



Chicago Freight Car Leasing Co.

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

Presented by:

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Standard Steel, LLC*



Questions for Analysis

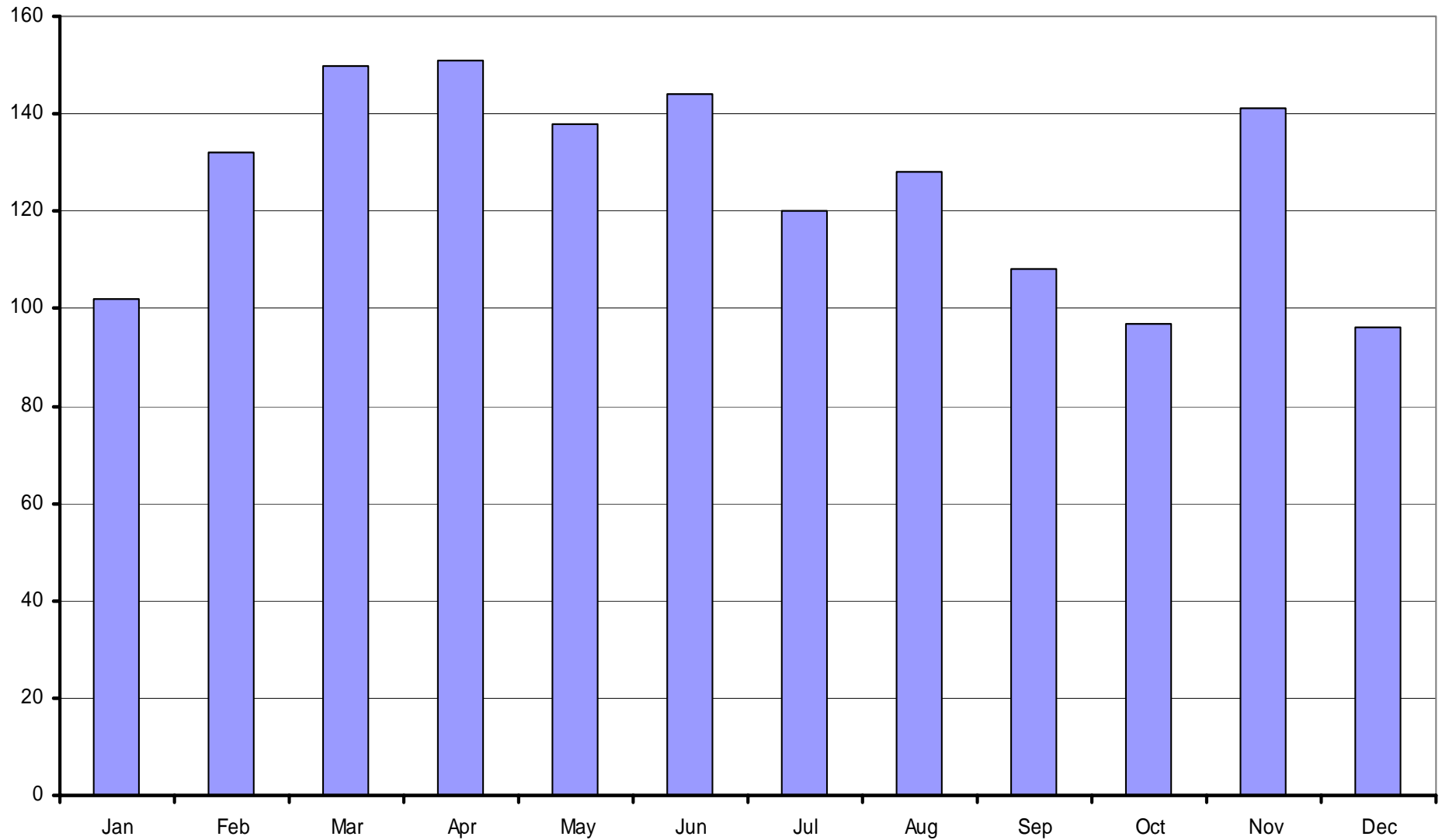
- How many wheels are being changed?
- Who is changing out these wheels?
- Why are wheels being changed out?
- How does CFCL manage WILD trends?



