Group no:- 17
Team id:-130009539

IMPROVEMENT AND DEVELOPMENT OF MOKSHDA GREEN CREMATION SYSTEM (MGCS)

Project Guidance:

Prof. H.C.Patel

Project type: I.D.P

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ENGINEERING COLLEGE

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5. Amjadali H. Parbadiya

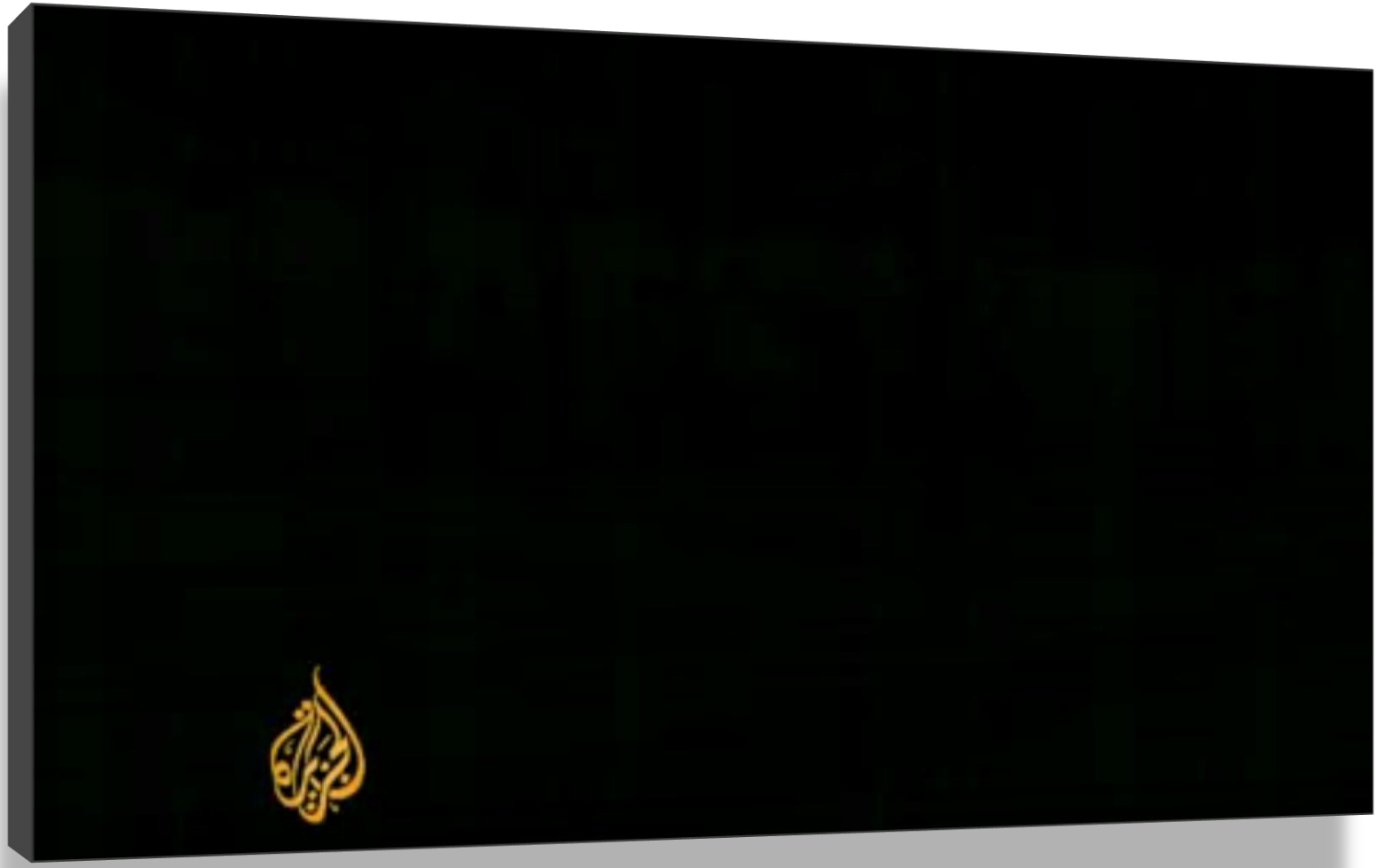
Overview of MGCS

What is MGCS?

- Many NGO's are working in India that are trying to reduce pollution due to cremation sector, as a result of development they developed a system called MGCS(Mokshda Green Cremation System).
- MGCS works on the principle that the collection of flue gases due to cremation and then releasing it outside the atmosphere through chimney.
- This project is the improvement of MGCS which will reduce the emission of flue gases in the atmosphere through chimney of MGCS by refining it using water sprayer or electrostatic precipitator(ESP).
- ESP and water sprayer are carbon capture methods to control the pollutants emission in atmosphere.
- This project is actively taken under the Shree Saraswati Sansthan, Sidhpur.

Why we selected this Project?

During the selection process of project we analyzed that everyone in engineering is trying to reduce the use of conventional sources but there are still some places where we can't avoid using conventional sources, one of them is Hindu Cremation. No one is paying attention on reducing the carbon coming out from crematoria. This is the place where people don't want to avoid rituals and according to Hindu rituals we have to burn dead body which requires large amount of wood that comes by deforestation. We cannot change the rituals but can modify it by applying modern techniques. We selected this project to separate carbon content from exhaust gases and to make cremation environment friendly.



Topics

1. Project Background
2. Project Objective
3. Scope of Project
4. Methodology
5. Methods of Carbon Capture
5. Modelling of Crematorium
6. Blower
7. Working of model
8. Conclusion
9. Reference

Project Background

- Estimates projected from the Census of India reveal that around 4.15 million tones of fuel wood is burnt annually in the cremation sector. There is no dedicated plantation for this use and as such the entire quantity of wood is obtained from forests only .It is estimated that about 40-50 million trees are deforested annually to meet the fuel wood requirement of this sector. Burning wood of this magnitude leads to emission of about 7.5 million tones of greenhouse gas (GHG) CO_2 annually.

- Due to prevailing socio-economic conditions and religious considerations , disposals, of unburnt /half-burnt dead bodies to rivers in a common practice all over the country. people below poverty line often resort to this mode of disposal because of higher cost of cremation, which is mainly on account of wood. Thus, cremation sector puts considerable pressure on environment.

