

A Project

on

DESIGN DEVELOPMENT OF A PORTABLE GREEN SOLAR COOKER

Submitted to IIT (BHU)

**under Project Varanasi
IIT (BHU) Varanasi**

by


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(Santosh Kumar, PI)



(Prashant Kumar, Co-PI)



(Sandeep Sangal, Co-PI)



(Rajendra Prasad, PA)

Format for submitting projects under Varanasi Project.

1	Project type (Strike off those not applicable, refer to the policy document for project types)	<ul style="list-style-type: none"> i. Technology Development or Prototype Development. ii. Faculty Projects (Innovation and application Projects) iii. Project (Student /staff Nurturing)
2	Title of the Project	DESIGN DEVELOPMENT OF A PORTABLE GREEN SOLAR COOKER
3	Duration of the project	2 Year
5	Name address and phone numbers of PIs and Co-PI's and others	Dr. Prashant Kumar, (Ex Prof. IITK, ME Dept.) (Co-PI) Dr. Sandeep Sangal, (IITK METT. Dept.) (Co-PI) Dr. Santosh Kumar, (IITBHU ME Dept.) (PI) <i>Mr. Rajendra Prasad, ME Deptt. Prod Lab.(Proj. Asso)</i>

6. General Description of the project:

This project is aimed to design develop a 'portable green solar cooker'. There are about 30 types of solar cooker designs available in world today in the last 20 years. At domestic front, box type solar cooker & ovens have been in market both having manual & semiautomatic versions having dual features. Cost today of box type cooker range from Rs. 2000 to 6000. In spite of several design developments in last 20 years, these cookers are having following difficulties:

1. Quite Expensive
2. Heavy to handle
3. Fixed and hard design having ergonomic problems
4. breaks down too frequently & Repair is a headache
5. No tracking system

Indian villagers would be extremely happy if a better design appears in market with the following features: Portable, compact, light weight, maintainable, sustained, cheaper, easy hand able, strong & aesthetically good, possibility of making it using locally available materials like brick/clay, bamboo/wood etc., easy manufacturing & maintenance free, efficient & auto-tractable, hygienic features, auto closer with sense (could communicate with users in words).

The project work involves visualization, CAD design & CAE process for finalizing assembly & the components of proposed green solar cooker based on thermal & optical design and consisting of minimum number of parts that will be fitted to function as a non movable green solar cooker using locally available materials like brick/clay, bamboo/wood etc. Solid-Edge modeler & application simulation packages will be used for design development and component modeling.

The cooker will be suited for Indian villages & conditions. Detailed project is being submitted with cost detailing as given below.

7. General Description of experience/ expertise of team on such/ similar projects

Prof. Prashant Kumar has worked for more than 30 years at IITK (ME Dept). He has vast experience of developing new machines from concept.

Prof. Sandeep Sangal is faculty at IITK in Materials & Metallurgical Engg Dept. He has experience of developing solar drier under RuTaG, IIT Kanpur.

Dr. Santosh Kumar is faculty at IITBHU in ME Engg Dept. He has experience of developing devices for solar energy utilization using homemade items.

Mr. Rajendra Prasad, is lab staff of Prod Engg. Lab. in ME Dept. at IITBHU. He has good expertise for fabrication work of all kind.

Design and Innovation Hub Project undertaken (2014-15) under me:

(Summer term project on: Developing kits to convert conventional bikes into e-bike)

With team of students:

- *Anuj Yadav (13135022) Mechanical Engg*
- *Pratosh Pratim Borah (12106EN097) Mechanical Engg (prakash.pratim.mec12@itbhu.ac.in)*
- *Suraj Prakash Gautam (12106EN077) Mechanical Engg (sursj.pgstam.mec12@itbhu.ac.in)*

and three more project was done during 2013-14.

8. Deliverables (The deliverables are to be described in each section. If there is no deliverable in a particular section then say the same clearly.):

- a) Prototype: Yes
- b) Process Prototype: NO
- c) Design/ Technical Document: Yes (Design and drawing detailing)

Based on modeling, a design for the case will be developed. Assembly & components will be finalized & other components will be procured from market if available or would be manufactured, assembly will be fabricated / made & tested on the prototype at IITBHU.

(d) Any other:

9. Method/ Technology to reach the deliverable. (A detailed description of method or technology may be described)

It is possible to design developed such cooker using conceptual design process. Initial purpose would be to develop 3-4 numbers of feasible designs so that best could be decided.

Steps could to do so could be: i) Defining the problem objectives & need analysis by calling brain storming session with experts and interested students (from open call of IIT(BHU) & IITK student's), ii) To decide time targets, plan steps, deciding groups and their problem, iii) Decide 4 best designs of groups, more discussions & guidelines passing, iv) freezing the feasible design (including optical & thermal load design etc), v) consulting the users (villagers & others) with feasible & refining the design as per need and suggestions, vi) Developing design prototypes & testing few cookers for real life testing vii) re-modifying & refining the product cooker for final version & viii) Drawing detailing & Technical report

Major Activities with Time Line	Year 1 months		Year 2 months	
	1-6	7-12	13-18	19-24
1. Recruitment of Project assistant				
2. Defining problem objectives & need analysis: brain storming session with experts and interested students (from open call of IIT(BHU) & IITK student's)		→		
3. Discussion brain storming meetings (2 nos) & decide issues of fund, time targets, plan steps				
4. Deciding groups and their problem & patent filing step				
5. Meeting of identified groups to monitor their progress.				
6. Decide 4 designs of groups, more discussions & guidelines passing		→		
7. freezing the feasible designs (including optical & thermal load design etc)				
8. Consulting the users (villagers & others) with the design step 6				
9. modifying and refining the design as per need and suggestions				
10. Developing design prototypes & testing			→	
11. Manufacturing few cookers for real life testing				
12. Modifying & refine the product cooker by Carrying out functionality experiments				
13. Analysis , redesign and modifications on the setup				
14. To explore defect analysis & final run tests at IIT				→
15. Drawing & detailing documentation, patenting step				
16. Final Technical report				

