TECHNICAL PAPER

DRIVING TO A MORE SUSTAINABLE FUTURE

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ABSTRACT

The twin goals of safety and fuel efficiency are closely linked. Society gains through increased safety on our roads and through a reduction in all emissions from internal combustion engines in vehicles. The economy also gains from constraining fuel imports and by using less fuel to complete critical transport tasks.

Driver development therefore makes sense. A New Zealand version of the Safe and Fuel Efficient Driving (SAFED) programme first developed at the University of Huddersfield on behalf of the UK Government, Department of Transport, is being rolled out in New Zealand. Our paper outlines what gains can be expected from such a program.

There is a standards mechanism available through the New Zealand Qualifications Authority (NZQA) which can be used to provide formal recognition of skills achieved, one of which could be measured and evaluated using the SAFED program. It should be expected that those who train drivers should hold the higher qualifications themselves including specialist instructor modules.

INTRODUCTION

This paper reviews the expanding literature on various means for achieving safer driving and fuel efficiency outcomes within commercial vehicle fleets comprising trucks, buses and coaches, vans, and cars. Active and on-going measurement of fuel consumption is required for without such measurement is not possible to calculate levels of improvement. Measuring fuel consumption is therefore a key metric.

Here we focus our consideration on drivers of large commercial vehicles and the impact upon fuel consumption of developing their fuel efficient driving skills.

Lowering fuel consumption will reduce operating costs and all emissions, not just carbon dioxide (CO_2). There are therefore good commercial and environmental reasons for looking for ways to reduce fuel consumption.

It is often stated that the driver or the driver's right foot is the biggest influence on fuel consumption and for many this is a simple truth. From our experience the driver is certainly one of the biggest, if not the biggest, influence on fuel consumption. Many organisations and some governments have recognised this and subsequently introduced a number of schemes aimed at improving fuel consumption through increasing the knowledge and skills of drivers.

The effectiveness of these schemes and their sustainability are challenges to company management and this paper will explore ways in which effectiveness can be evaluated and improvements sustained.

There are claims made for other savings, such as reduced maintenance and tyre costs and reductions in insurance premiums through the application of safer driving techniques. Clearly, the easiest to measure due to the generation of daily data is that of fuel consumption, whilst savings in the other areas mostly require data generated over a longer term to enable an effective evaluation to be made.

LITERATURE REVIEW OF DRIVER SKILLS TRAINING

Driver development programmes have proliferated under a number of names ranging from 'defensive driving', 'perceptual driving' and 'eco-driving' to Safe and Fuel Efficient Driving (SAFED) and have been reported upon widely. These programmes have been aimed at all drivers - car and van drivers, bus drivers and commercial vehicle drivers. Whilst the majority of the literature tends to be quite supportive there are a number that raise questions about the robustness of some of the claims.

In the UK the phrase 'driver training' tends to have been replaced with 'driver development'. This is because it was felt that informing a driver who might drive 500 kilometres (311 miles) or more a day that he would be undergoing training, could be seen as demeaning and lead to a negative attitude to the training, before the training had begun. Determining a suitable name is just one of the problems that are faced by drivers, trainers and managers. For example, does company management have the right perception of their drivers' attitudes to training, what is the driver's attitude, how can company management be assured of the quality of any training and how will any improvement be sustained.

Evidence from a study conducted by Boocock and Coyle (2003) into whether or not there was a need for skills development in the area of fuel efficiency for drivers found that there was. The UK based research involved vehicle manufacturers, training companies and vehicle operators. Whilst predominantly aimed at drivers of Large Goods Vehicles (LGVs) the resultant programme was flexible enough for drivers of all vehicle types. The research also conducted reviews of eco-driving, being taught as part of a European initiative to improve the

skills of car drivers and the FleetSmart program offered by Natural Resources Canada, which was aimed at drivers of commercial vehicles in Canada. Where the impact of major driver development programmes has been evaluated there appears to be a consistently positive result.

Boocock and Coyle (2003) also note that at the individual company level it is necessary to undertake a cost benefit analysis to determine whether or not such a fuel saving intervention should be introduced. What is the necessary minimum level of improvement in fuel consumption required to recover the full cost of any training; including the cost of the driver being temporarily removed from income generating activities whilst undergoing any training.