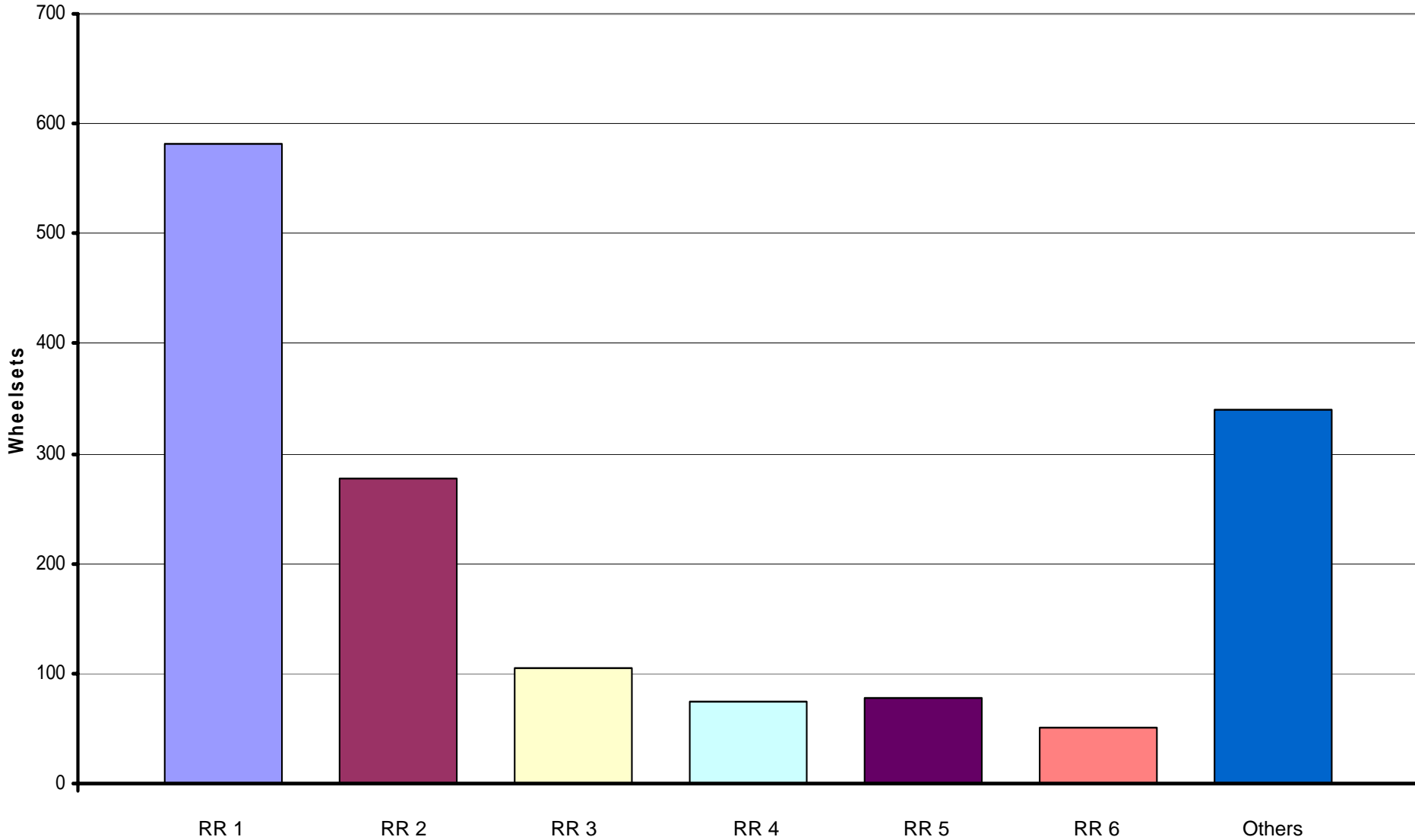
Introduction

- 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

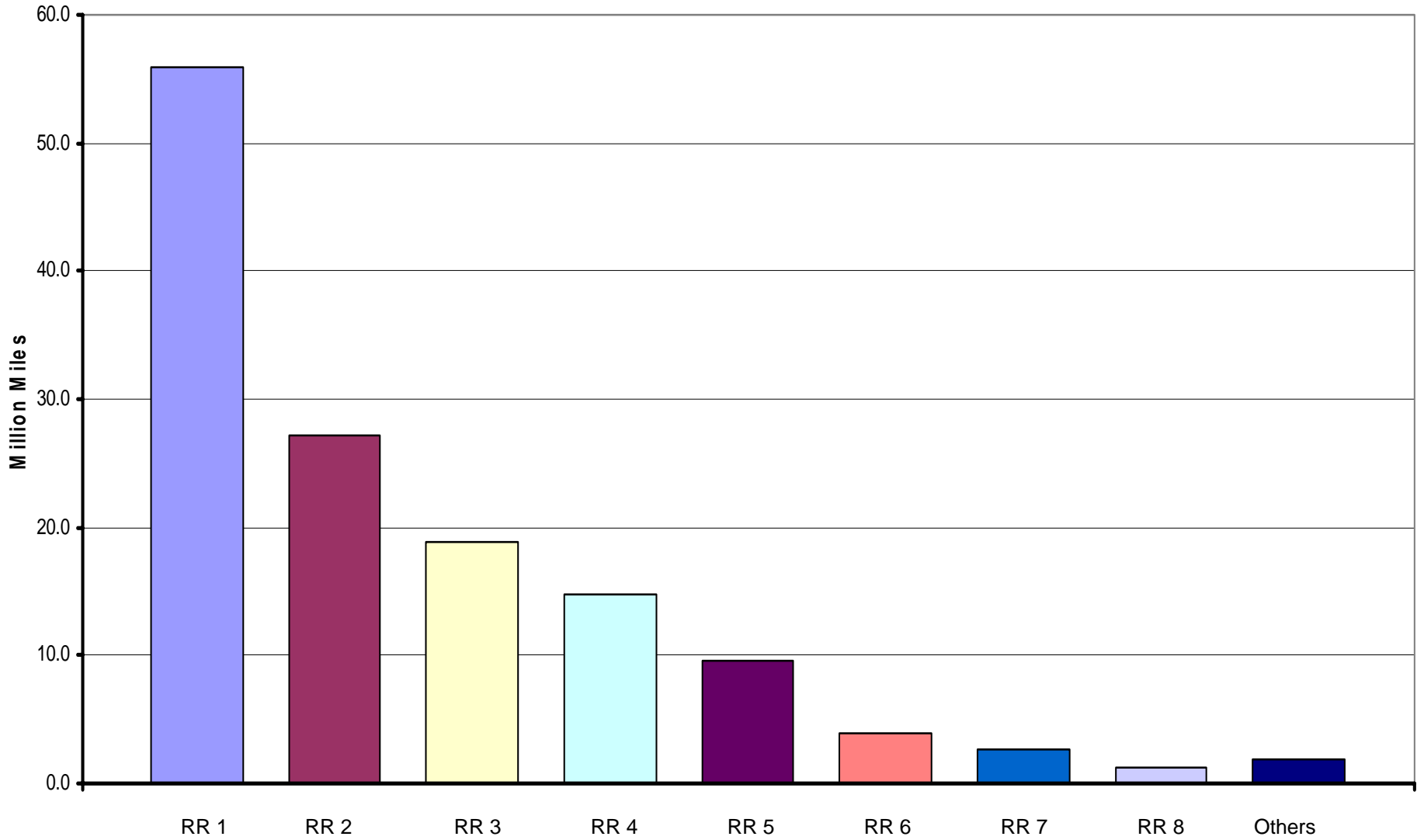
