

# THE OPPORTUNITIES OF ENTREPRENEURSHIP EFFICIENCY INCREASE IN ROAD CARGO TRANSPORT RANGE

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*Summary: The author deals with fleet management and it's sub-system called "eco-driving". Eco-driving is one of key sphere, in which enterprises still have possibilities to cut costs and to improve their entrepreneurship efficiency generally. The article is formed of presentation of development stages, main presumptions of realization and areas of fleet management's application. Next, the article focuses on the usage of fleet management in road cargo transport range and the problem of eco-driving.*

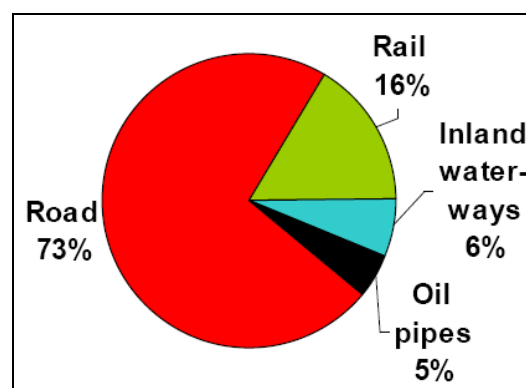
*Key words: eco-driving, efficiency increase, entrepreneurship, fleet management, road cargo transport.*

## INTRODUCTION

The road freight market in the European Union (EU) is now recovering from the deep economical crisis of 2008/2009 which greatly reduced transport activity. In 2010, road freight transport activity in the EU, measured in tonne-km, was roughly 3% higher than in 2009. However, this followed a fall of 2% in 2008 and another 10% drop in 2009 which leaves road freight transport activity in the EU still about 9% below pre-crisis levels of the year 2007.

This development has not been uniform throughout the EU. While EU15 haulers were on average still 13% below 2007 levels in 2010, their colleagues from the EU12 were on average already 8% above pre-crisis levels. (1).

The current position of road cargo transport in **EU freight modal-split** (based on tonne-km) is shown in **Fig. 1**.



Source: (1)

Fig. 1 – The current EU freight modal-split

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Every enterprise from the **range of transport and/or logistics** solves a serious problem with its entrepreneurship efficiency – especially now, when the economical crisis is obviously still not completely behind us. The author finds **four main ways of efficiency improvement**:

1. the *use of progressive logistic technologies/systems* => e.g. combined transport (accompanied, unaccompanied), Just-in-Time, Just-in-Sequence, kanban, Hub & Spoke, Crossdocking, City-logistics (the Gateway technology);
2. the *ordering and buying of modern, ecological vehicles with lower fuel consumption*, compared to the older ones;
3. the *use of road cargo vehicle-combinations with non-standard length and/or non-standard weight* => among these vehicle-combinations belong (above all): “tractor + Eurotrailer semitrailer” combinations with total length of 17.8 meters and EMS (*European Modular System*; also called Eco-Combi, EuroCombi, Gigaliner, etc.) combinations with total length of 25.25 meters – e.g. in “tractor + semitrailer + tandem-trailer” configuration;
4. the *application of fleet management* (FLM), in which an *eco-driving* has a significant position.

The author focuses on the **way no. 4**, in this article.

## 1. FLEET MANAGEMENT

### 1.1 Fleet management generally

Fleet management is a general concept for ITS applications in vehicle-fleet management range. Four development stages of FLM are defined:

1. (fleet) tracking,
2. (fleet) monitoring,
3. fleet management,
4. fleet controlling.

Fleet controlling is currently the last development stage of FLM. A swift historical FLM’s development is as followed. In 1980’ the systems of stolen vehicles’ searching started in the USA. Later, very important milestone was the year 1995, when American *Department of Defense* allowed general cost-free use of Global Positioning System (GPS). Unfortunately, the system worked with a willful inaccuracy of position detection by that time. This problem has been solved after the year 2000. Since then, the boom of satellite navigation and the raise of FLM’s importance have become.

Main presumptions of FLM realization are (2):

- GPS navigation technology;
- GSM mobile communication;
- GPRS data transfer technology;
- CAN-BUS systems and sensors mounted in vehicles.

