Two-Session-Clustering Workshop

March 3rd 2021 | SESSION 2: Advanced thermal storages based on phase change materials (PCM) with high power output using open porous aluminum foams

Presenter:

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Advanced thermal storages based on phase change materials (PCM)
OBJECTIVES

- Improve thermal management of car by reducing energy consumption of HVAC system
- Implement PCM storage in power circuit
- Use waste heat for charging
- Use PCM to support, e.g., the heat pump

- REQUIREMENTS:
  - 500W, 5min (42Wh minimum capacity), small volume, working temperature 15-20° C
- CHALLENGE:
  - high power for loading/unloading required
  - PCMs generally exhibit low heat conductivities

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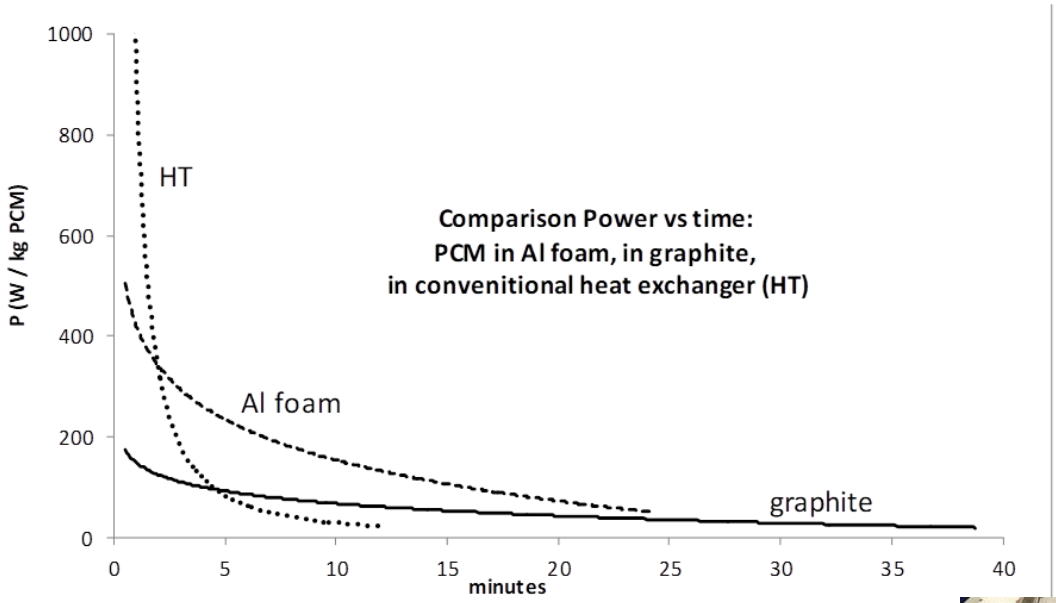
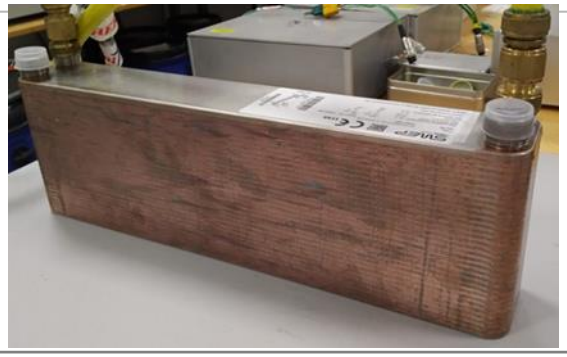
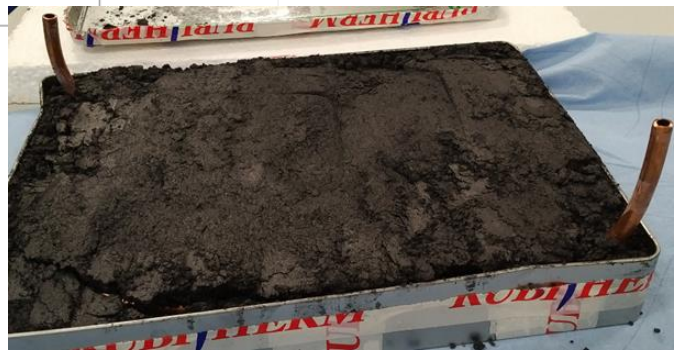
Advanced thermal storages based on phase change materials (PCM)

APPROACH: Different storage concepts were compared







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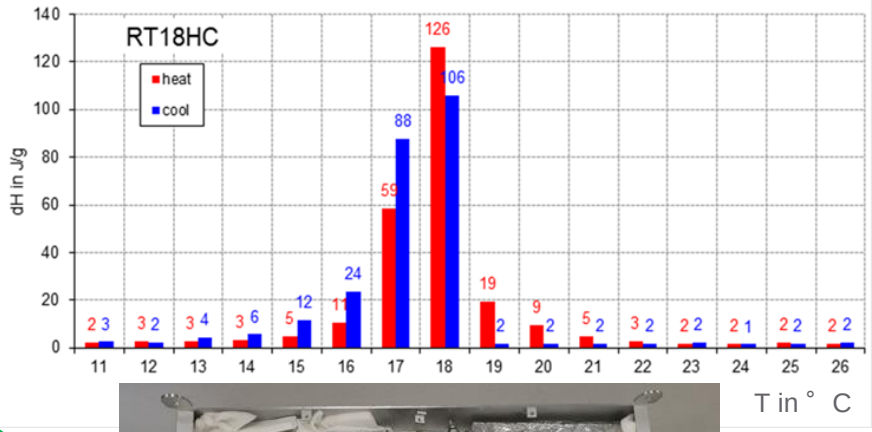
Advanced thermal storages based on phase change materials (PCM)

