AMERICAN TRUCKING ASSOCIATIONS
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Engineering Department

New Generation Wide Base Single Tires

New Generation Wide-Base Single (NGWBS) tires were designed to replace a set of dual tires at the tractor drive and/or trailer positions. They were designed to be interchangeable with the dual tires without any change to the vehicle. The new 445/50R22.5 tire replaces 275/80R22.5 duals, and the 455/55R22.5 tire replaces either 11R22.5 or 275/80R24.5 tires. Michelin and Bridgestone offer the 445/50R22.5 size while only Michelin offers the 455/55R22.5 size of these new tires. Other manufacturers may offer similar tires.

The information contained in this document was collected from ATA members and published sources. It is meant to be a summary of available information at the time of publication.

Advantages

The main advantages are that the NGWBS tires weigh less than duals, approximately 800 lbs less when combined with aluminum wheels on a five axle combination, and fleets have reported savings ranging from 1% to 8% on fuel on the same combination vehicle. This amount of fuel savings is not easy to obtain, and where the weight savings can be exchanged for payload there is an even better return. The use of these tires appear as approved EPA *SmartWay Transport Partnership tires* as a clean freight strategy due to their ability to reduce fuel consumption and CO_2 and NO_x emissions. SmartWay studies support the tire contributions to fuel savings of 3-4% as well as NO_x emission reduction.

Advantages of NGWBS tires can include reduced tire wear in some applications, increased payload capacity due to lower weight, improved fuel efficiency and emissions reduction, and improved vehicle ride and handling.

Ultimately this should result in improved profits for motor carriers. The NGWBS tires were developed using parameters provided by state highway agencies to minimize any negative effect on pavement.

They meet the inch width-weight limits for all states, but are restricted in certain states to 17,500 lbs on a single axle at 500 lbs/inch width limit, and are disallowed on single axle positions on certain double and triple combination vehicles. The NGWBS tires are not to be confused with the “Super Singles” used primarily on construction vehicles. That would be like comparing old bias ply tires to new radials.

Information on the NGWBS has been increasing since their introduction in 2000 and most of the poor perceptions have been eliminated. These perceptions included safety issues related to sudden deflation, increased pavement damage, and lack of availability in the field. Poor perception by some could also be based on some truckers running with one dual tire at each wheel end on axles designed for two duals.

There have been many tests conducted to prove that NGWBS do not pose a handling concern in the event of a rapid air loss. Many tire issues today are the result of under inflation. The fact that the inner dual is sometimes difficult to check compounds this issue. This situation is improved with the use of NGWBS, enhancing ease of tire maintenance and reducing the potential for field problems.

Although not a requirement, tire pressure monitoring systems can help drivers' awareness of the air level in their truck tires. This may prevent premature air loss and reduce the number of flat tires.

Many users have also cited that the brakes stay cooler on their vehicles due to improved air flow with the NGWBS tire and wheel assembly.

Comments from fleets in northern climates include improved traction and feel in snowy conditions.

Trailer stability is significantly affected by the center of gravity of the trailer and the distance between the centers of support at each wheel end (track width). While the center of gravity typically stays substantially the same with NGWBS tires, the track width is increased when a 2" offset wheel is used with the NGWBS tire.

Trailers may be ordered with increased axle lengths to take advantage of the overall narrower width of the single tire assembly compared to a dual assembly. This moves the center of support outward on each side of the trailer, increasing the track width and therefore increasing the stability of the trailer. This set-up is common on new tanker trailers ordered with NGWBS tires.

Trailers with standard axle widths and NGWBS tires still benefit from an increase in stability when the NGWBS tires are mounted on wheels with the 2" outset, thus moving the center of support out on each side of the vehicle, i.e. the track width is increased and vehicle stability is improved.

Overall availability has improved significantly and continues to improve as more fleets adopt the technology. Fleets report that availability is no longer an issue. Since they are interchangeable with standard size duals, a pair of conventional tires and wheels can be temporarily used to provide emergency mobility.

An occupational benefit is a proven reduction in dolly maneuvering force providing a safer environment less likely to cause injury. Fleets have reported dramatic reductions in back injuries from maneuvering and hooking up dollies. Drivers have also widely reported favorable on-road comfort and handling characteristics.

The Technology and Maintenance Council of the ATA has drafted a Recommended Practice (RP) “Guidelines for Outset Wide Base Wheels for Drive/Trailing Axle Applications”. The RP will discuss the effects on wheel bearing load with the single tire shift of centerline from duals. NGWBS tires appear to result in less scrap since they contain fewer sidewalls compared to a pair of dual tires. This, however, also depends on the number of miles between retreading and the number of times that is done. Some users have reported that they have successfully re-treaded NGWBS tires two times with no issues.

