

Smart Earth Soil to Air Heat Exchanger

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Abstract: *Conventional soil-to-air heat exchangers (SAHX) leverage the stable ground temperature for pre-heating or pre-cooling ventilation air. However, their performance can be limited by factors like static control strategies and a lack of real-time environmental data. This project proposes a novel approach for a smart and data-driven SAHX system. The proposed system integrates sensor technology for monitoring soil temperature, air temperature, humidity, and potentially soil moisture. This real-time data will be used to train and implement machine learning models for predicting heat transfer efficiency. The model's insights will be utilized by a control system to dynamically adjust airflow rates, fan operation, or other control parameters for optimal performance. This project aims to develop a prototype SAHX system with the following key features: Sensor Integration: Utilize sensors to capture real-time environmental data. Data Driven Optimization: Train machine learning models to predict heat transfer efficiency based on sensor data. Adaptive Control System: Implement a control system that utilizes model predictions to dynamically optimize airflow and heat transfer. The successful implementation of this project has the potential to significantly improve the efficiency of SAHX systems. By leveraging data-driven insights and adaptive control, the system can optimize thermal comfort while minimizing energy consumption in buildings.*

Keywords: Smart Soil-to-Air Heat Exchanger, Smart power management, Soil to air exchanger, SAHX system

