

## **ECO-DRIVE – THE SAFE, FLUENT AND ENVIRONMENT FRIENDLY DRIVING STYLE**

**Cornel ARAMĂ\*, Ioan BĂLOS\*, Ovidiu MOȘOIU\***

\*“Henri Coandă” Air Force Academy, Brasov, Romania

**Abstract:** *What can the driver against the requirements of increasingly heavy road traffic management? What Can I do to drive as safe as quickly, with minimal costs, as smooth and respecting environment? The answer can be only one: adjusting the driving style to meet these demands. That is the eco-driving style.*

**Keywords:** *eco-driving, environment, safety, smooth, fuel consumption.*

### **1. INTRODUCTION**

Sitting relaxed behind the steering wheel. More comfort for you and your passengers. A better overview over the traffic situation and more traffic safety. Cost saving through less fuel consumption. Contributing to environmental protection. That's what the economical, fuel saving driving stile can offer. Also you can profit from eco-driving.

Eco-Driving, the training of an economically and ecologically sound driving style, is a cheap method to save fuel and money whilst contributing to road safety. The average reduction of fuel consumption amounts to 10%. Pay back periods of the training lessons are reasonably short. Nevertheless, the development of the market for eco-driving is slow, at least on a European scale.

The project aims to accelerate the establishment of a European market for training lessons in an economic driving style as well as to integrate eco-driving in the driving license curricula in European countries.

In 2001, the initiative „eco-driving Europe” started aiming to accelerate the establishment of eco-driving in Europe. Until then, there had been rather isolated national initiatives in the Netherlands, in Germany, Finland and Switzerland. In the meantime eco-

driving has become a priority in most EU-countries as well as in the European commission when energy efficiency, climate protection as well as road safety programs are concerned. Eco-driving Europe has contributed to this favorable development by:

- building a European network

Resources have been shared to develop new solutions as well as to evaluate results. Experience and know-how have been exchanged in workshops, demonstrations, through newsletters or in personal contact. New solutions and knowledge are the result of working together. EU-countries have benefited from each others' experience and results and could thus accelerate eco-driving activities and programs.

- building a knowledge basis

Facts and figures concerning eco-driving have been collected throughout Europe and beyond and made accessible to stake-holders and starting countries. Moreover, know-how and expertise on how to implement, market and evaluate a program have been developed and disseminated.

- making eco-driving a policy issue

The convincing evidence of it's benefits has put eco-driving on both national and European policies' agendas and has resulted among others in an increased number of directives and calls from the European commission that include eco-driving issues.

## 2. BENEFITS OF “ECO-DRIVING”

Eco-driving improves road safety as well as the quality of the local and global environment and saves fuel and costs. All three benefits are important for furthering eco-driving. Different benefits facilitate bringing eco-driving to different stakeholders and policy fields and their activities. The differences between the normal drivers and the drivers who followed special courses can be seen into the figure 1 [3].

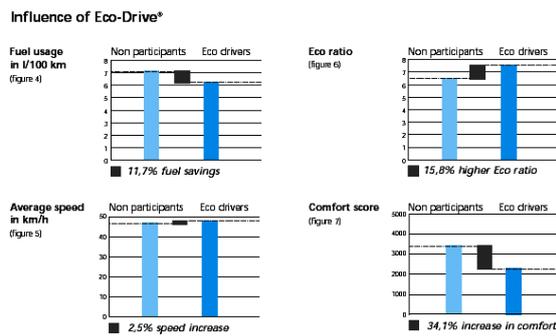


Fig. 1 The influence of Eco-Driving style

### Fuel consumption and climate protection

Eco-driving trainings lead to a consumption reduction up to 20 % after trainings and about 5% in the long run. The European Climate Change Program calculated a reduction potential of eco-driving of at least 50 million tons of CO<sub>2</sub> -emissions in Europe by 2010, saving about 20 billion euros [1, 2].

### Local environment and health



Fig. 2 Reducing the noise in urban traffic

Eco-driving reduces noise pollution as well as local air pollution. The engine noise of one car driving with 4000 rpm (revolutions per

minute) equals the engine noise of 32 cars at 2000 rpm (Fig. 2). Thus, eco-driving reduces one of the main problems of traffic in urban areas [1,2].

