TYRE AND WHEEL MAINTENANCE

Chair
Bob Woodward – Ron Finemore Transport

Panel members
Darren Wong - Michelin
Michael Nicholls - Alcoa
Chet Cline - Air CTI
Tyres
• Basics
• Importance of tyre selection
• Tyre maintenance, including: pressures (importance and how to determine pressures), fitting and balancing, rotations
• Ultrawide single tyres (X One)
Basics

• What is a tyre?
  - Tyre is the only connection to the ground
  - Holds/contains the air

• Functions of a tyre
  1. Supports the Load
  2. Provides Directional control (Handling, Cornering)
  3. Provides Mobility (Adherence)
  4. Absorbs Shocks (Comfort, Noise)
  5. Lasts with Time (Durability)
IMPORTANCE OF TYRE SELECTION

Choosing the Right Tyre
Three (3) questions that need to be asked

1. What are the Conditions of use?
2. What is the appearance of the tread?
3. What is the tyre mileage of the current fitment?

ANSWER =

• The right tyre for the application
• Lowest cost of ownership
Importance of Tyres

- 3rd in Transport operating costs (after Fuel, Wages)
- Main contributors to Fuel consumption

Tyres = 1/3 of Fuel Usage
TYRE MAINTENANCE

- Pressures
- Fitting
- Balancing
- Rotations
PRESSURES

- Most Critical factor
- Direct impact on
  - Tyre Performance
  - Fuel Economy
  - Casing life
- Pressure depends on the load, speed and condition of use
- Manufacturers provide load/pressure tables

Example:
11 R22.5 X Multi D – Drive 17,000kg
PRESSURE

- Calibrate/ replace gauges regularly
- Requires maintenance, moving & wearing parts!

UNDERINFLATION
Causes abnormal tyre deflection, which builds up heat and causes irregular wear. Similar to the rim being too wide.

OVERINFLATION
Causes tyre to run hard and be more vulnerable to impacts. It also causes irregular wear. Similar to the rim being too narrow.

PROPER INFLATION
The correct profile for full contact with the road promotes traction, braking capability and safety.
FITTING

Important to practise good fitting procedures

- Lubrication
- Cleaning rim
- Cleaning tyre
- Lie flat
- Double inflation

What happen if not fitted correctly
Fitting

How to check if the tyre has seated correctly
Balancing

- Correct balancing reduces vibrations
- Show fitting errors
- Balancing only hides the imbalance. The imbalance is still there!
- Check for excessive runout
  - Lateral
  - Radial
## Stacking of Tolerances

<table>
<thead>
<tr>
<th>Combined Tolerance – Radial run out</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel Bearings</td>
<td>0.13mm</td>
</tr>
<tr>
<td>Hub to Wheel Clearance</td>
<td>0.61mm</td>
</tr>
<tr>
<td>Hub to drum Assembly</td>
<td>0.50mm</td>
</tr>
<tr>
<td>Aluminium Wheel Run out</td>
<td>0.76mm</td>
</tr>
<tr>
<td>Tyre Mis Mount</td>
<td>1.6mm</td>
</tr>
<tr>
<td>Tyre only</td>
<td>0.56mm</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.16mm</strong></td>
</tr>
<tr>
<td>Max. Industry Tolerance</td>
<td>2.4mm</td>
</tr>
<tr>
<td>Difference</td>
<td>1.76mm</td>
</tr>
</tbody>
</table>
Rotations

- Not all tyres on the same axle wear at the same rate
- Important to maximise tyre life
- Minimise irregular wear

• At 50% worn, rotate from left to right. If shoulder wear is present on the tyres, flip the tyre on the rim as well
• As a general rule, the inner tyres of a dual assembly have more pronounced wear on the inside shoulder. This effect is due to several factors: The tyre load, camber angle, type of suspension and route.

• Recommendation
• On boogie Drive rotate front to rear and inside to out when the fastest wearing tyres are at 50% worn
• Rotate tyres with heel and toe wear so they will run opposite to it original direction of rotation
Rotations

- Rotate tyres between faster and slower wearing axles when tyres are 50% worn – swap inside to outside positions.
- If inside shoulder wear is present rotate the tyre on the rim to minimize additional tyre wear

### Tri Axle Wear Rate

<table>
<thead>
<tr>
<th>Axle</th>
<th>Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75%</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>60%</td>
</tr>
</tbody>
</table>

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**3 Axle Semi-Trailer**

1. All new
2. At 50% worn: Rotate between axle 2 & 3
3. At 3-4 mm RTD: Regroove 2nd axle
4. Renewal 3rd axle
Reasons to Convert

