GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

ESTIMATION OF LOAD FACTOR OF DIESEL ELECTRIC LOCOMOTIVES

MISCELLANEOUS REPORT NO. MP.MISC. – 432/71 (Rev.0.0)
SEPTEMBER, 1971

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ESTIMATION OF THE LOAD FACTOR OF DIESEL LOCOMOTIVES

1. OBJECTIVE

The objective of this report is to indicate methods of assessing the load factor of the diesel locomotives, while fixing the loads of the passenger and goods trains.

2. INTRODUCTION

The load factor of a diesel locomotive is one of the important criteria, which may influence the reliability of operation of the diesel engine. Prolonged operation of the diesel engine at maximum rated output increases the thermal loading on engine and may accelerate the eventual failure of the engine components due to thermal distress of fatigue. In order to obtain an optimum service life from the diesel engine components, it has been the endeavour of the different Railway systems in the world to work to a moderate load factor while programming running of the trains. The practice followed on some of the important railway system has been indicated in the Board's letter No. 67M(L)466/56 of the 20-3-71(Annexure-A). Based on this, the Board have stipulated that while fixing the loads of the passenger and goods trains, specially on sections with long and steep grades, it should be insured that the load factor is not in excess of approximately 60%. The railways have also been advised to conduct tests to ascertain the load factor of the locomotives hauling trains on graded sections. Sample calculations based on the actual tests conducted on the frontier mail locomotives on Delhi – Ratlam and Ratlam – Mumbai sections have also been worked out and included.

3. DEFINITION OF LOAD FACTOR

Load factor is the ratio between the average power required in service and the maximum power of the diesel engine.

The terms ' Load factor" has been used in different contexts –

- "ORE engine load factor" which corresponds to the average power developed by the diesel engine during its overall time of working on the test bench.
- "Train load factor" relative to the average power of the diesel engine during the working of the locomotive at the head of the train, including intermediate and terminal station stops.
- "Pure traction load factor" which is the ratio between the average power developed by the diesel engine during the effective running of the train and the nominal power of the engine.

As the Board's stipulation of 60% applies to the" pure traction load factor", this definition has been used in this report. The effective running period of the locomotive

is the time during which the wheels of the locomotive are moving i.e. the effective train journey time exclusive of the station halts when the diesel engine idling.

4. METHOD OF CALCULATION

The following two methods can be used to calculate the load factor :

i) Fuel Consumption Method
ii) Horsepower Output Method

4.1 FUEL CONSUPTION METHOD

This method is used by the UIC – ORE in the type test of the diesel engines for homologation. It assumes that the HP output of a diesel engine is directly proportional to the fuel consumption. To use this method, the hypothetical fuel consumption of the locomotive at maximum rated output during the effective train journey can be computed from the specific fuel consumption. The ratio of this quantity and the amount of fuel actually consumed by the locomotive during the effective train journey (i.e. the total fuel consumed – fuel consumption during halts when the engine is idling), will give the load factor of the locomotive. The fuel consumption of the locomotive depends on the ambient and site conditions. However, the following consumption figures for the different classes of locomotives may be taken as a guide under site conditions of 27ºC at sea level: -

Locomotive	Fuel consumption (Litres/ hour)	
	At maximum rated output	At idling
WDM2 (4 – Duct)	489	25
WDM2 (Single duct)	480	25
WDM3A	570	25
WDG3A	570	25
WDP3A	570	25
WDM3C	606	25
WDM3D	606	25
WDG4	746	25
WDP4	746	25
WDS6		12
YDM4/YDM4A		12
YDM3		12
YDM5		12

Mathematically, the load factor on fuel consumption basis may be represented as -

$$F = \frac{M - (n \times C_2)}{(N - n) \times C_1}$$

Where F = Load factor
M = Total fuel consumption in Litres.
N = Total journey time of train in hours.
n = Total time of halts and detention in hours.
C_1 = Specific fuel consumption in litres/hours at maximum rated output of the engine.
C_2 = Specific fuel consumption in litres/hours at engine idling.