The types of training can have an impact. There can be a debate about whether the training should be one to one, one to two or more, what, if any classroom element should be included and for how long and whether 'before' and 'after' training runs should be included. Research reported by Symmons and Rose (2009) suggests that a 'before' run followed by classroom training and ending with an 'after; run produces the best results. This particular project also addressed some of the issues raised about the use of control groups or rather lack of them by af Wahlberg (2007).

Luxmore (2009) looked at how a heavy vehicle driver is trained in New Zealand by comparison with legislative requirements in overseas licensing regimes. In particular he researched what benefits in operational safety might be achieved through use of simulator training as evidenced from studies elsewhere noting that better fuel efficiencies are usually obtained from such training. He refers to a 2005 report for the New Zealand Energy Efficiency and Conservation Authority (EECA), prepared by Baas and Latto on the topic of Heavy Vehicle Efficiency in which "It is recommended that EECA and Land Transport NZ introduce new initiatives that encourage transport operators to become more energy efficient and to encourage fuel efficient driving." How this should be undertaken was not spelt out. Luxmore considers simulators should be considered along with other means.

Luxmore (2009) surveyed a selection of New Zealand firms and concluded that there is awareness amongst New Zealand heavy vehicle truck owners and operators of the use of simulators for driver training overseas such that if simulators were to be introduced into New Zealand it could be expected that there would be an uptake of this form of training, even if there was an associated price increase. Preference was noted for the simulator to be taken around the regions so that the added expense and time costs of sending drivers to a central facility could be avoided.

SUSTAINING THE GAINS ACHIEVED FROM DRIVER TRAINING

Whatever the improvements gained on a training day, one of the challenges for company management is to sustain and build upon any improvements. As previously mentioned an advantage of focussing on fuel consumption is that the data can be available within 24 hours and with some telematic systems almost immediately. Logic suggests that the other savings relating to tyres, maintenance and insurance will be achievable, but much greater time is needed to generate the data. Therefore, a key metric is that of fuel consumption and where fuel is a major cost it can be used as a business sustainability tool. There is a number of sustainability tools that can be used by company management some of which are listed below:

Driver league tables;
Individual driver prizes and Team prizes
Self financing fuel bonus;
Telematics systems

Driver league tables – Individual driver prizes

A league table based upon fuel consumption records or upon a range of variables that are monitored by an electronic system such as a telematics package can be used to draw up rankings of drivers by vehicle groups at different time periods. Prizes may be awarded to individuals based upon their rankings or performances.

Team Prizes

An alternative is the case of team prizes where teams of drivers compete. It is probably good practice, however, to shuffle team membership after a prize has been awarded to prevent any unintended bias in team membership becoming established. It is of course accepted that putting up league tables of driver performance on a notice board can also have negative implications for staff and companies.

Self-financing fuel bonus

An investigation into the use of bonus systems by Coyle and Brown (2004) recommended simplistic group bonus systems to avoid the complexity associated with allocating an individual bonus. The importance of having fuel consumption data that was both accurate and timely was also pointed out. With accurate data, models can be produced to ensure that the fuel bonus is both workable and self financing. At least one year's data is required to indicate the existence of any seasonality and quite possibly two years data to enable a more complete statistical analysis.

Figure 1 below shows the fuel consumption pattern for a large UK fleet. This pattern has been found in other fleets in the UK with the difference about the mean usually of the order of ± 4%.

