’ perceptions and not from physical parameters,” explains Talotte. “We start with people’s needs and finish with their evaluations. And we use a prospective design approach, similar to the automobile industry.”

Thus passengers have ended up designing their own seats and toilets, or at the very least, playing a big role in the process.

Dr Gallais will make a presentation with the TNO at Railway Interiors Expo, to be held on 15-17 November 2011 in Cologne, Germany



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Something old, something new

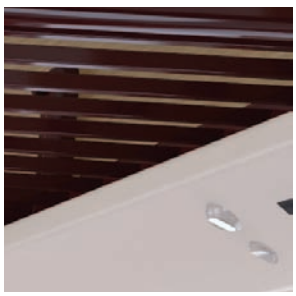
New operator Hamburg-Köln-Express chose to refurbish 1960s' train sets to compete with Deutsche Bahn

Designing the Hamburg-Köln-Express (HKX) was not just a question of creating a new train, but also an identity for an entirely new (eponymous) railway operator. Hamburg-Köln-Express is set to launch an open-access long-distance service in direct competition with Deutsche Bahn. Paradoxically, the new image had to be created from old rolling stock – three six-wagon 4010 EMU train sets constructed in the 1960s, which were previously in service with Austrian Federal Railways.

Hamburg-Köln-Express was founded in October 2009 as a joint venture between Locomore Rail, majority-shareholder RDC Deutschland (a subsidiary of USA-based Railroad Development Corporation) and British-Canadian advisor/investor Michael Schabas. Although deregulation began in Germany in 1994 with the Bahnreform, most previous initiatives have been small-scale and local. The HKX aims to compete with Deutsche Bahn on journey time, comfort and ticket pricing. With a top speed of 160km/h, three trains a day will cover the 450km between the two cities in just over four hours. Stops en route include Münster, Essen and Dusseldorf, and the train will serve three smaller Hamburg stations in addition to the central Hautbahnhof.

Nonetheless, there have been some delays in getting the project underway, initially in negotiating rail track access with DB's infrastructure subsidiary DB Netz, originally in competition against Keolis – still a potential future player, as is the French SNCF; HKX now has a framework contract until December 2015. With the three train sets currently being refurbished by H Cegielski FPS in Poznan, Poland, the company is hoping to start test operations around late 2011/early 2012.

One thing that immediately distinguishes this train is the total identification between the train, the company and a single route – Hamburg



RIGHT: A Basic saloon on the Hamburg-Köln-Express

Images: miller romca

to Cologne. In fact, the initial competition held at the end of 2009 focused largely on exterior design and brand image. It was brand strategy and communication agency boy (based in Kiel, Germany) that had the idea of bringing in industrial designer müller romca, also based in Kiel, to make suggestions for the interior as part of its tender.

"It was the only team to bring in an industrial designer," says Jochen Müller of müller romca. "We visited the trains on a very cold December day. We took a lot of photographs and a few dimensions on site. The first action was to model it in 3D just as a basis for our design, so we could make renderings and test colours in Photoshop and so on."

The strategy clearly paid off – boy and müller romca continued to work together on coordinating interior and exterior colours and graphics, and collaborated directly on the interiors with HKX through intensive meetings and discussions to produce the detailed design specifications in summer 2010.

Class distinctions

One idea introduced by HKX was to abandon classic class divisions (first, second and so on) for Premium and Basic, with five Basic wagons and one more exclusive Premium wagon. müller romca's solution was to distinguish the two through differently coloured laminate panels and stripe fabrics. A bright pink creates a cheerful mood in Basic, while Premium is more sober and calm, dominated by dark purple wall panels.

"The colours of the walls reflect the classes and the needs of the passengers," says Müller.

ABOVE AND RIGHT: The Premium cabin has a dark purple theme

BELOW: Premium class features custom-made table lamps

"Basic should be friendly, fresh and young and is for families and people who want to have cheap tickets. Premium is more distinguished and should look more private and quiet. Otherwise, the main differentiation between Premium and Basic is on the service side; you get a meal served at your place when you have a Premium ticket and you have a personal light at the table, so it's a more calm environment."

RIGHT: Meals are served at the seat in Premium class

"The reuse of the existing seats was a precondition of the design, so special priority was given to the new fabrics"

Basic-class wagons come in two configurations inherited from the old train – a classic six-seat compartment/corridor layout and an open saloon wagon with 2-1 seating and a centre aisle. There is also a multipurpose compartment, with space for bicycles, pushchairs, sports equipment or passengers and a lavatory with handicapped access.

Racing stripes

Although the idea of stripes was in müller romca's proposal from the outset, the actual colour specification changed in late 2010 during the detailed design process, to reflect the colours chosen for the new logo and the shiny dominant deep plum of the exterior livery, as well as to coordinate with existing elements in the train.

"A challenge here was the adaptation of the, at first sight, old-fashioned colours, especially the dark red of the overhead hat racks, which couldn't be changed for technical reasons," says Müller. A deep carmine red stripe was added into the mix, to match the hat racks and window frames, while yellow and orange echo the wood and the anodised metal.

Although there was no formal passenger survey or full-scale mock up, müller romca built a simple mock-up in its workshop, which it used to plan the tables and reading light rail, and to simulate the different seat fabrics.

The reuse of the existing seats was a precondition of the design, so special priority was given to the new fabrics. These were developed by müller romca in close collaboration with textile manufacturer E Schöpf. Two fruitful workshop sessions resulted in finding a way to integrate the colour scheme while creating a durable woven velour that was easy for the upholsterer to handle. The fabric is treated to meet fire safety requirements. To prevent the stripes looking too severe, for each stripe two of the six yarn colours were mixed to create seven harmonious colours.

A lot of attention was also paid to the quality of the lighting. In addition to the streamlined, custom-made table lamps in Premium, both classes feature new lighting rails carrying LED reading lamps, as well as an electronic panel

that indicates if seats are reserved or not. Central overhead fluorescent lighting remains from the original train but müller romca will be trying out different colours of fluorescent tube during the trial stage.

Heritage line

In the end, most structural elements and fittings were retained and most of the surfaces were renewed. The original wood panelling has been preserved where possible, with high-density laminate panels in matching colours used to replace those that were damaged.

"The trains will be perceived as 'historical' in terms of the general ambience of wooden surfaces, traditional compartments, golden anodised metal parts, etc; but everything the passenger is in contact with, such as fabrics, flooring, reading lights, table lights, tables and trash boxes, is new," says Müller. He believes the retention of the old features adds rather than detracts from the cabin experience. For example, the layout yields generous legroom and an exceptional amount of luggage space, even in Basic – enough for large suitcases behind the seats. "Our first idea was to make everything new but after a while we became aware of the quality of the old environment," says Müller. "From our point of view, it is the perfect combination of traditional and modern."

As is so often the case, the greatest limitations on the design were financial, but Müller believes the team successfully kept priorities in view. "The cost limitations played a role in every decision, but I believe nobody will notice the little places where we have had to make compromises," he says. The two areas that have changed least are the access areas and the lavatories, although flooring has been renewed in both, and there are many new elements such as new toilet seats and bowls.

"We have been working very accurately with attention to the overall look and feel and the details as well to make a harmonious design," says Müller. "If you look at some trains, especially with local services, you wonder why the ambience is so often cold and impersonal. That's what we want to avoid. The HKX is a long-distance train and vandalism will not be a problem, but we believe that trains in general should look unique and be a place where you feel good. That is our goal – to make people feel good."

BRAND DESIGNS

Branded across exterior livery, seat headrests, website and business cards, the Hamburg-Köln-Express's HKX initials form a striking element of the train's visual identity, cleverly transformed by boy Strategie und Kommunikation into an instantly recognisable, highly graphic logo in dark purple, lilac and orange.

"The arrows that appear as a part of the K and the X in the logo are supposed to show the dynamic movement of a train in general," says Oliver Boy, creative director and CEO at boy. "We wanted to create a modern, unusual design in contrast to the train itself. Since the train has a classical, rather soft design, we decided to develop an edgy logo to create an even bigger contrast. We wanted to strengthen the extraordinary character of this new player in the market and create a brand with a really new appearance."

boy has worked with numerous transport providers, including LVS Schleswig-Holstein, Hamburger Hochbahn, Veolia Transportation and Bombardier, and here the intention was to create "a modern, colourful design that differentiates HKX from its competitors, especially the Deutsche Bahn". The x element is picked out on the exterior livery in orange for Basic class and beige for Premium, standing out against the deep purple base colour.

Continuing the graphic theme, the words 'Basic' and 'Premium' are carried through both exterior and interior, using a classic Clarendon serif typeface that contrasts with the logo to become a decorative element on the wall panels – orange lettering on pink for Basic, beige lettering on dark purple for Premium. These help passengers' orientation and create a coherent image for HKX, inside and out.

ABOVE: Some Basic cars have a compartment/ corridor configuration

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Moveable feast

Leading designers explain how to overcome the challenges of designing buffet cars - from maximising sales to managing passenger flow

Buffet cars rank among the most difficult parts of a train interior to design and build. Which is hardly surprising, when you consider the often conflicting demands of space – for food preparation and sale, queuing passengers and through-carriage traffic.

"They are one of the most complex parts of the interior because there is so much going on and often people underestimate the interaction that occurs,'' says Paul Rutter of design company DCA. "There's a mixture of staff, people travelling doing a multitude of different things such as buying, and then they might be staying in there eating. From a design point of view you have to look at the interaction of all those factors."

Luke Hawes, director at Priestmangoode – which has designed buffet concepts for an operator in China, and for Virgin – compares the challenges of designing a buffet car, and the need to make passengers feel comfortable by maximising space, to the design of a caravan.

Then there are the engineering challenges. Martin Alge, project manager for Stadler on the design of new carriages (based on the Kiss model) for Austrian operator Westbahn, outlined a few.

"Space was a challenge, but also the weight of the buffet car, because it's actually quite heavy. It's made of stainless steel and lots of glass and has a vending machine with a lot of fibre composite," he says. "It was challenging because procurement was done by Westbahn to be transported to our factory and integrated so we had to stress to the manufacturers the need to reduce weight. We also had a major construction beneath the buffet to support the weight and handle all the forces in the case of collision. Then we had to balance that weight in the whole car.''

Despite the difficulties in design and construction, train operators still want buffet cars because they can bring important benefits. For one thing, as anyone who has complained about the price of a sandwich or a cup of tea on a train will testify, they make good

A buffet car concept by JPA

WHAT TYPE OF SERVICE?

Food and drink offerings on railways range from automated self-service to full restaurant offerings. The Westbahn Kiss project, for example, incorporates a drinks vending machine into its buffet offer. A stage beyond that is the traditional trolley service, but it has few fans and one designer describes it as "the lowest common denominator".

There can also be an element of self-service in the buffet car, with an open fridge from which the customer can select items before taking them to the counter to pay, as is common in many retail outlets.

The kind of food and drink offering on a train service is usually directly influenced by the length of journey. Westbahn's Kiss carriages, for example, will run between Vienna and Salzburg, Austria, with a journey time of about three hours. Generally it seems that any journey above an hour, or on a high-speed train, requires a buffet car.

"It depends on the location and the route and what the pressures are on a particular service," says James Park of JPA Design. "If there is a real shortage of seats then I think the preference is going to be for trolleys, and if the journey time is quite short the trolley comes into its own again."

ABOVE AND BELOW:
Westbahn's new Kiss train

financial returns for the operator. Secondly, if conceived and run properly, they enhance the travel experience and therefore the image of the operator.

"A buffet car, as with any food offer on a train, is a very important item that shouldn't be undervalued in terms of an opportunity to convey the corporate brand to the passenger, and the levels of customer care and respect that you would hope to see on most railway operations," says James Park of JPA Design.

Service area

The challenge is to strike a balance between the comfort and safety of the passengers and the operational needs of the staff who serve them. At peak times there can be two or three staff members working behind a buffet counter, moving around, pouring hot drinks – and all on a moving train. "Space is the key consideration," says Hawes. "It's how much space the company wants to give over on the staff side to make sure we can fit all the equipment and all the stock, with enough space for displays."

As well as providing an area for passengers to queue or sit in, the buffet area must also function as a corridor for the passage of through-train traffic. "We try to have some sort of curved transition from the corridor into the cabin and generally the shape of the counter will ease the queuing and the congestion around those

"There is a fine balance between how much queue space you give, how much display and the space given for people to eat and drink"

ABOVE: A car for Trenitalia by Italdesign Giugiaro

LEFT: MBD's buffet for SNCF

BELOW: An MBD mock-up for a Korean operator

areas. There is a fine balance between how much queue space you give, how much display and ultimately the space given for people to eat and drink," says Hawes.

Rutter agrees: "First you have an issue with queuing and people waiting to be served and then you have people who have been served wanting to go off to where their seats are and that is a big issue," he says. "You can place tables intelligently to create a sort of partition and create flow, so you have people queuing up on one side – which is what we did on a Eurostar design."

Stay or go?

Opinion appears to be divided as to whether customers should be encouraged to return to their seats after making a buffet purchase, or to stay and consume it in the buffet car. "I think people should be encouraged to eat and drink in a social area rather than always going back to their seats,'' says Hawes. He contends that technology, such as monitors, gaming, music or other forms of entertainment, can be deployed to encourage people to stay in the car; and recommends a mixture of perhaps a few stand-up poseur tables, lean-to tables and seating.

"You could have the diner approach but I am a big fan of upholstered or padded lean-tos that offer more high-level shelving so you can get more bodies in," he says. "It might be more of an offset or a staggered layout where you also try to get a little bit of privacy, so not everybody is looking over the shoulder of somebody else. You can angle the seating and tables 45° into the windows to enhance privacy, and achieve a more efficient use of space than with in-line seating. These offset patterns also create a lounge effect where people can sit together."

Park, however, doesn't believe in encouraging people to stay in the buffet area. "It's better to get them back to their seat, otherwise the buffet car and serving area become congested," he says.

However, there is a third way, which is being tried on the Westbahn project. Alge explains that each train will consist of six 150m double-decker cars, of which four will have a buffet or café

area. Each carriage will have a member of staff responsible for serving food and drinks to people in their seats. Passengers will also have the option of going to the lower-deck buffet car for counter and drinks vending machine service, where there will be seating for 8-10 people, opposite a counter 3-4m in length.

"The flow of people in the cars is kept quite low with the Westbahn concept," says Alge. "Each car has two toilets, so people will stay more or less within their own cars. The flow between the ground and first floors is separated from the café."

Sales display

Food presentation within a buffet car is also of paramount importance and Hawes emphasises that there has to be clarity. "Getting the product on display with a clear message is the goal to entice people to spend their money," he says. "You have to put your premium price point items right in the face of the passenger. It's a fine balance between stacking high and not having too much to prevent eye contact with the person serving you. Product, menu and pricing has got to be clear, normally with backlit menu panels or just a nice level of ambient light."

Generally Priestmangoode tries to design buffet cars to be as welcoming as possible and to look like an extension of the seating areas – materials have to be seen to be clean, and warmer tones are used. Composite materials, cast resins and laminates are preferred because if scratched the colour runs all the way through. "Lighter composite materials stain more easily, so darker surfaces are better," says Hawes. "We also like to include some familiar surfaces, whether it's panels or cladding, to make it look more like a piece of furniture than a kitchen."

ABOVE AND BELOW: Buffet designs by N+P

BOTTOM: Priestmangoode's design for Virgin's Pendelino

"There's nothing nicer than sitting down by a window with a friend and having some food – it's a mark of civilisation"

Lighting also reflects the dual nature of the buffet car, as Rutter explains, with strong illumination needed for the people working behind the counter and back lighting on the customer side to make the products look good but not garishly over-illuminated. "You don't want it overpowering, so what you tend to do is have a separate system for the passenger side, where you use diffused lighting, and direct lighting on the serving side," he says. "The flexibility of modern lighting systems means you can have whatever you want."

There is, however, less flexibility with windows, which tend to be blanked off on one side of the carriage to create more space for packaging and equipment, but it is important to preserve natural light on the passenger side.

Designers are helped by equipment becoming smaller and quieter. The equipment also has to be robust enough for buffet requirements, and operate with limited power supplies.

Ease of maintenance and cleaning in the carriage is also important. "We always look at wrapping materials, say from a floor to maybe 200mm up a wall, just to give a nice easy-to-clean surface, because a floor covering meeting a wall covering at 90° provides a dirt trap," says Hawes.

On Westbahn's Kiss train the seats will be cantilevered and table legs will be able to be raised to ease cleaning. Interestingly, the floor will be carpeted, whereas Rutter prefers a composite vinyl rubber flooring that is easily washable.

All are agreed, however, that providing food and drink is important. "Any service over an hour and a half should be providing some kind of hospitality facilities like a buffet or restaurant car," says Park. "There's nothing nicer than sitting down by a window with a friend and having some food. It's a mark of civilisation."

