

Application of phase change materials in nuclear facilities

Nuclear experimental facilities are sensitive to thermal variation and fluctuation of temperature, which can lead to unstable work and emergency situation. One of the idea to solve those problems is utilization of phase change materials (PCM). In the first part of article, the authors introduce PCM topic: describe types of PCM, thermal and chemical properties, advantages and disadvantages of particular materials. Second part presents the applications of PCM in nuclear facilities. Finally, the new idea of the PCM application in nuclear facilities is described. The concept assumed the use of the PCM thermal system for maintaining stable temperature in the nuclear research facilities by implementation of the PCM storage tank. Many nuclear systems need to cool down or warm up devices to the required temperature. Control systems for chillers and heaters allow achieving temperature accuracy ± 0.5 K. Location of PCM storage tank before the nuclear devices can compensate temperature fluctuations and keep the quasi-constant conditions. When the temperature of the fluid is too high PCM storage excess thermal energy while the temperature is lower than expected, PCM heated it up. Authors present schemes with possible applications of PCM storage tank in the nuclear facilities and describe advantages and disadvantages of each solution.

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