Project Objective

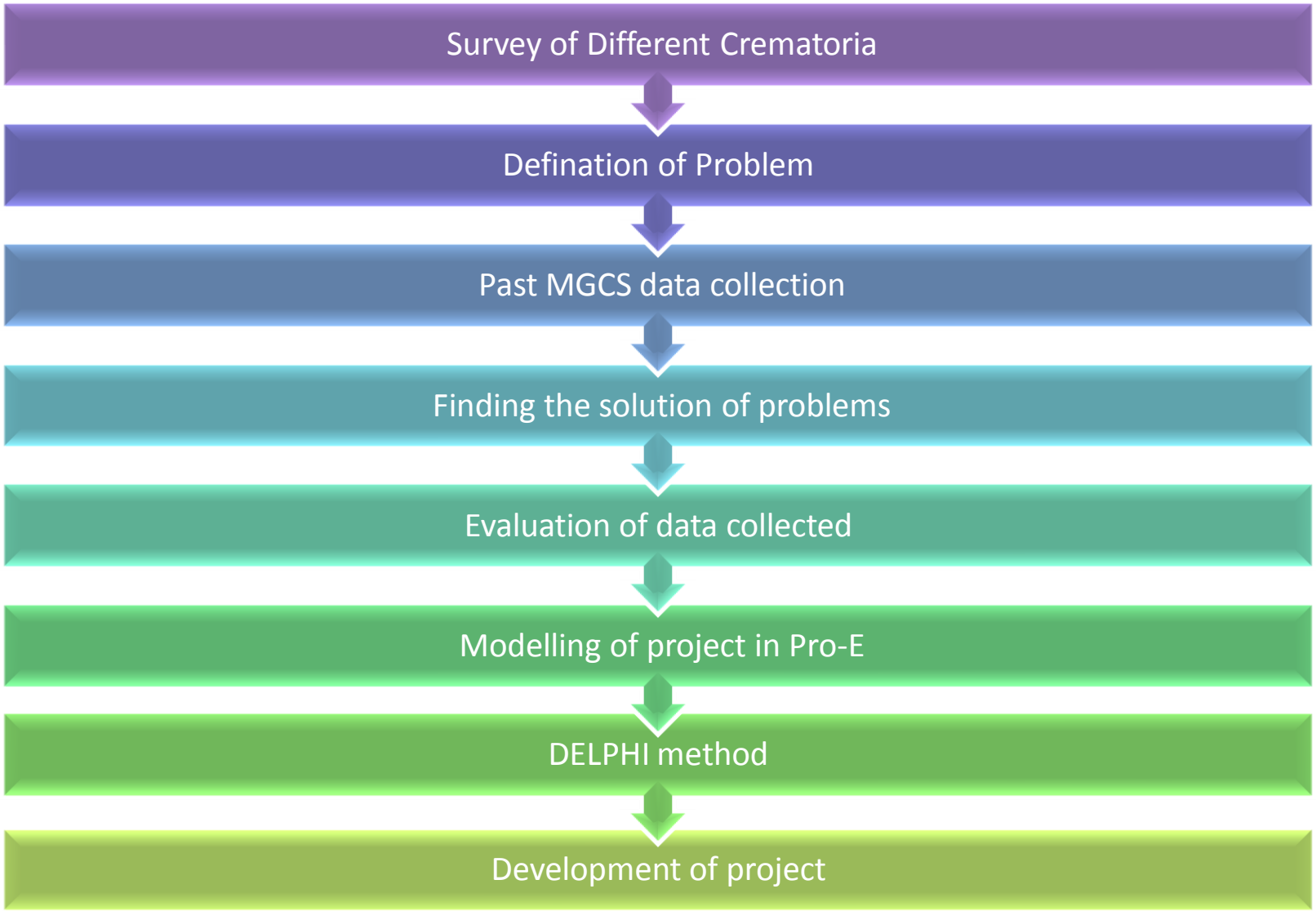
The main objectives of this project is:

1. To reduce the carbon content coming out with the exhaust gases from Mokshda Green Cremation System.
2. To decrease the use of wood from 70% to 75%, which may lead to reduce the carbon dioxide coming out.
3. To reduce the deforestation.
4. To avoid use of gas at a cremation Centre as it may be hazardous and can cause accident.
5. To make cremation environment friendly.
6. To do cremation easily, faster, completely and **according to rituals**.
7. To stop pollution of Air and Water.
8. To reduce the time for complete cremation of dead body.

Scope of Project

- The project aims on increasing the efficiency of cremation by reducing the use of wood and reduces the emission of CO2 by Water sprayer.
- This project mainly aims to reduce air and water pollution. Here air pollution occurs due to burning of woods along with dead body and water pollution when a half burned body is thrown into river due to incomplete combustion, here FD fan, and ID fan is used in this project for complete combustion.
- This project don't harm to any rituals as we are not interrupting with the procedure.
- The project aims at improving the MGCS model already under taken and identifying new techniques of cremation.
- This project will be implemented to nearby cremation center for testing later on will be approved.

Methodology



DESCRIPTION OF METHODOLOGY:

1) Survey of different crematoria:

We will discuss here about the methodology of work done during the semester as shown in a chart above. The steps are discussed here individually to elaborate work easily, among all the steps our first step is very important.

We had visited two crematories, one of them is having MGCS installed and another one is the place where improved MGCS is to be set up.

- **Khaswadi Crematoria, Vadodara.** (MGCS installed)
- **Shree Saraswati Crematoria, Sidhpur** (Improved MGCS to be installed)

Baroda MGCS visit

Baroda MGCS Crematoria

Baroda MGCS measurement

Baroda MGCS evaluation

Khaswadi crematorium.

- We visited different crematoria wherever MGCS is installed and had taken reviews of people operating it about the energy efficiency and cost of operating this system.
- The main objective of taking survey was to analyze that the application of modern technique should not harm the feelings of people or relatives of dead body and completely follow Hindu rituals.

2) Definition of problem:

During the visit at Khaswadi Crematoria, Vadodara while discussing about the MGCS we found that they are facing some problems and their solutions must be done, problems are discussed below:

- The bed is so much congested as the person with heavy body would not fit easily in it.
- The shutter provided around the hoper to prevent the escape of smoke in environment is not of sufficient dimension.
- The I.D. fan is needed between hopper and duct for a continuous drawing of gases evolved due to combustion let it out to the atmosphere.
- Another problem we observed there is that the gases going out from chimney are directly coming in contact with atmosphere along with the ash, so we decided to clean out those gases before releasing it to atmosphere and ash free.

3) Past MGCS Data collection:

The main objective of taking survey was to analyze that the application of modern techniques in MGCS should not harm the feelings of people or relatives of dead body and completely follow Hindu rituals. Our next step was to collect past data of MGCS, means the material used in it and dimensional analysis of whole system to eliminate errors.

4) Finding the solution of problems:

After the completion of two steps, our team had decided to give a proper and powerful solution to the four problems described in step 1. After analyzing each and every aspects of collected data, the outcome is the following solutions.

- A newly designed crematorium is having better spacing as required for placing body on a bed.
- In an improved MGCS, Shutters are provided with a small change of dimension to cover out whole bed for efficient combustion and no smoke come outside. Instead of shutters on two sides we have provided it on all four sides of bed.
- We have decided to provide both I.D. fan and F.D. fan in a system to improve efficiency of combustion and to complete the combustion in a minimum time. This will provide continuous flow of flue gases through hoper and duct.
- The solution for the last and main problem is to provide a water sprayer to stop the carbon/ash particle exposing to the atmosphere which may be helpful in reducing air pollution at a large extent.

5) Evaluation of data collected:

Analysis of a project means the calculation evaluation and manipulation of old data of project to get new and improved results. The data collected for analysis of this project includes the data of pollution occurred due to cremation, data of efficiency of combustion of wood, data of amount of wood required for cremation. The main three gases emits due to cremation that are CO2, CO and CH4. Following are the data collected from different standard resources:

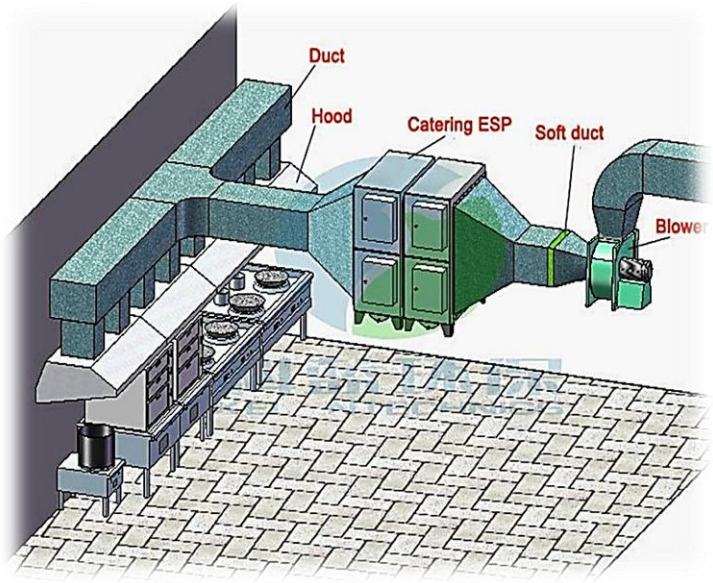
1kg of wood produces 1.805 kg of CO2.
1kg of wood produces 0.2 kg of CO.
1kg of wood produces 0.0187 kg of CH4.

y = amount of pollutant produced in kg.
x = amount of wood used in kg.
A= amount of pollutant released by combustion of 1 kg of wood.

$$y = A * x$$

Table: Pollutant Emission Data.

