DANA SPICER® Drivetrain Products

Questions and Answers About Reduced Pressure Operation and Spicer® Tire Pressure Control

Is the use of reduced tire pressures approved by the tire manufacturers?

The tire manufacturers have approved operation at reduced pressures when limiting the vehicle speeds. Their industry group, The Tire and Rim Association (T&RA), has published guidelines which outline the tire sizes, loads and pressures to apply this technology. While major manufacturers have monitored or taken part in numerous studies to determine the safety and efficacy of reduced pressure operation, most tire distributors are either unaware of the work or are inexperienced in applying the guidelines. Over time and with increasing popularity of tire pressure controlling systems, the awareness of the tire industry in the field will grow.

Does low pressure work only in sand? How about mud, clay, snow and ice?

Reduced tire pressure enhances the mobility of vehicles through two different mechanisms, flotation and traction. In both cases it is the longer footprint associated with reduced pressure operation that brings about the improvement. (A steel belted radial tire does not increase the width of the rubber in contact with the ground as frequently thought).

To understand the concept of flotation as it relates to land vehicles, one should consider the similarity to a water borne vessel. Just as a loaded ship displaces water and pushes a discernible “bow wave” in front of it, a truck on a soft surface displaces the sand or soil and is forced to run essentially uphill as it moves a “wave” of sand in front of it. By lengthening the footprint, the force exerted by the vehicle on the ground surface, measured in pounds per square inch (psi), can be significantly reduced. This reduction results in a lesser penetration of the surface by the tire, similar to the reduction in draft of a ship as its load is diminished (or the reduced penetration in snow of a person wearing snowshoes). This improved flotation allows the vehicle to move about the surface with less disturbance to it.

A discussion of traction needs to consider the difference between traction and friction. Although friction is independent of area, traction is very dependent on area. A surface with limited friction will demonstrate tire slippage with much less effect on the surface; the tire is slipping relative to the surface. Limited traction will show wheel slippage, but with resulting surface disturbance as the thrust generated by the tire overcomes the ability of the soil to resist it. Since a longer footprint results in a more favorable distribution of shear forces in the surface, the soil is less likely to be displaced by the torque of the rotating tire and increased traction results. Traction increases (as measured by drawbar pull) of 60% have been demonstrated solely through the reduction of tire pressures on a vehicle in a 6x4 configuration. When reduced tire pressure is combined with all wheel drive, improvements of over 100% are readily achievable.

The combination of improved flotation and traction results in the possibility of tremendous improvements in overall mobility. While these improvements are most striking in coarse grained soils such as sand, improvements are also measurable on other soils such as clay and muskeg. In simplest terms, if operation of a vehicle results in surface penetration by the tires, reduced tire pressures and the resulting improved flotation may help. If the surface is hard but slippery, reduced pressures should not have a significant effect since friction is the dominant limiter to mobility.

Uneven terrain should also be considered. Reduction in tire pressure will result in a loss of ground clearance. If operating in areas with deep ruts, high center crowns or sharp break overs this can become an important issue. It can also be noted however, that higher nominal speed capability stemming from the improved ride and control when traveling cross-country at reduced pressures may allow the operator to traverse some obstacles that could not be crossed at lower speeds.

Customers should be reminded that one need not actually install a tire pressure adjustment system on their vehicle to determine if reduced pressures will work in their operation. Manual reduction of tire pressure and reduced speed operation until tires can be re-inflated will allow most users to prove the benefits to themselves with a minimal investment in time or money. It should also be stated that the use of reduced tire pressure will not prevent one from ever becoming stuck again, especially when you consider the prospects that you will be operating in places where you may not have been previous to using lower pressures.

How are tire pressure settings developed?

Tire pressures have been developed to provide the sidewall deflections appropriate for various tire sizes. Of course, one must remember that reduced operating speeds are required to use these reduced pressures. Generally, tire manufacturers specify on-highway tire pressures to achieve sidewall deflections of 10-13%. These pressures allow operating speeds up the tire design limit. Off-highway deflections are typically 20-22% and limit vehicle speeds to 35 mph. Emergency pressure settings may go to 30% deflection, with a typical speed limit of 10 mph.