APPROACH: focus on Aluminium foams

- Box dimensions: 490x275x80

- **26 parts** in series → 52 connections
- 1.4kg RT18HC
- 119Wh in range 8-28° C
- 410cm tube length



- **4 parts** in series → 16 connections
- 1.2kg RT18HC
- 102Wh in range 8-28° C
- 240cm tube length

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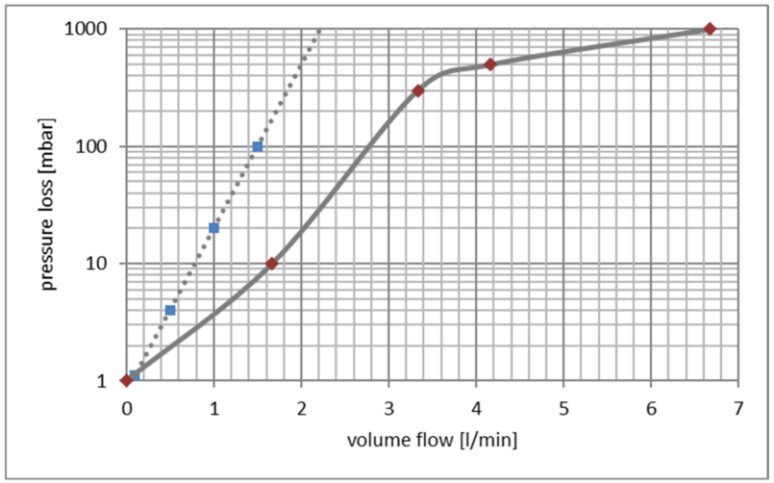
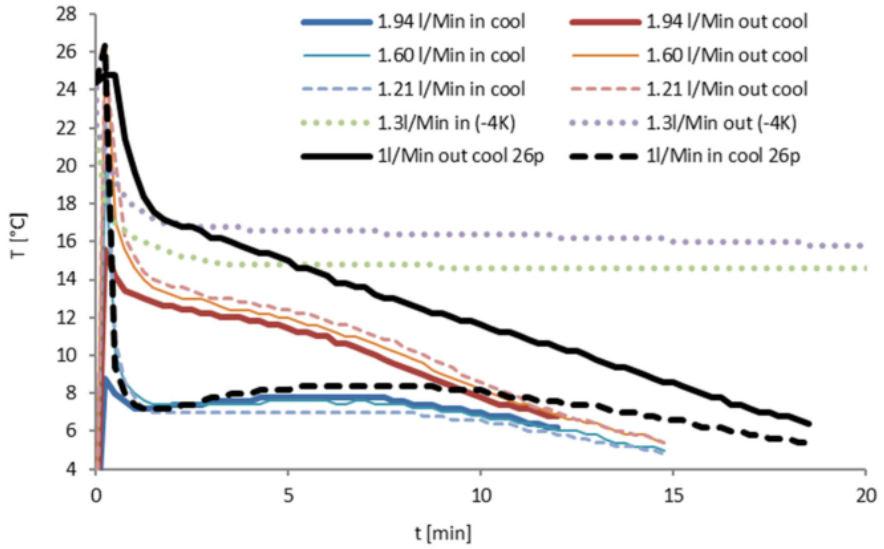
Advanced thermal storages based on phase change materials (PCM)
RESULTS: pressure loss and volume flow



- 26 parts storage
- 4 parts storage
- Bends and connections increase pressure loss in 26p storage
- Limits volume flow with available equipment

- Discharging using different volume flows
- Initial temperature HTF <8° C
- For -4K HTF at inlet 14° C



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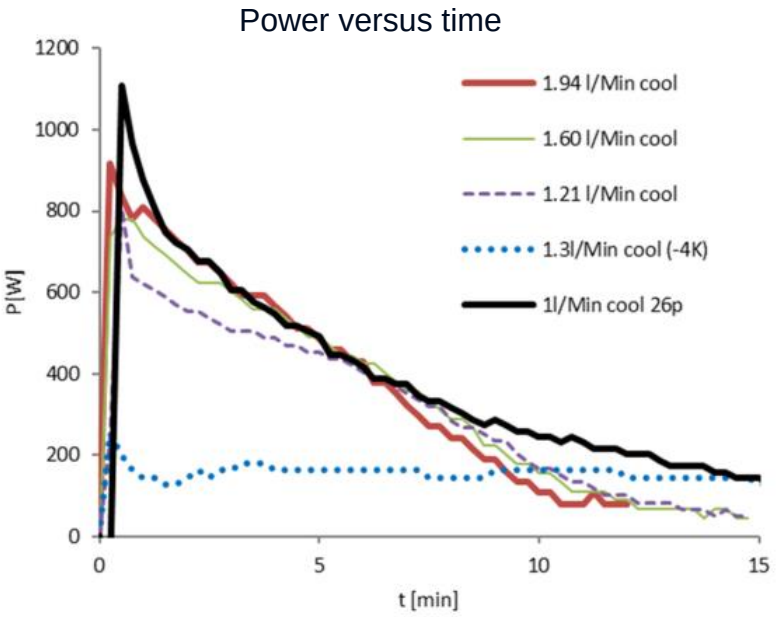
Advanced thermal storages based on phase change materials (PCM)
RESULTS and perspective

- Measurement of both storages are promising regarding the aim: 500W, 5min
- If temperature gradient is sufficiently high
- Room for improvement has been found
- e.g. in case of 4p storage the heat transfer to HTF is the limiting factor



- However next step: see how the prototype works in the HVAC system

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Thank you for your attention!

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Get in touch with the QUIET consortium!

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