4.2 HORSE POWER METHOD

As the load factor is related to the maximum rated output of the diesel engine, it follows that the load factor of the locomotive is unity while working at the maximum rated output i.e. at the maximum notch. The factor at intermediate notches will be related to the ratio of the HP output at intermediate notches to the maximum rated output. The cumulative pure traction load factor will thus be the ratio of the summation of the product of notch – wise load factor and the time spent at the different notches and the total effective journey time. On the basis of the HP output at intermediate notches, the notch-wise load factor for the different classes of locomotive under the site conditions of 27ºC at sea level, can be taken as under :

Locomotive	**Load factor at different notches**				
	8^{th}	7^{th}	6^{th}	5^{th}	4^{th}
WDM2	1.0	0.86	0.70	0.48	0.30
WDM3A	1.0	0.80	0.59	0.44	0.30
WDG3A	1.0	0.80	0.59	0.44	0.30
WDP3A	1.0	0.80	0.59	0.44	0.30
WDM3B	1.0	0.80	0.59	0.44	0.30
WDM3C	1.0	0.80	0.60	0.44	0.30
WDM3D	1.0	0.80	0.60	0.44	0.30
WDG4	1.0	0.89	0.67	0.46	0.35
WDP4	1.0	0.89	0.67	0.46	0.35
WDS6	1.0	0.78	0.58	0.43	0.32
YDM4/4A	1.0	0.67	0.45	0.32	0.20
YDM3	1.0	0.85	0.69	0.54	0.39
YDM5	1.0	0.85	0.69	0.54	0.39

Mathematically, the load factor on horsepower Output basis may be represented as -

$$F = \frac{\sum_4^8 Fi \times Ni}{(N-n)}$$

Where F = Load factor
F_i = Load factor of intermediate notches.
N_i = Time spent in intermediate notches in hours.
N = Total journey time of train in hours.
n = Total time of halts and detention in hours.

The two methods of calculation of the load factor are expected to give approximately the same value. The Railway may adopt any one of the methods for estimation of the load factor.

5. LOAD FACTOR TRIALS

Before conducting the running tests to estimate the load factor, it should be ensured that the locomotive is developing the rated HP by testing on load box. It is also desirable that load factor is assessed under the worst ambient conditions in summer. The trials conducted by RDSO team on the frontier mail locomotive during April/May, 1971 are described as a guide line to the railway to assess the traction load factor of the locomotive and to help them in arranging the load factor trials accordingly. For the load factor trials by RDSO, the total journey time of the frontier mail was split up into two sections i.e. New Delhi – Ratlam and Ratlam – Mumbai central sections, in all 8 sets of trials were conducted to arrive at a reasonable assessment of the load factor. Sample readings taken on the locomotive during one of these trials are indicated at Annexure –B. The summaries of the notchwise running times for the different trials are indicated at Annexure –C. From the data collected during the trials, the load factors were calculated for the different test runs by the two methods explained in para 3. The calculations pertaining to the trials conducted on 18-05-71 are indicated as follows to serve as a guideline.

5.1 On the basis of fuel consumption -

M = 3575 Litres
N = 733 Minutes
n = 90 Minutes
C1 = 480 Litres/hour
C2 = 25 Litres/hour

$$\text{Load Factor } F = \frac{M-(n\times C_2)}{(N-n)\times C_1} = 3575 - \frac{\left(\frac{90}{60}\times 25\right)}{\frac{(733-90)}{60}\times 480}$$

$$= \frac{3575.5}{5514} = 68.8\%$$

5.2 On the basis of Hp output –

F8 = 1
N8 = 363 Minutes
F7 = 0.86
N7 = 51 Minutes
F6 = 0.70
N6 = 47 Minutes
F5 = 0.48
N5 = 9 Minutes
N = 733 Minutes
n = 90 Minutes

Load Factor F= $\frac{\sum_4^8 Fi \times Ni}{(N-n)} = \frac{363\times1+51\times0.86+47\times0.70+9\times0.48}{(733-90)}$

= 69.06%

It will be seen from the sample calculations that the two methods gives a load factor of approximately 69% for this trials run.

