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TABLE OF CONTENTS

Abstract

The subject of this report are the findings of an extensive in-use field test of FPC Fuel Performance Catalyst conducted by Western Fuels Association, Prewitt, New Mexico. Western Fuels operates a coal train between the Lee Ranch Mine and the Plainfield Electric Powerhouse. The in-use test was to determine the effect of FPC upon engine efficiency measured in gallons consumed per ton of coal hauled.

First, the baseline fuel consumption rate in gallons of fuel per ton of coal hauled was established using the same three locomotives operating in consist and pulling the same number of coal cars over a thirty day period (August 1997). Next, the same consist and coal train were operated with FPC treated fuel for a 90 day period (September 1997-November 1997) and fuel consumption data recorded again. The 90-day period allowed for proper engine preconditioning and therefore, full additive effectiveness, as established in the previously conducted Association of American Railroads recognized Recommended Practice 503 test conducted by Southwest Research Institute (SwRI), San Antonio, Texas.

As many variables as possible were carefully controlled, including the engineer operating the locomotives. It is well known that the engineer can have a profound impact upon the fuel efficiency of the locomotives and train. Mr. Buskirk was the locomotive engineer throughout the entire baseline period, and only the FPC treated fuel test segments wherein Mr. Buskirk was the engineer for at least 90% of the operating time were compared to the baseline period.

This controlled in-use test documented the following:

(1) Fuel efficiency during the 90-day test period, measured in gallons per, was improved an average 5.40% with FPC treated fuel.

(2) Tons hauled per trip generally varied less then 0.2% with a maximum variation of 2.5% during the test period. Tonnage per trip was directionally greater during the FPC test period.

(3) Train delay was generally longer during the FPC treated fuel portion of the test. The trip delay time data indicate delay (idle time) had little effect upon overall fuel consumption during the test period.

(4) Fuel efficiency improvement increased with increasing operating time on FPC treated fuel. This trend agrees with the findings of the RP-503 test conducted by SwRI. This trend indicates fuel savings on a long term basis could be greater than observed in the 120-day WFA test.

I. Introduction

Western Fuels Association, Inc (WFA) operates three SD40-2 EMD locomotives in consist that haul coal trains from the Lee Ranch Coal Mine to the Plainfield Power Station. The consist of SD40-2s hauls 51 coal cars, each loaded with approximately 100 tons of coal over the same trackage, without deviation. Further, train delay is minimal, and with rare exception, the coal train is operated by the same locomotive engineer. The consist operates at duty cycle notch 5 to the minesite pulling empty coal cars, then returns to the power station pulling fully loaded cars at duty cycle notch 8.

WFA, in cooperation with FPC Technology, Inc., FPC International, Inc., and Gunderson Oil Company conducted a four month study to determine the effect of FPC fuel catalyst upon fuel consumption and work output (gallons per ton) of the consist.

II. Technical Approach

Prior tests of FPC have always been conducted with stationary locomotives connected to a loadbox. And, although a recognized method for determining specific fuel consumption (fuel consumption per unit of work output), by nature loadbox tests cannot reproduce transient conditions experienced by locomotive engines operating in the field.

A review of the WFA in-use historical data revealed remarkable consistency in fuel usage and net tonnage hauled by the consist of three SD40-2s locomotives pulling a coal train of 51 cars from the Lee Ranch Mine to the Power Station. This provided a unique opportunity to study the effect of FPC upon specific fuel consumption under actual operating conditions, which are more transient than steady-state loadbox testing. A review of weather data showed weather conditions in the desert area of north central New Mexico is lacking in extremes for the late summer and early fall, and the fuel supplier agreed to monitored fuel quality, thereby minimizing the effect of these variables upon engine performance.

The study did not include mileage, since the consist is isolated to the same trackage, and travels the same distance with each coal haul, but did monitor tons hauled and train delay time. Net tons were recorded and used since the number of cars are always the same for each trip.

August of 1997 was selected as the baseline data collection period. Data for net coal tonnage hauled were collected for each train. Once the baseline data were compiled and analyzed for reliability, the fuel for the consist was treated with FPC at the recommended treat rate. The coal train then continued to operate under the same careful controls from 1 September 1997 to 1 December 1997, and the fuel consumption, tonnage, delay time and operating engineer recorded. At the completion of the 120-day test period, the data were complied, analyzed, and compared.

III. Discussion of Results

Previous laboratory tests of FPC document full additive effectiveness is not realized until the engines operating on additized fuel undergo a conditioning period. The same studies show this "engine-conditioning" period may vary from 300 to 500 hours of additized fuel operation. The engine-conditioning effect appears to be related to the age, design, and operating regime or duty cycle of the engine.

For example, FPC was tested at Southwest Research Institute in San Antonio, Texas, using the Association of American Railroads Recommended Practice-503 test procedure. The test of engine performance was conducted over a 280 hour time period (40 hour baseline, 240 hour treated). Fuel efficiency continually improved over the entire 240 hour FPC test period (See Appendix 3, Figure 3).

The data from the WFA follow the same trend previously observed in the RP-503 and other lab studies. *Fuel efficiency measured as gallons per ton improved steadily over the entire 90-day additized fuel test period, with the largest gain in efficiency taking place in the final thirty (30) days of the test.*

The data for each month of train operation are graphed in Appendix 2 of the report. The tons hauled per trip were very consistent, as expected.

a. Tons per Trip

The baseline tons per trip averaged 5,138. Tonnage per trip averaged 5,259 tons in September, 5,200 tons in October and 5,218 tons in November. The tonnage per trip was generally higher for the FPC treated test period, but did not change more than 2.5% during the entire test period.

b. Delay Time per Trip

Delay time per trip increased on an average basis over the treated test period. It is unlikely train delay of such short duration as seen in this study would impact overall fuel efficiency. This is due to the relatively small amount of fuel consumed by the SD40-2 while idling (5.5 gph) when compared to the much greater fuel consumption at notches 5 (79 gph) and 8 (167 gph).

Trip delay time averaged 33.7 minutes in August, the baseline. Trip delay averaged 28 minutes in September, 130 minutes in October, and 13.6 minutes in November.

c. Locomotive Engineer

Mr. Buskirk was the locomotive engineer for the entire month of August, and therefore, the baseline data reflect his skill and habits as an operator. Consequently, only data from test periods wherein Mr. Buskirk operated the locomotives for at least 90% of the trips during the FPC test period were compared to the baseline test period.

IV. Conclusions

The WFA in-use study of FPC provides for the following conclusions:

(1) Fuel efficiency gain (reduced fuel consumption per ton of coal hauled) by the consist of three SD40-2 locomotives was improved an average of 5.44% (weighted) over the 90-day FPC treated fuel test period.

(2) The rate of fuel consumption per ton trended downward during the entire FPC test period, once again demonstrating the effect of engine-conditioning observed in the SwRI and other laboratory studies.

(3) Tons hauled per trip varied less than 2.5% during the test period. Tonnage per trip was directionally higher during the FPC test period.

(4) Delay time per trip was generally greater during the FPC test period, although the delay time and therefore, associated rate of fuel consumption, would have little impact upon specific fuel consumption of the consist over the period of the test.

Appendix 1

Western Fuels Association, Inc.
New Mexico Operations
FPC Fuel Catalyst Test

Test Segment	Tons Hauled	Gallons #2 Diesel	Gallons/Ton	% Improvement
Baseline	102, 778.58	15,598	0.1518	
Treated # 1	94,657.28	14,146	0.1494	1.56%
Treated # 2	62,406.20	8,917	0.1429	5.86%
Treated # 3	57,401.13	7,721	0.1345	11.40%
Treated Ave.	**214,464.60**	**30,784**	**0.1435**	**5.44%**

Note 1: Treated data taken from test periods where in Mr. Buskirk operated the coal train at least 90% of the time.

Note 2: The 5.44% weighted average indicates the fuel consumption reduction or fuel efficiency gain over the 90-day FPC treated fuel test period. The continual trend toward increasing fuel efficiency indicates actual fuel savings may be greater over a longer time period (See III. Discussion of Results).

WESTERN FUELS ASSOCIATION, INC.
NEW MEXICO OPERATIONS
FPC CATALYST TEST

Consist Fuel Consumption (3-SD40's)

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	(Engineer)/Comments
08/01/97	97122	5213.050	0.03%				(Buskirk) Full Fuel Tanks (no FPC)
08/02/97							
08/03/97							
08/04/97	97123	5213.775	0.04%				(Buskirk)
08/05/97	97124	5214.075	0.05%			55	(Buskirk)
08/06/97	97125	5212.550	0.02%				(Buskirk)
08/07/97	97126	5211.700	0.00%			15	(Buskirk)
08/08/97	97127	5211.475	0.00%			15	(Buskirk)
08/09/97							
08/10/97							
08/11/97	97128	5211.675	0.00%				(Buskirk)
08/12/97	97129	5212.150	0.01%				(Buskirk)
08/13/97	97130	5212.350	0.02%			50	(Buskirk)
08/14/97	97131	5213.100	0.03%				(Buskirk)
08/15/97	97132	5213.750	0.04%	8581		120	(Buskirk) Full Fuel Tanks (no FPC-2)
08/16/97		**57339.650**					
08/17/97	**Ave.=**	**5212.695**			**0.1496521**	**23 min/trip**	**Test Segment #1 Baseline**
08/18/97							
08/19/97	97133	5213.575	0.04%				(Buskirk)
08/20/97	97134	5218.875	0.14%			50	(Buskirk)
08/21/97	97135	5219.400	0.15%				(Buskirk)
08/22/97	97136	5219.900	0.16%				(Buskirk)
08/23/97							
08/24/97							
08/25/97	97137	5219.550	0.15%			15	(Buskirk)
08/26/97	97138	5216.725	0.10%			60	(Buskirk)
08/27/97	97139	5220.750	0.18%				(Buskirk)
08/28/97	97140	5220.675	0.18%			55	(Buskirk)
08/29/97	97141	3689.475	n/a	7017		240	(Buskirk) Full Fuel Tanks (no FPC-2)
08/30/97		45438.925					
08/31/97	**Ave.=**	**5218.681**	**(excluding 8/29)**		**0.1544271**	**47 min/trip**	**(2) Test Segment #2 Baseline**
Total		102778.575		15598			*Note: 8/30/97 Replaced #5 & #9 power assemblies on WFA-1.*

Baseline Average = 0.1517631 Gal/Ton

Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).

(2) 3.19% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.

(3) The load on 8/29 was only 6.05% more than 2/3 of the average load (only two locomotives operated that day.)

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
09/01/97							(Buskirk) Full Fuel Tanks
09/02/97	97142	5219.375	0.15%				(Buskirk) FPC Mixed in Fuel
09/03/97	97143	5220.950	0.18%				(Buskirk)
09/04/97	97144	5320.425	2.09%				(Buskirk)
09/05/97	97145	5320.925	2.10%				(Buskirk)
09/06/97							
09/07/97							
09/08/97	97146	5321.350	2.11%			80	(Buskirk)
09/09/97	97147	5321.350	2.11%				(Buskirk)
09/10/97	97148	5219.300	0.15%			60	(Buskirk)
09/11/97	97149	5218.700	0.14%			40	(Buskirk)
09/12/97	97150	5219.550	0.15%				(Buskirk)
09/13/97							
09/14/97							
09/15/97							
09/16/97	97151	5219.900	0.16%			25	(Buskirk)
09/17/97	97152	5219.450	0.15%	**8612**		95	(Buskirk) Full Fuel Tanks
		57821.275			**0.1489417**	**27 min/trip**	**Test Segment #1 Treated**
	Ave.=	**5256.480**					
09/18/97	97153	5219.300	0.15%				(Biskirk)
09/19/97	97154	5218.975	0.14%				(Biskirk)
09/20/97							
09/21/97							
09/22/97							
09/23/97	97155	5218.725	0.14%				(Biskirk)
09/24/97	97156	5215.200	0.07%			180	(Biskirk)
09/25/97	97157	5321.175	2.10%				(Biskirk)
09/26/97	97158	5321.800	2.12%				(Biskirk)
09/27/97							
09/28/97							
09/29/97							
09/30/97	97159	5321.150	2.10%	5534		20	(Buskirk) Full Fuel Tanks
		36836.325			**0.1502321**	**29 min/trip**	**Test Segment #2 Treated**
	Ave.=	**5262.332**	**0.91%**				
Total		**94657.600**		14146			

Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).
(2) 0.87% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.

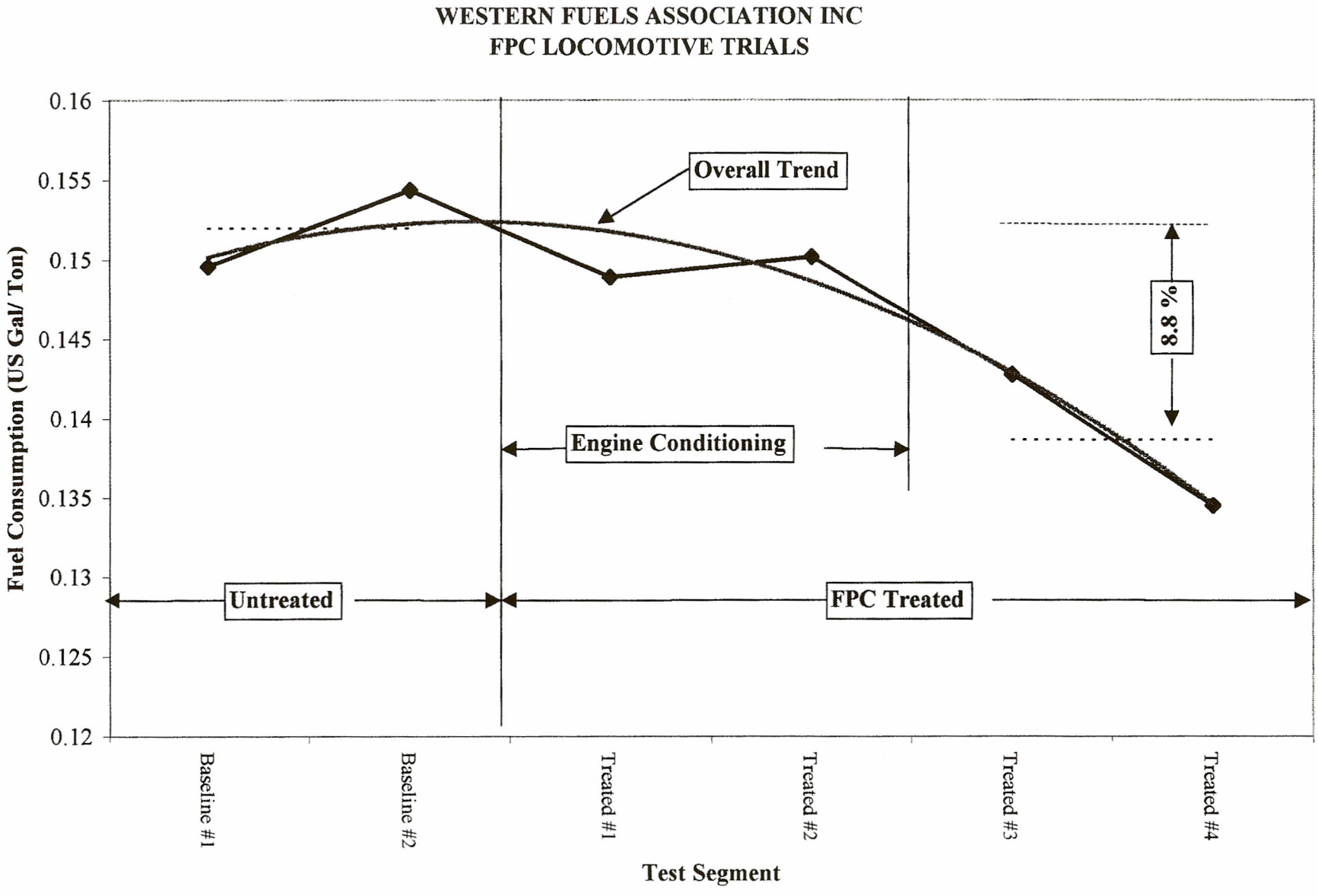
Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
10/01/97							Full Fuel Tanks
10/02/97	97160	5219.800	0.16%			270	(Buskirk)FPC Mixed in Fuel
10/03/97	97161	5217.950	0.12%			240	(Buskirk)
10/04/97							
10/05/97							
10/06/97							
10/07/97	97162	5218.375	0.13%			15	(Buskirk)
10/08/97	97163	5177.250	-0.66%			35	(Buskirk)
10/09/97	97164	5219.350	0.15%			430	(Buskirk)
10/10/97	97165	5218.600	0.14%			115	(Buskirk)
10/11/97							
10/12/97							
10/13/97							
10/14/97	97166	5081.425	-2.50%			240	(Buskirk)
10/15/97	97167	5220.300	0.17%				(Buskirk)
10/16/97	97168	5210.700	-0.01%				(Buskirk)
10/17/97	97169	5215.275	0.07%			50	(Buskirk)
10/18/97							
10/19/97							
10/20/97							
10/21/97	97170	5218.375	0.13%			85	(Buskirk)
10/22/97							(Buskirk)
10/23/97	97171	5188.800	-0.44%	8917		80	(Buskirk) Full Fuel Tanks
		62406.200			**0.1428864**	**130min/trip**	**Test Segment #3 Treated**
	Ave.=	**5200.517**					
10/24/97	97172	5132.775	-1.51%				(Greenbaum)
10/25/97							
10/26/97							
10/27/97							
10/28/97	97173	5218.875	0.14%			90	(Greenbaum)
10/29/97							
10/30/97	97174	5218.900	0.14%				(Greenbaum)
10/31/97	97175	5219.175	0.15%	3915			(Greenbaum) Full Fuel Tanks
		20789.725				**23 min/trip**	**Test Segment #4 Treated**
	Ave.=	**5197.431**	**-0.23%**				
Total		83195.925		12832			

Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).
(2) 31.79% Variation between Segment #3 Gallons/Ton and Segment #4 Gallons/Ton.