CFCL 2003 Wheelsets Changed Out



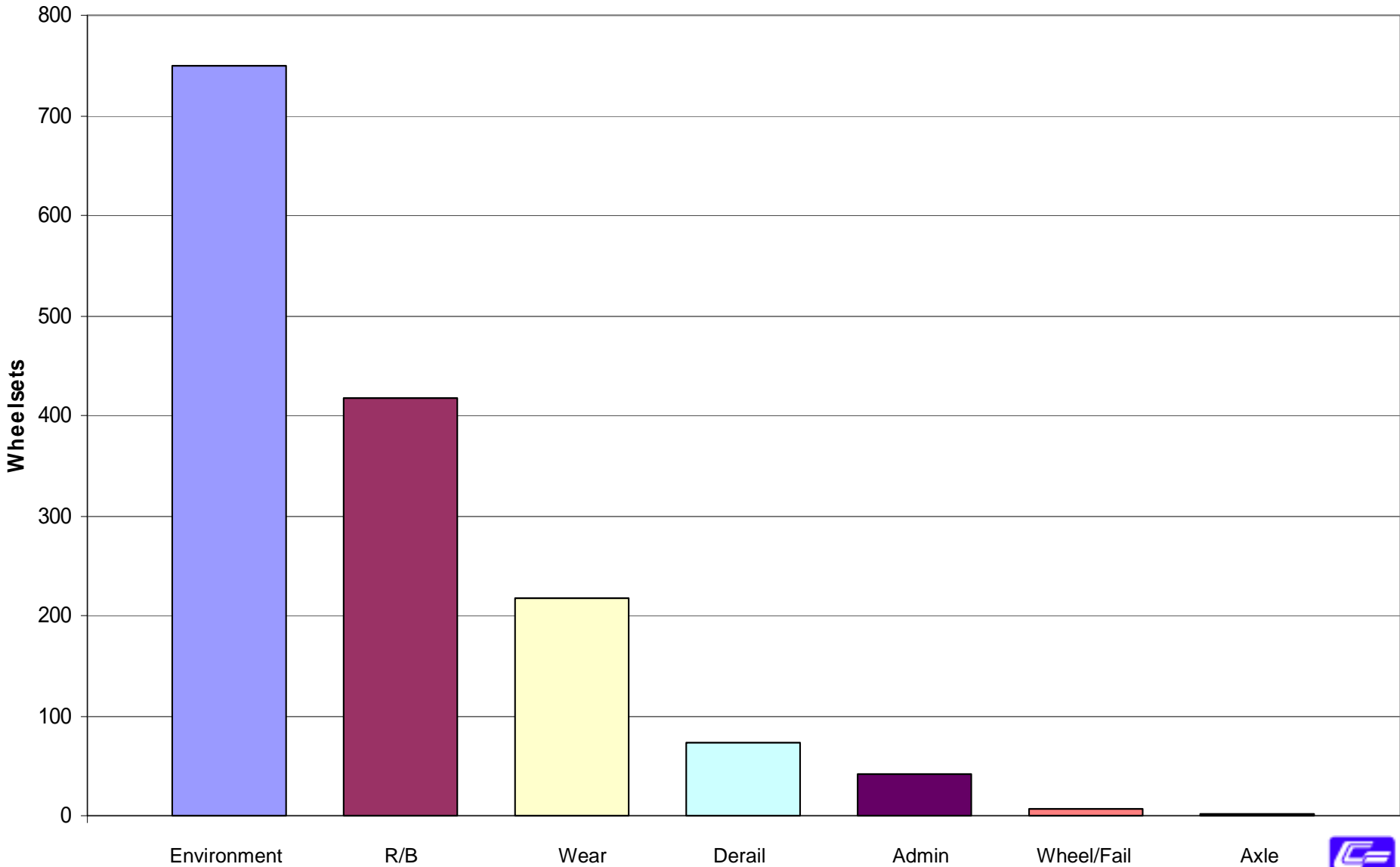
CFCL 2003 Wheelset Changeout By Railroad/Shop



