
PACCAR & DEALER
TMC
Technical &
Maintenance
Conference

Session T7 – TYRES and WHEELS
Safety and Compliance

Speakers

Andrew Stroud

Anthony Harris
Vicroads

Richard Brain
PACCAR Australia

Kevin Miller
Alcoa Wheel Products

Chet Cline
Air CTI

Renzo Barone
Meritor

Tim Ellis
Stemco

PACCAR & DEALER TMC Technical & Maintenance Conference

Anthony HARRIS

Andrew STROUD

Vicroads

Failure to torque wheel nuts
Causes major serious injury collision

PACCAR & DEALER
TMC
Technical & Maintenance Conference

LHF steer tyre side wall split

Measured at 25mm depth

PACCAR & DEALER TMC Technical & Maintenance Conference

3 axle Scania carrying timber LHF spider hub cracked

PACCAR & DEALER TMC Technical & Maintenance Conference

B’Double fully loaded with chemicals looses RHF wheel at 100kmh due to Wheel bearing failure

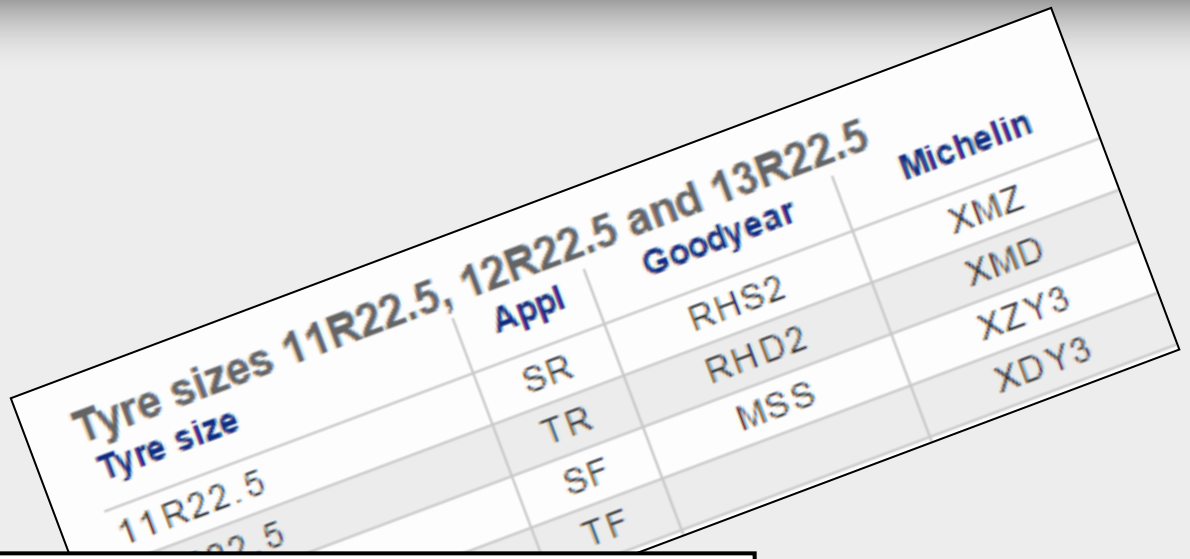
Richard Brain

PACCAR Australia

Tyre Selection

Discuss with your tyre supplier

Talk with other users



S = steered axle / overall	L = long distance	suffix e = energy
T = traction	R = regional	suffix w = winter
O = overall	F = on/off road	suffix m = Middle-East
M = pusher axle	O = off the road	

PACCAR & DEALER TMC Technical & Maintenance Conference

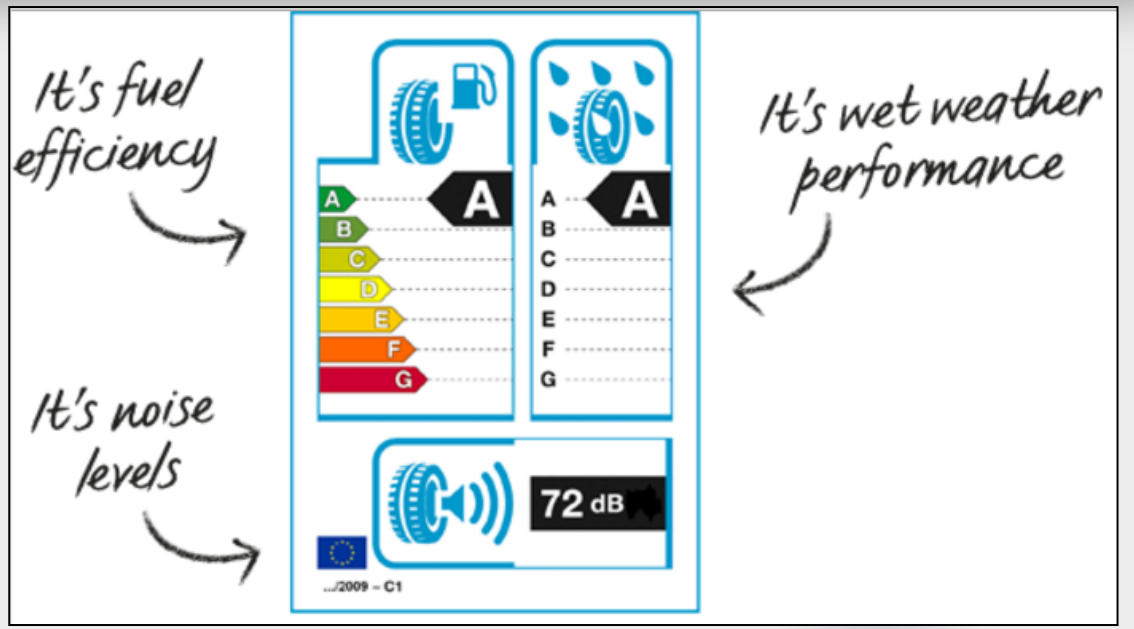
Tyre Labelling

Rolling Resistance

Wet Grip

External rolling noise

Size Variation



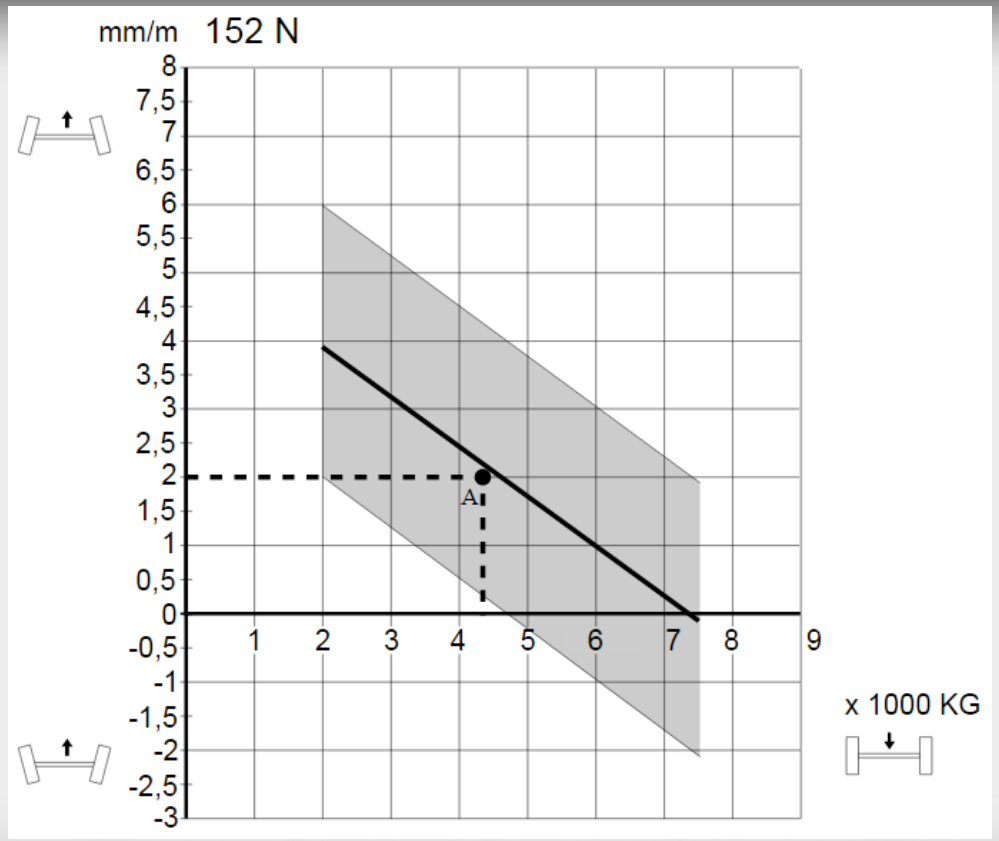
PACCAR & DEALER TMC Technical & Maintenance Conference

Axle loads 3500 - 7500 kg

Tyre size		Recommended pressure on axle loads. [bar]									Maximum axle load (kg)	Pressure at maximum axle load [bar]
		3500	4000	4500	5000	5500	6000	6500	7000	7500		
11R22.5	S		5.0	5.7	6.5	7.2	8.0				6300	8.5
12R22.5	S				5.6	6.3	7.0	7.7	8.4		7100	8.5
13R22.5	S						6.1	6.7	7.3	7.9	8000	8.5
235/ 75R17.5	S	5.3	6.3	7.2	8.1						5450	9
275/ 70R22.5	S		5.3	6.1	6.9	7.7	8.5				6300	9
295/ 60R22.5	S			5.6	6.4	7.1	7.9	8.7			6700	9
295/ 80R22.5	S				5.6	6.3	7.0	7.7	8.4		7100	8.5
305/ 70R22.5	S				6.0	6.7	7.4	8.1	8.9		7100	9

