Strategies to maintain ecodriving benefits in the long term

1. Introduction

Training ecodriving skills to truck drivers has a weakness, namely its effectiveness in changing driver behaviour over the long term. Drivers yield significant fuel savings after a training, but the improvement often lessens over time as drivers fall back into old habits. Studies show that the long-term fuel consumption improvement is only 2-5%, versus an in-training effect of up to 25%.

However, fleet managers and policymakers have a variety of tools to support a more permanent adoption of ecodriving skills. One option is regular re-training or refreshment courses for drivers. These could be made mandatory for professional drivers, as is the case in Germany.

The other options are on-board eco-driving technologies and incentives by companies for their drivers. This paper describes the variety of technologies and incentives that fleet managers can deploy to help drivers get better.

2. Ecodriving technology: In-truck devices and feedback information systems

This section presents an overview of technologies that can be installed in a truck to support the driver in driving efficiently and to help the fleet manager in monitoring fuel use and driving behaviour. Companies can use the monitoring data for incentives to promote better driving performance, optimised fuel efficiency, reduced maintance costs and emissions.

2.1 Eco-driving feedback information systems

Telematics devices can be installed in a truck to gather, record and display all kinds of vehide data. The data can then be used by the fleet operator to monitor the location, fuel-use, movements, status and behaviour of a vehicle and/or driver. Telematics systems collect data through different technologies, especially the vehide's CANBus and GPS.

Usually, telematic devices can monitor behavioural parameters central to eco-driving, such as speeding and acceleration, anticipatory driving, unsteady driving, etc. The fleet manager can access the data via a software in order to monitor performance over time and between drivers, thus providing the basis for additional incentives (see section below).

Telematics devices can also generate feedback directly to the driver on his ecodriving performance, either real-time or after-trip. While the former can motivate constant reflection and help the driver to adapt its driving behaviour during the trip, it may also be a distraction and a safety risk. After a trip drivers can compare their performance with previous trips and understand how they develop over time.

Real-time feedback is usually displayed through a visual interface and is designed to be intuitive and engaging for the driver to further motivate him/her. Via the vehide's dashboard, smartphones or specific devices developed for such purposes, real-time feedback can be communicated in different ways. These may indude a light in the dashboard that turns green when driving performance is optimal. More sophisticated solutions evaluate driving behaviour along various parameters (speeding, acceleration, unsteady driving, etc) through a traffic light system for each parameter, and other products indicate efficient driving by a number of leaves; more leaves mean a better performance.

Feedback information systems can benefit ecodriving in numerous ways (Dahlinger and Wortmann 2016):

- There is evidence that feedback is more effective than education and training of ecodriving (Barkenbus 2010). They are especially useful when actual and targeted performance are unknown, thus helping dose this information gap.
- Feedback systems can be used to increase motivation by goal setting and positively influence attitudes towards ecodriving behaviour.

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They can act as the basis for further incentives and rewards. Examples of rewards are point-systems, scores, badges, and the like. In order to have a positive effect, however, reward systems must be meaningful for the driver. This can be achieved, for instance, by combining reward systems with competition with other fellow drivers

2.2 Tyre-pressure monitoring devices

Tyre-pressure monitoring systems are fitted on a vehicle which can evaluate the pressure of the tyres or the variation of pressure over time and inform the driver while the vehicle is running. Information on tyre pressure is provided via a warning light indicating low-pressure, a pictogram display or a gauge. This solution will allow the driver to maintain an optimal tyre-pressure and thus reduce fuel consumption.

2.3 Cruise Control

The Cruise Control system allows the driver to set and maintain a desired speed by controlling the throttle-accelerator pedal linkage. This solution is best suited for long road trips and supports the driver through both reduced driver fatigue (the driver can disengage from pressing the pedal) and better fuel efficiency.

Adaptive Cruise Control is a sensor-based system that adjusts the vehide speed to the traffic environment. In addition to maintaining a set speed, the adaptive version will reduce or increase speed (until the set speed is reached) when required by the changing traffic conditions. The most basic version both maintains the vehide's pre-set speed and automatically adjusts speed in order to maintain a proper distance between vehides in the same lane. More modern versions indude functions such as Dynamic Set Speed, which uses GPS to adapt the speed of the vehide to speed limit signs, or Dynamic Radar Cruise Control, which uses a camera and wave radar to maintain a set point distance from vehides in front.

When cruise control technology is not installed and needs to be retrofit, it represents an additional cost to the fleet manager. A cheap low-tech alternative is to put a sticker on the speedometer that orients the driver to remain within a fuel-efficient speed range.

2.4 Start / stop system

Automatic engine start/stop systems allow the driver to reduce fuel consumption by reducing idling, as the engine turns off when the vehide is not moving. However, the system does not fully remove the need for idling.

3. Incentives and rewards

Incentives and rewards are useful motivation instruments that fleet managers can use as a supplement to training. There is variety of reward and incentive options. Not only economic incentives can play an important role, but also recognition and appreciation of drivers by the fleet operator or co-workers. Fleet managers need to determine what works best in the context of their specific company.

3.1 Positive working environment for drivers

Creating a positive working environment for drivers is essential for promoting desired behaviour that aligns with the company's priorities, induding safe and fuel-efficient driving.

A problematic working environment will negatively affect the ability of drivers to apply the learned ecodriving techniques. Problem factors could be stress due to tight schedules, heavy workloads, poor communication within the organisation, and inadequate resources by the latter to effectively address these problems. Demotivation can also come from a lacking sense of appreciation that drivers are human beings and the companies' most valuable assets. Fleet managers are well advised to address such problems in order to get optimal driver performance.

