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TO DEVELOP AND TESTING OF DIFFERENT COOKING ACCESSORIES FOR L.P.G SAVING

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ABSTRACT

Food inflation that hit double digits mid-august and the hike in the prices of LPG are adding to citizens woes in 2013 in India. Restaurant had to bear the rising LPG cost without changing the menu prices. Ordinary consumers are worry after the oil ministry proposed to limit the number of the subsidized cylinder would cost Rs.1200. The price of the LPG commercially was Rs.1735 for 17.5 kg cylinders. A rise in LPG and fuel prices pushes up transport and food cost. Moreover, the fluctuating prices of LPG gas totally influence the prices of the needful commodities in market. So there arise a need to reduce the unbearable cost of LPG by taking measures to reduce LPG usage as well as efficient stoves and utensils to achieve maximum efficiency for cooking food in domestic use. For this reason we decided to reduce the heat loss during the cooking by using the various accessories and insulating pots. And also by developing various types of modification in the pots like by providing a different geometric shaped fins at the base of pot for increasing the heat transfer rate and reducing the flame losses. This modification in the pot gives a better result as compared with a simple pots used in kitchen. It gives best suggestion to the housewife that the helps in their life and also effectively utilization of LPG gas as the prices of the LPG is very high. By usage of different types of burners, the efficient design of LPG stove to give better efficiency, the different shapes of utensils and pots for cooking in domestic use. Moreover, the flexible skirting and insulation for the maximum usage of the waste heat to improve the overall performance of stove which can properly go with the size of different utensils are main concern to this project to testing purpose. Also the testing is to be conducted on the variable size of fixtures to maintain a good height for improved efficiency. It summaries measures and steps for a modern housewife for improved usage of domestic LPG gas stove and its accessories. By providing the fins at the base of pot the heat transfer rate increase and the different type of losses like flame losses are decreases. With all these cooking efficiency increase about 35% to 45% that means it saves about 10 to 12 days in month and about 120 to 130 days per year. It is conclude that cost of modified pot and other accessories recovered in 2 to 2.5 year.

I. INTRODUCTION

L.P.G is the most convenient and clean fuel for domestic use and is very popular inthese days. The LPG hob industry is about 36 years old and is mainlyconcentrated in the smallscalesector. LPG is a by-product during petroleumpurification and is stored and marketed in gas cylinders of 14.2 KG capacity andused generally for cooking hobs and to some amount for industrial purpose also. The domestic LPG stove is primarily being used

in the urban areas as well as inrural areas. The industry of domestic LPG stove has grown considerably over.Last 18 years and offers a wide range of products. In 1980, the Government of India had planned to push the exploration and assembly of LPG from Bombay High Project, thereby providingtremendous push to the LPG Stove Industry. More and more number of newconnections is being released by the Govt. and therefore the demand of LPG stoves also increasing day by day. As per the last Survey, there were 186 unitsmanufacturing LPG stoves in India. Out of them, 139 were from SSI sector. Mostof the units are located in the state of Delhi and Haryana. Liquefied petroleum gas(LPG)is one of the conventional sources of fuel for cook hobs in the India . Theuse of LPG as source of fuel is common both in the urban and in the rural areas,Particularly in places where its supply is readily accessible .The main reasons whyLPG is widely adopted for household use are: it is convenient to operate, easy tocontrol, and clean to use because of the blue flame emitted during cooking.However, because of the continued increase in the price of oil in the world market,1the price of LPG fuel had gone up tremendously and is continuously increasing at afast rate.. For a typical domestic, having four children, one LPG tank can bedisbursed within 20 to 30 days only depending on the number and amount of foodbeing cooked. The prices of domestic L.P.G were last revised in June last year and arepriced at 399.2 Rs/ cylinder in Delhi. Which as compared is cheaper than 483.06Rsin Pakistan, and 670 Rs in Bangladesh, 666.31Rs in Sri Lanka and 702.27 in Nepal, thus the prices are still predicted to rise.LPG is a predominant mixture of propane and Butane currentwith a small percentage of unsaturated (propylene and Butylene) and some lighterC2 as well as heavier C5 fractions. Commercial LPG invariably contains traces oflighter hydrocarbons like ethane C2H6 and ethylene C2H4 and heavierhydrocarbons like pentane C5H12.There are two main sources from which LPgases are produced 1) Wet natural gas 2) Refinery operations. Different casestudies have been observed from the usage of different types of burners, theefficient design of LPG stove to give better efficiency, the different shapes ofutensils and pots for cooking in domestic use .Moreover the flexible skirting andinsulations for the maximum usage of the waste heat to improve the overallperformance of the stove which can properly go with the size of different utensilsare main concern to this project for testing purpose. Also the testing is to beconducted on the variable size of fixtures to maintain a good height for improvedefficiency. It summaries the measures and steps for a modern housewife forimproved usage of domestic LPG gas stoves and its accessories. By usage of different types of burners, the efficient design of LPG stove to givebetter efficiency, the different shapes of utensils and pots for cooking in domesticuse .Moreover the flexible skirting and insulations for the maximum usage of the2waste heat to improve the overall performance of thestove which can properly growth the size of different utensils are main concern to this project for testingpurpose. Also the testing is to be conducted on the variable size of fixtures tomaintain a good height for improved efficiency. It summaries the measures andsteps for a modern housewife for improved usage of domestic LPG gas stoves andits accessories.We have dealt with some energy efficient utensils available in market as well assome latest systems available in market for cooking. Our tests are mainlyconducted on WBT and set up includes same equipment's as the modern housewifeuses. We have added cooking accessories and insulating materials to save gas indomestic cooking system and done frequent modifications so as to see the optimumpositive results keeping in mind the cost of such accessories and handlingconvenience. Thus thereby we present tabulated results, steps, measures forefficient cooking for a modern housewife which in our tests are positive.