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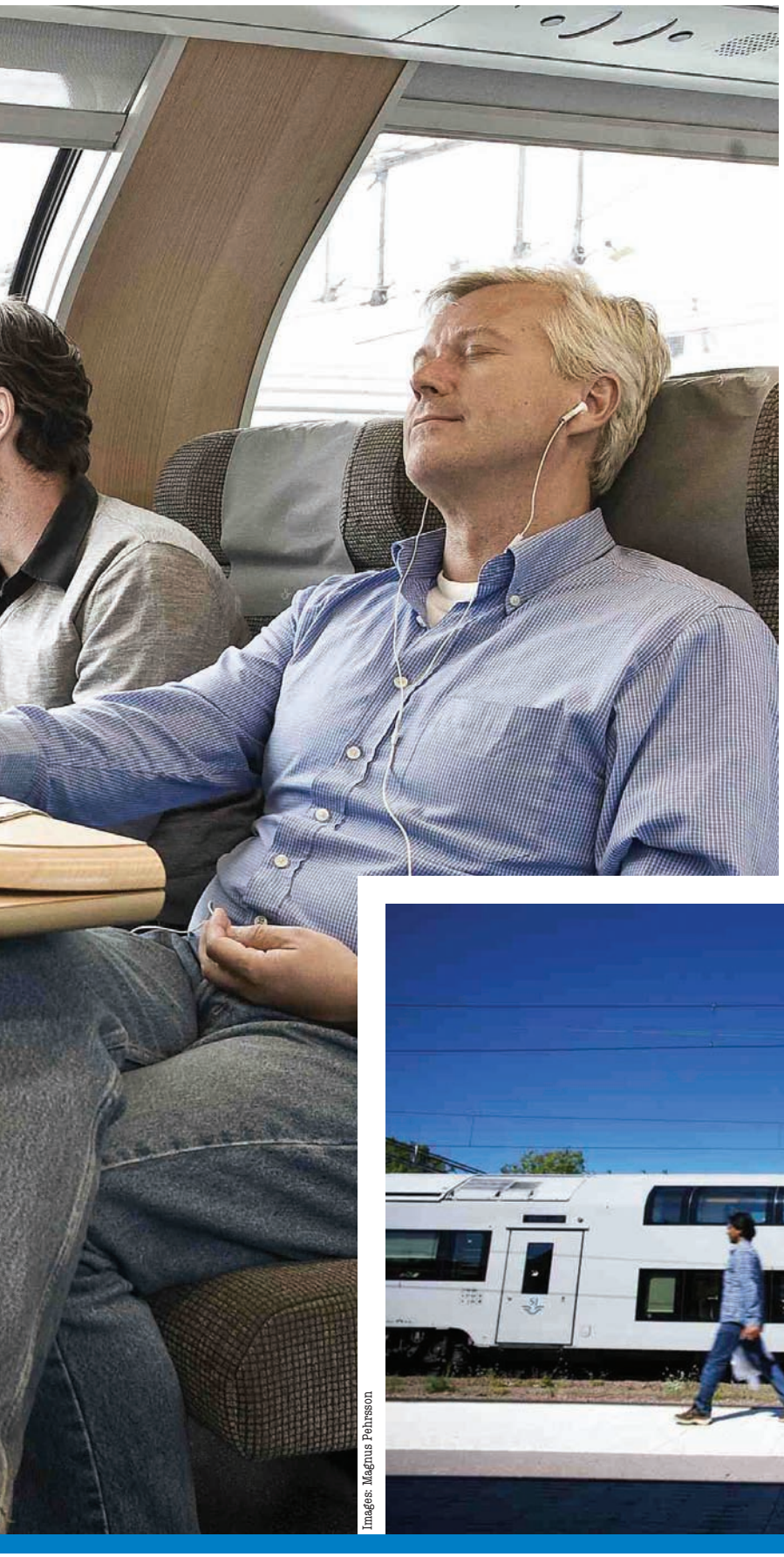
Never-ending story

Double-deckers serving a Stockholm commuter line are continually updated to cater for business travellers' changing needs



Images: Magnus Pehrsson

Since 2005, SJ has been addressing the need for added capacity on its busy commuter routes by utilising Alstom's X40 double-decker trains. The largest train operator in Sweden now runs the services on its Linköping-Stockholm-Gävle, Stockholm-Eskilstuna, and Stockholm-Västerås-Örebro-Göteborg routes.

The company's key goal remains the same over a decade on from the project's inception – to provide passengers with a modern, practical environment in which to travel to and from work.

SJ's plans to become the first operator to bring double-decker trains into service in Sweden began in earnest in 1999, as the company started to look at how to add more capacity to its routes in and out of the capital. Establishing that around 60% of passengers on its busy eastern lines were business travellers commuting to and from Stockholm, the organisation formed a vision of the core design principles it wanted to embrace.

Following the tendering process, SJ ordered 43 units from Alstom (16 two-car units and 27 three-car units) and development work continued until production began in 2002. A test train arrived in 2003, before returning to Alstom in 2005 to be fitted with the modified and upgraded interiors.

Based on Alstom's Coradia family, the X40 runs at up to 200kph. The two-car unit houses 153 passengers while the three-car variety takes 252. Wider than average doors (1.30m) allow the trains to make 30-second stops in smaller stations and 60-second stops in larger ones.

LEFT AND BELOW: SJ's X40 double-decker train

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ABOVE: The X40 trains are tailored to the route's core passengers – commuters

In addition to the flexibility that the 55.1m-long two-car and 81.5m-three-car sets can offer, SJ had almost complete control over the look and configuration of the interiors. This allowed the operator to utilise the universal benefits of the Coradia concept, while tailoring the interiors to the precise requirements of its passengers. "The Coradia concept is very flexible; the number of cars, the configuration of seats, the number of doors and interior layouts are all variable to provide the best response to different needs," says an Alstom spokesperson.

The original design

Working in tandem with Swedish designer Lars Hall, SJ set about creating an interior design concept to stand the test of time while meeting its customers' high expectations. "We wanted to create a strong, and more importantly, timeless design in terms of both the colours and materials used inside the trains," says Jan Kyrk, SJ's marketing manager for the northern/eastern region. "Normally in Sweden if you look at buses, metros and even aircraft you can see, both with the exterior and interior, a lot of decoration – lines, stripes, etc. Our intention with the X40 was to go in the other direction by reducing all graphic elements if they had no specific purpose. In some buses in Sweden you have design chaos. We wanted to see more harmony and a natural look inside our trains. It is passengers' clothing that sets the colour of the train, and in that way, we follow the fashion."

With Hall's assistance, SJ recognised that a large proportion of its travellers on these routes wanted functionality above decoration, practicality before colour. The materials used on the X40's interior complemented this design brief, with rubber and beech the dominant components.

While this choice of materials didn't bring any initial cost benefits, the advantages come further down the line. "You usually have a train for anywhere between five and 30 years, but we could have our train sets for even longer than that without ever having to change the interiors significantly," says Kyrk. "The design helps in terms of durability, and isn't affected greatly by discolouration over time, while the materials utilised are also extremely easy to maintain and keep clean."

SJ's original goal for additional capacity was compromised slightly to ensure feedback was fully taken on board. Although the average commute is relatively short – 30-90 minutes in each direction – SJ's passengers said that space remained a key requirement. This prompted the removal of some seats to provide extra space and a more premium service for travellers demanding a comfortable environment on longer journeys.

Storage was another factor that motivated revisions to the original design – even once the X40s were in operation. Focused on the needs of its regional commuter travellers, SJ's design team initially felt that storage wasn't an issue. However, a popular route for SJ is the Gävle-Stockholm-Linköping line, which stops at Arlanda Airport, obviously meaning an influx of tourists with larger items of luggage.

To address this variation from its usual passenger demographic, the company revised the interior configuration on some of its train sets to provide more storage. "That is largely the exception," says Kyrk. "Most of our passengers will only have small briefcases, which are easy to store, and trains on those routes are configured with that in mind."

RIGHT: SJ has vending machines on some routes

Technological updates

While the timeless design of the X40's interior means that changes to the colour palette shouldn't be required for some time, the journey is far from over for SJ. Technological advancements mean that business passengers are continually asking for more from their transport provider.

SJ's passengers want to use personal computers and mobile communications devices while travelling. As a result, power outlets have been incorporated into the original design and the need for good mobile coverage has been recognised.

However, the way passengers want to work and access information is continually evolving. For example, the arrival of wireless internet technology has recently been embraced by SJ, giving passengers more freedom and flexibility. The capability to access the internet through mobile telephones and devices has been taken on board the X40 train sets.

"The technology we need to have on board will always evolve," explains Kyrk. "This is not just in terms of commuters working – passenger information systems, through screens and speakers, continue to move forward too. In addition, in our newer trains we have a solution that allows our passengers to access up-to-date journey information on their own computers. These kinds of technical solutions progress very quickly and are extremely important to our passengers."

Food trends

Food and drink provision is another area being addressed by SJ. While the short average length of journeys for Stockholm's commuters means that traditionally catering has not been a primary concern, changing lifestyle trends have prompted a rethink recently.

SJ has opted to offer bistros on selected routes, while providing drinks and snacks through vending machines on others – giving passengers access to more meal options. "Providing good information about which trains have bistros and which have not is key," says Kyrk. "This allows the passengers to make a choice – if they want onboard refreshments and their journey is more than 40 minutes, they have the opportunity to pick the right train for them. Of course, some passengers will just want to have a cup of coffee or snack, and last year we began a trial service, offering breakfast on some routes for the first departure of the morning. If you can have your breakfast on board, you can then start your journey to work 20 or 30 minutes later."

SJ says it will continue to tailor its service to the needs of its passengers – whether that is in terms of aesthetics, seating, storage, technology or catering. The result? Simple and timeless.

BUSINESS CONFIGURATION

Getting the seating configuration right for its business passengers was a key aim for SJ. The operator embarked on a detailed study to identify the best solution, including visiting operators in other countries (for example, Spain and Italy) to see how they approached this challenge.

SJ saw that cultural differences throughout Europe affect how people like to travel, finding that commuters in other parts of the continent generally prefer a four-seat arrangement, which allows passengers to talk and interact. However, passenger studies back in Sweden found that SJ's focus on business commuters meant their requirements were in stark contrast to their European counterparts'.

"Here we want to sit in twos and face the same direction – preferring to work and not interact much with one another," says Jan Kyrk, SJ's marketing manager for the northern/eastern region. "In other countries, people were surprised when we said that 75% of our passengers preferred to face in the same direction. Also, we don't have as many families and children on our trains, who of course prefer the four-seat arrangement."

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Passenger power

Involving passengers in the design of the Washington Metropolitan Area Transit Authority's new railcar has resulted in a streamlined and spacious interior that is totally in tune with passenger needs

LEFT: The 7000 series eschews central poles, seatback grab handles and headrests for an open feel

Want to know the best features to include in the interior design of your new rail fleet, from the seating configuration and floor material to luggage space and the position of handrails? Then ask your passengers.

That's what the USA's Washington Metropolitan Area Transit Authority (Metro) has done, with spectacular results. In 2006, when its 7000-series railcar was still on the drawing board, Metro sought design input from the public via a number of focus groups. Then, in spring 2011, when suggestions had been incorporated into the design, passengers were walked through a half-size mock-up to gauge their reactions.

The main design issues of the 7000 series have now been finalised and presented to Metro's Customers, Service and Operations Committee; but, in August 2011, passenger research was still continuing to delve into the detail – such as the kind of vinyl customers wanted on the seats – and to confirm that the design was in tune with commuters' practical needs.

"It was important to get customer feedback and respond to it in the design," says Barbara Richardson, Metro's assistant general manager, who has been heading up the project. "But it was equally important to go back to those customers to verify that we're doing the right thing."

Metro has authorised the purchase of 364 railcars, manufactured by Kawasaki Rail Car in Nebraska, USA. These will be brought into service between 2013 and 2016 to replace Metro's 1000 series, which is more than 30 years old. The aim is to comply with recommendations from the National Transportation Safety Board, as well as support the expansion of Metro's service on phase one of the Dulles rail corridor, scheduled to open at the end of 2014. Altogether the 7000 series is costing US$880 million (approximately £513 million) and is expected to make a big difference to the lives of Washington commuters.

"Our customers will benefit from an improved design that accommodates many of their preferences and ultimately delivers a more reliable and more comfortable rider experience," says Richard Sarles, Metro's general manager and CEO. "The attention to detail will be evident to the customers, employees and stakeholders who invested their time to help us get this right."

The 7000 cars will be presented in a quad-unit configuration, accommodating 40 more passengers per eight-car train than the older ones with two-car grouping. Inside each carriage are 64 vinyl-padded seats. The 2-2 layout was chosen as passengers indicated a preference for this style. Some expressed doubts about the dark V-shape in the centre of the double seats; but others liked the feeling of personal space this created.

Space is everything in the 7000 series. For example, the aisle width has been increased slightly from the 32in of the 1000 series to 34in. "We wanted to give passengers the sense that the car was more spacious, so there are a couple of things we've done to help in that regard," says Richardson. "Firstly, the aisles are a little wider, although we've managed to keep the same seat width as the 1000 series. Also, the seats don't sit on pedestals, which makes the carriage seem much more open visually." As the seats 'float', there's another big benefit – passengers can fit luggage underneath them.

Central poles have been eradicated to ease accessibility. Instead, there are handholds in the door area and vertical poles at each seat, adding up to 25% more bar length than in the most recently built cars. "More than anything, our customers needed to feel safe and secure when travelling with us," says Richardson.

ABOVE AND BELOW:
Metro's new logo is used on the exterior and interior of the 7000 series

Colour code

The colour scheme – predominantly blue and grey – is also lighter and airier than Metro's older cars. "In our initial research, customers said they wanted to see our interiors lightened up," says Richardson. "In a lot of our cars we have earth-tone colour schemes, but customers indicated that they were done with that and were ready to move on! The colours now are a reflection of passenger anxiousness to get to a more lighter and brighter environment."

The 7000 series features assorted seat colours – a medium-blue window seat, light-blue aisle seat and dark-blue priority seat. This adds tonal variety to the car and makes it easier for passengers to recognise which seats are to be left for priority use.

The Metro logo has also been incorporated. "We brought in a design theme," says Richardson. "This is the shape of a capital city area radiating out in a particle pattern from our 'M' logo. This is on the livery of the lead cars, but we've also brought it inside and etched it onto our privacy screens in the vestibule area and in the v between the seats."

For the seating material, passengers were asked if they had a preference between fabric and vinyl. "We found that passengers preferred vinyl," says Richardson. "That had to do with cleanliness. Over time, the appearance of fabric seats deteriorates – even though they may have been recently cleaned – whereas customer comments about vinyl were along the lines of, 'This material will be easier for Metro to maintain'. I thought that was interesting, actually, because passengers are obviously aware of the challenges we face in keeping the inside of our cars clean." Passengers did, however, prefer a textured vinyl to give the impression of fabric.

The flooring is resilient and non-slip. "For the longest time we had brown carpet on the floor of our cars," says Richardson. "But our passenger research showed that customers preferred resilient flooring, partly because they rejected the old earth tones; but also because a non-slip material is easily cleaned." The floor also features wheelchair-zone markings in dark blue.

LED lighting is presented in a double strip down the carriage and over the seats. This gives a cooler, brighter light, which pleased many focus groups who thought it would make it easier for commuters to read during their journeys.

Two dynamic LCD route maps and four video screens in each car enable passengers to easily track train locations and station names. There are also high-tech automated public address systems and closed circuit television cameras (commonplace on Metro's bus fleets) for added safety and security.

"We want our customers to feel as though these are their cars," says Richardson. "We wanted them to have a voice in designing them, and we wanted them to know that we would be responsive to their ideas in creating the environment they would be using. The interiors are all about them."

LOCATION, LOCATION, LOCATION

The 7000 series' new communication technology was well received by passenger focus groups. "It was their number-one positive," says Barbara Richardson, assistant general manager at Metro. "First there is a digital arrival board that lights up to indicate what the next stop is, and how many more stops there are to a particular station. Customers who took part in our surveys really liked that because when it's very crowded or you are busy reading your newspaper or deep in conversation, it's easy to lose track of where you are."

There are two such illuminated arrivals boards in each car, plus four video displays that will perform the same station-identifying role. "The video screens have the capability of displaying Metro customer messages," says Richardson. "They also offer the possibility of advertising at some point in the future."

"We want our customers to feel as though these are their cars"

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Railway Interiors Expo will be held on 15-17 November 2011 in Cologne, Germany, and promises to be the event of the year. More than 100 companies will fill the exhibition hall, attracting thousands of railcar purchasers, managers, outfitters, designers and suppliers from around the world. Attendees use the show to find the latest and greatest technologies and designs for their railcar programmes, and to forge profitable partnerships. The railcar interior industry's only dedicated show also includes a free-to-attend forum featuring a packed line-up of experts. The following pages will highlight just a handful of the innovations on display…

Railway Interiors Expo remains the world's only exhibition and conference dedicated to railcar interior design and equipment. Every year the free-to-attend expo attracts thousands of senior industry figures from all over the globe who are looking for next-generation designs and technologies to help further railcar efficiency, improve safety, increase passenger comfort, lower weight, discover new revenue streams, save money and increase profits.

