EVALUATION OF MPL TECHNOLOGY SOLIDSTICK™ LOCOMOTIVE FLANGE LUBRICATIONS SYSTEM

Letter Report
For MPL Technology Inc.

Prepared by
Richard P. Reiff
Association of American Railroads
Transportation Technology Center
Pueblo, Colorado
March 1997
P-97-103

Background

Lubrication of the wheel/rail interface has been shown to reduce train resistance and system wear, thus improving operating efficiency. Lubrication is typically applied by wayside, hi-rail or locomotive-based systems.

Traditional locomotive flange lubrication utilizes liquid based lubricants which are sprayed onto moving locomotive wheel flanges. The lubricant is then transferred by wheel/rail contact to the gage face of rails. Liquid-based lubricants often migrate from the gage face to the top of rail. This can also fling off the wheel flange and contaminate the underframe of locomotives or the ballast. This wasted lubricant does not contribute to overall wheel rail lubrication effectiveness.

The use of solid-based lubricants has been proposed as a means of eliminating migration and fling-off characteristics of conventional lubricants. For this evaluation, locomotives were equipped with solid stick lubricators and operated over a closed loop track to evaluate performance.

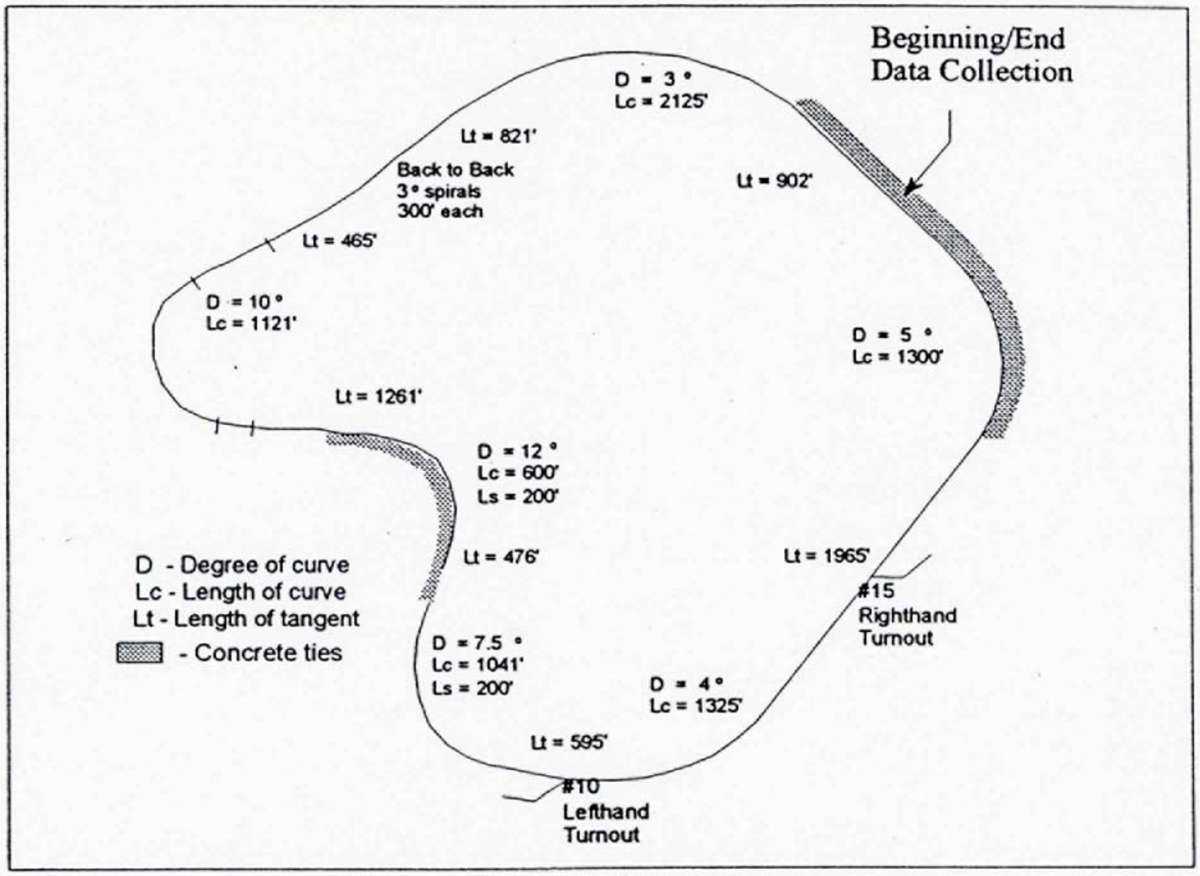


Figure 1. Wheel Rail Mechanism Loop

Test Conduct