1.1 NEED OF PROJECT

The prices of the LPG commercially were Rs.1200 for 17.5 kg cylinders. A rise inLPG and fuel prices pushes up transport and food cost. The fluctuating prices ofLPG gas totally influence the prices of the needful commodities in market. Thefluctuating prices of LPG gas totally influence the prices of the needfulcommodities in market. For a typical household, having four children, one LPGtank can be consumed within 20 to 30 days only contingent on the number andquantity of food being cooked. The prices of domestic LPG were last revised inJunelast year and are priced at 399.2 Rs/ cylinder in Delhi. Which as compared ischeaper than 483.06Rs in Pakistan, and 670 Rs in Bangladesh, 666.31Rs in SriLanka and 702.27 in Nepal, thus the prices are still predicted to rise.

II. LITERATURE REVIEW

A. Carrabba's Italian Grill, by Joel barker, carraba's Vice President of R &

D and Kitchen Operations.

This paper accomplishes that total energy essential to cooking is reduced to increasethe efficiency. It is conclude that energy consumption per burner is reduced to50%.payback on pot purchase and burner conversion is 5 to 6 months.

B. National Account Case Study: turbo pot, by Lee Huang Eneron Inc.

It is conclude that while it is used on electrical ranges then it is 70% efficient andwhile it is used on thermal ranges, it is 50% efficient. The total heating timerequired for cooking is decreased up to 30% to 48% of normal pot cooking timeByincreasing the heat transfer rate the total efficiency is increased up to 60% For theenvironment, once it is fully retrofit, the whole chain will reduces co2emissions byover 10 million pounds annually.

C. What's Cooking'? A Suite of Gas Efficiency Technologies forCommercialKitchens by Mary Horsey, E Source.

The purpose of this paper is to raise awareness of some new and emergingenergy efficientCommercial kitchenette technologies that are likely to demand to foodservice owners and4operators for their non-energybenefits as well as their efficiency. This paper willexamine four gas firedcommercial kitchen technologies—the Turbo Pot, theAdvanced Under fired Charbroiled, the Rocket Fryer, and the hybrid optimizedtankless waterheaterthat offer either large efficiency improvements. Standardpots allow the flame to slide ineffectively around the smooth bottom of the pot andup the sides. After a period of test and fault, Huang developed a design with finsthat capture and guide the burner flame into channels, creating turbulent flow as thehot gases contact the fins and increasing the surface area for heat transfer. The finsare easy to clean yet sturdy enough for the rigors of commercial food service.

D. Eneron, Inc. Prototype commercial Stock Pot Testing, by Greg Sorensen

And David Zabrowski.

It conclude that Gas fired range top was raised to over 40%. When used on atop range with energy efficiency in the low 30's the no. approached 60%.