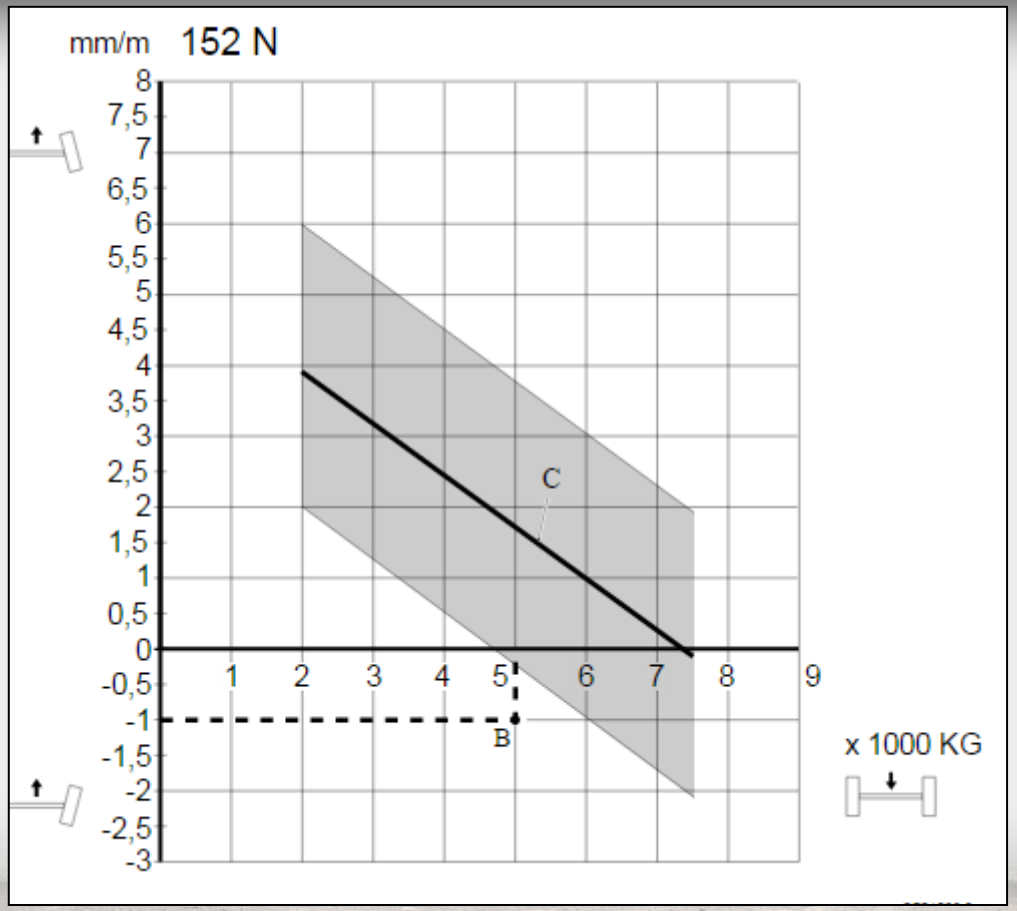
PACCAR & DEALER TMC Technical & Maintenance Conference

Toe in

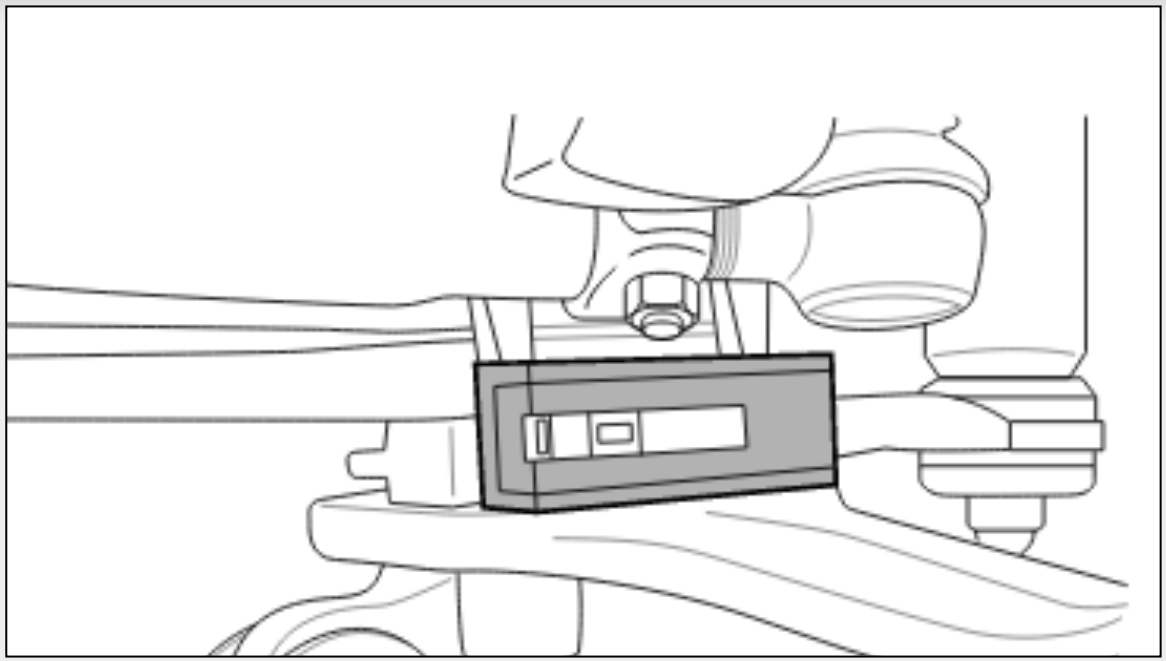


PACCAR & DEALER TMC Technical & Maintenance Conference

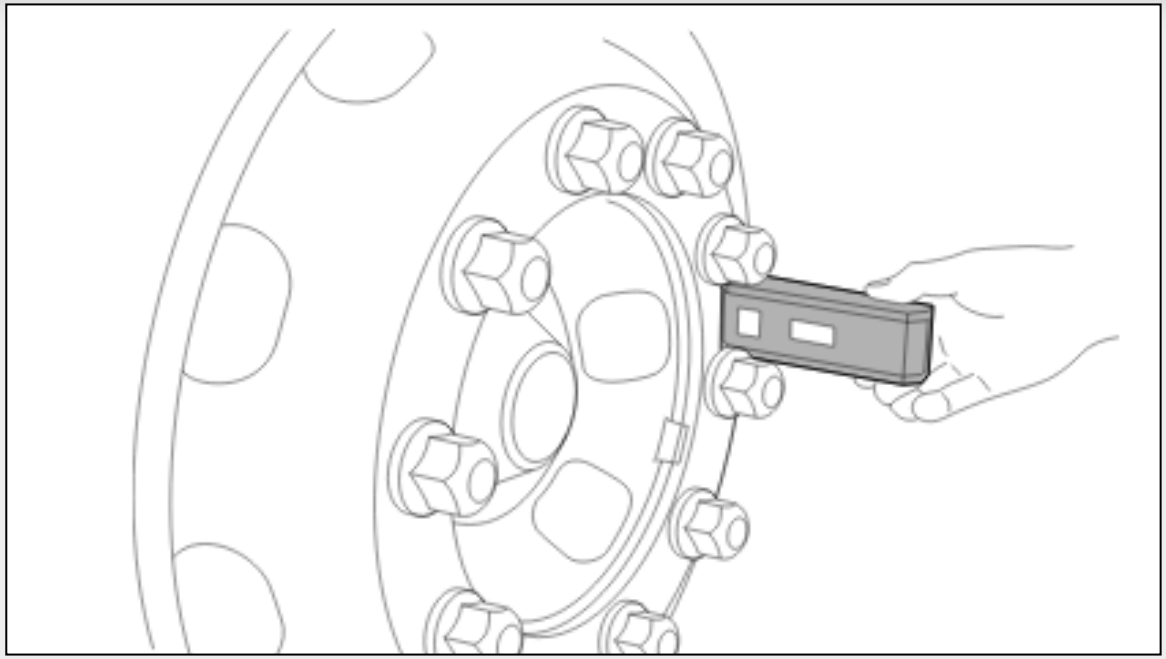
Toe in



PACCAR & DEALER TMC Technical & Maintenance Conference

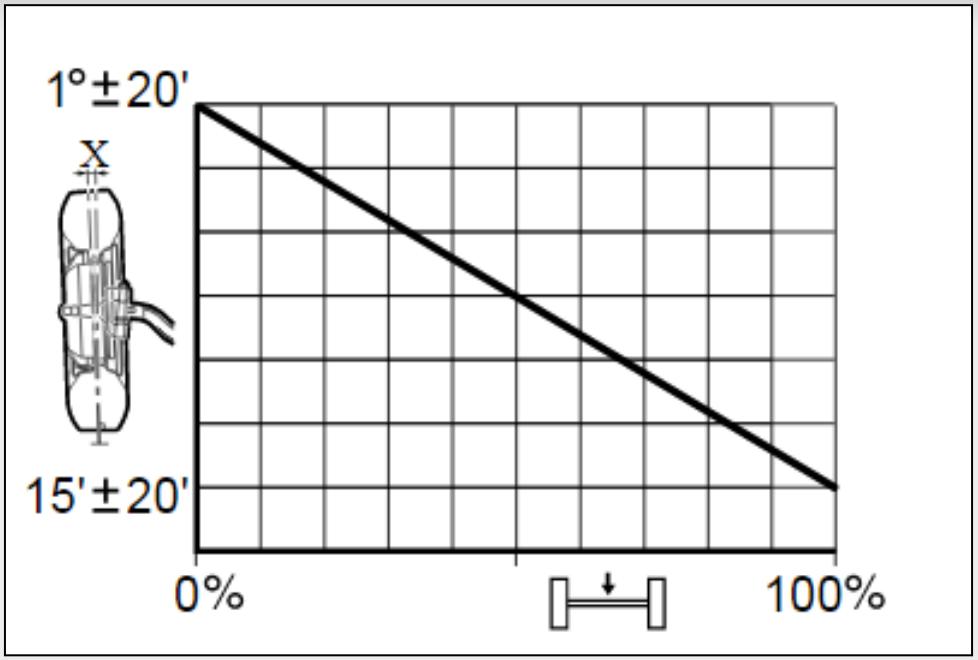


Caster



Camber

PACCAR & DEALER TMC Technical & Maintenance Conference



Camber angle

Keith Millar

Alcoa Wheel Products

TMC – October 2015

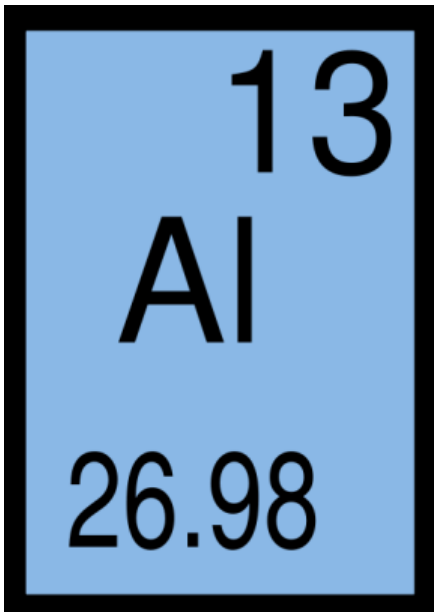
Kevin Miller – National Sales Manager

Alcoa at a glance

- Founded in 1888
- 200+ locations
- 30 countries
- 125 years of aluminium technical leadership, including the original aluminum process
- Founder invented the process to refine and smelt raw material into aluminium.

