

Regional Railway Trial Analysis and HiRail Trial Results from a Class 1 Railroad

Summary of Data from June and
September trials



Project Objectives

- Determine reduction in lateral forces achieved when applying KELTRACK™ HiRail using the atomized spray rig
- Determine application methods (application rates/strategy) necessary to achieve highest retentivity
- Determine lateral force and retentivity benefits when applying KELTRACK to the low rail only
- Determine the benefits achieved using TOR Robolube grease application.

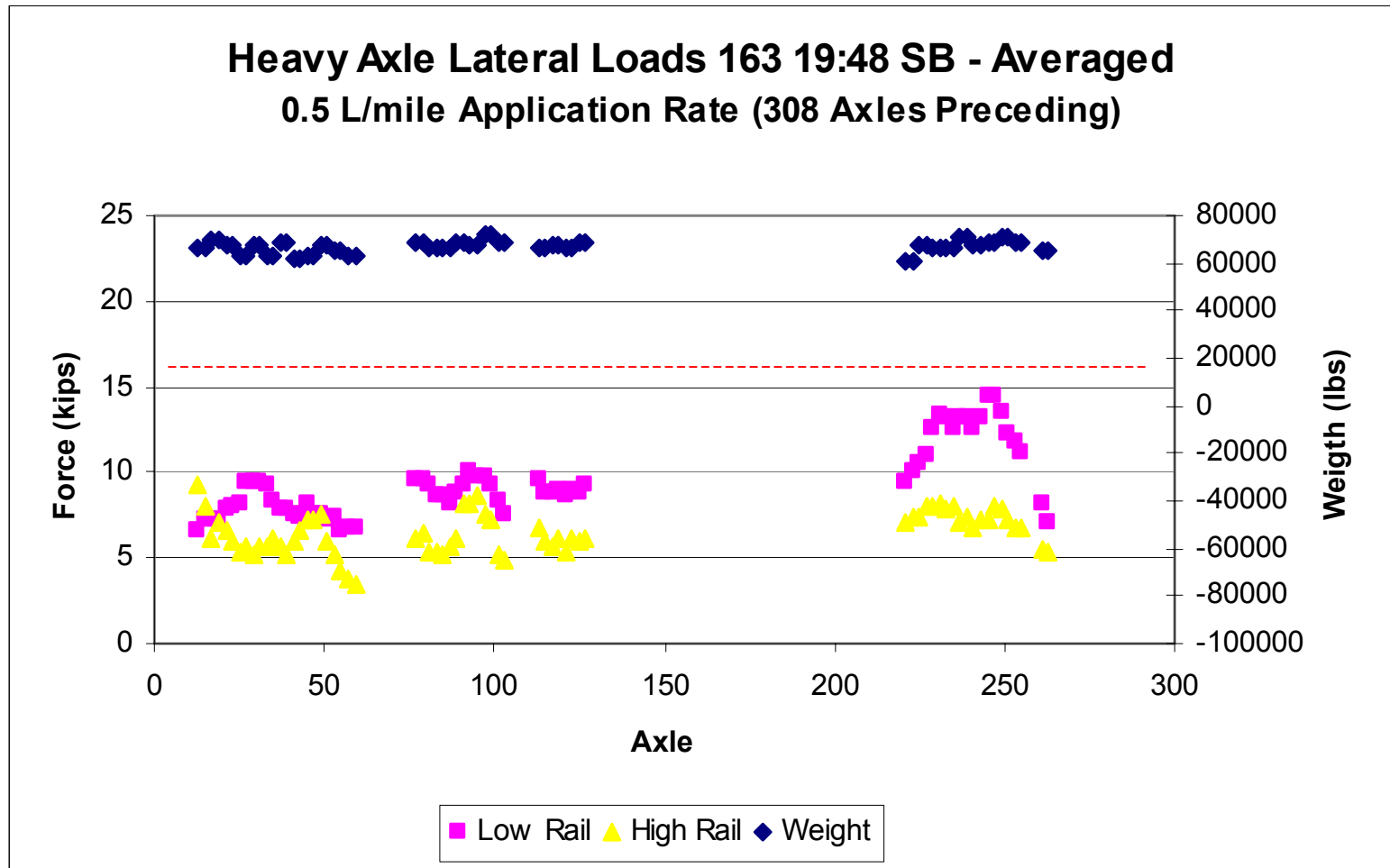


Summary of June Trial Data

- All trials conducted with the HiRail rig spray system. Product was only applied within the 2000 ft test curve.
- One low rail only application was conducted during this period.
- A 5-mile top of rail grease application dead ban was observed around the test site during these trials.
- During the trial, it rained on the Monday, Thursday and Friday.
- Due to rain, a second trial was conducted in September 2001.

