

Adsorptive Waste Heat Based Air-Conditioning Control Strategy for Automotives

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Abstract : As the trend in automotive technology is fast moving towards hybridization and electrification to curb emissions as well as to improve the fuel efficiency, air-conditioning systems in passenger cars have not caught up with this trend and still remain as the major energy consumers amongst others. Adsorption based air-conditioning systems, e.g. with silica-gel water pair, which are already in use for residential and commercial applications, are now being considered as a technology leap once proven feasible for the passenger cars. In this paper we discuss a methodology, challenges and feasibility of implementing an adsorption based air-conditioning system in a passenger car utilizing the exhaust waste heat. We also propose an optimized control strategy with interfaces to the engine control unit of the vehicle for operating this system with reasonable efficiency supported by our simulation and validation results in a prototype vehicle, additionally comparing to existing implementations, simulation based as well as experimental. Finally we discuss the influence of start-stop and hybrid systems on the operation strategy of the adsorption air-conditioning system.

Keywords : adsorption air-conditioning, feasibility study, optimized control strategy, prototype vehicle

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