Advance Automotive Seating Designs for Increased Comfort and Functionality

Consumers today are spending more and more time in their vehicles. Not only does this represent an increased expenditure in fuel, it also means consumers have much higher expectations for the level of comfort they experience while in their vehicles, whether they're driving or just along for the ride. Additionally, consumers are more sensitive to environmental issues like climate change and toxicity, and are therefore looking for vehicles that are built with lower-impact materials, greater fuel efficiency, and a healthier interior environment.

These concerns, along with a drive toward lightweight automotive seating components for greater fuel efficiency, have resulted in many innovative upgrades to conventional vehicle seat designs. The automotive industry is responding to consumer demands and environmental concerns with some incredibly creative solutions through advanced research into materials that provide greater thermal comfort and orthopedic support.

Science and Ingenuity Makes for Big Innovations in Vehicle Seat Comfort

Drivers are spending increasing amounts of time in their vehicles, which has sent the demand for serious comfort through the roof in recent decades. The industry is responding with some extremely interesting technologies that are both eco-friendly and substantially more comfortable so that consumer expectations are met on a number of fronts.

Let's look, for instance, at what Nissan is doing with their fatigue-free research with queues from NASA. By testing how the human body moves in a weightless environment, NASA has shown that we humans use lots of muscles to just keep ourselves in the seated position, which can lead to fatigue. In fact, the research shows that conventional seats actually force us into unnatural positions, require more energy and muscle fatigue than should be necessary.

Running with this idea, Nissan has been working with Yamazaki Laboratory at Keio University on a new seating technology that will allow drivers and passengers to be

cradled much more comfortably while on the road. They call it The Neutral Posture Concept seat.

Their seating design will attempt to reproduce the feeling of being in a zero-gravity environment by supporting the chest, pelvis, and lumbar. The seat will have an articulated seat back that supports the chest and pelvis in order to obtain as natural a sitting posture as possible to reduce strain on muscles and joints in the lumbar area and the pelvis. The pressure load will be more evenly distributed in this chair across the chest, lumbar area, and pelvis for a more comfortable feeling.

The seat will be made with cushions that help to limit pressure points based on the varying physiques of those sitting in the seats. As a result, their Neutral Posture Concept seats should be adaptable to any weight and body type, allowing any number of passengers to enjoy the benefits of their seating technology.

Early tests of the seats have shown that individuals are able to expend less energy over longer periods of time in the act of sitting for increased comfort and lower fatigue. In fact, when comparing muscular activity of conventional seats with the Neutral Posture Concept seat, Nissan has found a drop in muscular activity of almost half and a significant reduction in lumbar fatigue as well. Although these designs are still in the works, Nissan hopes that they will one day be used in all of their vehicles.[i]

Johnson Controls ComfortThin Seats

Johnson Controls has also been on the leading edge of automotive seating design when it comes to comfort. They've recently developed automotive seat foam products and head restraints that combine ergonomics, biometrics, thermal comfort, vibration, and pressure mapping to create the most balanced, comfortable seating with foam. These principles can be seen in several of their automotive seating options.

Their enhanced ComfortThin Seats are one example. Created to be 20% thinner than conventional foam seats, these designs are purportedly just as comfortable as

conventional seats. This seat design has a mat containing more than 100 small coil springs rather than a molded foam and suspension structure. Much like a mattress, the coils are supposed to respond to movement of the occupant individually to provide ultimate comfort.[ii] The ComfortThin Seat was recently honoured with the OkoGlobe 2012 global leader in automotive seating and seating components award.[iii]

The smart forvision has also made significant advances in comfortable seating technology with their e-textiles. Recognizing that a large part of comfort for driver and passengers is temperature control, these e-textiles are thin fabrics with custom-tailored conductive coatings. These textiles replace conventional seat heating systems, and allow direct heating close to the body in the lower and middle back areas for an increased feeling of warmth. These e-textiles are also weight-saving which means a smaller seat profile and greater vehicle fuel efficiency. [iv]

Comment [A.U.1]: Is this a title?

