HEAT RECOVERY SYSTEMS FOR PASSENGERS VEHICLES

CAR2011_1118

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Within the scope of new environmental standards (Euro 5, 6 and more), it becomes more difficult to reach the objectives of CO_2 emissions and pollutants by the solely optimization of the thermal engine (HCCI, double supercharging, low-pressure EGR, downsizing). Depending on the driving cycle, the ambient temperature and the technology, a thermal engine converts in average up to 30 % of the fuel energy into mechanical shaft work. A significant proportion of the rest of energy (approximately 60 %) is wasted through the cooling liquid and the exhaust gases. Thus, it would be possible to convert this wasted heat in order to improve the engine overall efficiency and reduce the fuel consumption of the vehicle.

This shows the big interest in energy recovery systems. This paper presents the various systems enabling the recovery of this energy. A Rankine cycle, widely used in the industry, is of particular interest. The efficiency of energy conversion varies from 5 to 20 % depending of its conception (working fluid, architecture, coupling…).

Moreover, the layout of the Rankine cycle integrated within a vehicle depends on the choice of the working fluid as well as the technologies of the components i.e. the expander, the evaporator, the condenser and the pump. Within this context, the issue regarding the mass and the size of the system has to be considered.

Finally, we present several solutions of Rankine systems for passenger car application and show each advantage and limits.