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# Designing a Calorimeter to Calibrate an Optical Radiative Flux Measurement System to Find the Power Entering a Solar Reactor

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**Designing a Calorimeter to Calibrate an Optical Radiative Flux Measurement System to Find the Power Entering a Solar Reactor**

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A solar furnace has been constructed at Valparaiso University to test the performance of various solar chemical reactors. A primary performance index of a solar chemical reactor is the efficiency, or the fraction of the energy that enters the reactor that is utilized in the chemical reaction. To calculate this efficiency, we must first know how much solar power is entering the reactor. An optical radiative flux measurement system has been developed that gives the solar flux distribution over the aperture of the reactor, but must be calibrated to provide the actual power level. Therefore, a calorimeter was designed and built to perform this calibration. The calorimeter is designed so that the solar power entering the aperture is transferred to water flowing through the tubes that make up the cavity. Then, by measuring the flow rate of the water and the temperature of the water at the inlet and outlet, the energy entering the calorimeter can be calculated using the first law of thermodynamics. The uncertainty in the calculated power level has also been established through a thermal loss and measurement uncertainty analysis.

*Information about the Author:*
Jesse Fosheim is a senior mechanical engineering major from Green Bay, Wisconsin. Jesse is also minoring in electrical engineering and math and is a member of Christ College. Jesse became involved in the solar furnace research because of his interest in sustainable energy. After finishing his five years at Valparaiso University, Jesse plans on continuing his education by pursuing a PhD in mechanical engineering with a focus on thermosciences and sustainable energy.

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