CFCL 2003 Miles by Railroad



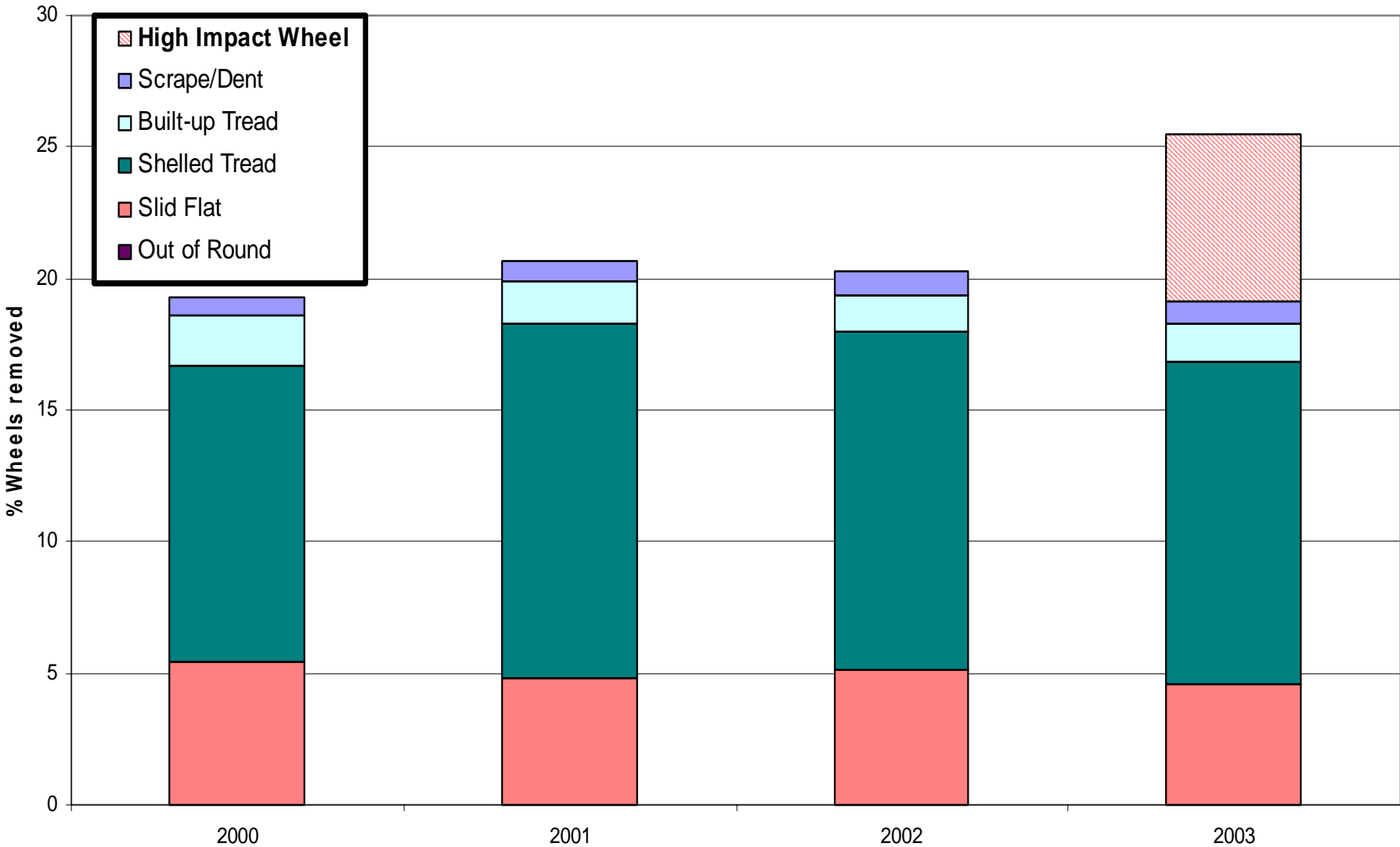
CFCL 2003 Changeout Groups



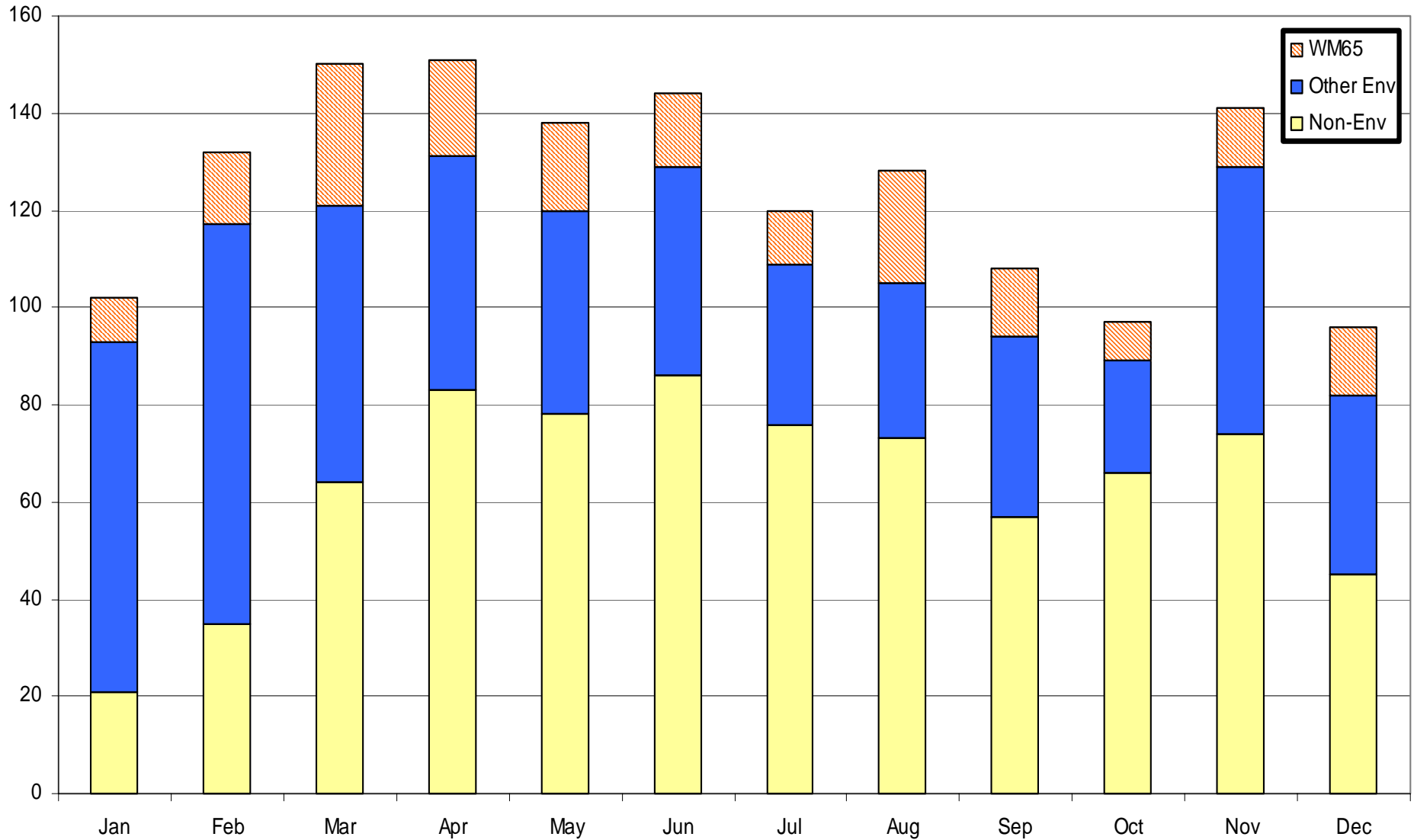
4 Year Wheel Wear Removal Trend (Industry)



4 Year Sliding Wheel Defect Trend (Industry)



CFCL 2003 Wheel Sets Changed Out





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

- r. Wheel Out-of-Round or 90,000 pounds or greater impact?

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



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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

