

Foam comforts

North American railway authorities have discovered that there are comfort, longevity and environmental benefits in using silicone seating

The current North American railway industry trend for long-lasting, high-performance rail carriage seat cushioning offers a list of case studies that provide valuable information for transit authorities worldwide. This is becoming increasingly important as the rail industry continues to emerge as one of the leading drivers for sustainability and urban reorganisation worldwide.

There are many options available for seating designs and their comfort-providing characteristics, and the seating industry is committed to integrating the most advanced ergonomic data and studies into seat designs in order to ensure a comfortable and safe transit for the passenger. Transit authorities, rail car OEMs and seating manufacturers work together to determine the best seating option for each project. There are a number of considerations, including cost, comfort and safety, and in terms of the materials chosen to make the cushions, upholstery and the actual seating structure, manufacturers must ensure they conform to fire, smoke and toxicity standards.

As more funding becomes available from both federal and local agencies, the largest transit networks in North America are preparing for either expansion, refurbishment or upgrading work. With all these types of work, passenger seating ranks as a high priority and keeping cost, comfort and safety requirements within budget is a significant challenge.

Cost-benefit analysis

For many North American projects, studies of seating options have been carried out to address the impact of a cost-benefit analysis in comparison to long-lasting comfort performance and sustainability initiatives. As a result, transit authorities incorporating light rail systems in New York, Seattle, Vancouver, San Francisco, Washington DC, Los Angeles, Philadelphia and Chicago have

RIGHT:
Interior view
of the Seattle
Sound Transit
railcar



specified open cell silicone foam materials for either the seating cushion or the seating cushion and seat back combined.

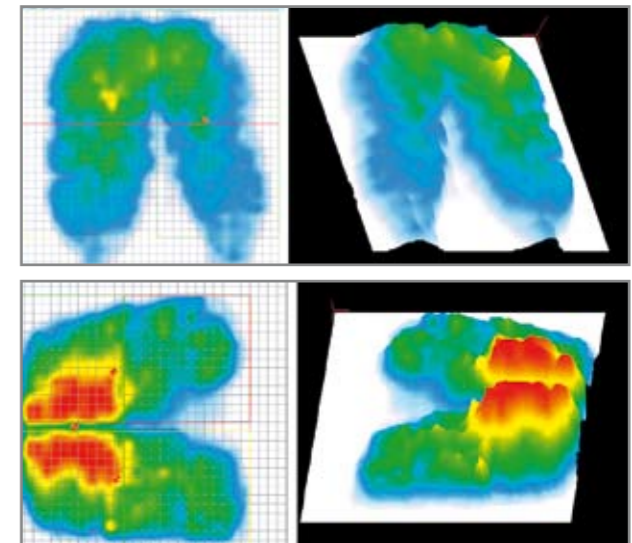
The cost-benefit analysis compares the price of silicone material to competitive polyurethane solutions, and compares the materials' performance over a specific length of time. For example, it was determined that a fire-retardant polyurethane foam seating solution would require refurbishment after three to five years of service. An open cell silicone foam, such as BISCO MF-1, which has a 10-year warranty and will not degrade by more than 10%, guarantees that intended Day-1 comfort pressure mapping performance will be minimally compromised over thousands and thousands of cycles. Pressure mapping is a scientific and objective measure of how the weight of the body is distributed over the seat cushion

and back rest in various seating positions. A good pressure map is one in which the colour code is a blue and green pattern throughout, which indicates that the weight of the body is evenly distributed. A bad pressure map is one with spots of yellow and red. Red shows an area of the cushion that is supporting significantly more weight than other parts of the cushion.

Silicone foams

The properties of silicone mean the foam structure distributes the load or weight of the body evenly across the surface of the seat pad. Compressing silicone foam is unlike other materials – the best way to describe its behaviour is to imagine the thickness (or cross-section) of the pad in a matrix of cell layers. As a load is placed upon the pad, the layers of cells transfer

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“Comfort, cost-benefit, sustainability, longevity and safety are the key considerations for a silicone seat pad”



the weight layer after layer. This seemingly systematic compression mode prevents the cushion from having a ‘hot spot’ or a red pressure map discomfort area. A second advantage of silicone is its longevity. The deterioration of silicone is much slower than that of polyurethane, especially in ideal temperature and environmental conditions, so it will offer evenly distributed weight (blue and green results) for many years.

New York’s Metropolitan Transit Authority, which includes the Long Island Railroad and Metro North commuter service lines, used this longevity of comfort as one of the key variables applicable to a cost-benefit analysis. The indisputable data led to the implementation of BISCO MF-1 silicone foam seats for the largest US train building programme in history between 2001 and 2003. Similar evaluations at SEPTA, BART, MARC, Chicago Metra, SCRRA, and WMATA resulted in the same conclusions and specifications.

Refurbishment project

Cost-benefit analysis was taken even further when Seattle’s Sound Transit carried out a study recently. BISCO MF-1 foam was specified not only for the seat cushions, but also for the seat backs for the entire Sound Transit fleet refurbishment project during 2010. Due to the longevity of the silicone, Sound Transit was able to estimate the volume of material that would not be sent to landfill by changing the material specification from polyurethane to silicone. The sustainability metric was calculated using the life of a typical polyurethane (PU) seat. PU seats require refurbishment after as little as three years’ service, although in reality, they are often left in service for longer than this due to limitations in maintenance budgets. A typical refurbishment project of 50 car sets, for example, could result in more than 400,000kg of material going to landfill. Should a transit authority have the funds and capabilities to carry

ABOVE: The New York Metro is fitted with silicon foam seats

out a refurbishment when the PU pads need replacing, the volume of material would be doubled or tripled over a 10-year period. A final factor to be taken into account is the material’s conformance to requirements for flame spread, smoke density and gas emission toxicity, and using silicone allows the foam seats to meet the most stringent standards in the world.

Comfort, cost-benefit, sustainability, longevity and safety are the key considerations for a silicone seat pad. As with any rail car feature, transit authorities around the world will have different preferences and priorities, but the fact is that the largest train networks in the United States have now specified silicone foam cushions for their new builds and refurbishments.

Rogers Corporation is globally positioned to collaborate with transit authorities and seating manufacturers to determine the best silicone foam designs for any project and case studies from the United States and Canada are an excellent starting point for guidance. Nonetheless, Rogers approaches markets in Europe and Asia with the same understanding of the differences between seating designs. The value of silicone remains the same – it is how the material is used in the design process to meet cost, manufacture and safety requirements that becomes the priority and these issues are now being evaluated by transit authorities and seat manufacturers throughout Europe and Asia. ☒