DEVELOPMENT OF A SOLAR CREMATORIUM

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ABSTRACT

In this paper we are going to describe the most recent developments in our ongoing work in India to build a Solar Crematorium.
The project went through many stops and goes, but in the last years we made some considerable progress and are now quite confident to have a working full size prototype ready by the end of this year.
A special Scheffler reflector was developed for this purpose, with an increased concentration ratio of about c = 600 and 50m² reflector surface.
It is designed to heat a 2m long cremation chamber to above 700 C.

Keywords: Solar Crematorium, Scheffler Reflector, India,

1. INTRODUCTION

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2. BACKGROUND

The idea was born by a group of Indians from the town of Valsad in Gujarat, India, about ten years ago.

After seeing some Scheffler reflectors there, they approached Deepak Gadhia and the author and asked whether this technology could be used to construct a solar crematorium.

In India, most of the dead people are traditionally cremated on an open woodpile.
Between 200 and 300 kg of wood are used for this.
In towns, the wood is to some extent replaced with electric and gas fired cremation chambers.
A solar powered cremation chamber will be another very much welcome alternative.

3. THIS PROJECT

The Solar crematorium is developed by the author jointly with Ronnie Sabawalla of Rashron Energy and Auto limited in Baroda, Gujarat, India.

In 1998 we started with a specially designed Scheffler reflector with 50m² mirror surface.
But its initial concentration-factor of about c = 100 turned out to be by no means enough to allow proper cremation.

As a next step we undertook experiments on a much smaller scale to establish what would be the correct conditions for a successful solar cremation.
First we used the focus of different sized fresnel lenses, which provided high enough temperatures to melt even stones, but with very limited power due to their small size.

Later we continued with an experimental reflector of 3.4m² aperture and a small cremation chamber.
This set up had the same proportions as the 50m² Scheffler reflector,but downsized by a factor of three.
To simplify the construction the shape was not flexible and therefore the chamber together with the reflector had to be mounted on a 2-axis tracking system.

The opening of the chamber was 8 cm in diameter.
With an aperture area of the dish of 3.4 m² this amounts to a geometric concentration ratio of 670.
Practically, about 1000 W were entering the chamber, heating it up to 700 – 800C.
This was also the minimum temperature which could start immediate combustion of any meat which we entered into the chamber.

Concerning the airflow for combustion, we had two arrangements.

In one, we used a counter-flow heat exchanger to preheat the fresh air with the hot exhaust gases.
A suction blower pulled the hot exhaust gases from the back of the chamber trough the heat-exchanger and out through a chimney.
At the same time a second blower provided the fresh inlet-air, which also passed the heat-exchanger and then entered the chamber.
During operation, the flow of both blowers was balanced so that there was almost no net-flow through the opening of the chamber at the focus.
With this experimental set-up we were able to burn 4 kg of goat meat completely within 35 min. The chamber reached temperatures above 900C in the process.

Fig.1 Experimental set-up for solar cremation in Baroda, India, with two axis tracking of the sun.

Fig.2 View into the glowing chamber during the final stages of the combustion. The focus was moved away to take the picture.

In the second arrangement, we didn't use the exhaust blower.
Instead we just used only the inlet air blower and the hot flue gases left the chamber through the opening at the focus, producing a long visible flame burning off with no smoke.
The maximum chamber temperatures were now lower, in the range of 800C, and the complete burning of 4 kg of goat meat took with 50 min a bit longer.

Fig.3 The flue gases are leaving the chamber through the focus opening and a long flame is seen, burning off without visible smoke.

These trials were completed in the winter 2004-2005.

Now work is in progress to rebuild the reflective surface of the existing 50m² Scheffler reflector to achieve the required high concentration ratio.
At the same time a full size cremation chamber is being prepared.