New technology to improve your bottom line
<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chris Loose</td>
<td>Daimler Trucks</td>
<td>Engine servicing</td>
</tr>
<tr>
<td>Alan Sutton</td>
<td>Goodyear and Dunlop</td>
<td>Retreading</td>
</tr>
<tr>
<td>Peter Heatley</td>
<td>Michelin</td>
<td>Fuel efficient tyres</td>
</tr>
<tr>
<td>Chet Cline</td>
<td>AIR CTI</td>
<td>Tyre pressure</td>
</tr>
<tr>
<td>Colin White</td>
<td>Isuzu</td>
<td>Aerodynamics</td>
</tr>
</tbody>
</table>
Engine servicing

Chris Loose – Daimler Trucks
Detroit Series 60, 1987
### Australian Road Transport Suppliers Association

**DDEC Reports - Monthly Activity #1**

**Print Date:** Mar 28, 2012 03:56 PM (AEST/EDT)

- **Driver ID:** 188491, 1 km
- **Odometer:** 188491, 1 km

#### Distance
- **Distance:** 22747.5 km
- **Fuel:** 14682.00 L
- **Fuel Economy:** 1.44 km/L
- **Avg Drive Load:** 51%
- **Avg Vehicle Speed:** 85.8 km/h

#### Time
- **Time:** 270:01:01
- **Fuel Consumption:** 55.04 L/h
- **Idle Time:** 16:41:18
- **Idle Percent:** 6.18%
- **Idle Fuel:** 43.53 L
- **Parked Regen Time:** 0:00:00

#### Driving Time
- **Driving Time:** 253:19:43
- **Driving Percent:** 93.82%
- **Driving Fuel:** 14681.47 L
- **Driving Economy:** 1.47 km/L

#### Vehicle Speed Limiting
- **Time:** 130:05:31
- **Percent:** 51.35%
- **Distance:** 12984.8 km
- **Fuel:** 6641.98 L

#### Top Gear
- **Time:** 184:32:46
- **Percent:** 72.85%
- **Distance:** 17936.1 km
- **Fuel:** 10687.64 L

#### Top Gear - 1
- **Time:** 17:34:39
- **Percent:** 6.94%
- **Distance:** 1403.1 km
- **Fuel:** 1353.28 L

#### Cruise
- **Time:** 130:06:23
- **Percent:** 51.36%
- **Distance:** 12563.2 km
- **Fuel:** 8706.92 L

#### Top Gear Cruise
- **Time:** 117:22:38
- **Percent:** 46.33%
- **Distance:** 11604.2 km
- **Fuel:** 7927.23 L

#### Speeding A (>10 km/h and <114 km/h)
- **Count:** 213
- **Time:** 0:30:23
- **Percent:** 0.20%

#### Speeding B (>114 km/h)
- **Count:** 0
- **Time:** 0:00:00
- **Percent:** 0.00%

#### Highest Speed
- **Occurred:** 03/11/12 11:09:51 (EST)
- **311.8 km/h

#### Coasting Time
- **Time:** 0:00:00
- **Percent:** 0.00%

#### Predictive Cruise Control
- **Time:** 0:00:00
- **Percent:** 0.00%

#### Over Rev Limit
- **Time:** 03/07/12 18:00 rpm
- **Count:** 03/07/12 18:00 rpm
- **Percent:** 0.92%

#### Highest RPM
- **Occurred:** 03/07/12 10:04:53 (EST)
- **2365 rpm

#### Diagn. Records
- **Count:** 22
- **Hard Brake Count:** 1
- **Firm Brake Count:** 98
- **Brake Count:** 8683
- **Eng. Brake Time:** 21:00:58

#### Optimized Idle Time
- **Active:** 0:00:00
- **Run:** 0:00:00
- **Battery:** 0:00:00
- **Engine Temp.:** 0:00:00
- **Thermostat:** 0:00:00
- **Extended Idle:** 0:00:00
- **Continuous:** 0:00:00

#### Optimized Idle Battery Charging Starts
- **Normal Count:** 0
- **Alternate Count:** 0
- **Continuous Run:** 0

#### Engine On Time
- **Total Time:** 6:07:03
- **Engine System:** 6:00:23
- **Manual:** 0:05:33
- **A/C:** 0:01:07
- **DPF Fan Time:** 0:00:00

#### Engine Utilization
- **40.70%**

#### Vehicle Utilization
- **38.10%**

#### DPF Regeneration
- **Parked Completed:** 0
- **Driving Completed:** 50
- **Parked Regen Fuel:** 0.00 L
- **Parked Regen Time:** 0:00:00
MB Acrtos, 1995
Intelligent Management of Service Intervals

