

Project Summary



Wood-Gasifier Based Crematorium

Installed at *Sanatan Dharm Shamshan Ghat, Chalaunthi, Sanjauli, Shimla*



PARIWARTAN

A voluntary organization endeavoring towards the equitable and sustainable development of the mountainous regions of India

PREFACE

Despite of various environmental and social drawbacks of its usage, firewood still remains a cheap and commonly used fuel in India, where a majority of the population depends upon firewood to meet their domestic energy requirements. The demand of firewood as fuel is generally lesser in urban areas as compared to that in rural areas because of the easier access to newer and efficient means of energy. Still, there are a few activities that require considerable quantity of firewood, both in rural and urban areas. One of these firewood consuming activities is cremation, the traditional burial practice of Hindus. It has been estimated that daily about 20,000 to 30,000 dead bodies are cremated by Hindu tradition in India which requires around 400 to 600 Kg. of fuelwood per cremation in the form of whole wood logs to completely burn the body. Apart from the burden that this firewood consumption puts on the forests, burning of the firewood during the traditional cremation practices produces smoke and unpleasant smell that deteriorates the air-quality of the local environment.

Residents of the village Chalaunthi in district Shimla had been facing the problem of poor air quality for long time due to the cremations taking place in traditional way at the local crematorium i.e. *Sanatan Dharm Shamshan Ghat*, Chalaunthi. This Crematorium is the biggest cremation site of the district and is situated close to Sanjauli, one of the highly populated areas of district Shimla. The crematorium has six cremation platforms which cause severe environmental pressure as around 400 cremations take place at this site every year. The biggest hospital of the state- Indira Gandhi Medical College (IGMC) is situated just 2 KM far from this cremation site. Every week, 2 to 3 unclaimed dead bodies are sent from IGMC to the *Sanatan Dharm Shamshan Ghat*, Chalaunthi for cremation which adds more to the problem of poor air quality. According to the villagers of Chalaunthi, for many years, hardly there has been a day when no cremation took place at this crematorium. The villagers of Chalaunthi were bound to face severe physical as well as psychological health problems as the location of the crematorium is such that the smoke and unpleasant smell from the "open-air" cremations goes straight into the houses of the village.

In the year 2006, 'Pariwartan' decided to deal with this multifaceted socio-environmental issue and started discussions with various departments. The organization got success in 2007 when it got financial assistance from the State Government under the Himachal Pradesh Forest Sector Reforms Project (funded by DFID-UK) for installing an energy-efficient and smoke-free cremation system at the *Sanatan Dharm Shamshan Ghat*, Chalaunthi. The Energy & Resources Institute (TERI), New Delhi provided its patented technology on 'Wood Gasification' to make the project a great success. The project was focused on reducing the fuel-wood consumption and making the cremations smokeless through the introduction of a **Wood Gasifier-Based Cremation System**. The project, which is the first initiative of its kind in the North India region, is contributing immensely in reducing the burden on the local environment by enhancing energy efficiency and maintaining the air quality of the surrounding area.

WOOD GASIFIER BASED CREMATION SYSTEM

An energy efficient technology for tackling a major environmental challenge

Cremation, traditional burial practice of Hindus, is one of the neglected huge biomass consuming activities in our country. It has been estimated that daily about 20,000 to 30,000 dead bodies are being cremated by Hindu tradition in India. The cremation activity alone consumes more than 5 million tones of fuel-wood annually, with fuel consumption of about 400 to 600 kg. per cremation in the form of whole wood logs to completely burn the body. Thus, depriving its usage as an energy source for other needful sectors e.g. meeting household cooking energy demand for which 60% of Indian rural population still depends upon. Many times due to scarcity of fuel-wood or high cost of fuel in urban poor sector, a large number of under burnt dead bodies are often discarded into the rivers at the fate of aquatic disposal, hence reinforcing considerable burden on aqua-system in addition to industrial and sewage pollution.

Disadvantages of present Modern Technologies

- Huge capital cost investments as well as high operating costs
- Long start-up time requirement makes electric crematoria unsuitable in the present energy scenario characterized by frequent power cuts and voltage fluctuations.
- They consume costly fossil fuels such as Diesel/LDO
- High specific fuel consumption (about 100-150 kWh electricity or 25-30 liter diesel per cremation; that too when system is operated round the clock)
- Most importantly, all these modern technologies do not provide psychological satisfaction (According to traditional belief, cremation in flames of wood is considered sacred)

WOOD GASIFIER BASED CREMATION SYSTEM: AN INTRODUCTION

TERI (The Energy and Resources Institute), world renowned premier energy research organization has successfully developed and field-tested an energy efficient and environment-friendly cremation system under MNES (Ministry of Non-conventional Energy Sources) sponsored project. This system uses renewable and eco-friendly biomass gasification technology. TERI's patented down draft Gasifier system (Patent No. 183935 of year 1991) is used here to extend thermal application of Gasifier system for cremation purpose. Gasifier converts solid biomass (woody as well as loose biomass in the form of densified briquettes) into more convenient to use combustible gaseous form, called producer gas, through series of thermo-chemical reactions under reducing environment at high (about 800-1000°C) temperature. Producer gas consists of 15-20% each of Carbon Monoxide (CO) and Hydrogen (H₂) along with traces of Methane (CH₄) and other hydrocarbons. On an average, one Kg. of wood produces 2.5 Nm³ of Producer gas having calorific value of the order of 1000-1200 kcal/Nm³. This combustible gas then can be burned to get clean products of combustion or can be used in internal combustion engine (after cleaning-cooling) to produce power.