Fuel (Wood)	CO2 (in kg)	CO(in kg)	CH4(in kg)	Total pollutants (in kg)
1 kg	1.805	0.2	0.0187	2.0237
160 kg (normal cremation)	288.8	32	2.805	323.792.
120 kg (MGCS)	216.6	24	2.244	242.844
90kg (Improved MGCS)	162.45	18	1.683	182.377

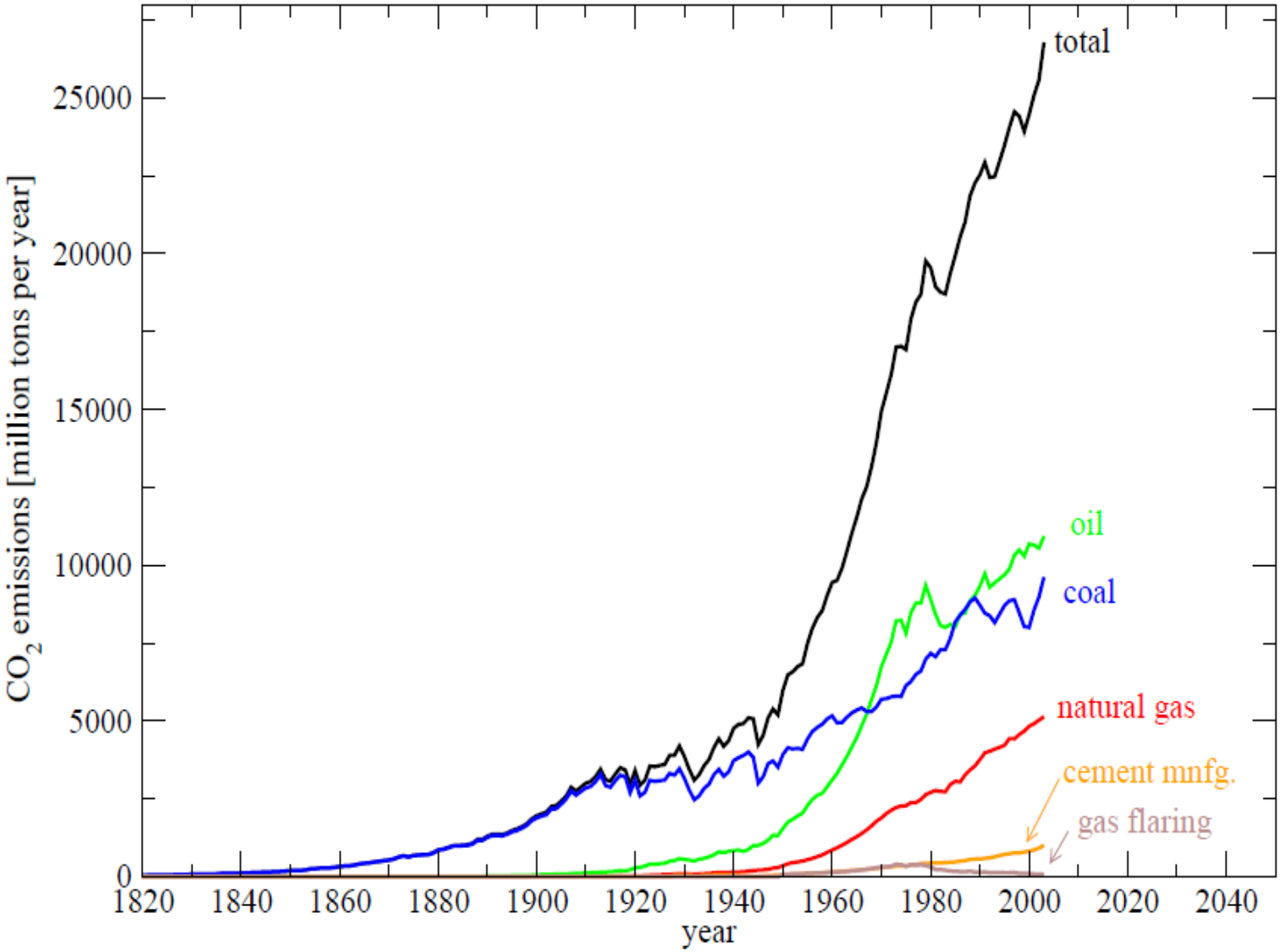


6) Modelling of project in CREO:

Design is the main part of our project so as to provide accuracy in work. The whole design was carried out under the software named Pro-Engineering (Pro-E). We spent much time to learn a software, so that we can work efficiently and easily.

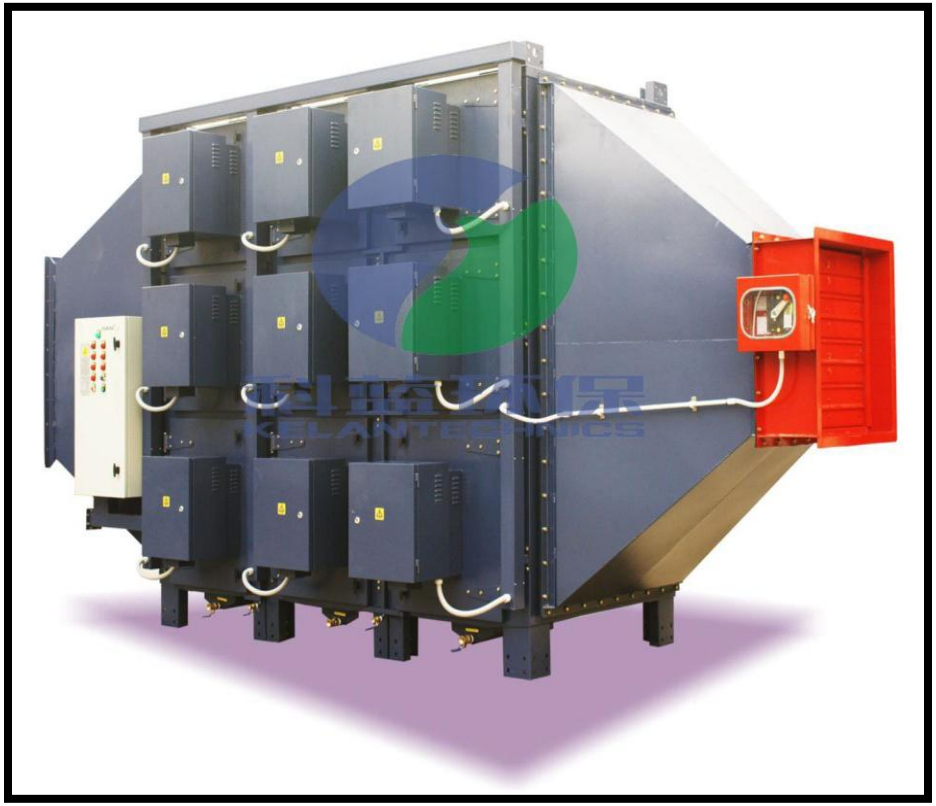
7) DELPHI method:

We have analyzed the design with the help of experts and took review of people on this design and to our surprise we have no negative reviews from public. Many social organizations have supported this design and we found awareness of environment among people.