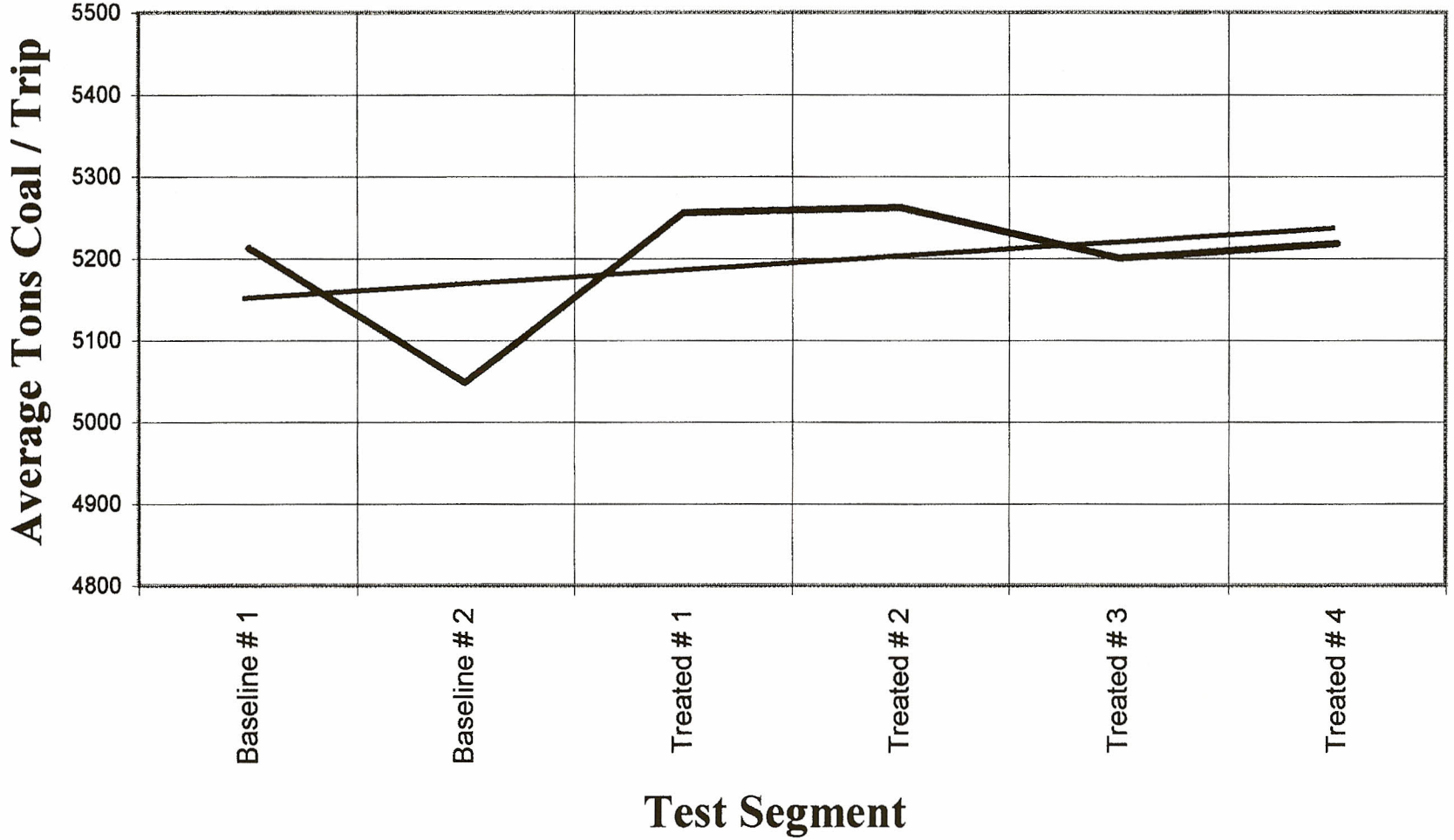
Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
11/01/97							Full Fuel Tanks
11/02/97							FPC Mixed in Fuel
11/03/97	97176	5218.025	0.13%				(Buskirk)
11/04/97	97177	5218.775	0.14%			20	(Buskirk)
11/05/97							
11/06/97	97178	5218.675	0.14%			70	(Buskirk)
11/07/97	97179	5217.975	0.12%				(Buskirk)
11/08/97							
11/09/97							
11/10/97	97180	5217.900	0.12%				(Buskirk)
11/11/97							
11/12/97							*Replaced power assemblies (11/13)*
11/13/97							*WFA-2 #3, WFA-3 #9&#1*
11/14/97	97181	5218.650	0.14%				(Greenbaum)
11/15/97							
11/16/97							
11/17/97	97182	5217.475	0.12%				(Buskirk)
11/18/97	97183	5218.525	0.14%				(Buskirk)
11/19/97	97184	5218.925	0.14%				(Buskirk)
11/20/97	97185	5217.650	0.12%			30	(Buskirk)
11/21/97	97186	5218.550	0.14%	7721		30	(Buskirk) Full Fuel Tanks
		57401.125			**0.1345096**	**14 min/trip**	**Test Segment #5 Treated**
	Ave.=	**5218.284**					
11/22/97							
11/23/97							
11/24/97	97187	5213.650	0.04%			100	(Buskirk)
11/25/97	97188	5217.975	0.12%				(Buskirk)
11/26/97	97189	5219.350	0.15%	**3002**			(Greenbaum) Full Fuel Tanks
		15650.975				**33min/trip**	**Test Segment #6 Treated**
	Ave.=	**5216.992**					
11/27/97							
11/28/97							
11/29/97							
11/30/97							
Total		73052.100		10723			

Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).
(2) 42.6% Variation between Segment #5 Gallons/Ton and Segment #6 Gallons/Ton.

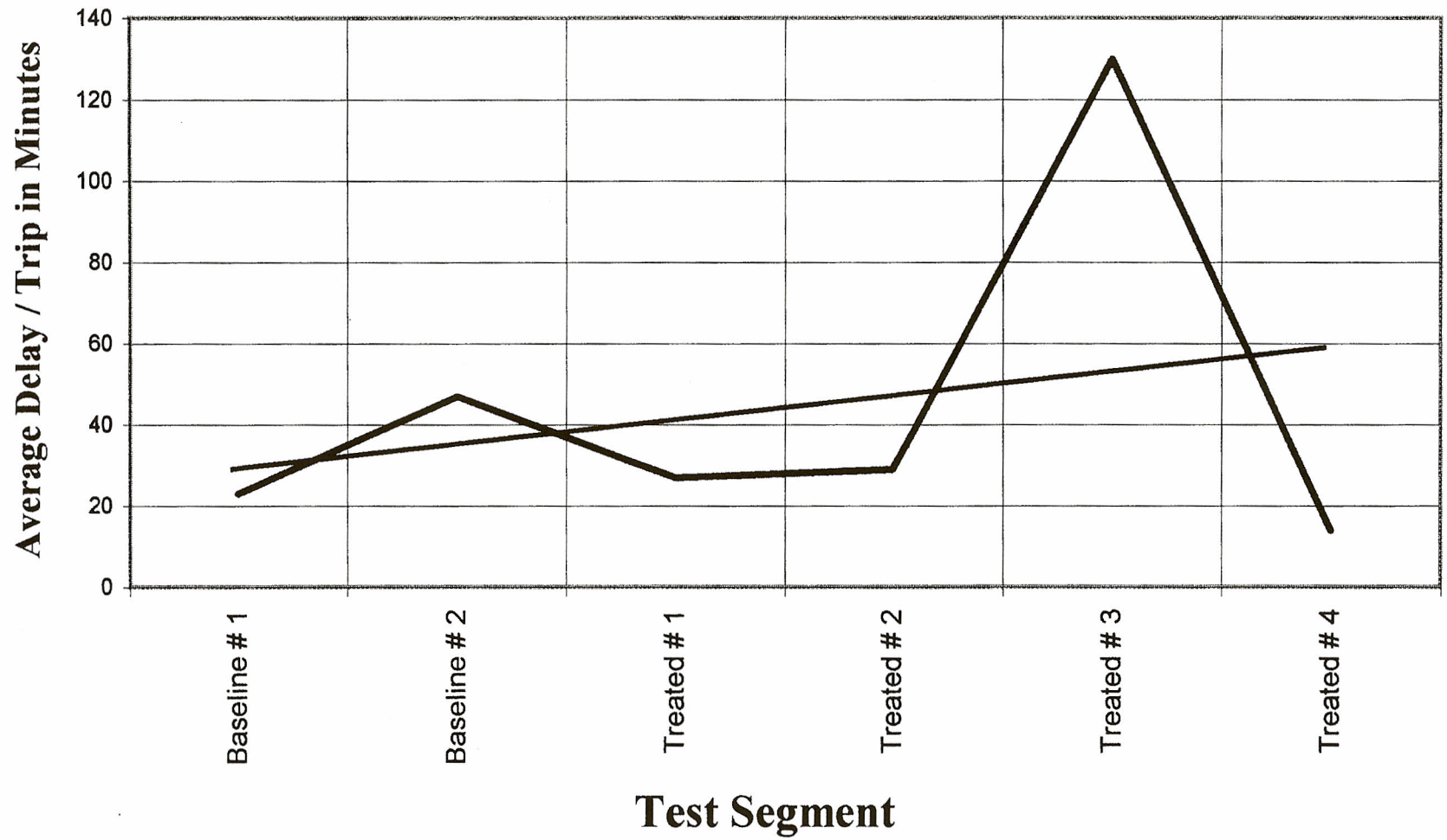
Appendix 2


WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS
Fuel Consumption (US Gal/ Ton)
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
Overall Trend
8.8 %
Engine Conditioning
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment

Average Tons Coal Per Trip



Average Train Delay - Minutes Per Trip



TECHNICAL BULLETIN No. 1104 MARCH 1998

WESTERN FUELS ASSOCIATION IN-USE LOCOMOTIVE TEST OF FPC

This bulletin summarizes the findings of an extensive in-use field test of FPC Fuel Performance Catalyst conducted by Western Fuels Association (WFA), Prewitt, New Mexico. WFA operates a coal train between the Lee Ranch Mine and the Plainfield Electric Powerhouse. The in-use test was designed to determine the effect of FPC upon the engine's efficient use of fuel (fuel efficiency), measured in gallons consumed per ton of coal hauled.

First, the baseline fuel consumption rate in gallons of fuel per ton of coal hauled was established using the same three locomotives (SD40s) operating in consist and pulling the same number of coal cars over a thirty day period (August 1997). Next, the same consist and coal train were operated with FPC treated fuel the following ninety day period (September 1997-November 1997) and fuel consumption/tonnage data again collected. The 90-day period allowed for proper engine-conditioning and therefore, full additive effectiveness, as established in the previously conducted Association of American Railroads recognized Recommended Practice 503 test conducted by Southwest Research Institute (SwRI), San Antonio, Texas, and several other laboratory studies.

As many variables as possible were carefully controlled, with emphasis placed upon variables having the greatest impact upon fuel efficiency. These include load (tons of coal hauled), the operating skills and habits of the locomotive engineer, train delay time (engine idling time), fuel quality, distance traveled, and weather conditions. This controlled in-use test documented the following:

(1) *Fuel efficiency during the 90-day FPC additized fuel test period was improved an average 5.44% with FPC treatment.*

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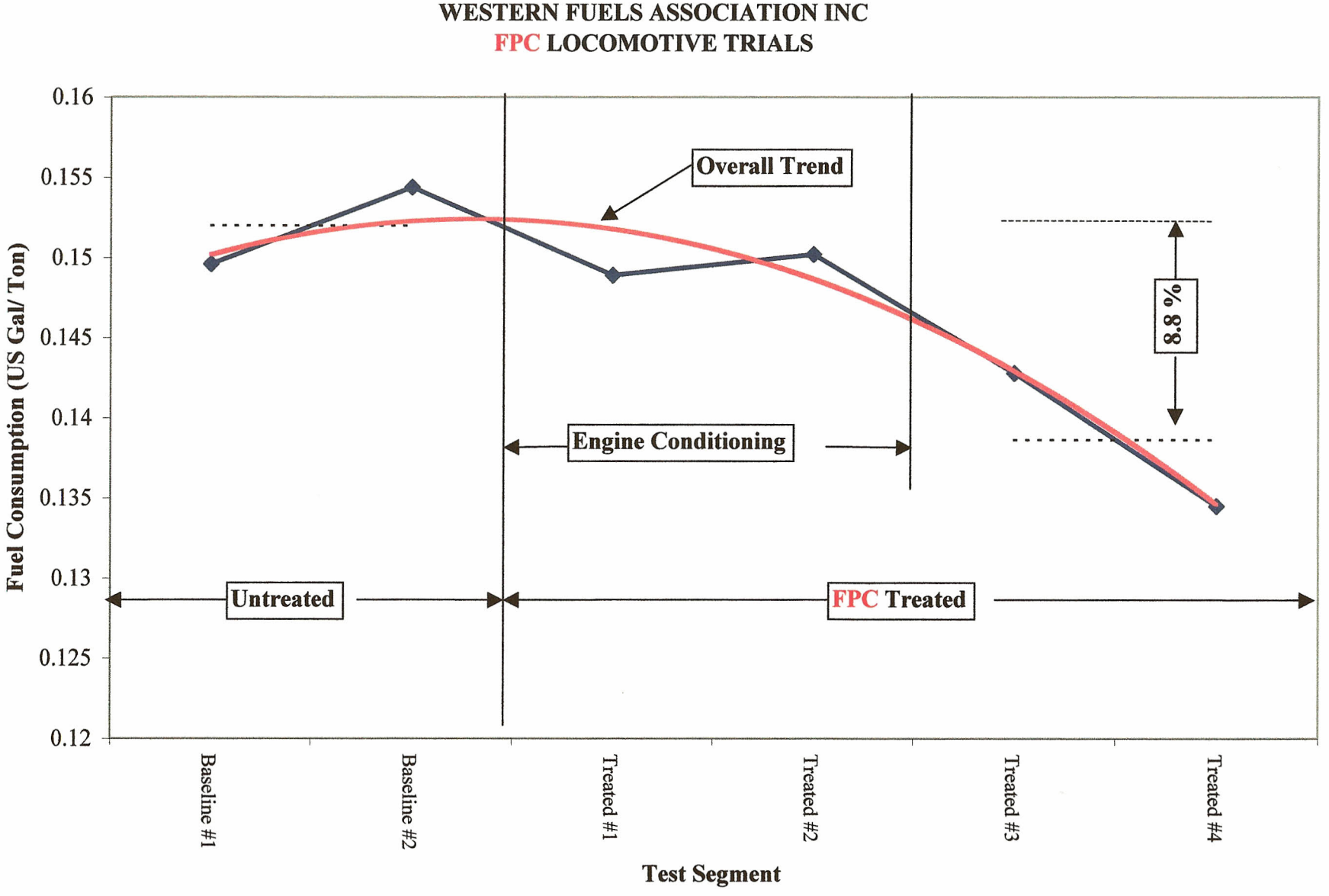
(3) *Train delay time per trip was generally longer during the FPC treated fuel portion of the test.*

(4) ***Fuel efficiency improvement increased with increasing operating time on FPC treated fuel**. This trend agrees with the findings of the RP-503 test conducted by SwRI. This trend indicates fuel savings on a long-term basis would be greater, in fact, as much as 8.8% (see attached trend line graph), than observed in the 120-day WFA test.*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0.16
0.155
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0.14
0.135
0.13
0.125
0.12
Overall Trend
8.8 %
Engine Conditioning
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment

IN-USE TEST OF FPC FUEL CATALYST
By
WESTERN FUELS ASSOCIATION, INC.
New Mexico Operations

December 15, 1997

Report prepared by
FPC Technology, Inc.
and
FPC International, Inc.

Data for the report provided by
Western Fuels Association, Inc.

TABLE OF CONTENTS

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August of 1997 was selected as the baseline data collection period. Data for net coal tonnage hauled were collected for each train. Once the baseline data were compiled and analyzed for reliability, the fuel for the consist was treated with FPC at the recommended treat rate. The coal train then continued to operate under the same careful controls from 1 September 1997 to 1 December 1997, and the fuel consumption, tonnage, delay time and operating engineer recorded. At the completion of the 120-day test period, these data were complied and analyzed, and compared to the baseline data.

III. Discussion of Results

Previous laboratory tests of FPC have shown that full additive effectiveness is not realized until the treated engines undergo a conditioning period. The same studies indicate this "engine-conditioning" period may vary from 300 to 500 hours of additized fuel operation. The engine-conditioning effect appears to be related to the age and operating regime or duty cycle of the engines.

For example, FPC was tested at Southwest Research Institute in San Antonio, Texas, using the Association of American Railroads Recommended Practice-503 test procedure. The test of engine performance was conducted over a 280 hour time period. Fuel efficiency continued to improve over the entire test period (See Appendix 3, Figure 3).

The data from the WFA follow the same trend previously observed in the RP-503 and other lab studies. Fuel efficiency in gallons per ton improved steadily over the entire 120-day additized fuel test period, with the largest gain in efficiency taking place in the final thirty (30) days of the test.

The data for each month of train operation are graphed in Appendix 2 of the report. The tons hauled per trip were very consistent, as expected.

a. Tons per Trip

The baseline tons per trip averaged 5,138. Tonnage per trip averaged 5,259 tons in September, 5,200 tons in October and 5,218 tons in November. The tonnage per trip was generally higher for the FPC treated test period, but did not change more than 2.5% during the entire test period.

b. Delay Time per Trip

Delay time per trip increased on an average basis over the treated test period, but appeared to have little impact upon fuel consumption. This is likely due to the relatively small amount of fuel consumed by the SD40 engine while idling (5.5 gph) when compared to the much greater fuel consumption at notches 5 (79 gph) and 8 (167 gph). Even long periods of idle time would have an insignificant impact upon overall fuel consumption on the WFA consist.