The vehicle owner should always select tire pressures with the assistance of their tire supplier. The Tire and Rim Association has developed reduced pressure and speed charts to assist in selection of tire pressures.

When did Dana start making tire inflation systems?

Dana is the world's leading provider of central tire inflation systems, having acquired the tire management businesses in 1999.
Over 35,000 systems have been provided since 1987 to numerous military and and commercial programs. These systems are fielded worldwide and were proven in Operation Desert Storm as a vital element of tactical wheeled vehicle mobility. Several important features account for the success of the product, among them:

- Depressurized control line strategy which extends seal life, eliminates tire leakdown when parked and provides "fail safe" operating capability.
- Speed sensing to assure that tires are not operated continuously at cross country pressures when traveling at highway speeds.
- Simple push button operation using pre-set terrain based pressure modes.
- Electronic pressure supply sensing to assure proper integration with brake and other on-board air systems.

The Spicer® Tire Pressure Control System, was introduced to the commercial market in 1994. It is presently available from Kenworth, Western Star, Volvo, Mack and Peterbilt. Dana continues to work toward wider availability of the system.

Tire Pressure Control was created by building on the same technology used successfully in the military systems. The following list represents some of the many enhancements that have been integrated into the commercial version:

- Multiple channel operation, allowing the independent control of pressures on steer, drive and trailer tires.
- Integration of the wheel valve into the hub cap using a rotary joint on non-driven axles to simplify installation and improve reliability.
- Introduction of diagnostic tools using either industry standard devices or personal computers, simplifying troubleshooting and repair.
- Publication of troubleshooting, and service manuals as well as driver instructions and in-cab aids to improve driver understanding of systems.
- Wheel valve design improvements to increase system reliability with longer trailer combinations and reduce sensitivity to control system leaks.
- Pneumatic controls design changes to reduce sensitivity to control system leaks.
- Introduction of new steer axle products up to 14,600 lbs. capacity to improve routing of air to steer wheel ends.

Does Spicer TPCS fit Meritor drives? Which ones? How about others?

Spicer drive axle air seal hardware was developed to fit on the Spicer "R" spindle configuration. Dana uses this spindle on single axles between 21,000 and 26,000 lbs. capacity and on tandems from 40,000 through 52,000 lbs. capacity. The "R" configuration meets industry standards for fitment of wheel end hardware (hubs, bearings, seals etc.), however individual axle manufacturers have latitude outside of the specific dimensions for the bearings and the seals to accommodate manufacturing processes and other considerations.

Historically, the Meritor "R" configuration has differed from the Spicer configuration specifically in the width of the outer bearing journal. It is Dana Corporation's understanding that the spindle configuration of the Meritor product was changed in 1999 to accommodate the hardware required to equip their axles with Spicer TPCS. The hardware will also fit on spindles from some other axle manufacturers. We have found that Mack tandems of 38,000 lbs. and 50,000 lbs. will accept the hardware without modification, however their 44,000 lb. axles will not. Dana will review axle spindle geometry from other manufacturers at their request if they provide the necessary drawing information.

What pressure range can the system control pressures to?

The Spicer System can reduce pressures to as low as 25 psi, and inflate to 90 psi. Practically speaking, 90 psi is the max cold tire pressure setting because of the air system limitations on most vehicles, where the compressor cut in is set to 90 psi. (It must be noted that although the cold setting is limited to 90 psi, Spicer Tire Pressure Control allows unlimited pressure rises resulting from heat generated in the tire. This is essential in that systems which do not allow unlimited pressure rises should rightfully have their pressures programmed to “hot” pressures which can be 15% higher than cold). Tire pressures beyond 90 psi can be achieved, however since the source pressure is very close to the tire pressure, actual inflation will be extremely slow. To say that any system can deliver pressures higher than 90 psi without consideration of this fact is somewhat misleading. Realistically, higher tire pressures will require that the truck air system pressure be increased to 145-150 psi and that pressure reducing devices be installed for vehicle braking and other systems.