Distance – 30,000 km
Hours – 600 hours
Fuel Burn – 10,500 litres

Or by need
Virtual Technician

- Remote engine diagnosis
- Alerts of check engine events
- Call Center Support
- Detailed resolution
- Visibility
- Track & trace
- Mileage Reporting
- Alerts reporting
Real Time Data is Analyzed, Corrective Action Determined
Future
Retreading

Alan Sutton – Goodyear and Dunlop
Retreading:
Making tyres last longer.....
Tyres in the Transport Industry

- New tyre costs increasing
  - Raw material costs
  - Regulatory requirements (EU tyre labelling)
  - New technology costs
  - Use and discard may become more and more expensive

- Environmental
  - Increasing environmental protection demands
  - Cost and limitations to landfill
Environmental impact of Tyres

Energy Used in Manufacture:
- For ONE tyre 85 Litres of Oil (in material) and 310 kgs. of “Greenhouse gas” generated
- Power consumed in manufacturing
- Raw material transport

Distribution:
- International shipping / Transport within Australia

Disposal:
- Australians generate ~170,000 tonnes of waste tyres per year
- Half of these end up in landfill (Equivalent to 6 million car tyres!)
Retread Benefits

Around half the price of many premium tyres

Uses 2/3's less oil compared to making a new tyre.

Landfill reduced

Many industry developments:

- New Patterns / Compounds / Processes

Strong local Industry manufacturers:

- Example Goodyear / Michelin / Bridgestone (Bandag)

- Reduced transport inputs

- Jobs
New Tyre Construction

Quality truck tyres are designed to last for more than one tread life…
The Reputation of Retreads

People often think tyre remnants at the roadside are failed retreads - this is incorrect.

Analysis of 2,200 tyres failed tyres done by independent experts for the USA Truck Association.

Most often retread had not failed!

- Belt Separations (Main cause: under-inflation)
- Manufacturing Issues (Incl. Retreading)
- Poor tyre repairs
Retreads retain their strength

Retread Strength / Fatigue Testing done by a USA State Department of Transport:

• Plunger Casing strength / fatigue test
  - Burst test to evaluate casing fatigue.

Both tests, retreaded tyres:

• Exceeded legal requirements
  - Were similar to new tyre test results.

Typical pressure range in service:

Plunger Test

Pressure range required to ‘burst’ retreads in test
Tips in using retreads....

**Buy premium quality new tyres**
- Use your OWN casings
- Brand your tyres (or RFID chip) for ID

**Maintain new tyres for retreading.**
- Regular pressure / tread-depth checks
- Inner duals have valve extensions
- Inspect regularly / remove tyres for retreading ‘on time’

**Buy Premium Retreads.**
- New designs and compounds good for durability / Treadwear
- Low Rolling resistance / Wet grip – To Meet “Tyre Labelling Scheme” in Europe

**Don’t retread tyres :**
- When they have been run underinflated for a long or unknown time
- Damaged from impacts with kerbs / stones badly drilled into the tread
- You don’t know the history of.
- Without discussing with your tyre supplier technical rep. to get the correct retread
Fuel Efficient Tyres

Peter Heatley - Michelin
Fuel Efficient Tyres

Should the question be fuel prices are rising how do I manage my costs?

All companies in the field of transport confirm: "The rise in fuel prices systematically weighs on company operating accounts" as fuel, on average, represents between 18 to 24% of company spending.

From all of the factors influencing fuel consumption, one third of all full tanks are directly absorbed by the rolling resistance of tyres used on motorways.
## Rolling resistance areas

<table>
<thead>
<tr>
<th>Line haul operation</th>
<th>Regional operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle/Deceleration – 5 %</td>
<td>Idle/Deceleration – 7 %</td>
</tr>
<tr>
<td>Inertia (brakes) – 12.5%</td>
<td>Inertia (brakes) – 31.5%</td>
</tr>
<tr>
<td>Drive train losses – 4 %</td>
<td>Drive train losses – 5.5%</td>
</tr>
<tr>
<td>Accessories – 5.5%</td>
<td>Accessories – 7%</td>
</tr>
<tr>
<td>Aerodynamics – 38%</td>
<td>Aerodynamics – 25%</td>
</tr>
<tr>
<td>Tyre RR – 35%</td>
<td>Tyre RR – 25%</td>
</tr>
</tbody>
</table>
The way that Manufacturers manage the reduction of the rolling resistance is always taking in account the 2 main performances: **mileage** and **grip**

It’s very easy for any tyre maker to get in his catalogue a low rolling resistance tyre, but more difficult for them to be competitive in mileage or adherence.