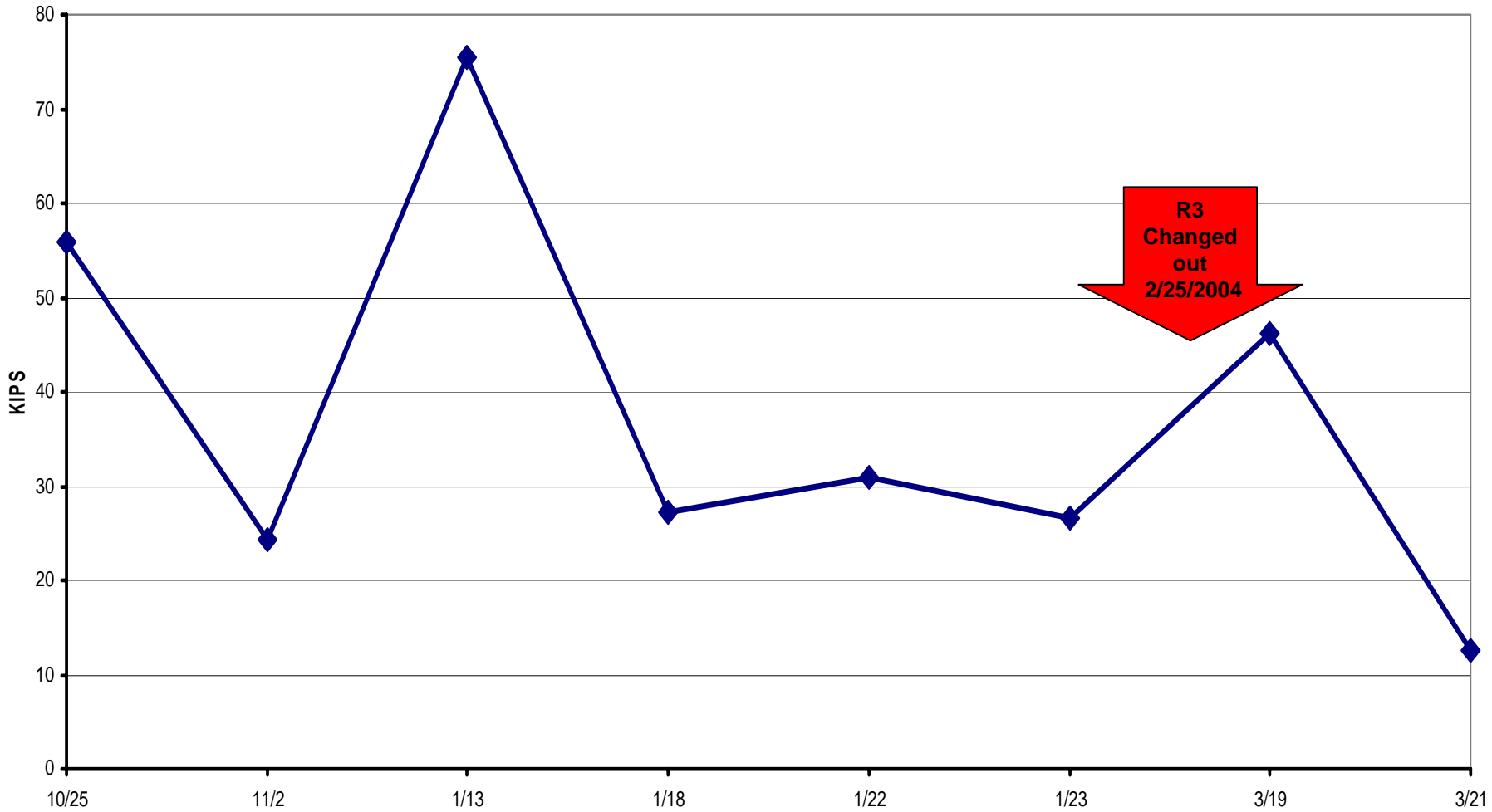
Chi-square Results

- **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

VehicleId	Lead End	Vehicle Side	Axle No	AvgVert	MaxVert	DynVert	DynRatio	AvgLat	TrainDate	Speed (mph)
<u>CRDX013648</u>	A	L	1	34.14	39.28	5.140	1.151	2.16	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	R	1	30.64	38.00	7.360	1.240	-1.75	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	L	2	35.82	39.79	3.970	1.111	1.82	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	R	2	29.62	34.61	4.990	1.168	0.04	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	L	3	32.81	42.88	10.070	1.307	1.04	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	R	3	32.96	75.45	42.490	2.289	2.81	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	L	4	33.90	41.34	7.440	1.219	0.67	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	A	R	4	31.14	39.22	8.080	1.259	-1.37	2004-01-13:23:32:00	43.03
<u>CRDX013648</u>	B	L	1	8.11	12.48	4.370	1.539	-14.73	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	R	1	9.50	11.90	2.400	1.253	3.75	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	L	2	7.90	12.41	4.510	1.571	-14.33	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	R	2	8.21	11.58	3.370	1.410	2.70	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	L	3	7.90	11.76	3.860	1.489	-14.06	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	R	3	8.51	27.12	18.610	3.187	4.17	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	L	4	7.83	11.90	4.070	1.520	-13.93	2004-01-18:17:24:00	31.19
<u>CRDX013648</u>	B	R	4	8.34	13.50	5.160	1.619	2.89	2004-01-18:17:24:00	31.19

CRDX 13648 R3 Impact Readings





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Speed and Load Correction

1 mile per hour = 1,000 lb momentum

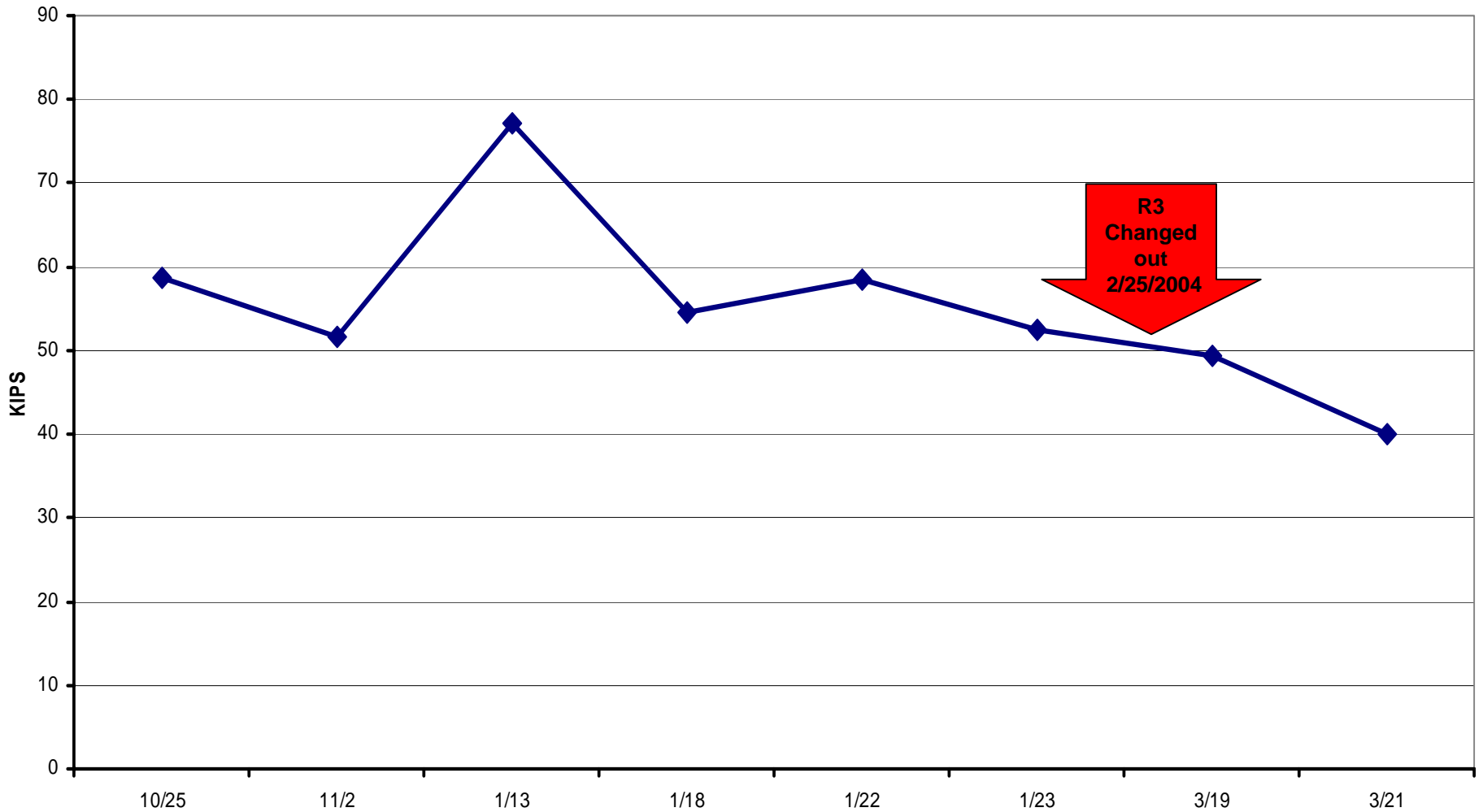
56 mph = 7 KIPS per wheel

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





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R3 Wheel from CRDX 13648





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Wheels that have not been slid

DO NOT

cause high impact readings.

A large, multi-pointed orange starburst graphic with a white border, containing the text 'NOTICE!!'.

NOTICE!!