Trip delay time averaged 33.7 minutes in August, the baseline. Trip delay averaged 28 minutes in September, 130 minutes in October, and 13.6 minutes in November.

c. Train Engineer

Mr. Buskirk was the engineer for the train the entire month of August, and therefore, the baseline data reflect his skill and habits as an operator. Only data from test periods wherein Mr. Buskirk operated the train at least 90% of the time during the FPC test period were compared to the baseline test period.

IV. Conclusions

The WFA in-use study of FPC provides for the following conclusions:

(1) Fuel consumption per ton of coal hauled by the consist of three SD40 locomotives was reduced an average of 5.40% over the 90-day FPC treated fuel test period.

(2) The rate of fuel consumption per ton trended downward during the entire FPC test period, once again demonstrating the effect of engine conditioning observed in the SwRI and other laboratory studies.

(3) Tons hauled per trip varied less than 2.5% during the test period. Tonnage per trip was directionally higher during the FPC test period.

(4) Delay time per trip was generally longer during the FPC test period, although the delay time and therefore, association rate of fuel consumption, appeared to have little impact upon specific fuel consumption of the consist over the period of the test.

Appendix 1

Western Fuels Association, Inc.
New Mexico Operations
FPC Fuel Catalyst Test

Test Segment	Tons Hauled	Gallons #2 Diesel	Gallons/Ton	% Improvement
Baseline	102, 778.58	15,598	0.1518	
Treated # 1	94,657.28	14,146	0.1494	1.56%
Treated # 2	62,406.20	8,917	0.1429	5.86%
Treated # 3	57,401.13	7,721	0.1345	11.40%
Treated Ave.	**214,464.60**	**30,784**	**0.1435**	**5.44%**

Note 1: Treated data taken from test periods where in Mr. Buskirk operated the coal train at least 90% of the time.

Note 2: The 5.44% weighted average indicates the fuel consumption reduction or fuel efficiency gain over the 90-day FPC treated fuel test period. The continual trend toward increasing fuel efficiency indicates actual fuel savings may be greater over a longer time period (See III. Discussion of Results).

WESTERN FUELS ASSOCIATION, INC.
NEW MEXICO OPERATIONS
FPC CATALYST TEST

Consist Fuel Consumption (3-SD40's)

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	(Engineer)/Comments
08/01/97	97122	5213.050	0.03%				(Buskirk) Full Fuel Tanks (no FPC)
08/02/97							
08/03/97							
08/04/97	97123	5213.775	0.04%				(Buskirk)
08/05/97	97124	5214.075	0.05%			55	(Buskirk)
08/06/97	97125	5212.550	0.02%				(Buskirk)
08/07/97	97126	5211.700	0.00%			15	(Buskirk)
08/08/97	97127	5211.475	0.00%			15	(Buskirk)
08/09/97							
08/10/97							
08/11/97	97128	5211.675	0.00%				(Buskirk)
08/12/97	97129	5212.150	0.01%				(Buskirk)
08/13/97	97130	5212.350	0.02%			50	(Buskirk)
08/14/97	97131	5213.100	0.03%				(Buskirk)
08/15/97	97132	5213.750	0.04%	**8581**		120	(Buskirk) Full Fuel Tanks (no FPC-2)
08/16/97		**57339.650**					
08/17/97	**Ave.=**	**5212.695**			**0.1496521**	**23 min/trip**	**Test Segment #1 Baseline**
08/18/97							
08/19/97	97133	5213.575	0.04%				(Buskirk)
08/20/97	97134	5218.875	0.14%			50	(Buskirk)
08/21/97	97135	5219.400	0.15%				(Buskirk)
08/22/97	97136	5219.900	0.16%				(Buskirk)
08/23/97							
08/24/97							
08/25/97	97137	5219.550	0.15%			15	(Buskirk)
08/26/97	97138	5216.725	0.10%			60	(Buskirk)
08/27/97	97139	5220.750	0.18%				(Buskirk)
08/28/97	97140	5220.675	0.18%			55	(Buskirk)
08/29/97	97141	3689.475	n/a	**7017**		240	(Buskirk) Full Fuel Tanks (no FPC-2)
08/30/97		**45438.925**					
08/31/97	**Ave.=**	**5218.681**	**(excluding 8/29)**		**0.1544271**	**47 min/trip**	**(2) Test Segment #2 Baseline**
Total		**102778.575**		**15598**			*Note: 8/30/97 Replaced #5 & #9 power assemblies on WFA-1.*

Baseline Average = 0.1517631 Gal/Ton

Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 3.19% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.
(3) The load on 8/29 was only 6.05% more than 2/3 of the average load (only two locomotives operated that day.)

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
09/01/97							(Buskirk) Full Fuel Tanks
09/02/97	97142	5219.375	0.15%				(Buskirk) FPC Mixed in Fuel
09/03/97	97143	5220.950	0.18%				(Buskirk)
09/04/97	97144	5320.425	2.09%				(Buskirk)
09/05/97	97145	5320.925	2.10%				(Buskirk)
09/06/97							
09/07/97							
09/08/97	97146	5321.350	2.11%			80	(Buskirk)
09/09/97	97147	5321.350	2.11%				(Buskirk)
09/10/97	97148	5219.300	0.15%			60	(Buskirk)
09/11/97	97149	5218.700	0.14%			40	(Buskirk)
09/12/97	97150	5219.550	0.15%				(Buskirk)
09/13/97							
09/14/97							
09/15/97							
09/16/97	97151	5219.900	0.16%			25	(Buskirk)
09/17/97	97152	5219.450	0.15%	**8612**		95	(Buskirk) Full Fuel Tanks
		57821.275			**0.1489417**	**27 min/trip**	**Test Segment #1 Treated**
	Ave.=	**5256.480**					
09/18/97	97153	5219.300	0.15%				(Biskirk)
09/19/97	97154	5218.975	0.14%				(Biskirk)
09/20/97							
09/21/97							
09/22/97							
09/23/97	97155	5218.725	0.14%				(Biskirk)
09/24/97	97156	5215.200	0.07%			180	(Biskirk)
09/25/97	97157	5321.175	2.10%				(Biskirk)
09/26/97	97158	5321.800	2.12%				(Biskirk)
09/27/97							
09/28/97							
09/29/97							
09/30/97	97159	5321.150	2.10%	**5534**		20	(Buskirk) Full Fuel Tanks
		36836.325			**0.1502321**	**29 min/trip**	**Test Segment #2 Treated**
	Ave.=	**5262.332**	**0.91%**				
Total		**94657.600**		**14146**			

Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 0.87% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
10/01/97							Full Fuel Tanks
10/02/97	97160	5219.800	0.16%			270	(Buskirk)FPC Mixed in Fuel
10/03/97	97161	5217.950	0.12%			240	(Buskirk)
10/04/97							
10/05/97							
10/06/97							
10/07/97	97162	5218.375	0.13%			15	(Buskirk)
10/08/97	97163	5177.250	-0.66%			35	(Buskirk)
10/09/97	97164	5219.350	0.15%			430	(Buskirk)
10/10/97	97165	5218.600	0.14%			115	(Buskirk)
10/11/97							
10/12/97							
10/13/97							
10/14/97	97166	5081.425	-2.50%			240	(Buskirk)
10/15/97	97167	5220.300	0.17%				(Buskirk)
10/16/97	97168	5210.700	-0.01%				(Buskirk)
10/17/97	97169	5215.275	0.07%			50	(Buskirk)
10/18/97							
10/19/97							
10/20/97							
10/21/97	97170	5218.375	0.13%			85	(Buskirk)
10/22/97							(Buskirk)
10/23/97	97171	5188.800	-0.44%	**8917**		80	(Buskirk) Full Fuel Tanks
		62406.200			**0.1428864**	**130min/trip**	**Test Segment #3 Treated**
	Ave.=	**5200.517**					
10/24/97	97172	5132.775	-1.51%				(Greenbaum)
10/25/97							
10/26/97							
10/27/97							
10/28/97	97173	5218.875	0.14%			90	(Greenbaum)
10/29/97							
10/30/97	97174	5218.900	0.14%				(Greenbaum)
10/31/97	97175	5219.175	0.15%	**3915**			(Greenbaum) Full Fuel Tanks
		20789.725			**0.1883142**	**23 min/trip**	**Test Segment #4 Treated**
	Ave.=	**5197.431**	**-0.23%**				
Total		**83195.925**		**12832**			

Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 31.79% Variation between Segment #3 Gallons/Ton and Segment #4 Gallons/Ton.

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	**Gallons/ Ton Coal**	**Delay (Minutes)**	Comments
11/01/97							Full Fuel Tanks
11/02/97							FPC Mixed in Fuel
11/03/97	97176	5218.025	0.13%				(Buskirk)
11/04/97	97177	5218.775	0.14%			20	(Buskirk)
11/05/97							
11/06/97	97178	5218.675	0.14%			70	(Buskirk)
11/07/97	97179	5217.975	0.12%				(Buskirk)
11/08/97							
11/09/97							
11/10/97	97180	5217.900	0.12%				(Buskirk)
11/11/97							
11/12/97							*Replaced power assemblies (11/13)*
11/13/97							*WFA-2 #3, WFA-3 #9&#1*
11/14/97	97181	5218.650	0.14%				(Greenbaum)
11/15/97							
11/16/97							
11/17/97	97182	5217.475	0.12%				(Buskirk)
11/18/97	97183	5218.525	0.14%				(Buskirk)
11/19/97	97184	5218.925	0.14%				(Buskirk)
11/20/97	97185	5217.650	0.12%			30	(Buskirk)
11/21/97	97186	5218.550	0.14%	**7721**		30	(Buskirk) Full Fuel Tanks
		57401.125			**0.1345096**	**14 min/trip**	**Test Segment #5 Treated**
	Ave.=	**5218.284**					
11/22/97							
11/23/97							
11/24/97	97187	5213.650	0.04%			100	(Buskirk)
11/25/97	97188	5217.975	0.12%				(Buskirk)
11/26/97	97189	5219.350	0.15%	**3002**			(Greenbaum) Full Fuel Tanks
		15650.975			**0.1918091**	**33min/trip**	**Test Segment #6 Treated**
	Ave.=	**5216.992**					
11/27/97							
11/28/97							
11/29/97							
11/30/97							
Total		**73052.100**		**10723**			

Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 42.6% Variation between Segment #5 Gallons/Ton and Segment #6 Gallons/Ton.

Appendix 2

Appendix 3

EVALUATION OF A FUEL ADDITIVE

FINAL REPORT

Volume I

SwRI Project No. 03-4810

Prepared for:
UHI CORPORATION
750 NORTH 200 WEST, SUITE 306
PROVO, UTAH 84601

Prepared by:
Vernon O. Markworth

July 1992

SOUTHWEST RESEARCH INSTITUTE
San Antonio
Houston
Detroit
Washington, D.C.

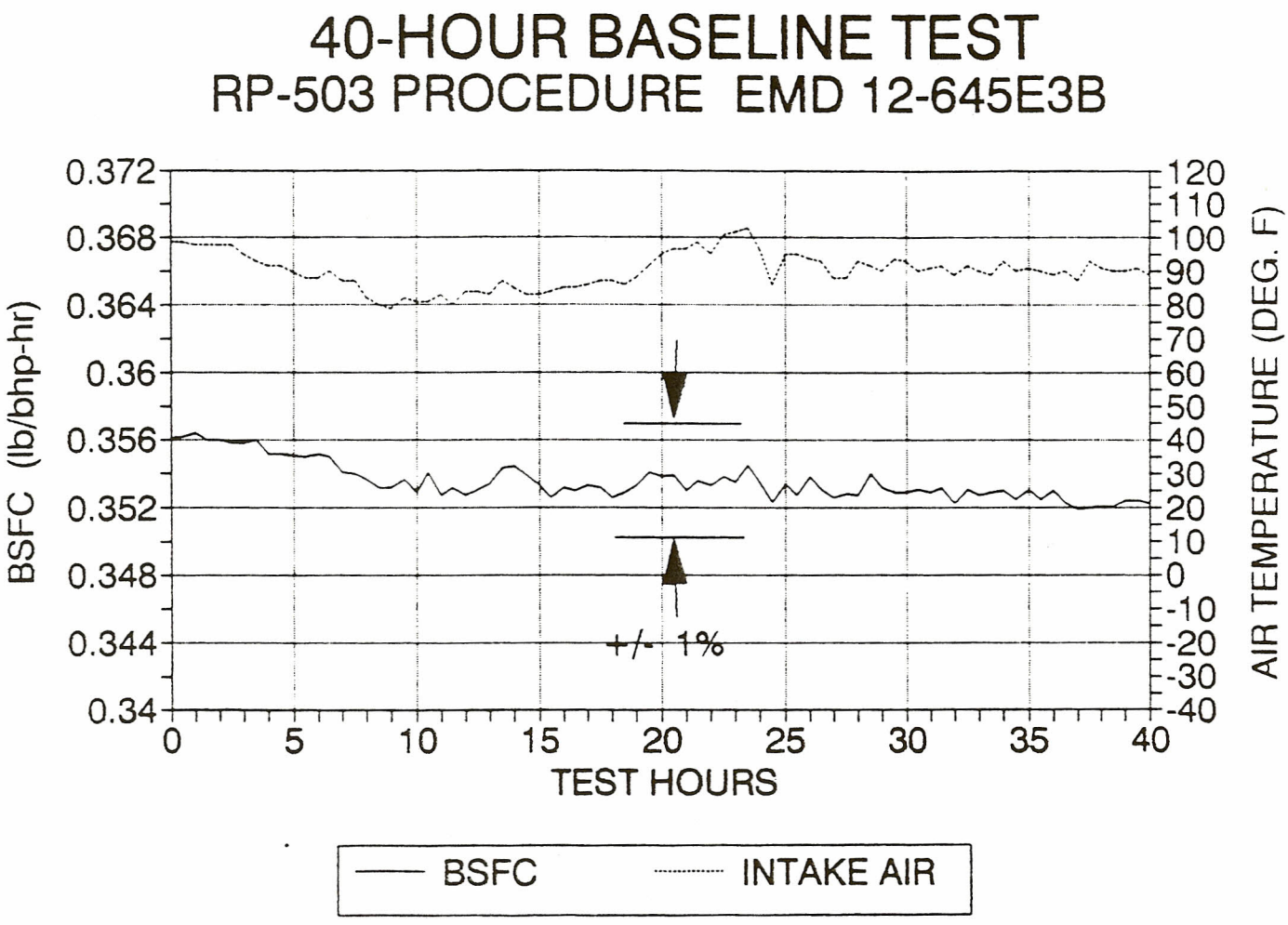
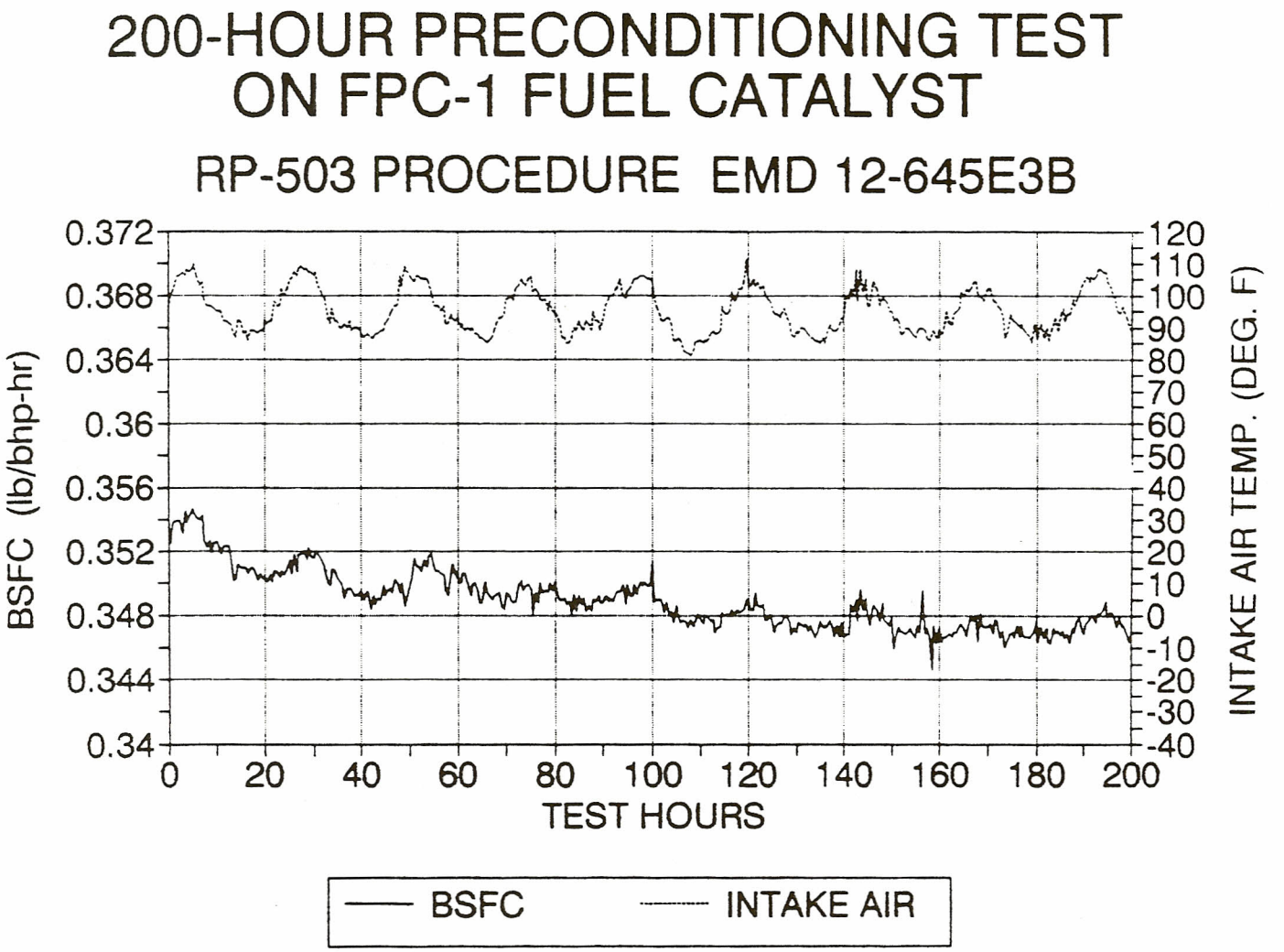

