

BP LPG Dual Fuel Pilot

Final Cost Benefits Report

Reference Group

Renault Premium 420.25

...ABZ

...ACJ

...ACO

...ACU

...CCV

Pilot Group

Renault Premium 420.25

...ABN

...ABO

...ABU

...ABV

...ABX **Excluded.**

Submitted 24th April 2008

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Fleetstat: _____

1.0 Introduction

Fleetstat were invited by the BP, Future Fuel Technology alliance to provide a totally independent service to monitor the effectiveness of the 'Dual Fuel' equipment fitted to five Renault Premium tractor units. Our brief was to look in detail at the change in total fuel costs which result from the installation of the Diesel/LPG 'Dual Fuel' technology.

Furthermore, in order to provide a 'true' picture of any fuel cost savings, we were to track 'actual' diesel and LPG prices paid during the period of the 'Pilot'. This approach is to avoid criticism that the figures presented relate to a 'fixed' diesel price, which, in the current climate, might not reflect current prices.

These particular projects are quite complex to monitor for several reasons:

- a) The characteristics of the 'Dual Fuel' equipment does not result in a straightforward volume displacement of diesel by LPG. This means introducing 1 Ltr of LPG into an engine does NOT mean the volume of diesel required is reduced by 1 Ltr. This is because the calorific value of the two fuels is different. Therefore calculating performance change based upon MPG (Km/Ltr) is totally meaningless.
- b) The ratio of diesel to LPG used by an engine is not a fixed figure but varies over the operational cycle of an engine, with optimum figures being achieved when the vehicle has reached a steady 'cruising' speed with lower figures of LPG usage being realised during periods of acceleration.
- c) Not only can the costs of diesel and LPG vary, because of differing duty rates and product costs from the supplier, the price 'ratio' between diesel and LPG is also a variable.

These factors together mean that conventional performance analysis, looking at MPG (Km/Ltr) cannot be used. Therefore our approach is to carry out this analysis in terms of £/mile. This not only gives a 'true' account of the change in fuel costs, but also accommodates all of the variables highlighted above, especially when week by week fuel costs are taken into account.

One final feature of our analysis is that we monitor the performance of two groups of vehicles. The 'Base' group are unmodified and serve to show the fleet performance changes which occur 'naturally' during the period of the monitoring programme. The second, or 'Pilot', group have the Dual Fuel technology fitted, and their change in performance is compared to that of the 'Base' group over the same period. This

approach minimises the impact of performance changes resulting from seasonal and operational factors.

2.0 Process.

During the execution of this project, additional ‘unforeseen’ complications arose:

- a) Due to delivery problems, there were two occasions when the ‘skid unit’ ran out of LPG.
- b) Although, for the most part, drivers did fill up with LPG on return to base, there were a number of occasions when this did not happen. For the most part these were the first drivers of the ‘double shifted’ pilot units.
- c) During our monitoring we identified a problem with the performance of ...ABX, which was subsequently identified as being due to an incorrect ‘set-up’ of the LPG equipment. This vehicle therefore was excluded from our analysis, and underlines the need for programmes such as this to involve five vehicles at the very least.

Fortunately, due to the ‘statistical’ nature of the ‘Fleetstat’ analysis process, anomalies such as this are ‘automatically’ identified and excluded from the analysis.

2.1 Process Stages:

2.1.1 Baseline

The first stage in our programme was to establish a performance baseline for both the ‘Base’ and ‘Pilot’ groups. To this end we analysed fuel data over a period covering 1st January to 26th February inclusive. The results of this analysis were initially presented in MPG so that the management could identify with them and agree they were an accurate reflection of the performance of all of the vehicles involved with this project. These figures were presented and ‘signed off’ on 4th March. The charts referring to this ‘baseline’ report are re-presented here in chart nos. 1, 2 and 3.

2.1.2 Baseline conversion

Once the baseline performance figure, expressed in MPG, was accepted, this was converted to £/mile, using the ‘actual’ fuel prices paid. This is represented here in chart no 4. **It is**

interesting to note that whilst the performance trend of both groups in terms of MPG (Km/Ltr) was slightly upwards, the £/mile trend is fairly flat. This is because over the period covered by this analysis the price of diesel increased and counteracted the improvement in vehicle performance.

2.1.3 Monitoring.

The LPG systems were enabled on the 5th March, and over the following weeks we continued to monitor the running performance of the two groups of Renault Premiums. This monitoring continued until we believed we had processed sufficient data, and reached a 'stable' performance figure, which would yield an accurate indication of the relative fuel costs between the two groups. This point was achieved when we processed the data which went to 5th April - one month after gas was introduced. For the reasons stated earlier, the performance figures have not been included for ...ABX, however as there were still four operational units in the 'Pilot' group, our results have not been compromised.

3.0 Findings

Chart no 5 shows graphically the performance of the two groups, expressed in £/mile, achieved during the weeks following the introduction of LPG. 'Linear' trend lines have been added to this chart to make interpretation easier. This seems to indicate that over the monitoring period the performance of the 'Base' group increased (i.e. running costs increased) whilst, over the same period that of the 'Pilot' group reduced.

In order to quantify this differential, chart no 6 shows the same data, but on an enlarged scale. This chart clearly shows that over the analysis period the running cost, in terms of fuel only, of the 'Base' group increased by around 3.2p/mile. Over the same period the running cost of the 'Pilot' group fell by around 4.2p per mile, a differential of 7.4p per mile.

Chart no 6 has used 'linear' trend lines to assist in quantifying the differential cost changes. However the impact of the LPG technology would not have been a linear progression. Therefore to prove that this differential has resulted from the introduction of LPG, chart no 7 shows graphically the performance of the 'Pilot' group, with superimposed upon it a 'power' trend line. This shows clearly the dramatic drop in fuel costs which resulted following the introduction of LPG.

Finally, as any savings from the use of Diesel/LPG technology is very sensitive to the price differential of Diesel and LPG, chart no 8 shows how this would affect the fleet for various 'Diesel Offset' ratios. The small blue circle shows where the 'Pilot' vehicles were operating, the vertical blue line the current LPG/Diesel price ratio.

4.0 Conclusion

On the basis of the results obtained from our analysis of the performance of two groups of Renault Premium tractor units, one group equipped with the 'Diesel/LPG' technology, the other group remaining on diesel, we believe we have demonstrated fuel cost savings of around 12% at current fuel prices. We have taken care to avoid anomalies brought about by irregularities in fuelling patterns and occasions when vehicles ran out of LPG. However, because of the problems identified with ...ABX early in the project, the individual figures for this unit have been excluded from our analysis. This problem has now been fixed and we believe that this unit is now returning comparable figures.