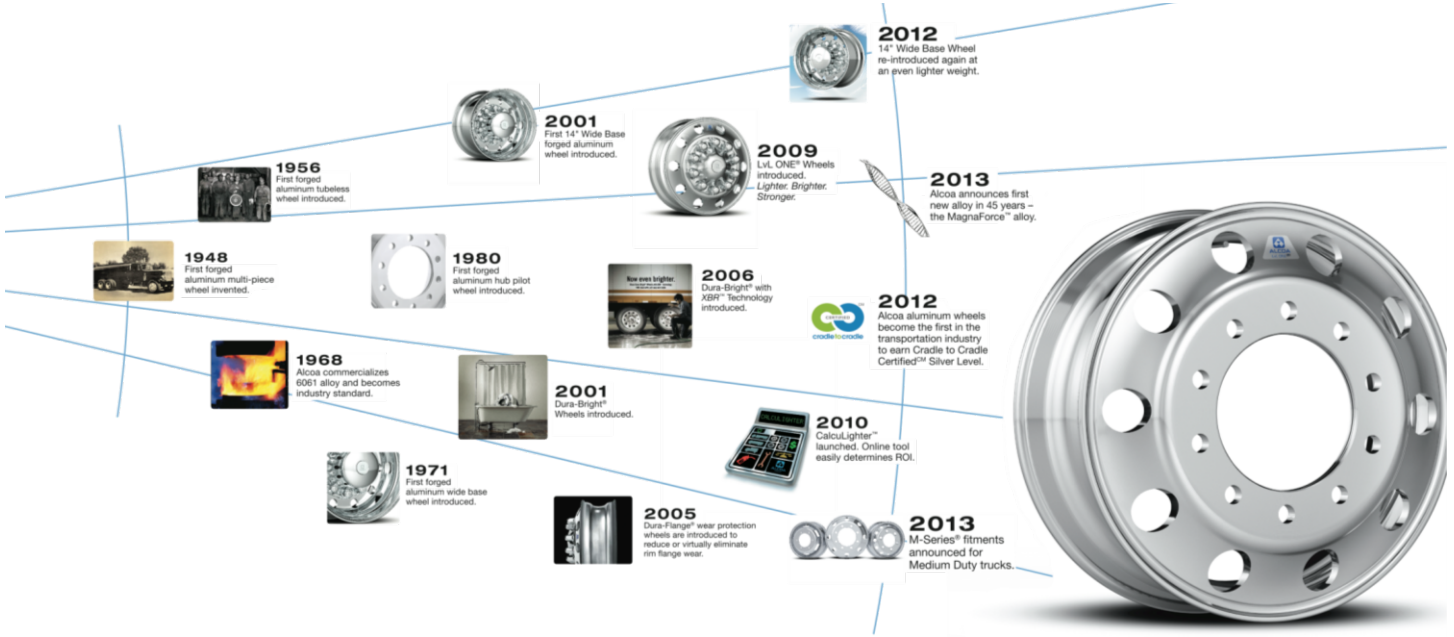
Number of Employees (2013)	
U.S.	26,000
Europe	17,000
Other Americas	10,000
Pacific	7,000
	60,000

Did You Know?



- 73% of all aluminum produced since 1888 is still in use today
- Recycled aluminum uses 95% less energy to produce than primary output
- The aluminum industry cut CO_2 factory emissions by 86% from 1990 to 2006, with the goal of achieving carbon neutrality by 2030
- Aluminum can eliminate 30 tons of lifecycle CO_2 emissions and increase payload by 1,497 kilograms. in weight-constrained heavy trucks

Leading Wheel Innovation for Over 65 Years



Forging Process

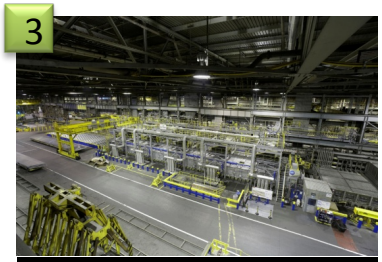
1

Every wheel starts as a block of high-strength aluminum alloy.

2

With an 8000 ton press, the block is forged into the basic wheel shape.

3



Once forged, the wheels are heat-treated to maximize the strength

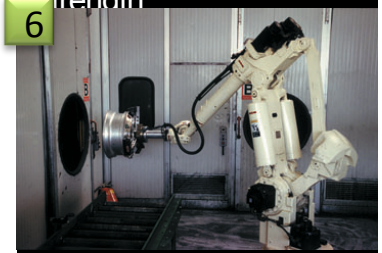
4

Precision machining ensures that each wheel is perfectly round.

5

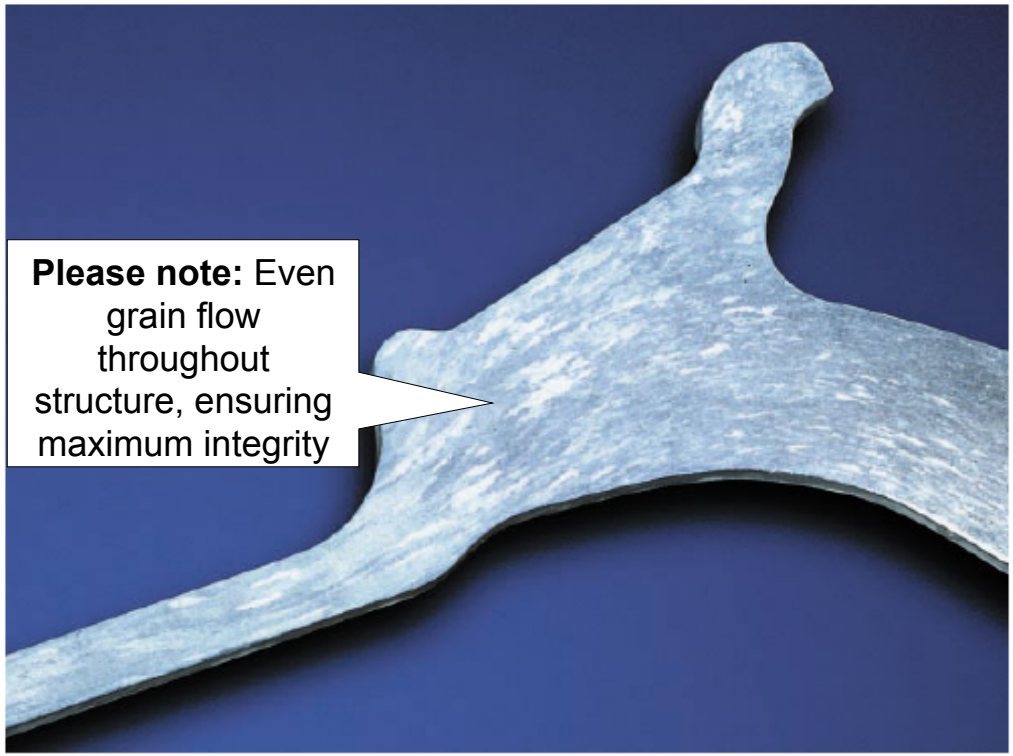
Next, the ventilation and mounting holes are drilled.

6



The polish operation gives the wheel a reflective shine.

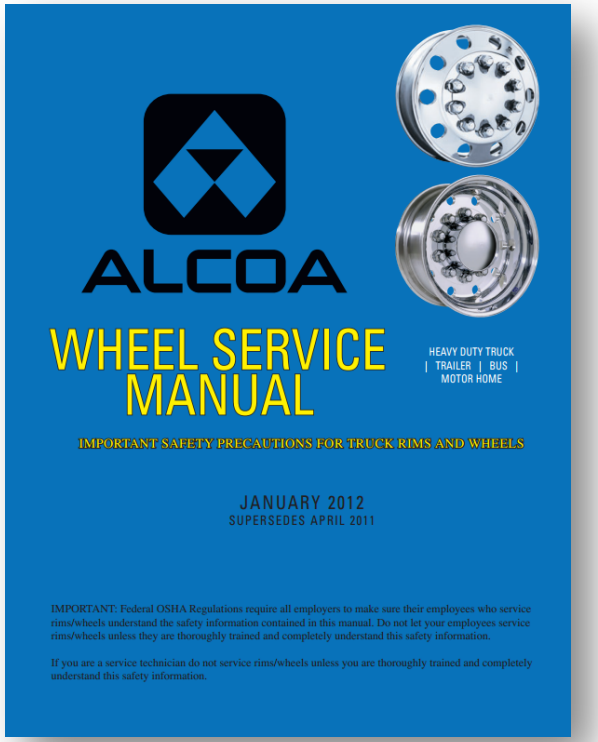
Grain Structure Alcoa Forged wheel

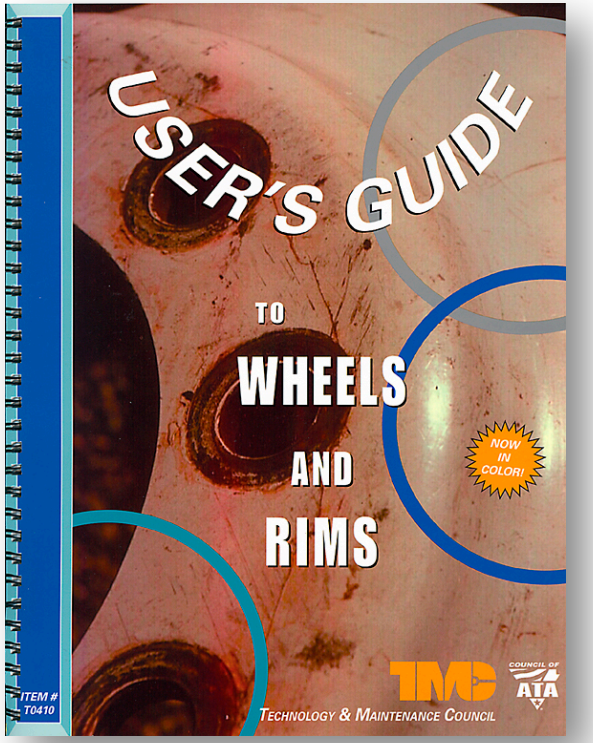


Machining

100% Fully machined in CNC lathe centres to maximise concentricity, ensuring a close to perfectly round finished product

How Do We Maintain Wheels?





