SWEDISH EXPERIENCE FROM LOW-EMISSION CITY BUSES: IMPACT ON HEALTH AND ENVIRONMENT

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Several field trials on city buses running on alternative fuels have been conducted in Sweden during the last decade. Reformulated diesel fuel and aftertreatment devices are measures that have been taken on diesel-fueled buses to reduce the emissions. The primary scope of this paper was to compare the impact on environment and health from various fuels and technology for low-emission buses. During the last decade, the emissions from gasoline-fueled passenger cars have decreased considerably. Since cars compete with buses, it was also of interest to compare the environmental impact of these vehicle categories.

The vehicles mentioned have been subjected to emission tests funded by various Swedish government programs. By using available emission test data, emission factors (regulated and unregulated) have been established for each option. In the comparison between buses and cars, corrections have been made for climate, deterioration, and driving pattern. The impact from the emission components has been calculated using weighting factors for each compound, Acidification, eutrophication, ozone-forming potential, cancer risk, greenhouse gases, and several other effects have been evaluated.

The analysis showed considerable improvement for the diesel buses by reformulating the diesel fuel and by fitting aftertreatment devices. Particulate emissions and its effects are probably the most severe emission component from the diesel engines. Particulate filters are the only commercially available solution to that problem today. The NO_x emissions can be reduced by some 50 percent through the use of an exhaust gas recirculation system.

Some of the alternative-fueled bused had a positive impact regarding several of the effects investigated, *e.g.,* acidification and local NO_2 emissions. In other cases (*e.g.*, ozone-forming potential), the difference between the best options was small. The cancer risk index is largely dependent on the unit risk factors, which are not fully developed yet, but the overall result in this case did not vary much between the risk factors evaluated. Clean diesel fuel with a particulate trap and CNG/biogas were the options with the lowest cancer risk index. The impact of the greenhouse gas emissions was the most significant advantage for the biofuels.

The comparison between gasoline-fueled cars and buses showed an environmental and health advantage for the buses in all aspects but NO_2 emissions and acidification. The significant impact of cold starts on cars was the major cause of the outcome of this comparison.

It is expected that future development on engines and aftertreatment devices will diminish the advantage of the alternative fuels in city buses regarding many of the effects. On the contrary, the impact on greenhouse gases from some biofuel options will be more pronounced in the future.