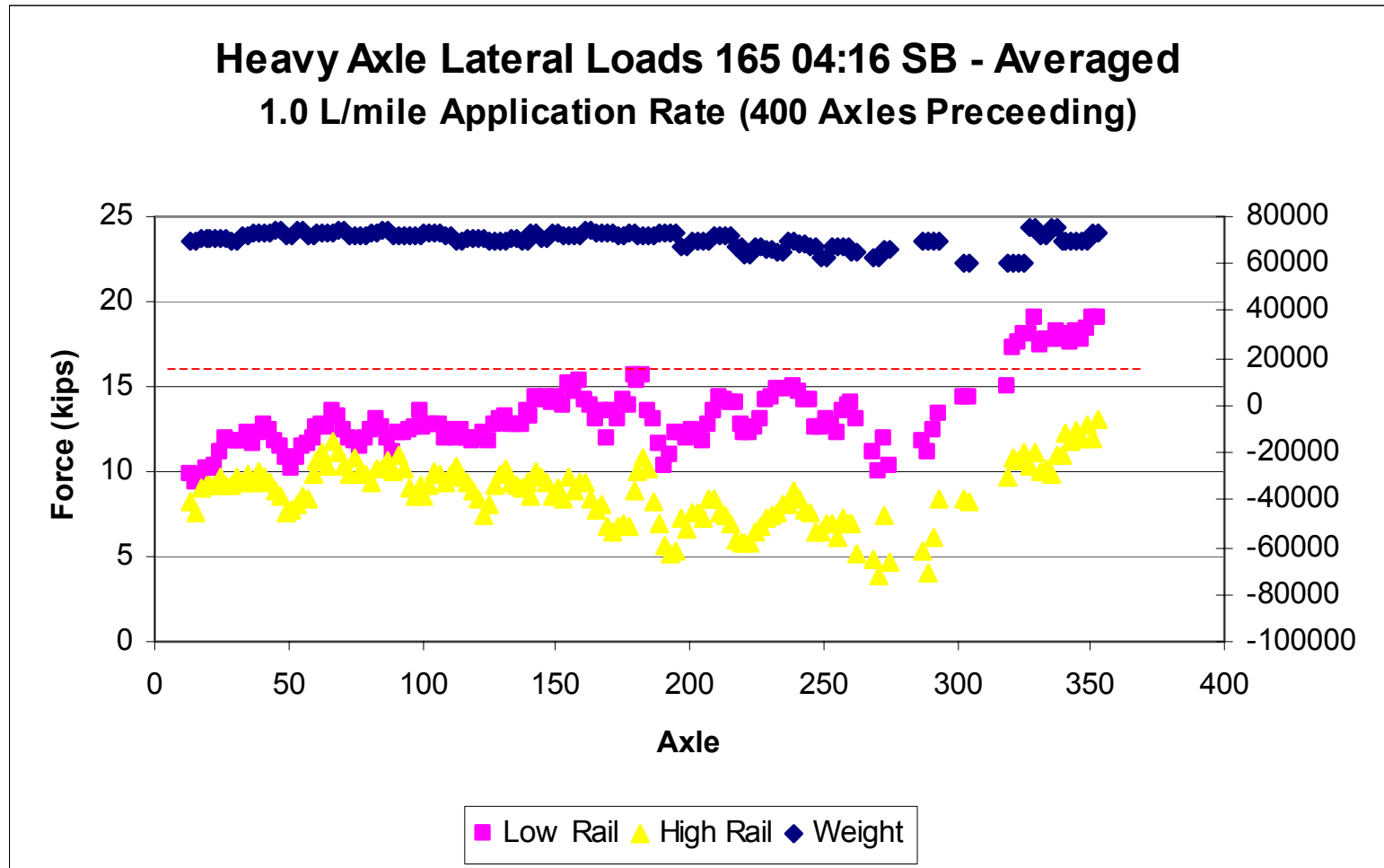
0.5 L/mile Application Rate

Both Rails, 2000 ft application area



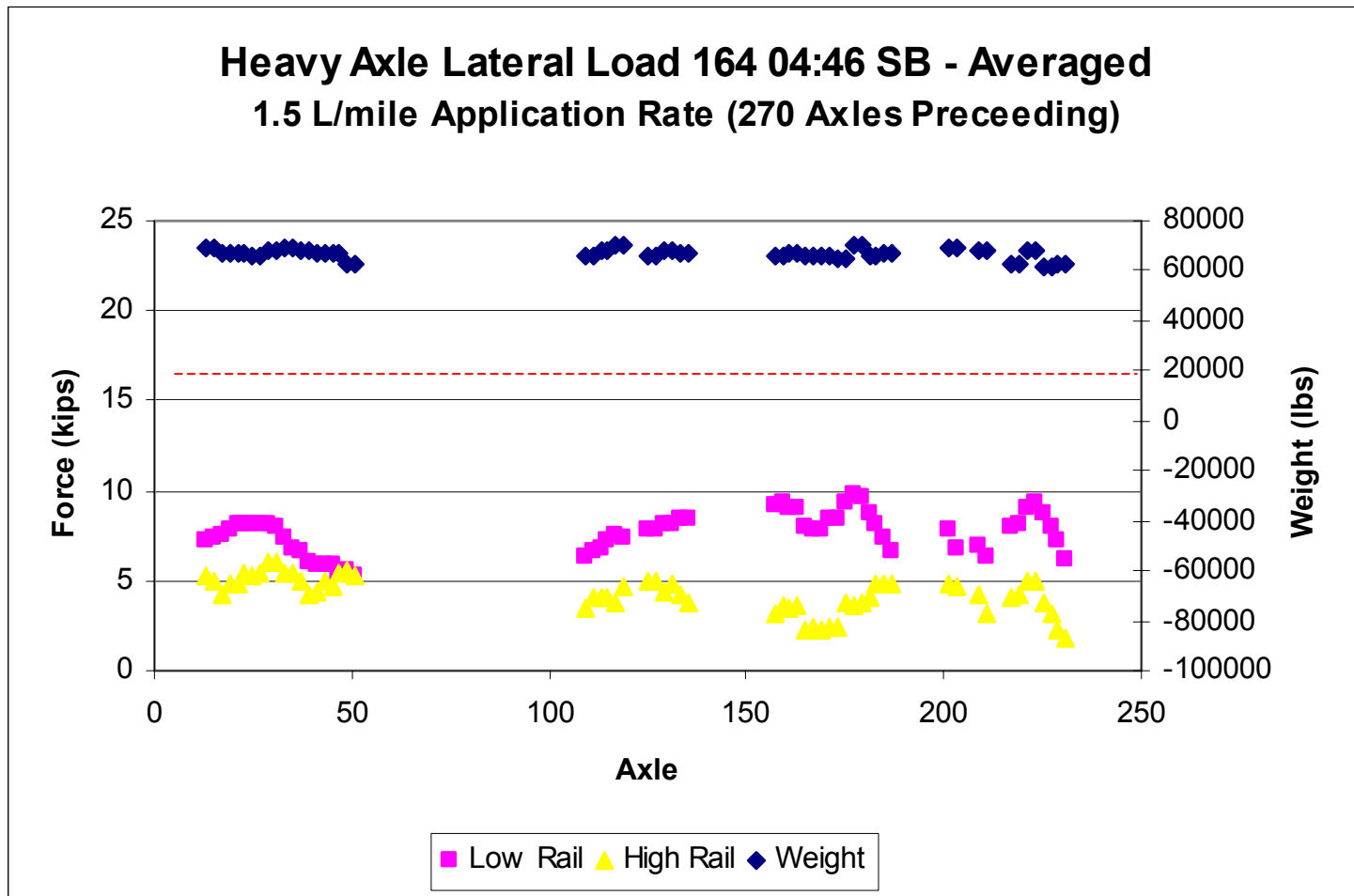
1.0 L/mile Application Rate

Both Rails, 2000 ft application area



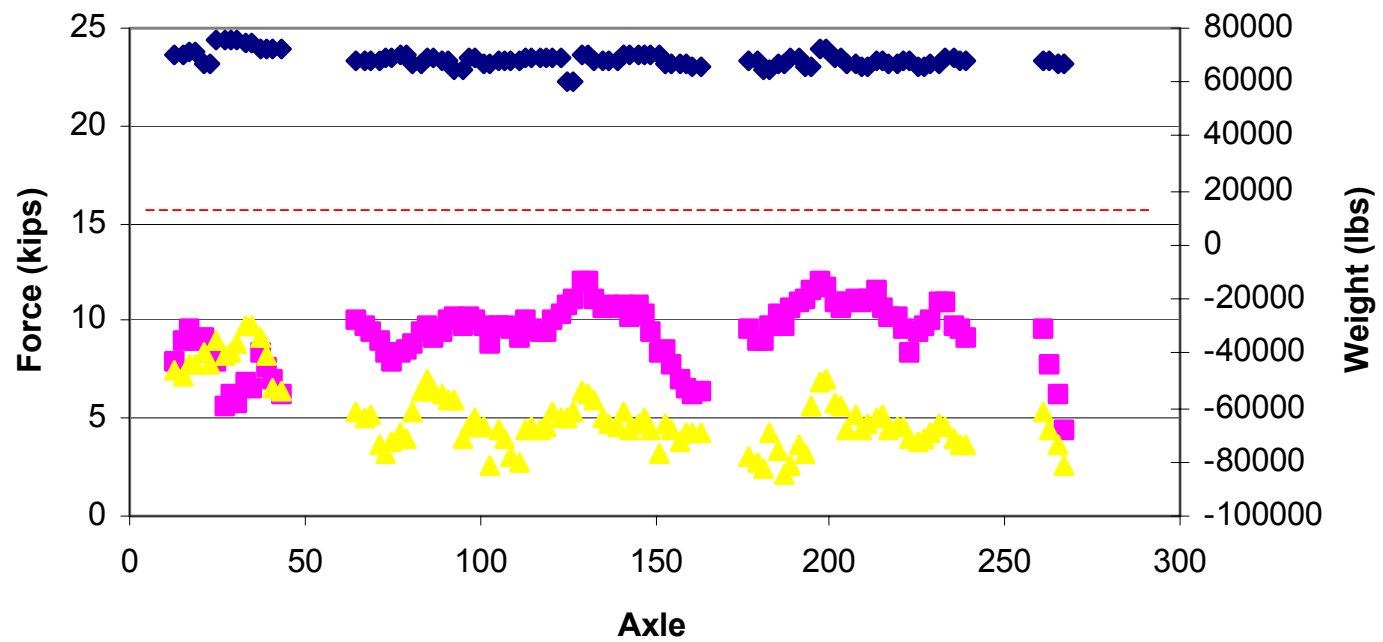
1.5 L/mile Application Rate

Both Rails, 2000 ft application area



One Rail Only Application

**Heavy Axle Lateral Load - 162 16:15 SB - Averaged
1 L/mile Low Rail Only Application**



■ Low Rail Avg
 ▲ High Rail Avg
 ◆ Weight

KELTRACK Application through Curve Extents @ Different Application Rates

Application Rate	Total NB Axles	Total SB Axles	Retentivity
0.5	308	268	576
0.75	308	304	558
1.0	350	350	600
1.0	400	354	555
1.5	270	240	510
1.5	344	386	543



Conclusions

- Lateral forces reduced by 50%, product retentivity is approximately 600 axles, for KELTRACK application in the curve only.
- Significant lateral force reduction achieved when applied KELTRACK to the low rail only.
- From the data collected during the lateral force trials, **no correlation exists between application rate and retentivity.**

Summary of September Trial Data

- Conducted three day trial from September 23rd to 26th.
- It rained prior to the 3rd day of testing.
- A 5-mile top of rail grease application dead ban was observed around the test site during this application.

