
Next generation hybrid bus // Lappeenranta University of Technology
CAMBUS
NEXT GENERATION HYBRID BUS // POWERED BY LUT

Hybrid bus brings urban transport emissions under control

LUT's, CAMBUS hybrid bus is currently being built and is almost ready for experimental use. The bus will be part of urban transport in a few years' time. The bus is being built in collaboration with the Saimaa University of Applied Sciences and the Saimaa ammattiopisto vocational college, Sampo.

The chassis of the bus has been taken from an old, de-commissioned, local transport bus. The power train, internal combustion engine, gears, rear end and most of the ancillary equipment have been removed. In their place, 32 kWh of batteries have been installed as well as a new power train made up of a 2.5 litre diesel engine, a generator and an electric motor. The project engineer, Teemu Sairanen from LUT, estimates that the first test drives will take place during September.

"The electric motor has already been run and the diesel engine has also been used. The main aspects of the technology are now pretty much mechanically sound. The only things missing now are the intercooler from the diesel engine and the booster heater. In addition the vehicle's drive shaft has temporarily been removed for safety reasons. Electrical work and internal furnishings are also still incomplete. On the electrical side, fine tuning of the automation and testing is still going on."

Electric transport

The new hybrid system that has been installed in the bus is the most energy efficient on the market: the radically reduced size of the combustion engine and the more efficient battery capacity enables emissions from urban transport to be halved from current levels. The vehicle's cooling system is also more advanced than commercial versions.

"The vehicle is liquid cooled with three separate circuits: the cooling for the batteries, the diesel engine, and the drive motor and inverters each have their own closed systems. If necessary, heat from the diesel engine can be transferred to the battery circuit using a heat exchanger. The aim is to utilise waste heat as effectively as possible using an advanced electrical control system," explains Teemu Sairanen.

After some alterations, the bus will be capable of being driven using the electric motor or the diesel engine as necessary, or using the two together. In the CAMBUS model, the diesel engine is used to assist the electric motor and not the other way round as with the hybrid systems on the market at the moment. The large battery capacity means that the CAMBUS can drive using only electrical power in urban areas, i.e. exactly the places where emissions are at their highest.

It will still be a while before the bus is seen driving in the city as risk analyses and other safety tests still need to be carried out. One risk factor for example are the batteries which are located in the rear part of the bus. The batteries weigh about a thousand kilogrammes.

"The results of the risk analyses have to be taken into consideration in the battery mountings. The mountings much be able to withstand forces that will be greater than usual in any collision. However, it is important to remember that this is a prototype. If commercial versions are ever built, then many of the solutions would probably be different. For example, the batteries could be installed on the roof or under the floor, and many of the welded structures that have been used in this CAMBUS prototype could be replaced by cast parts in commercial versions.

If necessary, the CAMBUS system could be adapted to suit different kinds and makes of bus as well as other machines. Operating the prototype will provide practical information about the behaviour of batteries in working engines in both the test environment and in Finnish urban conditions.

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http://www.lut.fi/web/en/-/hybrid-bus-brings-urban-transport-emissions-under-control