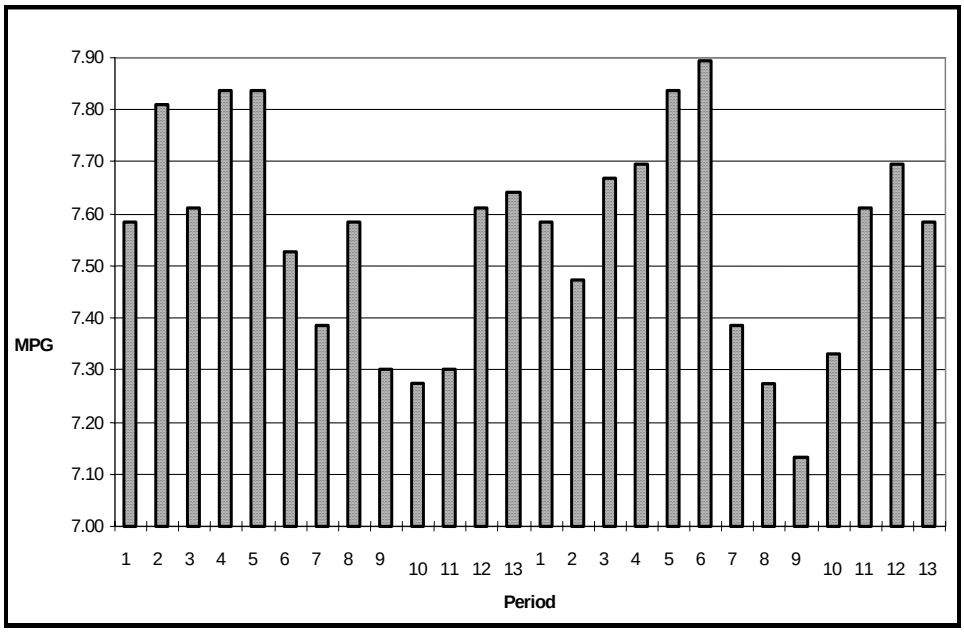

Figure 1 Seasonality in fuel consumption in a large UK fleet Source: Coyle (1999)

In this particular example there are thirteen periods in a year, because the information comes from an accounting system with the first period starting at the beginning of the financial year in April. A seasonal pattern is clearly noticeable.

Telematics

Advanced telematics systems can be used to monitor and report on a number of variables such as harsh acceleration and braking as well as fuel consumption. This data can then be put into a driver grading system with the added advantage that it can be used to identify specific areas where a driver needs help. An example of such a system is shown below in Table 1.

Table 1 **Driver grading system** Source: Btrack (2010)

Rank	Name	Driver ID	Group	Trip Time (h:m:s)	Drv Time (h:m:s)	Distance (km)	Fuel (mpg)	Idling (points)	H Brake (points)	Over Spd (points)	Over Rev (points)	Non Econ (points)	Grading (%)
1	Unknown	0	Unknown	19:55:45	00:00:00	0.00	0.00	0	0	0	0	0	100.0
2	Fellows	27	D Night Driver	10:28:41	08:40:06	711.53	7.81	18	0	0	5	13	99.3
3	Kirby	20	D Distance Drivers	192:10:55	171:06:33	13258.08	9.38	26	0	54	3	31	97.7
4	Spare 39	39	Traffic Office	119:42:04	111:04:38	8444.17	9.37	20	0	26	35	64	97.1
5	Lamb	50	Btrack / Misc	209:32:46	154:04:38	11536.98	9.62	88	0	83	8	57	95.3
6	Box	25	D Night Driver	09:17:57	08:31:55	717.09	7.97	12	0	239	7	13	94.6
7	Wheeler	23	D Distance Drivers	159:47:54	135:54:06	10418.89	9.38	66	0	19	174	57	93.7
8	Spare 36	36	Traffic Office	01:02:36	00:44:33	12.79	4.58	256	0	0	831	225	73.7
Fleet Average				**90:14:49**	**73:45:48**	**5637.44**	**9.38**	**61**	**0**	**53**	**133**	**58**	**93.9**

Similarly as shown in Table 2 an overview of fleet and individual vehicle performance can be produced to identify where performance can be enhanced over and above any fuel consumption figure achieved.

