ZERO-EMISSIONS VEHICLES: A HALF-TRUTH

The main source of atmospheric pollution in all cities is represented by motor vehicles. These consume mostly gasoline and diesel fuel, whose combustion emits into the atmosphere contaminating substances that affect the health of urban populations. The emissions' reduction in order to ameliorate air quality is a priority among urban authorities, and this is prompting the implementation of zero-emissions vehicles.

Vehicles fed by fossil fuels contribute with ~25% of the increase in greenhouse gases, which are responsible for global warming. Of the fossil fuels used in vehicles, the least contaminant, both at urban and at worldwide levels, is natural gas. The vehicles utilizing natural gas emit ~20% less carbon dioxide than gasoline vehicles; however, this can revert when considering the possible non-burnt methane losses (*Interciencia 18*: 285-286, 1993). With the goal of reducing oil dependency, the use of bio-fuels, alone or mixed with gasoline, is being implemented in several countries. In this case, the emissions of "urban contaminants" continue to be significant. As for the emissions of greenhouse gases, these depend upon the origin of the bio-fuel. In general, the evaluation of life cycles ("from the source to the wheel") indicates that the emission reductions are discrete, but when changes in the use of land are involved, the emissions are substantially higher than those produced by fossil fuels (*Interciencia 34*: 106-112, 2009).

Progressive technological advances have made possible a dramatic increase in the efficiency of vehicles that utilize fossil fuels, but the emissions reduction achieved is largely compensated by the increase in the number of circulating vehicles and, therefore, its contribution to urban pollution and global warming continues to increase. In hybrid vehicles, which in part are moved by an electric motor whose batteries are recharged during the functioning of the motor itself, the emissions of contaminants are close to 30% lower than those produced in vehicles moved by gasoline alone. In the case of the "pluggable" hybrids, whose batteries are recharged in the electric mains, the emissions will depend on the percentage of time that they operate with gasoline. However, zero emission of urban contaminants is only achieved with 100% electric vehicles or those moved by hydrogen, but the emission of greenhouse gases depends on the origin of the electricity or of the hydrogen used. For a null emission, the electricity or the hydrogen must come from primary sources alternative to fossil fuels, such as solar, eolic, hydroelectric or nuclear energy.

It is very likely that the air quality of cities will be improved in the midterm, with hybrids, pluggable hybrids, and electricity- and/or hydrogen-moved vehicles. Nevertheless, considering that close to 70% of the world electricity is produced from fossil fuels (mostly from coal, 41.5%) and that projections indicate a future increase in their incidence in electricity generation, vehicles advertised as "zero-emissions" are just a half-truth. Many users/owners of these vehicles will be convinced that they are contributing with global warming mitigation, which, unfortunately, will not be true in most cases, especially in places where the production of electricity is strongly dependent on fossil fuels. Moreover, in places where the electrical recharge of the vehicle depends exclusively on coal plants, the emissions of carbon dioxide "from the source to the wheel" will be higher than that of a vehicle of the same weight and performance moved with gasoline.

Climate change is a critical problem for mankind and, among many other relevant aspects, it is important that communities becomes aware of the fact that electricity is not a primary source of energy, and that its benefits regarding global warming depend upon its generation source. We must be alert for swindles or "a pig in a poke".

EUGENIO SANHUEZA
Instituto Venezolano de Investigaciones Científicas