Follow Recommended Practices

- Alcoa Service Manual
- Wheel installation practices
- Wheel inspections
- Ride disturbance questions

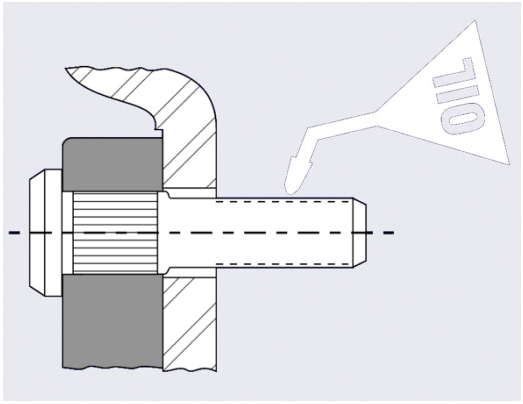
Follow Recommended Practices

- Alcoa Service Manual section 7
- U.S. OSHA law
  - Use safety cage
  - Use clip on air chuck
  - Comply with industry, wheel and tyre servicen manuals
  - Train your people
  - Tyres found with less than 80% air pressure must be inspected to find cause of air loss and any potential problems

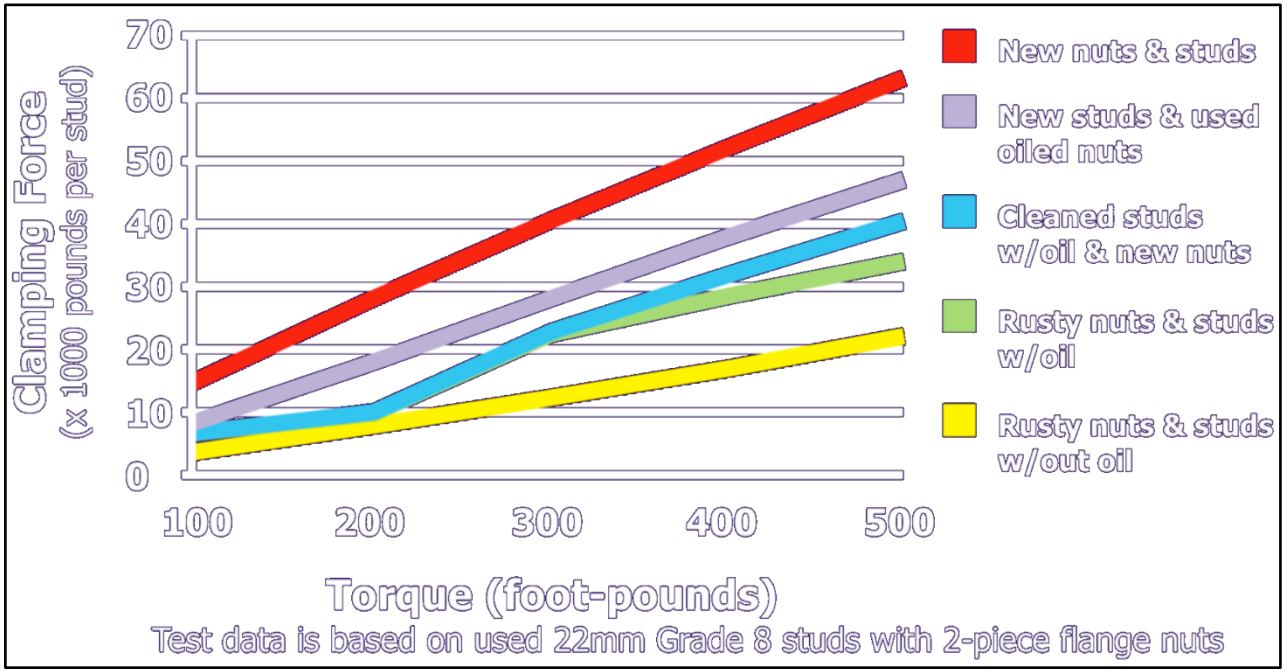
Proper Installation

- Clean all mounting surfaces
- Lubricate studs and nuts (hub piloted)
- Use proper torque sequence
- Initial torque 50 to 100 ft. Lb.
- Final torque 450 to 500 ft. Lb.
- Follow torque sequence
- Re-torque

Stud/Nut Lubrication



Affects of cleaning and lubrication (Clamping Force)



Why proper installation?

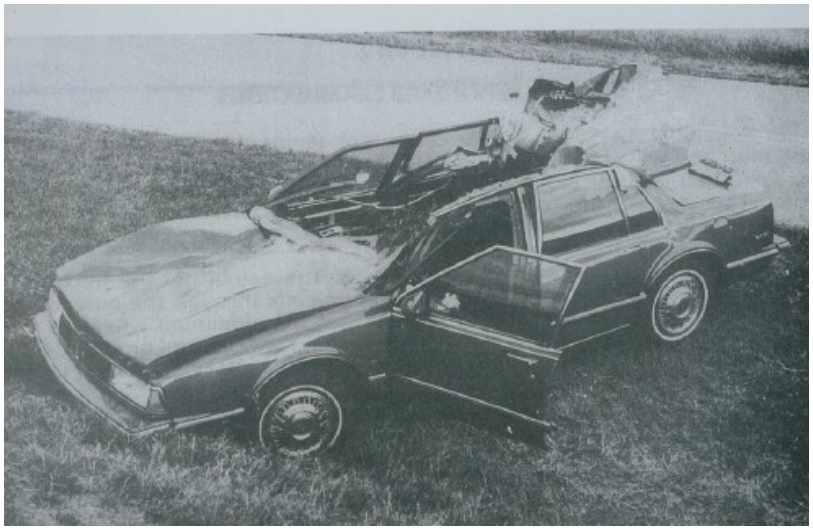
- Safety for you, your employees and the public
- To eliminate loose wheel conditions
- To improve wheel life

Miami Florida, October 1991

- Front left wheel bearing failure hub intact disengaged entered front of bus killing 2 children and the driver

Warrior Alabama, September 1991

- Left front trailer dual wheels disengaged killing passenger and seriously injuring driver
- Cause = wheel bolt fatigue due to loose wheel conditions



Wheel Stud Maintenance Recommended Practice

- 1 broken stud — replace broken stud and the ones adjacent the broken stud
- 2 or more broken studs — replace all the studs for that wheel
- Include stud replacement in your wheel maintenance program

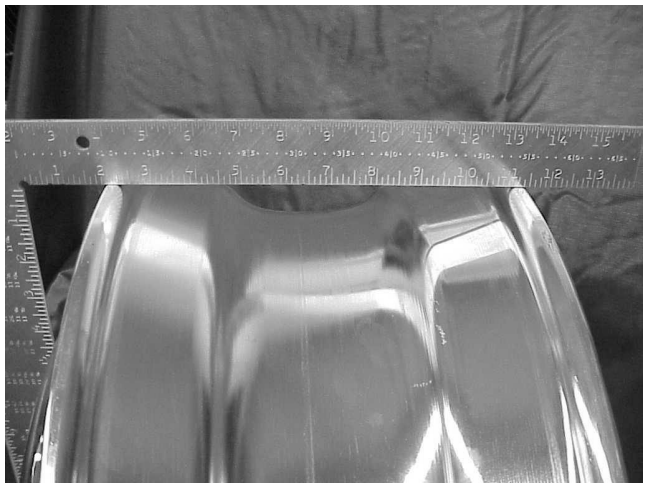
Tyre/Wheel Inflation Pressures

- Proper inflation pressure helps tyre and wheel life
- Low inflation pressure will increase rim flange wear
- Unequal inflation pressure may overload the tyre/wheel

Rim Roll Test

Wheel Inspection

Photos show the carpenter square even on both bead seats.



Wheel Inspection

Photos shows an undersized wheel that you can clearly place a .020 card between the square and the wheel