Exception is thermal-mechanical shelling

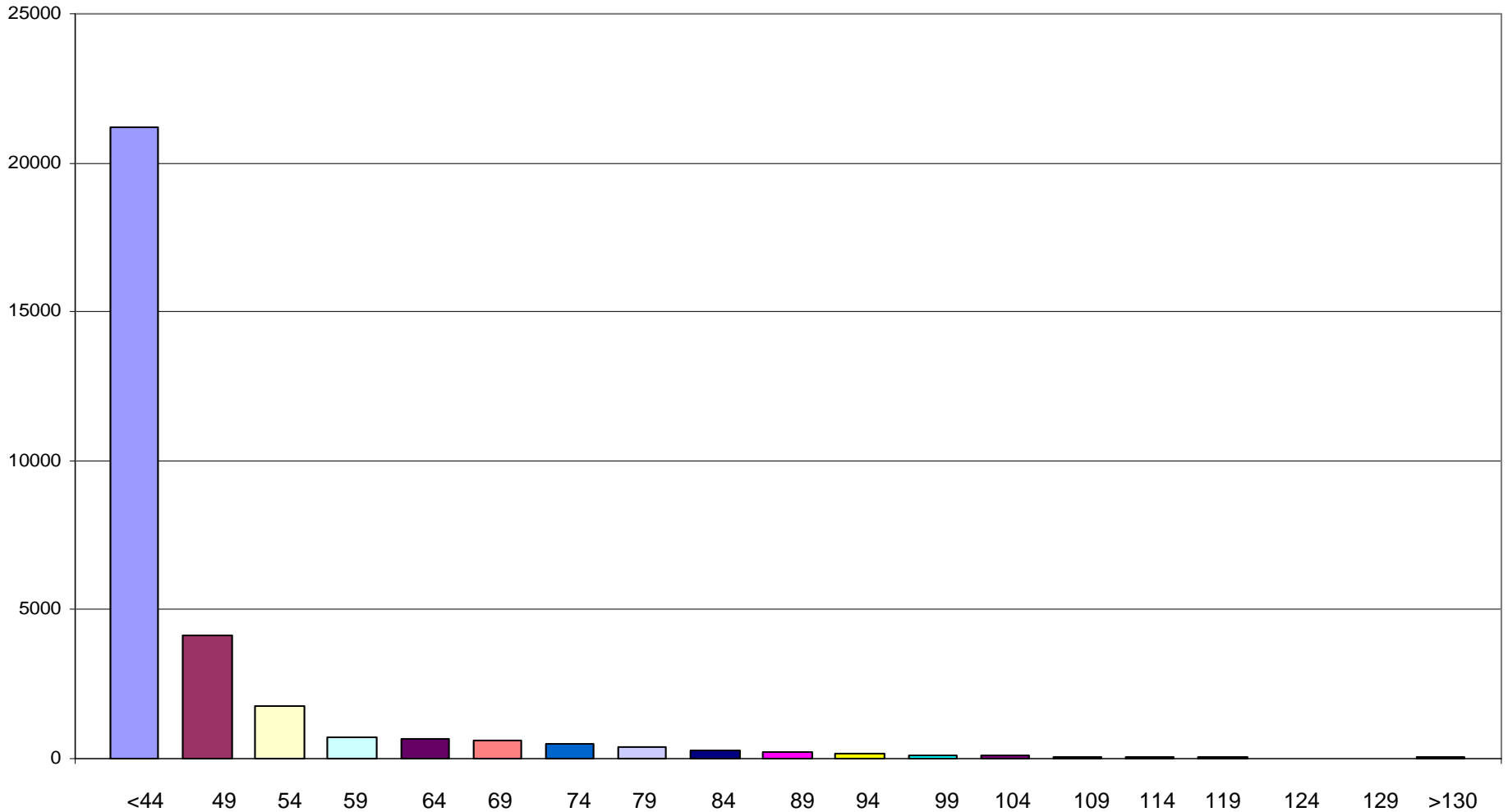


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Fleet KIP Distribution



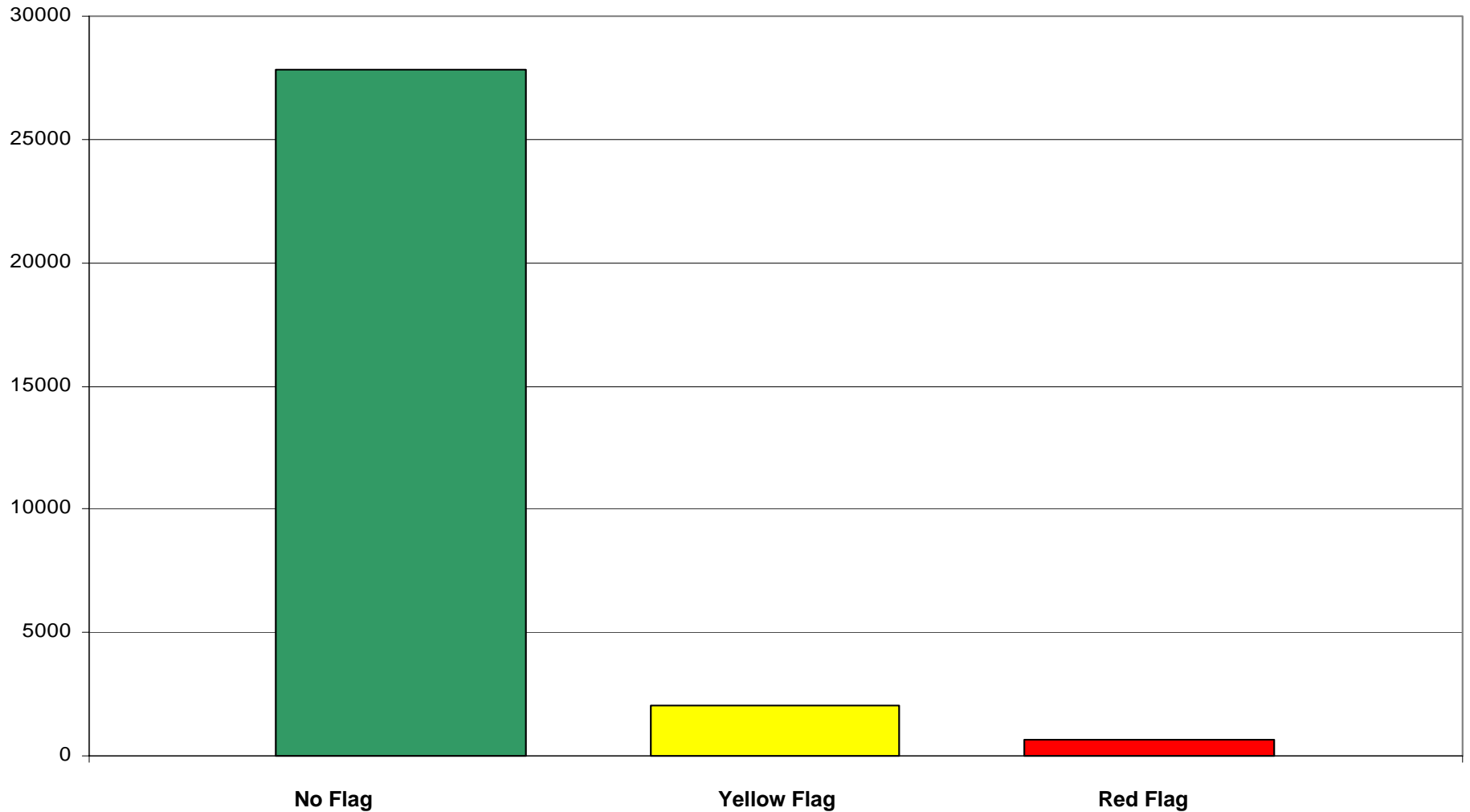


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Number Wheels by Flag Type