The test was conducted on TTC's Wheel Rail Mechanisms Loop (WRM) (Figure 1). The WRM loop is 3.3 miles in length, with several curves ranging from 3 to 12 degrees. The WRM has a mixture of jointed and continuous welded rail with concrete ties in the twelve and five degree curves (Figure 1). The length of the five degree curve is on a 2 percent grade. This loop is approximately 60 percent curve and 40 percent tangent.

The test began using two GP-30 locomotives, donated for the test by the Union Pacific Railroad, and 32 trailing cars. After the last baseline dry lap was completed, one car was removed from the consist due to high angles of attack in the 7.5 degree curve, leaving 31 cars for the remainder of the test. The cars were loaded 100-ton hoppers (average weight on rail of 263,000 pounds) with standard 3-piece trucks. Trailing tonnage with the 31 cars was approximately 4,150 tons. The baseline/dry data has been adjusted to account for the removal of the one car.

Results

Data collected in this test has been summarized by lap count and summarized in a variety of plots. These are discussed by data type in the following subsections:

Power Data

This includes plots showing the drawbar force converted to kilowatts for two dry laps (plot A1), and two lubricated laps (plot A2). Data for two selected laps under each condition has been overlaid to show consistency between runs. To show power savings between dry and lubricated runs, a typical dry and lubricated run are shown as an overlay on plot A3.

