



KRAKOW, POLAND

Introduction of CNG buses

Background/context

In January 2007 Miejskie Przedsiębiorstwo Komunikacyjne SA (the public transport operator) started to use and test five new compress natural gas (CNG) JELCZ buses. The exploitation tests, part of the CiViTAS/CARAVEL project, aimed to expand the company's knowledge about CNG technology, including all the advantages and drawbacks of CNG-driven vehicles in real operational and organisational conditions.

The project's goals were to enable the public transport operator to evaluate cooperation with involved actors: the vehicles' manufacturer, fuel distributors and national administration units. The project also collected data for a detailed analysis of financial and organisational requirements necessary for further development of CNG technology in Krakow, or to indicate alternative ecological solutions with better economic results for the company.

Participation in the project was also a good occasion to promote sustainable public transport as a means of environment protection as well as promotion of new technological and organisational solutions that allow for energy saving.

Case description

The chosen bus maker, the Polish company Polskie Autobusy Sp. z o.o., offered the Jelcz M121M/4CNG. The vehicle is equipped with the engine MAN E2866 DUH03 which has the following parameters of emission levels:

- CO [g/kWh]: 0,12
- HC [g/kWh]: 0,00
- NO_x [g/kWh]: 0,032 – 0,036
- PT [g/kWh]: 0,007

The construction of Jelcz M121M/4CNG is very well known among Polish public transport operators, and its technical solutions have been tested and known to run reliably for a period of approximately 12 years.

CNG buses operate on line No. 192 linking Balice International Airport with the city centre. The choice of this particular line allowed for refuelling at a gas-filling stations located at the intersection of Balicka and Siewna streets. Buses are filled up at the CNG station after their final runs.

The performance of the CNG vehicles was compared against that of diesel buses measured in similar operational

conditions. According to the CARAVEL project assumptions, MPK's specialists used several evaluation indicators, including operating costs, vehicle fuel efficiency, effective bus exploitation and noise level. These which were based on actual measurements and as well as modeling research methods applied by the University of Technology in Krakow (also CARAVEL project partner).

Results

In the first phase of the project, additional technical assistance and engine oil exchanges were necessary. The unit operating costs of CNG vehicles were influenced by extra payment for CNG bus drivers (8% of basic salary, according to MPK human resources policy related to safety issues), additional distances covered to reach CNG filling station and the long process of topping up gas tanks due to a lack of capacity at the station. It turned out that fuel costs were 14% less (0.1231 PLN/km) than with the diesel busses, which was far from operator's expectations. Moreover, the 4% lower unit operating cost of CNG vehicles during the first year meant that the higher necessary investments couldn't be recouped during the first year.

All noise measurements were made by MPK staff at the vehicle diagnostic station in accordance with binding norms. Results of outside noise level measurement showed the CNG buses were quieter than diesel vehicles.

Although the results of the technical evaluation of CNG vehicles – their construction, effectiveness and lower environmental impact – were pretty good, a total transformation into the CNG technology was found too costly and risky when taking into account such factors as the lack of availability of financial sources (Environmental National Funds, ERDF) for financing such investment, organisational and technical demands, monopolistic nature of the domestic gas distribution system and the higher relative costs of CNG vehicles.

Based on the one-year test, MPK's specialists concluded that the optimal way to transition towards a clean fleet would be substituting old vehicles for new diesel meeting the highest EURO standards.

Problems

Financial and technological problems remain the biggest barriers for an operator converting to CNG technology. Specific drawbacks included a lack of political support in securing external financial resources to pay for the vehicles, the requirement of acquiring an in-house CNG filling station and the expense of adapting maintenance facilities to CNG buses.

Another difficulty was uncertainty about gas-fuel delivery. The CNG filling station used by the operator belonged to a gas provider who did not react quickly to complaints about station failures. When technical problems affected the main station, the operator was forced to use a smaller one. The capacity of the alternative station was inadequate for the vehicles' size and, as a consequence, there were problems fulfilling transport tasks and organising maintenance support units.



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Transferability and success factors

The decision on introduction of CNG technology always depends on local conditions and factors. Based on the Krakow experience, one can recommend the CNG buses only if:

- an operator has its own gas filling station of sufficient capacity,
- maintenance facilities can serve CNG vehicles with respect to all safety and security rules,
- the arrangement with the CNG provider ensures seamless fuel delivery at a good price.

External financial and political (governmental) support is also very important.

Lessons learnt

Technical advances in clean fuels and vehicles have produced a variety of options that are as good as CNG from an environmental standpoint. And drive tests of hybrid and bio-ethanol buses already made by MPK in real operating conditions prove that these two are worth considering.

The CNG-based propulsion systems which are now well developed could win the competition with other environmentally friendly technologies, admittedly, but currently there are not enough incentives to invest in it. The CNG-driven bus is 20-25% more expensive than similar diesel vehicle. And the lower CNG fuel price cannot compensate for the high purchase and transition costs and make the investment cost-effective.

Conclusions

Generally speaking, the decision on introduction of CNG technology should be supported by governmental policy focused on this solution because it seems that local public transport actors with their shrinking budgets and lack of instruments to influence on CNG fuel providers cannot accomplish this technical transition without help.

References and contacts

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