

Technical Report

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FEASIBILITY STUDY OF SOLAR CREMATORIUM



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Preface

The Gujarat Energy Development Agency (GEDA), a nodal agency involved in promoting renewable energy in the State of Gujarat, intended to investigate into the possibility of employing solar energy for the Hindu ritual of cremation. In order to design the broad scope of specifications for solar crematoriums, there arose a concern regarding its performance considering the sentiments connected to the cremation process. The Gujarat Energy Research and Management Institute (GERMI) was given the task of studying the feasibility of solar crematoriums and providing accurate and sufficient specifications in order to ensure their successful implementation. The document is the final report by GERMI to GEDA validating the solar crematorium system.

Executive Summary

While cremation is an established Hindu ritual practiced since ancient times, there is much scope for renewable energy and energy efficiency applications in this ritual. On one hand, biogas cremation systems are already demonstrated; however, the cremation process is yet to experience an established solar thermal application. On the other hand, there have been a few demonstrations of solar thermal systems ranging from community cooker applications to generating electricity, where temperatures range from $\sim 1,000\text{ }^{\circ}\text{C}$ to $\sim 3,000\text{ }^{\circ}\text{C}$, respectively.

Wolfgang Scheffler performed initial experiments to construct a solar crematorium in 1998 using small reflectors of area 3.4m^2 , but achieving concentrations of up to 670 Suns and temperatures up to $800\text{ }^{\circ}\text{C}$, thus establishing the feasibility of solar crematoriums.

An existing, but non-operational, solar crematorium installation was studied at the *Muni Seva Ashram* at Goraj near Vadodara, Gujarat. Theoretical calculations of the solar crematorium at Goraj indicate temperature limits at $1,341\text{ }^{\circ}\text{C}$, which is in agreement with previously measured experimental temperatures of $1,050\text{ }^{\circ}\text{C}$ for this system, and a chamber insulation efficiency of about 80%.

In order to successfully procure and operate a solar crematorium, specifications and recommendations for the (i) system design, and (ii) guaranteed performance parameters are given. The system design specifications primarily include controllability, stability and accuracy of the support structure; well-specified reflectors; and insulation and operation of heat exchanger in the cremation chamber. The parameters requiring guarantees include thermal efficiency of the cremation chamber; time taken to reach cremation temperatures and complete cremation process; limit of system degradation; and guaranteed service life of the system at 5 years.

Further, a broad Standard Operation Procedure (SOP) and System Validation Method are recommended. These procedures are supported by sensors which are also recommended.

In conclusion, it is established that a well-designed and maintained system is capable of solar cremation. Utmost care should be taken in maintaining such a system and operating at appropriate weather conditions. It is finally recommended that such systems should be highly promoted to conserve energy and foster a cleaner environment.

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