1. Save Fuel
2. More Payload
3. Drivers Love ’em
4. Minimized Downtime
5. Increased Productivity
6. Be “Green”
Michelin X One®

1. Save Fuel
   - Up to 10% reduction in fuel consumption
   - 2 sidewalls instead of 4
   - Advanced tread and casing technology

2. More Payload
   - Up to 40kg per position saving
   - More when moving from steel rims
   - B Double Trailer 500kg saving!
Michelin X One

4

Save Time

- One tyre to check instead of two
- Only one tyre to mount instead of two
- Fewer Flats on the road
Michelin X One®

- Longer Brake List
  - Due to the outset of the wheel that goes with the MICHELIN® X One® Tyres, more brake drum is exposed. Providing greater flow around the brake drum.

  Allows the brakes to run cooler

Fleets have reported longer brake life
OPTIMIZE YOUR TYRE PRESSURES
CHET CLINE    AIR CTI
TYRE PRESSURE CONTROLS THE FOOTPRINT
The optimal footprint is important. It’s dimensions are specific: An 11R22.5 footprint at 7,727 kg is 204 mm long. Imagine how small it is when unloaded.

<table>
<thead>
<tr>
<th>TIRE</th>
<th>AXLE LOAD (lbs)</th>
<th>PRESS (psi)</th>
<th>LOADED SECTION WIDTH</th>
<th>FOOTPRINT LENGTH</th>
<th>FOOTPRINT WIDTH</th>
<th>TOTAL FOOTPRINT AREA</th>
<th>CONTACT SURFACE RATIO</th>
<th>% OF 2 DUALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>445/50R22.5 X One XDA</td>
<td>17,000</td>
<td>105</td>
<td>459</td>
<td>201</td>
<td>376</td>
<td>69,400</td>
<td>0.686</td>
<td>0.98</td>
</tr>
<tr>
<td>275/80R22.5 XDA2</td>
<td>17,000</td>
<td>105</td>
<td>297</td>
<td>200</td>
<td>216</td>
<td>39,450</td>
<td>0.616</td>
<td>0.95</td>
</tr>
<tr>
<td>455/55R22.5 X One® XDA-HT™</td>
<td>17,000</td>
<td>100</td>
<td>472</td>
<td>227</td>
<td>385</td>
<td>74,350</td>
<td>0.697</td>
<td>0.95</td>
</tr>
<tr>
<td>11R22.5 XDA-HT™</td>
<td>17,000</td>
<td>100</td>
<td>304</td>
<td>204</td>
<td>216</td>
<td>41,250</td>
<td>0.674</td>
<td>0.95</td>
</tr>
<tr>
<td>275/80R24.5 XDA-HT</td>
<td>17,000</td>
<td>100</td>
<td>298</td>
<td>206</td>
<td>215</td>
<td>40,750</td>
<td>0.670</td>
<td>0.95</td>
</tr>
</tbody>
</table>
5.9 Bar = 85 psi   3.4 Bar = 49 psi
The Optimum pressure depends upon the load

<table>
<thead>
<tr>
<th>Charge par enveloppe</th>
<th>Vitesse - Speed (Km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load per tire (Kg)</td>
<td>130        120    110  100</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Nominal route</td>
<td>2650</td>
</tr>
<tr>
<td>Nominal road conditions</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>2250</td>
</tr>
<tr>
<td></td>
<td>2000</td>
</tr>
<tr>
<td></td>
<td>1750</td>
</tr>
<tr>
<td></td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>1250</td>
</tr>
</tbody>
</table>
When the load changes, the ideal tyre pressure changes

Recommended Cold Tyre Pressure Load to Inflation Table

| Table of Inflation Pressure (bar) in relation to maximum load per axle (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 58 | 62 | 65 | 69 | 73 | 76 | 80 | 83 | 87 | 91 | 95 | 98 | 102 | 105 | 109 | 112 | 116 | 120 | 124 |
| 3.75 | 4.00 | 4.25 | 4.50 | 4.75 | 5.00 | 5.25 | 5.50 | 5.75 | 6.00 | 6.25 | 6.50 | 6.75 | 7.00 | 7.25 | 7.50 | 7.75 | 8.00 | 8.25 | 8.50 |

**11R single tyre axle load**

| 4140 | 4320 | 4500 | 4680 | 4860 | 5040 | 5220 | 5400 | 5580 | 5760 | 5940 | 6120 | 6300 |