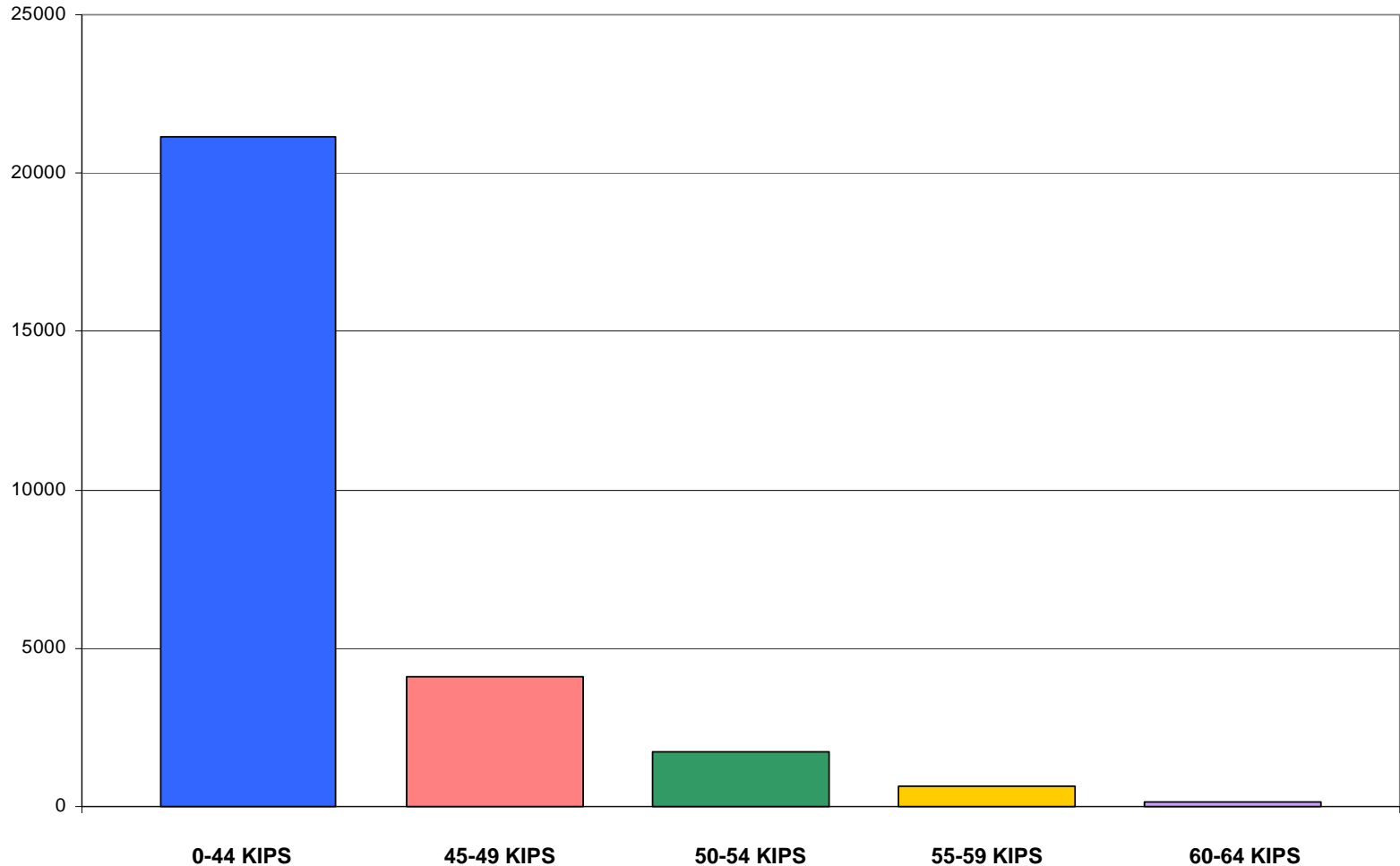


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No Flag KIP Distribution



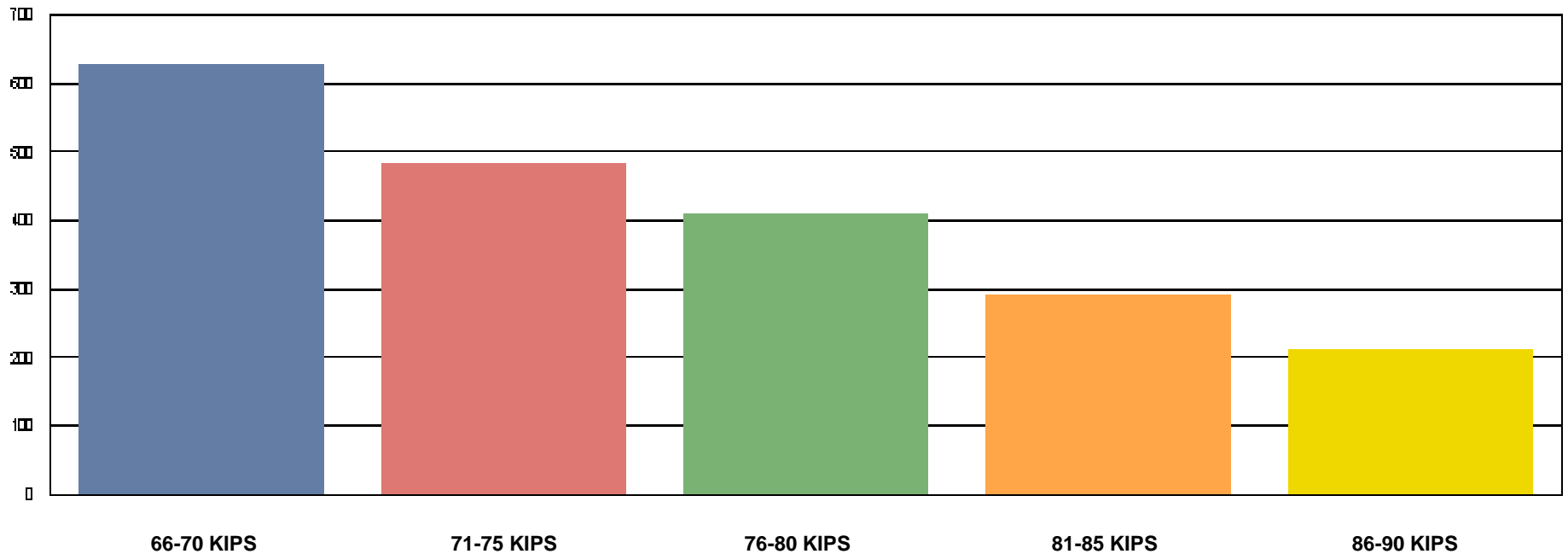


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Yellow Flag KIP Distribution