Tyre blow out video

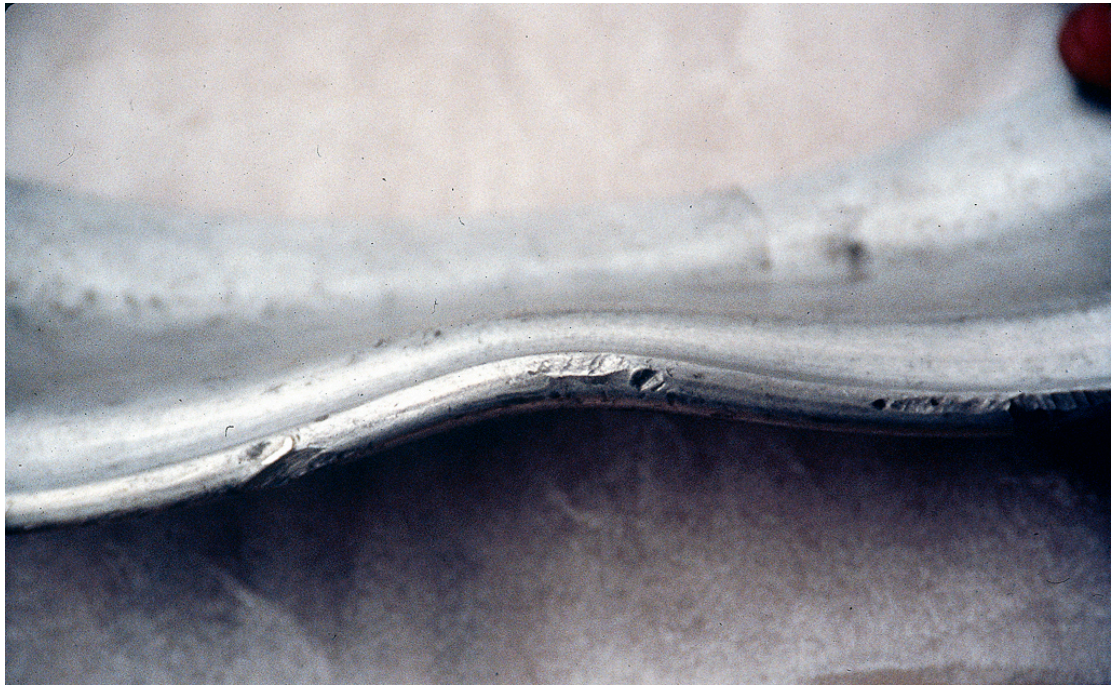
Play Video

Wheel Inspection

- Mounting Surface Corrosion

Friend

Wheel Inspection

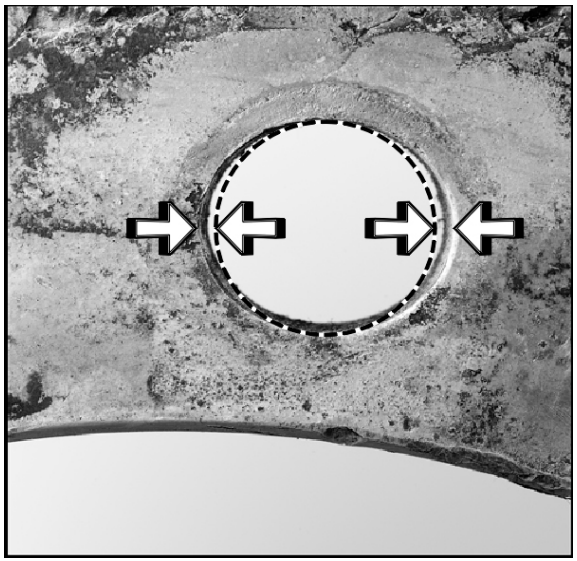


- Bent Flange

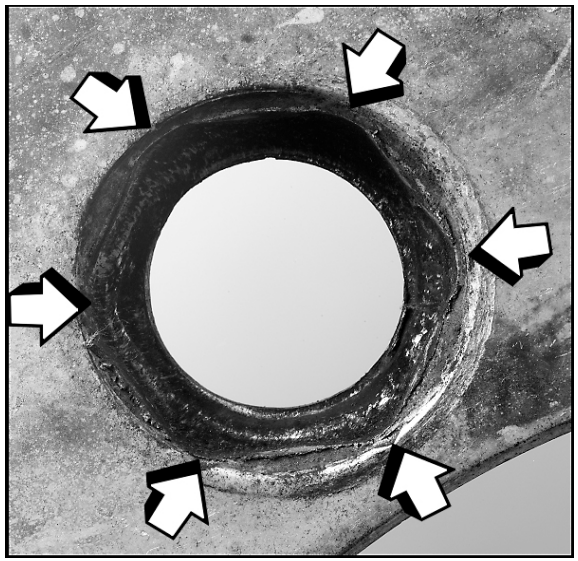
Wheel Inspection

- Valve Stem before removal

Wheel Inspection



Damaged hub piloted bolt hole.



Damaged ball seat contact area.

- Damaged Stud Holes

Safety Maintenance and Inspection Summary

- Follow practices as outlined in the Alcoa Service Manual
  - Follow torque specs and sequences
  - Keep the mating surfaces clean
  - Include studs in maintenance practice
  - Clean and inspect wheels

Wheel Inspection Summary

- Remove any **suspect** wheel from service
- Remove any **damaged** wheel from service

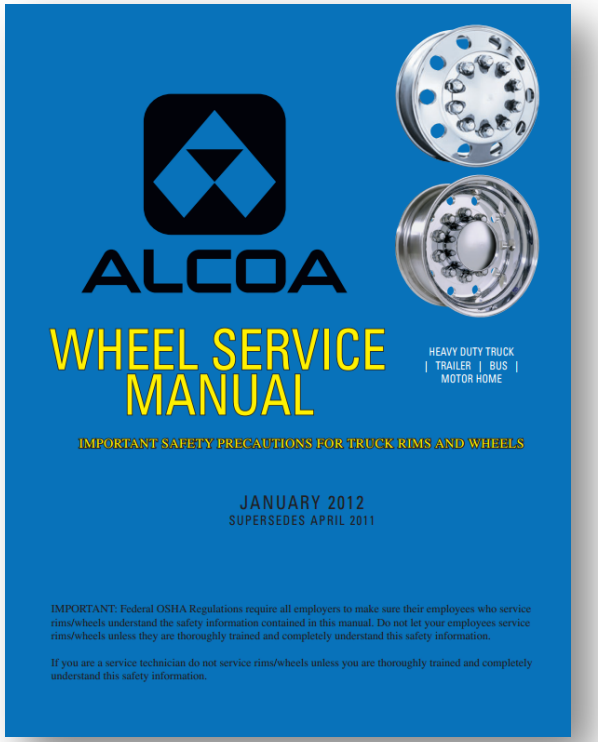
When removing a wheel from service, *clearly* identify the wheel as scrap and at a minimum remove valve stem, or drill hole in well of wheel.

Wheel Inspection Summary

- **Permanently remove** any wheel from service that has been **exposed to excessive heat** (for example: tire fire, bearing fire, brake fire, etc.)

Remember: When removing a wheel from service, *clearly* identify the wheel as scrap and at a minimum remove valve stem, or drill hole in well of wheel.

How to Obtain Literature



- Service manuals, specification data, videos and other literature are available ***free***: at www.alcoawheels.com, or alternatively call the following;
  - Melbourne 03 9311 5800
  - Brisbane 07 3375 7899

or the Alcoa wheel representative in your state

Thank you

Chet Cline

AIR CTI

IS TYRE PRESSURE THE BIGGEST WASTE IN TRANSPORT?

PACCAR & DEALER TMC Technical & Maintenance Conference

Our Industry Wastes a Billion Dollars Every Year

- 500,000 heavy trucks
- 6,000,000 truck tyres
- 1/3rd are wasted
- 2,000,000 tyres into waste
- Thats 1,000,000 tyres per year

- 83 liters of oil in each tyre
- 83,000,000 liters wasted
- $500,000,000 of tyres wasted every year

PACCAR & DEALER TMC Technical & Maintenance Conference

IT GETS WORSE

- Rough Roads Damage Drivers
- Rough Roads Have More Accidents
- Rough Roads Increase Wear and Tear
- Over Inflated Tyres Amplify Every Bump

PACCAR & DEALER TMC Technical & Maintenance Conference

- 50 truck drivers die on our roads annually
- Truck Drivers have a 16 year shorter life expectancy
- Average life expectancy is 56 years
- 42 countries have better roads than Australia
- Whole Body Vibration Damages Humans.

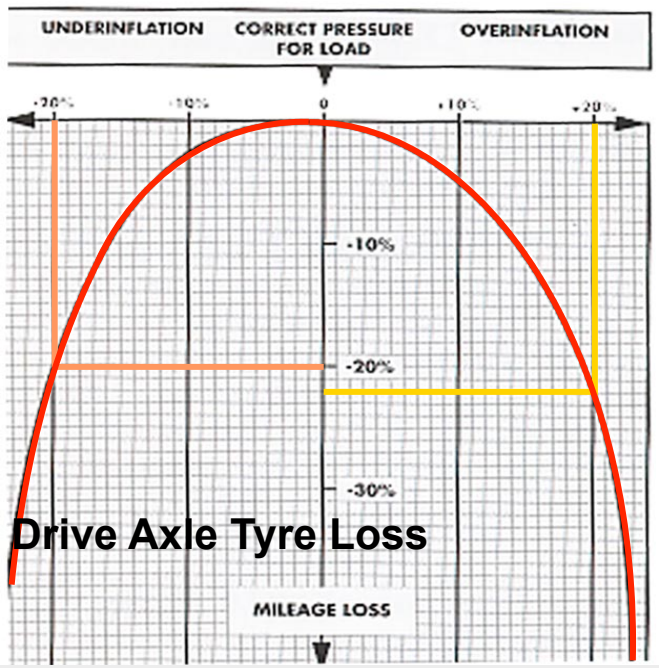
PACCAR & DEALER TMC Technical & Maintenance Conference

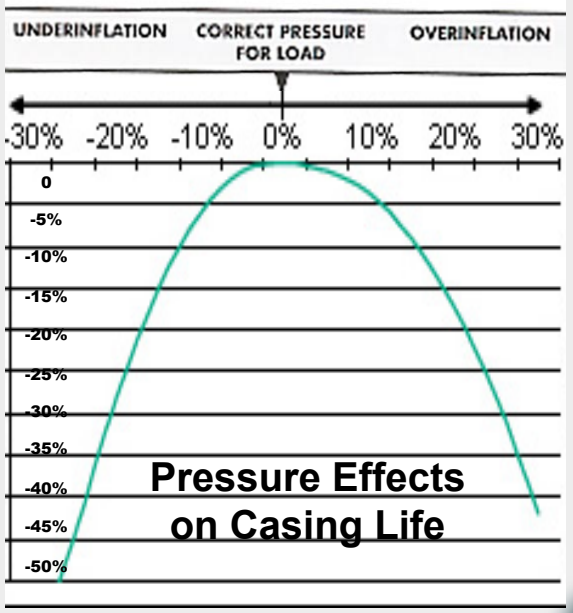
Tire Size Designation	USAGE	kPa	480	520	550	590
		psi		75	80	85
11R22.5	DUAL	kg	1	2080	2160	2250
		lbs.	43	4580	4760	4950
	SINGLE	kg	2050	2160	2260	2370
		lbs.	4560	4770	4990	5220

620	660	690	720	760	790	830
90	95	100	105	110	115	120
2360(F)[138] 5205(F)	2460 5415	2560 5625	2650(G)[142] 5840(G)	2680 5895		2725(H)[143] 6005(H)
2500(F)[140] 5510(F)	2600 5730	2700 5950	2800(G)[144] 6175(G)	2870 6320		3000(H)[146] 6610(H)

Correct Tyre Pressures Depend upon the Load per Tyre

PACCAR & DEALER TMC Technical & Maintenance Conference





The Wrong Tyre Pressure Wastes Tyres & Money

PACCAR & DEALER TMC Technical & Maintenance Conference

USA TIRE AND RIM ASSOCIATION Reduced inflation pressure limits used off highway Maximum speed - 80 kph 11R22.5						
Load kg	1000	1250	1500	1750	2000	2060
PSI	25	32	42	53	65	68

HOW LOW CAN YOU GO?