**11R dual tyre axle load**

| 7620 | 7950 | 8290 | 8620 | 8950 | 9280 | 9610 | 9940 | 10270 | 10610 | 10940 | 11270 | 11600 |
Michelin Second Most important point is: 
Put in the right pressure for the load

9 KEY POINTS FOR OPTIMUM TYRE MANAGEMENT

• Choose the right tyre for the right job: select the correct tyre and fitment according to vehicle type and operating requirements, whether for replacement or specification on new vehicles
• **Inflate your tyres in relation with load per axle and tyre sizes**
• Monitor regularly the wear and general condition of your tyres (tread pattern, sidewall, wheels etc.) and inflation pressure
• Utilise the Michelin multi-life casing New/Regrooving/Retreading
• Regroove to increase tread depth and mileage by as much as 25% with increased safe
• Retread Michelin casings with Michelin technology
• Manage potential life of casing for further retreading
• Choose Michelin Retreading tread patterns depending on your needs
• The benefit of Michelin Retreading is the quality and performance which is similar to a new Tyre
Mileage loss of a drive tyre on Aussie roads (Michelin)
Change the tyre pressure for different roads

### 11R22.5 Recommendations

<table>
<thead>
<tr>
<th></th>
<th>Charge Kg</th>
<th>Vitesse Km/h</th>
<th>Pression bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation route - Road use</td>
<td>2650</td>
<td>100</td>
<td>8.0</td>
</tr>
<tr>
<td>Utilisation piste - Track use</td>
<td>1700</td>
<td>65</td>
<td>3.1</td>
</tr>
<tr>
<td>Utilisation sable/boue - Sand/mud use</td>
<td>1700</td>
<td>20</td>
<td>1.7</td>
</tr>
<tr>
<td>Utilisation en jumelé - Dual fitment use</td>
<td>2650</td>
<td>100</td>
<td>8.0</td>
</tr>
</tbody>
</table>
There is one ideal tyre footprint for each tyre

This is an 11R22.5 Michelin tyre spec

<table>
<thead>
<tr>
<th>EMPREINTE AU SOL - GROUND CONTACT AREA*</th>
<th>Longueur-Length: 240 mm</th>
<th>Surface totale-Total area: 427 cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Largeur-Width</td>
<td>184 mm</td>
<td>Surface réelle-Net area: 365 cm²</td>
</tr>
</tbody>
</table>

* AUX CONDITIONS NOMINALES ROUTE - FOR NOMINAL ROAD CONDITIONS
This chart is for a single tyre, like a typical steer tyre. Dual tyres need higher pressures for the same load. This is recommended pressures at different loads.

<table>
<thead>
<tr>
<th>Nominal route</th>
<th>11R22.5 SINGLE TYRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3150</td>
<td>116 psi</td>
</tr>
<tr>
<td>3000</td>
<td>116 psi</td>
</tr>
<tr>
<td>2750</td>
<td>110 psi</td>
</tr>
<tr>
<td>2500</td>
<td>110 psi</td>
</tr>
<tr>
<td>2250</td>
<td>110 psi</td>
</tr>
<tr>
<td>2050</td>
<td>71 psi</td>
</tr>
<tr>
<td>2000</td>
<td>71 psi</td>
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<td>1750</td>
<td>71 psi</td>
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<tr>
<td>1500</td>
<td>71 psi</td>
</tr>
<tr>
<td>1250</td>
<td>71 psi</td>
</tr>
<tr>
<td>1000</td>
<td>29 psi</td>
</tr>
</tbody>
</table>

Charge par enveloppe (Load per tire (Kg))

<table>
<thead>
<tr>
<th>130</th>
<th>120</th>
<th>110</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0</td>
<td>8.0</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td>7.6</td>
<td>7.6</td>
<td>6.9</td>
<td>6.9</td>
</tr>
<tr>
<td>6.9</td>
<td>6.9</td>
<td>6.2</td>
<td>6.2</td>
</tr>
<tr>
<td>6.2</td>
<td>6.2</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>5.5</td>
<td>5.5</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>4.9</td>
<td>4.9</td>
<td>4.8</td>
<td>4.8</td>
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<tr>
<td>4.8</td>
<td>4.8</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td>4.1</td>
<td>4.1</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>3.4</td>
<td>3.4</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>2.7</td>
<td>2.7</td>
<td>2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>
NO FLAT SPOT

THIS TINY FOOTPRINT IS DANGEROUS

THIS TYRE IS SEVERELY OVER INFLATED!
THIS TYRE IS EVEN WORSE
THIS TYRE IS SEVERELY OVER INFLATED!
These tyres are severely over inflated