Disadvantages

One down side is that until the entire fleet has converted two sets of wheel hardware must be maintained.

In some operations such as a 10 ft spread tandem where high lateral forces during cornering will cause truck tires to wear at an accelerated rate, some NGWBS tires have been reported to have earlier tire removals. Just as there have been reports of better tread wear than duals in some applications, there have been reports of less tread wear in other applications. Mixed results on wear have come from members we have polled. The jury is still out on whether these NGWBS have comparable tread wear to the duals they replace, or if they can be successfully retreaded the same number of times. It appears that local or city operation, as well as spread axle applications, can result in significantly faster tire wear due to curbing, stone drilling, and scrubbing. However, the tire manufacturers continue to introduce new designs that improve the NGWBS performance in specific applications.

Today these tires only represent an estimated 0.5% of the 17.5 million tires sold each year in the US.

While the older “Super Single” tires increased wear on pavements, these new tires are wider and can operate at lower air pressures. They have been measured to be close to neutral as far as road damage.

Through studies conducted by Dr. Al-Qadi of the University of Illinois Urbana-Champlain, NGWBS tires have been found to produce slightly more stress and strain under the top layer of asphalt layer (HMA) than traditional dual tire assemblies. This type of wear is related to fatigue damage. However, the studies emphasize that the amount is negligible. In the same studies, NGWBS are also less damaging to pavement in top down cracking, which is initiated by the outer tire edges. NGWBS have only two edges compared with traditional wheel ends with four edges, thus they stress the road less in that mode. In addition, Dr. Al-Qadi has developed an improved tire modeling software to analyze road stress from the NGWBS tires.

Other studies in addition to Dr. Al-Qadi’s, have been completed on NGWBS tires.
Both independent and sponsored by manufacturers, while varying in results, the effect of the NGWBS on roadways is comparable to that of dual tires. Steer axles are still the primary source of road damage.

However, at present time there are some specific limitations in some states on the use of NGWBS tires due to early laws and regulations still on the books which restrict the use of single tires in specific over-size/over-weight, long combination vehicle configurations (“LCV”), or permit-required operations. These were intended to prevent “singling out” of wheel ends designed for dual tires, as well as regulating the previous era of “Super Singles”.

ATA engineering has a spreadsheet available of the latest regulations for some states that limit “single tire” use. Work is ongoing with these states to clarify regulations and resolve the limitations.

With respect to use of the NGWBS tires in Canada, the Council of Ministers Responsible for Transportation and Highway Safety approved in May 2008 an amended Memorandum Of Understanding on Vehicle Weights and Dimension, effective July 1, 2008, that approved the NGWBS tires for increased weight limits for consistency of weight limits applicable to the use of these tires across Canada. The national standards for weight limits on single and tandem axle groups are being increased to the federal limits currently applicable in the U.S., i.e. when an axle - except for steering axles – is fitted with two single tires, each of which has a width of 445 mm or greater, the limit shall not exceed 7,700 kg for single axles and 15,400 kg for tandem

axle groups. Exceptions to this include the Northwest Territories and on certain load restricted roads in New Brunswick and Newfoundland and Labrador.

With respect to Mexico, on March 5, 2008 , the Secretary of Communication and Transport approved the use of the NGWBS tires under specified guidelines.

Conclusions

The potential benefits to ATA members include improved fuel economy , reduced un-sprung weight (~800 lbs/ five axle combination vehicle) which helps improve handling, lower cost (~$130/wheel end for certain applications), reduced maintenance and improved safety due to improved ride and handling in all weather conditions.

These benefits would have to offset the wear and retread questions mentioned above to complete the payback picture. Users need to consider their application, dollars saved, and return on investment, as well as consulting with the tire manufacturer.

ATA Engineering will continue to monitor the NGWBS tire technology as it is used today. Study and knowledge sharing on NGWBS tires is continuing with a consortium led by the Federal Highway Administration. For example, a 2007 FHWA international “Wide Base Tire” workshop had representation from academia, government agencies including Canada, France, Netherlands, U.S., and South Africa, tire industry, and end users represented by ATA. The attendees generally accepted that the NGWBS tires are close to if not equal to standard duals in pavement damage. They equally felt that the NGWBS tires (not the “Super Singles”) merited an effort of support due to their environmental benefits.