In the driving seat

As seat fabrics and foam wear down, they can become less comfortable and lose their aesthetic appeal. *ATTI* spoke with leading suppliers about their seat comfort and durability test programs

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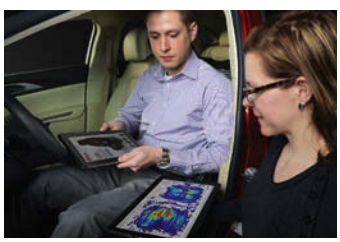
Tough times

Occupants repeatedly climbing in and out of a vehicle is one of the biggest causes of wear and tear. Robots are widely adopted across the industry to simulate the range of possible occupants and their motion patterns when climbing in and out of various vehicles. However, suppliers have had to fine-tune their egress-ingress test processes in order to replicate the real world more closely. David Kazyak, VP of engineering at seating specialist Lear, explains: "A tall person will fall into the seat of a vehicle with a low profile; a short person will slide off the seat of a high-profile vehicle when getting out; a short, stout person will be very hard on the bolster of a high-profile seat."

For that reason, Lear uses a patented process designed to measure how its target audience climbs in and out of a vehicle. "We measure a representative sample of individuals getting into and out of the vehicle and record the pressure profiles they put on the seat. Then a path is developed from that mapped population and we use a multi-axis robot to reproduce that profile for as many cycles as we choose. The robot (main picture) will adjust its path as the seat wears every cycle. We use a standard butt form but the path will change per vehicle."



ABOVE: The pressure maps at Lear have a frequency response of >40Hz
INSET: Lear's mini-recliner mechanism

Achieving an objective measure for vehicle seat comfort is more difficult. At Lear, different comfort profiles represent different regions. "Certainly North America and Europe are our most developed, but we've also developed profiles for India and China," says Kazyak. "So when we go through the evaluation phase, whether it's for transmissibility, road conditions, the seatback profile or the width and support of the different areas of the seat, we make sure that all the profiles feed into the comfort process.

"We also have target comfort individuals in our organization that we use in the assessment. However more of the development is moving toward software and mannequins as opposed to individual humans, because there's too much subjectivity. Differences in how the individual feels each day will give us different readings, and we want to get consistency."

Thinking outside the box

Standardized use and durability tests, however, can't cover every scenario. So during development, engineers at Magna – a seating component and system supplier – subject seats to random abuse based on what customers might do while in the vehicle: "We'll put a set of seats in a vehicle and do everything to them that we can imagine customers doing," explains product engineering specialist Ron Zimmerman. "Without any tools we will do things to it – pull on the side shields, push cargo into the back, pull on the handle. We can then try and mitigate damage by altering the design to reduce warranty claims."

The egress-ingress test process has also been improved to achieve more accurate results: "In the past, OEMs have given us a robot path, but we often found that it didn't represent the real world of people getting in and out. So we totally revamped the robot process for this particular test.

"We get 10 occupants of different sizes and we video them getting in and out of the car. At the same time we have our pressure mat on the surface of the seat. Then, using those videos and the pressure map, we can develop a profile for the body form that represents the real world. It's given us much better data on the wear characteristics of the trim and the seat," Zimmerman reports.

Meanwhile for comfort, a bio science group specializing in the biometrics of the human body helps the product development teams at Magna to adjust the firmness and contour of a seat based on pressure profiles: "They know where to have high pressure and low pressure, and where to distribute it into the seat," he says.

"Using a Tekscan system, we take a pressure profile and use our proprietary Magna map to interpret that data and compare it with our ideal pressure profile."

That provides a basis for the subjective evaluation, which is done as well. "Hopefully then there is some correlation and if needed, that would give us good information to go and change the pressure map."

TOP: Setting up a pressure map at Magna
ABOVE: Automated ingress-egress testing