40-HOUR BASELINE TEST
RP-503 PROCEDURE EMD 12-645E3B
BSFC (lb/bhp-hr)
0.372
0.368
0.364
0.36
0.356
0.352
0.348
0.344
0.34
AIR TEMPERATURE (DEG. F)
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
+/- 1%
0
5
10
15
20
25
30
35
40
TEST HOURS
BSFC
INTAKE AIR

FIGURE 1



Note: 0-100 hours at 1/4000 concentration; 100-200 hours at 1/5000 concentration

FIGURE 2

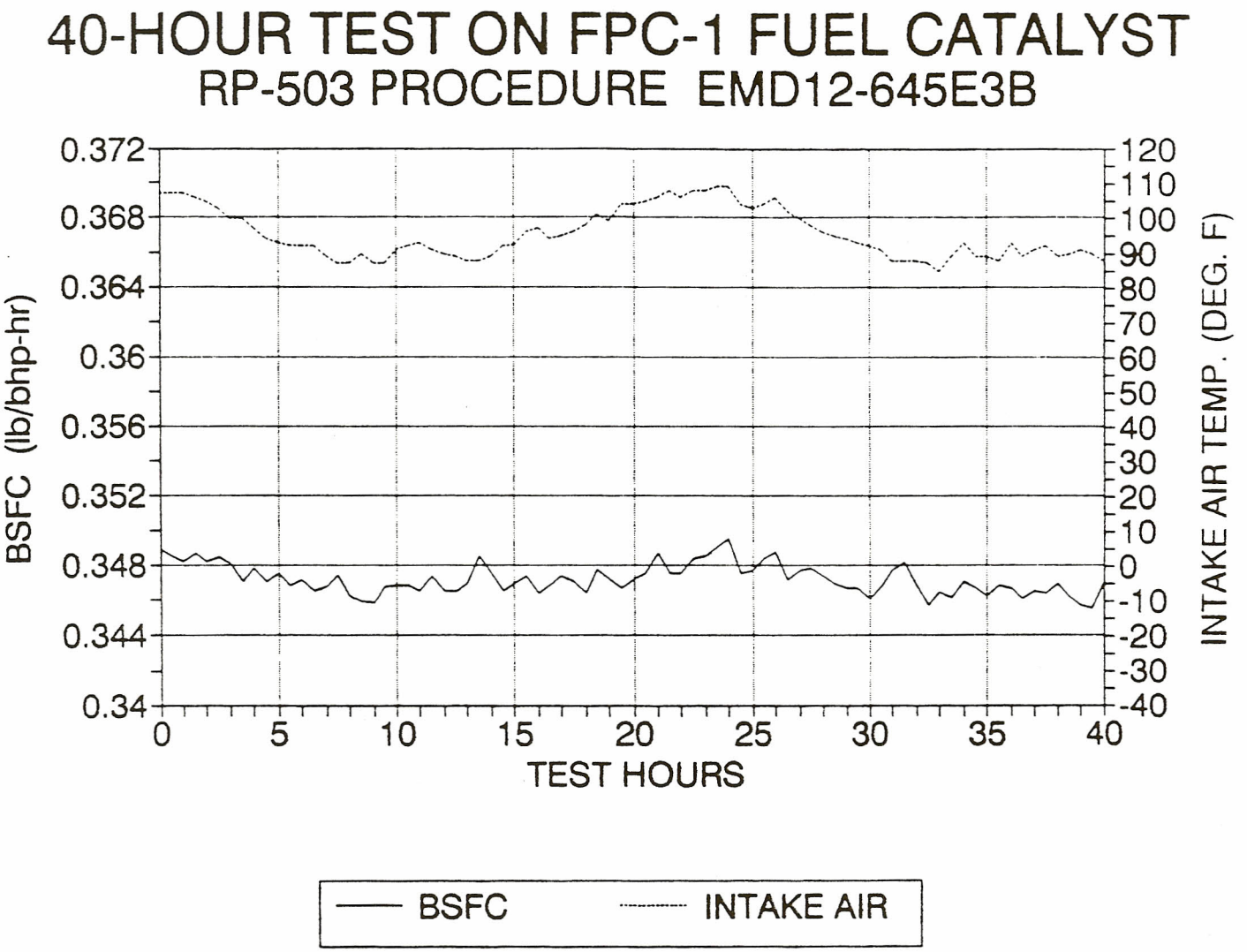

40-HOUR TEST ON FPC-1 FUEL CATALYST
RP-503 PROCEDURE EMD12-645E3B
BSFC (lb/bhp-hr)
0.372
0.368
0.364
0.36
0.356
0.352
0.348
0.344
0.34
INTAKE AIR TEMP. (DEG. F)
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
0
5
10
15
20
25
30
35
40
TEST HOURS
BSFC
INTAKE AIR

FIGURE 3

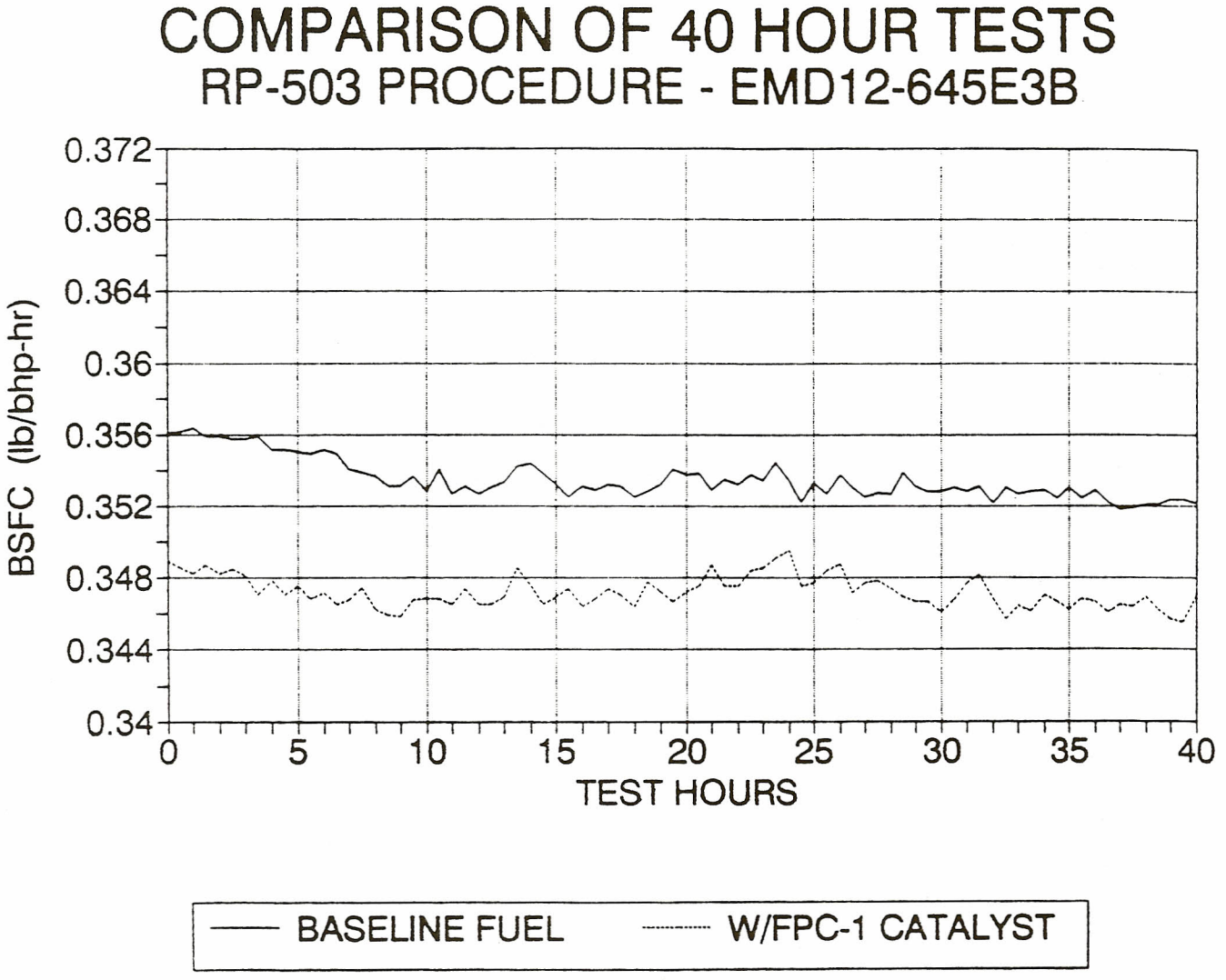

COMPARISON OF 40 HOUR TESTS
RP-503 PROCEDURE - EMD12-645E3B
BSFC (lb/bhp-hr)
0.372
0.368
0.364
0.36
0.356
0.352
0.348
0.344
0.34
0
5
10
15
20
25
30
35
40
TEST HOURS
BASELINE FUEL
W/FPC-1 CATALYST

FIGURE 4

IN-USE TEST OF FPC FUEL CATALYST
By
WESTERN FUELS ASSOCIATION, INC.
New Mexico Operations

December 15, 1997

Report prepared by
FPC Technology, Inc.
and
FPC International, Inc.

Data for the report provided by
Western Fuels Association, Inc.

TABLE OF CONTENTS

Abstract

The subject of this report are the findings of an extensive in-use field test of FPC Fuel Performance Catalyst conducted by Western Fuels Association, Prewitt, New Mexico. Western Fuels operates a coal train between the Lee Ranch Mine and the Plainfield Electric Powerhouse. The in-use test was to determine the effect of FPC upon engine efficiency measured in gallons consumed per ton of coal hauled.

First, the baseline fuel consumption rate in gallons of fuel per ton of coal hauled was established using the same three locomotives operating in consist and pulling the same number of coal cars over a thirty day period (August 1997). Next, the same consist and coal train were operated with FPC treated fuel for a 90 day period (September 1997-November 1997) and fuel consumption data recorded again. The 90-day period allowed for proper engine preconditioning and therefore, full additive effectiveness, as established in the previously conducted Association of American Railroads recognized Recommended Practice 503 test conducted by Southwest Research Institute (SwRI), San Antonio, Texas.

As many variables as possible were carefully controlled, including the engineer operating the locomotives. It is well known that the engineer can have a profound impact upon the fuel efficiency of the locomotives and train. Mr. Buskirk was the locomotive engineer throughout the entire baseline period, and only the FPC treated fuel test segments wherein Mr. Buskirk was the engineer for at least 90% of the operating time were compared to the baseline period.

This controlled in-use test documented the following:

(1) Fuel efficiency during the 90-day test period, measured in gallons per, was improved an average 5.40% with FPC treated fuel.

(2) Tons hauled per trip generally varied less then 0.2% with a maximum variation of 2.5% during the test period. Tonnage per trip was directionally greater during the FPC test period.

(3) Train delay was generally longer during the FPC treated fuel portion of the test. The trip delay time data indicate delay (idle time) had little effect upon overall fuel consumption during the test period.

(4) Fuel efficiency improvement increased with increasing operating time on FPC treated fuel. This trend agrees with the findings of the RP-503 test conducted by SwRI. This trend indicates fuel savings on a long term basis could be greater than observed in the 120-day WFA test.

I. Introduction

Western Fuels Association, Inc (WFA) operates three SD40-2 EMD locomotives in consist that haul coal trains from the Lee Ranch Coal Mine to the Plainfield Power Station. The consist of SD40-2s hauls 51 coal cars, each loaded with approximately 100 tons of coal over the same trackage, without deviation. Further, train delay is minimal, and with rare exception, the coal train is operated by the same locomotive engineer. The consist operates at duty cycle notch 5 to the minesite pulling empty coal cars, then returns to the power station pulling fully loaded cars at duty cycle notch 8.

WFA, in cooperation with FPC Technology, Inc., FPC International, Inc., and Gunderson Oil Company conducted a four month study to determine the effect of FPC fuel catalyst upon fuel consumption and work output (gallons per ton) of the consist.

II. Technical Approach

Prior tests of FPC have always been conducted with stationary locomotives connected to a loadbox. And, although a recognized method for determining specific fuel consumption (fuel consumption per unit of work output), by nature loadbox tests cannot reproduce transient conditions experienced by locomotive engines operating in the field.

A review of the WFA in-use historical data revealed remarkable consistency in fuel usage and net tonnage hauled by the consist of three SD40-2s locomotives pulling a coal train of 51 cars from the Lee Ranch Mine to the Power Station. This provided a unique opportunity to study the effect of FPC upon specific fuel consumption under actual operating conditions, which are more transient than steady-state loadbox testing. A review of weather data showed weather conditions in the desert area of north central New Mexico is lacking in extremes for the late summer and early fall, and the fuel supplier agreed to monitored fuel quality, thereby minimizing the effect of these variables upon engine performance.

The study did not include mileage, since the consist is isolated to the same trackage, and travels the same distance with each coal haul, but did monitor tons hauled and train delay time. Net tons were recorded and used since the number of cars are always the same for each trip.

August of 1997 was selected as the baseline data collection period. Data for net coal tonnage hauled were collected for each train. Once the baseline data were compiled and analyzed for reliability, the fuel for the consist was treated with FPC at the recommended treat rate. The coal train then continued to operate under the same careful controls from 1 September 1997 to 1 December 1997, and the fuel consumption, tonnage, delay time and operating engineer recorded. At the completion of the 120-day test period, the data were complied, analyzed, and compared.

III. Discussion of Results

Previous laboratory tests of FPC document full additive effectiveness is not realized until the engines operating on additized fuel undergo a conditioning period. The same studies show this "engine-conditioning" period may vary from 300 to 500 hours of additized fuel operation. The engine-conditioning effect appears to be related to the age, design, and operating regime or duty cycle of the engine.

For example, FPC was tested at Southwest Research Institute in San Antonio, Texas, using the Association of American Railroads Recommended Practice-503 test procedure. The test of engine performance was conducted over a 280 hour time period (40 hour baseline, 240 hour treated). Fuel efficiency continually improved over the entire 240 hour FPC test period (See Appendix 3, Figure 3).

The data from the WFA follow the same trend previously observed in the RP-503 and other lab studies. *Fuel efficiency measured as gallons per ton improved steadily over the entire 90-day additized fuel test period, with the largest gain in efficiency taking place in the final thirty (30) days of the test.*

The data for each month of train operation are graphed in Appendix 2 of the report. The tons hauled per trip were very consistent, as expected.

a. Tons per Trip

The baseline tons per trip averaged 5,138. Tonnage per trip averaged 5,259 tons in September, 5,200 tons in October and 5,218 tons in November. The tonnage per trip was generally higher for the FPC treated test period, but did not change more than 2.5% during the entire test period.

b. Delay Time per Trip

Delay time per trip increased on an average basis over the treated test period. It is unlikely train delay of such short duration as seen in this study would impact overall fuel efficiency. This is due to the relatively small amount of fuel consumed by the SD40-2 while idling (5.5 gph) when compared to the much greater fuel consumption at notches 5 (79 gph) and 8 (167 gph).

Trip delay time averaged 33.7 minutes in August, the baseline. Trip delay averaged 28 minutes in September, 130 minutes in October, and 13.6 minutes in November.

c. Locomotive Engineer

Mr. Buskirk was the locomotive engineer for the entire month of August, and therefore, the baseline data reflect his skill and habits as an operator. Consequently, only data from test periods wherein Mr. Buskirk operated the locomotives for at least 90% of the trips during the FPC test period were compared to the baseline test period.

IV. Conclusions

The WFA in-use study of FPC provides for the following conclusions:

(1) Fuel efficiency gain (reduced fuel consumption per ton of coal hauled) by the consist of three SD40-2 locomotives was improved an average of 5.44% (weighted) over the 90-day FPC treated fuel test period.

(2) The rate of fuel consumption per ton trended downward during the entire FPC test period, once again demonstrating the effect of engine-conditioning observed in the SwRI and other laboratory studies.

(3) Tons hauled per trip varied less than 2.5% during the test period. Tonnage per trip was directionally higher during the FPC test period.

(4) Delay time per trip was generally greater during the FPC test period, although the delay time and therefore, associated rate of fuel consumption, would have little impact upon specific fuel consumption of the consist over the period of the test.

Appendix 1

Western Fuels Association, Inc.
New Mexico Operations
FPC Fuel Catalyst Test

Test Segment	Tons Hauled	Gallons #2 Diesel	Gallons/Ton	% Improvement
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Treated Ave.	**214,464.60**	**30,784**	**0.1435**	**5.44%**

Note 1: Treated data taken from test periods where in Mr. Buskirk operated the coal train at least 90% of the time.

Note 2: The 5.44% weighted average indicates the fuel consumption reduction or fuel efficiency gain over the 90-day FPC treated fuel test period. The continual trend toward increasing fuel efficiency indicates actual fuel savings may be greater over a longer time period (See III. Discussion of Results).