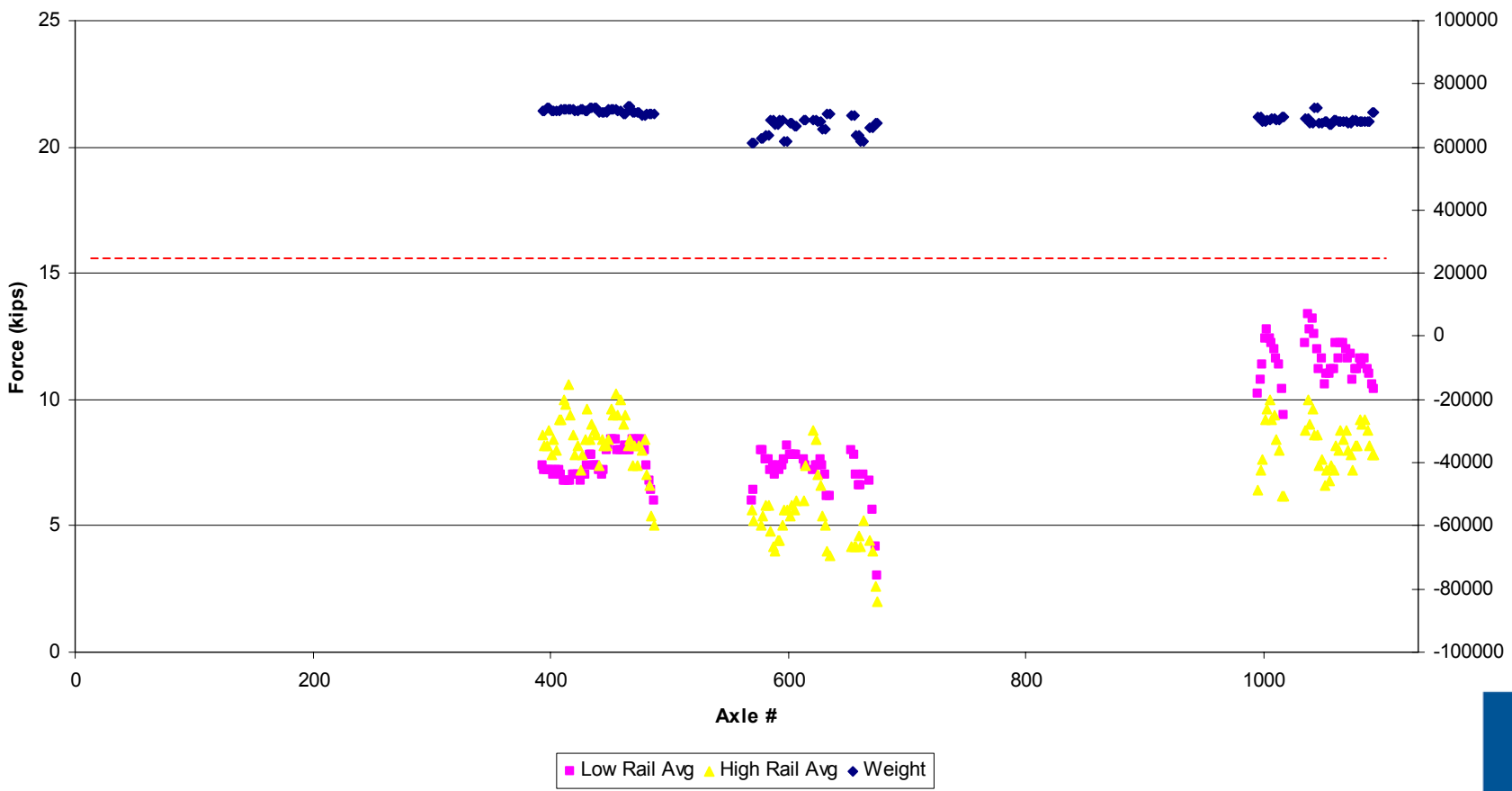
KELTRACK Application Strategy

- Through discussions between Don Eadie and Joe Kalousek from the NRC, a new application strategy was suggested.
- As the train wheels pass over the KELTRACK material, the product is transferred to the wheel tread and carried down the track. By applying product in the curve and the tangent preceding the curve, higher product retentivity should be achieved.
