RESEARCH FOR DEVELOPMENT OF GREEN FREIGHT TRANSPORT PROGRAM IN VIETNAM IN ORDER TO COPING WITH GLOBAL CLIMATE CHANGE

TU SY SUA
University of Transport and Communications

Summary: *This paper is going to research rigorously the green freight program and the potential of the effective application of this in Vietnam.*

Keywords: *Green freight transport; Green transport; Climate change, SDGs.*

I. INTRODUCTION

On 25th september 2015, all members of United Nations agreed to introduce 17 sustainable development goals (SDGs) which will be achieved in 2030. These passed targets include ending poverty, hunger and combating climate change…

Transport plays a vital or important role in the National Socio-economic growth; however, it also Increase polution. Especially it is responsible for air pollution, the greenhouse effect and climate change. Thus it is necessary to launch campaigns to boost transport in a friendly and environmentally sustainable way.

The Green Freight Transport Program is the main item of the Green Transport Program which has been established in 2004 in the US, under the management and operation of US Environmental Protection Agency (USEPA). The program is designed to encourage freight transport enterprises to use fuel responsibly and effectively with the aim of reducing the gas emission causing the greenhouse effect – the main reason for the global climate change due to freight transport.

With the support from US Transport Association, over 600 well-known enterprises, companies and branches in the US such as Wal-Mart, Nike, ExxonMobil, CSX Transportation, Whole Foord Market, FedEx, Schneider National, etc have been taking part in the program so far. The annual results are remarkable: reducing 33-66 million tons of CO2 and 200,000 tons of NOx emission and a significant quantity of particulate matter (Particulate Matter - PM) per year.

The Green Freight Transport Program has been Established widely and deeply all over the world.

II. MAIN CONTENTS OF THE GREEN FREIGHT TRANSPORT PROGRAM AND THE POTENTIAL OF ITS EFFECTIVE APPLICATION IN VIETNAM

2.1. Developing policies on fuel and exhaust gas management

Transport plays a vital or important role in the National Socio-economic growth; however, it also Increase polution.

Thus it is necessary to develop policies and regimes on fuel usage and; management of exhaust gas from vehicles.

a. Developing technical standards for Fuel

The development of technical standards for fuels includes: gasoline, diesel fuel and biofuels in order to regulate limitations for technical criteria relating to safety, health, environment and requirements for management of fuel quality.

Thereby, in Vietnam, the Standard QCVN 1: 2009/BKHCN promulgated by Minister of Science and Technology on September 30th, 2009 - National technical regulation on gasoline, diesel fuel oils and biofuels.

b. Developing the Standard for control of automobile emissions

The roadmap for application of the Standard for automobile emissions in Vietnam accords with the Standard for emissions in Europe. This is one of the most advanced standard systems, which is widely applied all over the world, including China and ASIAN countries.

The standard for emissions at level 3, level 4 and level 5 is in regard to test method and limitation of pollutants in emissions equivalent to the Euro III, Euro IV and Euro V which are regulated in the Technical Regulation on motor vehicle emissions of Economic Commision for Europe directly under UN or in the directives of European Union which are applied to motor brand new vehicles manufactured, assembled and imported.

The roadmap for application of the Standard for emissions for automobiles which are brand new manufactured, assembled and imported in Vietnam must be applied the standard for emissions at level 4 and level 5 as following:

+ The standard for emissions at level 4 from 01/01/2017.

+ The standard for emissions at level 5 from 01/01/2022.

Euro I, Euro II, Euro III, Euro IV, Euro V and Euro VI were developed in 1991, 1996, 2000, 2005, 2009 and 2014, respectively. The limited concentration of automobile emissions in each new standard is lower than that in previous standard.

The pollutants in vehicle emmission are toxic compounds which directly affect human health and environment for a long time including carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons in general (HC) and Particulate Matter-PM. Typically, out of such emissions, carbon monoxide (CO) is generated caused by the incomplete combustion of carbon-containing compounds.

Methods for determination.

In the materials regarding European Standards, the concentration of emissions may varies depending on each method of determination.

- The first method: determining the concentration of emissions under the route of the vehicle in "gram per kilometer".

- The second method: determining the concentration of emissions under energy generated by the engine, then the concentration of emissions has its unit of "g/kWh".

Besides the structure of an engine, emission volume significantly depends on other factors such as time of itialization, load, velocity, stability of velocity and type of road.