WESTERN FUELS ASSOCIATION, INC.
NEW MEXICO OPERATIONS
FPC CATALYST TEST

Consist Fuel Consumption (3-SD40's)

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	(Engineer)/Comments
08/01/97	97122	5213.050	0.03%				(Buskirk) Full Fuel Tanks (no FPC)
08/02/97							
08/03/97							
08/04/97	97123	5213.775	0.04%				(Buskirk)
08/05/97	97124	5214.075	0.05%			55	(Buskirk)
08/06/97	97125	5212.550	0.02%				(Buskirk)
08/07/97	97126	5211.700	0.00%			15	(Buskirk)
08/08/97	97127	5211.475	0.00%			15	(Buskirk)
08/09/97							
08/10/97							
08/11/97	97128	5211.675	0.00%				(Buskirk)
08/12/97	97129	5212.150	0.01%				(Buskirk)
08/13/97	97130	5212.350	0.02%			50	(Buskirk)
08/14/97	97131	5213.100	0.03%				(Buskirk)
08/15/97	97132	5213.750	0.04%	8581		120	(Buskirk) Full Fuel Tanks (no FPC-2)
08/16/97		**57339.650**					
08/17/97	**Ave.=**	**5212.695**			**0.1496521**	**23 min/trip**	**Test Segment #1 Baseline**
08/18/97							
08/19/97	97133	5213.575	0.04%				(Buskirk)
08/20/97	97134	5218.875	0.14%			50	(Buskirk)
08/21/97	97135	5219.400	0.15%				(Buskirk)
08/22/97	97136	5219.900	0.16%				(Buskirk)
08/23/97							
08/24/97							
08/25/97	97137	5219.550	0.15%			15	(Buskirk)
08/26/97	97138	5216.725	0.10%			60	(Buskirk)
08/27/97	97139	5220.750	0.18%				(Buskirk)
08/28/97	97140	5220.675	0.18%			55	(Buskirk)
08/29/97	97141	3689.475	n/a	7017		240	(Buskirk) Full Fuel Tanks (no FPC-2)
08/30/97		**45438.925**					
08/31/97	**Ave.=**	**5218.681**	(excluding 8/29)		**0.1544271**	**47 min/trip**	**(2) Test Segment #2 Baseline**
Total		**102778.575**		**15598**			*Note: 8/30/97 Replaced #5 & #9 power assemblies on WFA-1.*

Baseline Average = 0.1517631 Gal/Ton

Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).
(2) 3.19% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.
(3) The load on 8/29 was only 6.05% more than 2/3 of the average load (only two locomotives operated that day.)

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
09/01/97							(Buskirk) Full Fuel Tanks
09/02/97	97142	5219.375	0.15%				(Buskirk) FPC Mixed in Fuel
09/03/97	97143	5220.950	0.18%				(Buskirk)
09/04/97	97144	5320.425	2.09%				(Buskirk)
09/05/97	97145	5320.925	2.10%				(Buskirk)
09/06/97							
09/07/97							
09/08/97	97146	5321.350	2.11%			80	(Buskirk)
09/09/97	97147	5321.350	2.11%				(Buskirk)
09/10/97	97148	5219.300	0.15%			60	(Buskirk)
09/11/97	97149	5218.700	0.14%			40	(Buskirk)
09/12/97	97150	5219.550	0.15%				(Buskirk)
09/13/97							
09/14/97							
09/15/97							
09/16/97	97151	5219.900	0.16%			25	(Buskirk)
09/17/97	97152	5219.450	0.15%	**8612**		95	(Buskirk) Full Fuel Tanks
		57821.275			**0.1489417**	**27 min/trip**	**Test Segment #1 Treated**
	Ave.=	**5256.480**					
09/18/97	97153	5219.300	0.15%				(Biskirk)
09/19/97	97154	5218.975	0.14%				(Biskirk)
09/20/97							
09/21/97							
09/22/97							
09/23/97	97155	5218.725	0.14%				(Biskirk)
09/24/97	97156	5215.200	0.07%			180	(Biskirk)
09/25/97	97157	5321.175	2.10%				(Biskirk)
09/26/97	97158	5321.800	2.12%				(Biskirk)
09/27/97							
09/28/97							
09/29/97							
09/30/97	97159	5321.150	2.10%	**5534**		20	(Buskirk) Full Fuel Tanks
		36836.325			**0.1502321**	**29 min/trip**	**Test Segment #2 Treated**
	Ave.=	**5262.332**	**0.91%**				
Total		**94657.600**		**14146**			

Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).
(2) 0.87% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
10/01/97							Full Fuel Tanks
10/02/97	97160	5219.800	0.16%			270	(Buskirk)FPC Mixed in Fuel
10/03/97	97161	5217.950	0.12%			240	(Buskirk)
10/04/97							
10/05/97							
10/06/97							
10/07/97	97162	5218.375	0.13%			15	(Buskirk)
10/08/97	97163	5177.250	-0.66%			35	(Buskirk)
10/09/97	97164	5219.350	0.15%			430	(Buskirk)
10/10/97	97165	5218.600	0.14%			115	(Buskirk)
10/11/97							
10/12/97							
10/13/97							
10/14/97	97166	5081.425	-2.50%			240	(Buskirk)
10/15/97	97167	5220.300	0.17%				(Buskirk)
10/16/97	97168	5210.700	-0.01%				(Buskirk)
10/17/97	97169	5215.275	0.07%			50	(Buskirk)
10/18/97							
10/19/97							
10/20/97							
10/21/97	97170	5218.375	0.13%			85	(Buskirk)
10/22/97							(Buskirk)
10/23/97	97171	5188.800	-0.44%	8917		80	(Buskirk) Full Fuel Tanks
		62406.200			**0.1428864**	**130min/trip**	**Test Segment #3 Treated**
	Ave.=	**5200.517**					
10/24/97	97172	5132.775	-1.51%				(Greenbaum)
10/25/97							
10/26/97							
10/27/97							
10/28/97	97173	5218.875	0.14%			90	(Greenbaum)
10/29/97							
10/30/97	97174	5218.900	0.14%				(Greenbaum)
10/31/97	97175	5219.175	0.15%	3915			(Greenbaum) Full Fuel Tanks
		20789.725				**23 min/trip**	**Test Segment #4 Treated**
	Ave.=	**5197.431**	**-0.23%**				
Total		83195.925		12832			

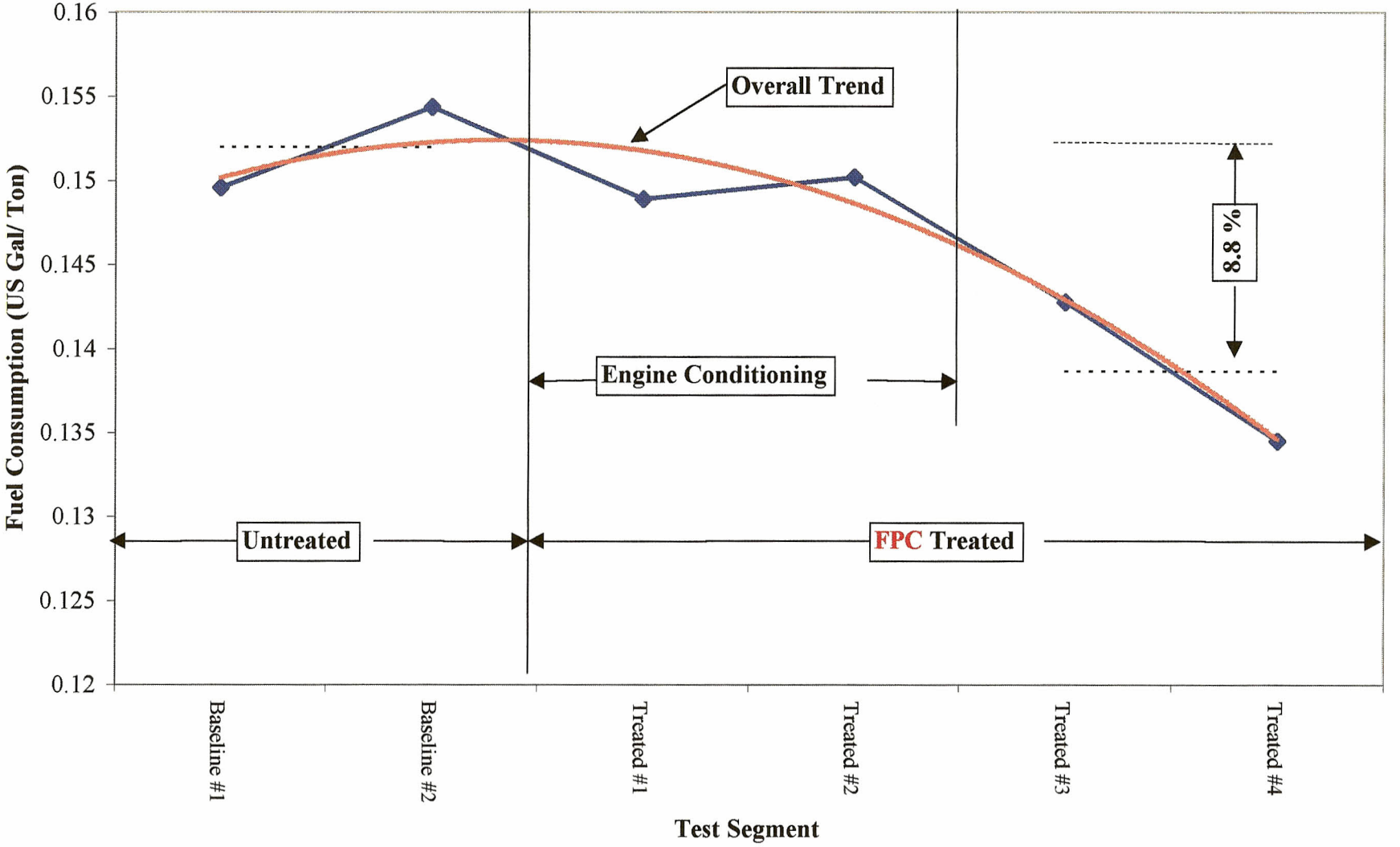
Notes: (1) % Variation vs. lowest "full" load in Baseline Data (5211.475).
(2) 31.79% Variation between Segment #3 Gallons/Ton and Segment #4 Gallons/Ton.

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Delay (Minutes)	Comments
11/01/97							Full Fuel Tanks
11/02/97							FPC Mixed in Fuel
11/03/97	97176	5218.025	0.13%				(Buskirk)
11/04/97	97177	5218.775	0.14%			20	(Buskirk)
11/05/97							
11/06/97	97178	5218.675	0.14%			70	(Buskirk)
11/07/97	97179	5217.975	0.12%				(Buskirk)
11/08/97							
11/09/97							
11/10/97	97180	5217.900	0.12%				(Buskirk)
11/11/97							
11/12/97							*Replaced power assemblies (11/13)*
11/13/97							*WFA-2 #3, WFA-3 #9&#1*
11/14/97	97181	5218.650	0.14%				(Greenbaum)
11/15/97							
11/16/97							
11/17/97	97182	5217.475	0.12%				(Buskirk)
11/18/97	97183	5218.525	0.14%				(Buskirk)
11/19/97	97184	5218.925	0.14%				(Buskirk)
11/20/97	97185	5217.650	0.12%			30	(Buskirk)
11/21/97	97186	5218.550	0.14%	7721		30	(Buskirk) Full Fuel Tanks
		57401.125			**0.1345096**	**14 min/trip**	**Test Segment #5 Treated**
	Ave.=	**5218.284**					
11/22/97							
11/23/97							
11/24/97	97187	5213.650	0.04%			100	(Buskirk)
11/25/97	97188	5217.975	0.12%				(Buskirk)
11/26/97	97189	5219.350	0.15%	**3002**			(Greenbaum) Full Fuel Tanks
		15650.975				**33min/trip**	**Test Segment #6 Treated**
	Ave.=	**5216.992**					
11/27/97							
11/28/97							
11/29/97							
11/30/97							
Total		**73052.100**		**10723**			

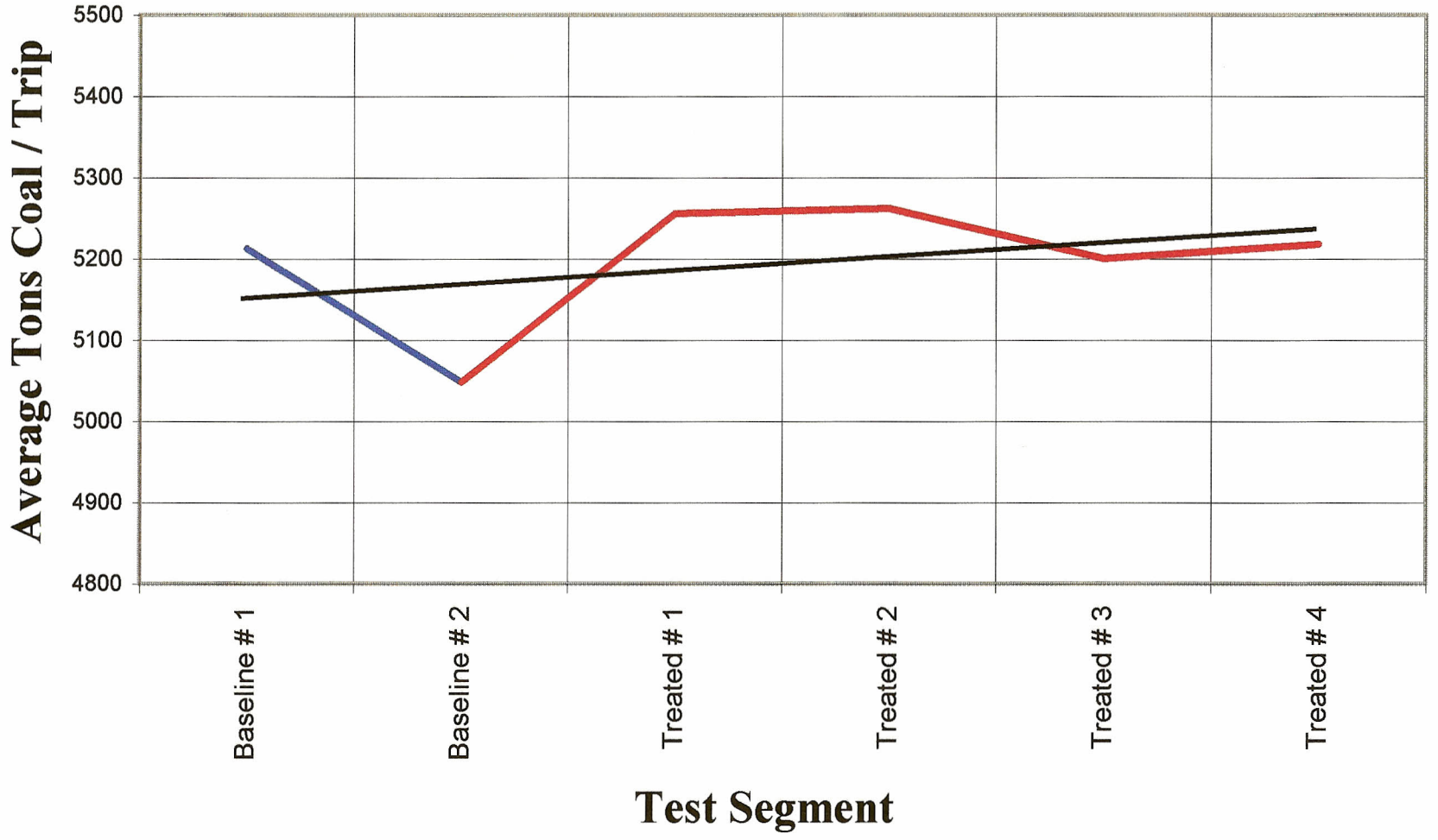
Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 42.6% Variation between Segment #5 Gallons/Ton and Segment #6 Gallons/Ton.