Use all of your rubber
Note the flat spot
This is closer to correct pressure for the load
NOTE THE FLAT SPOT
THIS IS HOW EVERY TYRE SHOULD LOOK WHEN COLD
DOES IT MATTER?
OVER INFLATION AGGRAVATES OR CAUSES ALL UNEVEN WEAR PATTERNS
OVER INFLATED TYRES CAUSE VERY HIGH LOADS ONTO SHARP ROCKS DAMAGING TYRES AND GET 60% MORE PUNCTURES AND STAKING.
OVER INFLATED TYRES ON GRAVEL ROADS SUFFER
WOULD YOU RUN 100 PSI IN THESE TYRES?
THESE DRIVE TYRES HAVE LESS WEIGHT ON EACH TYRE THAN YOUR FALCON. IT SHOULD HAVE 25 PSI.
LOWER PRESSURES FOR SOFT GROUND ARE SUPERB
Thank you for letting me rave on.

Chet Cline
AIR CTI
www.aircti.com

Aussie Made, World’s Best
Central Tyre Inflation
Wheels

• Rims
• Different wheels on different trucks
• Different types of wheels and interchangeability
• Which nuts to use
• What to look out for
WHEEL SIZES

- 10/285. 22.5x8.25. US Fitment
- 10/335. 22.5x8.25. European Fitment

- Most commonly used wheel sizes in both Truck and Trailer fitment
10/285 US FITMENT

- 26mm Stud Holes
- Long wheel studs used
- Conventional wheel nut used
- Commonly used on Kenworth, Mack, Western Star, Freightliner
10/335 EUROPEAN

- 26mm stud holes
- Long wheel studs used
- Conventional wheel nut used
- Commonly used on Scania, Mercedes, Iveco
10/335 EUROPEAN RETROFIT

- 32mm stud holes
- Used on trucks and trailers with short wheel studs.
- Tube nut used or retrofit nut
- Tube size differs from single wheel to dual wheel
10/335 VOLVO FITMENT

- 26mm internal, 30mm external stud holes
- To be used only on Volvo trucks
- Special Volvo nut
- Wheel nut does nut differ from single wheel to dual wheel
# WHEEL MARKINGS

<table>
<thead>
<tr>
<th>Wheel Decal</th>
<th>Wheel Roll Stamp</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="ALCOA Decal" /></td>
<td><img src="image2" alt="Wheels Roll Stamp" /></td>
<td>Lvl ONE® Wheels 883677</td>
</tr>
<tr>
<td><img src="image3" alt="ALCOA Decal" /></td>
<td><img src="image4" alt="Wheels Roll Stamp" /></td>
<td>Polished Wheels 883672 883671</td>
</tr>
<tr>
<td><img src="image5" alt="ALCOA Decal" /></td>
<td><img src="image6" alt="Wheels Roll Stamp" /></td>
<td>Dura-Bright® EVO Wheels 883672DB 883671DB</td>
</tr>
</tbody>
</table>
# Wheel Markings

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<th>Wheel Decal</th>
<th>Wheel Roll Stamp</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALCOA</td>
<td>ALCOA FORGED, MAX LOAD 33,556 kg (74,000 lb), MAX P.</td>
<td>ULTRA ONE™ Wheels</td>
</tr>
<tr>
<td></td>
<td>U.S.A., C6.9714, PART NO ULTRA2</td>
<td>ULTRA2</td>
</tr>
<tr>
<td></td>
<td>22.3 x 0.25, PART NO ULTRA2</td>
<td>ULTRA1</td>
</tr>
<tr>
<td></td>
<td>ALCOA FORGED, MAX LOAD 33,556 kg (74,000 lb), MAX P.</td>
<td>ULTRA7</td>
</tr>
<tr>
<td>ALCOA</td>
<td>ALCOA FORGED, MAX LOAD 33,556 kg (74,000 lb), MAX P.</td>
<td>ULTRA ONE™ Dura-Bright® XBR</td>
</tr>
<tr>
<td></td>
<td>U.S.A., C6.9714, PART NO ULTRA2</td>
<td>ULTRA2DB</td>
</tr>
<tr>
<td></td>
<td>22.3 x 0.25, PART NO ULTRA2</td>
<td>ULTRA1DB</td>
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<td>ALCOA FORGED, MAX LOAD 33,556 kg (74,000 lb), MAX P.</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
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DAMAGED WHEELS
Chair
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