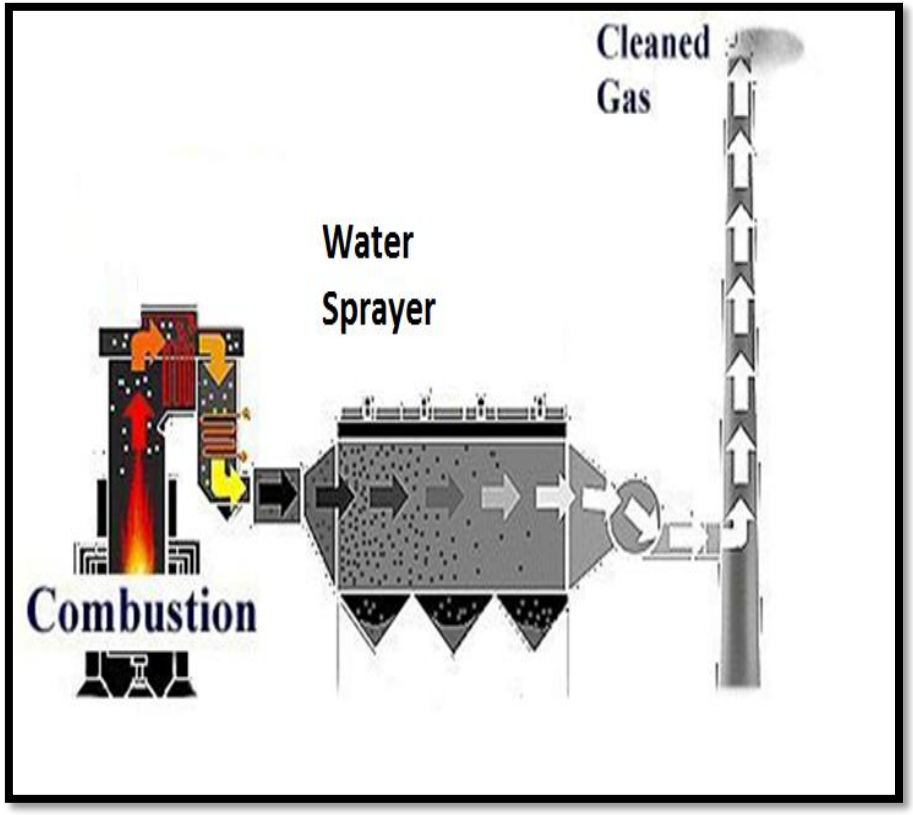

total
oil
coal
natural gas
cement mnfg.
gas flaring
CO_2 emissions [million tons per year]
year
0
5000
10000
15000
20000
25000
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
2020
2040

METHOD OF CARBON CAPTURE:

