Energy Efficient Phase Change Materials (PCM) Insulation

EW-201149

Objective | Technology | Benefits

Objective

This project will demonstrate the advantages of blown-in phase change materials (PCM) based insulation to mitigate energy loss in building envelopes. The technology addresses the problem faced by the Department of Defense (DoD) to reduce energy intensity (BTUs per square foot) by 3% per year or 30% overall by 2015 from the 2003 baseline, as per the Energy Independence and Security Act of 2007. Under DoD's High Priority Performance Goals, the interim target is an 18% reduction by the end of 2011. Energy monitoring instrumentation will be installed on a selected building at Fort Bragg, North Carolina, and the efficacy of the current fiberglass insulation will be monitored for 1 year. Cellulose insulation with PCM will then be blown into the attic just above the drop ceiling, and the energy usage will again be monitored for 1 year, and compared.

Back to Top

Technology Description

The PCM insulation to be demonstrated is made by combining cellulose insulation with hard shell polymer microcapsules (2-20 microns in diameter) that contain organic fatty acids and fatty acid esters as core materials. The core materials change phase from solid to a liquid or semi-liquid to prevent excessive heat flow and maintain comfortable temperatures; they exhibit a "thermal mass effect," i.e., capacity to store energy as latent heat. On very hot days the PCM will prevent outside heat from entering the building by changing phase to soak up the extra heat, thus reducing the cooling load. On cold days, the PCM helps to conserve heat energy escaping into the walls, by storing that energy as "latent heat." The latent heat is released back into the building as "sensible heat" when the temperature drops at night. This project will attempt to show that significantly less energy is required to maintain comfortable temperatures using the PCM insulation in attics, compared to the currently used fiberglass insulation.

Back to Top

Benefits

The innovative PCM-based insulation technology is expected to enhance energy efficiency in heating and cooling buildings in moderate climates by reducing excess sensible heat in the summer and reducing heat loss in the winter. The anticipated cost of this technology is 40% greater than the cost of standard insulation; however, the technology is expected to save 30% of the annual cost of energy for heating and

Points of Contact

Principal Investigator
Dr. Larry Stephenson
U. S. Army Corps of Engineers
ERDC-CERL
Phone: 217-373-6758 xx 675
Larry.D.Stephenson@usace.army.mil

Program Manager
Energy and Water
SERDP and ESTCP
ew@serdp-estcp.org

Document Types

Fact Sheet - Brief project summary with links to related documents and points of contact.

Final Report - Comprehensive report for every completed SERDP and ESTCP project that contains all technical results.

Cost & Performance Report - Overview of ESTCP demonstration activities, results, and conclusions, standardized to facilitate implementation decisions.

Technical Report - Additional interim reports, laboratory reports, demonstration reports, and technology survey reports.

Guidance - Instructional information on technical topics such as protocols and user's guides.

Workshop Report - Summary of workshop discussion and findings.

Multimedia - On demand videos, animations, and webcasts highlighting featured initiatives or technologies.

Model/Software - Computer programs and applications available for download.

Database - Digitally organized collection of data available to search and access.

cooling. (Anticipated Project Completion - 2014)

Back to Top

Strategic Environmental Research and Development Program (SERDP)
Environmental Security Technology Certification Program (ESTCP)
Phone (571) 372-6565 | Fax (571) 372-6386
4800 Mark Center Drive, Suite 17D08, Alexandria, VA 22350-3605