The summary of the load factor calculations for the different test run (details indicated at Annexure – C) is as under :

SUMMARY OF LOAD FACTOR TESTS ON FRONTIER MAIL

S.No.	Date trials conducted	Section	Load factor on fuel consumption basis	Load factor on Hp output basis
1	18-05-1971	Ratlam – New Delhi	68.8%	69%
2	16-04-1971	Ratlam – New Delhi	59.5%	58%
3	05-04-1971	New Delhi - Ratlam	67.2%	69.5%
4	17-05-1971	New Delhi - Ratlam	68.2%	70%
5	12-04-1971	Ratlam – Mumbai Central	52.8%	46.3%
6	08-04-1971	Ratlam – Mumbai Central	47.6%	48.8%
7	14-04-1971	Mumbai Central – Ratlam	55.5%	52.2%
8	10-04-1971	Mumbai Central – Ratlam	53.8%	49.5%

Annexure – A

Copy of Board's letter No. 67M(L)466/56 of 20-3-1971.

Sub : Load rating of diesel locomotives.

The permissible loads of diesel locomotives indicated in the haulage capacity charts issued by the RDSO are based upon limitations arising out of available tractive effort, adhesion and the minimum continuous rating speed of each type of locomotive. These load charts do not, however, take into account the overall load factor of the locomotive measured in terms of the power required to be developed by the loco throughout the run. The load factor may be defined as a ratio between the average power developed by the locomotive during the effective train journey (running time only) to the power rating of the diesel engine. For practical purpose, however, load factor may be assessed by the ratio of the period of running time that a load is operated in full notch to period it is operated at lower notches. In order to ensure reliability of operation and satisfactory standards of maintenance, It is necessary to ensure that the load factor is not excessively high. The common practice on some of the railway systems abroad are indicated in a statement attached at annexure 'A".

2. The WDM2 locos have been designed so as to provide the best match in the 7^{th} notch. Working for long periods in eighth notch will, apart from increasing the fuel consumption result in increase in exhaust temperature causing undesirable high thermal stresses to be imposed on the engine. While fixing the loads of both passenger and goods train, specially on sections with long steep grades, it is necessary to ensure that the load factor is not in excess of approximately 60%. The load factor should be assessed under the worst ambient condition, in summer weather. Prior to conducting the test, it should be ensured that the locomotive is developing full horse power by testing on load box.

Sd/-
(B.B.Lal)
Jt. Director (Traction) Rly.Board.

Annexure as
Given below

RESERVE POWER ON DIESEL LOCOMOTIVE FOR HAULING PASSENGER TRAINS

France :

The load factor for the actual running time is generally limited to 60% only. An extract in this connection from French Railway Techniques – Issue No. 3 of 1966 – page 108 is given below :

" We know that a modest load factor is indispensable if reliable operation of diesel engine and reasonable maintenance cost are to be achieved. It is recognized that the load factor for actual running time should not exceed 60%".

Germany :

The practice on the Deutsche Bundesbahn is to keep the load factor to 40% to 60% depending upon the type of service. For example, for V 200diesel hydraulic loco hauling long distances express trains, the load factor is just little above 40%. For ordinary express trains, the same locomotive is used at load factor of approximately 55%.

U.K :

The load factor on the British Railway is also of the order of 45%. An extract from the Magazine " Engineer of 29th Sept. 1967 – page 423 is given below:

" The reserve of Horse power required in the loco to cater for the recovery margin is significant. For example, between paddington and Exeter, with a stop at Taunton and a 15 Min. recovery margin, two D.833 locos (4400HP) hauling ten coaches would be running at about 46% full power if the recovery margin was not needed, i.e. a power reserve of 54%".

U.S.A. :

The practice on the railroads in the USA is to have a load factor of approximately of 60%.