Appendix 2

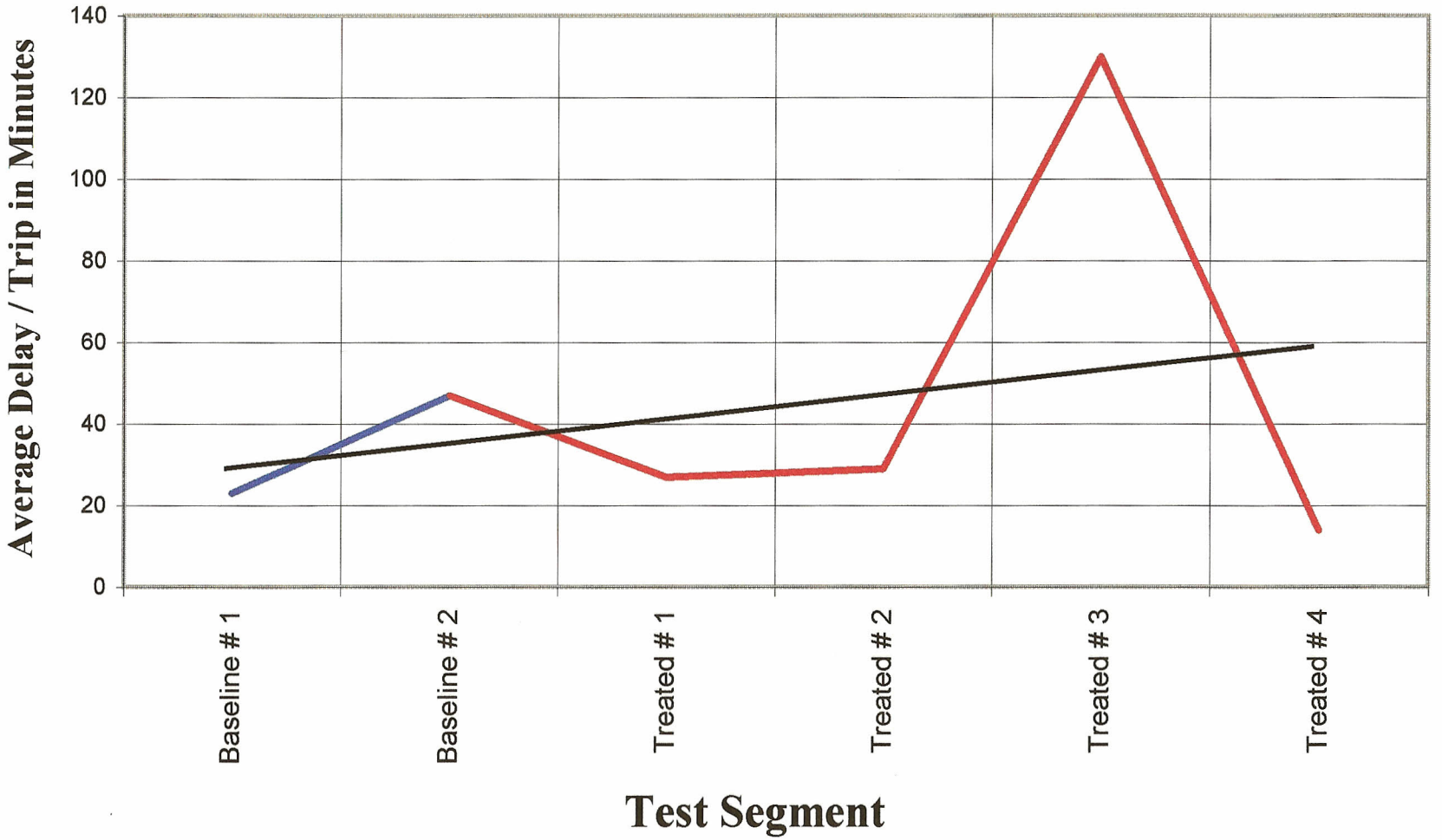
WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS



Average Tons Coal Per Trip



Average Train Delay - Minutes Per Trip



WESTERN FUELS ASSOCIATION, INC. **08/97**

New Mexico Operations

Train Fuel Consumption

DATE	TRAIN #	TONS	FUEL	ENGINEER	
08/01/97	97122	5213.050		Buskirk	Full Fuel Tanks
08/02/97					
08/03/97					
08/04/97	97123	5213.775		Buskirk	
08/05/97	97124	5214.075		Buskirk	
08/06/97	97125	5212.550		Buskirk	
08/07/97	97126	5211.700		Buskirk	
08/08/97	97127	5211.475		Buskirk	
08/09/97					
08/10/97					
08/11/97	97128	5211.675		Buskirk	
08/12/97	97129	5212.150		Buskirk	
08/13/97	97130	5212.350		Buskirk	
08/14/97	97131	5213.100		Buskirk	
08/15/97	97132	5213.750	8581	Buskirk	Full Fuel Tanks
08/16/97					
08/17/97					
08/18/97					
08/19/97	97133	5213.575		Buskirk	
08/20/97	97134	5218.875		Buskirk	
08/21/97	97135	5219.400		Buskirk	
08/22/97	97136	5219.900		Buskirk	
08/23/97					
08/24/97					
08/25/97	97137	5219.550		Buskirk	
08/26/97	97138	5216.725		Buskirk	
08/27/97	97139	5220.750		Buskirk	
08/28/97	97140	5220.675		Buskirk	
08/29/97	97141	3689.475	7017	Buskirk	Full Fuel Tanks
08/30/97					
08/31/97					
		102778.575	15598		

Gallons of fuel to deliver 1 ton of coal: **0.1517631**

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WESTERN FUELS ASSOCIATION, INC. **09/97**

New Mexico Operations

Train Fuel Consumption

DATE	TRAIN #	TONS	FUEL	ENGINEER	
09/01/97					Full Fuel Tanks
09/02/97	97142	5219.375		Buskirk	FPC-2 Mixed In Fuel
09/03/97	97143	5220.950		Buskirk	
09/04/97	97144	5320.425		Buskirk	
09/05/97	97145	5320.925		Buskirk	
09/06/97					
09/07/97					
09/08/97	97146	5321.350		Buskirk	
09/09/97	97147	5321.250		Buskirk	
09/10/97	97148	5219.300		Buskirk	
09/11/97	97149	5218.700		Buskirk	
09/12/97	97150	5219.550		Buskirk	
09/13/97					
09/14/97					
09/15/97					
09/16/97	97151	5219.900		Buskirk	
09/17/97	97152	5219.450	8612	Buskirk	Full Fuel Tanks
09/18/97	97153	5219.300		Buskirk	
09/19/97	97154	5218.975		Buskirk	
09/20/97					
09/21/97					
09/22/97					
09/23/97	97155	5218.725		Buskirk	
09/24/97	97156	5215.200		Buskirk	
09/25/97	97157	5321.175		Buskirk	
09/26/97	97158	5321.800		Buskirk	
09/27/97					
09/28/97					
09/29/97					
09/30/97	97159	5321.150	5534	Buskirk	Full Fuel Tanks
		94657.500	14146		

Gallons of fuel to deliver 1 ton of coal: **0.1494440**

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WESTERN FUELS ASSOCIATION, INC. **10/97**

New Mexico Operations

Train Fuel Consumption

DATE	TRAIN #	TONS	FUEL	ENGINEER	
10/01/97					Full Fuel Tanks
10/02/97	97160	5219.800		Buskirk	FPC-2 Mixed In Fuel
10/03/97	97161	5217.950		Buskirk	
10/04/97					
10/05/97					
10/06/97					
10/07/97	97162	5218.375		Buskirk	
10/08/97	97163	5177.250		Buskirk	
10/09/97	97164	5219.350		Buskirk	
10/10/97	97165	5218.600		Buskirk	
10/11/97					
10/12/97					
10/13/97					
10/14/97	97166	5081.425		Buskirk	
10/15/97	97167	5220.300		Buskirk	
10/16/97	97168	5210.700		Buskirk	
10/17/97	97169	5215.275		Buskirk	
10/18/97					
10/19/97					
10/20/97					
10/21/97	97170	5218.375		Buskirk	
10/22/97					
10/23/97	97171	5188.800	8917	Buskirk	Full Fuel Tanks
10/24/97	97172	5132.775		Greenbaum	
10/25/97					
10/26/97					
10/27/97					
10/28/97	97173	5218.875		Greenbaum	
10/29/97					
10/30/97	97174	5218.900		Greenbaum	
10/31/97	97175	5219.175	3915	Greenbaum	Full Fuel Tanks
		83195.925	12832		

Gallons of fuel to deliver 1 ton of coal: **0.1542383**

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WESTERN FUELS ASSOCIATION, INC. 1997

New Mexico Operations

TRAIN LOG AND COAL QUALITY

TRAIN TIMES DETERMINATIONS - 24 HR CLOCK

DATE	TRAIN #	# CARS	TONS	BTU	%MOISTURE	# SULF	%SULF	% ASH	1 DEPART PEGS	2 ARR LR LOAD OUT	3 FINISH LO LR MINE	4 ARR PEGS DUMPER	5 FINISH DUMPER	6 CREW OFF DUTY
08/01/97	97122	51	5213.050	9296	15.95	0.89	0.83	16.30	06:50	08:15	09:55	11:45	13:25	14:00
08/04/97	97123	51	5213.775	9281	15.87	0.93	0.86	16.33	07:05	08:30	10:20	12:05	13:50	14:40
08/05/97	97124	51	5214.075	9559	16.17	0.88	0.84	14.56	06:45	08:10	10:00	12:10	14:45	15:30
08/06/97	97125	51	5212.550	9451	16.75	0.91	0.86	14.46	06:50	08:15	10:20	12:15	13:55	14:45
08/07/97	97126	51	5211.700	9101	16.66	0.81	0.74	17.17	06:50	08:15	10:20	12:15	13:55	14:45
08/08/97	97127	51	5211.475	9118	16.62	0.76	0.69	16.89	06:45	08:10	09:55	12:05	14:00	14:45
08/11/97	97128	51	5211.675	8858	16.38	0.89	0.79	19.14	07:05	08:30	10:30	12:25	14:15	15:00
08/12/97	97129	51	5212.150	9272	15.74	0.78	0.72	16.61	06:55	08:25	10:00	12:00	13:50	14:45
08/13/97	97130	51	5212.350	9262	15.90	0.70	0.65	16.51	06:55	08:20	10:55	12:50	14:35	15:15
08/14/97	97131	51	5213.100	9382	15.60	0.71	0.67	16.54	06:45	08:10	09:55	11:45	13:35	14:14
08/15/97	97132	51	5213.750	9662	15.74	0.71	0.69	14.21	05:40	08:10	09:50	11:45	13:40	14:00
08/19/97	97133	51	5213.575	9117	15.12	0.72	0.66	18.80	07:25	08:50	10:40	12:50	14:35	15:00
08/20/97	97134	51	5218.875	9511	15.43	0.67	0.64	15.79	06:50	08:15	10:30	12:40	14:25	14:45
08/21/97	97135	51	5219.400	9410	15.39	0.71	0.67	16.77	06:50	08:15	10:05	12:00	15:00	15:30
08/22/97	97136	51	5219.900	9138	15.23	0.65	0.59	18.14	07:00	08:25	10:05	11:55	13:50	14:15
08/25/97	97137	51	5219.550	9380	14.30	0.75	0.70	17.73	07:15	08:40	10:15	12:20	14:00	14:25
08/26/97	97138	51	5216.725	9355	16.28	0.68	0.64	16.01	06:55	09:20	11:00	13:00	14:40	15:30
08/27/97	97139	51	5220.750	9294	15.73	0.68	0.63	17.26	07:10	08:30	10:10	12:00	13:45	14:30
08/28/97	97140	51	5220.675	9411	15.08	0.77	0.72	17.05	07:40	09:10	11:10	13:05	14:45	15:30
08/29/97	97141	36	3689.475	9070	14.82	0.69	0.63	19.91	10:35	12:10	13:25	15:55	17:20	17:59

TRAIN REPORT

DATE	TRAIN #	LOAD TIME	UNLOAD TIME	TOTAL CYCLE TIME	DELAY REPORT
08/01/97	97122	01:40	01:40	06:35	
08/04/97	97123	01:50	01:45	06:45	
08/05/97	97124	01:50	02:35	08:00	00H55M-PEGS, dumper
08/06/97	97125	02:05	01:40	07:05	
08/07/97	97126	02:05	01:40	07:05	00H15M-LRM, sample system
08/08/97	97127	01:45	01:55	07:15	00H15M-LRM, MOW
08/11/97	97128	02:00	01:50	07:10	
08/12/97	97129	01:35	01:50	06:55	
08/13/97	97130	02:35	01:45	07:40	00H50M-LRM, sample system
08/14/97	97131	01:45	01:50	06:50	
08/15/97	97132	01:40	01:55	08:00	02H00M-LRM,TEPCO
08/19/97	97133	01:50	01:45	07:10	
08/20/97	97134	02:15	01:45	07:35	00H50M-LRM, uncoaler, BNSFdispatch
08/21/97	97135	01:50	03:00	08:10	
08/22/97	97136	01:40	01:55	06:50	
08/25/97	97137	01:35	01:40	06:45	00H15M-LRM, BNSFdispatch
08/26/97	97138	01:40	01:40	07:45	01H00M-PEGS, BNSF local
08/27/97	97139	01:40	01:45	06:35	
08/28/97	97140	02:00	01:40	07:05	00H55M-PEGS, TEPCO
08/29/97	97141	01:15	01:25	06:45	04H00M-PEGS, TEPCO

WESTERN FUELS ASSOCIATION, INC. **1997**

New Mexico Operations

TRAIN LOG AND COAL QUALITY

TRAIN TIMES DETERMINATIONS - 24 HR CLOCK

DATE	TRAIN #	# CARS	TONS	BTU	%MOISTURE	# SULF	%SULF	% ASH	1 DEPART PEGS	2 ARR LR LOAD OUT	3 FINISH LO LR MINE	4 ARR PEGS DUMPER	5 FINISH DUMPER	6 CREW OFF DUTY
09/02/97	97142	51	5219.375	9377	15.34	0.83	0.78	16.60	07:45	09:05	10:50	12:45	14:30	15:15
09/03/97	97143	51	5220.950	9015	15.15	0.83	0.75	19.28	07:05	08:30	10:20	12:20	14:00	14:45
09/04/97	97144	52	5320.425	9124	16.00	0.75	0.68	17.65	07:05	08:30	10:15	12:10	13:55	14:45
09/05/97	97145	52	5320.925	8767	15.92	0.75	0.66	20.10	06:40	08:05	09:50	11:40	13:35	14:15
09/08/97	97146	52	5321.350	9402	15.38	0.73	0.69	16.59	09:15	10:55	12:45	15:35	17:10	18:00
09/09/97	97147	52	5321.250	9432	15.86	0.69	0.65	15.63	07:00	08:25	10:15	12:15	14:00	14:45
09/10/97	97148	51	5219.300	9245	15.25	0.74	0.68	17.56	07:30	09:35	11:20	13:20	15:05	16:00
09/11/97	97149	51	5218.700	9033	15.38	0.80	0.72	18.64	07:15	08:45	10:35	13:10	14:55	15:45
09/12/97	97150	51	5219.550	9211	15.48	0.77	0.71	17.48	07:00	08:25	10:10	12:05	13:50	14:45
09/16/97	97151	51	5219.900	8947	15.88	0.87	0.78	19.02	07:10	08:40	10:35	12:40	14:25	15:15
09/17/97	97152	51	5219.450	9116	16.25	0.77	0.70	17.63	07:00	09:55	11:40	13:30	15:15	16:00
09/18/97	97153	51	5219.300	9161	15.78	0.75	0.69	17.69	06:50	08:15	10:00	11:55	13:45	14:15
09/19/97	97154	51	5218.975	9207	16.19	0.83	0.76	16.93	06:55	08:20	10:00	12:00	13:45	14:15
09/23/97	97155	51	5218.725	9085	15.89	0.75	0.68	17.88	09:05	10:40	12:25	14:35	16:30	00:00
09/24/97	97156	51	5215.200	9098	16.43	0.84	0.76	17.22	07:20	11:25	13:10	15:10	16:55	17:20
09/25/97	97157	52	5321.175	9111	15.86	0.72	0.66	17.87	07:25	08:45	10:35	12:30	14:20	14:45
09/26/97	97158	52	5321.800	9269	15.35	0.72	0.67	17.28	07:05	08:35	10:30	12:20	14:05	14:30
09/30/97	97159	52	5321.150	9074	16.02	0.83	0.75	17.91	08:15	09:45	11:45	13:45	15:30	16:15

TRAIN REPORT

DATE	TRAIN #	LOAD TIME	UNLOAD TIME	TOTAL CYCLE TIME	DELAY REPORT
09/02/97	97142	01:45	01:45	06:45	
09/03/97	97143	01:50	01:40	06:55	
09/04/97	97144	01:45	01:45	06:50	
09/05/97	97145	01:45	01:55	06:55	
09/08/97	97146	01:50	01:35	07:55	01H20M-LRM, BNSF dispatch
09/09/97	97147	01:50	01:45	07:00	
09/10/97	97148	01:45	01:45	07:35	01H00M-PEGS, BNSF & set out bad order car
09/11/97	97149	01:50	01:45	07:40	00H40M-LRM, BNSF dispatch
09/12/97	97150	01:45	01:45	06:50	
09/16/97	97151	01:55	01:45	07:15	00H25M-LRM, scale test
09/17/97	97152	01:45	01:45	08:15	01H35M-LRM, TEPCO
09/18/97	97153	01:45	01:50	06:55	
09/19/97	97154	01:40	01:45	06:50	
09/23/97	97155	01:45	01:55	07:25	
09/24/97	97156	01:45	01:45	09:35	03H00M-LRM, COCHISE
09/25/97	97157	01:50	01:50	06:55	
09/26/97	97158	01:55	01:45	07:00	
09/30/97	97159	02:00	01:45	07:15	00H20M-LRM, computer

WESTERN FUELS ASSOCIATION, INC.