Technologies and products on show span the entire spectrum of equipment for railcar interior design, with many companies presenting brand-new concepts, materials and products. From seating and lighting to floor finishes and textiles, food service equipment, WiFi and in-train entertainment systems, everything is on show for this specialist industry.

As well as an impressive European contingent, confirmed exhibitors include companies from the USA, China, India and Taiwan. Indeed, of the 100+ companies exhibiting, participants include leading firms such as Aviointeriors (Italy), Exmorail Retardant Decorative (China), Fuchi Textile (Taiwan), Huber + Suhner (Switzerland), LPA Excil Electronics (UK), Nora Systems (Germany), Perrone Aerospace (USA), Responsive Industries (India), Rogers Corporation (USA) and Schneller (USA).

Many suppliers use Railway Interiors Expo to unveil brand-new products, and you can also check out what your competitors are up to! At this year's exhibition, lightweight composite materials will enjoy a particularly strong presence: there will be more than 20 companies showcasing their advanced composite material solutions.

As well as the essential exhibition, there will be a free-to-attend Design & Technology Conference that runs on all three days of the event. Topics will include everything from optimising space, comfort and durability to seating; the latest connectivity and communication technologies; revenue generation; accessibility; high-speed rail schemes; catering; fire safety and crashworthiness regulations and standards; new lighting technologies and the weight-saving potential of various materials and composites.

Speakers include leading specialists such as Dr Joachim Winter, research director of the Next Generation Train project at the German Aerospace Center; Peter Snape, senior engineer at MIRA; and Aaron Weinstein of San Francisco's BART.

FLUSHED WITH SUCCESS

Jets will show its Vacuumarator toilet pump. Over 25 years, the pump has proven its worth in everything from cruise ship toilets in the Caribbean to army units in Afghanistan. Over the past decade, Jets has also secured a rapidly increasing number of railway contracts. The system is now used in rolling stock in Europe, Asia and Africa.

"Railways, in our experience, are usually concerned about weight," says Frode Bakke, sales manager at Jets. "Although Jets uses fewer parts than other brands, the stainless steel and other corrosion-resistant materials in the Vacuumarator pump mean it is admittedly a bit on the heavy side. Still, the system's weight compares very favourably with that of traditional vacuum-based railway toilets."

Bakke adds that the same is true for comparing the cost of Jets with other systems. "Because of the Vacuumarator's design, there is no need for compressed air to operate toilets," he says. "So the hidden cost and weight of the compressor power needed by other designs are completely removed from the equation when using Jets."

With annual sales of €30 million and 300,000 toilets sold so far, Jets has been able to devote considerable resources to develop solutions for rolling stock. As a result, both its preassembled Sanpack unit and individually tailored systems are now built from the same core technology. **Stand 9421**

SPEAKER SPOTLIGHT

Joachim Winter, project manager at the Institute of Vehicle Concepts, German Aerospace Center (DLR), will present highlights of the centre's Next Generation Train project and a study into a possible high-speed double-deck train

Why is high-speed rail such a pertinent topic?

High-speed rail is an important topic where cities with growing business sectors are to be connected over 800-1,000km distances. It is 'green', attracts passengers and is competitive to domestic European air services. The major challenges are drive dynamics at crosswind, quality of track and noise.

What is your background in this area?

My education is as a mechanical engineer specialising in aerospace sciences. I have a Dr.-Ing. degree in mechatronics. Over the past 25 years, my roles have included managing research projects and systems technology within the Daimler Group and Bombardier Transportation; the development of aircraft (for Dornier and Daimler Aerospace) and cars (Daimler Research); as well as train positioning and signalling (Adtranz and Bombardier Transportation). I have managed the Next Generation Train project for the German Aerospace Center since 2008. The project will run until 2013, and is expected to be extended until 2018.

What can attendees learn from the presentation?

We will explain the overall project and highlight some innovations we want to introduce into railway vehicles. In particular, passenger comfort will be addressed in terms of vibration, noise and air-conditioning. Furthermore, we will show the interior design and lightweight structures we are working on.

Why did you choose a panel discussion format?

The ideas we are thinking about are related to passengers. Thus we want to get as much feedback from the public as possible to challenge our thoughts and guide our future work. We hope a short presentation will provoke enough questions to run a successful panel discussion.

Joachim Winter's presentation and panel discussion will be held at 14:00 on Tuesday 15 November 2011

FOOD FOR THOUGHT

The Subway restaurant chain will highlight franchise opportunities for railway terminal operators. Subway is a leader in non-traditional restaurant development and can offer rail stations and their passengers the same benefits as high street and suburban locations. The company says these include the use of fresh and nutritious ingredients; the elimination of frying, cooking or grilling in on-site preparation; the highest possible standards in the industry in terms of cleanliness, food safety and quality; the ability to prepare sandwiches to exact customer specifications, fast; a globally recognised brand with more locations around the world than any other restaurant; more than 45 years of experience; and an intensive training programme.

Supporting rail stations' efforts to go green, the Subway chain is committed to making operations more environmentally friendly and socially responsible by conducting business in ways that create profit while reducing impact on the environment. Stores can be designed and built as Eco Stores.

The company says that rail stations can realise additional revenue by becoming a franchisee or leasing space to an existing franchisee. **Stand 9446**

Image: Big Stock.com

MIXED BLESSING

Advanced Composites Group (ACG) will focus on the application of its composites across mass-transit applications, particularly its MTM82S-C phenolic resin pre-preg system. ACG says the MTM82S-C pre-preg technology enables the manufacture of thin, lightweight sections that provide outstanding mechanical performance and big weight savings for railway interior applications.

ACG will exhibit a full-size MTM82S-C pre-preg standback, which is currently installed on commuter trains in the UK, as well as composite seats in both glass and carbon fibre, to illustrate the mechanical performance of composite construction.

Typical applications include railcar wall panels, window frames, partitions, connecting archways, floors, ceilings, standbacks, luggage racks, seats and doors. The MTM82S-C pre-preg is available in a wide range of carbon and glass fibre materials, making the product suitable for both monolithic and sandwich structures. **Stand 9245**

TOP OF THE POPS

Marioff will introduce a completely new Hi-Fog pop-out spray head and an updated version of a Hi-Fog pop-out sprinkler launched in 2010. Pop-out nozzle solutions are the latest innovations in the Hi-Fog range of high-pressure water mist systems for rolling stock. They have been designed and thoroughly fire tested to ensure the safety of passengers in a case of fire on board. Both models are hidden in the ceiling and activate only after a fire has been detected – an aspect that the company says enhances the aesthetics of the carriage, reduces the risk of vandalism, and increases the fire protection system's reliability.

Either a pop-out spray head or sprinkler system can be specified. Whereas a pop-out spray head discharges high-pressure water mist right after system activation, the pop-out sprinkler requires a higher ambient temperature to break the bulb. Marioff says this minimises the risk of false discharges and enables better visibility in the car for easier evacuation. Because only a few pop-out sprinklers are activated, a smaller unit can be installed. **Stand 9540**

FRENCH FANCY

On its stand, and in a conference session on 15 November, French design agency MBD Design will present its latest railcar designs, including the Rio de Janeiro Metro in Brazil, MI09 and MI79 refurbishment projects in France, and many other projects in China and elsewhere.

One of its recent designs was for the Reims Tramway in France. Commissioned by manufacturer Alstom, MBD Design created three projects translating the operator's identity, as imagined by designer Ruedi Baur, for the tram's exterior and interior. The chosen concept features vivid blocks of colour on the exterior, neutral colours inside, tinted bay windows and a concave windshield. **Stand 9630**

SPEAKER SPOTLIGHT

Bas Leermakers, project officer for interoperability – TSI sector at the European Railway Agency, will provide an insight into the latest fire safety regulations and TSIs

What can attendees learn from the presentation?

The presentation will bring attendees up to speed with the latest European railway regulations, which will harmonise the rules for railway products and railway operations across the EU. I will explain the difference between standards (which are usually voluntary to apply) and TSIs (which are law) and how they interact. I will also uncover the latest TSI developments related to rolling stock.

How will the new regulations affect railcar interior design?

It will not so much affect the design, because the product regulations as set out in TSIs will generally not go beyond what is already common practice. The biggest news comes from the harmonised assessment methods, often performed by notified bodies, and the clear description of responsibilities of the different actors that work in the railway business.

What is your background?

After having worked in a railway consultancy company in the Netherlands for eight years, I joined the European Railway Agency in 2007. Previously I've worked in the Locomotives and Passenger TSI units and currently I'm in charge of the work related to the Noise TSI and the Safety in Railway Tunnels TSI. I also chair the international working groups related to the revision of the latter two TSIs.

What are you looking forward to seeing?

In general I'm keen to see the latest news relating to interiors and fire safety. I'm particularly looking forward to seeing the presentation by Franck Poutch, the director of CREPIM France (14:40 on 16 November), to hear the latest on fire testing materials with the future European standard.

Bas Leermakers' presentation will be held at 14:00 on Wednesday 16 November 2011

GET YOUR COAT

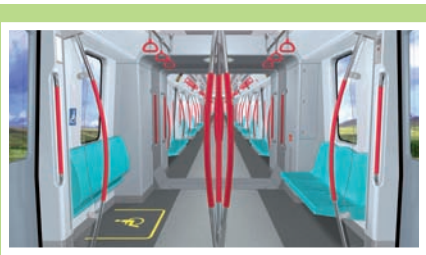
Walter Mäder of Switzerland will be making the most of its three days at Railway Interiors Expo with a full range of highly engineered 'total solutions'. The company is one of Europe's leaders in the manufacture of fire-retardant polyester resins and gel coats, with manufacturing sites in Switzerland and France, and soon in China and India.

Mäder promotes 'total solutions' for rail and mass-transit vehicles; it says composites made with its systems (with water- or solvent-based coatings) meet most of the required norms.

Walter Mäder systems (painted or unpainted) are designed to comply with the new CEN TS45545-2 HL1-3, NF-F M1 F1 and DIN 5510-2 norms and other international standards that railway and mass transport vehicle manufacturers and suppliers are expected to meet.

Its solutions can be applied by hand lay-up, spraying, vacuum bagging, RTM and RTM light methods and are designed to offer good anti-graffiti capabilities.

Paul Wartenweiler, marketing and sales manager for Walter Mäder, will also be speaking in the Fire Protection, Regulations, Standards and Passive Safety stream of the Design & Technology Forum, to be held on Wednesday 16 November 2011 at 15:40. The address will cover composite solutions acc. EN 45545-2, as well as the coatings, gel coats and resins within the company's range of products that meet the new requirements.



Walter Mäder is part of the Mäder Group and its products are used in a range of sectors. The company aims to expand its position as a leading independent worldwide manufacturer, and the rail and mass-transit sector will be an important part of that initiative. **Stand 9325**

FLEXIBLE FRIEND

Margon will exhibit a new toilet module concept based on its Fleximodul design, which can easily be adapted to all kinds of carbodies and requirements. The system uses two standard technical columns. One of the columns contains the sink and water system, while the other integrates the bowl and the toilet system. This means the module's walls are free of technical components and are therefore easier to adjust in terms of height, width and special customer requirements.

Margon is a full-cycle metalworking company that specialises in the design, engineering, integration, production and supply of equipment for new and refurbished rolling stock. Its range of products and services covers interiors, WC modules and metal components to specialised welding standards (EN 15085-2 CL1). Stand 9110

SAFE AND SECURE

Q'Straint will showcase its new adaptable QM3 range for securing wheelchairs and occupants in transit, alongside its renowned QRT retractors.

The QM3 range currently includes Standard, Deluxe and Max versions. All have been specifically designed to be easy to operate and compatible with virtually all wheelchairs, powerchairs and scooters.

The QM3 comprises a wheelchair backrest mounted on a tubular steel frame, with varying levels of restraint depending on the version selected. It can be installed as a rear-facing solution in low-floor city buses or in either direction within a train or tram.

Q'Straint says that QM3 meets all the design requirements of PSVAR 2000 (Public Service Vehicles Accessibility Regulations 2000) and 2001/85/EC (Bus Directive). Stand 9610

SPEAKER SPOTLIGHT

Dr Bernhard Rueger, assistant professor at Vienna University of Technology, Austria, will address the topic of accessible railcar boarding

Why did you choose this subject?

I have worked for more than five years now in different research projects dealing with accessibility in railway transport. EU regulations stipulate that public transport systems must be accessible for everyone without any restrictions. The interface between the platform and the rail vehicle is one of the largest problems, particularly for wheelchair users.

What research have you conducted into railcar accessibility issues?

I am currently working on the EU FP7 project 'Public Transportation – Accessibility For All', which aims to support the development of a new boarding assistance system for RIC-coaches. Other projects I've been involved with have dealt with accessible railway interiors or special service devices.

What can attendees learn from the presentation?

Attendees can learn about the special needs and expectations of all the various groups of mobility-reduced people. A possible surprise may be that nearly all long-distance travellers are mobility-reduced. Additionally, an overview of several existing boarding assistance devices will be presented.

What are you looking forward to seeing?

I am pretty interested in the topic of interior design. I am especially looking forward to the presentation about SBB's new double-deck trains because I have been invited to work in this project as a consultant to improve luggage storage.

Dr Bernhard Rueger's presentation will be held at 13:10 on Thursday 17 November 2011

LIGHT YEARS

The Invertec group will showcase its 30 years' experience in providing interior systems for trains, trams and buses. The company offers LED and fluorescent lighting for saloons, vestibules, steps and other interior applications from its factories in the UK and Malaysia. To complement its expertise in rolling stock applications, it is able to draw on its experience as a European leader in the design and manufacture of all-LED interiors for buses and coaches.

Invertec also has extensive experience in the specification and manufacture of interior fittings and panels. Projects during 2010/2011 have included the supply of body end panels, ceilings, sidewalls, dado panels, electrical cupboards and floors. Invertec adds value to the OEM wherever possible, for example by the integration of carpets, wiring looms and machined seat extrusions into a total carriage floor package.

Invertec uses a range of materials including aluminium honeycomb and lightweight core materials, and is an expert in using high-pressure laminate. The company's components are designed to combine a hard-wearing, attractive surface material with a choice of cores, emphasising low weight and high durability and meeting all appropriate rail standards.

Invertec can also combine its own LED lights and components in integrated lightweight ceilings. Stand 9402

FREE-TO-ATTEND DESIGN & TECHNOLOGY FORUM

View the full programme at **www.railwayinteriors-expo.com**

The **Design & Technology Forum** is a unique feature of Railway Interiors Expo, providing attendees with a three-day conference with top international speakers talking on a wide range of subjects but all focused on railcar interiors and passenger comfort and safety. The free-to-attend presentations deliver content and great value to the event, and many seats are reserved well in advance.