Annexure – B

NOTCHWISE RUNNING TIME OF FRONTIER MAIL

Date:	18 - 05-1971	RTM Departure:	07.36 hrs
Train No.	3 DN	New Delhi arrival:	19.49 hrs
Loco No.:	18415 WDM2	Fuel oil at RTM :	4900 Litres
Section:	RTM – NDLS	Fuel oil at New Delhi :	1325 Litres

Time	Running time in minutes at different notches					Remarks
	8th	7th	6th	5th	Others	
1	2	3	4	5	6	7
7.36/7.37	-	-	-	-	1	
7.3	-	-	-	1	-	
7.39	-	-	1	-	-	
7.41	-	2	-	-	-	
7.44	3	-	-	-	-	
7.49	-	-	-	-	5	For signals & L/C
7.51/7.52	-	-	-	-	-	**Bangord (7.49-7.51= 2 Mint.)**
7.52	-	-	1	-	-	
7.53	-	1	-	-	-	
8.06	13	-	-	-	-	Home signals 45º, starter lowered on approach
8.10	-	-	-	-	4	
8.13	3	-	-	-	-	
8.17	-	-	-	-	4	**Nagda (8.17-8.21= 4 Mint.)**
8.21/8.22	-	-	-	-	1	
8.25	-	-	-	3	-	
8.32	-	-	-	-	7	Cautions driving 10 km/h
8.58	26	-	-	-	-	
9.00	-	-	-	-	2	
9.01	-	-	1	-	-	
9.04	-	-	-	-	3	
9.10	6	-	-	-	-	
9.11	-	-	-	-	1	
9.32	21	-	-	-	-	
9.37	-	-	-	-	5	**Shamgarh (9.37-9.41= 4Mint)**
9.41/9.42	-		-	-	1	
9.43	-	-	1	-	-	
9.45	-	2	-	-	-	
9.54	9	-	-	-	-	

1	2	3	4	5	6	7
9.56					2	
10.00	4					
10.04					4	**Cattle run over, Stopped at Km 816/2 due to vaccum dropped (10.4-10.17=13Mint)**
10.18				1		
10.19						
10.19/10.23	4					
10.29					6	
10.30		1				
10.50	20					
10.53					3	
10.54		1				
10.56	2					Caution driving 55 km/h at Km 867/4 to 868
11.01					5	
11.20	19					Caution driving 15 km/h at Km 898/6 to 898/4
11.26					6	
11.27			1			
11.34	7					
11.40					6	Kota home lowered on approach
11.43		3				
11.45					2	
11.57						**Kota (11.45-11.57=12 Mint.)**
11.58					1	
11.59			1			Caution driving 45 km/h at Km 934
12.07	8					
12.10					3	
12.11		1				
12.31	20					
12.34		3				
12.35					1	
12.39		4				
12.41					2	
12.48	7	-	-	-	-	
12.54	-	6	-	-	-	
12.55					1	
12.56		1				
13.11	15					
13.11/13.15					4	**SWM (13.15-13.19=4Mint)**
13.19/13.20					1	
13.21			1			

1	2	3	4	5	6	7
13.27	6					
13.29			2			Home signal raised
13.36					6	**Mokholi (13.35-13.36=1Mint)**
13.36/13.38		2				
13.43	5					
13.45					**2**	
13.50	5					
13.51					1	
13.54	3					Caution driving 10 km/h at Km 1070,1071
14.00					6	
14.15	15					
14.16		1				
14.20					4	**GGC (14.29-14.35= 15 Mint)**
14.35/14.39		4				
14.49	10					
14.50					1	
14.51			1			
14.53	2					
14.56		3				
14.57					1	
15.02	5					Caution driving 10Km/h at Kms1136,1137
15.05					3	
15.07		2				
15.20	13					
15.22					2	
15.29	7					
15.35					6	**Bayana (15.35-15.39=4 mint)**
15.39/15.41					1	
15.41	-	-	-	1	-	
15.41/15.43		2				
15.49	6					
15.54					5	Passed via Loop Keladevi
15.55		1				
16.05	10					Passed via Loop Sewar
16.10					5	
16.12			2			
16.15	3					Cautions driving 50 Km/h at Kms1210
16.21					6	
16.25/16.26				1		**BTE (16.21-16.25= 4 Mint)**
16.27			1			
16.28		1				
16.32	4					Cautions driving 40Km/h at Kms1219/4

