

Thermal Energy Storage using Phase Change Materials at UPCT

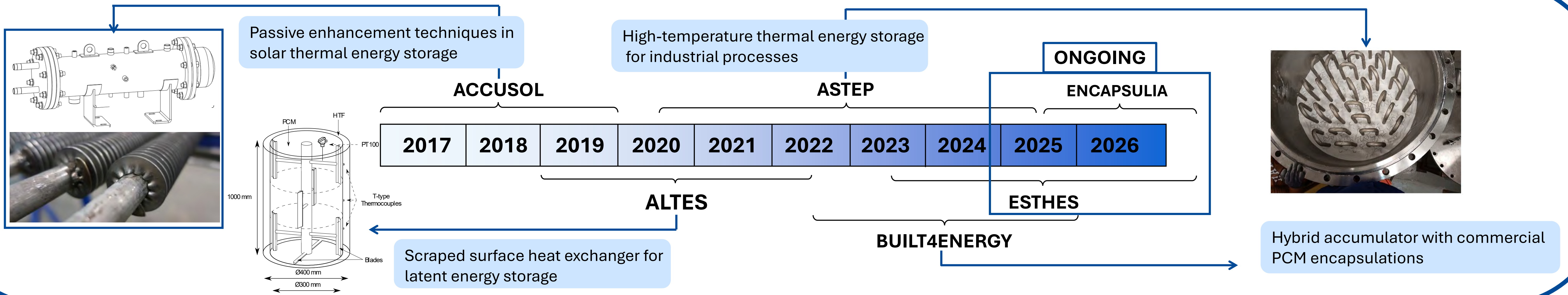
MECITER - Fluid Mechanics and Thermal Engineering Research Group

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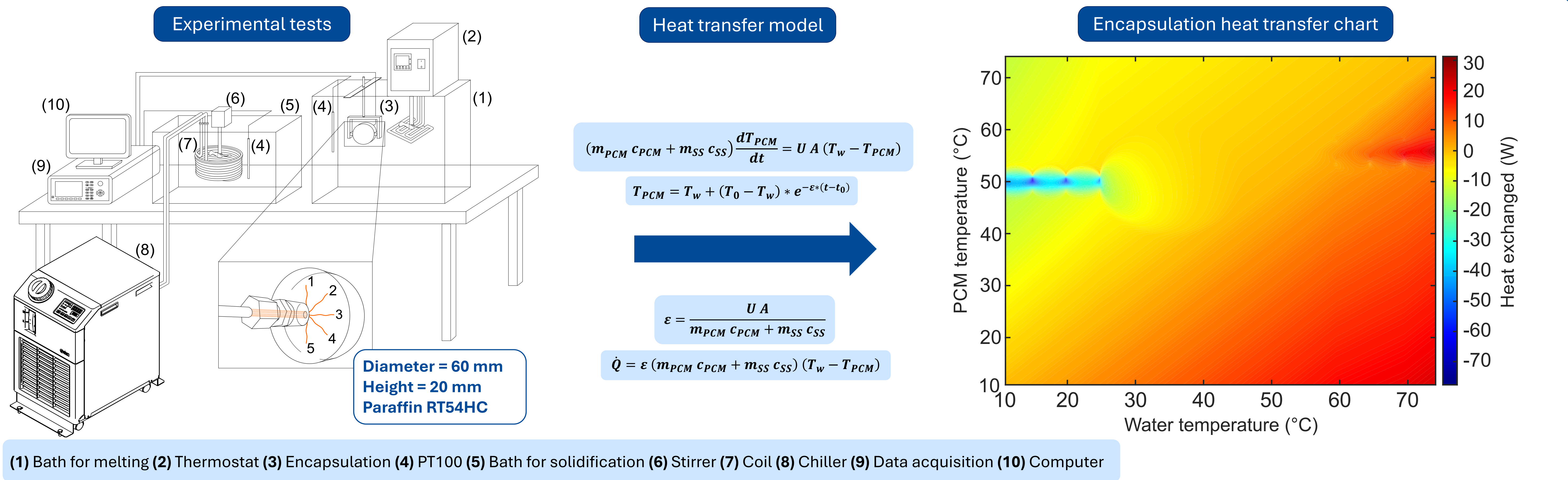
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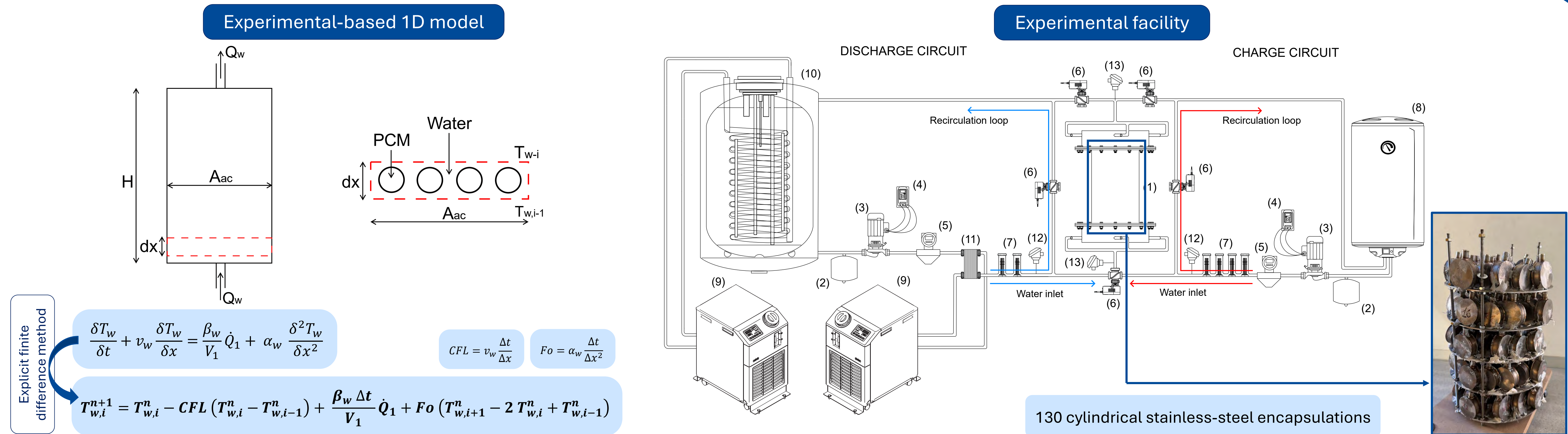
A DECADE OF
RESEARCH ON PCM



