

# 10 tips for better driving behavior

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## Who should read this paper?

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EXECUTIVES | PROFESSIONAL DRIVERS AND DRIVERS IN  
GENERAL

What kind of impact does driving behavior have on your fleet's costs? Why does a better driving behavior contribute to climate protection and pollution reduction? Delyan Kostov answers these questions and presents you easy to implement methods which will have a significant impact on your fleet's costs and productivity.

# Introduction

Vehicles are part of every contemporary business. In fact, large amounts of company operation costs are directly related to them. According to the type of business, vehicles can be involved in the main company activity – transportation of passengers and/or loads, or they can be involved in attendant company activities – service, distribution, trading and other activities.

Regardless of the activity they are involved in, vehicles generate a big part of company costs – from 20% in attendant activities to 60% in main business activity.

**We can separate costs related to vehicles into several main groups, as depicted in the following study, focused on European businesses:**

Costs	Light vehicles		Heavy vehicles	
	Eastern Europe	Western Europe	Eastern Europe	Western Europe
Salary	50%	75%	20%	45%
Leasing	15%	13%	17%	20%
Insurance	1%	1%	1%	2%
Fuel	30%	10%	55%	20%
Service	4%	1%	4%	5%
Other			3%	8%

Table 1 – Source: Telematics Update Europe Amsterdam 2012

As shown in the table, costs vary for different types of vehicles and also for different geographical regions. By analyzing the data, we will see that costs for salary and fuel form the main part of costs related to vehicles, as they reach 75% of all costs, while the rest has a slightly lower impact.

While salary costs cannot easily be influenced in order to be reduced, **fuel costs can be influenced by employing a policy for an economic driving behavior.** Through better and more effective exploitation of vehicles, **you can achieve a 10-15% fuel cost reduction**, and in some cases even more. This means **reducing the total costs related to your fleet by 1 to 8%!**

There is another point of view concerning fuel consumption – ecology. In the combustion of different types of fuel, varying quantities of carbon dioxide (CO<sub>2</sub>) are released into the atmosphere:

Fuel	Fuel CO <sub>2</sub> emissions (kg CO <sub>2</sub> /kg fuel)
Petrol (Gasoline)	3,3
Diesel	3,2
Propane-butane (LPG)	3,0
Methane (CNG)	2,8

Table 2 – Source: [http://www.engineeringtoolbox.com/co2-emission-fuels-d\\_1085.html](http://www.engineeringtoolbox.com/co2-emission-fuels-d_1085.html)

As you can see, the use of the “alternative” fuels propane-butane and methane leads to a reduction in CO<sub>2</sub> emissions in the air by more than 10%, in comparison to the conventional ones – petrol and diesel.

The **10 tips for better driving behavior** we present here represent a change in driving habits and in the adopted way of exploitation of vehicles, but they also have a great impact on fuel economy, and therefore on CO<sub>2</sub> emissions in the atmosphere.

## Tip #1

### Choose the right vehicles

Review the organization of your fleet's activity – if necessary make changes in order to optimize it. Good organization is achieved by planning and allocating the work in such a way that **minimizes number of vehicles and downtime, while maximizing work time of each vehicle.**



The vehicles you choose for your fleet must comply with the type of work they are going to be used for (not vice versa): number of passengers, size, and weight of load. Do not choose vehicles that are too big or too small – large vehicles can transport a large number of passengers, and a large quantity of freight, but if their capacity (freight volume) is not 100% used, this reduces their effectiveness.

As it comes to small vehicles, their capacity is smaller and this can lead to the need of using more vehicles or more trips, which leads to more costs on fuel and work force for performing the same work.

Other important factors you must pay attention to are:

**The terrain** where your vehicles will travel – flat, hilly, with steep slopes. Taking the type of terrain into account, you will be able to make the right choice of engine – engine type, capacity, power; transmission box – automatic or manual; differential gear – with bigger or smaller ratio. Do not choose engines of big capacity and power for vehicles which will travel mostly on flat terrain or in cities, and vice versa – engines of small capacity and power for vehicles which will travel on terrain of prevailing slopes.

For the right choice of engine, transmission box and differential gear you'd better consult your vehicle distributor.

**The fuel you will use** – petrol, diesel or an alternative one. Research in your region on the possibilities of using alternative fuels – legal framework, distribution of the fuel, service centers for the specific equipment.

After you have made the research, make comparative cost calculations on acquisition and exploitation of vehicles, using conventional and alternative fuels.