Day 1 – Tuesday 15 November

Railcar interior design – concept, perception and continuity

Moderator: *Michael Thomson*, consultant director, Tangerine, UK

10:30 - Customers in the spotlight
Dr Mark van Hagen, principal consultant, Netherlands Railways, Netherlands

10:50 - Interior design from the traveller's perspective
Saco Heijboer, programme manager, NedTrain, Netherlands

11:10 - Accessibility of PRM as a source of innovation
Robert Dumortier, product development manager, SNCF, France

11:30 - The Next-Generation Equipment Committee: a unique approach to railcar specification standardisation mandated by the US Congress
Michael Weinman, managing director, PTSI Transportation, USA

11:50 - Business connections: designing rail experiences for the business traveller
Paul Priestman, director, Priestmangoode, UK

12:10 - Rolling stock refurbishment design: creating tangible passenger benefits
James Alton, senior industrial designer, Interfleet Technology, UK

12:30 - Floating floor: easy and cost effective
Dr Goran Solenicki, head of new technology development department, TZV Gredelj, Croatia

High-speed design and future travel

Moderator: *Michael Thomson*, consultant director, Tangerine, UK

14:00 - Panel discussion – next-generation trains
Joachim Winter, project manager, Institute of Vehicle Concepts of Deutschen Zentrums für Luft- und Raumfahrt (DLR), Germany

14:50 - The hopes, failures and challenges of US high-speed rail: the customer's perspective
Dr Richard Rudolph, chair, Rail Users' Network, USA

15:10 - Australian high-speed vehicle (A-HSV) concept
Mark Loughnan, principal, Hassell, Australia

15:30 - Why is providing catering important in rail car design?
Roger Williams, president, International Rail Catering Group (IRCG), UK

Mass-transit railcar design

15:50 - Multicultural design through 2010
Stephane Pottier, design director, MBD Design, France

16:10 - Designing new railcars adaptable to change over the next 50 years
Aaron Weinstein, chief marketing officer, San Francisco BART, USA

16:30 - BMW Group DesignworksUSA's key insights from BART's fleet of the future design programme
Adrian Corry, senior consultant, Public Transportation, BMW Group DesignworksUSA, USA

Day 2 – Wednesday 16 November

Materials and composites – weight reduction and efficiency

Moderator: *Richard Horn*, rail market manager, Advanced Composites Group, UK

10:30 - Advanced lightweight composite materials for railway interiors
Dr Richard Horn, rail market manager, Advanced Composites Group, UK

10:50 - The case for light weight in rail applications
Philipp Angst, product manager Core Materials, Airex, Switzerland

11:10 - Lightweight flame-retardant thermoset composites compounds with low smoke generation
Waldomiro Moreira, ABMACO member – Associação Brasileira dos Materiais Compósitos, Brazil

11:30 - Improved transit vehicle construction and operational cost reductions through lightweight, fire-safe, moisture-resistant phenolic composite panels
Ryan Kober, sales manager, Milwaukee Composites, USA

11:50 - Sandwich panels in railway interior applications
Gunnar Ziwes, manager of sales, Euro-Composites, Luxembourg

12:10 - Aluminium rail interiors: superforming your design
Samuel Jeffreys, sales engineer, Superform, UK

12:30 - Fire-resistant UP systems for infusion and RTM process
Cyril Becuwe, technical engineer, Nord-Composites, France

Fire protection, regulations, standards and passive safety

Moderator: *Richard Horn*, rail market manager, Advanced Composites Group, UK

14:00 - Insight into the latest developments of fire safety regulations and TSIs
Bas Leermakers, project officer – Interoperability – TSI sector, European Railway Agency, France

14:20 - Fire protection: blessing or curse? How compensation helps solve problems
Michael Klinger, consultant, IFAB, Germany

14:40 - TS 45 545: does a new standard mean new materials?
Franck Poutch, director, CREPIM, France

15:00 - Passive safety of standing passengers in public transportation
Marie-Christine Chevalier, research engineer, LBMC UMR_T 9406, IFSTTAR - Université Lyon1, France

15:20 - Combining high-class fire safety and interior design: Hi-Fog pop-out nozzles
Petteri Valkohaapa, manager, stations and rolling stock, Marioff Corporation, Finland

15:40 - Total composite solutions acc. EN 45545-2: coating, gel-coat and resins passing all requirements
Paul Wartenweiler, marketing and sales manager, Walter Mäder, Switzerland

Day 3 – Thursday 17 November

Seating design, comfort and safety

Moderator: *Kenneth Kozicki*, applications engineering manager, Rogers Corporation, USA

10:30 - Towards comfortable train seats for diverse users and activities
Dr Cedric Gallais, project leader in comfort, SNCF, France; *Liesbeth Groenesteijn*, project manager, TNO, Netherlands

10:50 - Developing a crashworthy seating system using advanced finite element analysis
Peter Snape, senior engineer, MIRA, UK

11:10 - The development of the first electrically powered operator seat for public transport
Anneke Noteboom, director – PR and marketing, SAVAS Seating, Netherlands

11:30 - Comfort, FST, durability and cost benefit lifecycle costs
Kenneth Kozicki, applications engineering manager, Rogers Corporation, USA

11:50 - Iseat: research and development of integrated components for railway seats
José Rui Carvalho Mendes Marcelino, design manager, Almadesign, Portugal

12:10 - Enhanced design of modular seating for passenger safety and comfort
Rama Krishna Gudipati, APM – rail, Infotech Enterprises, India

Intuitive lighting and accessibility

12:30 - The application of new-generation LED technology in interior lighting solutions
John Hesketh, director and general manager, LPA-Excil Electronics, UK

12:50 - 24-hour lighting scheme for train drivers: effects of light on alertness
Levent Sahin, design engineer, Lighting Research Center, USA

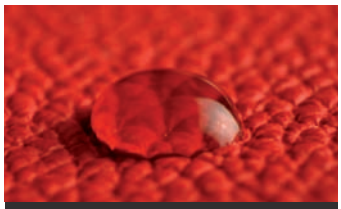
13:10 - Accessible boarding for everyone: system overview, customer and operator needs
Dr Bernhard Rueger, assistant professor, Vienna University of Technology, Austria

13:30 - Wheelchair passenger safety in trains
Heidi-Marie Kainu, regional sales manager, Q'Straint, UK

*This programme may be subject to change

Railway Interiors Expo

Attendance at the forum is free of charge to all visitors to Railway Interiors Expo. Reserve your seat by registering in advance at www.railwayinteriors-expo.com

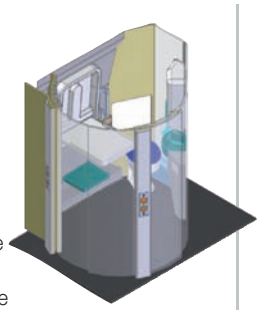


THE X FACTOR

Boxmark will show Xtreme Railway, a leather designed to be extremely hard-wearing, making it suitable for use in railway carriages on commuter and mainline passenger systems. The company says that Xtreme Railway achieves very high tension, ductility and tear values by using the best central European bull hides, and offers particularly good abrasion and crease values, even at frost temperature, guaranteeing the leather's durability.

With special finishes, Boxmark says that Xtreme Railway meets all required flame-resistant standards worldwide and is also prepared for the future European standard AN 45545-2 (Technical Data p.II). Stand 9620

EASY ACCESS



PCC.eu will exhibit a newly developed PRM TSI compliant toilet module, which is available in fully assembled or flat-pack form to cover new-build and refurbishment projects throughout Europe. The company says the toilet module covers all PRM TSI requirements for full compliance of British rolling stock to the end of 2019, and that all its toilet module products are Class 1 certified. The new module has been designed to have the smallest footprint possible for universal installation within all rolling stock classes.

The company will also show a carbon fibre phenolic material that it says not only meets Class 1 fire regulations, but can potentially be as strong as steel. PCC.eu says that by using this composite, panel reinforcement and structural supporting metals within the vehicle can be reduced without compromising panel strength or crashworthiness. Stand 9655

GOOD TO GO

First-time exhibitor TRB Lightweight Structures will display a range of lightweight composite materials for applications including floors, exterior and interior doors, toilet modules, ceiling panels and draught screens. TRB has also recently undertaken three major contracts for detainment doors – including design, validation and manufacturing services.

The company is currently undertaking a contract to supply lightweight composite structures for a high-speed train, including the train manager's office, magazine rack, server and stock room. These are painted and fully fitted out before they leave the factory so that they can be installed immediately.

The company boasts a team of highly experienced project engineers and an in-house design facility, and recently gained the International Rail Industries Standard. Stand 9606

SILICONE ALLY

UK silicone producer Silex and its German partner MVQ Silicones will exhibit a range of extruded, calendered and moulded parts. Both companies are also preferred converters and distributors for US speciality foams manufacturer, Rogers Corporation. Silex says that these strong partnerships facilitate a one-stop shop for production, technical advice and logistical support. The company says the specially selected compounds and materials meet the requirements of BS6853 Cat 1A and NF F 16-101. Stand 9255


Image: Novograf

TARTAN ARMY

A cluster of forward-thinking Scottish companies has joined forces to offer railway operators a one-stop shop for train carriage interiors, and will promote the new offering at the show.

Together, the consortium of five companies aims to offer all the expertise and materials required to transform a carriage from an empty shell into a modern, attractive and comfortable environment for passengers travelling in any class, from standard to luxury.

Rail Interiors Scotland consists of East Kilbride-based novograf (finishes and materials), Replin Fabrics of Peebles (textiles), Livingston's Transcal (seating, accessories, leather and textiles), Kirkcaldy-based Forbo Flooring (flooring) and Glasgow's Andrew Muirhead & Son (leather).

The companies recently collaborated on a £6 million project to refurbish carriages for East Midlands Trains, which was met with great acclaim. The new consortium will exhibit together at the show, joining forces to design and create a concept railway carriage and demonstrating the wealth of products on offer. Rail Interiors Scotland hopes to strengthen Scotland's position in the competitive railway interiors market and enable this group of companies to target new and bigger customers. Stands 9200, 9202 & 9204

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COLOGNE STAND 9670

Rubber sole

Rubber floor coverings from nora are being used on South America's first fully automated metro

Being one of the rising BRIC countries, Brazil has ambitious plans with regards to its local urban rail network. By 2014, the São Paulo urban rail network alone is slated to reach 420km. Four more metro lines are to come over the next decade.

It is thus no surprise that the country should be the one to operate South America's first fully automated metro line – São Paulo Metro Line 4. Being built by the ViaQuatro consortium, the line is also the country's first public-private partnership project. The fully automated line enables trains to run at closer headways than conventional driver-operated systems and is to carry up to a million passengers a day.

In May 2010, the central section of São Paulo Metro Line 4 between Paulista and Faria Lima was inaugurated. Once completed in 2012, it will cover about 13km and 11 stations, linking the Luz district in the city centre to Vila Sônia in the west with interchanges to metro lines 1, 2 and 3, as well as CPTM lines 7, 9, 10 and 11.

Passenger safety has been a major concern during the planning and construction process. The state-of-the-art subway line relies on a number of special features to safely carry its passengers. A passenger information, video surveillance and train radio system, for instance, is designed to ensure optimum safety conditions, while an operation control centre monitors and controls the line.

RIGHT: noraplan flooring installed on a train serving São Paulo Metro Line 4

PRODUCT SPECIFICATIONS

nora's rubber floor coverings are designed to offer outstanding fire protection properties. The products' fire, smoke and toxicity behaviour has been tested according to EN 13 501-1, DIN 5510-2, NF F 16-101, ASTM E-648 and E-662, BS 476 p.7, BS 6853 App. B.5.4, and UIC-Codex 564-2/12. They are free of PVC, plasticisers (phthalates) and halogens (for example, chlorine) as well as asbestos, cadmium, CFCs and formaldehyde.

The company says its products offer extraordinary wear resistance, are resistant to cigarette burns, are dimensionally stable (they do not contain any plasticisers, thus are resistant to shrinkage) and are environmentally safe (they are made from rubber, mineral fillers and environmentally friendly colour pigments).

The products are designed to provide a dirt-repellent and easy-to-clean surface – through an extremely dense surface and cleanguard, a post-curing surface finish. As the products don't need an extra coating, nora says they reduce care and maintenance costs as well as wastewater loading. Other benefits include antistatic properties and sound insulation values of up to 20dB.

Materials being used in the line's six-car trains have to meet the highest demands. Floor coverings, for example, need to meet the strict fire protection requirements specified by the local authorities. The nora rubber floor covering selected by Hyundai Rotem has been specially developed for metro trains.

noraplan stone mix 931 is designed to provide superior resistance to flame, smoke and toxicity – it contains no PVC, plasticisers (phthalates) or halogens (for example, chlorine). nora says that this ensures there is no risk of toxic gas from substances like hydrogen chlorine, hydrochloric acid, dioxins or furan in the event of fire. Additionally, the floor covering meets the durability requirements of the railway. Hyundai Rotem searched for a flooring solution that was abrasion-resistant and could withstand the train's heavy foot traffic, particularly in aisles and entranceways where traffic flows non-stop.

nora's rubber floor coverings stepped up to the challenge, providing the required durability and a dense surface designed to make the floor resistant to dirt, stains and grime, while its structure ensures slip resistance. Furthermore, the floor's granular design and slate grey colour support the train's sophisticated aesthetic. More than 5,300m^2 has been installed in the first trains, with many more to come.

"nora's rubber floor coverings are well prepared to fulfil the needs of the transport business," says Kathrin Kutter, market segment manager for industry and transportation at nora. "Leaving our many customers satisfied is of utmost priority."

Some of nora's most notable past projects include Lint railways all over Europe; people movers in Las Vegas, USA; metros in Taipei (Taiwan) and Seoul (South Korea); Citadis trams in many European cities; and the renovation of nearly 1,200 subway cars in New York, USA, a project that required approximately 113,000m^2 of noraplan.

nora offers more than 300 types of rubber floor covering designs and surfaces in its standard range alone, as well as a multitude of options for custom-made alternatives.

The company (formerly known as Freudenberg Bausysteme) is headquartered in Weinheim, Germany, and was founded in 2007. It employs more than 1,100 people and achieved a turnover of approximately €180 million (£156 million) in 2010.

TECH STOP

nora recently added a very handy tool for designers to its website – a virtual interior design studio. Designers can select a train interior, and try out various shades and designs of nora floor coverings in that environment.

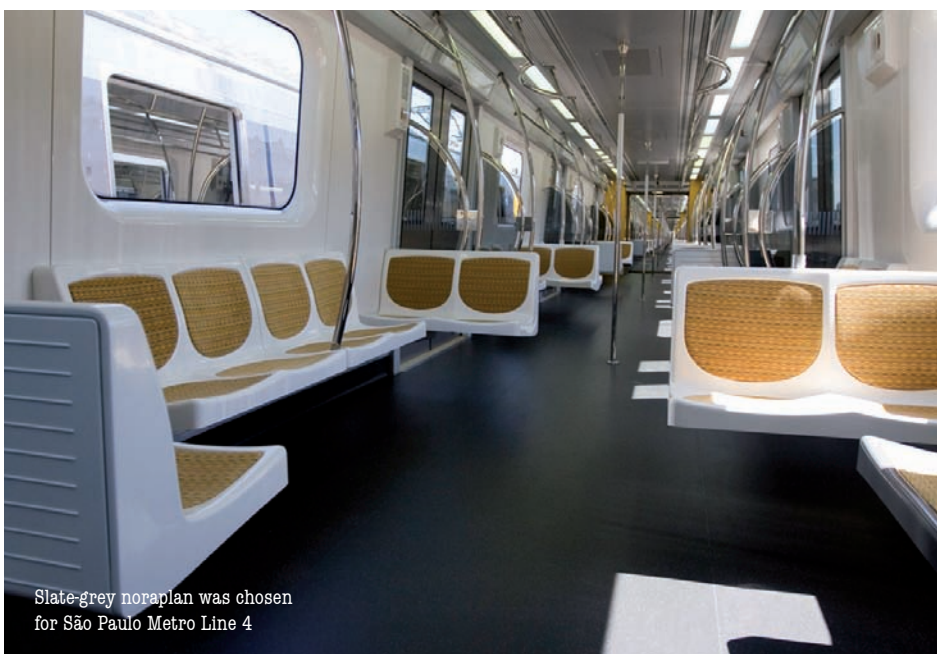
They can even try out the products in their own CAD files – by selecting the desired colour and specifying the floor area needed. This data is provided in a zip file that can then be imported into the designer's own applications.

"The application is not complicated and facilitates trying out different textures quickly. That saves us contacting the manufacturer again and again," says architect Manuela Hingst-Kopani of Behnisch, Hermus, Schinko and Schumann in Leipzig, Germany, who has tested the programme.

Anyone can access the studio at http://nora.esignserver2.com/gallery.do

The company also offers free apps for BlackBerrys, iPhones and iPads, which provide product and company information including images and product specifications. "We understand our customers are often away from the office, on the road, meeting with their clients. We are constantly looking for ways to make it easier and simpler for them to connect with nora and to see our complete range of commercial rubber flooring products," says Amy Bostock, manager of marketing and creative services at nora. "With nora on the go, our customers can bring nora with them no matter where their job may take them."

"Hyundai Rotem searched for a flooring solution that was abrasion-resistant and could withstand heavy foot traffic"



Slate-grey noraplan was chosen for São Paulo Metro Line 4

nora® Rubber Floor Coverings – The Transportation Solution from nora®

nora systems produces a variety of rubber floors for transportation and non-transportation applications.

The extensive range of transport application areas for **nora**® floor coverings and stair treads include light and heavy rail vehicles, high speed trains, people movers, and subways.

Find out more and meet us in Cologne at the Railway Interiors Expo 2011 at booth no. 9028!

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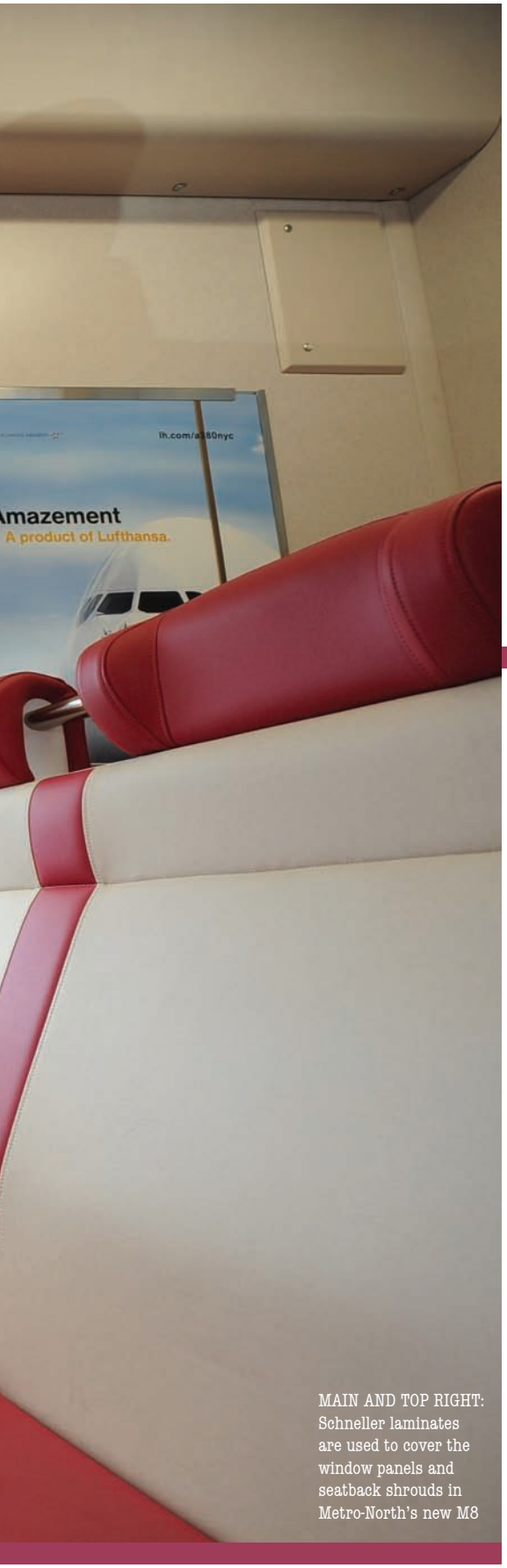
Star turn

Rail design superstar Cesar Vergara turned to Schneller for Metro-North's M8 programme



MAIN AND TOP RIGHT: Schneller laminates are used to cover the window panels and seatback shrouds in Metro-North's new M8

Few if any passenger rail lines have as storied a past or as prominent a present as Metro-North, one of the busiest commuter railroads in the USA. Once part of Commodore Vanderbilt's fabled New York Central empire, the five main lines leading to New York City include the New Haven line, which traces its roots to the dawn of the railroad era in 1830.