The only performance that energy tyres cannot meet is on/off road conditions because the compound cannot resist aggression and tear off damages.
Tyre pressure

Chet Cline – AIR CTI
Almost ALL Truck Tyres are Over Inflated, or Under Inflated
The black tread is the correct footprint size for a standard 11R 22.5. (16.5 tonne on tandem axles)
The Red footprint is the same tyre, with the legal load removed. (with 4 tonne load on tandem axles)
### Influence of Pressure on Tyre Mileage

**Michelin**

- **25% - 20%**
- **-10%**
- **0**
- **+10%**

**20% under-inflation: 19% mileage loss**

**20% over-inflation: 22% mileage loss**

<table>
<thead>
<tr>
<th>Max Speed Rating (MPH)</th>
<th>Single (S)</th>
<th>Dual (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>3370</td>
<td>3270</td>
</tr>
<tr>
<td></td>
<td>3560</td>
<td>3410</td>
</tr>
<tr>
<td></td>
<td>3730</td>
<td>3550</td>
</tr>
<tr>
<td></td>
<td>3890</td>
<td>3690</td>
</tr>
<tr>
<td></td>
<td>4080</td>
<td>3860</td>
</tr>
<tr>
<td></td>
<td>4235</td>
<td>4005</td>
</tr>
<tr>
<td></td>
<td>4390</td>
<td>4150</td>
</tr>
<tr>
<td></td>
<td>4540(F)</td>
<td>4300(F)</td>
</tr>
<tr>
<td>65</td>
<td>4080</td>
<td>3860</td>
</tr>
<tr>
<td></td>
<td>4280</td>
<td>4045</td>
</tr>
<tr>
<td></td>
<td>4480</td>
<td>4230</td>
</tr>
<tr>
<td></td>
<td>4675</td>
<td>4410</td>
</tr>
<tr>
<td></td>
<td>4850</td>
<td>4585</td>
</tr>
<tr>
<td></td>
<td>5025</td>
<td>4760</td>
</tr>
<tr>
<td></td>
<td>5205(F)</td>
<td>4940(F)</td>
</tr>
<tr>
<td>75</td>
<td>4530</td>
<td>4380</td>
</tr>
<tr>
<td></td>
<td>4770</td>
<td>4580</td>
</tr>
<tr>
<td></td>
<td>4990</td>
<td>4760</td>
</tr>
<tr>
<td></td>
<td>5220</td>
<td>4950</td>
</tr>
<tr>
<td></td>
<td>5510</td>
<td>5205</td>
</tr>
<tr>
<td></td>
<td>5730</td>
<td>5415</td>
</tr>
<tr>
<td></td>
<td>5960</td>
<td>5625</td>
</tr>
<tr>
<td></td>
<td>6175(G)</td>
<td>5840(Q)</td>
</tr>
<tr>
<td></td>
<td>6320</td>
<td>5985</td>
</tr>
<tr>
<td></td>
<td>6465</td>
<td>6005</td>
</tr>
<tr>
<td></td>
<td>6610(H)</td>
<td>6005(H)</td>
</tr>
<tr>
<td>75</td>
<td>4940</td>
<td>4780</td>
</tr>
<tr>
<td></td>
<td>5200</td>
<td>4990</td>
</tr>
<tr>
<td></td>
<td>5450</td>
<td>5190</td>
</tr>
<tr>
<td></td>
<td>5690</td>
<td>5390</td>
</tr>
<tr>
<td></td>
<td>6005</td>
<td>5675</td>
</tr>
<tr>
<td></td>
<td>6205</td>
<td>5785</td>
</tr>
<tr>
<td></td>
<td>6405</td>
<td>5895</td>
</tr>
<tr>
<td></td>
<td>6610</td>
<td>6005</td>
</tr>
<tr>
<td></td>
<td>6870</td>
<td>6265</td>
</tr>
<tr>
<td></td>
<td>7130</td>
<td>6625</td>
</tr>
<tr>
<td></td>
<td>7390(H)</td>
<td>6780(H)</td>
</tr>
<tr>
<td>75</td>
<td>3470</td>
<td>3260</td>
</tr>
<tr>
<td></td>
<td>3645</td>
<td>3425</td>
</tr>
<tr>
<td></td>
<td>3860</td>
<td>3640</td>
</tr>
<tr>
<td></td>
<td>3980</td>
<td>3740</td>
</tr>
<tr>
<td></td>
<td>4140</td>
<td>3900</td>
</tr>
<tr>
<td></td>
<td>4300</td>
<td>4080</td>
</tr>
<tr>
<td></td>
<td>4455</td>
<td>4190</td>
</tr>
<tr>
<td></td>
<td>4610</td>
<td>4335</td>
</tr>
<tr>
<td></td>
<td>4675(Q)</td>
<td>4410(Q)</td>
</tr>
</tbody>
</table>
$$$$$$
Health Safety

AIR CTI Making Life Better
Aerodynamics

Colin White - Isuzu
Aerodynamics

• Why bother with aerodynamic improvements
  • Aero losses are a major part of truck power requirements
  • Fuel economy
Where Does My Fuel Go?