In order to model the whole impacts of such factors, testers have established two methods including ESC (European Steady Cycle) and ETC (European Transient Cycle).

ESC is the method of determination which is implemented in manh stages. In each stage, both velocity and load of an automobile remain the same. When moving to another stage, two factors (velocity and load) are changed at random. During the process of implementation, emissions continuously pass through a concentration measuring equipment and the final value is the arithmetical mean of all stages. ESC method is suitable for operation conditions in roads which cause little changes of velocity and load.

Unlike ESC, ETC method is based on the transient changes of velocity and load. Emissions are collected in a plastic air bag rather than passed through a concentration measuring equipment, then are analyzed after completion of the experiment. ETC is suitable for operation conditions within cities which cause transient changes of velocity and load

Nevetheless, the roadmap for application of the new standard for emissions only stipulates the emissions of automobiles which are brand new manufactured, assembled and imported rather than used ones.

c. Selecting appropriate transport modes to save fuel.

Each regional and national mode of transport in the agreed transport system has its own scope of operation with certain economic efficiency.

Thereby, a reasonable mode of transport not only satisfies the needs of customers, but also saves fuel for transport and reduces emissions to the environment corresponding to the principle of increasing for pipeline transport, waterway transport, rail transport, automobile transport and air transport.

In a long-term planning, the organization of multimodal transport and selection of a reasonable mode of transport towards saving fuels as mentioned above are important solutions to the Green Transport Program.

2.2. Regarding structure of vehicles.

a. Using aerodynamic shape to reduce air resistance and save fuels

Today, everyone knows that the lower the wind resistance index is, the more smooth and slient the operation is. However, in the early days of the automotive industry, aerodynamic design only played a minor role compared to the technical and economic issues.

The wind resistance index is used to assess the geometric resistance of an airflow to particles moving in it. This index does not depend on the speed of an object, but depends on its

shape.

Eduard Rumpler, the father of the German aviation industry, is the first man who had launched an aerodynamic model of automobiles. His valuable experience gleaned from the automotive industry during World War I helped him convince the entire automotive industry to believe in the outstanding advantages of aerodynamics. In 1921, the first automobile designed by himself with a falling teardrop shape made the whole automobile exhibition in 1921 surprised at its wind resistance index of 0.27 while such average index of almost automobiles until 1984 was 0.4. Unfortunately, the difficulties in the development of engines has made the project never become a reality.

One year after the launching Rumpler's automobile, Paul Jaray received a paten on "an automobile of the future" when he was 33 years old. The Hungarian young engineer has spent most of their time and energy on researching into air resistance, calculating aerodynamic components in order to design a chassis of an automobile that he believed that such automobile would be a design model in the future. The most significant differences of Jaray's drawing is the design of front end and rear end. Regardless of the design of 'port' radiator grille of contemporary automobiles, Jaray's the curved front end helped it smoothly get the opposite air flow causing less air resistance and saving fuels.

b. Using fuel-saving tires.

Currently, many brands have used the technology of fuel-efficient tire production. According to calculation, this new tire type can save 4.0-4.5% of fuels which contributes to reduce the greenhouse effect and reduce waste to the environment due to its higher durability.

Energy loss in tires is caused by heat generated in the operation. When the tire rolls, its surface is deformed to maintain the contact with the road surface. When leaving the road surface, the tire recovers its shape. The continuous deformation under a rotary cycle generates heat making the tire hot which is partially dissipated into the environment causing the loss. The energy calculation required to deform the tire is called rolling resistance. Reducing the rolling resistance depends on not only tire surface but also many other factors. "Each element and material of a tire contribute to reduce rolling resistance", Alessandra Ferraris, R&D Manager in Continental Tires said. If the elements are optimized, the temperature lag and deformation shall be minimum. Mr. Girvin from Michelin Tire brand explained the principle of working as following: "Rubber is not a perfect elastic material, its temperature lag is worthy to take interest. If you hold two rubber balls and drop them in turn from overhead down, they shall bounce but shall be always lower than the drop location. This proves the lost energy. In other cases, the balls are nearly close to the ground, its mechanical power is absorbed and converted into heat."

Accordong to Mr. Berger from Bridgestone, the area of a tire which directly contacts with a road is the most important factor affecting the rolling resistance, making up about 40-50%. The importance of tire wall and tire casing is about 20-30%; the remaining percentage is belonged to the importance of rim.

