



**Connexio 2016**

## Rural Development Problem Statement

### Fabrication of an Indigenous Stove

According to TERI (The Energy and Resources Institute), only one in every three households uses LPG or other forms of modern cooking fuel. Four out of every five rural households use solid biomass fuels like cattle dung, firewood and crop residue in traditional mud stoves or *chulhas* for **domestic cooking** purposes. These stoves are characterized by low thermal efficiency and incomplete combustion of fuels. The latter leads to emission of toxic gases like carbon monoxide as well as particulate matter that can cause a myriad of health problems, especially in women and children. In fact, according to a report by WHO, indoor air pollution takes 488,200 lives in India every year. There is a pressing need for **inexpensive, efficient and eco-friendly modern stoves** that can put an end to rural cooking woes.

Design a stove for rural heating and cooking purposes that ideally fits into the following criteria:

- Built from indigenous materials
- Relatively inexpensive
- High thermal efficiency
- Low smoke emission
- Lightweight and portable
- Eco-friendly

#### **Objectives:**

- To provide chemical engineering students a platform to apply their knowledge of heat transfer and materials science
- To create awareness about the common problems faced by people in the rural areas
- To come up with innovative solutions for said rural problems
- To design an appropriate model that incorporates one or more solutions
- To learn to make the best possible use out of waste
- To successfully demonstrate the working model
- To understand the importance of taking safety precautions while making and handling of the model



## Progression of Rounds:

### Round 1:

Participants can participate in teams of **three or less**. Teams have to submit an abstract detailing their model to [connexio.vortex16@gmail.com](mailto:connexio.vortex16@gmail.com) by the 15<sup>th</sup> of October. Subject of mail should be **<Team-ID>\_Rural Development Project Abstract** and file name must be **RuralDevelopment\_<Team\_ID>.pdf** .

The abstract must include:

- The names of the participants and their Vortex IDs
- A detailed diagram of the model
- Description of the model in terms of materials used and the dimensions of all the components such as:
  1. Outer frame of the stove
  2. Insulation used (if any)
  3. Exhaust (if any)
- Working principle of the model
- Details regarding the fuel to be used
- Calculations, if any
- Safety precautions to be taken with the model
- Cost of Construction and Predicted Duty Generated in Terms of Water Heating

### Final Round:

Participants whose abstracts are selected **will demonstrate their working model** during the allotted time slot in the final round. The participant team is expected to have developed a **presentation to deliver** in front of the judge/s and the audience. The final round will be held during Vortex and will be judged by esteemed faculty of Institute of Chemical Technology.



## Rating:

The stove models will be rated as follows:

- Efficiency rating: A water-boiling test will be conducted to examine the thermal efficiency of the stove. The amount and type of fuel used will also be taken into consideration while giving the efficiency rating.
- Safety rating: The stoves will be given a safety rating depending upon the smoke discharge. Lower the smoke release by a model stove, higher will be its safety rating.
- Novelty rating: Stoves that make innovative utilization of waste (either as fuel, as insulation or in the construction of the stove itself) will be given a novelty rating. Any other idea that is determined to be inventive enough will receive a novelty rating.
- Time rating: The participants will be given \*insert time here\* minutes to demonstrate their model. The stove must use up all the fuel before the allotted time is over for a good time rating.

**Note:** Participants may be given an optional reciprocating bicycle pump to use while demonstration for additional air supply to the stove. However, using the pump will result in a slight deduction in the final rating.

A formula has been generated that considers all the fore mentioned parameters on basis of their individual weightages that would help decide a superseding “Stove Design Rating” variable. This shall be presented to the esteemed panel of Judges whose decision shall be considered final.

## Safety:

While handling models like stoves that involve fire and smoke, safety is paramount. The following safety procedures must be followed:

- Do not use any form of plastic as the fuel. Burning plastic releases noxious fumes that cause breathing problems
- Do not touch the stove while heating or immediately after heating is stopped. Wait for a cooldown period of at least 15 minutes before touching the stove
- Do not stand near the stove exhaust while the stove is being operated. The flue gases may be toxic
- Do not use any easily combustible material as insulation inside the stove

**Note:** If the model presented in the abstract is deemed unsafe/risky, shall be disqualified (upon the discretion of the event heads)



### **Violation and Disqualifications:**

Teams should strictly abide to the following rules violation of which may lead to elimination from the competition-

1. No team is allowed to hinder the functioning of other participating teams.
2. No team is allowed to touch the vehicle during its run on the track.
3. Any kind of damage to the venue

Judges have the right to disqualify any team if they feel the team is not playing with fair interests. In case of any disputes judge's decision will be considered final and no argument from the teams will be entertained.

### **Inspiration:**

<https://www.youtube.com/watch?v=Tfqa-Cp9XfQ>

### **Contact Information:**

For any issues contact-

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