There are two FLM's types: "*internal*" and "*external*". The first one is completely managed and controlled by a certain enterprise. The second one means, that FLM is completely outsourced on a specialized company and the fleet is controlled and managed by this company. (3)

Main areas of FLM use are the fleets of (4):

- **trucks**;
- busses, coaches;
- taxi-cars;
- police cars, ambulances, fire-trucks;
- military vehicles;
- cars owned by authorities and bureaux;
- specialized vehicles and construction machines (crane-trucks, excavators);
- forklift trucks, etc.

## 1.2 Fleet management usage in the range of road cargo transport

Almost every **truck-producer** in Europe offers some FLM system. Among others e.g.: Volvo offers system called "*DynaFleet*", DAF offers "*DAF Telematics*", Mercedes (Daimler-Benz) offers "*FleetBoard*". (7) (8) (9)

Among **specialized enterprises** which offer FLM systems belong: *Berg Insight*, *Frost and Sullivan* and *YMS Czech Republic*. (5) (6)

The most of functions of these systems are quite similar. They allow fleet manager, dispatcher, and administration to have information about:

- **driver**:
  - working mode (driving times, rest times, loading/unloading, waiting),
  - driving style (actual/maximal speed, gear-changing accuracy, safety and support systems' activation – mainly ABS, ESP, and driver's vigilance control system);
- **vehicle**:
  - actual engine revs and temperature,
  - engaged gear,
  - fuel tank status,
  - fuel consumption (instantaneous/average),
  - vehicle weight (per axle and total) => the ECAS (*Electronically Controlled Air Suspension*) system needed,
  - tyre pressures => the TPM (*Tyre Pressure Monitoring*) system needed;
- **cargo**:
  - observation of beginnings, processes and endings of cargo loading/unloading procedures,
  - in the case the vehicle is equipped with ECAS => a fleet manager or a dispatcher has information on real weight of loaded cargo and so has a basis for transport invoicing,

- in the case of perishable cargo transport (realized in the terms of international agreement ATP), there is a possibility of loading-space temperature observation.

The **satellite navigation** forms an important element in FLM, as mentioned hereinbefore. For the segment of road cargo transport (omitting the up-to-date maps) the “*truck-attributes*” are essential. Among these attributes belong mainly:

- bridge bearings,
- underpass and tunnel heights,
- allowed vehicle widths,
- allowed vehicle (vehicle-combination) lengths,
- parking and rest areas suitable for trucks (so called “*truck-parks*”),
- roads and areas where truck traffic is prohibited.

**In the range of valuable-cargo transport** (i.e. tobacco, cigarettes, alcohol, computers, pharmaceuticals, etc.), the information about locations of so-called “*safe truck-parks*” is needed either. The equipment of these truck-parks has to comply with norms *TAPA EMEA* and *ISO 28 000*, which regulate conditions of transport, loading operations and warehousing of valuable cargo. Thanks to this, the truck-parks are suitable for parking vehicles which transport valuable cargo in the terms of aforementioned norms.

## 2. ECO-DRIVING

**Eco-driving** is a general concept for principles of **economical** (fuel saving), **ecological**, and **safe driving**. Sometimes the term “*Green Driving*” is used for these driving principles. This term underlines mainly positive effect in the range of environment protection.

### 2.1 Driver’s acknowledgement and competency

Generally, there are two ways of drivers’ education in the range of fuel saving style of driving. The first one is to use the possibility of **regular obligatory courses** defined in the Czech legislation – law 374/2007. This law (among others) defines conditions of driver’s professional competence and obligatory periodical courses that drivers have to attend every year. The other one possibility is to order a **tailor-made training course** for drivers of a certain transport enterprise.

#### 2.1.1 Obligatory courses

The length of regular obligatory courses is seven hours in a row per year. Among defined themes, those drivers may attend, belong e.g. (10):

- Driver’s working times;
- Digital tachographs;
- Safe and defensive driving;
- *Fuel saving and ecological driving*;
- Loading and fixation of cargo;
- National legislation in transport range;

- International legislation in transport range.

All courses are theoretical only. It is, of course, a pity at a problem like eco-driving, or loading and fixation of cargo. Naturally, the price of these courses is significantly lower, compared to tailor-made courses. The decision, of which course to attend, depends on driver's time possibilities (towards his work) and/or company's decision.