1	2	3	4	5	6	7
16.35					3	
16.36		1				
16.47	11					
16.50					3	For signals
16.51		1				
16.55	4					
17.00					5	**Mathura (17.00-17.09=9 mint)**
17.06/17.18				2		
17.20			2			**(17.09-17.16= 7mints.) alarm chain pulled at station**
17.39	19					
17.40					1	
17.45	5					Cautions driving 75/50& 65Km/h at Kms 1434,1437
17.50					5	
18.05	15					
18.08					3	W/signal on
18.09					1	Cautions driving 30 & 15 Km/h at Kms 1461 to 1462
18.15					6	
18.17		2				
18.25	8					
18.27					2	
18.28			1			
18.28/18.33	5					Asaoti passes via Loop
18.39					6	
18.41		2				
18.50	9					
18.51					1	Faridabad outer signal lowered on approach.
18.56			5			
19.00		4				
19.06	6					**Alarm chain pulled at Km 1518 (19.06-19.13=7mint.)**
19.13/19.20			7			
19.21					1	
19.28			7			
19.30					2	
19.34/19.35					1	**NZM (19.30-19.34= 4 mint.)**
19.46			11			
19.49					3	NDLS arrival 19.49 hrs
Total time taken	**363**	**51**	**47**	**9**	**173**	**90 Minutes**

Annexure - C

SUMMARY OF RUNNING TIME AT DIFFERENT NOTCHES

TRIAL NO.: 1 **Date : 18-05-1971**

Train No. : 3 Dn
Load 19 bogie : 38/745 tonnes.
Loco No. : WDM2 18415
Section : Ratlam – New Delhi.

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	7.33 hrs	7.36 hrs	
2.	Arrival	19.15 hrs	19.49 hrs	
3.	Total time	11.42 hrs	12.13 hrs	
4.	No. of halts	9	13	Extra time on scheduled halts 9 minutes. Time on non – scheduled halts = 30 minutes.
5.	Effective running time	10.51 hrs	10.43 hrs	

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	363	Total fuel consumed = 3575 Litres. Estimated fuel consumed for halts = 37.5 Litres fuel consumed during effective running time = 3537.5 Litres
2.	7	51	
3.	6	47	
4.	5	9	
5.	1^{st} to 4^{th}	173	

Note : Fuel consumption at idle 25 Litres/hours.

TRIAL NO.: 2 **Date : 16-04-1971**

Train No. : 3Dn
Load 18 bogie : 708tonnes.
Loco No. : WDM2 18418
Section : Ratlam – New Delhi.

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	7.33 hrs	7.33 hrs	Right time
2.	Arrival	19.15 hrs	19.12 hrs	3 mint before time
3.	Total time	11.42 hrs	11.39 hrs	Total extra time on Advertised halts = 16 mint
4.	No. of halts	9	12	
5.	Effective running time	10.52 hrs	10.00 hrs	Total time on 3 non scheduled halts = 28 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	192	Total fuel consumed = 2900 Litres. Estimated fuel consumed for halts = 41.46 Litres fuel consumed during effective running time = 2858.34 Litres
2.	7	88	
3.	6	107	
4.	5	13	
5.	1st to 4th	200	

TRIAL NO.: 3 **Date : 5-4-1971**

Train No. : 4 Up
Load 18 bogie : 36/708tonnes.
Loco No. : WDM2 18418
Section : New Delhi - Ratlam

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	8.45 hrs	8.50 hrs	5 mint late start
2.	Arrival	20.45 hrs	21.00 hrs	
3.	Total time	12.00 hrs	12.10 hrs	Total extra time on Advertised halts = 43 mint
4.	No. of halts	8	13	
5.	Effective running time	11.15 hrs	10.04 hrs	Total time on 5 non scheduled halts = 33 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	253	Total fuel consumed = 3200 Litres. Estimated fuel consumed for halts = 52.5 Litres fuel consumed during effective running time = 3147.5 Litres
2.	7	140	
3.	6	38	
4.	5	40	
5.	1st to 4th	133	

TRIAL NO.: 4 **Date : 17-5-1971**

Train No. : 4 Up
Load 19 bogies : 38/745 tonnes.
Loco No. : WDM2 18407
Section : New Delhi - Ratlam