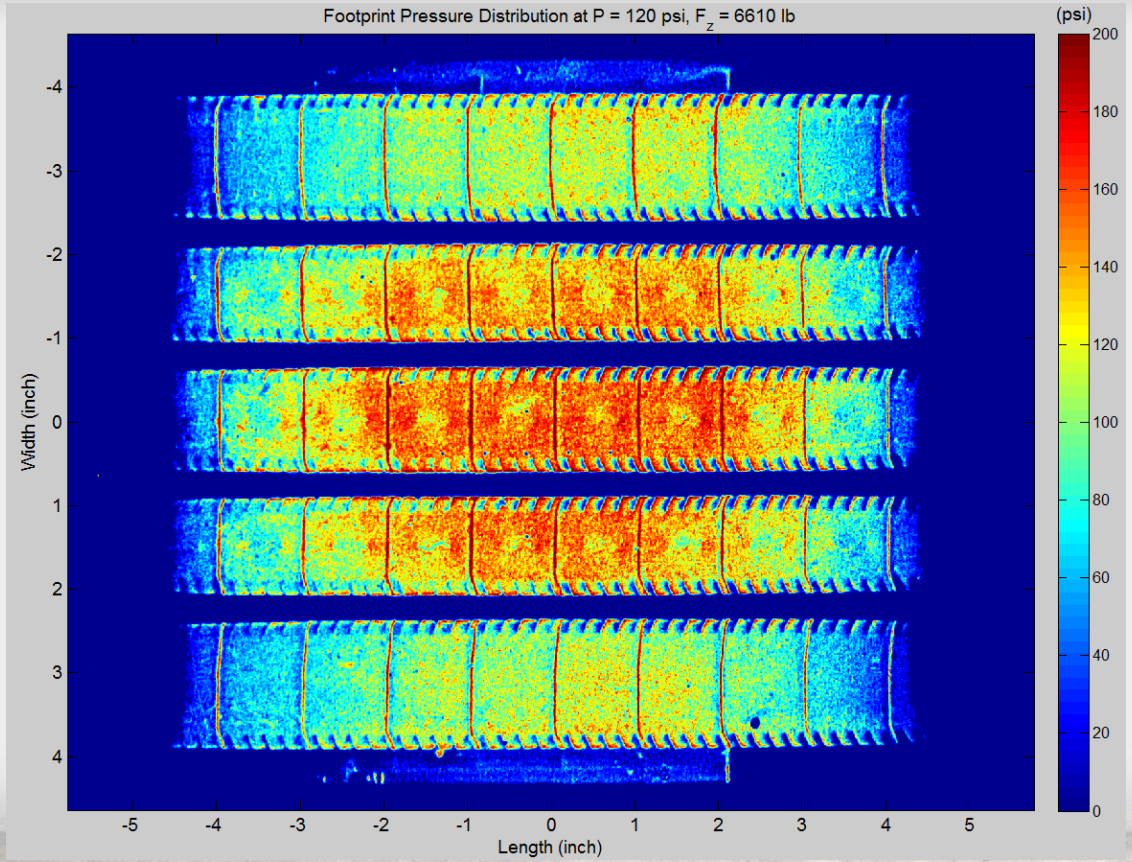
PACCAR & DEALER TMC Technical & Maintenance Conference

Severely Over Inflated

PACCAR & DEALER TMC Technical & Maintenance Conference

Correctly Inflated

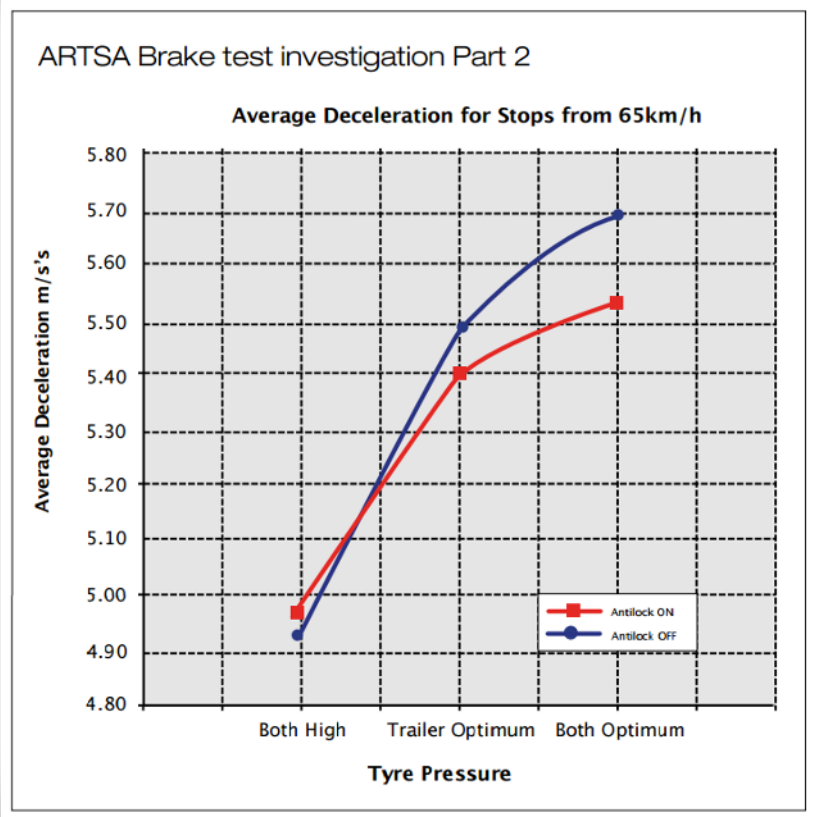
PACCAR & DEALER TMC Technical & Maintenance Conference



It's all about the footprint.

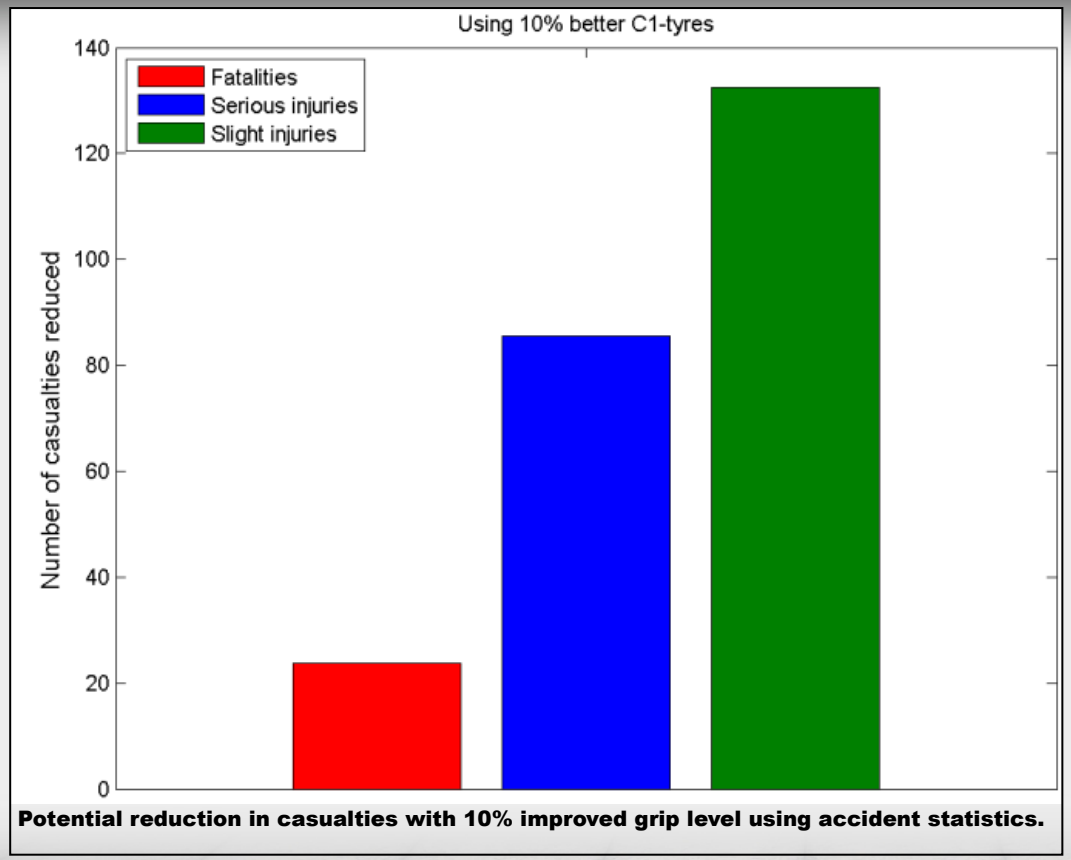
Note uneven load distribution

PACCAR & DEALER TMC Technical & Maintenance Conference



Correctly inflated tyres stop 15% faster.

PACCAR & DEALER TMC Technical & Maintenance Conference



Potential reduction in casualties with 10% improved grip level using accident statistics.

10% better traction saves lives.

3-4% reduction

PACCAR & DEALER TMC Technical & Maintenance Conference

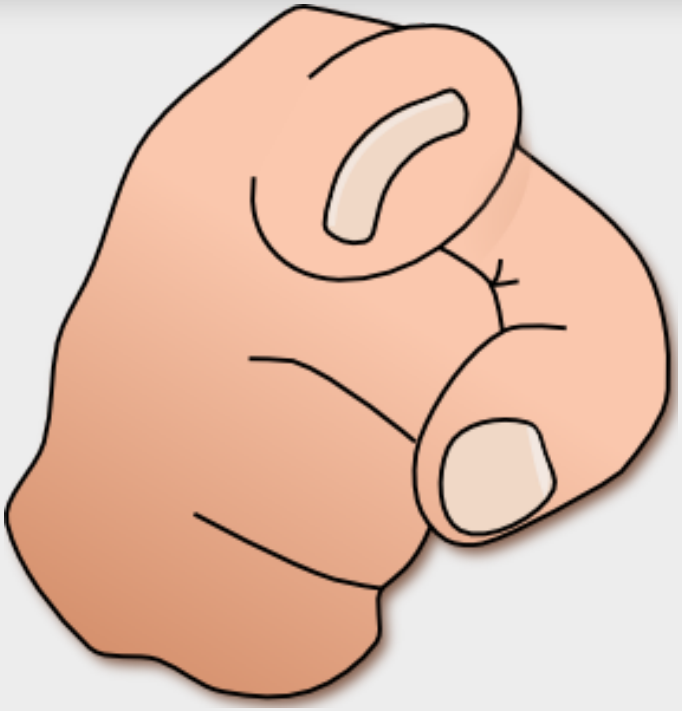
AIR CTI

LOADED FOR TRACTION

PACCAR & DEALER TMC Technical & Maintenance Conference

- Under inflation leads to blow outs, wastes tyres, reduces handling, and wastes fuel
  - Over inflation wastes tyres, damages trucks, drivers, roads, and our world
    - Potential Legal Ramifications are Scary
      - The costs are enormous
    - All because we ignore Manufacturer Recommendations