Today, the lines are collectively operated by Metro-North Commuter Railroad, which in turn is managed by New York State's Metropolitan Transportation Authority. It operates commuter trains between New York City and the northern suburbs of New York and Connecticut. With daily service to and from New York's Grand Central Station, Metro-North operates in a fishbowl, forever under close media and public scrutiny. Several Hollywood movies have featured footage shot on a Metro-North train.

That spotlight also applies to the railroad's latest major project, the addition of new M8 railcars built by Kawasaki. The first 26 M8 cars were put into service in early 2011, with about 10 additional cars subsequently put into active duty each month. A total of 405 cars will be delivered by 2014.

When Metro-North went shopping for a car designer, it seemed almost a foregone conclusion that the job would eventually go to Connecticut-based Cesar Vergara, formerly Amtrak's chief designer, who is among a handful of the world's leading designers of rail interiors.

Vergara turned to a company he stays in touch with regularly, and which he had worked with in the past, Schneller (based in Ohio, USA), which produces highly engineered laminate materials for railcar interiors.

Collaborative effort

The resulting M8 programme is an example of how a world-class rail designer and one of the major domestic industry suppliers, Schneller, can smoothly collaborate to create railcar interiors that are functional, attractive and budget-conscious.

Schneller is a global leader in the development and production of engineered decorative laminates for aviation and ground transport. The company provides continuous roll and sheet production from its ISO-9001/AS9100 facilities in the USA and has sales and services support offices in France and Singapore.

The company started out in the mid-1960s, when founder John Schneller developed a vinyl-coated fibreglass cloth for use on the Douglas DC-3 aircraft. From that modest beachhead, the company slowly began helping to transform aircraft interiors and later passenger railcars, not to mention architectural offices and various other interior environments.

In response to clients' needs for interiors that were more attractive, comfortable and compliant with ever more stringent safety regulations, Schneller began developing a portfolio of engineered decorative materials, including film

CESAR VERGARA

Cesar Vergara likes to say that trains are essentially moving buildings. But he insists they deserve nothing less than first-rate design. The motto of his design studio, after all, is, "If it costs a million, it should look like a million."

Born in Mexico City and trained in Sweden, Vergara is fluent in three languages (English, Swedish and Spanish) but conversant in most major European tongues. He first came to the USA in 1986, to work for a New York City design firm. He was part of a team that designed one of the most ambitious commuter lines in the USA in the second half of the 20th century – the subway system in Washington DC. Vergara later became chief designer of his native system, National Railways of Mexico, and of Amtrak and the New Jersey Transit system, the latter of which he also served as the assistant executive director. In 2009, he established Vergara Studios, based in Ridgefield, Connecticut, USA.

Vergara's breakthrough rail designs have been recognised in museum exhibitions, including the Smithsonian Institution's National Design Museum. He now works on four continents, and is one of the most prominent designers of railroad cars in the world.

Given his stature, Vergara is predictably fussy about who he'll collaborate with. Over the last decade or more, he's called upon Schneller to help execute his designs on a half dozen or so rail interior projects (Vergara also designs the exterior of railcars).

"They're very easy to work with," Vergara says of Schneller. "I've never even visited their office. They just bring the materials to me to show me." He goes on to say that while most US rail authorities have rules governing required domestic content, it's increasingly hard to find world-class USA-based suppliers, given both the global nature of the supply base and small US passenger rail market, at least relative to many other countries. "Sometimes you really have to work hard to get your North American content," he says.

Schneller's Martin Tranié, who has known Vergara for at least 20 years, says, "The reason I like working with him so much is that as soon as he starts dreaming and comes up with a concept – which is always great – he understands technical objections and adapts very quickly to make his concept doable".

laminates, reinforced laminates, thermoplastic sheets and an expanding array of custom applications. Today, the company is a creative partner to numerous airlines and many major aircraft and railcar manufacturers.

The design that eventually emerged from Vergara's studio boasts a number of unusual features, including curved interior architecture, an oval lighting system in the welcoming vestibule and gently curved baggage racks.

"Some of the most highly regulated places per square inch in the world are train cars and train stations," says Vergara, who has worked on projects all around the world. "In the USA, it's more engineer-driven, whereas in Europe, it's more designer-driven. So here, you work for the engineers. It should be like that – the engineer is the one signing on the dotted line that everything will be safe. Designs should be secondary to engineering."

Schneller designed all the laminates for non-soft surfaces above the floor, including window masks, seatback shrouds, seat end caps, the cove ceiling and partitions between various zones.

"In commuter rail design, each project is very different, because each local or regional rail authority wants something different, with its own signature," says Schneller's Martin Tranié. "But that being said, in principle, these projects also have some similarities. The seats might be different, or the shape of the window, but it helps to have worked on many earlier projects."

Project specs

On the Metro-North project, Schneller provided about 99% of the material used to cover the seatback shrouds and window masks, and about 90% of the rest of the material used in the railcar's interiors, aside from the flooring. The products used – Indura GTglas, Indura GTfilm and Indura GTform – were designed to be low in weight but durable, and are available in a nearly unlimited array of colours, patterns and textures.

Indura GTglas is a fibreglass-reinforced laminate designed specifically for high-wear, high-traffic areas such as railcar entryways, galley walls, partitions, luggage racks and doors. The material is designed and engineered to be stiff enough to conceal panel surface variations.

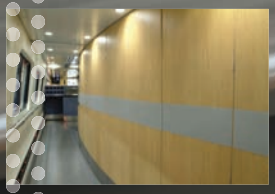
Indura GTfilm is a three-dimensional laminate suitable for complex contours and engineered exclusively for railcar interiors. Schneller says it provides surface protection for low-maintenance panels, and is resistant to graffiti, stains and solvents. The material is primarily used in ceilings, stowage bin doors and window masks.

Finally, Indura GTform is a thermoplastic decorative laminate designed to help convert rigid, contoured parts into interesting design features. Schneller says it works especially well in heat-vacuum applications, and is most frequently used for door linings, seatback shrouds, lavatory walls and partitions and bulkheads.

As a key supplier to the commuter rail industry, Schneller takes great pride in having contributed to many of the major commuter railcar projects in North America over the last decade or more. Its track record includes projects for rail authorities in Long Island, New Jersey, Los Angeles, Montreal, as well as various car refurbishment projects for such operators as Amtrak, VIA Rail and Amfleet. The company expects to continue to serve as a trusted partner to the passenger rail industry for many years to come.

RIGHT: The seat end caps are covered with Schneller laminate

SCHNELLER



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Light relief

LPA Excil Electronics sheds light on the relative benefits of chip and power LED technologies

RIGHT: Downer EDI Rail's Waratah train, which uses LPA's LumiStrip

The introduction of LED lighting in rail interiors can offer advantages such as power savings, dimming ability, cool beams and low maintenance costs, according to LPA Excil Electronics. The company boasts 29 years of expertise in rail interior lighting and has been designing and manufacturing LED lighting products for the industry since 2003.

A close partnership with two major LED manufacturers enables LPA Excil Electronics to stay up-to-date with LED technology. The company says low-power chip LED technology is the latest advance that could revolutionise railway lighting systems.

"A highly flexible and fully compliant modular system comprising reliable drive electronics and chip technology LED light engines can now be designed and manufactured," says Martin Ramsden, engineering manager at LPA Excil Electronics. "The system not only offers industry-leading energy savings and reliability, but is also able to offer unparalleled levels of uniformity, freedom from point source visibility and therefore, an aesthetically pleasing solution. Flexibility in both the light engine's form and drive electronics enable their adaptation to a wide range of luminaire designs, with lumen output equivalent to single and multiple lamp types."

A new generation of lighting-grade low-power LED chip technology, originating from television screens, now offers a luminous efficacy greater than 100 lm/W. Each device can be powered with a drive current up to 160mA (0.5W). The luminous intensity per LED is therefore 50 lumen (in any colour temperature) at maximum drive current.

LPA Excil Electronics says chip LEDs are the perfect solution for high-density arrays, strip lighting and backlighting applications where a more uniform light distribution is desired. "Chip LEDs offer tightly controlled flux, colour and voltage binning, which allows for tighter matching and blending of individual sources within a fixture," says Ramsden.

Chip LEDs can also offer great flexibility, as the pitch and light output can be customised to meet specific illumination requirements. Shape and size are also completely flexible – they are available in flat, curved, circular and rectangular form.

"Additional benefits of LEDs include dimming ability and responsiveness to ambient light levels, both of which can be used to bring about further energy savings and extended product life," says Ramsden. "The dimming interface can be pulse width modulation or vehicle-supply logic-level binary code, which enables operators to preset various light levels, including an emergency mode."

But however great the benefits are, Ramsden says chip LEDs need to comply with railway standards to maximise their performance and service life. "The rail industry has seen the arrival of non-railway products, which do not satisfy all the requirements of rail standard EN50155," says Ramsden. "Problems with these

ABOVE AND LEFT: Chip LEDs from LPA

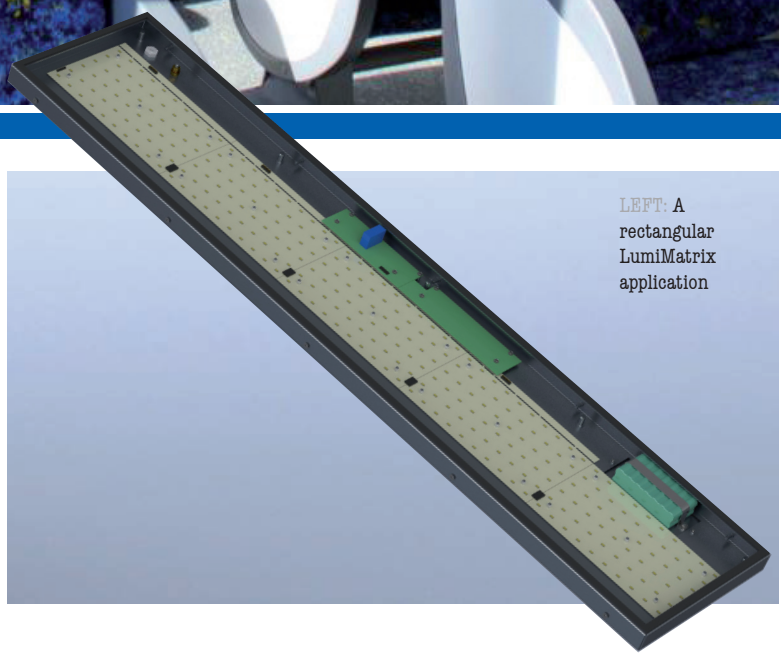
products can include a lack of output regulation over the full vehicle-supply range, resulting in variations in light output. Also, the type of LED technology these products use is often not lighting grade, thus resulting in low efficacy and poor colour control and rendering."

Chip products

LPA Excil Electronics has embraced this new chip LED technology and decided to apply it to the LumiMatrix concept, part of its LumiSeries LED-based product range. A matrix of individual low-power chip LEDs is arranged on a back plane with a glass or polycarbonate diffuser placed in front of the LEDs in a conventional manner. Ramsden says this matrix can be configured to match the luminous intensity of fluorescent lamps and achieve a specific service life.

"Using a high quantity of LEDs operated at low power prevents source visibility or 'spotting', which can be a problem when using a lower number of high-power LEDs," explains Ramsden. "As the power dissipation and concentration of the individual LEDs is low, they are mounted to conventional FR4 glass fibre printed circuit boards, which are in turn mounted to the luminaire gear tray. This results in obvious cost savings in comparison with a power LED solution, where aluminium thermal substrate printed circuit boards would be required."

LPA Excil Electronics says the LumiMatrix uses extremely high-performance LEDs from a leading manufacturer, to ensure a high colour rendering index (CRI) and close control of colour temperature. The LEDs are mounted, 13-15 in a series, to an FR4 printed circuit board with white solder resist. LumiMatrix has independent series circuits, each powered by a constant-current switch-mode power supply. The LEDs on each series circuit are mounted alternatively so that in the event of a failure of one series circuit, the overall appearance remains largely the same but at a reduced illumination level. This system offers redundancy within a single LED module. Each series circuit and associated constant-



LEFT: A rectangular LumiMatrix application

“Power LEDs are ideal in general lighting systems that rely solely on indirect illumination”

current power supply is individually fused so that in the event of a catastrophic failure of one circuit, the remaining circuit should operate normally. The built-in central power supply unit of each LumiMatrix is designed for very high reliability and to produce a constant voltage output.

When required, batteries and all the control electronics needed for emergency lighting can be integrated within the product. Predetermined quantities of LEDs are separated electrically and maintained by the integrated batteries in the event of a power loss.

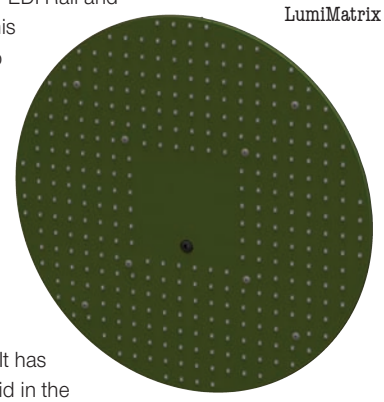
LumiMatrix should not be viewed as an LED luminaire only. Rather, it is a ‘light engine’ that can be supplied in any shape (rectangular, circular or strip) or size as a simple printed circuit board or as a full luminaire. LPA Excil Electronics is currently working on several projects using the LumiMatrix concept.

Power products

The company also offers lighting products based on power LEDs, including the LumiStrip and LumiPanel. “Power LEDs driven at 325mA (1W) can produce 90 lumen in warm white or up to 130 lumen in cool white,” says Ramsden. “They also maintain well – lasting up to 100,000 hours at 70% of the original light output, in comparison with 60,000 hours for chip LEDs.”

LumiStrip is an LED strip with built-in drive electronics, which mounts directly onto the gear tray. It has been chosen for direct lighting in RailCorp’s Waratah train in New South Wales, Australia, which is being manufactured by Downer EDI Rail and Hitachi. LPA Excil Electronics believes this is the first passenger train in the world to use LED lamps for all lighting, including external marker lights. The company is delivering more than 20,000 units for 626 Waratah carriages.

Meanwhile LumiPanel is being trialled on the London Underground in the UK, on the Central line. It consists of a thin, complex side projection and internal reflection lighting system luminaire with built-in drive electronics. “It has exceptional robustness as there is no void in the luminaire,” says Ramsden. “It is IP65 sealed, has a glass diffuser and is therefore ideal for environments dealing with low ceilings and the threat of vandalism.”



ABOVE: Alstom’s Regiolis incorporating LPA LED reading lights

BELOW: A circular LumiMatrix

Another project using power LEDs is Alstom’s Porteur Polyvalent or Regiolis. LPA Excil Electronics is supplying 30,000 LED reading lights for attachment to seat headrests.

Which to choose?

LPA Excil Electronics says power LEDs are still the most suitable and reliable source of light for localised applications such as spotlights, step lights and reading lights. “Given their light intensity, power LEDs are ideal in general lighting systems that rely solely on indirect illumination,” says Ramsden. “They can be used for direct lighting luminaires but will offer less flexibility than chip LEDs.”

Meanwhile, the company says chip LEDs are best suited for direct lighting when a large surface area with an unconventional shape has to be illuminated with good uniformity. “Their lumen/cost ratio is also more competitive than power LEDs,” says Ramsden.

Ultimately, the choice between using power or chip LEDs relies on understanding customers’ requirements in terms of light output, light uniformity, service life and target price.

HOW LONG DO LEDS LAST?

An LED is a solid-state semiconductor device that can convert electricity directly into light. Being a relatively new technology, confusion can sometimes occur between the terms ‘service life’, ‘lumen maintenance’ and ‘mean time between failures’ (MTBF).