3. CASE STUDY

3.1. CONVENTIONAL METHOD OF COOKING FORDOMESTIC LPG STOVE Generally the domestic cooking in households of India are carried out by thehousewives. Variable sizes of cylinders are available in market for bothcommercial and domestic purposes ranging from 14.2 kg to 17.5 kg and also inlower range of 2 kg to 5 kg. A cylinder of 14.2 kg has the price of Rs 400 fordomestic purposes including the subsidy provided by the government. The LPGMix used in India is made up of 78% butane and 20% propane also 2 %mercapten, adding that during the month of August, the price of butane increasedto over US$1,000 per ton .However the calorific value of combined LPG gas is46.1 MJ/Kg. It is found to be convenient and easy method for cooking. Also it hashis limitations of emission of CO and CO2 gases as they are hydrocarbons.A general housewife waste a good amount of heat energybecause of the unawareness of energy efficient quotient and not so scientificand traditional methods of cooking .Some people have the habit of switching onthe fan while cooking which disturb the flame of the fuel. Moreover lessconcern is taken to see that a good amount of draft of air is available for6combustion. Cooking is done in suffocating areas of the house. The cookingmethod should be such that optimum time is taken for cooking therebyproviding delicious and nutritious food. The nutritious value of the food shouldbe conserved .pollution free cooking is also favourable, waste heat should beminimized and used as much as possible.Mostly the cooking utensils used are of aluminium, stainlesssteel, brass and there alloys. The regulator used is also conventional having theflow rate of 0.5 Cu.m/hour as for the domestic use. Generally burners made upof cast iron is used which has circumcised hole surrounded by it according tothe design. The stoves are made of aluminium and sheet metal.

3.2.CARELESSNESS AND WASTAGE OF HEAT ENERGYWHILE COOKING FOOD

Generally carelessness occurs because of the unawareness about the need ofenergy conservation and the importance of energy saving and its efficiency. Therole of housewife has a good amount of participation in it. The usage of fanalters the food cooking capacity of stove and its efficiency. The flame from theburner is more or less is wasted outside the surface area which comes indirectcontact of the flame i.e. the utensils used for cooking should have good bottomsurface area at which the flame of the burner is directly impinged. Theconductive heat transfer rate should be highest of the burner so as not to retainheat.Also heat retaining capacity of the utensil should be good. Sometimes goodamount of draft of air is not available for the combustion of fuel i.e stove is7placed corners of the houses adjacent to the wall with no space. Sometimes thestove is burning at high flame at the intervals or the gaps between shifting ofcooking utensils. Inadequate information about the regulation of flow rate ofgas while different cooking methods are not available in general public and alsoare unawareness.

IV. WORKING

4.1 TEST PROCEDURE

Make ready the gas assembly.

Step 1:- Take5 lit. of water in the pot and put it on the stove. Allow it to evaporateabout 1.3 lit. Water for each test then mark the level of water by inserting stick intothe water using marker.

Step 2:-Notethe room temperature and water initial temperature. Take initial

Weight of water with pot and initial weight of cylinder by using weighing machine.

Step 3:-Nowput the pot on stove at the same time start the stopwatch and duringthis according to test keep the knob of stove in maximum or simmering state.

Step 4:-Duringboiling of water, throughout check out the level of water by usingstick.

Step 5:-Whenwater will evaporate at the desired marking of stick then stop

heating simultaneously stop the stopwatch.

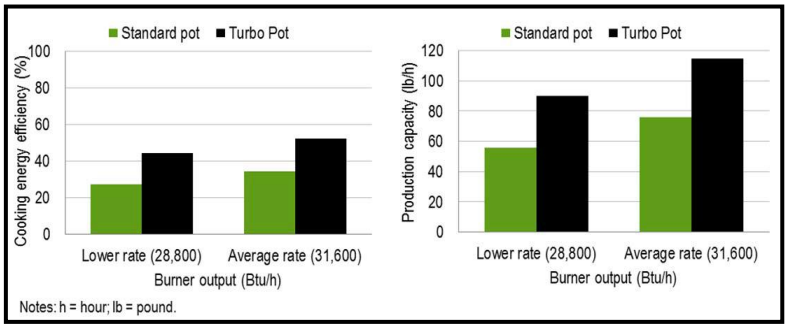
Step 6:- Nownote down the final weight of water, cylinder weight and note downthe final temperature and time required.