In most of the cases results are in favor of alternative fuels.

In the past few years, most vehicle manufacturers started manufacturing vehicles which operate with alternative fuels – mainly propane-butane and methane.



You may consult your vehicle distributors for varieties of fuel types they offer. Even if your vehicle distributor does not offer varieties of vehicles with alternative fuel, there is a wide range of equipment manufacturers on the market. If you choose alternative fuel you will have to make a higher initial investment for vehicles and equipment, but after that your fuel costs will be lower. And on the other hand, alternative fuels do not pollute the environment as much, which reduces the ecological footprint of your fleet.

**Contemporary systems used in the automotive industry** – new technologies and systems for improving the fuel efficiency of the vehicles are being researched and developed. Such systems are Engine Start/Stop, regenerative braking systems, etc. Usually, these systems are offered as extras, but you can often negotiate with your vehicle distributor. Make the needed calculations and see if they pay off in a reasonable time.

**Other types of new technologies are hybrid and fully electric vehicles.** The difference between both technologies is that Hybrid Engines use an electric motor as a support to the main engine, while the latter uses only an electric motor without petrol or diesel assistance. Electric engines use batteries which store the needed electricity. This is their main downside for now, every battery has a limited life cycle as a result of the number of recharges; moreover, for as of now they are still large and cumbersome.

You can ask your vehicle supplier if they offer such types of vehicles and supply you with the exact details: battery life, single charge range, charging options, etc. After inspection you can evaluate if this type of technology suits your fleet requirements.

## Tip #2

Keep your vehicles in good shape

**Maintain your vehicles in perfect technical condition,** observing the manufacturer's recommendations for the regularity of technical inspections.

If there is a problem in the vehicle, immediately take the necessary actions to rectify it, because delaying the correction of a problem may lead to more serious problems in the future and threaten the life and health of employees, passengers, and other people taking part in the traffic.

**The main systems which have impact on fuel consumption and gas emissions are the fuel exhaust and brake systems.** Each of them has to be kept in perfect technical condition in order to ensure minimal fuel costs.

Also, keep air intake filters in good conditions. Keeping them clean will help running the engine at its maximum efficiency. **This is particularly important for vehicles traveling in dusty areas.**

## Tip #3

Pay attention to the tires and fuel you use

There is a variety of products with different parameters and prices on the market. Some of the recent tire developments and fuel can have a significant impact on energy efficiency.



**Tires are responsible for up to 15% of fuel consumption. They use up energy<sup>1</sup>.** This is mainly due to the rolling resistance, which is one of the main forces a vehicle must overcome in order to carry on moving. Vehicle tire manufacturers offer tires of low rolling resistance, which lead to lower fuel consumption and longer tire life. According to tests conducted by Michelin<sup>2</sup>, tires with low rolling resistance can save up to 80 liters of fuel during their lifetime.

Which means, that the investment made for energy-efficient tires will pay for itself through lowering fuel consumption, extending the lifetime of tires and also reducing CO2 emissions.

Tire pressure is also quite important. Every vehicle manufacturer issues recommendations on the proper air pressure of their tires. **Observe these recommendations and regularly check the air pressure in tires.** Especially during periods of weather changes – warm-cold or vice versa. The ambient temperature influences the extent to which air expands which in turn increases the air pressure in tires. Improper air pressure in tires leads to premature wear and tear due to deformation. This also leads to increased fuel consumption due to increased rolling resistance. More important is the fact that driving with under-inflated tires is dangerous, because it may lead to flats. This may threaten the life or health of the driver, passenger and other people taking part in the traffic.

Optimizing fuel consumption also requires the use of proper fuel. All fuel distributors offer the standard variations of fuel in different chemically-enhanced versions – chemically enhanced fuels. Improvements are due to the addition of supplements to the fuel.

Those supplements help clearing the fuel system. They decrease the friction in the engine, increasing the octane/cetane number of the fuel.

You can perform an experiment on the engine's operation and fuel consumption with several types of fuel. **From the results you will be able to select your fuel distributor and the type of fuel that is most suitable for you.** According to the European Petroleum Industry Association (EUROPIA – [www.europia.com](http://www.europia.com)) the use of chemically-enhanced fuel may lead to a fuel economy increase of 2 to 4%.

You also have to pay attention to refueling – **do not refuel your vehicle to the top of the fuel tank.** This may lead to unnecessary spillage on roads, which does not only mean financial loss, but also pollution of the environment, and it may also endanger other road users. Full fuel tank also means a heavier vehicle.