“The MTBF of an LED device (generally millions of hours) is the time it takes for the LED to fail completely,” says Martin Ramsden, engineering manager at LPA Excil Electronics. “However, this figure is not relevant to interior illumination as an LED’s intensity gradually decreases over its life and becomes unusable after a certain time.”

The industry generally uses the term lumen maintenance. This is a measure of how well a lamp maintains its light output over time. “In the case of chip LEDs, the lumen maintenance figure is 60,000 hours to 70% of the initial light output,” says Ramsden. “However, this does not mean that you need to replace an LED lamp after 60,000 hours, as long as you still meet the rail lighting illumination standard EN13272. In this case, the term useful/service life is most appropriate to specify the time to the point where the vehicle lighting does not meet the illumination requirements of EN13272.”

Ramsden says an LED module can be designed to meet a specific service life by taking into account its predicted decay, ensuring optimal thermal management and by increasing the initial light output. LPA Excil Electronics can provide full illumination renderings taking into account LEDs’ lumen output, diffuser transmission properties, car dimensions and interior material reflection properties. The idea is to ensure that illumination standards are met (in terms of light output and uniformity) in general and emergency lighting modes.

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Inner visions

A metro concept designed to bring prestige and business to the city of the future

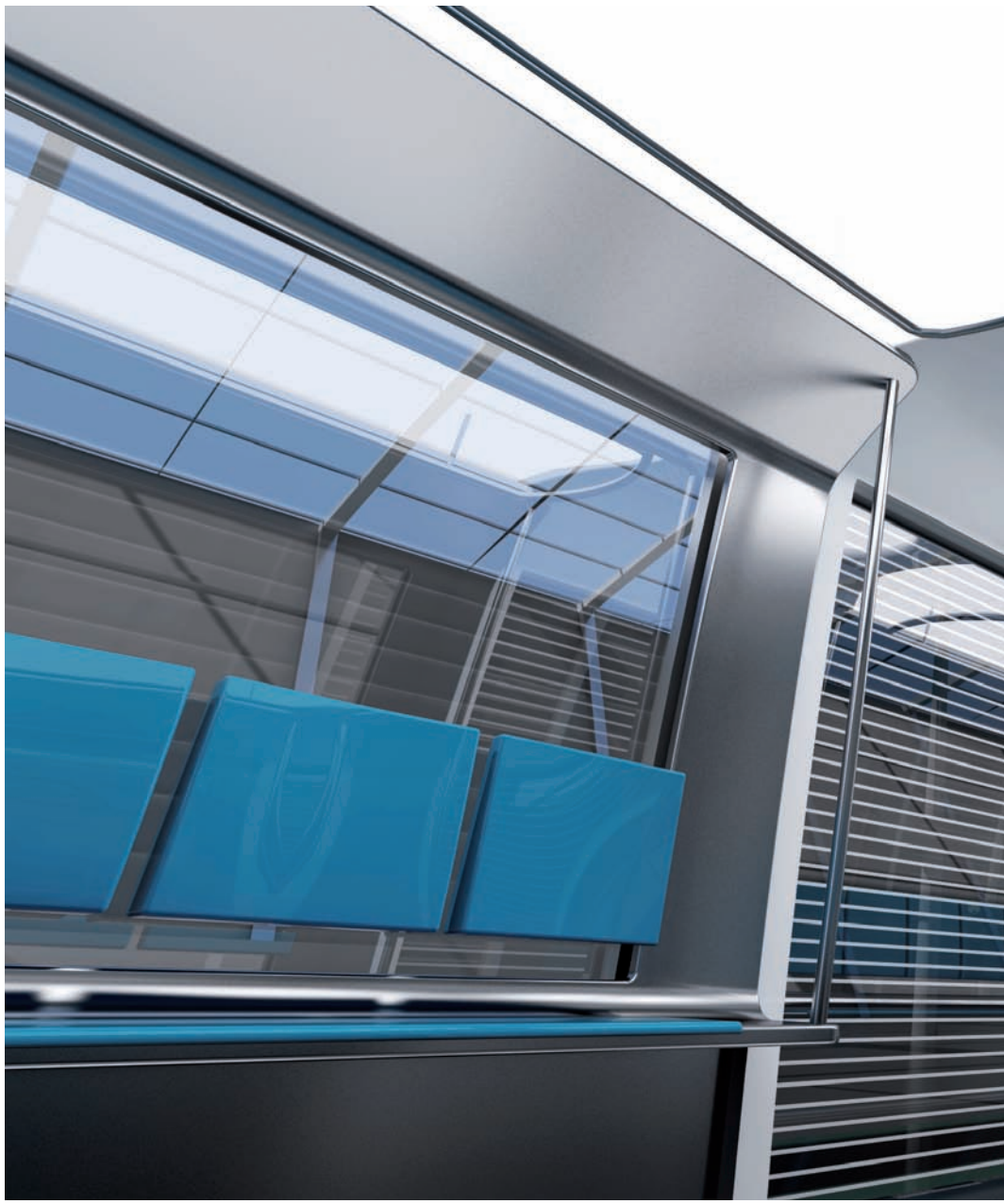
Leaving a stylish home, getting into a sleek car and then stepping into a conventional metro – for some passengers the contrast could not be more stark. "While our living environments and the cars we drive have gone through a dramatic transformation over recent years, all too often public transport systems are left trailing behind with a design standard that would have only just been acceptable decades ago," says Thomas König, CEO of Tricon Design, a railcar design firm based in Kirchentellinsfurt, Germany.

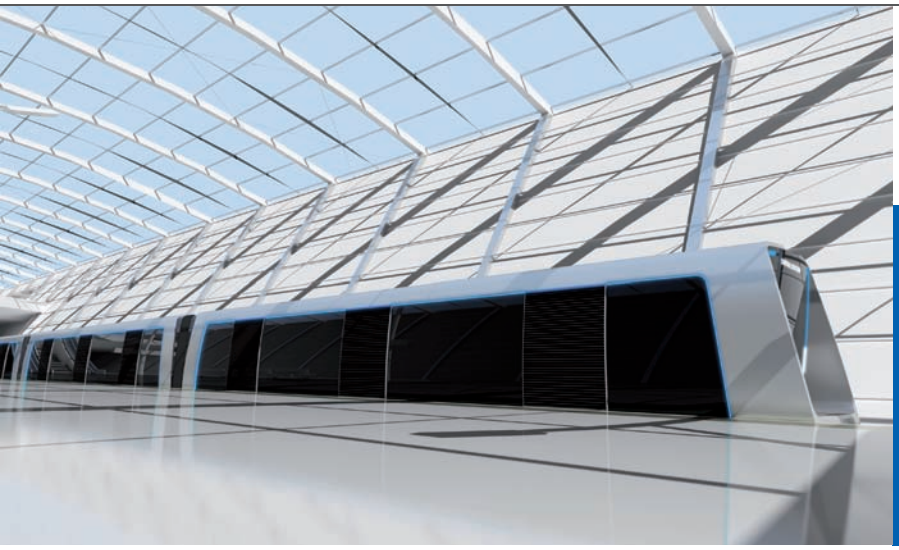
But König has noticed the tide turning. "Only a few years ago, the design of an underground or local train was frequently relegated to the sidelines, partially because of assumed cost aspects, and treated as something of a poor relation," he says. "But times have certainly seen a fundamental change. The movement towards ever-greater individualisation and the ever-increasing value attached to the design of public transport vehicles is unstoppable. The designers involved in these projects are increasingly being treated as real partners by manufacturers and clients, as they hold the key to addressing future market demands."

König believes this re-evaluation of the importance of a railcar's interior design is in part down to increased competition from different transport providers, particularly automotive manufacturers, which are investing "enormous sums" into new, green city cars.

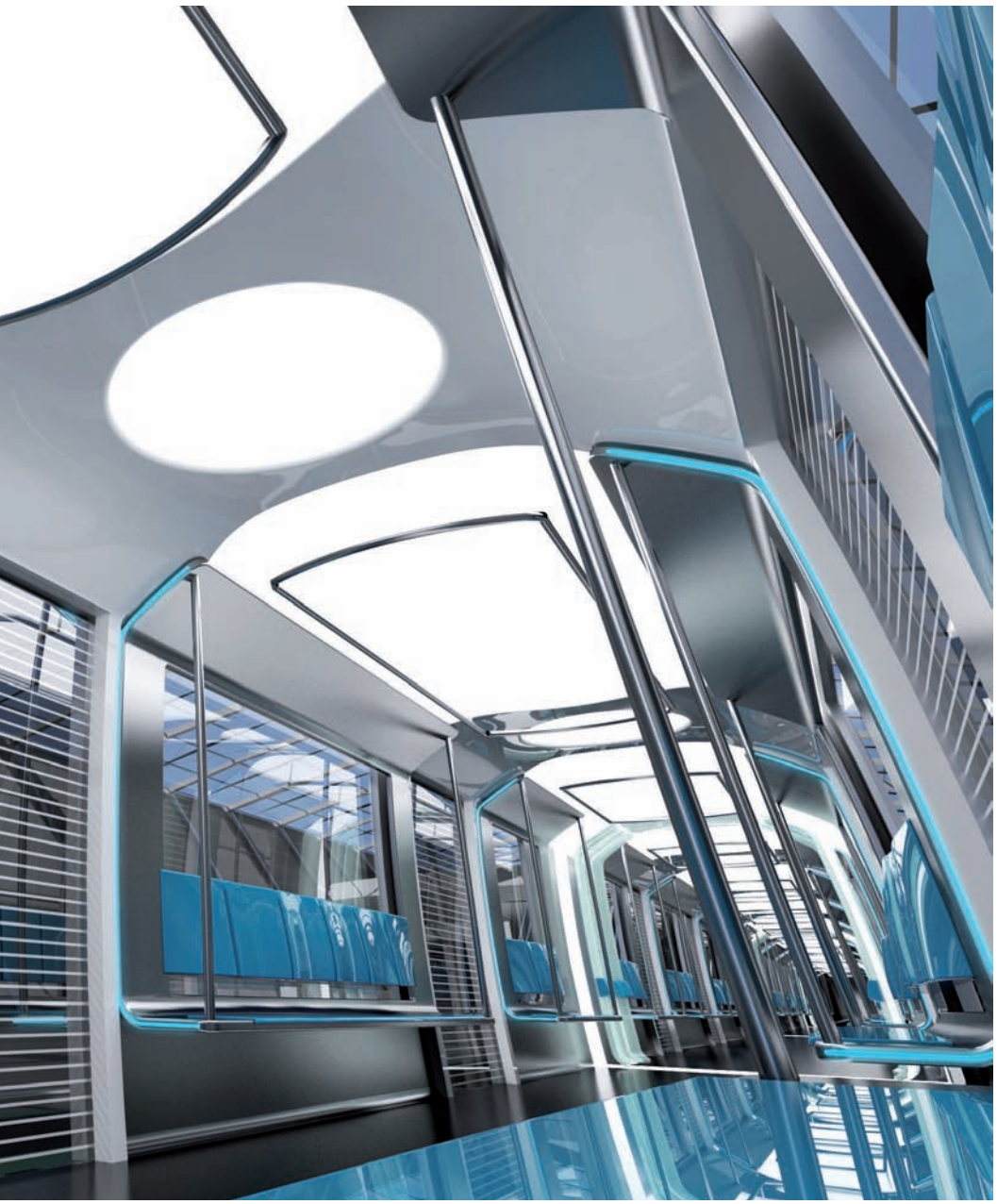
Character building

"It is no longer enough to simply tick all the functionality boxes if you want to compete with other transport providers to attract customers," says König. "Instead you need to pay attention to evoking emotions and lending vehicles a totally individual and unmistakable character. In this regard we are taking the lead set by automotive manufacturers, which have been putting this





BELOW AND LEFT: Tricon's vision for the metro of the future



philosophy into practice – highly successfully despite the highs and lows of the global economy – for many years."

The way König sees it, traditional areas of conflict are moving gradually towards resolution. "Buyers and transport network operators are looking for an attractively priced, reliable and unmistakable vehicle and the manufacturers want to achieve a good price for what is a largely standardised vehicle. Passengers expect not only safety and punctuality, but also an appealing, high-quality design and acceptable fares."

The Tricon design team is built around the two CEOs, König and Frank Schuster, and includes a large number of designers and interior architects. Recently completed projects include the Zurich S Bahn urban railway and Glacier Express in Switzerland; a shuttle at Beijing Capital International Airport in China; new rolling stock for Hamburg's Hochbahn urban railway in Germany; and metro vehicles for Hong Kong, China, and Izmir, Turkey.

Rather than resting on its laurels, the team is continuing its quest for the new, the previously inconceivable and the visionary. "After over 25 years in railway vehicle design, there is always a risk of falling into the experience trap," says König. "This makes it all the more important to clear our heads for new ideas, with our own independent studies that are not driven directly by manufacturers or operators."

Looking ahead

In this context, over recent months Tricon Design has developed a number of new interior ideas for modern railway vehicles under the conceptual heading 'Always Ahead'. According to Schuster, the designs (which have been prepared in the form of visual drafts) are not intended to be implemented immediately, but rather to illustrate the forms that interior design could take in the future – in the same way that visionary concepts are presented in the automotive industry.

The driving idea behind these designs was that a district public transport system can play a part in enhancing a community's image and attracting business to an area. "Our aim is to create an architecturally configured feeling of space rather than a 'transport tube', in which the interior is in harmony with the exterior," says König. "The evident quality of the vehicles clearly reflects the endeavour made to attract passengers, in response to competition with other transport providers. It goes without saying that

RIGHT: The concept envisages the use of projection technology

technical aspects such as lightweight construction and more flexible refurbishment are also part of the concept."

The company believes that by taking this approach to vehicle design, it is possible to attract a more discerning customer base. "If we succeed in lavishing the same degree of attention on the interior of the vehicle as we do on the exterior, then the travel ticket will be transformed into an admission ticket – and this is the only way to secure existing customer loyalty and attract new passengers," says Schuster.

As well as sporting clear-cut, minimalist exterior styling, the driverless metro design includes an interior that combines transparency and new lighting ideas to create a futuristic ambience. LED technology has been used in two ways – linear light to emphasise contours and transitions, and planar lighting to highlight entrances and other key areas.

'Frameless' all-glass elements are used for the entrance doors. From the outside, these provide a cohesive continuation of the window structure, while also affording unobstructed views of the station platform from the inside. Windows in the seating area are maximised by being extended downwards, separating the seats optically from the side wall and fixing them on what are termed 'C' panels by Tricon Design.

The C panels form an essential element of the interior. They appear to be detached from the outer wall, and their edges can be illuminated in the operator's signature colours. The C panels can also be configured using a wide selection of materials and surfaces, enabling operators to customise their vehicles, both when commissioning new stock and for subsequent refurbishment projects. The seat surfaces are fixed on the C panels, while the ergonomically styled seatbacks appear to hover in front of the carriage's glazed wall.

"Conventionally neglected, the gangways are dramatically upgraded by the integration of an innovative light system"

Window display

The C-panels also provide a background for displaying destination information, which can be projected in real-time. The windows can be used as a background for infotainment – they are configured as multiple glazed panels and the gaps between them can be equipped accordingly.