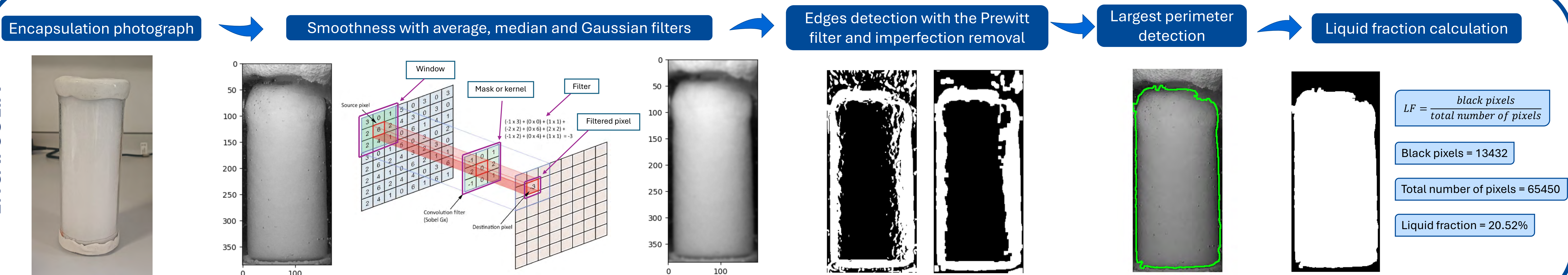
ESTHES: SINGLE ENCAPSULATION STUDY



ESTHES: HYBRID ACCUMULATOR STUDY



ENCAPSULIA



RESEARCH HIGHLIGHTS

MECITER has ten years of experience in PCM-based thermal energy storage, covering different storage concepts and applications, from solar thermal energy to high-temperature industrial processes. Two research projects are currently ongoing, addressing the development and optimization of thermal energy storage systems with PCM encapsulations.

- ESTHES**
 - PCM encapsulations are experimentally characterized under melting and solidification conditions to analyse their thermal behaviour.
 - The experimental results obtained from a single PCM encapsulation are used to develop a heat transfer chart that characterizes their thermal response under different operating conditions.
 - An experimental-based 1D model of a hybrid water-PCM thermal energy storage system is developed.
 - A full-scale experimental facility with a hybrid accumulator prototype is used to perform charging and discharging tests and validate the 1D model.
- ENCAPSULIA**
 - Image-processing techniques are applied to melting test to determine the liquid fraction evolution throughout the process.
 - Artificial intelligence is used to support the optimization of encapsulation design, seeking geometries that enhance heat transfer and improve melting performance.