PACCAR & DEALER TMC Technical & Maintenance Conference



Optimal Tyre Pressure is Up to You

PACCAR & DEALER TMC Technical & Maintenance Conference

Renzo Barone
Meritor

Wheel Bearing Adjustment

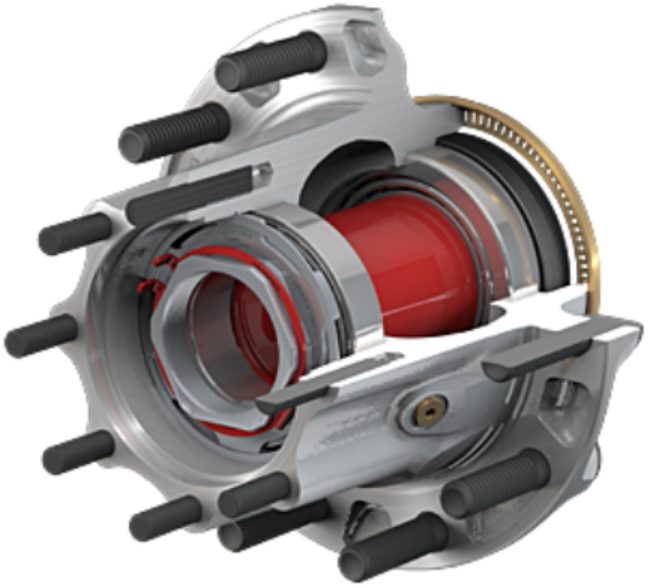
Meritor Wheel Bearing Adjustment

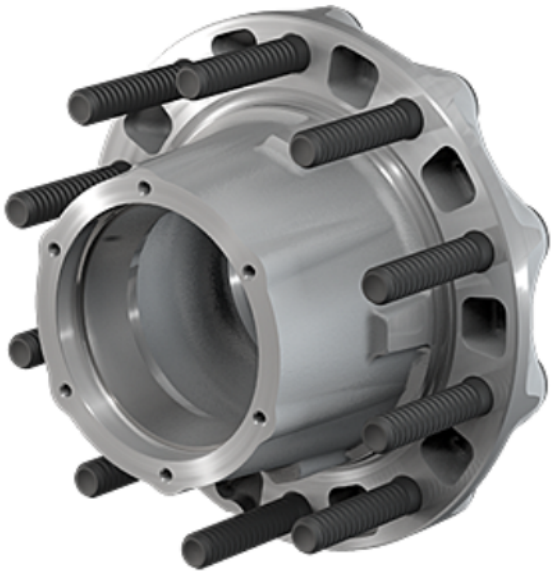
27th October 2015

Renzo Barone

Types of Hubs

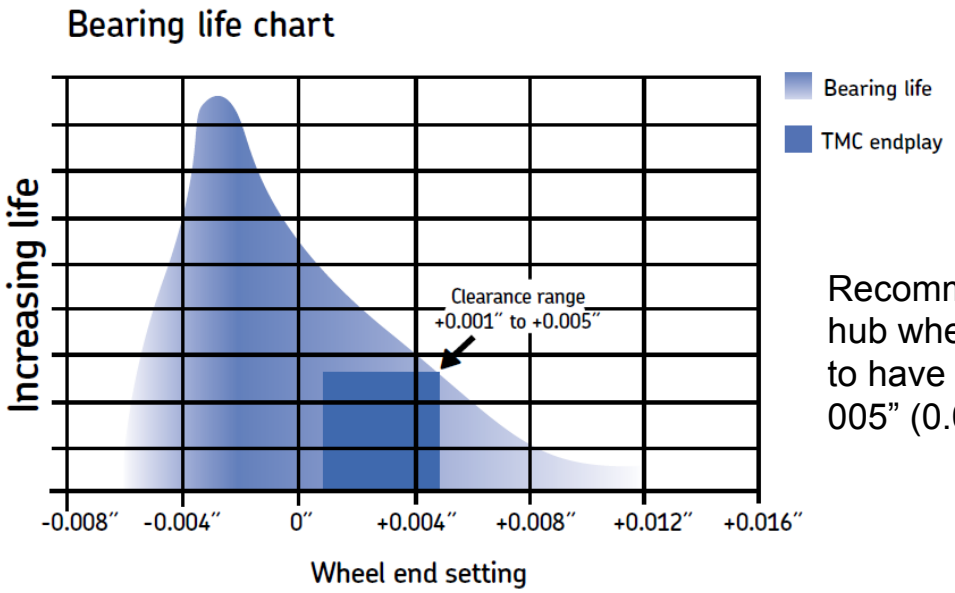
Standard
Hub Assemblies





PreSet ®
Hub Assemblies

Wheel Bearing Life

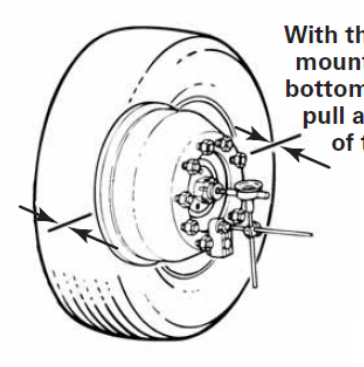


Recommend specification for std hub wheel bearing adjustment is to have endplay of .001” - .005” (0.025 – 0.127mm)

Bearing life drops approx. 40% for a setting of .005” endplay compared to a setting of 0.001”. A primary cause of bearing wear is loose bearings.

Wheel Bearing Adjustment

Use a dial indicator to verify acceptable endplay of .001” - .005” (0.025 - 0.127mm)
If end play is not within specification, readjustment is required
Be sure to install or activate any locking device



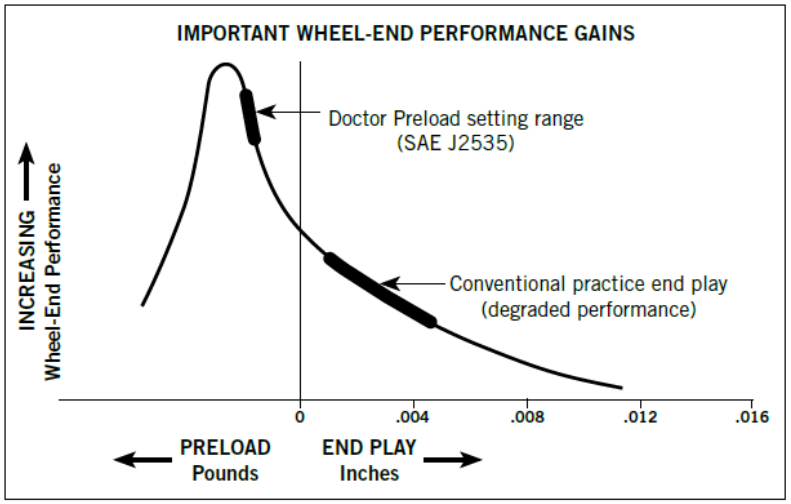
Wheel Bearing Adjustment

MERITOR

Axle Wheel Bearing Installation Specifications

Conventional Wheel-End System					
Axle	Initial Adjusting Nut Torque ①	Final Adjusting Nut Torque ③	Spindle Thread Diameter	Jam Nut Torque Specification	Acceptable End Play Range ③
Drive axles without lock washers	200 lb-ft (272 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/4 turn	Less Than 2-5/8" (66.67 mm) 2-5/8" (66.67 mm) and over	200-300 lb-ft (272-408 N•m) 300-400 lb-ft (408-544 N•m)	0.001"-0.005" (0.025-0.127 mm)
Drive axles with bendable lock washers	200 lb-ft (272 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/4 turn	Less Than 2-5/8" (66.67 mm) 2-5/8" (66.67 mm) and over	100-150 lb-ft (136-204 N•m) 100-200 lb-ft (136-272 N•m)	0.001"-0.005" (0.025-0.127 mm)
Front non-drive steer axles	150 lb-ft (203 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/3 turn for 1-1/8" (28.6 mm), 1-1/2" (38.1 mm) Back off 1/4 turn for 1-3/4" (44.45 mm) and over	1-1/8" (28.6 mm) MFS-06, MFS-07, MFS-08 Over 1-1/8" (28.6 mm), Less Than 2-5/8" (66.67 mm) 2-5/8" (6.67 mm) and over	150-225 lb-ft (203-305 N•m) 200-300 lb-ft (272-408 N•m) 250-400 lb-ft (339-542 N•m)	0.001"-0.005" (0.025-0.127 mm)
Trailer axles	200 lb-ft (272 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/4 turn	2-5/8" (66.67 mm) and over	300-400 lb-ft (408-544 N•m)	0.001"-0.005" (0.025-0.127 mm)

Wheel Bearing Adjustment



Optimal setting for wheel bearings is a light preload.

A setting in which all of the rollers in the tapered roller bearings are kept under a slight force, or load.

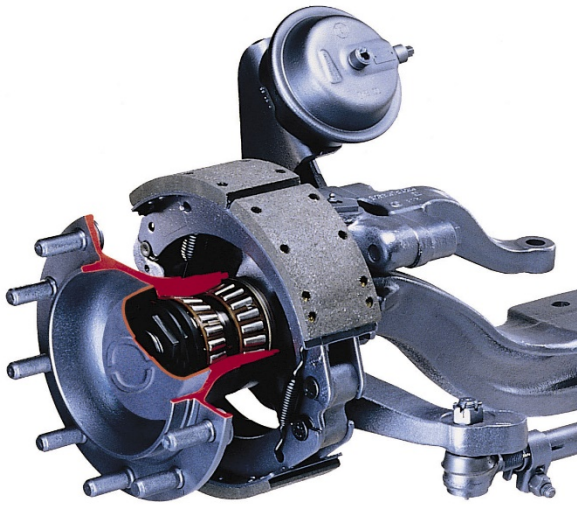
Preload keeps vibration and angular movement in the wheel end to a minimum during operation, reducing potential bearing wear.

Wheel Bearing Adjustment

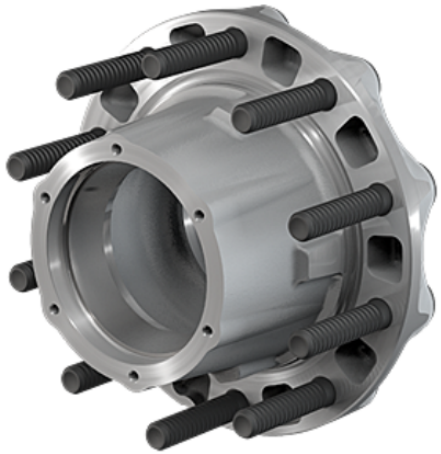
Without preload, there is space, or clearance, between the bearing components and the bearings are said to have end play (also referred to as a loose bearing setting).