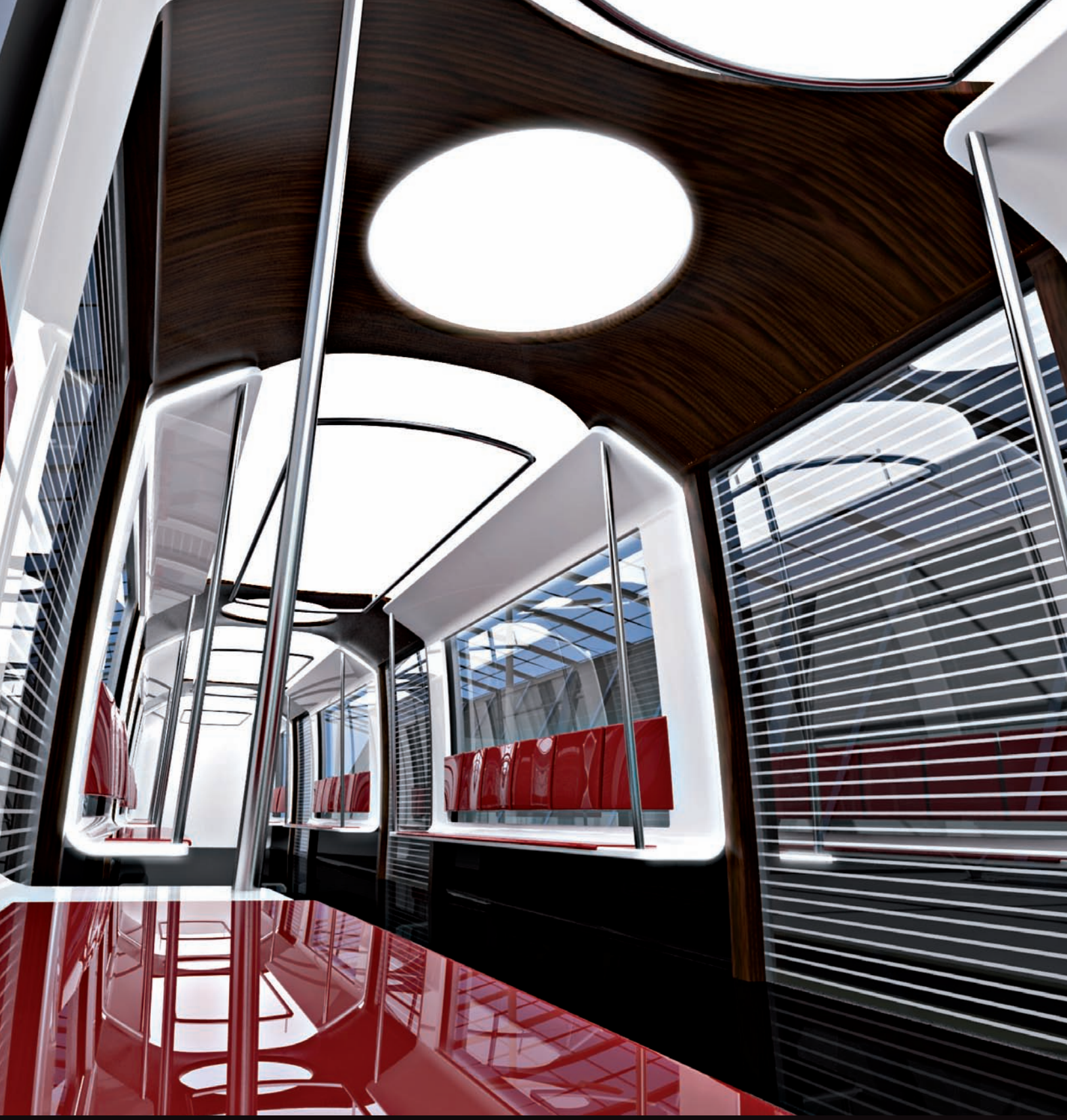
Tricon Design has also paid attention to the gangways. "Conventionally neglected as mere transit zones, the gangways are dramatically upgraded by the integration of an innovative light system," explains König. "As well as lighting the floor area, the flexible bellows between carriages and their covers are also emphasised by the lighting architecture. A particular feature of this innovation is that the intensity of the light changes depending on the degree of curvature, making the vehicle appear to breathe and intensifying the travel experience."

The idea was to transform these transition areas into 'light tunnels' marking out the route to the next carriage. "Time spent travelling and moving through the train is transformed into an emotional experience," says Schuster.

"Cities aiming to attract the best businesses and top talent to their regions will have to offer a local public transport system that addresses the high expectations of this type of client," says König. "More than ever before, vehicle design will have a key role to play in the future."

Over the coming weeks and months, Tricon Design will present these concepts at various railway vehicle industry events. The design team is already looking forward to stimulating and productive discussions.

RIGHT: Entrance zones are highlighted with planar LED lighting



Always ahead

Design ist mehr als Gestaltung.

TRICON DESIGN AG

Nose to tail

Andrew Muirhead & Son explains why its leather is called 'low carbon', revealing a commitment to the environment that starts with sourcing the raw material and continues all the way through the manufacturing process

The Low Carbon Leather marque that Andrew Muirhead & Son introduced in 2010 is proving to be popular with the rail market in Europe. Most recently, a large number of hides have been supplied to the UK's East Midland Trains in a bespoke ink (dark blue) colour for the refurbishment of its fleet of 27 Meridian trains. The leather manufacturer is also currently at the testing stage on a number of contracts for operators in both the UK and eastern Europe.

"Our rigorous testing procedures, quality standards and commitment to producing low-carbon leather have made our products attractive to the rail industry, allowing customers to fulfil their green credentials and reduce their carbon footprints," says Archie Browning, sales director at Andrew Muirhead & Son. "We are the only leather manufacturer to hold Class 2 specification from BTTG Fire Testing Services. In addition, leather is proving attractive as it is harder-wearing than fabric, is easier to clean and delivers a better experience for passengers."

The rail sector is a growing market for the company. "Rail is a very important part of our business and we are always looking to improve our service to customers," says Browning. "We are the UK's biggest supplier of leather to the aviation market and that experience has helped us to develop the rail side of our business."

Group dynamic

Andrew Muirhead & Son is part of the Scottish Leather Group, which also includes Bridge of Weir Leather Company, NCT Leather and W. J. & W. Lang. Together the group commands a large slice of the UK's bovine leather manufacturing industry, with a turnover in excess of £60 million.

"At Scottish Leather Group we believe in making leather without it costing the earth and have been working to attain and develop our green credentials and reduce carbon emissions across all parts of the business since 2003," says Browning. "We take our environmental responsibilities seriously. Our customers expect it and our reputation as an industry leader demands that we are ahead of the competition. Sustainability is not a choice, it's a requirement."

Putting its money where its mouth is, in 2008 the group set up SLG Technology to implement the subsidiary companies' environmental policies across the board and look at new ways to reduce their carbon footprints. A big part of this effort culminated in the launch of a thermal energy plant in July 2010. The plant uses the 30,000 tonnes of waste generated by the group's subsidiaries to generate approximately 45 million kilowatts of power per year.

BELOW:
Muirhead leather on East Midland Trains' Meridian fleet

LEFT: Muirhead leather seating at London St Pancras station

"We have reduced our carbon footprint for the fifth successive year"

"It's part of our commitment to customers to not only deliver high standards, but to also help them to actively reduce their environmental impact," says Browning. "This year we have reduced our carbon footprint for the fifth successive year. We have now decreased by 20% and as such, received a Carbon Trust Energy Efficiency Award for our efforts. We currently use 15kWh/m^2 of leather in the manufacturing process (raw to finished), as opposed to an industry standard of 47kWh/m^2."

Waste not, want not

The group has a stated objective of achieving zero waste and has a strategy in place to deliver this target. "Landfill costs have risen dramatically over the last few years and anyone who does not address this will be out of business. There are rumours that the government is also looking at introducing a carbon tax and there is no point in burying your head in the sand and hoping all this will go away, because it won't," says Browning. "We are using less water in our process and by installing highly efficient waste water plant we are able to meet IPPC requirements, using primary, secondary and tertiary effluent treatment and on-site generated oxygen."

As well as controlling the manufacturing process, Andrew Muirhead & Son also pursues sustainability through the sourcing of its hides, taking 'hide miles' into account. "We are already using a by-product of the beef industry in our manufacturing process, which is in itself recycling. However, if you are importing your hides from Brazil and Argentina to the UK you aren't doing much for your green credentials," says Browning.

ABOVE: A bespoke leather is used in first class on East Midland Trains' Meridian fleet

"Higher-quality raw materials mean less waste and less intensive processing. We source nearly all our hides from top-quality British beef cattle and apply rigorous standards."

The company buys hides directly from abattoirs to ensure the consistency of its end product. "We even employ someone to work directly with the abattoirs to ensure that we have the best hides possible," says Browning. "We demonstrate our quality control throughout the entire manufacturing process."

Browning says the key to the Scottish Leather Group's success lies in its ability to back up its green message with facts. Each of the group's companies has an environmental policy and statement, which can be viewed on the internet.

"The continuous investment in technical innovation through SLG Technology has moved our manufacturing process from a craft-based operation to a technology-driven enterprise with our own manufacturing IP," says Browning. "We hold ISO 14001, which sets the standard and puts us well ahead of our competitors."

Hidden dangers

Rogers Corporation warns that there can be hidden costs that need to be included in product lifecycle cost analysis

Product lifecycle cost analysis, cost of ownership, life cost analysis (LCA), whole life cost, and cradle-to-grave costing – what do these terms have in common? The answer is they are all ways of evaluating the cost of a product throughout its time in service. They are certainly nothing new to the rail industry. In fact, many governments and municipalities require an LCA as part of a tender offering, and some transit authorities have expanded the criteria to include end-of-life costing and the triple bottom line (TBL or 3BL) of the cost impact upon environmental sustainability (the TBL takes ecological and social performance into account in addition to financial performance).

"Surprisingly, LCA is often misunderstood or only partially considered in railway tender awards," says Ken Kozicki, applications engineering manager for Bisco silicones at Rogers Corporation. "Some vendors enhance or misrepresent their respective products' life performance claims and either omit substantiated time-simulated data or exaggerate future savings. Typical cost models have the tendency to be over simplified and lack the flexibility needed to accommodate specific and customised variables not shared among transit authorities. Lastly, there are hidden, intangible and questionable costs that may be difficult or impossible to estimate."

Seat lifecycle analysis

While LCA can be assessed for any railcar component, this example uses a seating tender to scrutinise the validity of the model. "Within the interior, seating is one of the five most costly elements of the

Rogers' Bisco silicone used for railcar seat cushions

ABOVE LEFT:
The impact of a 100,000-cycle test on silicone (left) and polyurethane (right) foam

railcar and is at the top of the list for refurbishments," says Kozicki. To assess new-build costs with forecast refurbishment estimates, a whole cost analysis can be used.

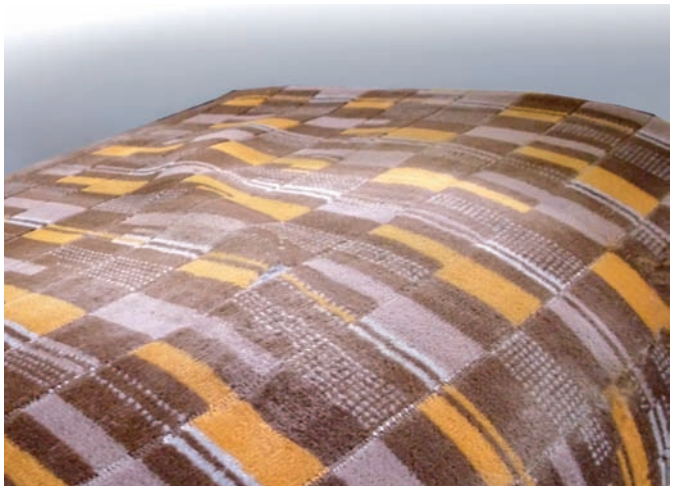
A whole cost analysis would take into account the cost of the seating for the initial new-build delivery; an estimate of how long the seats will be in service before a full or partial refurbishment; the estimated cost of the refurbishment; and historical costs for replacements between refurbishments. Other considerations may include the cost of labour and lost revenue while the seat or railcar is in refurbishment or out of service. Ridership dissatisfaction because of seating discomfort or style could also be identified as an intangible cost.

"Regardless of the depth of such an analysis, this list is relatively common and generally used in the decision matrix," says Kozicki. "There are, however, hidden costs that rarely come to the surface."

Kozicki says that in the development of a seating lifecycle cost analysis, time to refurbishment is most commonly coupled to loss of comfort. "An argument can be made, however, suggesting compromised safety as another criterion, as it could become a big source of hidden cost," he adds.

The notion of compromised safety is predicated upon the global rail standards that address flame, smoke and toxicity (FST), such as ASTM D 3675, BS 6853, NFF 16-101 and DIN 5510. Full seat assemblies or the individual materials used in the construction of a seat and seat cushion are mandated to conform to specific FST measurements dependent upon the category

"Compromised safety could become a big source of hidden cost"



ABOVE: After a 100,000-cycle test, the silicon foam (on the left) remains largely unchanged

of the train. "In practice, certified third-party FST test reports must accompany a seating tender as verification of conformance. Thus, the qualification testing of a material or full seat is of the utmost importance," says Kozicki.

The language in the standards, as well as the testing methods, is the result of professional expertise and years of collaboration. "They are well defined, sophisticated and strictly reviewed," says Kozicki. "Thus, the preparation of a vendor sample designated for testing submission will be of the highest level of engineering and craftsmanship. For example, a seat that is to be submitted for a British Spec (BS) 6853 Category 1a burn test will be meticulously assembled, with special attention to the wrapping of the fire barriers and upholstery fabric over the foam seat cushion. Objectively, the entire process is logical, legitimate and of the utmost regard for the safety of the ridership."

Why, then, is this a discussion on hidden lifecycle costs? Kozicki's answer to this question is built upon cycle-testing data, field observations and a hypothesis.

"It has been established that achieving good FST results is partially dependent upon the best-of-the-best material samples and assembly practices," he says. "What would be the FST result if a mass production seat were pulled out of service after thousands of cycles and months or years of usage?"

"What would be the FST result if a mass production seat were pulled out of service?"

Depending on the type of foam specified for the cushioning, Kozicki says the cycling of a seat can result in a loss in foam thickness, reduced spring-back force and compromised weight distribution. "This deterioration will cause the fit between the upholstered fabric, fire barriers and foam to become loose and crumpled," he adds.

In a recent lab study performed in the UK, a 100,000 cycle test was conducted on two upholstered foam cushions – fire-retardant open-cell polyurethane foam and open-cell silicone foam. "The fire-retardant polyurethane material diminished in thickness by >10% with a spring-back force loss of >50%, while the silicone foam deterioration was negligible in both thickness and spring force," says Kozicki. "In addition, the polyurethane cushion took on a compression set with a concave shape replicating the shape of the Jounce and Squirm impact apparatus. It was also discoloured, the remnants of the fire-retardant filler after having eroded away the cell walls of the polyurethane foam."

In contrast, Kozicki says the silicone foam showed no shaped compression set and had no visual defects.

Back to LCA

"Would the 100,000-cycle tested polyurethane seat still pass the FST requirements as did its hand-crafted predecessor without any cycling or wear? Is this a compromise of safety? Also, is this a hidden cost that should be included in an LCA?" asks Kozicki. "A thorough lifecycle cost analysis should include a systems approach – analysing potential costs, with probabilities, of a system or module failure because of performance degradation of the component under evaluation. In the case of the seats, there may be a point in time when loss of thickness, spring-back force or a shaping from compression set could cause a system failure. The system failure could range from acceptable comfort to something as severe as non-compliance to an FST standard."

Rogers Corporation, which makes Bisco MF1 open-cell silicone foam specially formulated for railcar seat cushions, will launch a Seat Cushion Cost of Ownership Tool at the upcoming Railway Interiors Expo, to be held in Cologne, Germany, on 15-17 November 2011. The tool enables users to simulate a specific scenario – size of seat cushion, number of seats per car, number of cars in the fleet, average number of years between refurbishments, cost of competitive materials, labour rates, estimated number of replacements, need for fire barriers and revenue loss. The calculator presents a picture of the total cost of ownership for each material along with metric tonnes of material that will be designated for landfill over the time period.

"It will be up to the user to add in the hidden costs – if there are any," says Kozicki. "Hidden costs can be difficult to measure, but that doesn't make them any less significant, especially when it comes to any potential compromise of safety."

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Opening ceremony

Satek's Samove door system has won its first customer and is now being fitted on Desiro RUS trains destined for the 2014 Winter Olympics

Satek presented the prototype of its Samove door drive for the first time in 2008. Now the company can report that the first WC cabins with this door have been delivered (in September 2011) for installation at Siemens' facility in Krefeld, Germany. The contract, signed at the end of 2010, will see Samove installed on Desiro RUS trains, which will be used for the 2014 Winter Olympics in Sochi.

To meet the necessary requirements, the system has been extensively tested. After the first series of testing, which included more than 200,000 motion sequences, every part of the system was revised and optimised. The system was declared ready for serial production after a second bout of endurance tests also reached the 200,000 mark. Satek says the door retained a smooth and even motion throughout the test period, without any system failures or the need to replace any parts through wear and tear.

The 200,000 motion sequences completed (unlocking, opening the door, open position, closing the door and locking) correspond

“The novel thing about this door is its double functionality – it can be opened manually or powered by the motor”

to approximately three to four years of actual usage in a carriage. “The door runs smoothly, is ready for serial production to begin, and is now fit for use out in the big wide world of public transport,” says Christine Kaiser, assistant project manager at Satek.

ABOVE: Satek’s R&D department now has eight full-time employees

LEFT AND RIGHT: The Samove door

Double functionality

The novel thing about this door is its double functionality – it can be opened both manually or powered by the motor. The product is designed to do this without the user even noticing and without compromising comfort for anyone, whether they prefer powered or manual doors.

Observations at an exhibition revealed that the vast majority of users who hadn’t been told about the door’s functionality opened it manually, without even noticing that it is actually a powered door. “It is intuitive to use; the passenger can move the door using the handle without noticing any resistance, and can lock the door in just the same way as any normal door,” says Kaiser. “No buttons – which can sometimes be hard to understand – are needed, and there is no delay while waiting for the motor to open or close the door, allowing the user to go through the door immediately.”

Operating the door manually also obviously means no energy is consumed by the motor drive, and also no pressure is exerted on the drive components.

On the other hand, for users with restricted movement, who rely on the help of a powered door, the door also offers a motor function. The drive unit starts instantly at the press of a button and the door opens. After a predetermined time has elapsed (which can be set by the operator), the door closes again automatically, allowing the user to lock the door either manually using a locking knob, or electro-pneumatically by pressing a button.

Satek recommends displaying the standard disabled symbol on the actuating button, so that the button is automatically ignored by most users, while being noticeable for disabled users as relevant to them. The idea is that the powered drive is generally only used by passengers with restricted movement.