### 2.1.2 Specialized training courses for a certain transport enterprise

Enterprises that take the problem of cost efficiency particularly seriously, invest in these courses, because the know-how the drivers receive is very significant. The most important benefit of this type of drivers' education is *the practical part of training* => i.e. driving in real road traffic (using a vehicle that driver usually drives, or a vehicle owned by a training company) with an instructor, who advises the driver and take notes about driver's driving-style. After this journey, evaluation and discussion take place. On average, the fuel savings may vary from 2-10 % (i.e. 1-3 litres/100 km) after attending this training. Examples of quantified savings for an enterprise are presented in **Table 1**.

Tab. 1 – Potential savings after eco-driving training

number of educated drivers in an enterprise	the decrease of average fuel consumption	distance driven per year	financial savings per year
1	1 litre/100 km	120 000 km	40 000 CZK
1	3 litres/100 km	150 000 km	125 000 CZK
150	3 litres/100 km	150 000 km	18 750 000 CZK

Source: Author, (11)

## 2.2 Key eco-driving principles

Among main principles of **truck's fuel-saving driving** belongs:

1. read vehicle's manual and learn information about engine power and torque;
2. after engine start begin driving as soon as possible, heat the engine by driving;
3. don't use full gas-pedal press in *lower range* (or, generally, until the engine isn't at its operating temperature);
4. change the gear(s) up no later than at ca. 1 600 rpm – the power of engine is usually already at its top and then only fuel consumption increases;
5. skip gears (even two or more) while accelerating;
6. in *high range*, use full gas-pedal press in the area of maximum torque revs – usually 1 000-1 500 rpm (vehicles with extra powerful engine (let us say 500 HP and more) has maximum torque already at 900 rpm and even lower);
7. change gear(s) up at the upper limit of torque;
8. use full gas-pedal press soon enough in front of gradients;
9. while driving up-hill, change the gear down when engine revs are approaching 1 100 rpm;
10. release the gas-pedal fluently before the vehicle is coming over gradient's top (horizon) and change up on the highest gear – without any gas-pedal press;

11. while driving down-hill, change gears down, so the retarder and/or the engine brake has adequate effect;
12. use the highest possible gear when driving at a constant speed – even at quite low revs (i.e. under the lower limit of torque – generally under 900-1 000 rpm), but use the gas-pedal sensitively a listen to the engine (sound, potential vibrations);
13. while braking, prefer auxiliary brake systems (engine/exhaust brake, retarder);
14. check tyre inflation frequently (twice a month);
15. adjust all spoilers and deflectors correctly;
16. tighten the tarp sufficiently;
17. use vehicle's inertia – engage neutral on a flat sections of roads;
18. don't drive at speed-limiter – follow speed regulations;
19. switch the engine off when staying for more than a minute;
20. use air conditioning and independent heating systems as seldom as possible.

Concerning a 40-tonne truck, the *theoretical training itself* may bring, on average, **1.5 litre/100 km** lower fuel-consumption. And *combination of theoretical and practical training* brings ca. 10-15 % => ca. **4 litres/100 km**. (11)

Reached fuel savings haven't any negative impact on average speed. Vice versa: **drivers usually reach even higher average speed**, thanks to fluent style of driving. So any disadvantages in the range of delivering times (or driving times) take place.

### 2.3 Support systems for eco-driving

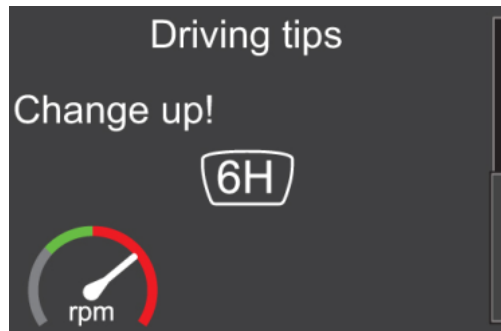
Swedish truck-producer Scania offers a system which operates as a support system for a driver himself and helps him to behave correctly in the terms of economical and ecological driving. This system is called "*Scania Driver Support*".

Main benefit for a driver is that this system serves only to him/her (not to a fleet manager, dispatcher, director, or any superior employee). All information about driver's behavior behind the steering-wheel may be reset anytime during driving, or is deleted after driver shuts the engine down. So any potential persecution from superiors takes place.