Excessive end play can result in extreme wear on bearings, spindles, tyres and wheel seals. It can also cause anti-lock braking system (ABS) faults.

Correctly preloaded wheel bearings do not generate excessive heat.

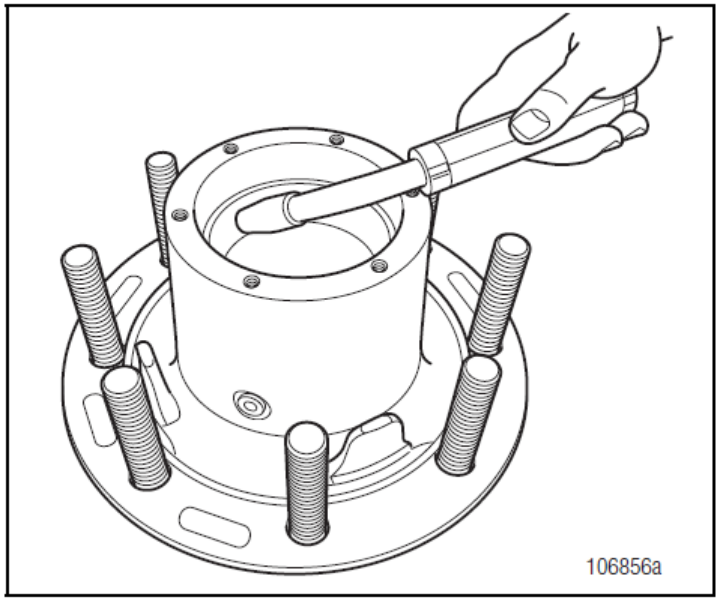


Removing Bearing Cups Aluminium Hub



Welding a large bead around the bearing surface of the steel cup, letting the assembly cool to remove cup. If a welder is not available, heat the hub in an oven to a temperature not to exceed 150°C and press or pound out the cup with a hammer and drift.

Inspect the bearing cup bore for evidence of cup rotation or spun cups. If cup rotation exists, replace the hub.



Installing Bearing Cups Aluminium Hub

Recommended that the hub be heated in boiling water 100° C or in an oven at a temperature not to exceed 150° C.

Cooling the cup in a freezer to 0° C or below will further ease the installation.

Do not overheat the hub as it may degrade the heat-treated strength of the hub.

Do not heat the hub with a torch or open flame.

Remove the aluminium hub from the oven or water and carefully drop in the new bearing cup being certain it is fully seated.

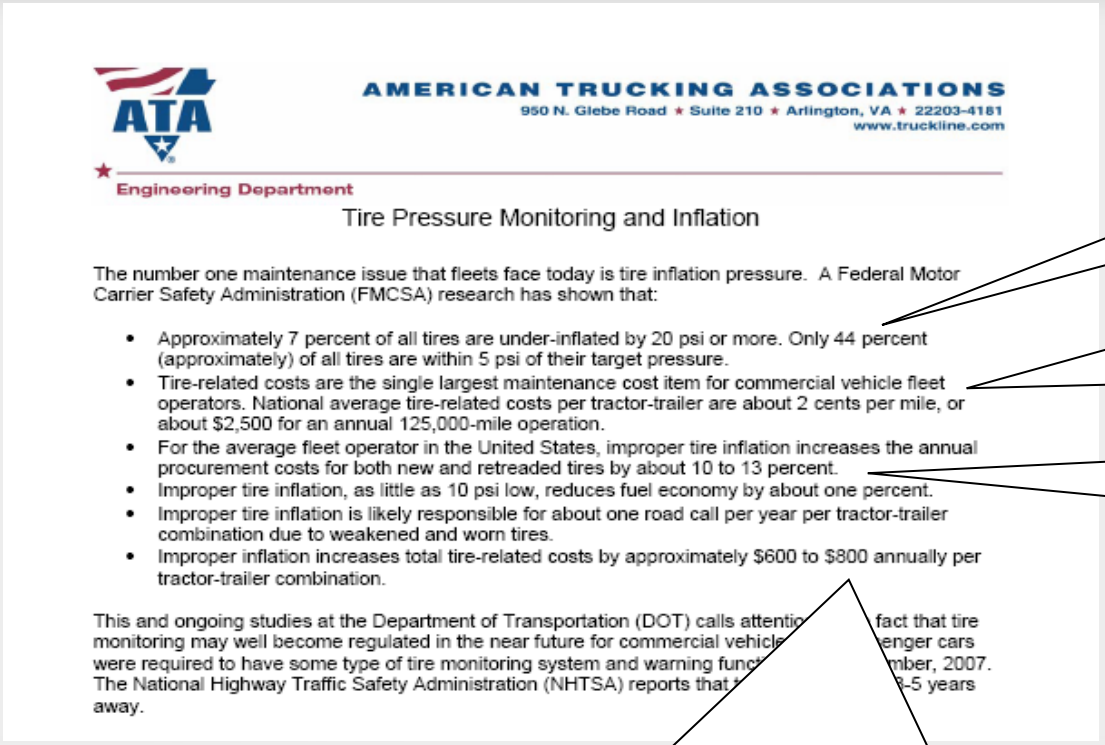
If the cup is loose, allow a few seconds for it to heat up and secure itself before moving the hub.

Use a 0.001″ to 0.002″ feeler gauge to ensure the cup is fully seated against the shoulder of the bearing bore


MERITOR

Tim Ellis
STEMCO Australia

Tyre Pressure Monitoring



AMERICAN TRUCKING ASSOCIATIONS
950 N. Glebe Road ★ Suite 210 ★ Arlington, VA ★ 22203-4181
www.truckline.com

Engineering Department

Tire Pressure Monitoring and Inflation

The number one maintenance issue that fleets face today is tire inflation pressure. A Federal Motor Carrier Safety Administration (FMCSA) research has shown that:

- Approximately 7 percent of all tires are under-inflated by 20 psi or more. Only 44 percent (approximately) of all tires are within 5 psi of their target pressure.
- Tire-related costs are the single largest maintenance cost item for commercial vehicle fleet operators. National average tire-related costs per tractor-trailer are about 2 cents per mile, or about $2,500 for an annual 125,000-mile operation.
- For the average fleet operator in the United States, improper tire inflation increases the annual procurement costs for both new and retreaded tires by about 10 to 13 percent.
- Improper tire inflation, as little as 10 psi low, reduces fuel economy by about one percent.
- Improper tire inflation is likely responsible for about one road call per year per tractor-trailer combination due to weakened and worn tires.
- Improper inflation increases total tire-related costs by approximately $600 to $800 annually per tractor-trailer combination.

This and ongoing studies at the Department of Transportation (DOT) calls attentio fact that tire monitoring may well become regulated in the near future for commercial vehicl enger cars were required to have some type of tire monitoring system and warning funct mber, 2007. The National Highway Traffic Safety Administration (NHTSA) reports that t -5 years away.

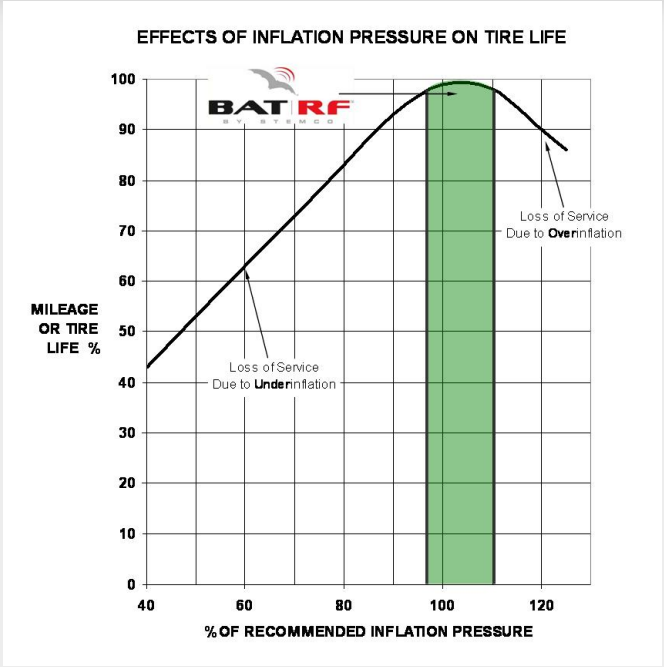
*"Approximately **7% of all tires are under-inflated by 20 psi or more**. Only 44% are within 5 psi of target pressure"*

*"Tire-related costs are the single largest maintenance cost item for commercial vehicle fleet operators… **Cost per tractor-trailer is about 2¢ / mile.**" (2cents per 1.6km)*

*"…**improper tire inflation increases annual procurement costs** for both new and retreaded tires by about **10 to 13%**"*

*"Improper tire inflation **increases tire-related costs by $600-$800 annually** per tractor-trailer."*

PACCAR & DEALER TMC Technical & Maintenance Conference



Correct inflation is the key !

PACCAR & DEALER TMC Technical & Maintenance Conference

Tyre Pressure Considerations:

- Under inflation impact on fuel economy ?
- Inflation pressure that is directly related to tread wear ?
- Time and labour checking tyre pressures ?
- Accuracy of pressure readings and recording ?
- Safety of vehicle ?
- Call out costs from tyre providers ?
- Cost of tyres ?
- Truck and Trailer down time ?

Tyre Pressure Monitoring System (TPMS) Considerations:

- ✓ **Sensors** - Valve mounted / External or Internal mounted sensors
- ✓ **Hoses** - Fill ports / Heavy Duty construction / Fittings / Replacement
- ✓ **Low Limits** - Pre-Set / Changeable
- ✓ **Tyre Pressure** - Equalisation / Each tyre monitored
- ✓ **Low limit Indication** - Visual / In cab / Telematics / EBS / Simple
- ✓ **Applications** - Steer / Drive / Trailer / Road Train / Mountings
- ✓ **Cost** - Entry level / Commercial / Customer Support
- ✓ **Maintenance** - Workshop training / Fleet culture

PACCAR & DEALER TMC Technical & Maintenance Conference

Tyre Pressure Monitoring System Benefits:

- Reduce vehicle maintenance costs
- Increase operational efficiency
- Increase fleet safety

PACCAR & DEALER TMC Technical & Maintenance Conference

PACCAR & DEALER
TMC
Technical & Maintenance Conference

Discussion Time