



Comparison and Evaluation of a new innovative drive concept for the air conditioning compressor of electric vehicles

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The development of an energy efficient air conditioning system for electric vehicles is an ever increasing challenge, because the cooling as well as the heating of the passenger cell reduces the cruising range dramatically.

Almost always the compressor of the air conditioning system in electric cars is a scroll compressor with a separate electric motor and appropriate power electronics. However, this solution is critical in terms of the installation space, the weight and also the costs. Therefore, IAV develops innovative and energy efficient drivetrain structures for electric vehicles, which integrate the motor of the air conditioning compressor directly into the drivetrain of the vehicle.

Thus it is possible to switch off the compressor motor and to use the main motor for the propulsion of the air conditioning compressor at certain driving situations. As a result the operating point of the main motor can be shifted to a better efficiency. This leads to a reduced power loss and an enhanced cruising range. In addition the compressor motor can be used for the propulsion of the vehicle, too, if the efficiency of the compressor motor is higher than the efficiency of the main motor, e.g. at urban traffic. Thereby the efficiency and the cruising range of the vehicle can be increased.

This contribution presents a new powertrain concept which realizes the above-mentioned mechanical coupling of the main motor and the compressor motor. Moreover, the developed simulation models for the air conditioning system, the passenger cell and the drivetrain of electric vehicles are introduced. These models were used to compare an electric vehicle equipped with the new powertrain concept with a common electric car with a separate scroll compressor. Both systems are evaluated by means of the achievable cruising range for different driving cycles and environmental conditions.

Keywords: Electric Vehicle; Drivetrain; Air Conditioning Compressor; Cruising Range