Step 7:-Calculategas required by using formula

Gasrequired = Final weight of gas – Initial weight of gas

Fig 4.1 -STANDARED POTS Fig 4.2-TURBO POT

4.2 COMPARISION



V. FUTURE SCOPE

Graph No-1 :Turbo Pots Cooking Energy Efficiency and Production Capacity Improvements over Standard Cooking Pots

5.1 FUTURE SCOPE

Gas for more 20 days than our estimate of 10 days. Different alternative methods of saving energy such as induction cooking, using wood stoves and LPG saving stoves are welcome in today's world. A whole new genre for house wife friendly cooking systems may come to effect in coming generations.

5.2 ADVANTAGES

1. Less heat consumption.
2. Cooking accounts for one quarter of energy consumption.
3. The release of heat energy from burning fuel saved.
4. To improvement the efficiency.
5. To reduced cooking times and the energy saving.
6. Fast heat up time can preserve freshness of food, especially while cooking in large quantities.
7. Cost of modified pot and other accessories recovered in 2 to 2.5 year.
8. The total heating time required for cooking is decreased up to 30% to 48% of normal pot cooking time.
9. Increases the heat transfer rate.
10. Thermal efficiency is high.

5.3 LIMITATIONS

1. More expensive to build & operate
2. Airflow cannot easily regulated to change heatsetting.
3. Potentially less efficient.
4. The prices of LPG gases is high.
5. Fuel prices pushes up transport and food cost.

5.4 APPLICATIONS

1. It is use for household purpose.
2. The System is also useful for residential complexes, hotels, college hostels etc.
3. It is used in multitude of industrial manufacturing processes.

VI. CONCLUSION

1) There is increase of **10%** in efficiency in cooking without fan than with fan i.e.we can save up to around **7 day's**; Likely a week. So it is of utmost importance tocook fan without presence of fan which is opposite to what a house wife does inday to day cooking.

2) Today the house wife can buy a spare burner head for Rs.50/onlyand exchangethis with her current burner every month contingent on usage. Now she has thetime & effort later, to clean the removed burner leisurely not

in a hurry, thoroughlyand effectively. She can later dip & rinse it for an hour in the solvent and withnylon brush, spotless the holes &measures with appropriate detergent etc. and keep it readyto reuse. This can give savings in her LPG up to 10 % & more and her cookingtime is less now! .There is saving for 3 days equivalent to 6 frequent meals. Soplease buy a spare burner head for your existing stove today and experience theLPG savings. And when you have accomplished less time in cooking & LPG savings,kindly pass on this message to others for their benefit & it is our National importancetoo. When you are buying a new stove, then and there itself please buy a spareburner head for extensive&proficient usage by using alternatively monthly over thegas hob life period.

3) We have used skirting made of sheet metal , one is low height skirting and other is high height skirting .It has specific design providing proper no of holes allowing air for proper combustion. We have been able to see difference in gas consumption with availability of proper air duct ie holes provided in skirting .Again there is saving of 3 to 4 days for skirting with high height than low height .

4) The release of heat energy form burning fuel is saved in skirting without holes than skirting with holes, which directs the passing air directly to the utensil thereby saving wastage heat .It accounts for 2 days saving; Gas will run for two days extra.

5) In our case we have used combination of glass wool with sheet metal which gave us positive results. The low height skirting with insulation gives better results than without insulation ; There is saving of around 3 days, again 6 frequent meals can be cooked extra. Glass wool is known to have good insulating properties.

6.1 TIPS AND MEASURES FOR ENERGY EFFICIENT COOKING

Follow the simple tips given below

- Cleanthe burner of your stove (gas/pressure/wick) regularly.
- Beforecooking, allow frozen food to come to room temperature, as it will useless fuel to get cooked.
- Soakpulses, dals and rice for some time before cooking.
- Alwaysuse a pressure cooker instead of an open pan as it will use less fuel.
- Try to cook as many things (e.g. rice, dal, vegetables etc.) as possible at one time inthe pressure cooker, using the separators.
- Ifyou are using the pressure cooker, lower the flame after the pressure is built inthe cooker i.e.after the first whistle.
- Coverthe pan while cooking.
- Allowhot food to come to room temperature before storing in the refrigerator.

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