The first generation of fuel-saving tires could be made from super-hard rubber rings. But there were some issues relating to traction and vibration-absorbing. It creates pressure on manufacturers to produce new rubber compounds by adding natural and synthetic materials in order to limit the heat generation without losing the tire characteristics.

With major changes in technology, the current generations of fuel-saving tires have been improved all of three main working criteria including high performance, high abrasion resistance and good traction (even in a wet road surface)

2.3. Improving the efficiency of means exploition to save fuels.

a. Improving the coefficient of distance use (ß).

Among the criteria of exploition-engineering of means, the criterion of the coefficient of distance use (ß) and the criterion of the coefficient of load use (γ) are considered as quality criteria, because when such these coefficients increase to the optimal limit (by 1.0), the cost of transport in general and cost of fuels in particular also increase but not significantly.

Thereby, improving the criterion of the coefficient of distance use (ß) through combination of goods and optimization of a route to reduce the distance without goods is a feasible solution to increase the efficiency of means exploition and to save fuels, contribute to successfully implement the green transport program.

b. Improving the coefficient of load use (γ).

Selection of appropriate vehicles with goods; characteristics of the goods transport to enhance the coefficient of load use within the allowable limitation (γ = 1,0) is to improve the efficiency of vehicle use, efficiently use and save fuels.

c. Reduce the mobilization distance.

A mobilization distance is the distance that an automobile runs (without loads) from garage to the first place of loading on the route and after unloading (finishing the working shift) and driving back the garage. Reducing the mobilization distance by reasonably arranging the garage location and appropriately arranging the location of shift handover (in case of many automobiles).

d. Appropriate organization delivery and receipt of empty containers in ICD (Inland Container Depot).

ICD is a port located inland, without a harbor. Import or export goods (mainly are contained in containers) are unloaded from marine vessels – import goods; or assembled from the factory – export goods – and trans-shipped to ICD to make procedures for import and export. In term of the State management, ICD is a real port, is controlled by customs and customs clearance procedures are performed in the same way as those of other deports.

The organization of the delivery and receipt of container tyres at the ICD rather than in only one deport (commonly applied today) will significantly reduce the distance of transportation of empty containers, reduce cost of freight transport by containers and save fuels.

2.4. Eco – Driving skills

Eco-driving skills relate to a method of fuel-saving and smart driving. The eco-driving skills can be applied to all engines of older vehicles. Eco-driving method is easily performed and achieve cost efficiency with the goal of reducing fuel consumption as well as environmental improvement.

Eco-driving benefits to the society by reducing environmental pollution, the traffic jams and traffic accidents. It also brings financial benefits to the society by reducing fuel consumption and saving maintenance costs. Eco-driving is also a way to express the social responsibility of transport enterprises and can be used for the purposes of brand promotion.

Programs on eco-driving training have been held in Europe for about 20 years; in Japan since 2003; in Korea since 2010 and in many other countries.

In Vietnam, such programs shall be deployed at the end of 2015 and held by the Core Environment Program and Biodiversity Conservation Corridors Initiative in Greater Mekong Subregion (CEP) – the second phase.

The elementary content of eco-driving skills is compliance with the following 4 principles:

1. Check vehicle before driving including: check pressure of all tires in order to ensure pressure under the design (non- inflated tires shall fast become hot and tire explosion and fuel consumption of more than 2.0%), check aerodynamics of the vehicle.

2. Avoid starting engine too long because newer vehicles do not need to preheat the engine and increase the rotation speed even when the outside temperature is low (it is cold).

3. Speed up (turn gear) as fast as possible in order to suit to all use conditions.

4. Maintain a stable speed (economic speed); avoid changing speed or braking suddendly, use the highest possible gear to drive uphill and brake by engine and brake pedal to drive downhill.

III. CONCLUSION

The Green Freight Transport Program a main part of the Green Transport Program which was established in 2004 in the US, is designed to encourage goods freight transport enterprises to sparingly, responsibly and effectively use fuel with the aim of reducing the gas emissions causing the greenhouse effect – the main reason of the global climate change due to freight transport.

With the high responsibility before the international community to the global climate change, freight transport enterprises have both scientific and practical bases to affirm that they shall efficiently perform the Green Freight Transport Program in Vietnam, contribute to comply with 17 sustainable development goals (SDGs) launched by UN.

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