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# Simulative Potential Analysis of Combined Waste Heat Refrigeration using Ammonia in an Intercity Bus on dynamic route

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## Abstract

In this work, a simulative potential analysis of a possible topology for combining waste heat recovery and passenger compartment refrigeration using ammonia is carried out. The focus is on the energetic assessment using a detailed simulation model of a long haul intercity bus.

The topology combines a conventional refrigeration cycle with an Organic Rankine Cycle (ORC). Both systems share the working fluid and the condenser. The used refrigerant is Ammonia (R-717). Expansion machine and compressor are both connected to the drive belt of the vehicle. In order to evaluate the fuel consumption reduction potential of that topology the intercity bus simulation model, equipped with a CO<sub>2</sub> (R-744)-refrigeration system, is used as a reference.

The results show that using an Organic Rankine Vapor Compression Cycle (ORVC) equipped with ammonia leads to an effective reduction of fuel consumption for a long-haul journey. The ORVC topology reduces fuel consumption by 7.9 %.

*Keywords:* ORC, ORVC, CO<sub>2</sub>, Ammonia, R-744, R-717