

# Energy Efficient and Eco-friendly Porous Radiant Burner for Cooking and Industrial Applications

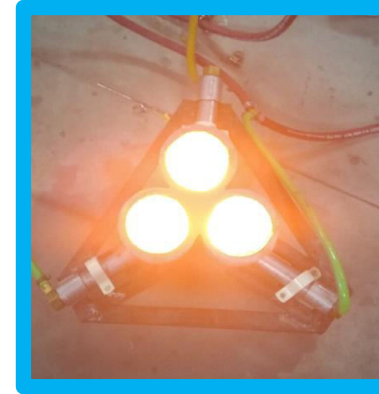
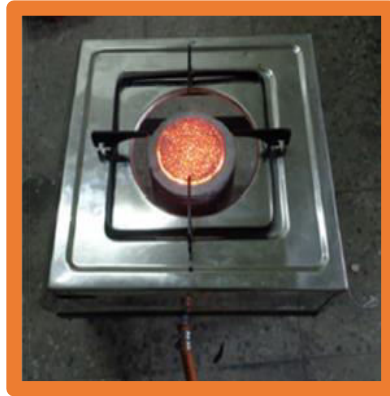
Objectives:

Design, development and testing of Porous Radiant Burners for various cooking and Industrial applications with 20-60 % fuel saving and 70-80 % reduction in emissions.

Prof. P. Muthukumar, Mechanical Engg  
Funding: IMPRINT, BIRAC, APJ KALAM

## Domestic, LPG

Burner rating: 1-3 kW  
Max. thermal efficiency: 82%  
Emissions, CO: 39-64 ppm  
NOx: 1-2.5 ppm  
Fuel saving: 30%



## CPRB, LPG

Burner rating: 12.56 kW  
Max. thermal efficiency: 65%  
Emissions, CO: 50 ppm  
NOx: 8 ppm  
Fuel saving: 50%

## Commercial, LPG

Burner rating: 5-7 kW  
Max. thermal efficiency: 65%  
Emissions, CO: 34-58 ppm  
NOx: 2.1-5 ppm  
Fuel saving: 40%



## Domestic, Biogas

Burner rating: 2-2.7 kW  
Max. thermal efficiency: 60%  
Emissions, CO: 36-48 ppm  
NOx: 1-2 ppm  
Fuel saving: 22%

This technology is also extended for methanol and ethanol stoves and reported 20-30 % fuel saving. Many industrial applications such as medical waste incineration, cremation, drying, furnace, etc are also being tested.

## Technology Readiness Level of Various PRB Products Developed at IITG

PRB Product	TRL	Fuel Saving
LPG Domestic stove	7	25-30%
LPG Commercial stove	8	40-60%
Biogas Domestic stove	7	20-25 %
Methanol Domestic stove	6	20 %
Medical waste incinerator	5-6	25-30 %
Cremation system	5-6	50 %
Sanitary napkin disposal system	5-6	50%
Industrial furnace, Space heater, ceramic dryer, Food dryer, etc.	6-7	30-60 %

## Potential Market

- Developed PRBs have huge potential for both domestic and commercial cooking applications
- Since the developed PRBs can be used for any liquid and gaseous fuels; they are ideally suited for methanol, ethanol and biogas based cook stoves
- Further, PRB can be extensively used in medical waste disposal, cremation and sanitary napkin disposal systems.
- PRB is also ideally suited for all types of furnaces and thermal management applications including space heating.

## Social/commercial Impact

- Considering 45 lakh LPG domestic cylinder consumption per day, with 30 % fuel, PRB leads to a saving of 13.5 lakh LPG cylinder (122 Cr per day) per day.
- Commercialization of PRB technology in various industrial application, will lead a fuel saving of 50%. This will reduce the manufacturing cost to a larger extent
- Since PRBs are ideally suited for biogas and methanol, PRB also provides sustainable cooking option for future.
- PRBs also reduce up to 80 % emissions, providing better working environment.
- Commercialization of PRB will reduce the LPG import and subsidy given on LPG cylinder.

# Metal Hydride based Hydrogen Storage, Purification, Compression and other Thermal Management Applications

## Major Objectives and Deliverables

- Design and Development of Metal Hydride Based Hydrogen Storage system of 2 kg H<sub>2</sub> for fuel cell.
- Design and Development of Metal Hydride Based Hydrogen Purification system of 1 kg H<sub>2</sub> capacity.
- Development of MH Based Hydrogen Compressor with discharge Pressure About 300 bar
- Development of Compressor Driven MH Based Cooling System of 5 kW Capacity
- Development of a Prototype Metal Hydride Based Combined Cooling and Heat Pump (MHCCHP) System of 5 kW Capacity .

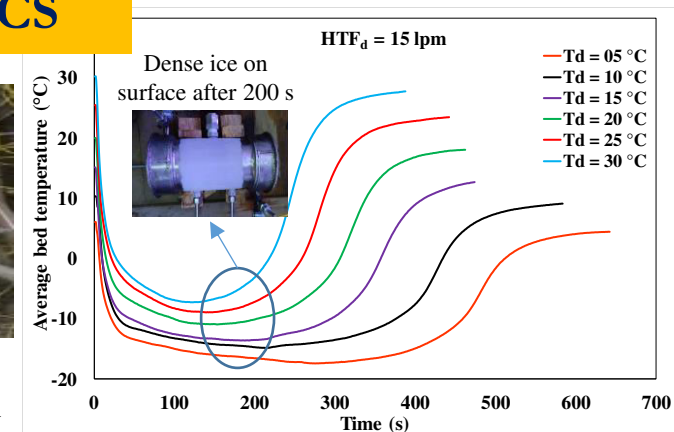
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Funding: DST, MHRD, NTPC, BRICS



Hydrogen purification system with 40 kg LaNi<sub>4.7</sub>Al<sub>0.3</sub> for storing and purifying ~ 7000 lit. of H<sub>2</sub>. Successfully tested at NTPC Ltd. with 99.99% pure H<sub>2</sub>.



**Hydrogen storage reactor g tested with 40 kg MmNi<sub>4.7</sub>Fe<sub>0.3</sub> for fuel cell of 5 kW capacity**



Testing **4 kg MmNi<sub>4.7</sub>Fe<sub>0.3</sub>** capable of delivering **1.5 kW** cooling capacity



**MH based hydrogen storage and cooling system of 10 kW**

**Designed, developed and tested various capacities of hydrogen storage, purification and cooling systems. Development of industrial scale hydrogen compressor and hydrogen generation systems are under way.**

# Design and Development of Hybrid Solar Dryer for North Eastern Climatic Conditions

Solar drying of high value agricultural products

Fresh

Solar dried

Open sun dried



Sliced Ginger



Lumped Ginger



Ghost Chilli



Jack Fruit

Prof. P. Muthukumar, Mechanical Engg; Funding: DBT

## Solar dryers developed in IIT Guwahati