Another detail which is important to note involves the physics of moisture control. Spicer Tire Pressure Controls utilize an operating regime which minimizes the possibility of moisture accumulating in the tires by forcing all of the air to be compressed to a level higher than that to which the tires will be inflated. Since all of the air going to the tires will be less than this peak pressure, it will be even dryer than when it left the on board air dryer since it has been expanded. Such a regime is critical for proper long term system operating reliability and keeping moisture out of the tires where it can have long term consequences. Systems which do not use such a regime may appear to be working when they are not, as they do not signal inability to change pressures to the operator.

Finally, the issue of safety cannot be ignored. The design of Dana’s Tire Pressure Control demands that vehicle air brake reservoirs be brought to a high pressure level before any tire pressure checking or changing operation be allowed to begin, not merely the minimum governor cut in level. Other systems may be programmable to allow higher tire pressure settings, but pressures above governor cut in come at the expense of high brake reserve pressures. Dana considers high vehicle braking reserve pressures an essential element of vehicle safety and therefore prefers to use the margins between governor cut in and cut out to assure maintenance of these reserve pressure levels. Dana feels that any strategy which reduces the average braking reserve levels or substantially increases the time required to achieve those levels violates the intent and spirit of regulations such as FMVSS 121.

How long does it take for inflation and deflation?

Any discussion of inflation and deflation times must consider many factors such as tire volumes, pressure settings and compressor capacities to adequately address the issue. One must also distinguish between the time required to change the pressure in a given group of tires and the time required for a system to signal that a pressure changing operation has been completed.

For example, the Spicer® Tire Pressure Control System can, through its wheel valve, reduce the pressure in a 11R24.5 dual set from 90 psi to 45 psi (a 3 atmosphere reduction) in approximately 2 minutes, but the system may indicate that the operation has not been completed for more than three minutes. Several factors may influence this time. First, the system checks to assure that brake pressure reserves are maintained and may suspend operations which change pressures to give this first priority. Second, the system monitors itself to assure that deflation can proceed reliably and deflation may be delayed while the system assures that all deflation parameters are properly met. Finally, to assure that tire pressures are balanced following a deflation sequence, Spicer Tire Pressure Controls are programmed to go through a short reinflation period to bring all pressures within the proper limits.

Inflation times are affected by even more factors, primarily related to overall tire volume and compressor output. The Spicer® Tire Pressure Control System has been designed to work on a wide range of trucks and truck configurations and as such will work with most any compressor output (presuming the compressor is in good operating condition). The issue of inflation time requirements deserves some discussion. Over the past ten years, numerous test results have been documented which show that the use of on-board controls to adjust tire pressures does not reduce tire life. Tire manufacturers have suggested that tire durability will not be compromised as long as inflation capability is sufficient to inflate tires to 75% of the recommended cold highway pressure within 15 minutes of achieving highway speed, and 100% in 25 minutes. This guideline can lead the person spec’ing the vehicle to an approximation of required compressor capacity using the simple analysis below. Dana urges those who are considering the use of Tire Pressure Control technology to work closely with their tire supplier to obtain the information needed about tire volumes and operating pressures as well as suggested inflation times for their application.

In simple terms, inflation time can be approximated by dividing the internal volume of the tires by the compressor output, and multiplying the result by the amount of the desired pressure increase. In order for this to work however, all terms must have compatible units – tire volume in cubic feet (ft^3), compressor output in standard cubic feet per minute (SCFM) and pressure increase in atmospheres (atm.). Atmospheres can be found by dividing the pressure increase in psi by 14.7. A formula for this can be expressed as:

{Volume (ft^3) / Output (SCFM)} X Pressure Increase (psi) / 14.7 (psi) = Time (min)

Since the Spicer Tire Pressure Control System allows the independent control of pressures on steer, drive and trailer tire groups, the times must be calculated for each of the channels and added together for a total time. For example, let's presume a typical 18 wheel tractor trailer combination, with two tires on the steer channel and eight each on the drive and trailer axle groups, an internal tire volume of 4.5 ft^3 for each tire and a compressor output of 13.2 SCFM. (Typically, compressor output is rated at a nominal engine output speed such as 1250 RPM). Furthermore, lets presume the following pressure increases between the off highway and highway pressure settings:

Channel	Off Hwy	Highway	Increase
Steers -	70	90	20
Drives -	55	90	35
Trailers -	50	90	40

The analysis would be as follows:

Steer Channel

{(2x4.5)/13.2} X 20/14.7 = .9 minutes

Drive Channel

{(8x4.5)/13.2} X 35/14.7 = 6.5 minutes

Trailer Channel

{(8x4.5)/13.2} X 40/14.7 = 7.4 minutes

Total Time

.9 + 6.5 + 7.4 = 14.8 min.

This analysis is only an approximation. It does not take into account several major factors such as compressor efficiency (which will change over time) or engine speed (inflation time can be improved by downshifting until highway pressures are achieved), or numerous minor factors (such as atmospheric variables or the compressibility factor of air). It should suffice however, to guide one through the task of compressor selection. The use of turbo-charged compressors can result in inflation times that improve as engine loads are increased only up to the limit of the system's ability to use the air (approximately 20 SCFM), but this improvement should be weighed against its impact on compressor life and overall vehicle air system design. Too much air can be detrimental to system performance as the excessive compressor temperatures generated can result in a higher level of contamination (oil blow-by) and reduced air dryer effectiveness, possibly requiring the use of additional means to cool the air, such as condensers and heat exchangers.

How does one diagnose service items for TPCS?

The Spicer® TPCS wiring harness includes a connector which meets industry standard requirements for connection to modern diagnostic tools. The interface is fully compatible with other vehicle systems to also allow connection through a central OEM supplied connector interface. Both hand held tools, such as those from MPSI, and personal computers may be used. Use of a personal computer requires the purchase of a serial interface connector (such as Kent Moore part number J38351 or B&B Electronics part number 232ESAER) to make the connection. By plugging the tool connector into the TPCS diagnostic connector, the technician can do a complete diagnostic analysis of the system, including retrieval of historic service codes. Diagnostic software discs are available for System users at no charge from Dana Spicer Heavy Axle and Brake Division.

How does the Spicer System detect tire imbalances and low tires?

The Spicer® Tire Pressure Control System uses sophisticated microcomputer technology and has extraordinary capability to analyze information. Dana engineers have developed algorithms for the System which critically evaluate many details of operation. Much of this evaluation is done in the short period of time between initiation of a pressure check (or selection of a new pressure mode) and the decision to proceed with a change of pressure.

The System evaluates the pneumatic signature from the time of the wheel valve opening pulse to the time of the actual pressure reading. During this period, approximately two seconds, the pneumatic response of the System is compared to acceptable responses stored in the memory of the controller. If the response merely indicates that the pressure of a given channel is low, inflation will be initiated. If the response indicates that pressure is higher than that requested, a deflation will be commanded. Other responses may indicate something less than acceptable readiness for the change of tire pressure and trigger a service code so the driver can evaluate how best to proceed.

The signature analysis technique allows the system to detect if one tire is significantly out of balance from the others in the same axle group. Parameters for the low tire detection have been established to trigger the "check tire" icon when the pressure in one wheel end of a channel group is approximately 50% or less than the others in the group. Since such a loss of pressure could have occurred over the 5 to 15 minute pressure check interval, a substantial tire leak could be indicated and therefore, the driver may also see an 11!P code indicated after the completion of a pressure changing sequence. The driver should physically inspect the tires on the affected axle group for possible leaks or damage before proceeding. If a tire puncture is found, the driver may select the run-flat key to reduce the interval of tire pressure checks to 15 seconds and thereby use the system to keep the tire inflated. If the tire damage is significant, the system will not be able to keep up with the leak and a 9P! or 10!P code may result. In this event, the vehicle may require immediate tire repair. –It is important to note that tire damage is not always readily visible and that operators should use care in determining the extent of tire damage. *The only reliable way to determine which tire is low is to use a pressure gage and inspect any tire which measures low.*

Frequently, out of balance tire pressure conditions occur on start-up after the vehicle has been idle for extended periods (such as weekends) as a result of slow leaks in the tire and wheel assembly. The system can help to identify these leaks early enough that the observant owner can have small leaks repaired before they become larger leaks which force downtime and limit retreadability.

