2005 AAR CAR REPAIR BILLING WHEEL REMOVAL ANALYSIS

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RWMEC

Who we are

Approved AAR Wheel Manufacturers

Mission - Support the WABL Committee and the Railroad Industry
7 Year Trend for Wheel Removals
Reasons for Increase

☐ A. Increase in Traffic
☐ B. Change in Rules for Condemning Axles
☐ C. Increase in Usage of Why Made Code 65
2004 Effect of High Impact Usage
2005 Effect of High Impact Usage

![Graph showing the effect of high impact usage over the years from 1999 to 2005.](image)

- **Out of Round**
- **Thermal Cracks**
- **Tread Shell**
- **Slit Flat**
- **High Impact**
7 Year Trend for Thin Flange and High Flange
WHEEL REMOVAL CATEGORIES

Categories

- Administrative
- Wear Related
- Environment
- Wheel Failure

Bars representing the categories with Administrative having the highest number, followed by Environment, Wear Related, and Wheel Failure.
Administrative

**Administrative Wheels**

- 07 Obsolete
- 11 Good Condition
- 23 Govt. Reg.
- 25 Owner's Req.
- 90 Mate Wheel

0 100000 200000 300000 400000
Unusual Trends

- Why Made Code 11 Removals have increased 175,000 during the past three years.
7 Year Trend – Administrative Wheels

Administrative Wheels

Administrative Wheels

1999 2000 2001 2002 2003 2004 2005

Wear Related Wheels

- 60=Thin Flange
- 64=High Flange
- 73=Thin Rim
- 98=Reapplication
7 Year Trend – Wear Related Wheels

Wear Related Wheels

1999 2000 2001 2002 2003 2004 2005
Environmental Wheels

- 65 High Impact
- 67 Out-of-Round
- 74 Thermal Cracks
- 75 Tread Shelled
- 76 Tread Build-Up
- 78 Tread Slid Flat
7 Year Trend - Environmental Wheels

- Environmental Wheels
- Graph showing trend from 1999 to 2005 with values ranging from 50,000 to 200,000.
Spalling

Spalling starts when a thin localized layer of tread metal is transformed to martensite. The martensite, being very hard and brittle, forms cracks that propagate into the non-transformed material. These cracks turn and grow in fatigue roughly parallel to the tread. When these cracks link together material vacates the tread leaving a pitted surface.
Thermal Mechanical Shelling
Failed Wheels

66=Flange Cracked
68=Rim Cracked
71=Rim Shattered
72=Rim Spread

Failed Wheels
7 Year Trend – Failed Wheels

Failed Wheels

1999 2000 2001 2002 2003 2004 2005
26-Year Trend
Shell/Spall Wheels

Tread Shelled (Spalled) Wheels

[Graph showing the trend of Tread Shelled (Spalled) Wheels from 1980 to 2004]
Distribution of Failed Wheels by Year

Failed Wheel Distribution

- Y-axis: 0, 20, 40, 60, 80, 100
Wheel Removals by Year Manufactured

Year Built Distribution

0 20000 40000 60000 80000
Average Wheel Life/Category

- Administrative: 9.8 Years
- Wear Related: 11.0 Years
- Environmental: 8.8 Years
- Wheel Failure: 12.2 Years
# Average Wheel Life/Car Type

<table>
<thead>
<tr>
<th>Type of Car</th>
<th>Wheel Life, Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box</td>
<td>12.5</td>
</tr>
<tr>
<td>Gondola</td>
<td>8.5</td>
</tr>
<tr>
<td>Hopper</td>
<td>9.5</td>
</tr>
<tr>
<td>Covered Hopper</td>
<td>12.6</td>
</tr>
<tr>
<td>Tank</td>
<td>12.5</td>
</tr>
<tr>
<td>Flat</td>
<td>7.8</td>
</tr>
<tr>
<td>Articulated</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Wheel Removals by Year Manufactured

Year Built Distribution

[Chart showing the distribution of wheel removals by year manufactured, with years ranging from 1959 to 2001 and removal counts ranging from 0 to 80,000.]
**Distribution of Wheel Types**

<table>
<thead>
<tr>
<th>Wheel Type</th>
<th>HT-CP</th>
<th>NHT-CP</th>
<th>HT-SP</th>
<th>NHT-SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAR Raw</td>
<td>91.7%</td>
<td>5.7%</td>
<td>.7%</td>
<td>1.8%</td>
</tr>
<tr>
<td>AAR Accel.</td>
<td>92.1%</td>
<td>6.2%</td>
<td>0.6%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>
Distribution of SP Wheels

SP Wheel By Car Type

- Tank Cars
- Covered Hopper Cars
- Hopper Cars
- Gondolas
- Flat Cars
- Box Cars
RWMEC Recommendations

- Already Implemented
  - Accelerate removal of straight plate wheels
  - Proposal to accelerate earlier removal of Non-Heat Treated Curve Plate Wheels
  - Improving their wheel marking procedures
RWMEC Recommendations

- Improve air brake testing methods.
- Train employees about the proper use of hand brakes.
Comparisons

- Removals for high impact are more common for 36-inch and 38-inch wheels.
- 36-inch wheels have a higher percentage of wheels removed for slid flat, thin flange, built-up-tread and out-of-round.
Comparisons

- Articulated cars have many unique characteristics.
- The wheels wear out faster.
- They have the most wheels removed for High Flange.
Comparisons

- Covered Hopper Cars have the most wheels for all causes.
- Tank cars and covered hopper cars have the most wheel removals for Why Made Code 78, Slid Flat.
Comparisons

- The primary reasons for wheel removals from flat cars:
  - Why Made 64, High Flange
  - Why Made 65, High Impact
  - Why Made 75, Tread shelled
Comparisons

- Tank cars have the second highest wheel removals for Why Made 74, Thermal Cracks.
Comparisons

- Gondolas, Hoppers and Box Cars have a similar pattern. The most frequent causes for removal for these car types are:
  - Why Made 65, High Impact
  - Why Made 64, High Flange
  - Why Made 60, Thin Flange
Thanks

RWMEC thanks the AAR for providing 2005 wheel repair data for this analysis and report.

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Questions