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Optimum configuration for roadway embankment stabilization on permafrost using constructal law

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Constructing surface facilities on the permafrost soils is an engineering challenge. Moreover, evading the thaw-settlement on roadway embankments is not an easy task due to the shifting thermal regime under the ground soil in accordance to the seasonal temperature variations. Out of all the engineered cooling solutions available to stabilize the permafrost soil, the usage of thermosyphons has attracted many researchers through its outstanding results compared to other cooling methods. The only limitation in using thermosyphons is of their high cost. In this research, optimization of thermosyphons is the primary goal. We are using constructal law for this, which accounts for the universal tendency of freely morphing flow systems to generate configurations that evolve towards greater access for their currents. The areas of interest in the research are to compare the cooling effects and to find the optimal spacing between thermosyphons for both parallel evaporator and the bifurcated evaporator (T, Y and U sections), to find the ideal bifurcation level and analyze the cooling effects of different bifurcated level models.

Biography

Sunwoo Kim received his PhD degree in Mechanical Engineering and Materials Science from Duke University in 2008. Upon graduation, he began his Post-Doctoral career, working as a Research Assistant Professor at the University of Nevada, Reno. In 2010, he joined the Mechanical Engineering Faculty of the University of Alaska, Fairbanks. His research interests are in a board spectrum of enhanced heat and mass transfer and renewable energy systems.

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