CARD Webinar Audience Questions & Answers

Field study of phase change material (PCM) use for passive thermal regulation

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Presumably the benefits will increase as temperatures shift and extremes are more frequent, has there been any modeling or analysis to account for that?
The energy modeling used historic weather data (Typical Meteorological Year) and did not explore the use of future weather data. As the climate changes, overall higher temperatures could lead to higher cooling savings (and potentially less heating savings) from a strategy like PCM. The research team does not expect to see an increase in large diurnal temperature swings, which PCM can use for night flushing (free cooling of the space/PCM during the heating season).

Did the team learn anything about the risk for condensation on the PCM panels as a function of its freeze temperature, installation location, or HVAC configuration?
The research team did not study the risk of condensation forming from the PCM panels. At multiple site visits, the study team did not notice any condensation on the PCM tiles' surface.

> **Follow-up: Dew point is the important temperature for determining condensation risk.**

Question about Cost-effectiveness: Have you explored the possibility that PCM panels enable setbacks that are acceptable to occupants compared to non-PCM setbacks?
The research team assumed that the presence of PCM would not impact the acceptability of nighttime temperature setbacks for building occupants since these temperatures occur when the building is not occupied. The nighttime setbacks used to activate the PCM differed little from the nighttime setbacks that were in place before the PCM was installed. The main exception was that during the cooling season there was a pre-cool period in the early morning hours before occupancy that should not have changed the indoor temperatures at the time occupants arrive at the building.

> **Follow-up: Then is it reasonable to deduct non-PCM setback impacts from the PCM savings?**
> Since nighttime temperature setbacks can be equally applied to a building with or without PCM, the research team found it reasonable to attempt to isolate the impacts of the setbacks from the impacts of the PCM itself.

How was the difference in weather/climate accounted for in the year-on-year comparison?
The research team modeled daily energy on the observed data and imposed the model outputs on Typical Meteorological Year (TMY3) data to weather normalize the results.

Are there any plans to study chilled water applications of PCM in HVAC systems or industrial refrigeration applications in MN.
Project partner Slipstream is currently working on a separate CARD-funded project to study the use of PCM in refrigeration applications, primarily for food processing, storage, and sales. The project is still accepting participants and there are incentives for participants, so please reach out if you're interested

in more information. For other HVAC applications, project partner Slipstream is reviewing the potential for use of PCM in some other work (not CARD-funded). Chilled water does not appear to be leading application in any current investigations. (Unless you are considering ice, which is technically a PCM.)

If you were to focus on afternoon demand savings instead of reduced energy use, would that impact your selection of freeze temperature and control?
Yes, PCM selection can be optimized based on how the project prioritizes peak demand, cooling energy, heating energy, total energy, energy costs, and carbon.