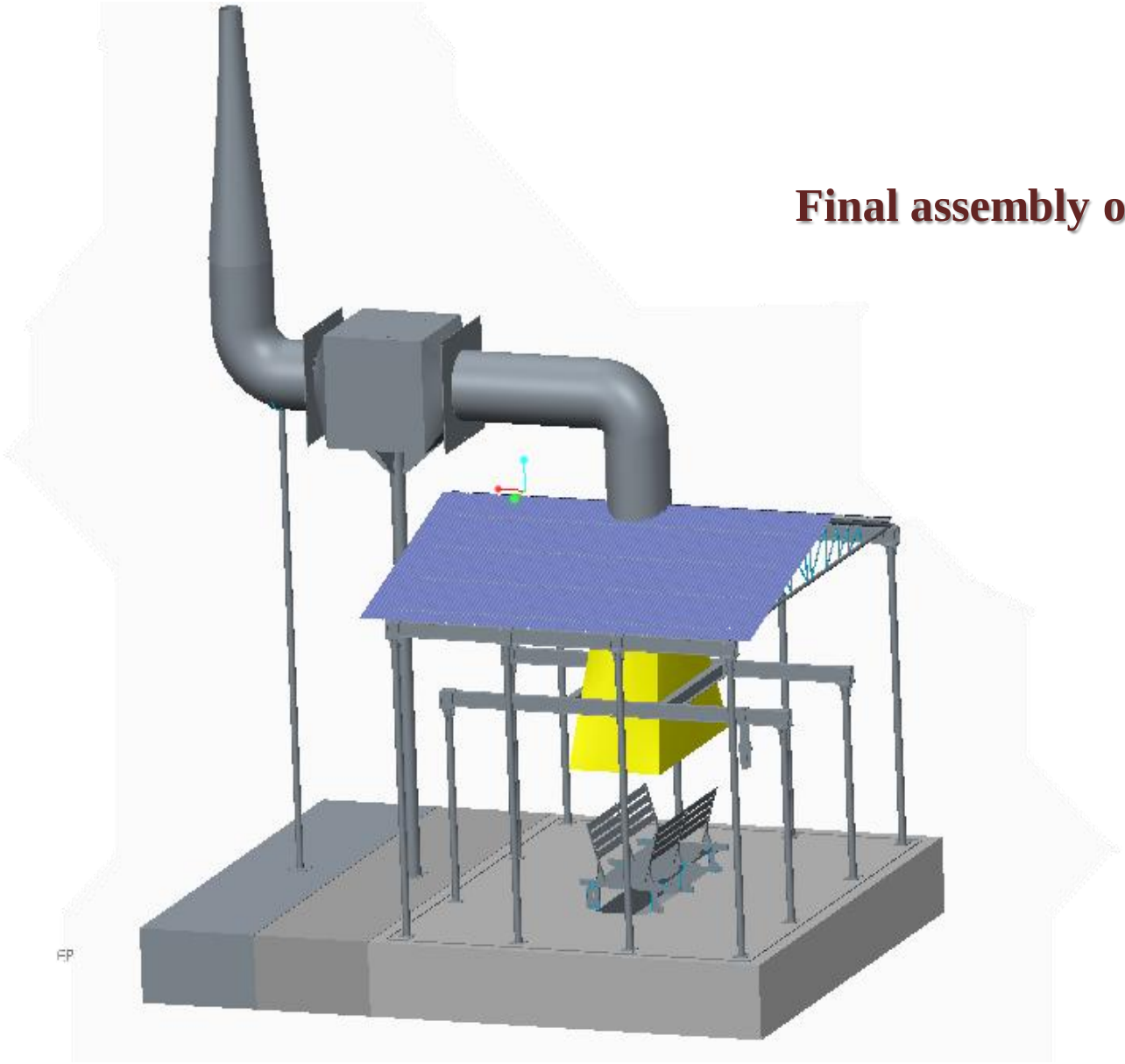
Electrostatic Precipitator Method



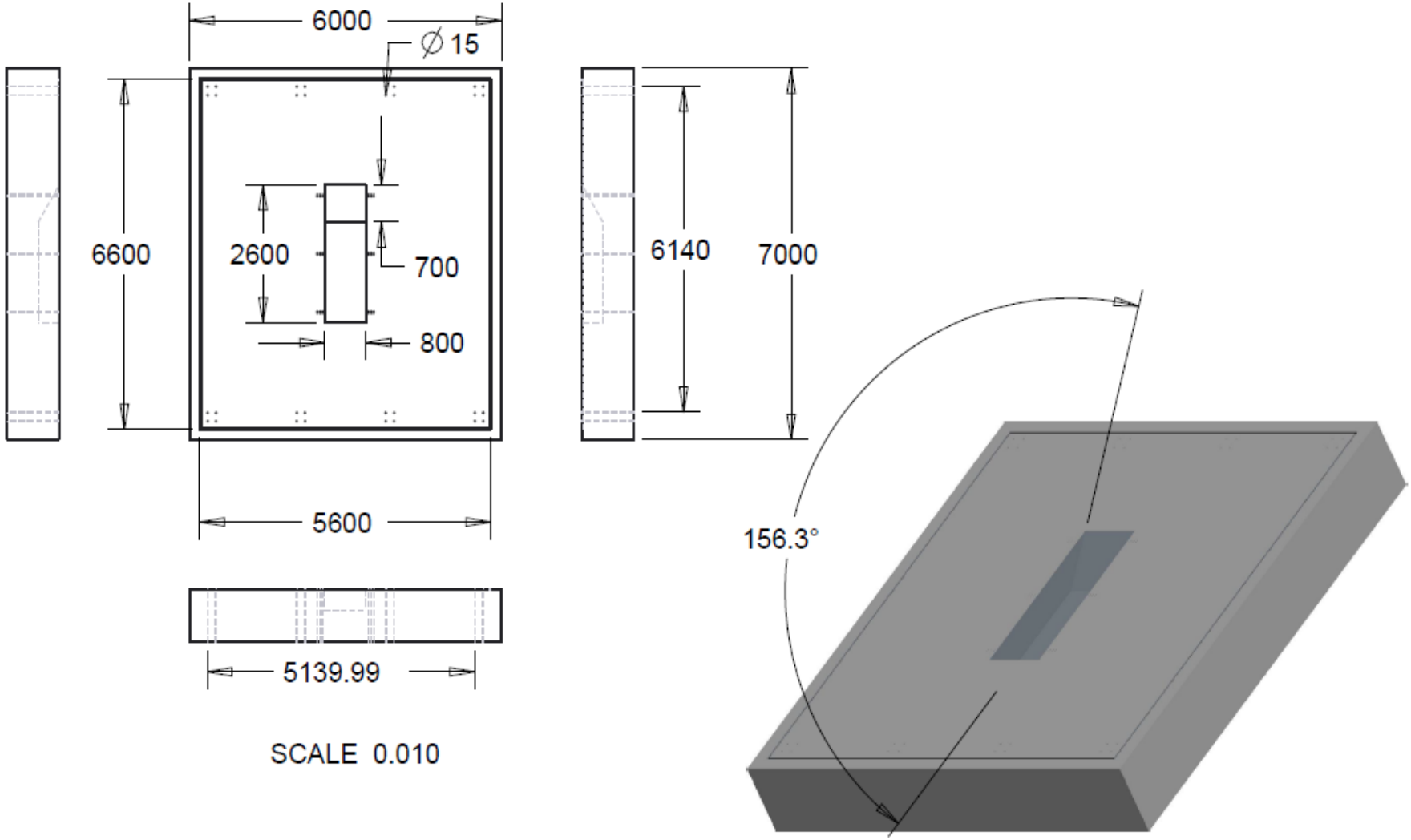
Water Sprayer Method



Modelling of improved crematoria

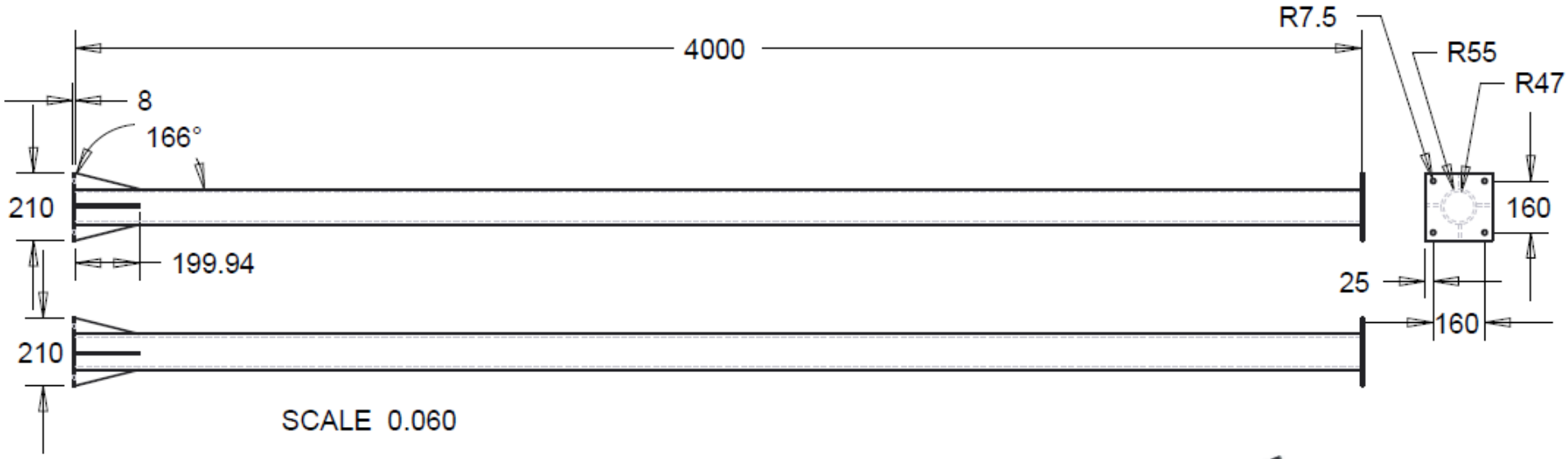


Final assembly of project



SCALE 0.010

GROUNDPART



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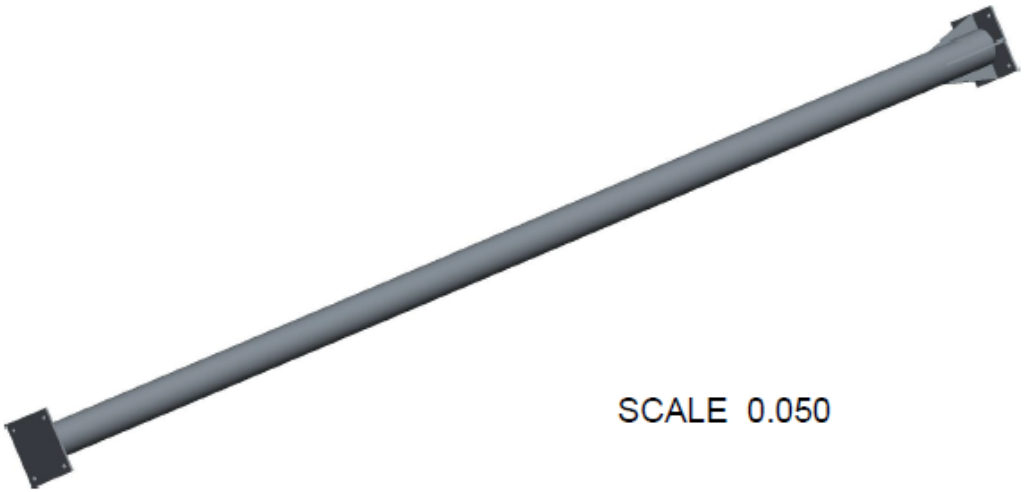