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	8.45 hrs	9.26 hrs	41 mint late start
2.	Arrival	20.45 hrs	21.30 hrs	45 mint late arrival
3.	Total time	12.00 hrs	12.04 hrs	Total extra time on Advertised halts = 29 mint
4.	No. of halts	8	15	
5.	Effective running time	11.10 hrs	10.14 hrs	Total time on 7 non scheduled halts = 31 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	348	Total fuel consumed = 3400 Litres. Estimated fuel consumed for halts = 45 Litres fuel consumed during effective running time = 3355 Litres
2.	7	24	
3.	6	87	
4.	5	4	
5.	1st to 4th	151	

TRIAL NO.: 5 **Date : 12-4-1971**

Train No. : 4 Up
Load 18 bogies : 708 tonnes.
Loco No. : WDM2 18422
Section : Ratlam – Mumbai CT

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	21.03 hrs	21.24 hrs	21 mint late start
2.	Arrival	10.10 hrs	11.55 hrs	105 mint late arrival
3.	Total time	13.07 hrs	14.31 hrs	Total extra time on Advertised halts = 7 mint
4.	No. of halts	6	11	
5.	Effective running time	12.24 hrs	10.39 hrs	Total time on 5 non scheduled halts = 3 hrs 70 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	178	Total fuel consumed = 2800 Litres. Estimated fuel consumed for halts = 96 Litres fuel consumed during effective running time = 2703 Litres
2.	7	48	
3.	6	75	
4.	5	51	
5.	1st to 4th	287	

TRIAL NO.: 6 **Date : 8-4-1971**

Train No. : 4 Up
Load 18 bogies : 708 tonnes.
Loco No. : WDM2 18422
Section : Ratlam – Mumbai CT

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	21.03 hrs	21.21 hrs	9 mint late start
2.	Arrival	10.10 hrs	10.18 hrs	8 mint late arrival
3.	Total time	13.07 hrs	13.06 hrs	Total extra time on Advertised halts = 20 mint
4.	No. of halts	6	12	
5.	Effective running time	12.24 hrs	11.22 hrs	Total time on 6 non scheduled halts = 45 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	188	Total fuel consumed = 2650 Litres. Estimated fuel consumed for halts = 43.3 Litres fuel consumed during effective running time = 2606.7 Litres
2.	7	48	
3.	6	56	
4.	5	63	
5.	1^{st} to 4^{th}	327	

TRIAL NO.: 7 **Date : 14-4-1971**

Train No. : 3 Dn
Load 18 bogies : 708 tonnes.
Loco No. : WDM2 18418
Section : Mumbai Central - Ratlam

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	18.50 hrs	18.50 hrs	Right time
2.	Arrival	7.15 hrs	7.15 hrs	4 mint late arrival
3.	Total time	12.25 hrs	12.16 hrs	Total extra time on Advertised halts = 20 mint
4.	No. of halts	7	8	
5.	Effective running time	11.36 hrs	10.59 hrs	Total time on non scheduled halts = 8 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	219	Total fuel consumed = 2950 Litres. Estimated fuel consumed for halts = 31.25 Litres fuel consumed during effective running time = 2918.75 Litres
2.	7	30	
3.	6	72	
4.	5	103	
5.	1st to 4th	235	

TRIAL NO.: 8 **Date : 10-4-1971**

Train No. : 3 Dn
Load 18 bogies : 708 tonnes.
Loco No. : WDM2 18418
Section : Mumbai Central - Ratlam

S.No.	Detail of timing	Advertised	Actual	Remarks
1.	Departure	18.50 hrs	18.53 hrs	3 mint late start
2.	Arrival	7.15 hrs	7.15 hrs	
3.	Total time	12.25 hrs	12.22hrs	Total extra time on Advertised halts = 15mint
4.	No. of halts	7	9	
5.	Effective running time	11.36 hrs	11.20 hrs	Total time on 2 non scheduled halts = 3 mint.

THROTTLE OPERATION DETAILS

S.No.	Notch position	Time (Minutes)	Remarks
1.	8	199	Total fuel consumed = 2950 Litres. Estimated fuel consumed for halts = 25.80 Litres fuel consumed during effective running time = 2924.20 Litres
2.	7	42	
3.	6	96	
4.	5	73	
5.	1st to 4th	260	