The driver is advised and evaluated "by a vehicle" in following four disciplines (12):

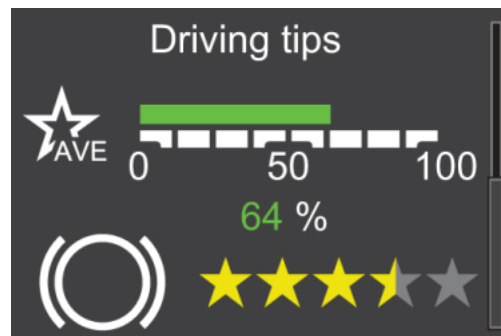
1. gear changing;
2. use of auxiliary brake systems;
3. anticipation;
4. driving in a hilly terrain, especially over hill horizons.

All disciplines separately (see **Fig. 2** to **Fig. 5**) or all together (see **Fig. 6**) are displayed by pictograms on vehicle's dash-board and evaluated in percents and "stars" (from none to five). So the driver can see the progress.



Source: (12)

Fig. 2 – The gear changing accuracy



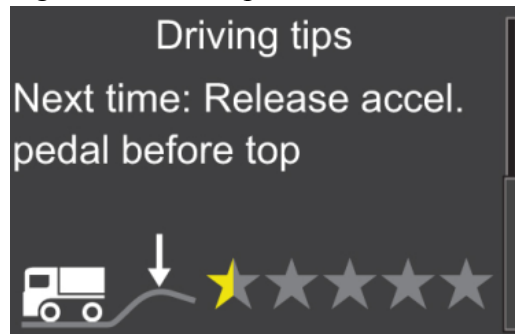
Source: (12)

Fig. 3 – The use of auxiliary brake systems



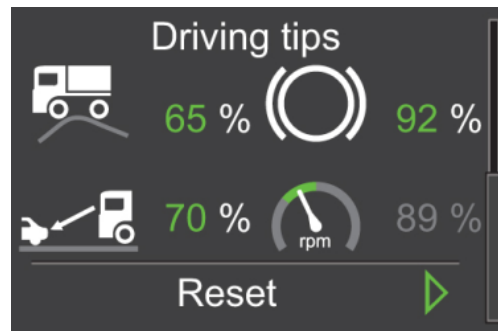
Source: (12)

Fig. 4 – The anticipation of traffic ahead



Source: (12)

Fig. 5 – The driving over hill horizon



Source: (12)

Fig. 6 – The driver’s total “score”

Using *Scania Driver Support* extends the positive effects of driver training courses. Tests have shown that *Scania Driver Training* can reduce fuel consumption by up to 10 % immediately. Combined with *Scania Driver Support*, variation in fuel consumption is also dramatically reduced from 15-20 % to around 5 %, indicating a much more consistent driving style. (12)

In the range of **driving safety**, e.g. Volvo offers also a function of alert in the case the driver’s vigilance control system (based on camera surveillance of driver’s face and eyes) detects driver’s oncoming tiredness – see **Fig. 7**.



Source: (13)

Fig. 7 – Driver’s tiredness alert (Volvo)

## CONCLUSION

Enterprises in the road cargo transport range are still facing problems with their entrepreneurship efficiency caused (among others) by global crisis impacts and consequences. Because fuel and tyre costs form a serious part of total operational costs (let us say 20-30 %), especially enterprises which own 20 and more vehicles, have to use specialized systems of FLM. These systems help to manage company’s fleet and to control driver’s work and his driving behavior (driving style, eco-driving practices etc.) and to cut operation costs.

Generally said – the main goal of FLM systems is to **secure effective, economical, ecological and safe operation of a vehicle fleet** of given enterprise. Important social and global positive contribution of FLM’s application is in the range of *environmental protection* and *traffic safety*. The up-to-date practice shows, that **the investments into adequate**



**theoretical and practical education of drivers** are quickly paid-back in the form of savings in fuel and service range mainly.

The author, as an owner of *Driver's Certificate of Professional Competence* on "C+E" driver's license group, attended the theoretical fuel-saving education in February 2012. According to this experience, he is able to say that these courses are very useful, even without practical part! But everything strongly depends on driver's interest, motivation and discipline => only then enterprises are able to cut their costs and raise their profitability.

## ACKNOWLEDGEMENT

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