It must also be noted that pneumatic control system leakage can mimic the pneumatic signature for an 11P! code, and result in false alarms. In this case, the operator can use run flat to proceed, however the system should be serviced as soon as possible since leaks will always get worse over time and eventually cause additional service messages and make diagnosis and repair more difficult. The use of service diagnostic tools will greatly simplify the identification and repair of leaks.

How does the air get to the tires?

Air is routed to the tires via air seals which have been installed in the axles. Two approaches are used, one for non-driven axles (steers and trailers or tag axles) and another for drive axles. Air is routed through the center of non-driven axles and through a rotary joint which is mounted on the end of the spindle. Driven axles utilize a patented air sleeve in conjunction with a special hub. Once the air is passed through the hub or hub cap, it is connected through the wheel valve to the rim with an air hose. It is important to remember that wheels and hubs need to be positioned properly relative to each other to assure proper fit of the hoses to the valve stems. Failure to do so may result in stress on the hose or valve stem that can result in air leakage and improper operation.

If an air line ruptures, do I lose all of the air in the system?

The Spicer® Tire Pressure Control System utilizes wheel valves to assure that air is not lost from the system in the event of air line breakage. Air pressure only exists in the control lines of the system when measuring, inflating or deflating the tires. (Only the hoses between the tires and the wheel valves are normally pressurized). Failure of a control line is sensed by the system and the affected channel is shut down and the operator notified through a service message. This depressurized operation also guarantees that tires will not leak down through the air seals while the vehicle is parked, even for extended periods.

How do the wheel valves work? Can they malfunction?

The wheel valve is an essential part of the Spicer System which improves overall system safety and reliability by allowing control lines to be depressurized unless actually inflating, deflating or measuring tire pressures. It is an extremely simple device consisting of spring loaded diaphragms biased against seats to contain air to the wheel end. In the absence of a control signal, the springs act against the diaphragms and seats to close the valve. Positive pressure signals are used to measure and inflate tires, negative pressures are used to deflate.

As a result of the simple design, the wheel valves possess an inherent high reliability, even in the environment of a truck air system. In fact, similar diaphragm and spring concepts are used in most of the valves used in a trucks today because of their high reliability and ability to tolerate wide temperature ranges and some level of contamination. The biggest difference between the Spicer® Tire Pressure Control System and other systems used on the truck is in the volume of air used. Since inflating tires uses a large volume of air, possibilities of contamination are greater. Contamination is the largest single reason for wheel valve malfunction. Measures must be taken to prevent contamination from entering the system.

Each wheel valve includes a filter in the port which connects it to the tire. These filters are intended to trap contaminants contained in the tire and prevent them from entering the wheel valves, and should be changed at any time the tire is removed, either for rotation or replacement. Service technicians must be careful not to damage the filter by installing adjustable fittings too deeply into the tire port. To do so will crush the filter and possibly tear it. Instructions in the service manual should be followed closely.

Care must also be taken to prevent contaminant entry any time control air lines are disconnected. Trailer couplings are especially critical as they may frequently be disconnected with the trailer. For this reason, Spicer recommends the use of an in-line air filter in the trailer line, to prevent contamination from entering the coupling and traveling to the trailer wheel valves. It is also important to blow any debris from hoses, tubing and fittings when servicing the vehicle. Instances have been encountered wherein hose slivers from the initial installation have been trapped in the system, causing problems later.

What is the minimum temperature for operation?

The Spicer® Tire Pressure Control System has been developed using the same industry standards for operation to -40 degrees as most vehicle components. Operation at temperatures below that is possible, however some service codes may be encountered under extremely cold conditions which may disappear when either the component warms up under use or from increasing ambient temperatures. These may include codes related to temperature induced leakages, as extremely cold temperatures will cause materials to shrink and reduce the effectiveness of sealing. Dana recommends that the pneumatic control unit be placed in the cab wherever cold weather is encountered so that cab heat can assist in warming the unit to enable operation.