- During the September trial, KELTRACK was applied in the 2000 ft test curve as well as 2500 ft on either side of the curve, called the tangent-curve-tangent method.
- Unlike Grease, KELTRACK provides a uniform lateral force reduction while the product remains on the top of the rail.

Tangent-Curve-Tangent Application

0.5 L/mile

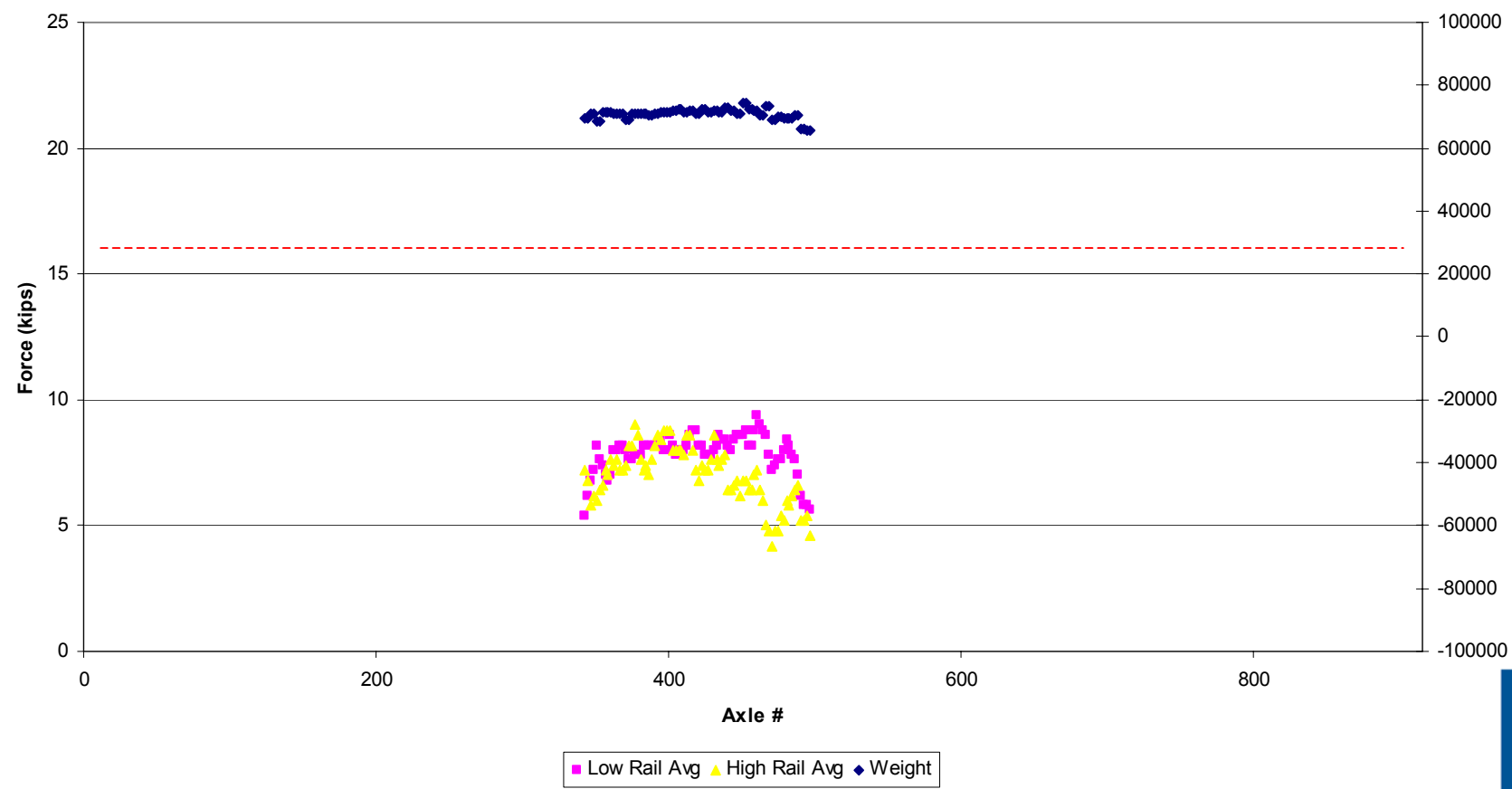
Lateral Force Reduction - Keltrack 0.5 L/mile



