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FRAUNHOFER INSTITUTE FOR TRANSPORTATION AND INFRASTRUCTURE SYSTEMS IVI

1 *Application during the instruction of drivers.*

DISPLAY FOR FUEL CONSUMPTION AND VEHICLE CONDITION

Motivation

Over the past few years, developments in both conventional propulsion configurations and new propulsion technologies such as different hybrid variations (serial, parallel or power-split hybrid propulsion) have enabled higher fuel savings and a more efficient operation of buses.

In order to ensure a maximally efficient operation, however, the drivers need to adapt their driving styles to the respective propulsion system. Investigations on hybrid vehicles undertaken by the Fraunhofer IVI in several large cities in Germany show that the potential savings may be increased substantially by offering specialized training and practical exercises in the respective vehicles.

One central component for this is the display for fuel consumption and vehicle condition developed by the Fraunhofer IVI. The system is made up of a compact, robust display unit, which is installed directly in the driver's field of view, and a customer-specific user interface, which graphically represents the most important vehicle data.

Direct feedback provided by the vehicle increases the efficiency of operation and will reduce fuel costs, leading to the system's amortization in a minimum of time.

In addition, the display unit can be used to show images from an interior or backup camera.

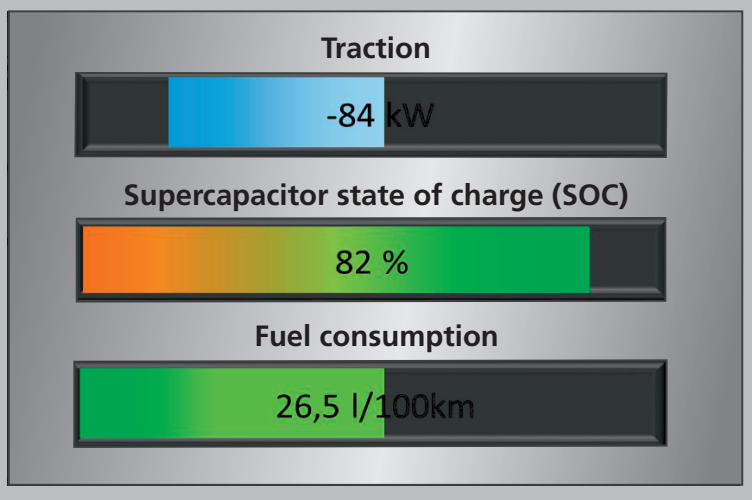
Fraunhofer Institute for Transportation and Infrastructure Systems IVI

Director
Prof. Dr.-Ing. Matthias Klingner

Zeunerstrasse 38
01069 Dresden

Contact
Dr.-Ing. Frank Steinert
Phone +49 351 4640-846
frank.steinert@ivi.fraunhofer.de

www.ivi.fraunhofer.de



User interface

During both driving instruction and regular operation, it is very helpful for the instructed persons or drivers, respectively, to receive direct feedback about their driving style. There are many options on how to present this data to the drivers, but all of them also have to take their specific needs and requirements into consideration.

In its simplest configuration, the display will indicate the current mileage, the amount of fuel consumed and the average fuel consumption per 100 kilometers. In addition, vehicle specific data may be integrated. Parameters such as the number of combustion engine shut-downs during start-stop operation, the distance covered in full electric mode, driving time, and the energy saved compared to a default value can be visualized by the display.

If the hybrid vehicle is equipped with a capacitor, its state of charge can be directly displayed. Drivers thus receive instant feedback regarding the effects of their brake pedal and accelerator positions on the capacitor's condition, making it easy for them to efficiently use the capacitor.

Hardware

The display units are available with or without touch screen and in different sizes starting with a screen diagonal of 4.3 inches.

The devices have a rugged design (protection class: IP 65 K and 67 K) especially suited for the operation in vehicles and are able to process data from the CAN bus interface, digital and analogue inputs and outputs, as well as camera data. Via USB connection, it is easy to export recorded series of measurements.

For installation, the system only requires a connection to the vehicle's CAN bus and a 24 V power supply.

Driver bonus program

The data which are evaluated during vehicle operation can be stored on a USB flash drive and may be used for further training purposes. Based on the recorded fuel consumption and efficiency data, a driver bonus program can thus be easily implemented.

To meet privacy standards, drivers may decide between deleting the recorded data directly in the display unit, e. g. by entering a personal PIN, or sharing the data with the bonus prgram to benefit from the vehicle's feedback.

References

Leipziger Verkehrsbetriebe (LVB) GmbH

The display unit was developed in collaboration with the staff of the corporate driving school in order to enable direct feedback to future drivers regarding an economical driving style.

Stadtbus Ingolstadt GmbH

The focus of the user interface design was put on the long-term acquisition of route and consumption data, in order to avoid errors and inaccuracies which may occur during refueling.

2 ***Bar graph at regenerative braking before stopping at an intersection.***