### Costs and safety

Eco-driving reduces not only fuel costs, but also costs for maintenance and costs for repairing cars after accidents. The safer driving behavior results from:

- an anticipating driving style;
- maintaining a steady speed;
- less speeding;
- less overtaking;
- less stress/aggressiveness.

### Some examples:

- CANON company in Switzerland trained the eco-driving style with 350 service car drivers in VSZ VELTHEIM. The drivers reduced fuel consumption by 6,1%, had 22% more km per accident and 35% less accidents in total;

- Eleven month after eco-driving trainings, the German company HAMBURGER WASSERWERKE effected fuel consumption reductions of more than 6 %, accidents and related costs could be diminished by more than 25 %;

- In the year 2000, eco-driving trainings in the Austrian bus company NIGGBus reduced fuel consumption by 5% in day-to-day driving. The effect increased up to 7% in the year 2001;

- Eco-driving programs prove to be very cost-effective. The Dutch eco-driving program results in a cost-effectiveness of about 5 euro per avoided ton of CO<sub>2</sub>-emissions over a period of 10 years.

## 3. THE IMPLEMENTATION OF “ECO-DRIVING” STYLE IN EU-COUNTRIES

Safe and economic driving behaviors (often referred to as eco-driving) have the potential to considerably reduce the energy use and CO<sub>2</sub> emissions of transport. This has been stated in many national strategies and programmers concerning transport in Finland. However, in order for eco-driving to become a common behaviors model there is a need for systematic and long-term training and communication to many stakeholders. This

concerns especially those who already possess a driving license, since the training of safe and economic driving has already been obligatory for new drivers (in the 2nd training phase) in Finland for 6 years.

The awareness of stakeholders is raised concerning the economical, safety and environmental benefits of safe and economic driving. Pilot projects based on new models of getting drivers trained are launched among certain target groups.

The primary target groups are the following:

- consumers (car buyers, car owners);
- transportation companies, companies; purchasing transportation services;
- municipalities;
- decision-makers of company car acquisition.

The secondary target groups are:

- retailers of passenger cars;
- media;
- political decision-makers.

The key messages of marketing are based on the following viewpoints (the priority order and the communication for each target group is defined separately):

- safe and economic driving enhances traffic safety;
- safe and economic driving can bring about fuel cost savings of 5–10 % without lowering the average speed;
- safe and economic driving is the fastest and the most cost-effective measure to reduce the environmental effects of transport;
- safe and economic driving can reduce the vehicle repair costs considerably.

The project was implemented between 01.01.2005–31.12.2006. The costs of the project was 95000€. Responsible for the implementation of the project were:

- ECODRIVING CENTER Ltd (training network including 35 training units and 70 trainers in Finland);
- KH FIN LTD (KEY training network including 14 training units and 90 trainers in Finland).

The project involved also the following co-operating parties:

- The Ministry of Transport and Communications;
- The Ministry of Trade and Industry;

- Vehicle Administration;
- Car importers;
- The Finnish Central Organisation for Motor Trades and Repairs;
- OIL INDUSTRY SERVICE CENTER;
- TAPIOLA INSURANCE COMPANY.

The Netherlands ECO-DRIVING programmer ‘Het Nieuwe Rijden’ resulted from the Kyoto agreement and from national policy documents targeting CO<sub>2</sub> emission reductions in traffic and transport. The programmer concerned a long-term strategy for the period 1999 until 2006, involved about € 20 Million. There already was a long tradition of eco-driving projects and activities in the Netherlands since 1988. After the Kyoto agreement however, the programme grew to maturity.

The programme was implemented by NOVEM (Netherlands agency for energy and the environment) on behalf of the Dutch Ministry of Transport and in co-operation with the Ministry of Environment. It aims to motivate (professional) drivers and fleet owners to purchase and drive passenger cars, delivery vans and lorries more energy-efficiently. The programme created conditions and organizational and logistics structures to achieve CO<sub>2</sub> emission reductions. The programme co-operated with over 20 consumer and retail organisations, mainly in the transport and car business. These organizations had signed an agreement to implement eco-driving activities. Among these organisations are the Royal Dutch Touring Club (ANWB), the Dutch Consumer Association (CONSUMENTENBOND) and the Dutch Association of Car Importers (RAI-VERENIGING). These organisations are best fitted to address the target groups with the eco-driving mission.