Tangent-Curve-Tangent Application

1.5 L/mile

Lateral Force Reduction - Keltrack 1.5 L/mile



Tangent-Curve-Tangent KELTRACK Retentivity

Application Rate	Retentivity
Robolube Grease	976
0.5 L/mile KELTRACK	1130
1.5 L/mile KELTRACK	916*

*retentivity would be around 1100 axles, but only measured 3 consists instead of 4 due to weather

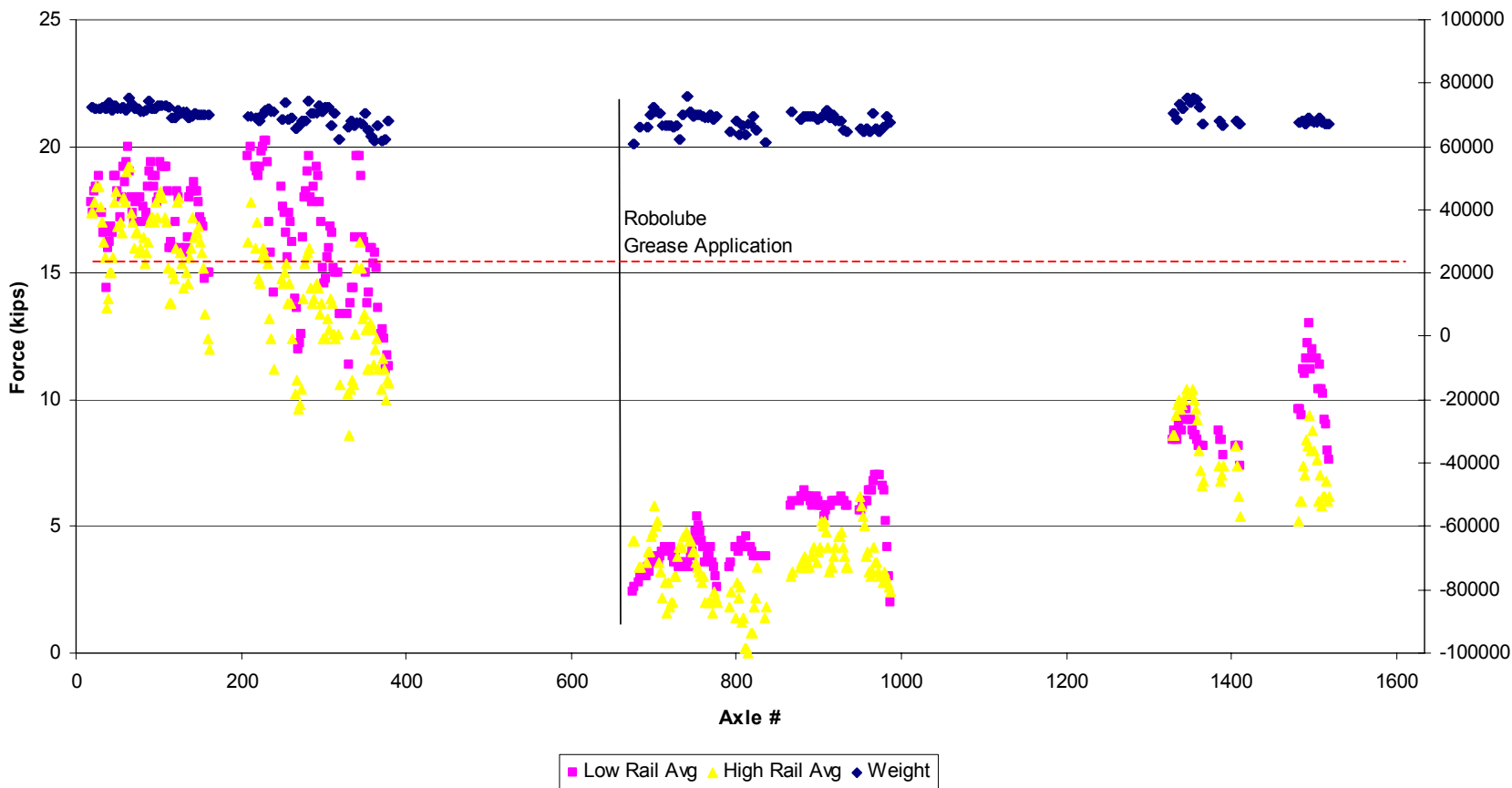
Robolube Grease Application

- On Sunday September 23rd, a controlled Robolube Application was made through the test curve.
- Grease was applied to both rails through the 2000 ft curve. Application rate was 1.6 L/mile per rail (measured during trial).
- **Retentivity: 976 Axles**

