

## UNDERSTANDING TRAILER AIR SUSPENSION SYSTEMS

According to a recent independent industry survey, over 70% of fleets in the U.S. have specified air suspensions for one or more of their commercial trailers.

The potential perks of switching from spring suspensions to air suspensions vary by fleet operation and individual.

### Fleet Managers

- ✓ Reduced maintenance costs
- ✓ Higher resale value
- ✓ Enhanced tire life
- ✓ Improved fuel economy



### Shippers

- ✓ Better cargo protection



### Drivers

- ✓ Flexibility to haul a wide variety of freight
- ✓ Ride quality



### Ride Quality

Ride quality can be viewed as the degree of isolation the suspension provides the vehicle from road inputs without compromising vehicle control. Minimizing the road forces and vibration reflects how well the suspension helps isolate or protect a trailer from potential damage. If a suspension has a lower natural frequency, it reduces the forces transmitted to the trailer thus improving the ride quality. Air suspensions in general can achieve very low natural frequencies.

The growth of air suspensions in the market over the years is largely due to their ability to reduce shock and vibrations transmitted to the trailer from the wheels and road. Air suspension geometry and air spring design work together to produce natural frequencies generally below 1.5 Hz. A typical spring suspension will have natural frequencies that range between 2 Hz and 5 Hz, depending on the payload and other factors.

A typical air suspension changes its spring rate to match the load it supports; a spring suspension does not. Thus, air suspensions can deliver benefits that spring suspensions cannot offer. First, when the spring rate changes with the load, the natural frequency of an air suspension generally remains at a constant, low level resulting in consistent cargo protection regardless of payload. Second, the trailer deck height does not change as the trailer load changes, allowing the suspension up travel to remain the same. This is important when trying to maintain required isolation levels for suspensions with low natural frequencies.

### The potential perks of a better ride are:

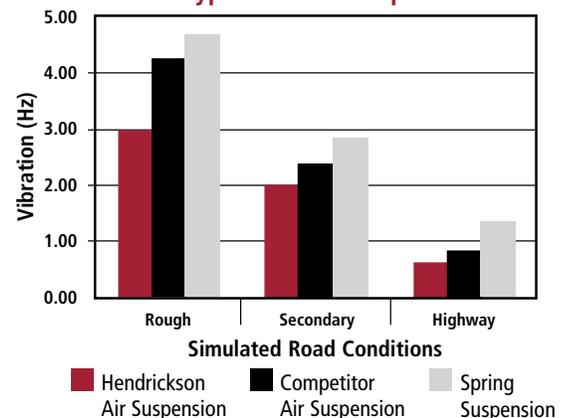
Reduced maintenance costs, higher resale value, improved cargo protection and flexibility to haul a wide variety of freight.

### Not All Air Suspension Systems Are Equal

Just because a trailer is equipped with an air suspension doesn't mean it always delivers a smooth ride. The levels of ride quality and vehicle control provided by a suspension are largely dependent upon the design of the suspension as an integrated system. The suspension system must work together with the trailer in its application to give optimum system performance.

Hendrickson air suspensions are designed to achieve optimum suspension performance. Hendrickson does this by designing a complete series of integrated suspensions systems to meet various trailer applications.

Average Vibration Levels - Typical Trailer Suspensions



Above data is based upon internal testing and/or published studies and specifications. Actual product specifications and performance may vary depending upon suspension and vehicle configuration, operation, service and other factors.

## Hendrickson Advantage

The growth of air suspensions in the market has led to new advancements in the industry such as system integration. Hendrickson led this charge with the introduction of INTRAAX®, the revolutionary integrated trailer air suspension system that combined the suspension, axle and brakes all into one seamless system.

The core of our suspension system performance is in the details with the development of INTRAAX, VANTRAAX® and our other integrated trailer air suspension system lineups. Suspension geometry, travel, load capacity, suspension spring rate and damping levels are all interdependent characteristics that must be considered when developing an integrated suspension design. No single element alone can determine ride quality.

The main design feature of Hendrickson integrated suspension systems is the axle, which features an advanced axle wrap design and window weld for optimal structural integrity.

Hendrickson air suspensions resist trailer roll by utilizing the axle in a manner similar to a torsion bar on a spring suspension. The axle tube provides the necessary trailer roll resistance that is equal to or greater than what can be provided by spring suspensions. This allows Hendrickson air suspensions to have roll stability characteristics similar to spring suspensions while providing a ride that is significantly superior to a spring suspension.

Hendrickson air springs are designed to accommodate specific load capacities and to provide a spring rate and air spring height that match the suspension travel requirements. Hendrickson shock absorbers meet specific targets for damping levels based on suspension geometry, application and actual fleet experience.

Hendrickson's standard Cam Tube System™ enhances S-cam alignment and helps extend brake component life. The shorter S-cam helps to eliminate windup and reduce bushing wear.

The latest in Hendrickson's advancements is ZMD® ZERO MAINTENANCE DAMPING® ride technology. This revolutionary new approach provides an alternative solution for reduced maintenance and improved ride quality by eliminating the need for an external damping component, such as a shock absorber, without sacrificing any of the benefits discussed above.



## Smart Spec'ing Tips

### Tip 1: Look for a suspension brand with a good reputation

As a market leader in the trailer segment, Hendrickson builds its reputation on air suspension system excellence.

### Tip 2: Select a product with a good performance record in the field

Hendrickson offers excellent technical support and extensive warranties, such as a 7-year warranty on the TRI-FUNCTIONAL® Bushings and a 10-year warranty on the integrated trailing arm-to-axle connection\*.

### Tip 3: Look for systems that provide minimal maintenance requirements

Hendrickson suspensions are designed with very few wear items to minimize maintenance. Unlike most other suspension brands, Hendrickson suspensions have minimal re-torque requirements. In general, a simple visual inspection is all that is needed as part of a routine maintenance check.

### Tip 4: Always consider the application requirements when spec'ing a suspension system

Hendrickson suspension systems are rigorously tested in our state-of-the-art research and development facility to support a variety of application requirements.

**Note:** For additional information and spec'ing tips refer to L761 Understanding Trailer Air Suspensions.

\*Contact Hendrickson for complete warranty terms, conditions and limitations.

*Actual product performance may vary depending upon vehicle configuration, operation, service and other factors.*

*All applications must comply with applicable Hendrickson specifications and must be approved by the respective vehicle manufacturer with the vehicle in its original, as-built configuration. Contact Hendrickson for additional details regarding specifications, applications, capacities, and operation, service and maintenance instructions.*

Call Hendrickson at **330.489.0045** or **866.RIDEAIR (743.3247)** for additional information.



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