The Netherlands eco-driving programme has been addressed the following issues:

1. Driving style of (professional) drivers;
2. Driving school curriculum;
3. Fuel-saving in-car devices;
4. Tyre pressure;
5. Purchasing behaviour (e.g. car labeling).

Some achievements and aims of the Netherlands eco-driving programme:

- More than 90% of the Dutch driving instructors and examiners (6,500) were trained in eco-driving.
- Eco-driving is already part of theory exams for driving instructors, examiners and learner drivers. Shortly eco-driving will also become part of practical exams.
- The eco-driving program aims at the standard equipment of all newly sold cars in the European Union with fuel-saving in-car devices such as on-board computers and cruise control.
- A large mass media campaign (TV, radio and print) starts in 2004, mainly focusing on private car drivers. Aim of the campaign is to stimulate car drivers to apply the main driving style recommendations.
- The program co-operates with a large network of consumer and retail organizations, mainly in the transport and car business. These organizations actively promote eco-driving to the target groups.
- A certification and education system has been set up for eco-driving trainers.
- The number of providers of eco-driving courses as well as the variety of courses has increased significantly since 2001.

In the time from 1995 to 1996, the German Road Safety Association, the Commercial Professional Co-operation and the Federal Union of Driving Instructors developed, tried and tested, a practical training programme using real traffic situations for the education of drivers on a more environmentally friendly driving style. The programme had the title „Safe, economical and environmentally friendly driving” and the target was to teach fleet drivers in the new driving style. In the time from 1996 and 1997, the DVR, Commercial Professional Co-operation and Federal Union of Driving Instructors have installed training network for the whole Federal Republic of Germany. The trainers educating the drivers have all received a certificate from DIN EN ISO 45013 and are subjected to an ongoing quality control.

On the basis of the former programme, the trademark „Fahr und Spar mit Sicherheit - Sicher wirtschaftlich und umweltschonend fahren” was developed in 1998 by the German Road Safety Association in co-operation with

the Commercial Professional Co-operation, the Federal Union of Driving Instructors, the FORD company, the German foundation on environmental help

On the basis of the brand „Fahr und Spar mit Sicherheit - Sicher wirtschaftlich und umweltschonend fahren” „ECO-DRIVING” has been developed, tried and tested, and evaluated by FORD COMPANY AG and the German Road Safety Association together with the Federal Union of Driving Instructors. „ECO-DRIVING” is a programme for private customers and companies and will be spread to the public through FORD dealer Federal wide offers.

In June 2000, eco-driving, managed by DVR, was presented to the public. The programme was supported by the Federal Ministry for Construction, Housing and Transport. The „DVR-Spritsparstunde” was introduced in 2002. Interested persons can join courses nearby and only in one hour. A professional trainer teaches the technical of the new driving style in the customer’s car and gives support when it is needed.

#### **4. THE “GOLDEN RULES” OF “ECO-DRIVING”**

In the last decades, engine technology and performance of passenger cars, Lorries and buses have improved rapidly; however, most drivers have not adapted their driving style. Eco-driving is adapted to modern engine technologies and means smooth and safe driving at lower engine revolutions. Eco-driving is easy to learn and it has been shown that written information itself has a substantial impact on driving behavior, on safety and on fuel consumption without increasing travel time.

There are four basic rules to follow (main recommendations):

1. Shift into a higher gear as soon as possible (Fig. 3);
2. Maintain a steady speed, using the highest gear possible. Your engine will work in the very efficient area;
3. Look ahead and anticipate traffic flow. This gives you enough space to react adequately and without stress;

4. Decelerate smoothly by releasing the accelerator in time, leaving the car in gear. In this case, modern engines do not need any fuel.