1.6 L/mile Grease Application

Both Rails, 2000 ft application rate

Lateral Force Reduction - Robolube Grease



Conclusions

- KELTRACK provides controlled friction - uniform lateral force reduction while the product is active on top of the rail.
- Grease provides uncontrolled friction - lateral force reduction increases steadily as the material is consumed.

HiRail Trial Results from a Class 1 Railroad

Objectives:

- Quantify the reduction in high lateral forces (above a threshold of 10 kips)
- Determine application methods (application rates/strategy) necessary to achieve highest retentivity
- KELTRACK HiRail applied using atomized spray rig, at a 1 L/mile application rate



Notes

- Test site contained a back-to-back reverse curve. Primary traffic was loaded coal trains heading east, and unloaded coal cars returning west.
- The curve has been instrumented with 3 lateral/vertical force cribs.
- Crib 1 is located in the 8 degree right curve just before the spiral to full body transition
- Crib 2 is located in the 8 degree right curve just after the spiral to full body transition

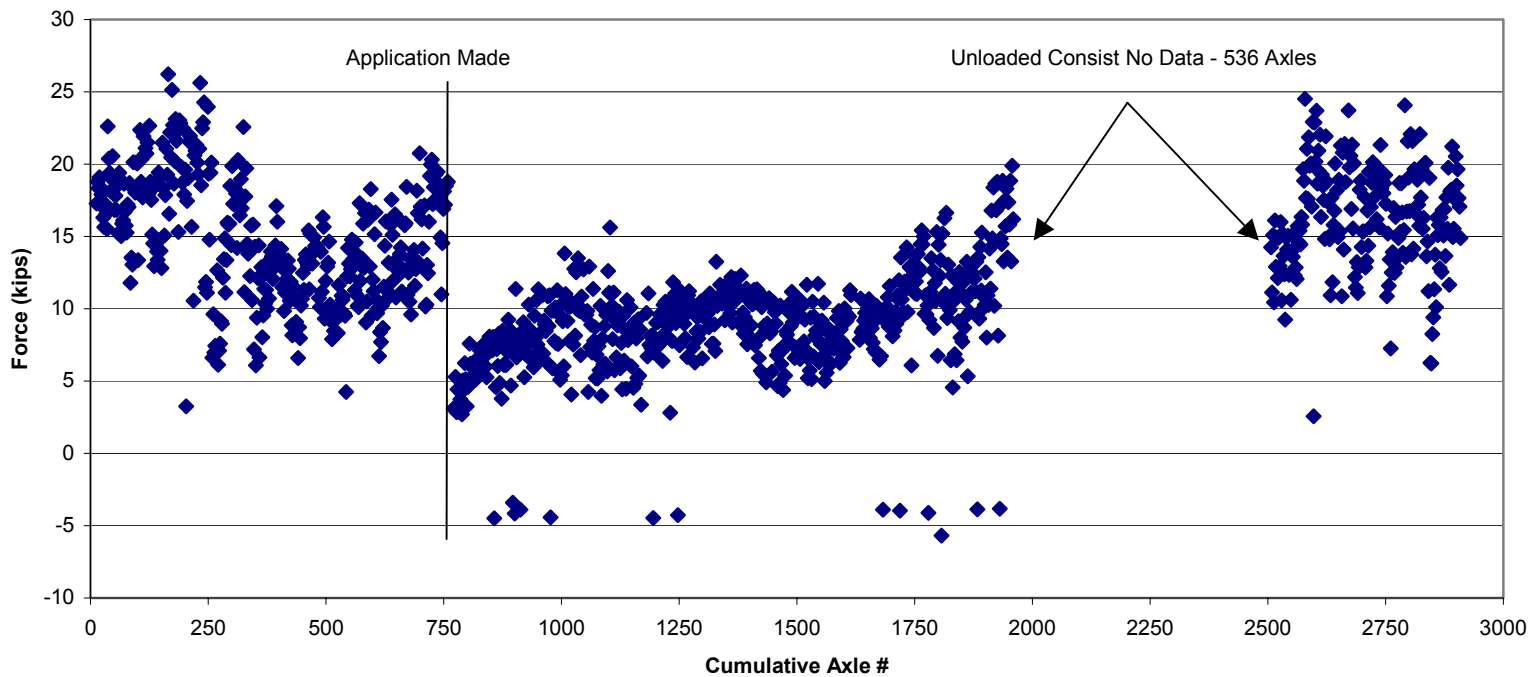


Notes

- Crib 3 is located in the 5.4 degree left curve just after the spiral to full body transition
- Data from a trial date on July 12, 2001 when 24 hour coverage was used to collect lateral forces for every consist
- For analysis purposes, only loaded coal trains were used.