You should plan refueling so that the fuel you have in your tank is enough for the mileage you are going to travel during the day or, if you have a long trip, just divide refueling into two or more times.

<sup>1</sup> Source: [http://en.wikipedia.org/wiki/Low-rolling\\_resistance\\_tires#Comparison\\_with\\_conventional\\_tires](http://en.wikipedia.org/wiki/Low-rolling_resistance_tires#Comparison_with_conventional_tires)

<sup>2</sup> According to Michelin and the Energy Saver line of products (<http://www.michelin.co.uk/tyres/michelin-energy-saver>).

## Tip #4

### Respect aerodynamics

**Resistance between air and the vehicle is also one of the main factors which have impact on fuel consumption.** All contemporary vehicles are manufactured and tested in aerodynamic wind tunnels to test for aerodynamic optimization. Design elements subsequently added to vehicles influence the aerodynamics of the vehicle in two ways – positively and negatively.

Elements which reduce air turbulence and minimize cab resistance – side skirts, encapsulation of the entire floor of the vehicle, side panels decreasing vortices at the wheels (for trucks and trailers), tail panels, etc., have a positive influence on fuel consumption.



Figure 1 - Aerodynamics study of a truck and trailer.

However, do not resort to developing, mounting and setting aerodynamic elements of vehicles on your own, because if this is not conducted professionally it may have a negative effect.

Elements which increase air resistance of vehicle – luggage-carriers, decorative elements at the front or at the sides of the vehicle, etc., all have a negative influence on fuel consumption.

To improve the aerodynamics of your vehicle you should remove all that is not used and increases air resistance. You may also add fenders, side panels or spoilers to reduce air resistance.

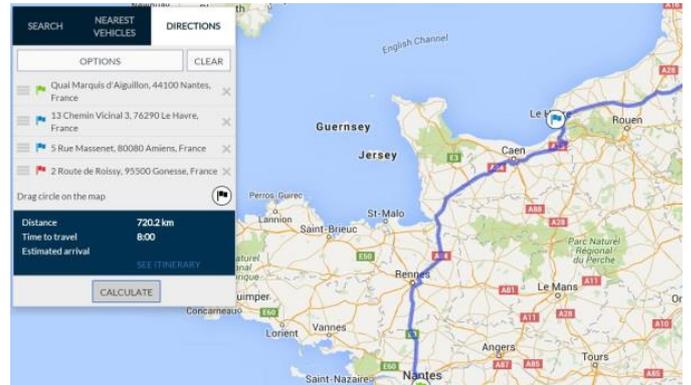
**Improved aerodynamics of vehicles may contribute to a reduction in fuel consumption of three to 17%**, according to different equipment manufacturers<sup>1</sup>.

<sup>1</sup> For instance, Cartwright is a manufacturer of equipment for the optimization of aerodynamics of heavy vehicles. They have made many tests in collaboration with TNT, and now have energy efficiency certificates issued to some of their products due to the test results.

## Tip #5

### Plan and optimize trips

When you plan daily trips, try to optimize both travel time and the number of passengers or freight transported.



Use traffic information and your own knowledge of typical traffic patterns. Then, **as far as possible, execute trips when there is not much traffic.** This will help you save time and fuel, because vehicles will not need to wait in traffic jams or at traffic lights.

Plan trips in advance and in a way that there will be enough time for additional activities such as refueling, waiting, loading and unloading, etc. **This will allow drivers to drive at lower speeds and in a calmer manner, which will lead to lower fuel consumption and minimization of the chances for mistakes or incidents.**

You may also try to allocate your freight so that your vehicles will be full up to 80-100% of their capacity and there will be no vehicles travelling empty or half-empty. Vehicles which travel empty consume less fuel, of course, but they do not bring any income, and meanwhile they have the same exploitation cost, which means that in the end they have a lower efficiency.

## Tip #6

### Familiarize yourself with the vehicle(s) you drive

Use some time familiarizing yourself with the technical features of the vehicles you drive. All features are described by the vehicle manufacturer in the vehicle's documentation. **If you do this in advance, you will avoid difficult situations later on, when you may need this information.**

Pay attention to the systems available in your vehicles for optimizing and helping driving - cruise control, speed limiter and others.

These systems are developed in order to optimize vehicle operation and help drivers. Cruise control is a system which allows drivers to switch to automatic mode for maintaining a certain speed, which also means automatic control of engine and gearing (in automatic transmission boxes).