New Mexico Operations

1997

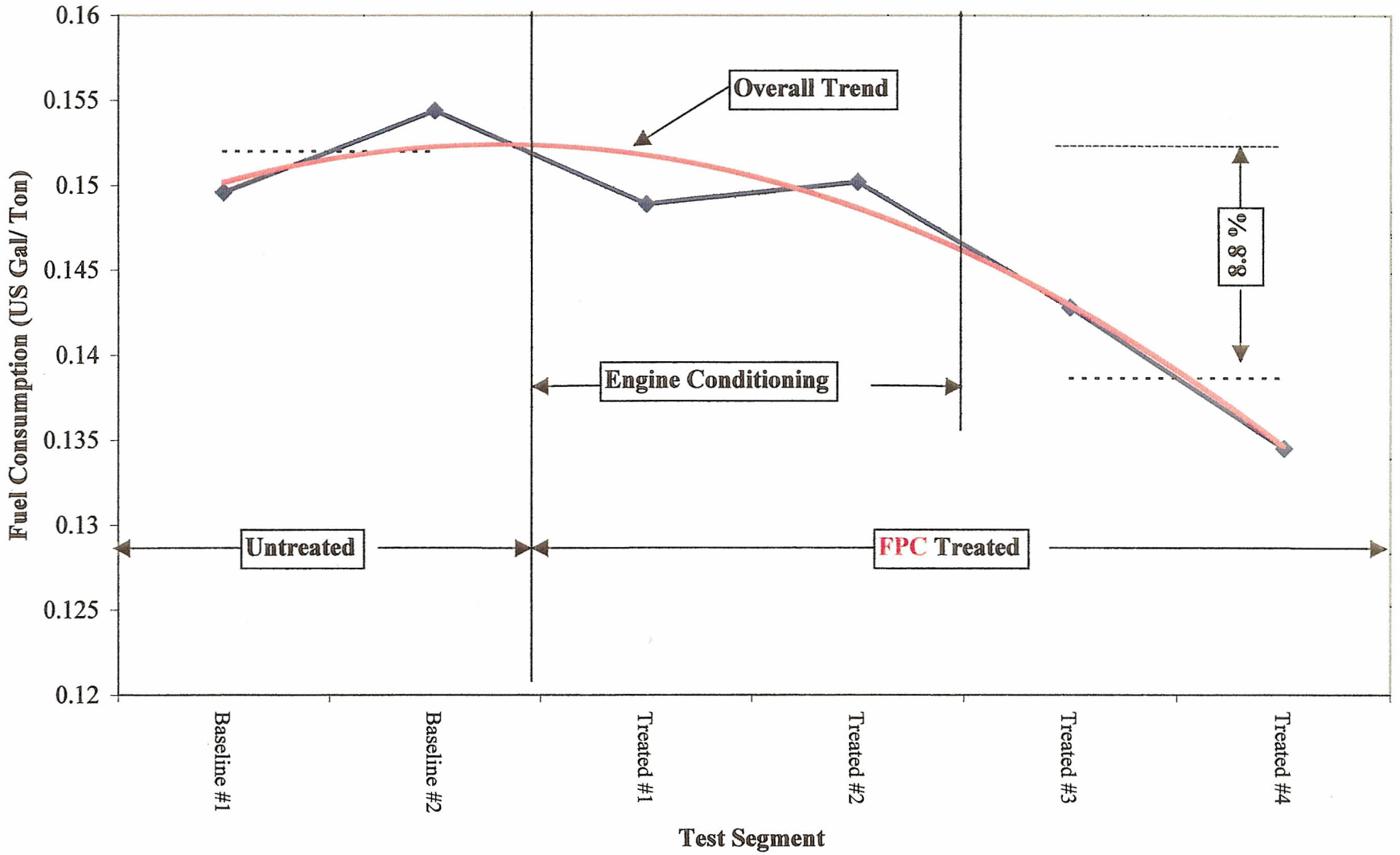
TRAIN LOG AND COAL QUALITY

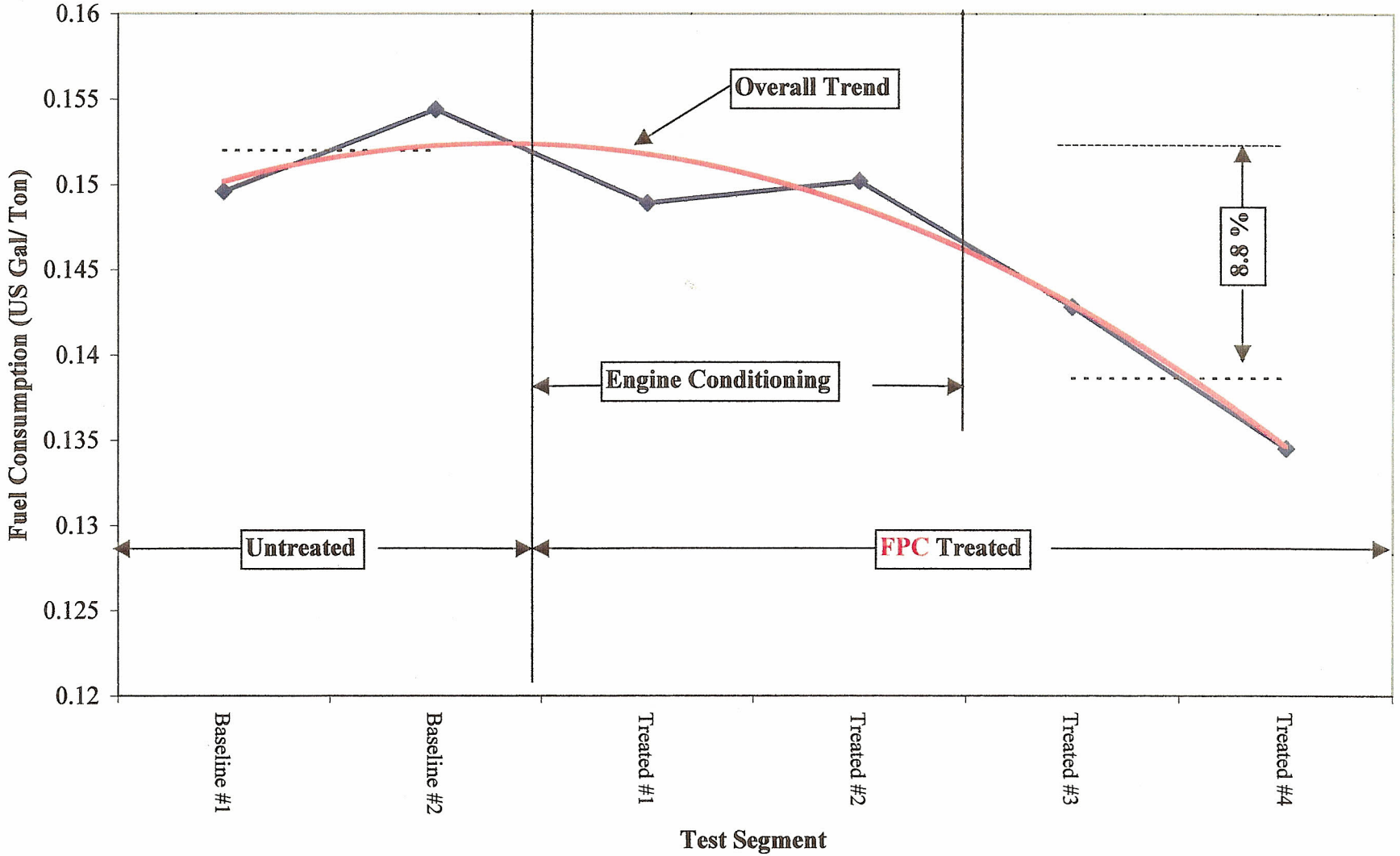
TRAIN TIMES DETERMINATIONS - 24 HR CLOCK

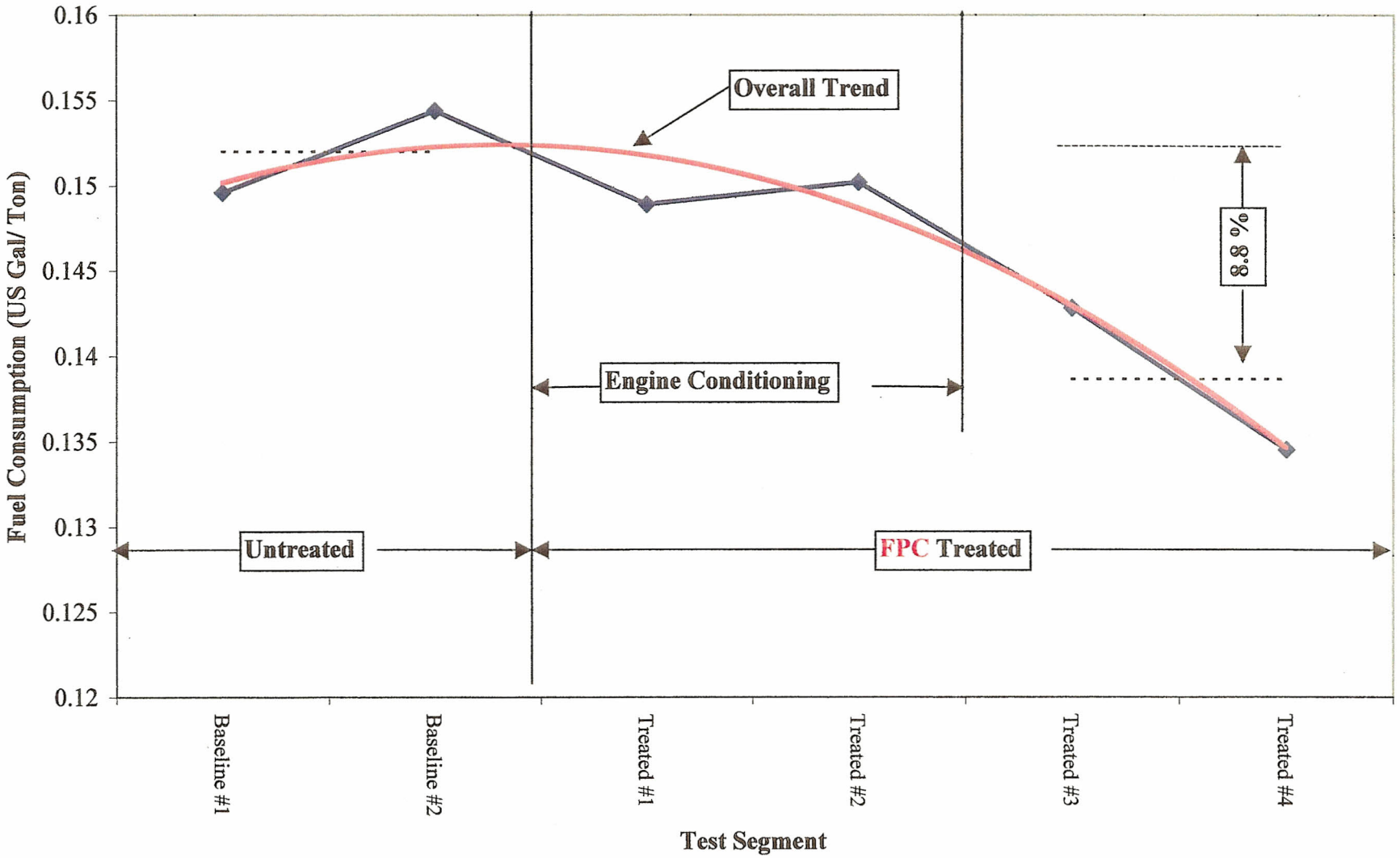
DATE	TRAIN #	# CARS	TONS	BTU	%MOISTURE	# SULF	%SULF	% ASH	1 DEPART PEGS	2 ARR LR LOAD OUT	3 FINISH LG LR MINE	4 ARR PEGS DUMPER	5 FINISH DUMPER	6 CREW OFF DUTY
10/02/97	97160	51	5219.800	9001	16.72	0.83	0.75	17.90	09:00	12:05	14:25	16:30	17:50	17:59
10/03/97	97161	51	5217.950	9251	15.84	0.80	0.74	17.07	08:30	12:35	14:30	16:30	17:50	17:59
10/07/97	97162	51	5218.375	8998	15.09	0.84	0.76	19.47	08:10	09:35	11:15	13:30	15:15	16:00
10/08/97	97163	51	5217.250	9061	13.36	0.77	0.70	20.28	07:00	09:05	11:05	13:05	14:45	15:30
10/09/97	97164	51	5219.350	8833	15.18	0.72	0.64	20.43	07:20	15:55	17:35	19:35	21:20	21:35
10/10/97	97165	51	5218.600	9315	15.00	0.74	0.69	17.40	07:50	10:25	12:10	14:00	15:45	16:30
10/14/97	97166	51	5081.425	9012	15.40	0.85	0.77	18.86	08:45	13:25	16:05	18:00	19:45	20:15
10/15/97	97167	51	5220.300	9110	16.25	0.79	0.72	17.29	06:45	08:10	09:45	11:40	13:25	14:15
10/16/97	97168	51	5210.700	9247	15.96	0.77	0.71	16.84	07:00	08:35	10:30	12:20	14:05	14:50
10/17/97	97169	51	5215.275	9166	15.53	0.81	0.74	17.58	07:10	09:40	11:20	13:05	14:45	15:30
10/21/97	97170	51	5218.375	9049	15.85	0.83	0.75	18.22	08:50	10:55	12:45	14:10	16:00	17:00
10/23/97	97171	51	5188.800	9320	15.99	0.77	0.72	16.07	06:45	09:30	11:35	13:30	15:10	15:45
10/24/97	97172	51	5132.775	9133	16.01	0.79	0.72	17.58	07:10	09:00	10:50	12:35	14:15	15:00
10/28/97	97173	51	5218.875	9139	16.23	0.79	0.72	17.17	07:35	09:15	11:15	13:35	15:15	16:00
10/30/97	97174	51	5218.900	9023	15.04	0.88	0.79	19.35	06:50	08:20	10:10	12:00	13:40	14:30
10/31/97	97175	51	5219.175	8947	14.79	0.80	0.72	20.82	06:55	08:20	10:30	12:30	14:10	15:00
11/03/97	97176	51	5218.025						08:20	09:45	11:50	13:40	15:25	16:10
11/04/97	97177	51												
11/06/97	97178	51												
11/07/97	97179	51												

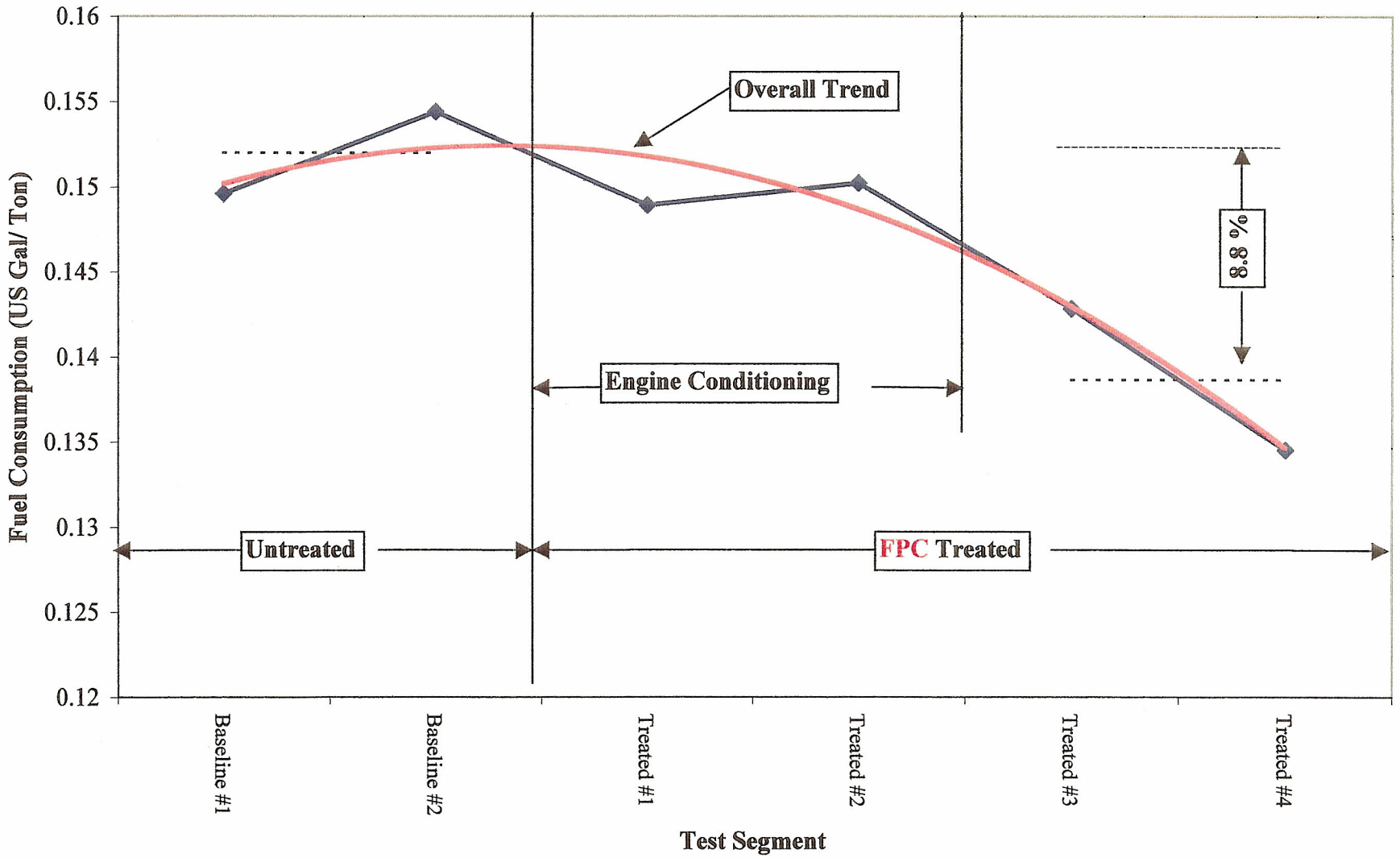
TRAIN REPORT

DATE	TRAIN #	LOAD TIME	UNLOAD TIME	TOTAL CYCLE TIME	DELAY REPORT
10/02/97	97160	02:20	01:20	08:50	04H30M-PEGS & LRM, CHOCHISE & TEPCO
10/03/97	97161	01:55	01:20	09:20	04H00M-PEGS & LRM, TEPCO
10/07/97	97162	01:40	01:45	07:05	00H15M-LRM, BNSF dispatch
10/08/97	97163	02:00	01:40	07:45	00H35M-LRM, TEPCO
10/09/97	97164	01:40	01:45	14:00	07H10M-LRM,COCHISE
10/10/97	97165	01:45	01:45	07:55	01H55M-LRM, TEPCO
10/14/97	97166	02:40	01:45	11:00	04H00M-LRM&PEGS, COCHISE.40MLRM.chute
10/15/97	97167	01:35	01:45	06:40	
10/16/97	97168	01:55	01:45	07:05	
10/17/97	97169	01:40	01:40	07:35	00H50M- LRM, TEPCO
10/21/97	97170	01:50	01:50	07:10	01H25M-LRM,COCHISE & BO off pass track
10/23/97	97171	02:05	01:40	08:25	01H20M-LRM, COCHISE
10/24/97	97172	01:50	01:40	07:05	
10/28/97	97173	02:00	01:40	07:40	01H30M-LRM & PEGS, BNSF & TEPCO
10/30/97	97174	01:50	01:40	06:50	
10/31/97	97175	02:10	01:40	07:15	
11/03/97	97176	02:05	01:45	07:05	
11/04/97	97177	00:00	00:00	00:00	
11/06/97	97178	00:00	00:00	00:00	
11/07/97	97179	00:00	00:00	00:00	


WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS
Fuel Consumption (US Gal/ Ton)
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
Overall Trend
8.8 %
Engine Conditioning
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment


WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS
Fuel Consumption (US Gal/ Ton)
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
Overall Trend
8.8 %
Engine Conditioning
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment


WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS
Fuel Consumption (US Gal/ Ton)
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
Overall Trend
Engine Conditioning
8.8 %
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment


WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS
Fuel Consumption (US Gal/ Ton)
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
Overall Trend
8.8 %
Engine Conditioning
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment

WESTERN FUELS ASSOCIATION, INC.
NEW MEXICO OPERATIONS
FPC-2 CATALYST TEST

Train Fuel Consumption

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Comments
08/01/97	97122	5213.050	0.03%			Full Fuel Tanks (no FPC-2)
08/02/97						
08/03/97						
08/04/97	97123	5213.775	0.04%			
08/05/97	97124	5214.075	0.05%			
08/06/97	97125	5212.550	0.02%			
08/07/97	97126	5211.700	0.00%			
08/08/97	97127	5211.475	0.00%			
08/09/97						
08/10/97						
08/11/97	97128	5211.675	0.00%			
08/12/97	97129	5212.150	0.01%			
08/13/97	97130	5212.350	0.02%			
08/14/97	97131	5213.100	0.03%			
08/15/97	97132	5213.750	0.04%	**8581**		Full Fuel Tanks (no FPC-2)
08/16/97		**57339.650**			**0.1496521**	**Test Segment #1 Baseline**
08/17/97	**Ave. =**	**5212.695**				
08/18/97						
08/19/97	97133	5213.575	0.04%			
08/20/97	97134	5218.875	0.14%			
08/21/97	97135	5219.400	0.15%			
08/22/97	97136	5219.900	0.16%			
08/23/97						
08/24/97						
08/25/97	97137	5219.550	0.15%			
08/26/97	97138	5216.725	0.10%			
08/27/97	97139	5220.750	0.18%			
08/28/97	97140	5220.675	0.18%			
08/29/97	97141	3689.475	n/a	**7017**		Full Fuel Tanks (no FPC-2)
08/30/97		**45438.925**			**0.1544271**	**(2) Test Segment #2 Baseline**
08/31/97	**Ave. =**	**5218.681**	**(excluding 8/29)**			*Note: 8/30/97 Replaced #5 & #9 power*
Total		**102778.575**		**15598**		*assemblies on WFA-1.*

Baseline Average = 0.1517631

Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 3.19% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.
(3) The load on 8/29 was 6.05% more than 2/3 of the average load (assuming only two locomotives operated that day.