While system operation is possible at low temperatures, the primary reason for problems at temperatures below freezing is not with the system components, but with the effectiveness and maintenance of air drying equipment. Extremely cold air has very little moisture in it, while warm air can hold tremendous amounts. In fact, at +80°F (+27°C), atmospheric air can hold almost 50 times more water than at -13°F (-25°C). Failure to monitor and maintain the air system during warmer months will result in entrained moisture in the air tanks and system components that are certain to cause problems as temperatures fall. Failure to routinely drain air tanks can result in whole water passing from the tanks through the system, and even into the tires where it can inhibit the system's ability to deflate even at temperatures of +65°F (18°C). Although the Spicer System minimizes the possibility of condensed water in the controls and the tires, whole water can only be controlled by positively draining all water which has condensed from the tanks. Proper preventative maintenance demands draining all tanks to zero pressure whenever the truck is to be left unused for an extended period.

Does a standard truck air compressor satisfy the requirements for TPC?

Air compressor output capacity requirements are determined by factors such as the total internal volume of the tires being controlled and the pressure range over which one is operating the tires. While in some cases a manufacturer's "standard" compressor may be appropriate, it will not be in others. Specifying too much air capacity can also be harmful by causing additional heat which results in oil consumption that will contaminate the system. Owners, dealers and manufacturers will need to consider the application when specifying the compressor. Manufacturers will also need to work with compressor and air dryer suppliers to assure the factory installed air system will meet the needs of the user. Compressor and dryer manufacturers may have established specific installation requirements for the use of their products with high air usage systems such as Spicer® Tire Pressure Control.

Is it more difficult to change tires on a TPCS equipped truck?

Tire changes on a TPCS equipped truck will require additional steps, which although not difficult, will add to the amount of work required. The technician will need to take care and note or mark the location of the wheel relative to the hub to assure that the new wheel is installed in proper position to reconnect the hoses when complete. Prior to removing the tire, he must disconnect the air lines and plug or cap them if the tire is still pressurized as there are no valve cores in the stem of a TPCS controlled wheel. (A smooth jawed locking plier or other tool may be used to temporarily crimp the hose). After putting the new tire in position, the hoses must be replaced and properly restrained to prevent damage. While inflating, following completion of a tire change, the system may display a "check tire" icon, indicating that air in one tire is lower than others on the channel. This indication should clear after the system is used to inflate the tires.

Is the system reliable in sandy and/or dusty environments?

The Spicer® Tire Pressure Control System uses many of the same operating principles of the Spicer® Central Tire Inflation System which was so successful in Operation Desert Storm. Over 5,000 systems were fielded in that effort without any reported failures. The desert terrain of Saudi Arabia and Kuwait (and Iraq) represents some of the harshest conditions in the world. The commercial system has been tested across the United States in wide ranging environments for over 1.5 million miles prior to production.

What is the maintenance impact of adding a system to my truck?

Several items should be looked at from a maintenance perspective when using vehicles equipped with Spicer® Tire Pressure Control.

Wheel Valve Filters – The first item is the wheel valve filters. Filters are included in each wheel valve in the air connection to the tire hose. This filter traps debris from the tire and helps to assure reliable wheel valve operation. Even tires which were clean during mounting have been found to have loose debris in them after many hours of operation and it is important that this debris not get into the wheel valve. Dana recommends that these filters be changed whenever tires are rotated or replaced. Since it is difficult to determine how long it takes for this tire dirt to develop, your application may demand more frequent changing. Tires which deflate to uneven pressures within the same axle group would be a reason to look at changing the filters.

Non-driven Wheel End Lubrication – Another item is the area of wheel end lubrication for non-driven wheel ends, such as steers and trailers. In order to deliver air to a tire, a system must route air through the wheel end via a rotary joint inside the hub cap. If air were to leak from this rotary joint and pressurize the wheel end, the main inboard oil seal could be damaged or displaced. The Spicer® Tire Pressure Control System utilizes a special plug in the center of the hub cap window which vents easily to make build-up of pressure in the wheel end unlikely, and the hub cap itself has been designed to mount the wheel valves to provide a neat package for steer axles.