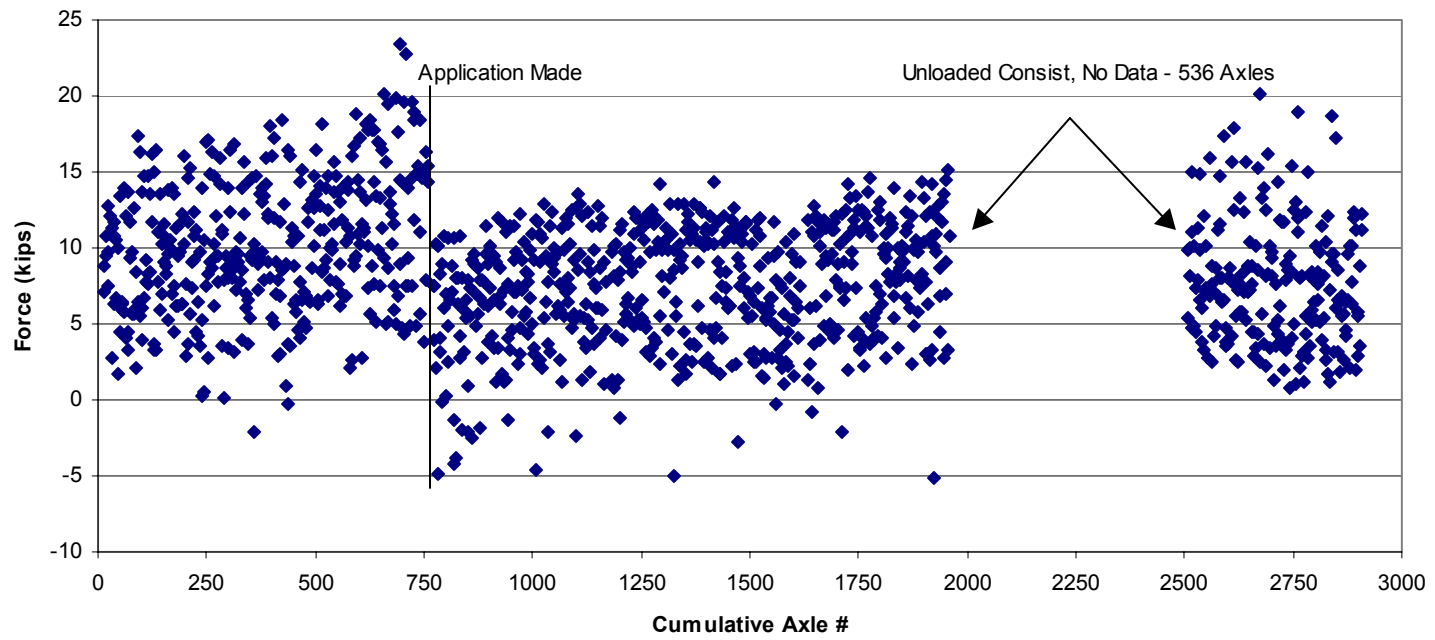
Crib 2 Low Rail: Leading axles, Before and After Application

Crib 2 Low Rail
Leading Axles 0712 9:30 - 22:11



Crib 3 High Rail: Leading axles, Before and After Application

Crib 3 High Rail
Leading Axles 0712 9:30 - 22:11



Notes

- The following slide quantifies the reduction in the number of axles above a threshold value.
- > 10 kips for the 8 degree curve
- > 7 kips for the 5.4 degree curve
- Results indicate that ~20% less axles have lateral forces above 10 kips when KELTRACK is applied
- That translates into a 50% reduction in axles having lateral forces over 10 kips compared to the baseline data

Date/Time	Condition	Total Axles	Crib 1 Total Axles >10 Kips	Crib 2 Total Axles >10 Kips	Crib 3 Total Axles >7 Kips
7120930	Base	760	498	686	365
			33%	45%	24%
7121109	Keltrack Effective	412	42	97	152
7121706		448	163	241	161
7121736		346	136	216	152
		1206	341	554	465
			14%	23%	19%
Reduction in Lateral Forces Above 10 (or 7) kips during			57%	49%	20%

Summary of KELTRACK HiRail Performance

- Retentivity is considered to be 1150 – 1200 axles
- Retentivity appears to be independent of application rate
- Lateral forces reduced by 50% while KELTRACK is retained on the rail
- No train handling issues identified during normal product application