Automatic control of engine and gears leads to reduction in fuel consumption, because the fuel supplied of the engine is optimized. This happens at the most appropriate gear (again in automatic transmission boxes).

Also, when using cruise control, driving becomes easier for drivers, because they are calm and do not accumulate stress. **This system is advisable to be used whenever you are travelling on highways or first-class roads where the speed limit is above 80km/h.** Use the other systems available in your vehicle, because they also allow you to optimize driving and therefore fuel consumption.

Systems which complement the brake system (mainly for heavy vehicles – engine brake, intarder, retarder) are developed with the purpose of being able to slow down or stop vehicles from moving, aiming at preventing dangerous situations and to maintain a certain speed. Use them whenever possible instead of the brake pedal. This way the operation of the brake system is reduced and therefore replacement of consumables is rarely needed.

Get acquainted with the equipment available in the vehicle – safety equipment, SOS kit, spare tires and tools. If something is missing you should replace it immediately in order to avoid unpleasant situations on the road in case you need it. Do not overload the vehicle; just place the things that are legally required or indispensable. Remove everything else, because additional weight increases fuel consumption.

## Tip #7

### Use engine and gears effectively

Every internal combustion engine is characterized by two main indicators – maximum torque (Nm) and maximum power (hp).

In theory, torque is described as rotational or torque force. When it comes to vehicles it means that this is the power transmitted from the crankshaft of the engine to the transmission. Torque is measured in Newton meters (Nm).

Power is a physical quantity and represents the work performed by a certain force for a certain time period or the speed with which the work is done. The unit of measurement of power is watts (W). Another unit of measurement is horsepower (hp) – this is a more outdated unit which however is still used in areas such as the automotive industry.

For each engine the manufacturer provides data on the changes of torque and power at different engine speeds, as well as their maximum values. Here is an example of the features of an engine – Scania, 420hp, Euro 5, 11.7 liters.

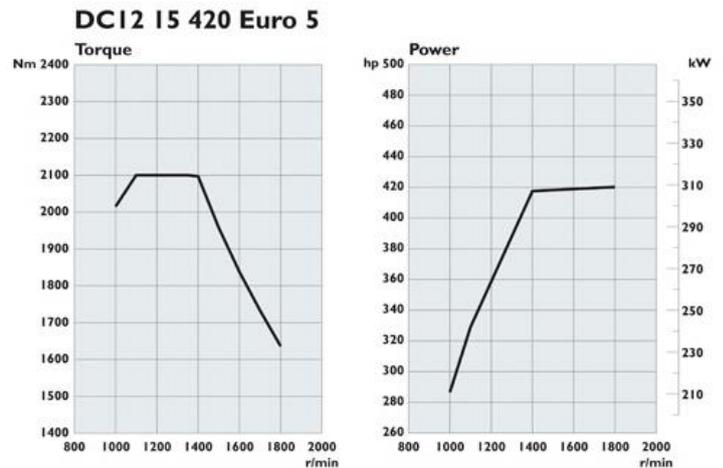


Figure 3 - Source: [www.scania.com](http://www.scania.com)

As you can see the maximum torque for this engine occurs between 1100 and 1400 revs, whereas the maximum power occurs between 1400 and 1800 revs. **The engine is most effective in the interval in which the torque is at its maximum value** – the power coming from the crankshaft to the transmission is highest.

Always observe this vehicle data and **try to drive your vehicle in the revs interval in which it is most efficient.** This way you will reduce fuel consumption and avoid operation at high revs, which will extend the engine's life.

As mentioned above, when choosing a vehicle, together with your vehicle distributor, you need to think of the right transmission box. No matter what the type of the box is (automatic or manual) and the number of gears is, try to operate with it as precisely and quickly as possible. This means that you need to choose the proper gear according to the revs of the engine. Change gears as often as necessary so that the engine will be in optimum revs, no matter whether you increase or decrease the speed. Also try to change gears quickly so that you will reduce the pressure on the clutch and therefore extend its life.

In automatic transmissions, control blocks are designed to choose the optimal gear depending on the speed and the extent to which the accelerator is pressed. However, they make mistakes in choosing the correct gear, mainly due to the fact that they cannot predict the road on which the vehicle is travelling and what is ahead. The mistakes happen usually when ascending and descending slopes. Almost all contemporary transmission boxes offer option for manual shifting, so in case of a mistake of the control block of the box do not hesitate to choose more suitable gear in that situation.