Since the hub cap section is not uniform, the apparent oil level in the wheel end will vary depending on the position of the hub cap when the vehicle is stopped. The addition of oil to the wheel end should always be done through the fill plug in the side of the hub cap, not the vent plug in the window, since the lines on the window are the appropriate oil level only when the fill plug is at 12 o'clock. Adding lubricant to the lines with the fill plug in any other position may result in an over-filled condition and oil will likely leak past the low pressure vent plug, resulting in an unsightly leak. Furthermore, water or detergent spray should never be directed at the vent plug, as it can get past the plug and enter the hub cap, contaminating the oil and reducing wheel end life. Oil should be examined frequently for such contamination, and be changed if any oil discoloration is found. Many applications for Tire Pressure Control are severe duty applications which demand routine wheel end inspection of bearings on an annual or semi-annual basis. You should always follow the manufacturer's recommendations for wheel end service.

Drive Axle Wheel Ends – While the addition of air seals into the drive axle hubs does not create any unique requirements for maintenance of the wheel end, it does make adherence to current recommended maintenance practices more important to assure the best life from the seals.

Wheel bearing adjustment is just as important to good air seal life as it is to good oil seal life. Improper adjustment allows excessive play and runout in the seal and results in reduced seal performance. Always follow the recommended practices of the axle supplier and The Maintenance Council of the American Trucking Associations to assure satisfactory performance.

It is very important that seals which are performing properly not be disturbed unnecessarily during routine maintenance for brakes or other wheel end repairs. The wheel end equipment utilizes an outboard mounted brake drum design so that brake repairs can be made without disturbing the hub. Removal of the wheels with the hub and brake drum as a unit is not recommended, and may necessitate replacement of all seals, both air and oil. Even if these seals are to be replaced, proper installation will be extremely difficult with the wheels and drums attached to the hub, with a higher likelihood of damage to the seal. The specification of hub piloted wheel designs allows the removal of dual wheels with only ten fasteners, avoiding the additional labor requirements of older stud piloted designs.

Removal and replacement of drive axle hubs will also demand addition of lube through the hub lube fill hole to assure sufficient wheel end lubrication to the inner bearing. This lubrication must be added after the axle shafts, but before the wheels are installed.

Vehicle Air System – A final area demanding additional maintenance attention is the vehicle air system, including the compressor and the dryer. The adjustment of tire pressures requires the use of far more air than normal, where air is used primarily for braking. Increases in both compressor duty cycle (percent on time) and continuous on time make the load on the air system far more severe and demanding of special attention. As the actual air system impact is strongly dependent on the application, i.e. how frequently the tire pressure system is being used to adjust pressures, it is not possible to predict with certainty how often a particular fleet or owner will need to service the compressor and air dryer, but it is essential for users to determine a maintenance cycle that works for their application. While getting acquainted with the use of Tire Pressure Control in your operation you should pay particular attention to the air dryer to determine a proper service interval for you. Initially, a daily look at the discharge from the dryer will tell you if the system is working properly. Oil or any discharge other than water is cause for investigation and correction. Maintenance personnel should also be checking air dryer cartridges and the air supply tank for signs of contamination monthly until the first replacement is necessary, and then checking cartridges at an interval half way to the period of the first change until you are comfortable with the rate at which they are losing effectiveness. Operators should also be instructed to drain the vehicle supply tank from which the system draws its supply completely every night. Any water observed coming from the tank while draining deserves to be looked into, as a properly working air dryer will not allow water into the air tank during a working day. Manual drain valves should be installed which do not require the operator to stand by the truck while the tank is depleted to zero psi, as even air from a properly working air system contains sufficient moisture to condense in the tank during overnight drops in ambient temperature.

For spec'ing or service assistance, call 1-877-777-5360 or visit our website at www.dana.com

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