

A Methodology For Improving Fuel Economy In a Transportation Company

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ABSTRACT

The paper discusses and outlines a method for implementing a program to improve mileage by following a relation "Better mileage = Better maintenance + Good driving habits". This method was studied theoretically by observing the past scenario in a renowned company. A Methodology was developed keeping mileage factor in mind. The Methodology consists of maintenance practices like Greasing, filters, oil changing etc. Then the methodology was incorporated in the company's training program. The results obtained through this method were compared with the past results and it was proved that by implementing this method the mileage can be improved. The company has a fleet of above 450 vehicles and operates in 174 different routes. We conducted a test by selecting five different routes that the company operates between and analyzed the results which showed an improvement in mileage. This also resulted in improved performance of the vehicles and a reduction in the maintenance costs, there by resulting in profits to the company.

Keywords – Maintenance, Mileage, Driving habits, Routes, Methodology.

I. INTRODUCTION

The routine recurring work required to keep a vehicle in such condition that it may be continuously utilized, at its original or designed capacity and efficiency, for its intended purpose. It includes: inspection, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation etc.[1]. The average number of kilometers a vehicle will travel on a litre of fuel is called mileage. Mileage is a very prominent factor that is to be considered in every transportation company [2]. Fuel consumption in a vehicle depends on various factors like vehicular design, road conditions, traffic pattern, driving habits, and maintenance practices. Out of these, the quickest and cheapest way to effect saving of fuels is by following good driving habits. Proper driving not only saves fuel but also reduces breakdowns and increases road safety. This also reduces the pollution levels due to vehicle emissions. The objective is to

train drivers/driver instructors and mechanics of the organized and unorganized sectors of the road transport on good driving habits and maintenance practices. Also, to develop a cadre of drivers and driver instructors who can further train other drivers on their own and thus promote and propagate fuel conservation in the road transport sector. On an average a saving of about 10-20 percent of diesel consumption is possible [3]. The company has a fleet of above 450 vehicles and operates in 174 different routes. A road, course, or way for travel from one place to another is called route. We considered the longest route while calculating the distance between the two places. The company has a standard estimation sheet which contains the data regarding a route i.e , the distance of the journey and the time within which it has to reach its destination[4]. We formulated a methodology which is based on the relation "Better mileage = Better maintenance + Good driving habits". Here better maintenance consists of various maintenance activities like cleaning of nozzles, cleaning of air filter, changing of diesel oil and engine oil filters, greasing of wheel hubs periodically, calibrating the fuel pump etc. The good driving habits include following road signs, driving in a correct gear, good breaking etc. The drivers were trained twice a week both theoretically and practically on this methodology [5].

The company set a standard mileage of 4kmpl for 10tyre vehicles of Tata and Ashok Leyland which the drivers were not able to achieve due to lack of knowledge and training. So, the company trained the drivers based on the methodology we designed.

II. EXISTING METHOD

There is no standard procedure being followed in the organisation to train the drivers. The only criteria being checked to recruit a driver is for a heavy licence. If a person has a heavy licence he's being hired regardless of his knowledge or experience about maintenance of the vehicle. The maintenance plays a very vital role in improving the mileage of a vehicle. The driver's knowledge about how the vehicle should be driven in order to obtain a better mileage is another

important aspect which has to be addressed. the driver has only one objective in mind which is to reach the destination in the specified time. As a result of which he ignores the factors which contribute to achieve a better mileage like driving in the correct gear, accelerating and decelerating unnecessarily, jack rabbit starting etc. All these factors result in more fuel consumption and hence a poor mileage.

The table below indicates the percentage of drivers in whom various driving flows were observed before training:

| Sl.no | Reason | Percentage |
|-------|-------------------------|------------|
| 1 | Over speeding | 42% |
| 2 | Rash and rough driving | 39% |
| 3 | Sudden acceleration | 30% |
| 4 | Jack rabbit starting | 12% |
| 5 | Improper gear selection | 30% |
| 6 | Clutch riding | 27% |
| 7 | Unnecessary riding | 12% |

TABLE:-1.

We have selected 5 routes that the operates between and the mileage achieved was calculated using the formula

“Mileage = Total Distance / Travelled Total Fuel Consumption”.

The details about the routes we selected are as below:-

| Route | Distance (km) | Fuel Qty(Lts) | Mileage (KMPL) |
|-------------------|---------------|---------------|----------------|
| Ahmedabad-chennai | 1821 | 480 | 3.79 |
| Vijayawada-cochin | 1246 | 319 | 3.90 |
| Vizag-rajkot | 1960 | 496 | 3.95 |
| Morvi-vizag | 1859 | 538 | 3.45 |
| Cochin-kurnool | 809 | 246 | 3.29 |

TABLE:-2.

TABLE 2 represents the data collected for Tata and Ashok Leyland 10 tyre vehicles. The above data shows the mileage achieved by the vehicles with the existing method.

III. PROPOSED METHODOLOGY

After detailed study of the existing method we formulated a methodology consisting of some postulates. These postulates were then included in the training program for the drivers. The various points covered were:-

1. Do not drive fast, drive sensibly

The faster you go, the more wind resistance your vehicle will face. If you go at speeds above 60 Kmph, you will waste diesel. Tests on Indian trucks prove that you can get up to 40 % extra mileage at 45-55 Kmph as against 80 Kmph.