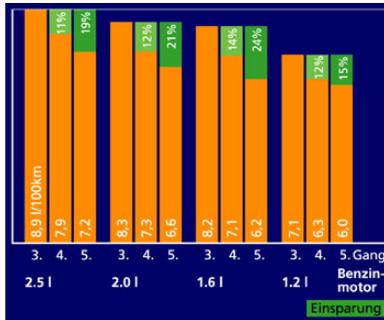


Fig. 3 The influence of Eco-Driving on fuel consumption

Additional recommendations:

- Switch off the engine at short stops (> 1 minute);
- Check the tire pressure once a month. High tire pressure saves fuel and endures the lifetime of the tire;
- Make use of fuel saving in-car devices such as board computers, econometers, cruise control etc;
- Change into a lower gear when you approach a curve;
- Take care of your vehicle aerodynamics;
- Do not accelerate without reason;
- Get rid of surplus weight and not used roof racks.

## 5. TESTING THE DRIVER, „ECO-DRIVING” CRITERIA

There must be a reference point for the assessment of a driver. In assessing a driver, the trainer has to consider following items [3]:

### Defensive and social driving behavior

Defensive and social driving reflects the overall style of driving. The consultant should take this into account in the overall picture of a driver:

- adapted and determined (safe) driving;
- taking into account road and weather conditions;
- taking into account other traffic;
- taking into account the interests of other road users (particularly the more vulnerable);
- anticipation.

### Controlling the vehicle

- proper use of safety belts, rear-view mirrors, head rest, seat;
- proper use of lights and other equipment;
- proper use of clutch, gearbox, accelerator, braking systems (including third braking system), steering wheel;
- controlling the vehicle under different circumstances, at different speed;
- steadiness on the road;
- taking into account the measures, weight and characteristics of the vehicle;
- taking into account the weight and kind of the load;
- taking into account the comfort of the passengers (no fast acceleration, smoothly driving and no hard braking).

### Observation

- all-round observation;
- proper use of mirrors;
- long, near, middle distance vision.

### Priority giving way

- priority at crossroads, intersections and junctions;
- giving way at other occasions (eg. changing direction, changing lanes, special maneuvers).

### Correct position on the road

- proper position on the road, in lanes, on roundabouts, in bends, suitable for the type and the characteristics of the vehicle;
- pre-positioning.

### Keeping distance

- keeping adequate distance to the front, the rear and the side;
- keeping adequate distance from other road users.

### Speed

- not exceed the maximum allowed speed;
- adapt speed to weather/traffic conditions and where possible up to national speed limits;
- drive at such speed that stopping within distance of the visible and free road is possible;
- adapt speed to general speed of same kind of road users.

### Traffic lights and road signs

- acting correctly at traffic lights;
- obey indications from traffic controllers;

- acting correctly at road signs (prohibitions or commands);
- take appropriate action of road markings.

#### **Braking and stopping**

- decelerating in time, braking or stopping according to the circumstances, if necessary using the third brake;
- anticipating.

Important remark: “If these points are done properly, a driver automatically drives economically and environmentally friendly”.

### **6. CONCLUSIONS**

And because road safety is the most important will conclude with some useful tips and maximum:

- Quality is not essential to drive slowly, but it is to drive well [4];
- Many people think they are exceptional drivers, but among those snooty recruitment is producing most of the serious accidents;
- Experience is an important factor, but not exclusively;
- Nearly 90% of all crashes are caused by about 10% of drivers [4];

- No man, however experienced it can not provide everything;
- A good driver uses as little clutch pedals and especially the brake;
- Especially at night to drive so we can turn to where we see;
- “Better late in the earth, than in advance ... underground” [4].

### **REFERENCES**

1. www.ecodrive.org, *Perspectives and challenges for ECO-DRIVING*, the Hague, the Netherlands, 9 June 2004;
2. www.ecodrive.org, BEET – *Benchmarking Energy Efficiency in Transport*, Rijswijk, the Netherlands, 11 April 2002;
3. www.drivingskillsforlife.com, *Eco-Drive Under Test, Evaluation of Eco-Drive Courses*, Swiss Energy, 2006;
4. Cristea, P., *Arta de a conduce automobilul*, Technical Publishing House, București, 1970;
5. Buzea, V., Beda, V., Ene, Gh., *Conduita preventivă în circulația rutieră*, Sport-tourism Publishing House, București, 1979.