Friction Data

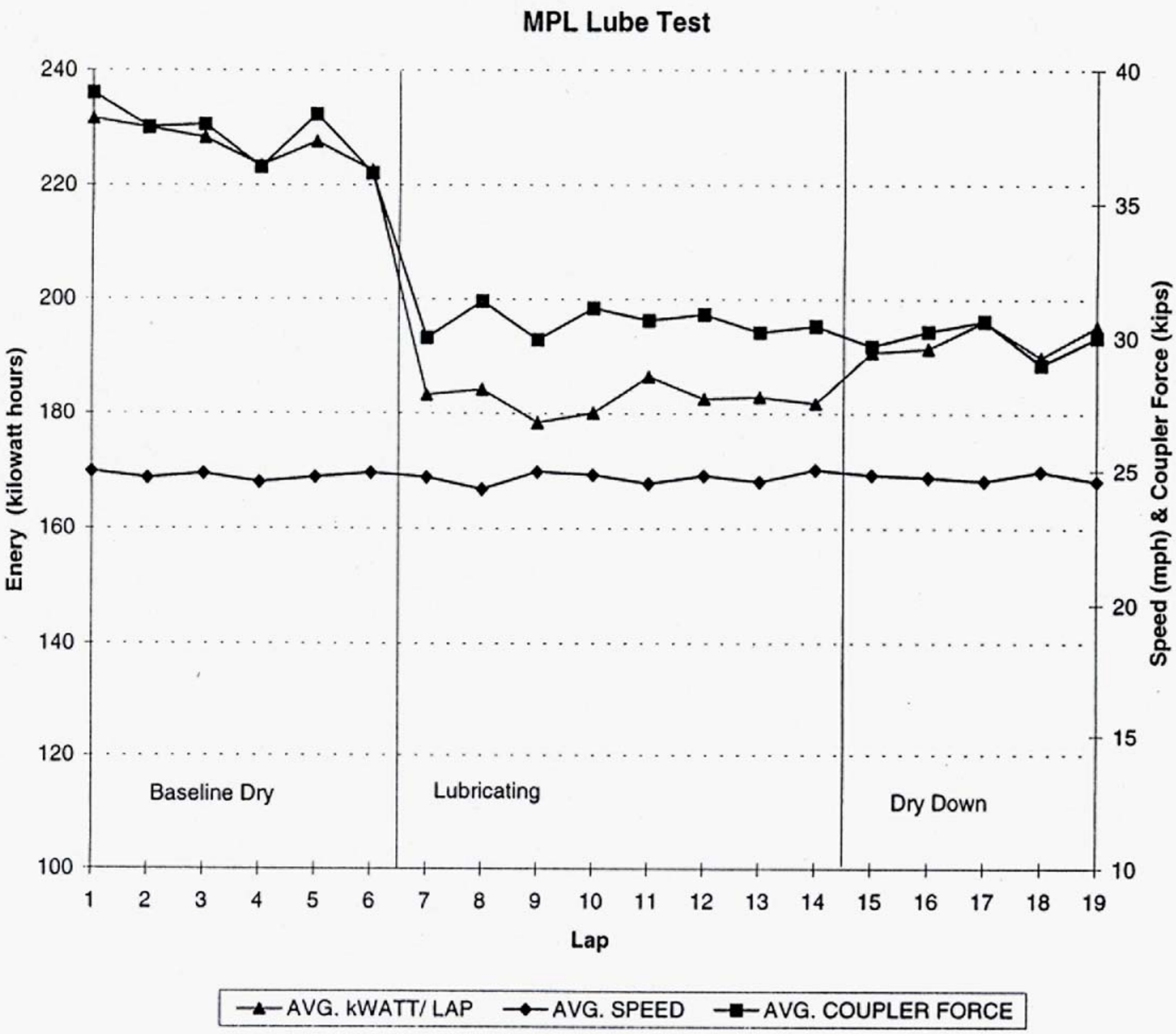
Plots B1-B4 show friction data for top of low rail, top of high rail and gage face of high rail for the 3, 4, 7.5 and 10 degree curves. These curves were selected prior to testing as the primary locations for monitoring wayside friction. Other locations were spot checked to determine performance.

Energy and Coupler Force Data

An average of each lap for energy data collected on the locomotive and force at the drawbar is shown in plot C1. Note that after lap 14, when the lubrication system is turned off, there is a slight reduction in energy saved compared to that seen at the drawbar. The immediate, but small increase in energy consumption when the lubricators were turned off may have been due to the lack of fresh lubrication applied at the locomotive wheels. The trailing tonnage was subjected to a relatively steady level of lubricant built up on the rail, thus did not exhibit an immediate change in drawbar force when the lubricators were turned off. This indicates that part of the energy savings is obtained by lubricating the locomotive wheels in addition to that received from the track. This difference indicates about a 0.8% additional savings from lubricating the locomotive wheels directly.

Data from Plot C1 can be summarized as follows:

Rail Condition (dry/lubricated)	Force	Energy
Average Dry Rail Data, per lap	37.7 kips	227.3 kilowatt hours
Average Lubricated Rail Data per lap	30.6 kips	182.7 kilowatt hours
Percent reduction from dry data	18.8%	19.6%


MPL Lube Test
240
220
200
180
160
140
120
100
40
35
30
25
20
15
10
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Lap
Enery (kilowatt hours)
Speed (mph) & Coupler Force (kips)
Baseline Dry
Lubricating
Dry Down
AVG. kWATT/ LAP
AVG. SPEED
AVG. COUPLER FORCE