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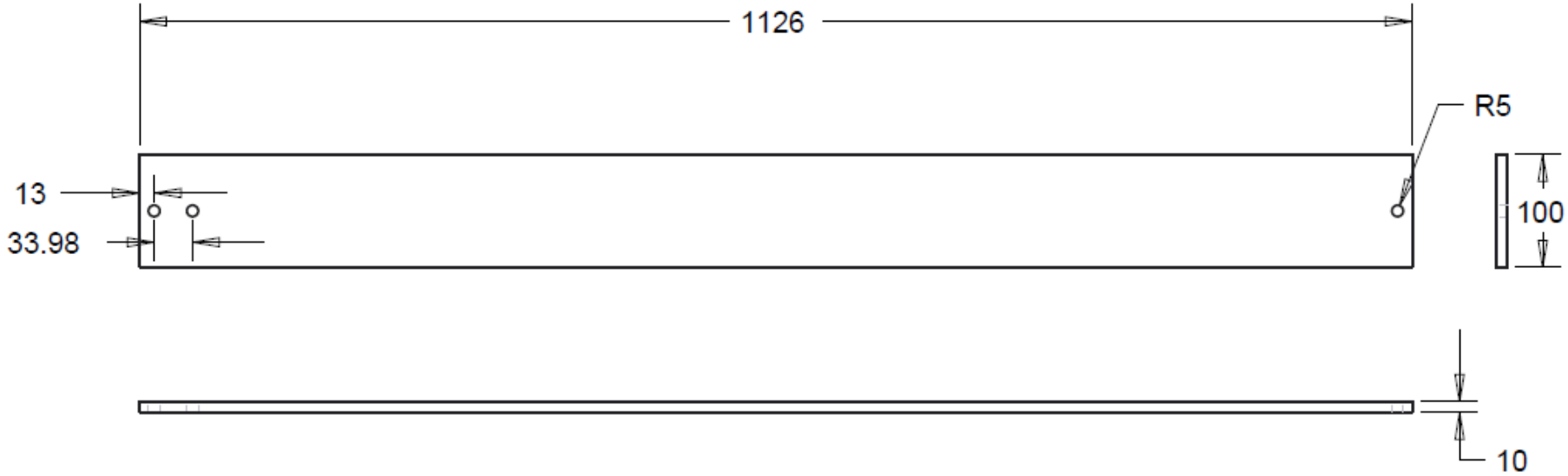
BEAM FOUR SECTION



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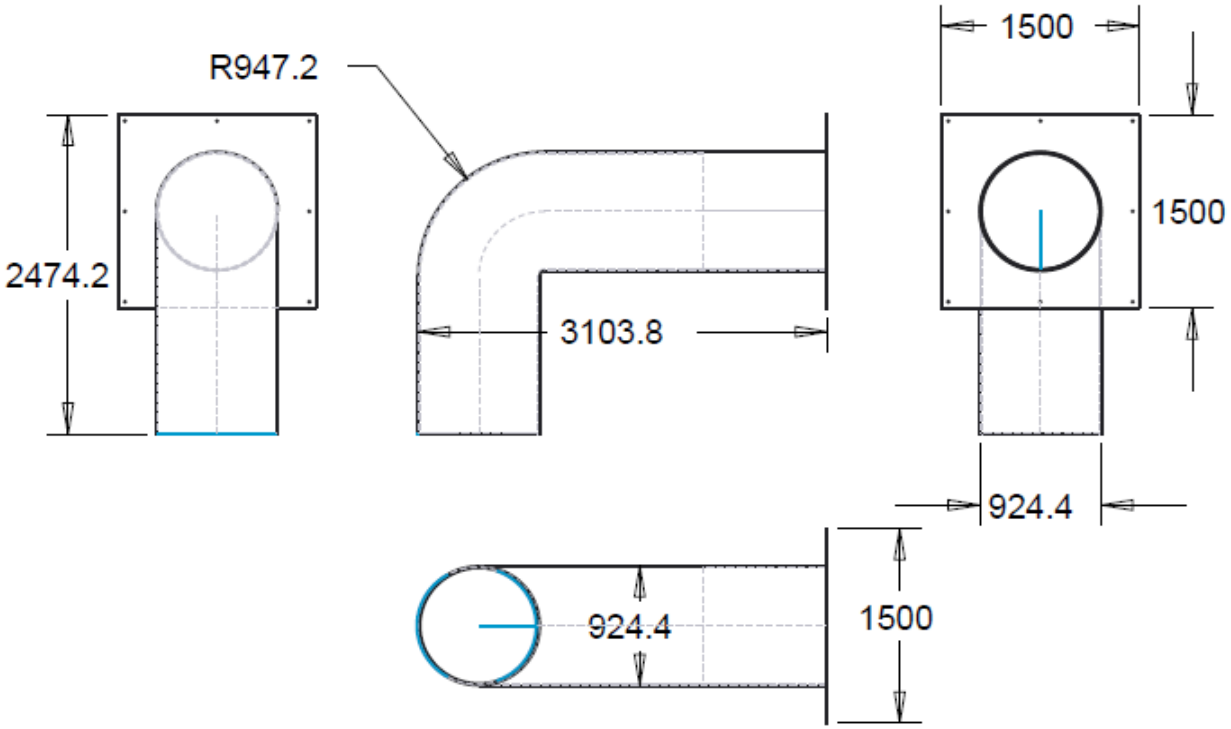
SCALE 0.100

BAD STRIP



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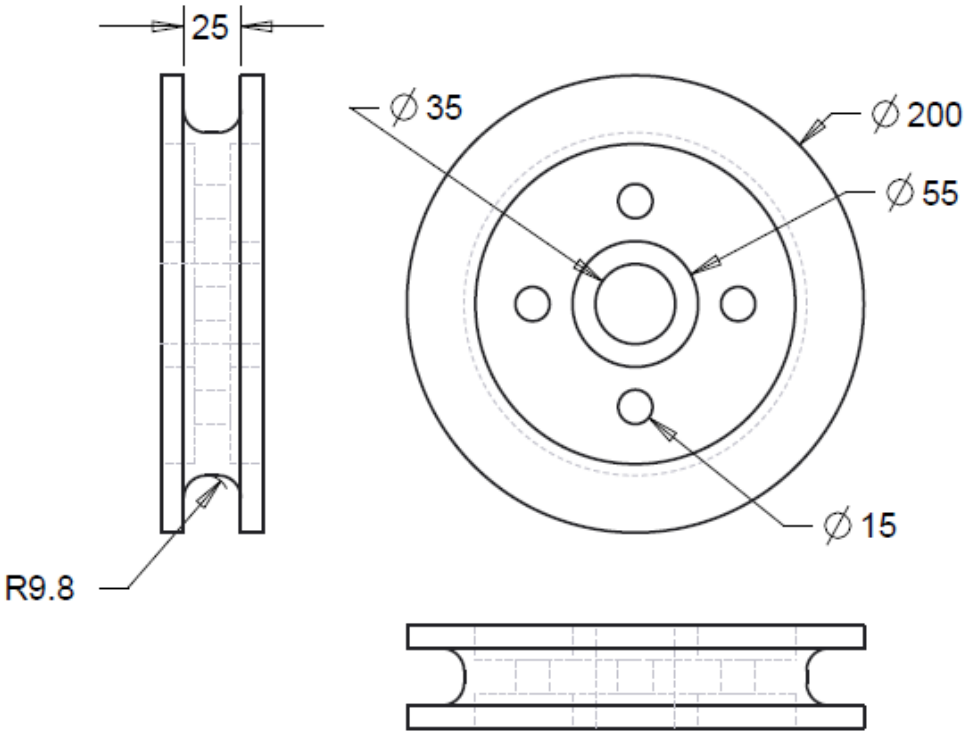
DUCT FOR FLUE GASES



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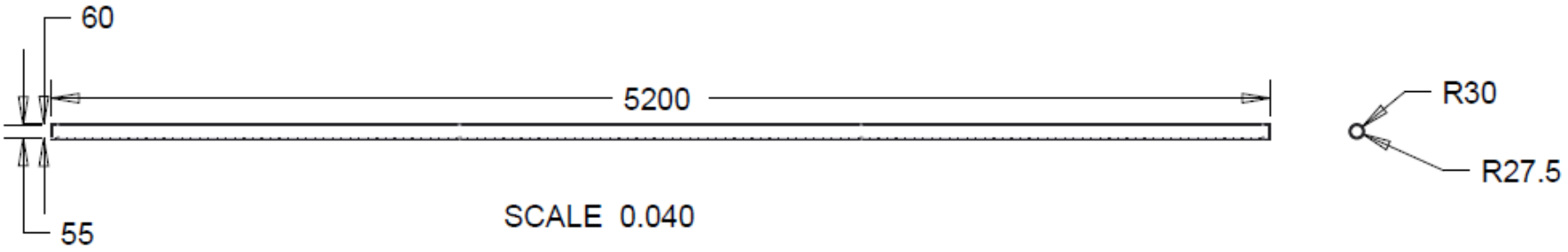
PULLEY