Power Losses: Semi-trailer

- U = Unladen 15t
- L = Laden 42t
- Engine: 450Hp

<table>
<thead>
<tr>
<th>Speed (km/h)</th>
<th>% Max Engine Power</th>
<th>Drivetrain Losses</th>
<th>Engine Auxiliaries</th>
<th>Tyre Losses</th>
<th>Aero</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Drivetrain Losses
- Engine Auxiliaries
- Tyre Losses
- Aero
Where Does My Fuel Go?

Power Losses: B-Double

- U = Unladen 22t
- L = Laden 68t
- Engine: 600Hp

% Max Engine Power

<table>
<thead>
<tr>
<th>Speed (km/h)</th>
<th>L</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>L</td>
<td>U</td>
</tr>
<tr>
<td>75</td>
<td>L</td>
<td>U</td>
</tr>
<tr>
<td>95</td>
<td>L</td>
<td>U</td>
</tr>
<tr>
<td>100</td>
<td>U</td>
<td>L</td>
</tr>
</tbody>
</table>

- Drivetrain Losses
- Engine Auxiliaries
- Tyre Losses
- Aero
Where Does My Fuel Go?

Power Losses: Medium Van

- U = Unladen 6t
- L = Laden 15t
- Engine: 300Hp

% Max Engine Power vs Speed (km/h)

- Drivetrain Losses
- Engine Auxiliaries
- Tyre Losses
- Aero

Speed (km/h): 60, 75, 95, 100
Aerodynamic Effects

- Manufacturers always strive for more efficiency.
- New cabin shape improves fuel consumption by reducing drag co-efficient.
Aerodynamics and You

• What can the operator control?

• Body Type and Size
• Operating speeds
• Aerodynamic configuration
Aerodynamics and You

- Body Type and Location
  - What size body do you need?
  - Frontal Area has direct first order relationship to fuel consumption
- Example of same spec truck with 33% greater frontal area:
Body Size Impact

Rigid Truck 22.5 t - 2.5m x 3.0m High

128 kW @ 100 km/h
Body Size Impact

Rigid Truck 22.5 t - 2.5m x 4.0m High

159 kW @ 100 km/h

Extra 31 kw required
24% greater power required.

24% more fuel consumption
Body Size Impact

- **Body Type and Location**
  - What size body do you need?
  - Frontal Area has direct first order relationship to fuel consumption
- **Example of same spec truck with 33% greater frontal area:**
  - 24% greater fuel consumption
- **Make sure the body is no bigger than you need**
  - Do you need a full height body?
  - Do you need a full width (2.5m) body?
Impact of Speed

• Operating Speeds

Aero drag increases in proportion to speed cubed.

Drag = Cd x km/h^3
Impact of Speed

Rigid Truck 22.5 t - 2.5m x 4.0m High

- 129.5 kW @ 100 km/h
- 143.3 kW @ 105 km/h

10.7% greater power required.
10.7% more fuel consumption
Aero Efficiency

Aerodynamic Configuration
Roof Fairing and side Extenders
• 10 - 15% Drag Reduction
Make sure aero devices configured for trailer /body
Aero Efficiency

Additional Aerodynamic Devices
Cab Side Extenders or Gap Seals
Improve Cd by up to 0.03
Aero Efficiency

Body Location has same effect as trailer gap

ADR 80/00 with Vertical Exhaust

Current ADR80/03 with Horizontal Exhaust
Can you do more?

Additional Aerodynamic Devices
Trailer or Body Skirts
Improve Cd by up to 0.05
Can you do more?

Additional Aerodynamic Devices

• Truck Cd is around 0.6 to 0.65
• Cd improvements of by up to 0.05 + 0.03 improves Cd by 13%
• Implies fuel consumption improvements of up to 6 – 9%
Future Developments

Future Aerodynamic Devices

Rear of trailer or body is the major source of pressure drag

Watch for developments in this area
Conclusion

- Proper aerodynamic design offers significant fuel economy improvements/
- Gains are measurable
- Gains are not affected by driver behaviour.