While developing the Gasifier based crematorium system, efforts were made not only to make it energy-efficient, eco-friendly, and user-friendly, but special attention is also given to incorporate several factors in order to enhance its social acceptability.

SALIENT FEATURES OF THE SYSTEM

- **Substantial decrease in the fuel-wood consumption;**
Fuel-wood consumption reduced to 100-150 kg. as compared to 400-600 kg per cremation in traditional way. It is also helpful for poor people who do not have enough money to buy 400 to 600 Kg. of fuelwood for cremation.
- **Faster Cremation Process**
About 1-1.5 hours are required for converting corpse into ashes. Heavily populated places not having enough cremation sites, the wood gasifier based cremation system is very useful.
- **Low payback period – about 2 years;**
The installation cost of the wood gasifier based cremation system is about Rs. 18 Lakhs but the system is cost effective considering the reduced quantity of required fuelwood. The higher fuel-costs in cities would further bring down the payback period.
- **Low fixed (capital) and operating fuel cost per cremation;**
Due to low investment required, low specific fuel consumption and switchover from costly fossil fuel to cheap renewable biomass fuel.
- **Potential high social/religious acceptability**
 - ✓ Can charge wood in Gasifier like piling wood on pyre
 - ✓ Can ignite wood in Gasifier and gas torch in burner of chamber
 - ✓ Can break skull form port (window) provided near head
 - ✓ Can get ash and remains for further rituals for putting that in river or so
 - ✓ Cremation in flames of gas obtained from wood is believed sacred
- **Clean Environment (Local: smoke free operation; Global: biomass is carbon neutral)**
The cremation done in a Wood Gasifier based Crematorium does not produce smoke and also reduces the environmental burden on the forest

MAJOR PARTS OF WOOD GASIFIER BASED CREMATION SYSTEM

- **Gasifier** for converting biomass into combustible gas
- **Air Preheater** to obtain preheated air through waste-heat recovery from hot exhaust to enhance operating efficiency and help in achieving higher flame temperature in gas burner
- **Producer Gas Burner** to efficiently burn gas and produce required heat at higher temperature with clean products of combustion. Premixing of heated air helps in achieving complete combustion and achieving higher chamber temperature
- **Cremation Chamber** where dead body is placed on trolley for cremation purpose

KEY STAKEHOLDERS IN THE PROJECT

Himachal Pradesh Forest Sector Reforms Project (HPFSRP)

Himachal Pradesh Forest Sector Reforms Project was launched by the Forest Department of Government of Himachal Pradesh in the year 2003. The project was funded by DFID-UK under the Good Idea Fund scheme, within which, 85 panchayats from Himachal Pradesh were identified for the implementation of small projects pertaining to the sustainable development. The Wood Gasifier Based Crematorium was chosen as a model under the Good Idea Fund by the empowered committee headed by Shri Ram Lal Thakur, Hon'ble Minister of Forests, Govt. of Himachal Pradesh. Shri R.K. Sood (IFS), In-charge HPFSRP, consulted with TERI for the technological input for this project and involved Pariwartaan in the project as the main implementing organization.

The Energy and Resources Institute (TERI), New Delhi

TERI was established in 1974 through a corpus of a few Tata Group companies. TERI provides environment-friendly solutions to rural energy problems; helps forest conservation efforts by local communities; promotes energy efficiency in Indian industry; shapes the development of the Indian oil and gas sector; finds ways to combat urban air pollution; and tackles issues related to global climate change. TERI provided its patented Wood Gasification Technology to the Himachal Pradesh Forest Sector Reforms Project (HPFSRP) for setting up Wood Gasifier Based Cremation Systems in the state. Dr. Sanjay Mande (TERI) coordinated the support provided by TERI by facilitating the technological mechanism of the Wood Gasifier Based Crematorium.

Sanatan Dharm Sabha, Shimla

Sanatan Dharm Sabha, Shimla is a society for community services that works towards the social welfare with a spiritual inclination to help the needy people. The society runs several academic institutions, community centres, crematoriums etc. and helps the poor and needy people with a philanthropic approach. *Sanatan Dharm Sabha* also owns the land of *Sanatan Dharm Shamshan Ghat* at Chalaunthi. Shri Kulbhusan Sood, (President, *SDS*) on behalf of his society, administered the space-allocation related tasks for installing the Wood Gasifier Based Crematorium and also assured further maintenance and proper running of the Crematorium in future.

Pariwartaan, Shimla

'Pariwartaan' is a grassroots level, voluntary organization endeavoring towards the equitable and sustainable development of the mountainous regions of India. Registered at Shimla on May 11, 2005 under the Societies Registration Act XXI 1860, the organization believes in a community-centric approach to maximize the actions for an eco-friendly and equitable development of the Himalayan areas. In the guidance and pro-active involvement of Shri Het Ram Thakur (General Secretary, Pariwartaan), Pariwartaan implemented the project through providing the logistics support and human resource and undertaking overall responsibilities of the project.

Wood Gasifier Based Crematorium installed at
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