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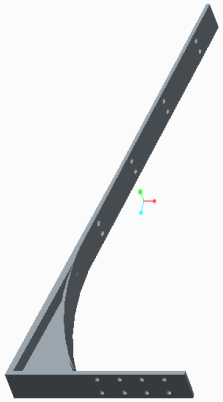
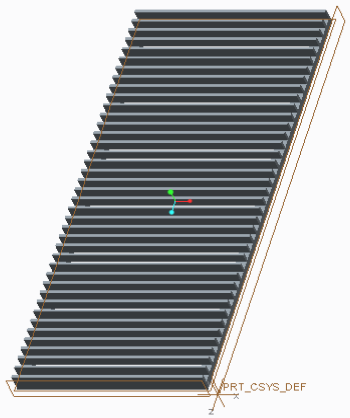
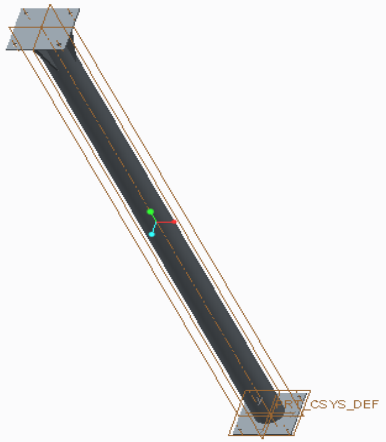
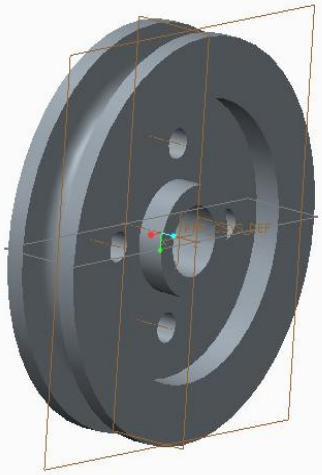
SCALE 0.040

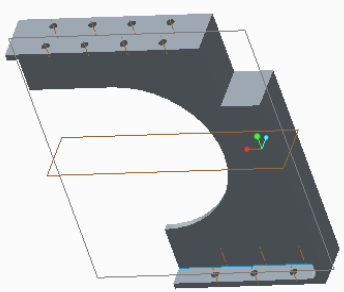
SUPPORTED PIPE







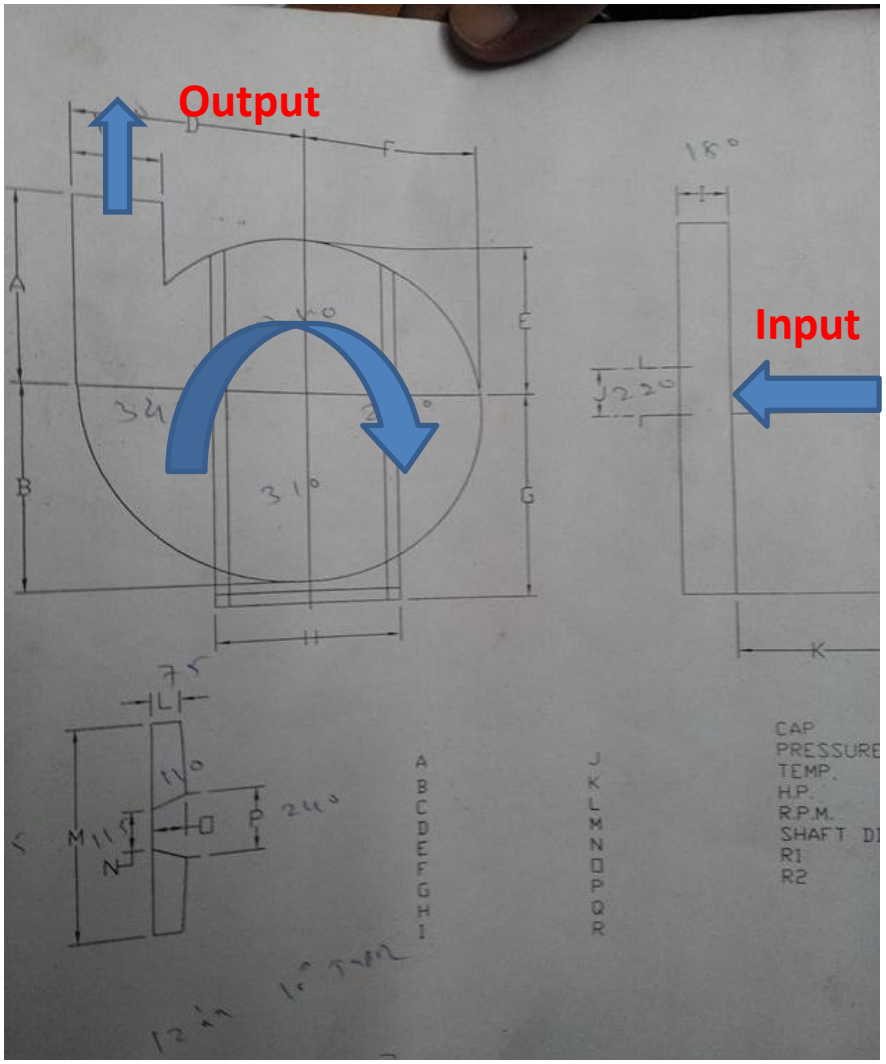




- Design of Newly improved MGCS crematoria was carried out which is at the edge of completion, different parts of crematoria were designed by all the active members of team under guidance.

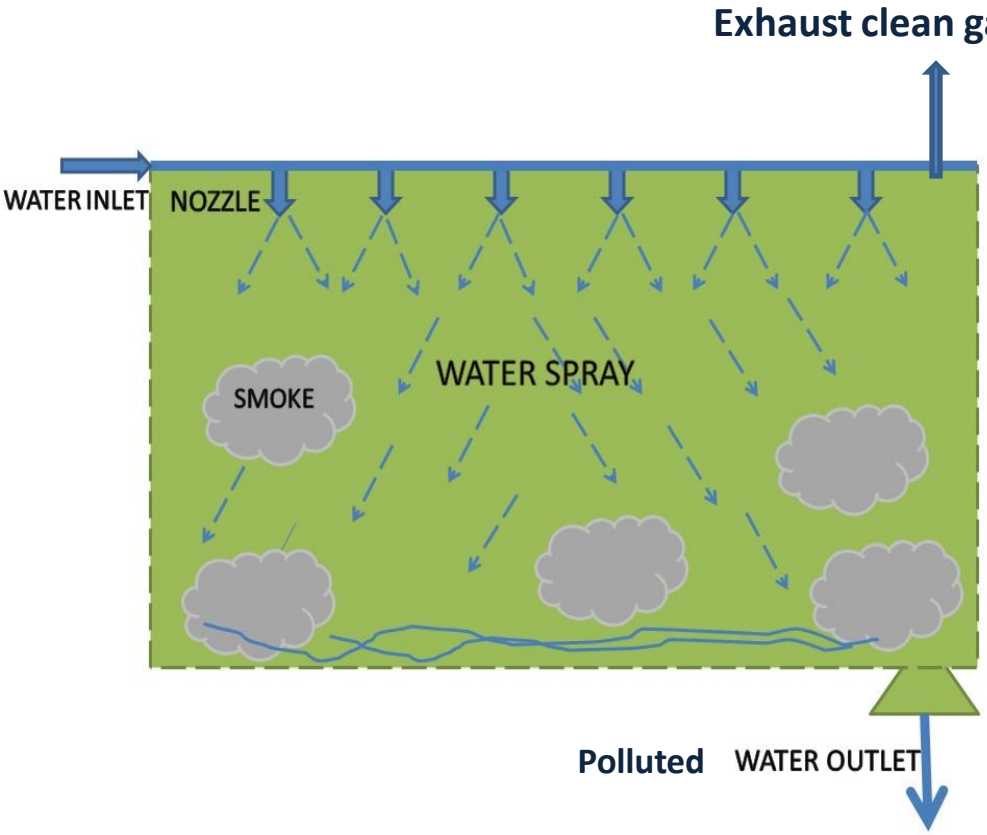
Components

BLOWER



INDUSTRIAL EXHAUST FAN

Water Sprayer:



Water Sprayer is used to clean the exhaust gases that are coming from the combustion chamber. As shown in fig. 7.3 water is sprayed in a water sprayer using nozzle which sprays water at 60^0. The exhaust gases are settled down to the base of water sprayer and the settled down dirty water is taken out using an outlet pipe which contains carbon particles which means carbon is captured from the exhaust gases. And the clean gas is send to chimney.