Table 2 **Vehicle grading system** Source: Btrack (2010)

Rank	Reg No	Fleet ID	Group	Trip Time (h:m:s)	Drv Time (h:m:s)	Distance (km)	Fuel (mpg)	Idling (points)	H Brake (points)	Over Spd (points)	Over Rev (points)	Non Econ (points)	Grading (%)
1	Y3 ABC	BB0037	44T	197:12:30	171:06:41	13258.08	9.38	103	0	54	9	31	96.0
2	J7 ABC	BB0090	44T	134:45:13	119:44:44	9155.70	9.23	78	0	24	98	60	94.8
3	X6 ABC	BB0055	44T	217:20:49	154:04:39	11536.98	9.62	352	0	83	23	57	89.7
4	X7 ABC	BB0056	44T	174:28:44	145:10:35	11148.77	9.26	254	0	33	492	56	83.3
	Fleet Average			**180:56:49**	**147:31:39**	**11274.88**	**9.38**	**197**	**0**	**48**	**155**	**51**	**91.0**

Telematic systems can appear to be quite expensive and many suppliers of such systems make various claims on payback. However, a key element is that of company management acting upon the information provided by such systems. It might be the case that an operator implements a self financing fuel bonus system first and then uses the savings to purchase a telematics system.

This approach encourages the emergence of a fuel efficiency culture that is a financial plus for businesses as well as to the individual employee drivers. Fuel efficient driving is inherently safer driving, eliminating speeding but still completing tasks within similar timeframes. Businesses can invest in fuel efficient technology with confidence knowing that their drivers will convert that outlay into commercial advantage. However, Coyle and Kissling (2008) in their surveys found that few New Zealand firms have experimented or adopted self financing fuel bonus schemes perhaps overlooking the loyalty inducement that can be engendered in the process. Retention of good drivers has been an on-going issue in New Zealand.

CONCLUSION

The evidence, of fuel savings comes from the generation of accurate and timely fuel consumption data. Research suggests that a correctly structured and delivered programme aimed at improving a driver's skills will improve fuel efficiency. The key challenges for company management are to ensure that the content of the programme is correct and delivered in a format that supports the programme's aims by suitable trainers. Formal recognition of the SAFED scheme through the NZQA qualifications system would help gain driver support. Additionally, robust mechanisms to ensure sustainability through retention of efficiency gains need to be in place irrespective of whether they are a fuel bonus, telematics system or a combination of both.

Investing in driver development needs to be approached like any other investment decision. This requires that if a need is determined then a cost benefit analysis of the options is undertaken, possibly leading to a trial or pilot and in this particular case – with issues of sustainability addressed.

Recognition of professional development in the commercial driving workforce is an important step towards raising the social image of this occupation and thereby improving prospects for recruitment and retention.

SOURCES

af Wahlberg, A. E. (2007) Fuel efficient driving training – state of the art and quantification of effects.
Available from:
http://www.ecodrive.org/fileadmin/dam/ecodrive/Downloads/ecodrive_2010.pdf
[Accessed 11th January 2010]

Baas P. (2008) Fleet Commitment Initial Work Programme Trial, Ministry of Transport, October.

Boocock J. R, & Coyle M. (2003) Report on the Development of the Safe and Fuel Efficient Driving Standard (SAFED), Department of Transport and Logistics, University of Huddersfield, July.

Btrack (2010) Material sourced from Btrack Limited. *This is original data that has had anything that could identify the vehicles, drivers or fleet changed*.

Coyle M. (1999) Basic Steps to Improving Fuel Efficiency, Presented at the One Day Conference on Improving Vehicle Fuel Efficiency to Reduce Costs and Environmental Impact, University of Huddersfield 15th April.

Coyle M. & Brown S. (2004) A Scoping Study into the Potential for the Application of a Fuel Bonus System for Drivers in the Road Freight Transport Industry, Department for Transport, March.

Coyle M. & Kissling C. (2008) Report on a Survey of Key Influencers, Fleet Operators and Drivers of Heavy and Light Commercial Vehicles in New Zealand to Ascertain the Practices, Attitudes, Perceptions and Barriers to Change in Relation to Introducing Fuel Efficiency Interventions, Ministry of Transport, October.

Luxmore C (2009) The Truck Simulator – A training option for the New Zealand Heavy Vehicle Industry? Masters Dissertation, Lincoln University, New Zealand.

Symmons M. A. and Rose G. (2009**)** Ecodrive Training Delivers Substantial Fuel Savings for Heavy Vehicle Drivers, presented at the 5th International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design, Big Sky Resort, Yellowstone Conference Center, Big Sky, Montana, USA, June 22-25, 2009.