In fact the inclusion of the motor means that the door closes automatically, even after being opened manually. The door has a microprocessor controller that enables it to tell if it is not shut properly, and close accordingly. This function also closes the door automatically if the door is moved from its shut position by carriage movement, for example through acceleration, braking or going round a bend. The controller can also be adapted to suit other specific customer requirements.

As always, Satek adopted a modular approach and kept space usage to a minimum when developing this door. It is thus possible, because of the consistent distinction made between the moving, guiding and locking functions, to use the same drive, without requiring any major changes, for different opening widths, radii or movement patterns (curved or straight), sliding in front of the wall or in a pocket.

Satek says other benefits of this approach include easy adjustment, low maintenance costs, rapid replacement, low warehousing costs and the elimination of complex substructures.

“It is possible to produce sanitary cubicles of any kind – standard, universal, urinal or washroom – in next to no time”

ABOVE AND RIGHT: Satek’s production facility

Other projects

The development of this door drive is by no means the only example of the abilities of Satek’s development team. Over the past couple of years, the company has steadily expanded its research and development department, which now has eight full-time employees.

Satek’s core business is the production of toilet cubicles for rail vehicles. As well as customised cubicles to meet specific customer requirements, the company offers a patented modular system, Samo. “Using this system it is possible to produce sanitary cubicles of any kind – standard, universal, urinal or washroom – in next to no time,” says Kaiser.

The company developed the system independently, without a connection to a specific project. It can be used in just about any type of rail vehicle. Samo has already seen use in small and large projects, in carriages such as the Desiro Mainline, double-decker DTZ for SBB, and low-floor Nina carriages for Lötschbergbahn.

Satek also offers a full range of products for sanitary cubicles, including water tank systems with the associated suction and filling boxes designed for integration in the carriage wall; space or water heating systems; electric hand dryers; infrared tap sensors; washbasin systems; odour traps; lightweight walls; wall cladding systems; and the Sambino baby-changing table.

Within the company, Satek believes in the importance of cooperation between departments. For example, the service department and designers cooperate to maximise product safety. The service department has a first-hand view of products in use, as well as their maintenance and service requirements after delivery. This vital information is flowed back into the development and design of new products.

Satek has evolved from being a low-volume producer to being able to handle large projects as well. In the past four years it has supplied WC cubicles for Velaro high-speed trains in China and Russia. Aside from the Sochi contract, other current projects include producing cubicles for the Velaro in Germany; for the Desiro in Belgium; and for NDW low-floor double-deckers.

Satek’s certifications include ISO 9001 for quality management, ISO 14001 for environmental management, DIN 6700-2 for welding and DIN 6701-2 for adhesive bonding.

The future

Flexibility and continuity are two of the values that Satek places the greatest emphasis on – continuity in terms of reliability and quality, and flexibility in terms of customer requests. When it comes to the latter, Satek also tries to engage a degree of forward thinking, to be able to meet these requirements as soon as they arise.

To meet the challenges of the future, Satek is constantly investing. For instance, in 2010 it installed a climatic chamber, where grey cloth for sandwich panel production can be conditioned according to requirements. It also purchased a large CNC machining centre to accelerate throughput, achieve higher precision and ensure shorter reaction times in spite of increasing production volume. To ensure it has enough space to handle increasing production volumes in the long term, the company also recently reached a reservation agreement to potentially take over neighbouring production facilities.

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Local hero

Image: Siemens Transportation, designed by Enthoven Associates

The latest seat from Franz Kiel is designed to bring first-class comfort and aesthetics to buses and trams

Franz Kiel, a leading European manufacturer of passenger seating for buses and railway vehicles, recently launched a new seat that is specially designed for local transport, in particular city buses and trams.

"Its perfectly shaped design makes Esos stand out as a modern, innovative and downright 'first-class' seat," says Josef Vega, director of sales and marketing at Franz Kiel.

The seat is designed to be very functional, comfortable, robust, low in weight and to look attractive. "With Esos we have fulfilled our aim of developing a practical product with an appealing shape for local transport," says Vega. "Passengers who spend a short journey facing a fellow passenger on the bus want to sit comfortably in a pleasant atmosphere. With the Esos seat, this is now possible. Comfortable cushioning, elegant and modern lines and a noticeable ergonomic design provide a pleasant sitting experience even on short journeys."

Franz Kiel says the seat is produced using environmentally sound techniques. It has been

ABOVE: Esos installed in a Siemens tram

Image: Siemens Transportation, designed by Enthoven Associates

ABOVE: Esos is designed for short tram and bus journeys

designed to offer an excellent size-to-weight ratio. Esos can be used for public transport throughout Europe – with a width of 430mm, regulations for buses and trams are strictly adhered to. Esos can also be used by disabled passengers.

The fact that the seat can be used in both buses and trams means that transport operators can use it to achieve a consistent company image.

"Using Esos across operators' bus and tram fleets also yields other advantages, such as a reduction in spare parts stock and simpler servicing," says Vega.

Esos can be configured to offer numerous seating arrangements, for example, as an individual seat, double seat, parent-child seat and double facing seat. "The possibilities are unlimited," says Vega. "This is an advantage that our clients already know from the Ideo seat line."

Mounting parts are available in various colours, adding to the seat's aesthetic advantages. "The seat in fact looks more impressive than normal tram and suburban railway seats," says Vega. "The design of the backrest is particularly refined, providing harmony and balance."

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In full flow

A Portuguese consortium has come up with a railcar seat loaded with material and technological wizardry

In September 2009, a consortium of Portuguese companies initiated Project Iseat, with the aim of developing a seat for long-distance and high-speed trains using integrated, lightweight, comfortable and eco-efficient solutions. The Flow seat is the outcome of that project.

The name 'Flow' reflects the design's flowing lines and feeling of suspension. The seat cushions, armrests and backrest are suspended from the structural elements (central console and column) for a light 'flying carpet' aesthetic. Extending this feeling of lightness, the seat makes extensive use of advanced lightweight materials (composites) to constitute the structural elements that form this support.

Passenger comfort is addressed by features such as set rotation around the central console, which enables the adjustment of the seat in line with travel direction. Accessories include sockets, USB and audio connections, cup holders and a litter bin.

The back panel includes accessories such as an LCD entertainment screen, magazine rack, table, seat numbering, footrest, handle and reading light. The backrest and seat folding system move together to offer a reclined position, while the headrest boasts two folding lateral supports with integrated lighting.

A set of controls in the armrest is assembled under the leather in such a way that all physical contact happens between passenger and leather. The consortium calls this 'Skin2Skin' technology. With Skin2Skin, passengers control all the technological aspects of the seat, for example selecting the audio/video channel or adjusting light intensity, without the ubiquitous plastic interface. Alongside the LCD display, the backrest includes a ticket validation system.

The backrest is made from a carbon fibre and cork (Corecork) composite sandwich panel, which is then covered in leather, employing different textures and punctured holes for strength and to draw away perspiration. The consortium says the leather complies with all relevant industry standards, provides added comfort, durability and ensures a low cost of ownership through low maintenance costs. Corecork is designed to provide weight savings, in addition to comfort and thermal and acoustic insulation.

Project Iseat brought together the expertise of several Portuguese companies – including Caetano Components, part of a large group of bus and coach integrators (Grupo Salvador Caetano); Amorim Cork Composites, a supplier of cork solutions (Corticeira Amorim); Couro Azul, a leading supplier of leather for the transport industry (Carvalhos Group); and INEGI, a research and technology organisation with expertise in the development, design and prototyping of composite materials and structures.

The consortium worked with Alstom and Almadesign, a leading industrial design company, for technical and marketing consultancy. Nibble, an electronic systems specialist, provided input for lighting, interfaces and infotainment; while CIN, an Iberian company specialising in the production and marketing of paints and varnishes, provided the skills required for painting and finishing. The project also had the support of the Portuguese National Association for the Advancement of Railway Industry (PRIA).

Iseat was funded by approximately €900,000 (£779,630) from the Portuguese National Strategic Framework Programme under the Operational Programme for Competitiveness Factors and European Regional Development Fund.

ABOVE AND BELOW: The Flow seat, designed for long-distance and high-speed routes

Stick fast

Road congestion and environmental concerns have given an unexpected boost to the railway network, especially high-speed rail. “Currently the high-speed network is over 17,000km, another 18,600km is under construction, and a further huge expansion is planned for the USA,” says Dale Buckley, R&D director at Forgeway. “This need for speed has meant a concerted drive to lightweight structures, with a lot of technology being ‘borrowed’ from the aerospace sector.”

Buckley believes the introduction of composite structures has resulted in an increase of bonding with specialised structural adhesives designed to withstand the stresses and vibrations experienced in high-speed trains. He notes that safety standards have also increased significantly at the same time.

Purok and Forbond adhesives from Forgeway were recently specified on a major interior project in Europe for structural doors and galley structures. The honeycomb panels were manufactured using a two-component epoxy adhesive and the edges were filled with Aerok void filler, designed to comply with the stringent standards.

Purok VX adhesives were used for bonding the inserts into the honeycomb panels, which provided the mechanical fastening points. The decorative laminate was bonded using Forbond 2K epoxy adhesive, which is designed to meet not only the fire requirements, but also the durability required in wet zones. Similarly, the air-conditioning ducts were manufactured using Forbond epoxy adhesives.

Young at heart

Imagine yourself reclining in a comfortable seat on the upper floor of a double-decker train, soothed into a half-hearted nap by the hypnotic repetitive sound of the train wheels passing the rail joints. Time passes, and a strange new sound penetrates your consciousness. ‘This can’t be right’, you think to yourself, and open your eyes only to find yourself in the middle of a playground, children whooping as they go down the slide, scale the castle wall and solve puzzles!

The wrong car for a business traveller, perhaps, but a potential lifesaver for those taking the kids to see grandma. Finnish operator VR employs children’s play areas as the centrepiece of its family-friendly travel concept, with 10 installed sets in the latest batch of its double-decker coaches. For the manufacturer, Rica Seats, this solution is an expansion into the interiors market after a long history of making passenger seats.

With the total number of play areas in operation passing the 50 mark, with installations in earlier double-deckers as well as Alstom’s Helsinki-St Petersburg Pendolinos, the idea of a playground within the train appears to be gaining popularity with operators.

Back on track

Fresh from delivering a number of high-profile and award-winning transport interior designs for some of the world's biggest airlines, James Park Associates (JPA) is re-establishing itself in the railway interior design sector.

"In its 30-year history, JPA has built up impressive credentials in the design of transport interiors," says managing director, James Park. "We started out specialising in the design of railway interiors and our first project was the design and refurbishment of the Venice-Simplon Orient Express. We went on to work with the Orient Express on six other luxury train projects, including the Eastern & Oriental Express and The Royal Scotsman."

Following this work, JPA was appointed as the design team on Project Mallard for the GNER Mk. IV IC225 fleet refurbishment and has developed conceptual designs for India Rail (pictured) and high-speed trains.

"JPA has a strong design pedigree and a proven track record in the delivery of high-quality design projects for the rail sector," says Park. "We are able to take on every phase in the project, including research, concept design, branding, design development and engineering. We also cover materials sourcing, testing and specifying; build mock-ups (from small-scale to large-scale models); and provide project management from the beginning to the project end."

Other work by JPA includes Cathay Pacific's new business-class seat; the award-winning business-class seat for Singapore Airlines' A380; interiors for The Pierre hotel in New York; and airport lounges for Gulf Air and Oman Air.

INSIDE TRACK

Dr Joe Carruthers, manager of the Vehicles Group at Newcastle University's railway research centre (NewRail), examines the application and development of composite materials

Mention composite materials and most people will probably think of racing cars, tennis rackets or golf clubs. In terms of transport, they'll most likely reference aircraft or maybe boats. But composites are also routinely employed in rail vehicles. Indeed, they've been used in trains for more than 50 years, albeit for a limited range of application areas. One such area is rail vehicle interiors, and in this article I will examine some of the issues surrounding the specification of composites for train carriage interiors and highlight several recent developments from a materials engineering perspective.

What is a composite material?

Let's start by defining what we mean by a composite material. In the broadest sense it is any material that combines two or more physically different constituents, each of which largely retains its original structure and identity. So concrete, which consists of a mixture of aggregate and cement, can be considered a composite, as can wood, which is a natural composite of cellulose fibres bound together with lignin.

Modern engineered composites include specialist materials based on reinforced metal or ceramic matrices. But one of the most common types of composite material is the fibre-reinforced polymer (FRP). FRPs typically consist of carbon, glass or aramid fibres within a polymer matrix resin such as epoxy, polyester or phenolic. By varying the material combinations, and the proportion and physical characteristics of the reinforcing fibres, it is possible to engineer parts with a very wide range of properties – from ultra-high performance structural FRPs to affordable decorative fibreglass mouldings with relatively low stiffness and strength.

Advantages

So, why might you be interested in using composites for railcar interiors? Well, in all likelihood it will be for one of two reasons. The first is that, because composites are moulded parts, it is relatively easy to produce components with complex shapes. If the interior dictates that a panel should have a certain curvature or profile, then it is often more affordable and reliable to mould this from composite materials than it would be to fabricate it from metal.

The second reason for using composites in train interiors is lightweighting. With careful material selection and design, it is possible to produce FRP parts that have a higher stiffness per unit mass than their metallic equivalents, thereby allowing lighter parts to be produced.

For example, a lightweight material selection exercise conducted by NewRail in partnership with Alstom, Bombardier and Siemens led to the development of a lightweight grab rail for a metro vehicle. The carbon fibre-reinforced polymer solution is less than half the weight of the stainless steel grab rail that it replaced, but no more costly to produce.

Challenges

Although composite materials can provide some real product benefits, they also bring some additional challenges. Their high degree of flexibility can be something of a double-edged sword in that it requires designers to manage an increased number of design variables. Furthermore, for high-performance structural parts that would necessitate the use of carbon fibre-reinforced polymer composites, cost remains a barrier for many rail vehicle applications.

Another acknowledged weakness of polymer-based composites is their relatively poor fire performance. This is because of the organic matrix resins, which first soften on heating, causing a loss of mechanical properties and then, at higher temperatures, decompose to produce heat, smoke and toxic gases. While it is possible to modify composite matrix resins to improve their fire performance, or to use resins with inherently good fire properties, fire-retardant composites are often compromised in some other respects such as mechanical performance, weight or surface finish.

NewRail is currently leading a European consortium, Fire-Resist, which is working to develop new composite materials that are less compromised in such respects.

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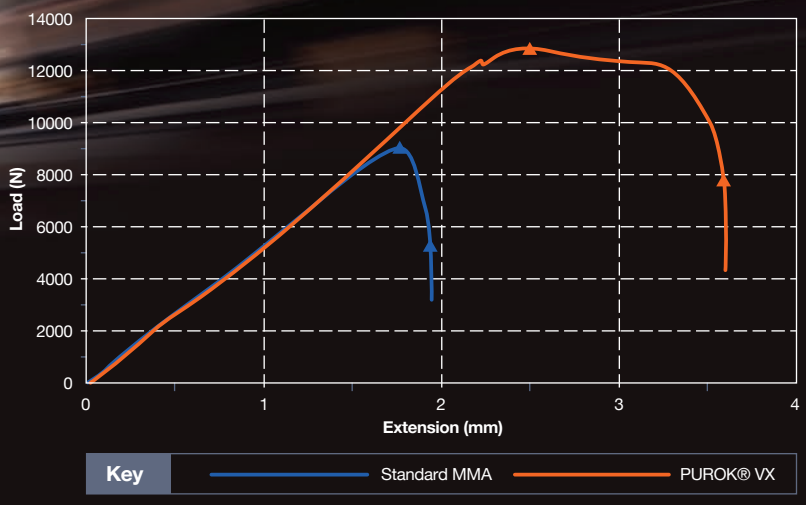
MMA Comparison with PUROK® VX Range



Purok VM series are blended with flexible adhesive technologies to give an elastic medium strength bond or seal.

Used in vehicle manufacture where a tenacious flexible bond is required to allow movement and absorption of stress and strain.

Purok VX series are based on hybrid methacrylate technology offering excellent adhesion, flexibility, high temperature and chemical resistance with fast cure times suiting many applications in product assembly.

Purok VO series are based on polyurethane–oxirane technology and offer high levels of adhesion, minimal exotherm and no shrinkage on cure. Widely used for bonding SMC and RTM parts in automotive and transportation applications.

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NEW
Door system
samove

satek – performance and experience

Sanitary cabins

Standard WC

Wheelchair-passable WC
(UIC and TSI conform)

Door system “samove”

Manually and automatically use at same time without any restrictions or loss of comfort

Muscular strength or engine power move the door

User decides whether he wants to lock the door manually or automatically

Individual customer and project requirements can be met by using a micro-processor controller

satek gmbh

Diaper changing table “sambino”

- Intelligent maintenance-free and easy-care design
- Solid construction allows loading up to 90 kg
- Protection against vandalism due to using of resistant materials
- Two possible ways of installation, on and in the wall

Washbasins

- Fire protection requirements are met
- Production in any shape
- Countertop as flat plate or with elevated edge

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