Nozzles:

Nozzles are used in a water sprayer to spray the water at high pressure and a humidified spray. Nozzle is set to spray at 60^0 to cover the whole area of water sprayer to cool down the exhaust gases and capture the carbon contained in it. Nozzle is made of Mild steel which can withstand the high temperature and resist to corrosion, Water is sprayed at 20 bar pressure.

Visit of project places

Hindu Crematoria in valsad

- In Valsad we saw that there was a movable hopper.
- This system uses reused of exhaust heat which minimizes the time of burning of the body.
- Also this system uses ID Fan & FD fan for suction of exhaust gases.
- This system uses GLASSWOOL which maintains the temperature of the system.
- This system uses only 80 kg of wood.

DISADVANTAGES:

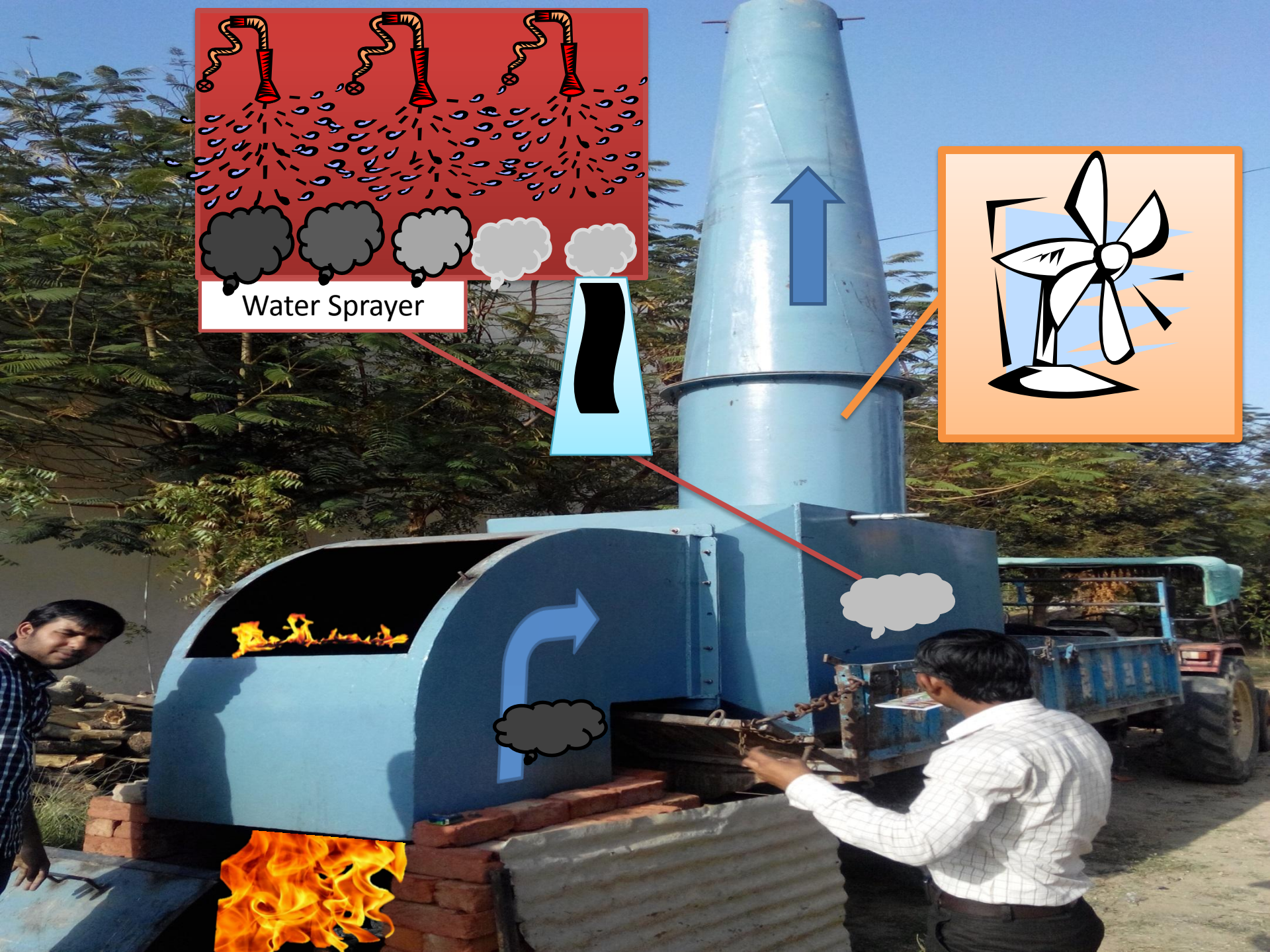
- Bed size is fixed straight which is not suitable for heavy body.
- The exhaust gases is directly thrown in to the air and not using of water nozzle.
- In this system Fat is stuck to the piping system which has to be frequently clean.

SARGASHAN IN GANDHINAGAR

DESCRIPTION:

- This system is some of different from that of Valsad system.
- In this system when the exhaust gases passes from the chimney then there is one plate which closes by the pressure of gases so that the gases moved to another pipe which has water nozzle system for collecting of ash and then clean air is going to the atmosphere.

WORKING OF PROJECT


Water Sprayer

Problems faced during Experiment and it's remedies:

In this project, during experimentation we faced some problems as described below:

1. Heating of system because of overall heat concentration towards the system.
Sol: Increasing water supply to maintain the water sprayer temperature.

2. Flue gases are escaping from the side corners of water sprayer from the area where no water spray reaches.
Sol: Increasing area of water spray nozzle to cover whole area

3. Burning of Industrial exhaust fan wiring during casual experiment due to high temperature.
Sol: Used Industrial exhaust fan with a special arrangement of bevel gears that transmits power from motor to fan.

Conclusion

In this project we conclude that

1. The reduction in the emission of pollutants like CO2, CO, and methane produced by combustion of dead body along with wood is 141.41 kg as compared to recent MGCS.
2. The I.D. fan installation in MGCS increases efficiency of combustion.
3. By literature only 90 kg of wood is required as against 160 kg in the conventional method. As such, there is an equivalent reduction in GHG emissions also.
4. Maintenance cost is negligible because our design of MGCS, This helps in improving the sustainability of the system.
5. Air and water pollution is minimal.
6. A minimum of five to six cremations can be done on one unit in a day, unlike the conventional platform, which is blocked for three days for a single use. Thus, MGCS helps in saving prime land which has high opportunity cost in big cities.
7. All rituals like Tarpan, Mukhagni, Kapal kriya etc. can be performed in a traditional manner without affecting the religious faith of people.
8. Saving of wood also reduces cremation cost substantially & makes MGCS affordable to people below poverty line.
9. Adoption of improved MGCS at national level will generate additional employment avenues besides helping in conservation environment.

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Thank you…