Date	Train #	Tons Hauled	(1)% Variation	Gallons #2 Diesel	Gallons/ Ton Coal	Comments
09/01/97						Full Fuel Tanks
09/02/97	97142	5219.375	0.15%			FPC-1 Mixed in Fuel
09/03/97	97143	5220.950	0.18%			
09/04/97	97144	5320.425	2.09%			
09/05/97	97145	5320.925	2.10%			
09/06/97						
09/07/97						
09/08/97	97146	5321.350	2.11%			
09/09/97	97147	5321.350	2.11%			
09/10/97	97148	5219.300	0.15%			
09/11/97	97149	5218.700	0.14%			
09/12/97	97150	5219.550	0.15%			
09/13/97						
09/14/97						
09/15/97						
09/16/97	97151	5219.900	0.16%			
09/17/97	97152	5219.450	0.15%	**8612**		Full Fuel Tanks
		57821.275			**0.1489417**	**Test Segment #1 Treated**
	Ave.=	**5256.480**				
09/18/97	97153	5219.300	0.15%			
09/19/97	97154	5218.975	0.14%			
09/20/97						
09/21/97						
09/22/97						
09/23/97	97155	5218.725	0.14%			
09/24/97	97156	5215.200	0.07%			
09/25/97	97157	5321.175	2.10%			
09/26/97	97158	5321.800	2.12%			
09/27/97						
09/28/97						
09/29/97						
09/30/97	97159	5321.150	2.10%	**5534**		Full Fuel Tanks
		36836.325			**0.15023214**	**Test Segment #2 Treated**
	Ave.=	**5262.332**				
Total		**94657.600**		**14146**		**Treated Average**

Treated Average = 0.1494439

Per Cent Change vs. Baseline = 3.23% Reduction in Fuel Consumption

Notes: **(1) % Variation vs. lowest "full" load in Baseline Data (5211.475).**
(2) 0.87% Variation between Segment #1 Gallons/Ton and Segment #2 Gallons/Ton.

WESTERN FUELS ASSOCIATION, INC. **08/97**

New Mexico Operations

Train Fuel Consumption

DATE	TRAIN #	TONS	FUEL		
08/01/97	97122	5213.050			Full Fuel Tanks
08/02/97					
08/03/97					
08/04/97	97123	5213.775			
08/05/97	97124	5214.075			
08/06/97	97125	5212.550			
08/07/97	97126	5211.700			
08/08/97	97127	5211.475			
08/09/97					
08/10/97					
08/11/97	97128	5211.675			
08/12/97	97129	5212.150			
08/13/97	97130	5212.350			
08/14/97	97131	5213.100			
08/15/97	97132	5213.750	8581		Full Fuel Tanks
08/16/97					
08/17/97					
08/18/97					
08/19/97	97133	5213.575			
08/20/97	97134	5218.875			
08/21/97	97135	5219.400			
08/22/97	97136	5219.900			
08/23/97					
08/24/97					
08/25/97	97137	5219.550			
08/26/97	97138	5216.725			
08/27/97	97139	5220.750			
08/28/97	97140	5220.675			
08/29/97	97141	3689.475	7017		Full Fuel Tanks
08/30/97					
08/31/97					
		102778.575	15598		

Gallons of fuel to deliver 1 ton of coal: **0.1517631**

c:\123r5w\work\expenses\diesel97.wk4

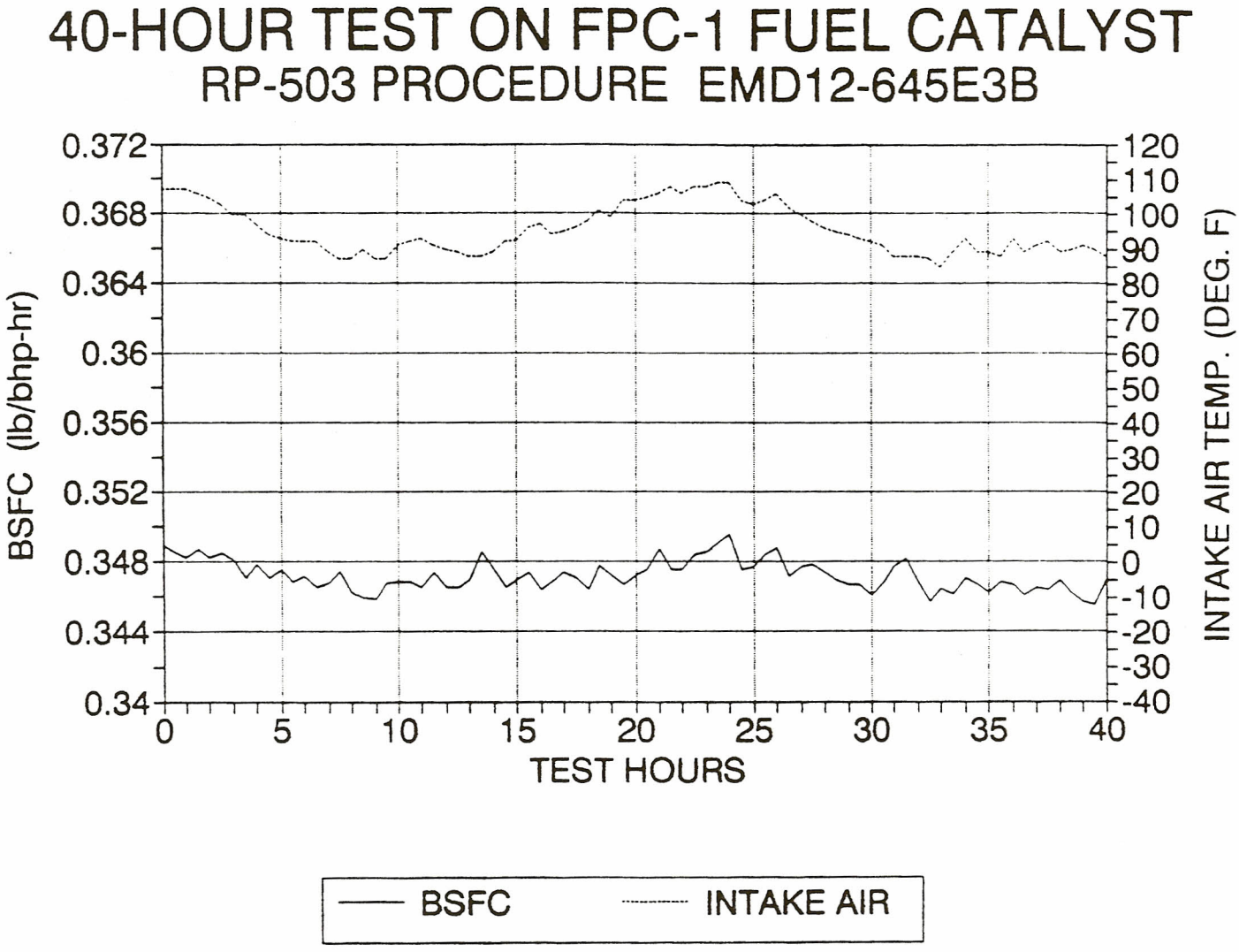

40-HOUR TEST ON FPC-1 FUEL CATALYST
RP-503 PROCEDURE EMD12-645E3B
BSFC (lb/bhp-hr)
0.372
0.368
0.364
0.36
0.356
0.352
0.348
0.344
0.34
INTAKE AIR TEMP. (DEG. F)
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
0
5
10
15
20
25
30
35
40
TEST HOURS
BSFC
INTAKE AIR

FIGURE 3

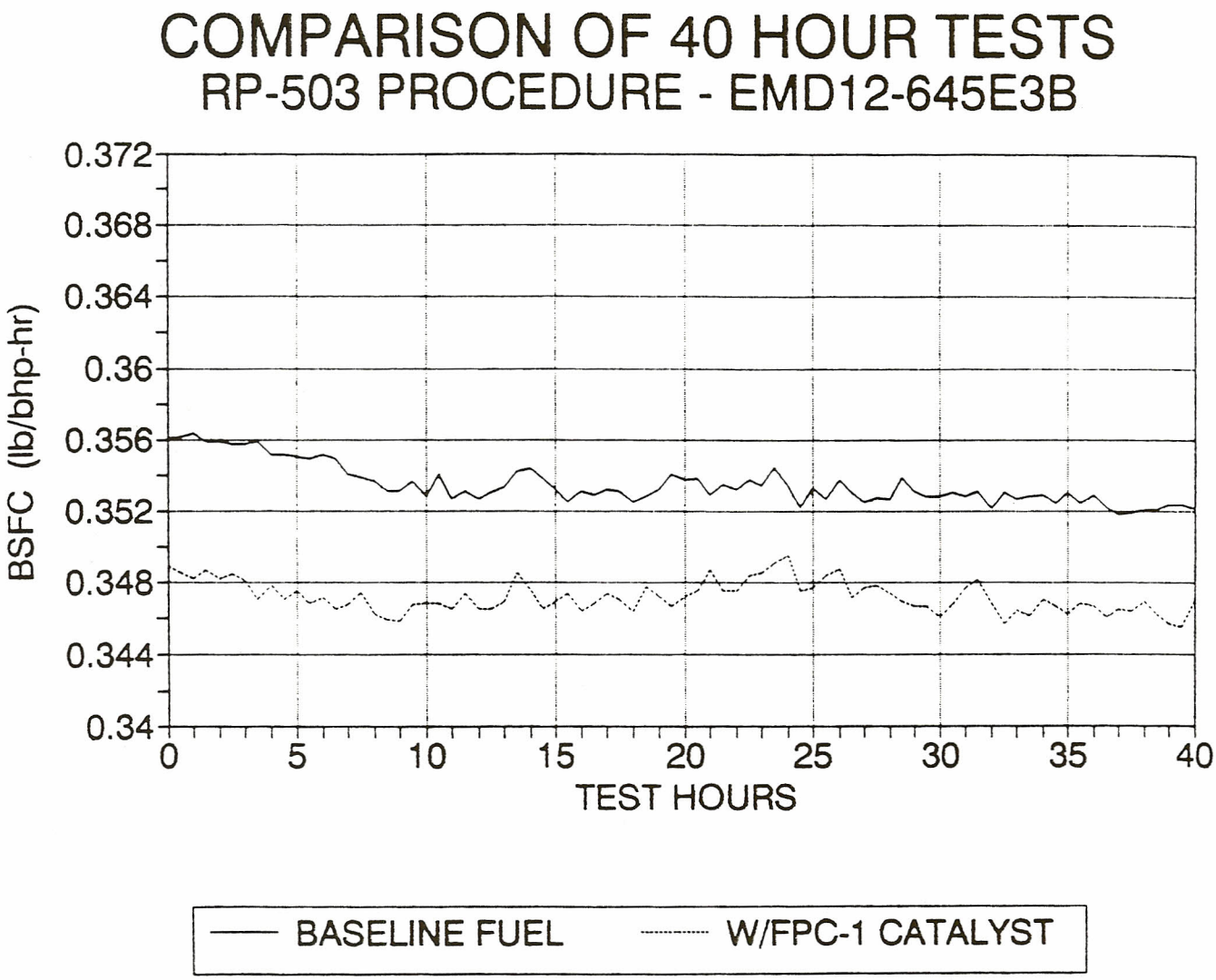
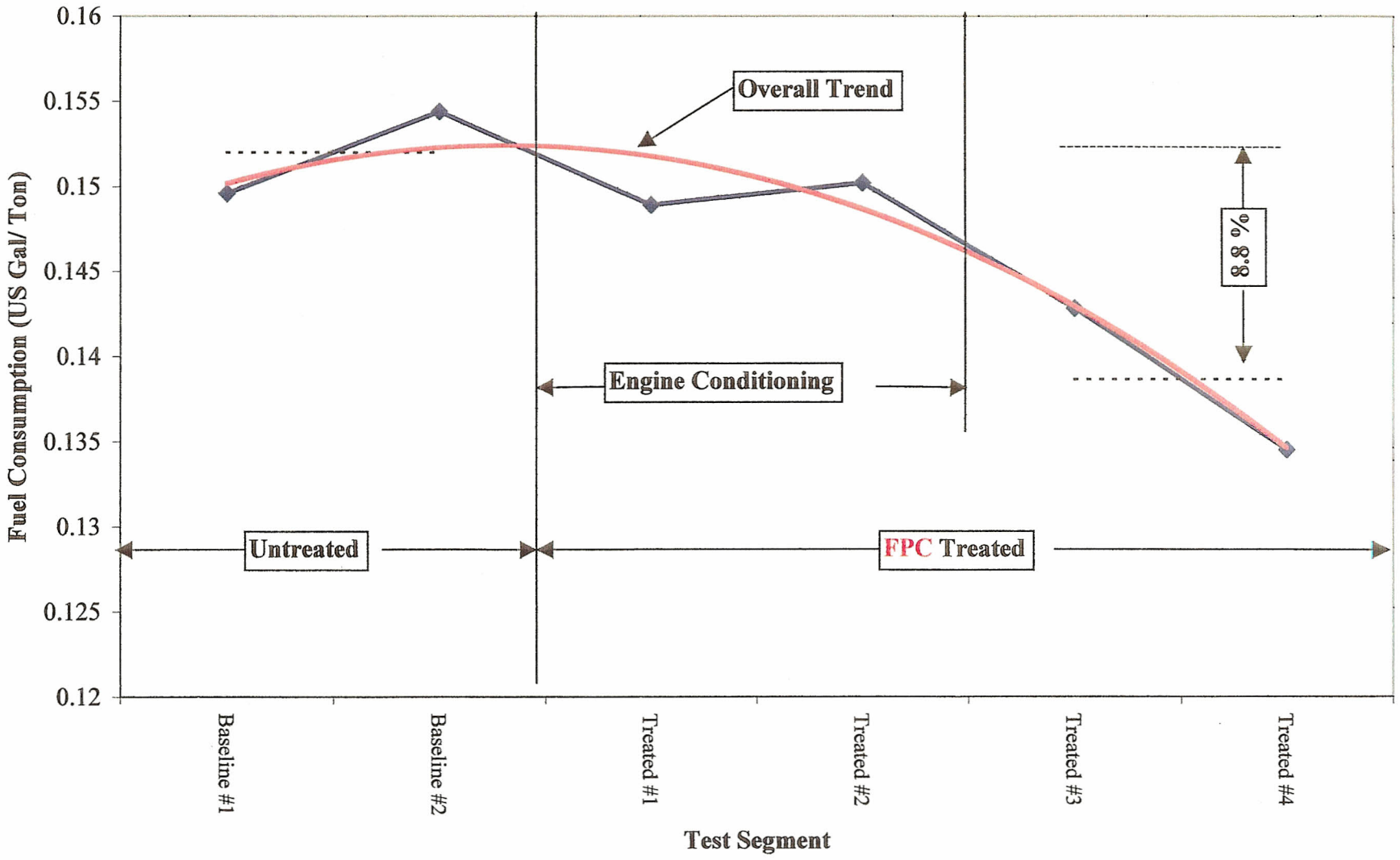

COMPARISON OF 40 HOUR TESTS
RP-503 PROCEDURE - EMD12-645E3B
BSFC (lb/bhp-hr)
0.372
0.368
0.364
0.36
0.356
0.352
0.348
0.344
0.34
0
5
10
15
20
25
30
35
40
TEST HOURS
BASELINE FUEL
W/FPC-1 CATALYST

FIGURE 4


WESTERN FUELS ASSOCIATION INC
FPC LOCOMOTIVE TRIALS
Fuel Consumption (US Gal/ Ton)
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
Overall Trend
8.8 %
Engine Conditioning
Untreated
FPC Treated
Baseline #1
Baseline #2
Treated #1
Treated #2
Treated #3
Treated #4
Test Segment