“Review and Analysis of Wheel Impact Load Detector (WILD) and Wheel Removal Data”

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Questions for Analysis

- How many wheels are being changed?
- Who is changing out these wheels?
- Why are wheels being changed out?
- How does CFCL manage WILD trends?
Introduction

- CFCL Fleet has about 7,600 cars
- General service cars - 20K miles/year
- Similar to AAR CRB fleet
- 4 groups - Administrative, Wear Related, Environmental, Wheel Failures
- Numerous Why Made Codes - In paper
4 Year Wheel Wear Removal Trend (Industry)

- **% Wheels Changed**
- **Categories**:
  - Thin Rim
  - High Flange
  - Thin Flange

The chart shows the percentage of wheels changed each year from 2000 to 2003, differentiated by the type of wheel rim (Thin Rim, High Flange, Thin Flange).
CFCL 2003 Wheel Sets Changed Out

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

WM65 Other Env Non-Env
Why Made Code 65

- Effective January 1, 2003
- Industry Average 6.4%, 2003 CRB wheel removals
- CFCL Average 12.5%, 2003 wheelset removals
- For period Jan-April, 2004 - WM 65 accounts for approximately 25% of CFCL Wheelset Removals
Why Made Code 65

High Impact Wheel - Detector

• New Why Made Code for wayside wheel impact detectors
• Implemented to reduce the “Stress State” of the railroads
• 90,000 pounds impact or greater for removal
• Previously - Also had to measure TIR
WILD Background – Education

Rule 41

\begin{itemize}
\item Wheel Out-of-Round or 90,000 pounds or greater impact?
\end{itemize}

Detected by a wheel impact load detector reading greater than 90,000 pounds for a single wheel. The detector used must have been calibrated per manufacturer’s instructions and must reliably measure peak impacts and must provide a printable record of such measurements. Device calibration records must be maintained. Wheels with condemnable slid flat spots are handling line responsibility and must not be billed as out-of-round.
Why Made Code 75 - Shelling

• 1 Why Made Code - 3 separate causes
  – True shelling - rolling contact fatigue
  – Thermal-mechanical shelling - rolling contact fatigue with tread brake heating
  – Spalling - sliding related
• Most shelling on general service cars is spalling caused by wheel sliding
Examples of sliding-related wheel tread defects

• High Impact wheel (detector) - WM65
• High Impact wheel (gage) - WM 67
• Shelling (Spalling) – WM75
• Built up tread – WM76
• Slid flat – WM78
Why do wheels have high impacts in service??
Answer: The wheel was slid in service.

**WHY??**

- Handbrake left on
- Air brake problem
- Empty/load not working properly
- Cars on rear of train pulled/not released
- Slippery rail
- Wheel/rail profiled issue
- Train handling
- Other
Chi-square Statistical Comparisons

- Determines if there is a statistically significant difference in attribute data between 2 samples - “Successes” and “Failures” evaluated using Minitab® software package
- Null hypothesis - No difference in the number of wheel removals between 2 samples
- If “P-value” less than 0.05 is calculated, there is a statistically significant difference between the 2 groups of wheel removals
- “Expected” values are provided to compare actual vs. expected number of removals
AAR CRB vs. CFCL Removals

Chi-square Results

• WM 65, 67, 75 - no difference in removals

• WM 74, 76, 78 - statistically significant difference - CFCL had more removals than expected for WM 74 and 76 - fewer removals than expected for WM 78

• WM 66, 68, 71, 72 (Failures) - statistically significant difference - CFCL had more removals than expected
InteRRIS Data for CRDX 13648

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Speed and Load Correction

1 mile per hour = 1,000 lb momentum
56 mph = 7 KIPS per wheel

286,000 lb car = 35.75 KIPS per wheel
263,000 lb car = 32.875 KIPS per wheel

Average car = 40-43 KIPS per wheel
Speed and Load Corrections for CRDX 13648 R3 Wheel

R3 Changed out 2/25/2004
Chicago Freight Car Leasing Co.

R3 Wheel from CRDX 13648
Wheels that have not been slid

DO NOT

cause high impact readings.

Exception is thermal-mechanical shelling
No Flag KIP Distribution

- 0-44 KIPS: 22,000
- 45-49 KIPS: 3,000
- 50-54 KIPS: 1,000
- 55-59 KIPS: 500
- 60-64 KIPS: 100
Yellow Flag KIP Distribution
Red Flag KIP Distribution

- 90-95 KIPS
- 96-100 KIPS
- 101-105 KIPS
- 106-110 KIPS
- 111-115 KIPS
- 116-120 KIPS
- 121-125 KIPS
- 126-130 KIPS
- 130+ KIPS
Wheel Set Distribution
Concluding Remarks

• Root cause of wheel defect is important
• WM65 - What is true root cause?
• CFCL is dedicated to removing damaging wheels from service - A 100,000 pound impact every 9.4 feet isn’t doing ANYTHING any good…..
• 97% of benefits from WILD detectors go to railroads - Need cost/benefit sharing
• Private car owners - Active role in AAR rule making process - Voting role?
QUESTIONS