Career development opportunities for drivers within a company are good practice and additional incentive towards better driving. Drivers with better performance could become lead drivers, instructors, specialise in dangerous goods etc. This, in turn, requires active promotion and recognition of ecodriving skills among their drivers by the employer.

Successful performance management requires a shared understanding of the goals of the company, the ability of drivers to value their contribution to the overall success of the organisation and the existence of reward mechanisms, both social and economic, provided by the company to those drivers that successfully perform their expected roles. Central performance management mechanisms that can be specially implemented to promote ecodriving behaviour are outlined below.

3.2 Reward schemes by fleet operators

When monitoring drivers' behaviour, the fleet operators can incentivise eco-driving by setting specific performance goals that are coupled to rewards like salary bonuses, additional vacation days or recognition within the company. Fleet managers need to be cautious, however, that external incentives don't lead to a crowding out of drivers' intrinsic motivation to do a good job. Words of recognition or a praise in front of others can at times be more powerful than monetary incentives.

The most common reward instruments that companies can make use of include the following (Transport for London 2017):

- Game-based systems for recognition: league tables, traffic light system, medals
- Financial rewards: increase in salary or cash bonuses on a monthly, quarterly or annual basis for the best performing drivers
- Prizes and gifts
- Career rewards: promotions or vocational qualifications, such as training opportunities
  Usually, this approach will only be available to fleet operators with the necessary administrative capacities (for monitoring and data collection and processing), as the fleet operator will be responsible for setting goals, establishing the type of reward and monitoring performance. However, relatively simple schemes can also be adopted, such as offering financial incentives to drivers whose fuel consumption is below average or who have not caused accidents in a certain period of time.

Key Performance Indicators and Driver Performance League Tables can serve as the basis for developing such reward schemes.

3.3 Key Performance Indicators (KPI)

Key Performance Indicators are measurements of progress toward an intended goal set by an organisation. KPIs provide a framework for strategic and operational improvement and create an analytical basis for decision making. Fleet operators can make use of KPIs to monitor their drivers' ecodriving behaviour over time and use this data to decide on measures to improve performance when needed and reward improvements.

There are a number of Key Performance Indicators which are often recorded and monitored by fleet operators:

1) green band driving;
2) engine idling;
3) harsh breaking;
4) harsh acceleration;
5) over speeding;
6) vehicle fuel consumption.

Key Performance Indicators allow the operators to influence driver behaviour by providing additional training when needed (for example, when a driver shows a low performance) or offering additional incentives for drivers who improve their performance over time.

3.4 Driver League Tables

Setting up a driver league table allows a fleet manager to compare the driving performance of single drivers or group of employees along several indicators (e.g. speeding, harsh breaking events, idling, fuel efficiency etc.). The telematics data can then be used to determine how drivers have performed in their efforts to reach the goal set for them.

Driver league table or Leaderboards allow the truck drivers to compare their performance with that of other drivers. Competition will act as an intrinsic motivating factor on its own, but rewards provided for the best drivers will serve as an additional incentive. Negative side-effects must also be considered, as too much competition may cause stress among some drivers. They should, therefore, have the opportunity to exit competitive schemes and make use only of real-time and after-trip feedback provided by the device, if possible.

3.5 Competition / benchmarking

Fleet operators can make use of benchmarking of drivers' performance with the objective to foment competition among its employees. Benchmarking can be coupled with benefits for best performances in the form of incentives and rewards.

Competition and benchmarking also works beyond a companies boundary. Truck driver associations and vehicle manufacturers can also promote competition within the sector and offer prizes in addition to recognition of their peers. For instance, truck manufacturer Scania conducted such a campaign in Europe for all truck drivers of Euro 5 and Euro 6 trucks, regardless of the vehicle brand. Scania provided for an app and website, in which the drivers could register their performance together with environmental conditions and vehicle data and allowed them to evaluate their performance. Other drivers could 'like' the registered journeys and the website offered additional information on ecodriving, such as driving tips and a quiz.

3.6 Insurance benefits

Insurance providers may offer reductions in their premiums to such drivers/fleet operators who have completed eco-driving training (as evidence of using eco-driving techniques). This approach may be limited and available only in such countries and contexts with widely available/institutionalised eco-driving trainings and may require involvement of government to promote such an approach.

4. Other measures

Periodic courses / trainings

After receiving a general eco-driving course, fleet operators can offer refreshment trainings for their drivers in order to guarantee the internalisation of ecodriving. These trainings may be short sessions and can be offered at different time intervals (for example weekly or monthly).

Communication campaigns

Communication campaigns on eco-driving can be promoted and implemented internally, that is, by the fleet operator, or by external actors, such as eco-driving organisations, the responsible public authority, or vehicle manufacturers through, for example, ecodriving challenges such as Renault's Optifuel Challenge or Scania Fuel Masters.

Communication campaigns aim at raising awareness on a regular basis through various information channels, such as radio stations, billboards, television, internet, newspapers, etc.

Therefore, such measures may be useful for keeping drivers well informed on the benefits and techniques of ecodriving.

Mandatory daily checks by the driver

Eco-driving not only depends on the driver's optimal behaviour. Of central importance is also ensuring the roadworthiness of the vehicle before starting and during any trip. This is not only important for legal reasons (that is, compliance with vehicle regulations), but also for fuel efficiency through optimal conditions.

For such a purpose, mandatory checks can be introduced, according to which the driver must complete a vehicle check at the start of a shift/trip and fill a special report to be submitted to the fleet operator. Daily checks will therefore guarantee not only compliance with legal requirements and guaranteeing roadworthiness of the vehicle, but will also contribute to fuel efficiency, avoiding unnecessary accidents and reducing maintenance costs.

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