Comment [mbp2]: Yes, this is how they format their vehicle name: http://www.smartforvision.basf.com/

The addition of superabsorbent Luquafleece Humidity control fleece fabric adds to the comfort of smart forvision's seats through passive climate control.[v] They are finished with a Steron breathable design surface for even greater thermal comfort.[vi]

Manufacturers are also thinking about comfort for backseat passengers. Many, including Faurecia, have developed back seat designs that have multiple points of adjustment, including backrest tilt positions previously seen only for front seat passengers which can be seen in the Renault Grand Scenic. [vii]

Again, Johnson Controls has made some developments in this space as well with their Slim Stow seat which can be installed in pick-up trucks for more comfortable rear seating. This design is created with 50% less foam and weighs 33% less than a regular back seat, but again, is supposed to be extremely comfortable, especially compared to conventional back seats in pick-up trucks. Not only does the slim profile offer weight savings, it provides greater space in the rear seating area for even more comfort for the occupants.[viii]

Another innovative comfort feature offered for rear seat passengers is Faurecia's raised rear seats seen in the Volkswagen-Skoda Yeti. Each subsequent row of seats in the vehicle is raised two centimetres higher than the front seats which allows rear seated people to see a clearer view of the road. These seats can all be adjusted and configured for a total of 20 different layouts.[ix]

Many companies are also exploring innovative ways to create more flexible seating designs. Take Johnson Controls, for instance. They have created multiple points of adjustments on their second and third row seating designs for compact utility vehicles and minivans that allow for increased functionality of the back seating areas. Perhaps most interesting is the ability to fold both the second and third rows flat and an extra layer of sheething to provide a complete flat load floor for easy storage of boxes and other items. This innovating seating design, which was designed for Ford, earned Johnson Controls the Henry Ford Technology Award in 2010.[x]

With better weight distribution, superior thermal comfort, more legroom, and an increase in features for rear passengers as well, vehicles of the future certainly will feel more like living rooms than vehicles.

Sustainable Materials for Tomorrow's Automotive Seating

Yet even more innovations are being seen in sustainable materials used for vehicle seating. These materials should not only be better for the planet, but also healthier for the passengers of the vehicles in which they are used.

Johnson Controls has created several sustainable solutions for their seating designs. Their soy-based foam called RenuTec is created using soy, palm, castor, and natural polyols, making it very renewable. It also reduces overall CO2 emissions during the production phase and is recyclable at the end of life.

Their FaserTec is another solution, which is a coconut fiber-based seating material that is bonded in a matrix of natural latex or chloroprene with non-woven materials. This is a lightweight material and offers a slimmer profile compared to conventional materials.

Another of the leaders in the innovative textile space is Lear with their ECO fabrics. Working on several fronts to develop new warp knitting technologies, quality testing, weft/circular knitting technology, and weaving or non-woven technologies, Lear has developed beautiful yet functional fabrics that offer better performance as well. In particular, their ECO Fabrics are made with 100% recycled content, which earns them green points from customers and manufacturers alike.[xi]

Creativity in the Seat Design Development Process Means Even More Innovation

While most of these vehicle seating innovators look to their labs to create their new designs, some are seeking unconventional design process routes to develop the next big thing in automotive seating. For instance, BASF recently announced the launch of their "Sit down. Move." global competition for car seats that will encourage international inventors and scientists to come up with a new seating design that emphasizes comfort using BASF materials. The deadline for submission is January 20, 2013 and there will be three winners who will be announced at the Design Night of the Geneva International Motor Show in March of 2013. It's a unique and interesting way to spur innovation in this space.[xii]

BASF sit down. move. global competition for seating design

These types of interesting development processes, along with various partnerships among materials and vehicle manufacturers will surely spur the growth in innovative automotive seating design in the years to come.

Maryruth Belsey Priebe

A student of all things green, Maryruth has a special interest in cleantech and green buildings. In recent years, Maryruth has worked as the senior editor of The Green Economy magazine, is a regular blogger for several green business ventures, and has contributed to the editorial content of not one, but two eco-living websites: www.ecolife.com and www.GreenYour.com. You can learn more about Maryruth's work by visiting her site, www.jadecreative.com.

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