## Tip #8

### Use accelerator and brake carefully

Acceleration, deceleration and braking entirely depend on you, the driver. That is why you need to be extremely concentrated on the vehicle and the road condition in order to deal with the throttle and brake pedals adequately.

In most modern vehicles the gas flow is controlled electronically by the throttle pedal, which means that even small changes in the pressure of the pedal count in transmitting fuel to the engine. That is why the gas pedal should be handled carefully and gradually. Abrupt or excessive gas flow may take the engine out of its normal operating mode, which means bigger gas detonations, higher vibrations and operation at too high or too low revs. This causes disturbances in engine lubrication, higher fuel temperature and higher exhaust temperature, which shortens engine's life and increases risks of damaging or breaking elements in different systems. And in the end, all these lead to higher fuel consumption and higher maintenance costs.

**By using the throttle properly, you may use the engine as a brake, using its friction and resistance for smooth deceleration.** For this purpose, remove your foot from the accelerator, staying at the gear you are driving at. Under the influence of kinetic energy, the vehicle will continue to move but the speed will decrease. If you need to decrease the speed additionally, just lower the gear you are travelling at.

In this situation the vehicle is travelling without consuming fuel, because the throttle is not pressed and forced idle mode is activated – fuel supply to the engine is stopped.

Try to use the brake pedal only when it is necessary to stop or a contingency has occurred on the road. In all other cases you may use the engine and the change of gears for deceleration.

Also note that inadequate handling of the gas and brake pedals may lead to discomfort of the passengers or damages to the freight you are transporting. It may also create dangerous situations on the roads, threatening other participants in the traffic as well.

## Tip #9

### Try to look as far as possible

When driving, try to be well focused and to observe what is ahead and around you. This way, you will avoid dangerous situations and last second reactions.



Watching as far as possible, you may predict approaching situations, and so be able to take measures in advance, bringing the vehicle to an optimal regime for passing through these situations. Here are some of the most common situations happening on the road and the ways of optimizing fuel consumptions when passing through them:

- **There is a traffic light in front of you** – the signal is red, you may start lowering the speed firstly by decelerating, after that by lowering the gears, aiming to reach the traffic light when it already has the green sign and to pass without having to stop. Every vehicle consumes fuel mostly at setting off. Try to eliminate the situations in which you stop and after that set off;
- **You will have to climb a slope** – accelerate to the maximum possible speed (without over revving, breaking the law or creating hazard), before reaching the beginning of the slope. This way, you will be able to climb the slope or at least a part of it at a higher speed, but at higher gear and at lower revs of the engine;
- **You are climbing up a slope** – choose the proper gear, carefully handle the gas and try to maintain maximum speed at low rpm. Before reaching the top, when you feel the vehicle starts to accelerate, take off the gas. In this way, the vehicle will climb the top without consuming fuel.

The main objectives you should aim at when passing through different situations on the road are: maintaining a **constant speed, minimizing stops and set-offs, avoid abrupt throttling followed by pressing the brakes for abrupt stopping** and **vice versa**, use to the fullest the **kinetic energy of the vehicle**, as well as **the friction and resistance of the engine for stopping**.

## Tip #10

### Small things also count

Things you have probably not thought of also influence negatively the vehicle's fuel consumption. Most of them not to a big extent, but in combination with the rest they may increase the fuel consumption of your vehicle. Try to reduce using them or change your driving style if it is necessary. Here are some:



- **Turn off the engine when not moving** – when idling longer than 1 minute, turn off the engine. Not only will it not consume fuel, the engine will not be subjected to work in an abnormal environment – during travelling the oncoming air surrounds the engine and cools it, when idling this does not happen and the working temperature increases. This is extremely important, especially for diesel engines!
- **Restrict the use of air-conditioner** – use it only in long trips, when the temperature you set it to can actually be achieved. Maintaining the air-conditioner operating requires around 5 hp from the engine's power;
- **All additional electrical consumables** require more work from the charging system of the vehicle and therefore higher fuel consumption. **Turn them off unless they are necessary;**
- At speeds exceeding 70 km/h close the windows, because **open windows increase air resistance.**
- **In traffic jams, opt for a lower speed**, which minimizes the number of times you have to accelerate and decelerate. This will save fuel and make your journey safer.

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*About the author: Delyan Kostov is CEO at Frotcom Bulgaria, a member of Frotcom's worldwide network. Delyan has been working in the trading and transportation business industries since 2003 and in vehicle tracking since 2008.*