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Electric vehicle user-centric design for optimised energy efficiency

GRANT AGREEMENT No. 769902

Design OptiMisation for efficient electric vehicles based on a USer-centric approach

DOMUS – Deliverable Report

D5.2 – Pre-conditioning strategies and components

Deliverable No.	DOMUS D5.2	
Related WP	WP5	
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1 Publishable summary

This document is intended at providing an overview of the development of:

- preconditioning strategies aimed at optimizing the operating conditions at vehicle level (cabin & powertrain),
- and of a high energy density thermal energy storage (TES) subsystem, including the investigation and development done on innovative materials that are able to reduce the thermal losses and to store the thermal energy as long as possible.

Based on the vehicle level requirement and specifications, use cases and packaging study defined in Work Package (WP) 1 and in WP5:

• powetrain and passenger comfort preconditioning strategies of the addressed vehicle, when driving or not, have been of interest and investigated to provide additional benefit for systems start-up in cold-starts situations, even at moderate temperatures.

• a thermal energy storage subsystem of 3 MJ energy density will be developed, based on the latent heat accumulation of Phase Changing Materials (PCM), for capturing otherwise wasted thermal energy from both preconditioning phases, when the vehicle is plugged to the power grid and when remaining heat fluxes that would otherwise be lost; for use by vehicle thermal comfort, particularly at start-up.

The TES component will be added to the usual coolant loop of the vehicle.

Mainly two types of materials have been investigated and implemented:

- First, a family of materials based on PCM with adequate thermal properties as a high thermal conductivity (when macro-encapsulated) and a very strong capacity for energy absorption.
- Second, a super thermally insulating material based on organic aerogel technology with very low thermal conductivity (λ<7mW.m-1.K-1). This super thermally insulating material has been used in a double wall to insulate the TES subsystem.

Further an overview on all the theoretical analysis representing the TES component for virtual assessment and on all the experimental protocol (including their setups) which will be conducted in an efficient way on test benches to validate the developed TES subsystem are presented and qualitatively described along with initial interface definition.

This deliverable is preliminary, as it will be supplemented by a detailed report (related to section **Error! Reference source not found.**) in M25 on the tests and validation of the TES subsystems at component level.