Benefits of Semi Active and Active Suspension Seat Technologies for Commercial Drivers

SEAT SUSPENSION TECHNOLOGY

Commercial truck and bus drivers spend many hours sitting throughout the workday, sometimes sitting between 8 to 10 hours per day across 40 to 60 hours per week. Low back pain is one of the most commonly reported health conditions by professional drivers, which has been linked to exposures to whole-body vibrations (WBV) while driving on the job (Johnson et al., 2019, Johnson et al., 2018; Johnson et al., 2012).

For many decades, the industry standard for commercial driver seats has utilized passive air suspension (air-ride) systems. In recent years, new technologies in active suspension and semi-active suspension seats have become available in the market and have been found to help reduce the harmful impacts of WBV (Kim et al., 2016; Johnson et al., 2018).

It is time for employers and owner-operators to consider switching to new seat technologies.

Active and semi-active suspension seat technologies have sensors that can detect seat and/or cab motion and help dampen vibrations transmitted to vehicle operators. Active suspension seats have electromagnetic motors that can adjust the position of the seat, as well as minimize and counteract unwanted motion using a state-of-the-art, built-in microcomputer. The industry standard passive air-ride seats do not have sensors but include mechanical parts such as shock absorbers and air-springs that do not efficiently reduce the lower and intermediate frequencies of WBV that can help improve vehicle operator comfort and health (Johnson et al., 2019, Blood et al., 2011; Kim et al., 2018; Heidarian et al., 2019; Dennerlein et al., 2022).

Researchers have found that vertical vibrations at lower frequencies (0.5 - 4.0 Hz) can influence the comfort, safety, and ride of a driver and intermediate frequencies (4.0 - 12 Hz) can influence the drivers' health, and most prominently, help alleviate low back pain. Active and semi-active seat technology systems are seen to be more efficient to isolate and reduce lower and intermediate frequency WBV versus a passive air-ride seat (Heidarian et al., 2019).

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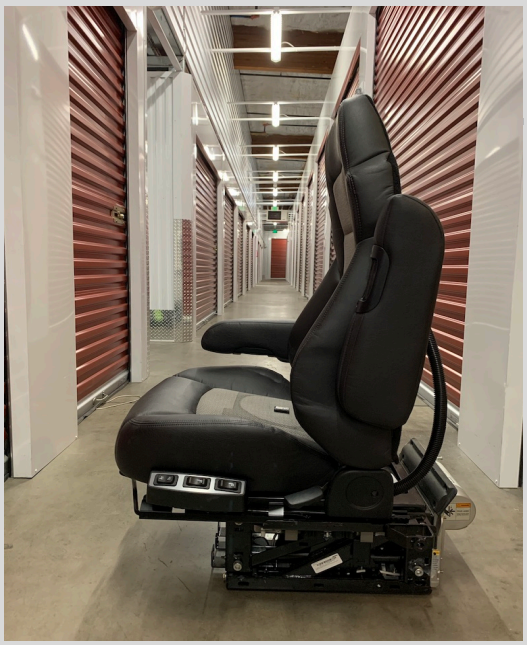
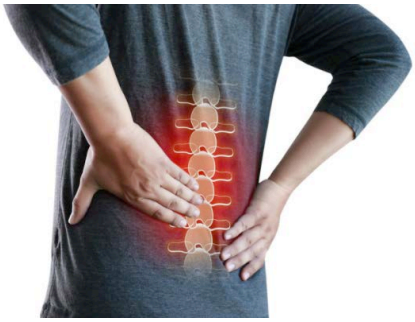
Seat technology research to help reduce whole-body vibrations, improve safety, health, and well-being for commercial truck drivers and bus operators. A photo of an active suspension seat is shown below.





THE RESEARCH

Research at the University of Washington conducted a study on long-haul truck drivers and Whole Body Vibrations (WBV) exposures. The study results showed that an active suspension seat reduced WBV by 50% compared to industry-standard, passive, air suspension seats which only reduced the WBV by 21%. In another study, drivers using active suspension seats self-reported a decrease in low back pain by 25% compared to a much smaller decrease in drivers that received new air suspension seats. Research has found that the industry-standard passive air suspension seats produced higher WBV exposures.

Studies have shown higher levels of WBV exposures to negatively affect the alertness of drivers and can contribute to cognitive fatigue (DEOHS, 2016; Johnson et al., 2018; Wang et al., 2018).

CONSIDERATIONS OF ACTIVE SUSPENSION & SEMI ACTIVE SEAT TECHNOLOGY FOR FLEET OWNERS

Benefits of upgrading to a semi-active and active suspension seats can reduce WBV by up to 45% compared to a passive air-ride seat system.

Other potential benefits include:

- Decrease in musculoskeletal disorders, such as low back pain
- Reduction in back injuries
- Reduction in fatigue while driving
- Improvements in alertness on the road

Things to consider before fleet owners or commercial organizations switch or upgrade to active or semi-active suspension seats.

- Active suspension seat technology can be expensive to purchase, averaging 2 to 6 times more in cost per seat, and this doesn't include installation costs.
- Would this investment help retain drivers longer?
- Would this benefit older drivers and extend their careers?
- How would this extra investment compare to low back injury costs for drivers?
- If your company regularly purchases new vehicles, does the original equipment manufacturer offer these seats as an option?

WHAT DRIVERS ARE SAYING ABOUT THE SEAT TECHNOLOGY?

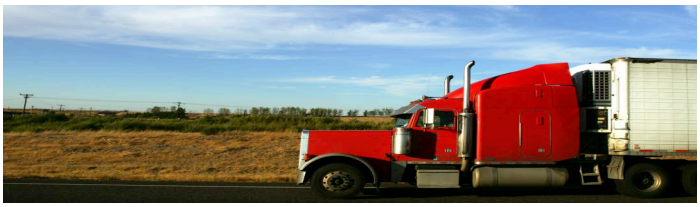
"Using this seat was amazing from the start... it made me feel energized and ready to keep driving."

"With the seat, what you guys provide, it's comfortable. It's a little more couching and you don't feel the truck vibration or jumping that too much. You feel like more comfort. It's way better. It's definitely way better."

"...It's good and smooth. Felt like I was riding a boat versus bouncing down the road. Made it more fluid."

"But as far as when using it though, it was amazing from the start. We were fighting over it like a couple kids over a new bike. Honestly, it was like I drive my shift and he would drive his and he's like all right I'm ready. I'm like I'm still driving man. And so it was nice to have that experience where before, we go 4,500 miles and the next couple hundred miles you're plugging through ...energetic and ready to keep going."

**Quotes from Anonymous participants in the Tech4Rest study*



WHAT SEAT TECHNOLOGY OPTIONS ARE AVAILABLE IN THE MARKET?

Our research institute is not promoting any one manufacturer. We have provided some current options for active and semi-active suspension seats.

- Sears Seating
- Clear Motion
- United Safety & Survivability Corp. (USSC)

FUTURE STUDIES? WHAT'S NEXT?

Oregon Healthy Workforce Center will have additional research and data available on the seat technology in 2022 with an additional engineering control in place, a therapeutic mattress, as well as a *Total Worker Health®* educational component in place through the Tech4Rest study.

Learn more about Tech4Rest
YourWorkpath.com/tech4rest

Funding for Tech4Rest was provided by the National Institute for Occupational Safety and Health (NIOSH; Grant: NIOSHU190H010154)