2. Avoid accelerating or decelerating unnecessarily.

Braking should be done by anticipating stops and curves well in advance. Drive slow and steady.

3. Do not idle the engine.

Idling wastes diesel at the rate of 2 Liters per hour. Switch off the engine for stops of over 2 minute.

4. Drive in the Correct Gear

Incorrect gear shifting can lead to as much as 20% increase in fuel consumption. Start your vehicle in the 1st gear only, except if you are in a muddy patch or going downhill then engage the 2nd gear. For city driving, change to a higher gear when you are sure the engine will not struggle. Get into top gear as soon as possible. Use same gear for uphill and downhill journey. Always move the vehicle in the 1st gear during start

5. Stop-and-go driving wastes fuel. When you slam on the brakes, a lot of useful energy is wasted in the form of heat. A good driver always anticipates stops. Develop good braking habits.

6. Keep your Foot off the Clutch

Start engine with clutch pedal pressed. Use clutch only when you change gears. Riding the clutch causes loss of energy and damages clutch-linings.

7. Correct fuel injection pump calibration and mounting

Always get the pump calibrated at well equipped centers. Also, ensure mounting of the calibrated pump as per mounting recommendations.

8. Binding of brakes restricts free wheel movement and the engine consumes more diesel in order to overcome resistance. Check wheel alignment at regular intervals. Improper wheel alignment and over inflated tyre could become fatal and also will have strong impact on tyre life.

9. Stop diesel leak

Wastage of one drop of diesel per second can yield to 2000litres of wastage in a year.

10. Air filters should be cleaned regularly.

Air filter prevents dust from Fouling the engine. Dust causes rapid wear of engine components and increases fuel consumption.

11. Check tyre pressure regularly

If the tyre pressure drops by 10psi. It leads to decrease of 1% of mileage. Any factors affecting the tyre life will directly impact the mileage of the vehicle .Usage of the Wear tyres will impact the mileage by 7%. Under inflated tyres increase rolling resistance, this leads to higher diesel consumption. Tests showed that a 25% decrease in tyre pressure can cost you 5-10% more on diesel and 25% on tyre

life. Use radial tyres for 3-7% fuel economy, longer tyre life and greater riding comfort.

12. Plan your route.

Rush hour, or stop-and-go traffic, can waste fuel excessively. You will get more mileage from each litre if you take a less congested route, even though it is slightly longer. Select the best route possible which can reduce the distance to your distance which will save some fuel.

13. Maintain proper distance between vehicles.

This can prevent sudden application of brakes which in turn save fuel. Use your eye sight as brakes i.e estimate the distance and reduce the speed instead of sudden brakes.

14. Checks before every journey:

- ❖ Level of engine oil and radiator water.
- ❖ Leakage of diesel, lubricating oils or water.
- ❖ Tyre pressure and condition.
- ❖ Fan belt tension and condition.
- ❖ Free play of clutch and brake pedals.
- ❖ Engine oil pressure, ampere meter charging rate, air
- ❖ Tank pressure and radiator water temperature.

IV. DATA ANALYSIS

After the drivers were trained with the proposed methodology, the same five routes were considered and mileage was calculated again using the same formula. The results obtained were tabulated as follows.

| Route | Distance (km) | Fuel Qty(Lts) | Mileage (KMP L) |
|-------------------|---------------|---------------|-----------------|
| Ahmedabad-chennai | 1821 | 464 | 3.92 |
| Vijayawada-cochin | 1246 | 285 | 4.37 |
| Vizag-rajkot | 1960 | 427 | 4.59 |
| Morvi-vizag | 1859 | 497 | 3.74 |
| Cochin-kurnool | 809 | 217 | 3.72 |

TABLE:-3.

The results obtained after training the trainers with proposed methodology and the results obtained with the existing methodology were compared and we could find increment in the mileage. The results are shown below:-

| Route | Present mileage | Previous mileage | Increment |
|-------------------|-----------------|------------------|-----------|
| Ahmedabad-chennai | 3.92 | 3.79 | 0.13 |
| Vijayawada-cochin | 4.37 | 3.90 | 0.47 |
| Vizag-rajkot | 4.59 | 3.95 | 0.64 |
| Morvi-vizag | 3.74 | 3.45 | 0.29 |
| Cochin-kurnool | 3.72 | 3.29 | 0.43 |

TABLE:-4.

The TABLE 4 shows the mileage increment for only the five routes considered. The same can be applied to the remaining 169 routes between which the company operates.

The daily requirement of fuel for the company is 6000 litres. The figure can be brought down drastically if the proposed methodology is followed and will result in a reduced fuel consumption the company. As a result the company can be benefited as the maintenance costs for the vehicles can be brought down.

V. RESULTS

The amount of fuel saved in litres for all the 5 routes = 189 litres.

The amount saved in the trip in Rs=189 x 52.05 = 9837.45Rs.

Number of trips in a month = 4

The amount of money saved in a month

$$= 9837.45 \times 4 = 39350Rs.$$

The amount saved in 1 year = 39350 x 12 = 4,72,200 Rs.

VI. CONCLUSION

The paper gives an acumen into the present existing methodology being used in the company and how the proposed methodology is better compared to present methodology. The proposed methodology reduces the fuel consumption and results in an increment in the mileage thereby resulting in benefits to the company. It imparts some technical knowledge regarding the maintenance of the vehicle to the drivers.

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