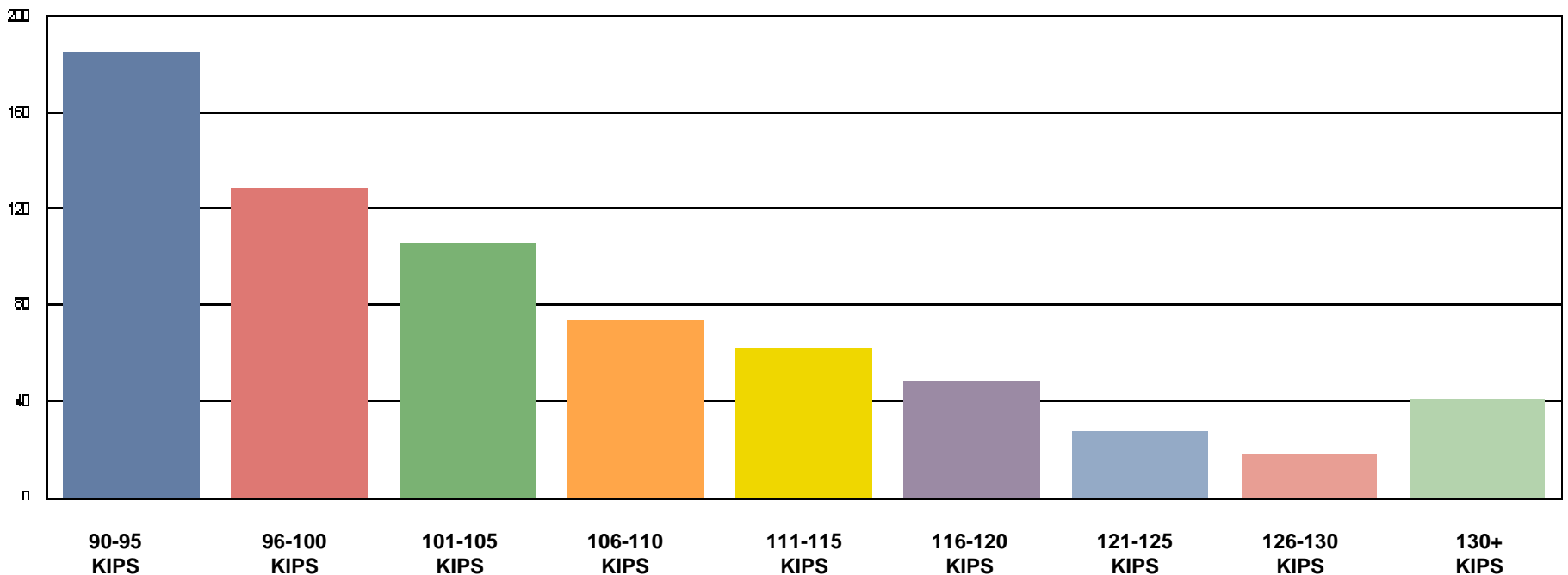


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Red Flag KIP Distribution



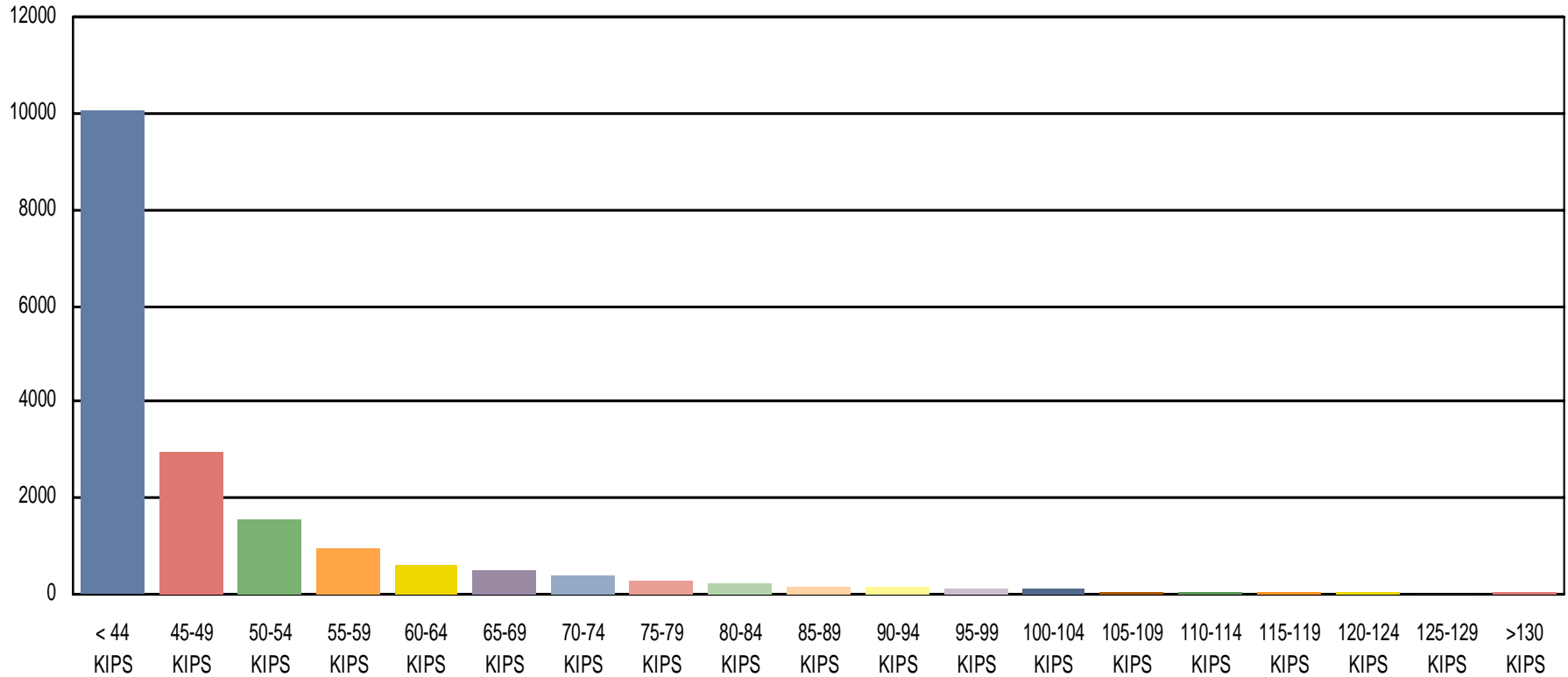


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Wheel Set Distribution





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

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