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Experimental Analysis of Cumulative Pressure Cooker System

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Abstract - *Catering is the humankind's oldest and still it's most important monetary movement, providing the food necessary for our survival. As the global population is increasing rapidly and as the time is limited, the food production must be increased. Given limited water and fuel resources, it is estimated that the efficiency of the food productivity must be increased to meet that goal, while limiting the growing pressure that fuel consumption puts on the environment. Cumulative cooking plays an important role in society meeting the production needs. For a decade cumulative cooking have played a fundamental role in increasing the efficiency and reducing the cost of food production and food products. In past few years, a similar trend have been started, food producers started to experiment with autonomous systems and alternate fuels such as solar power, biogas, etc. This is just the beginning of what will be the revolution in the way that the food is made. So considering the same approach we have developed a cumulative cooker system for making idli's. Time consumed in cumulative method with insulation and plate is 49 minutes, fuel consumed is 0.106 kg, and the efficiency is 68.24%.*

Key Words: Cumulative Cooking, Efficiency, Fuel Consumption, Pressure Cooker.

1. INTRODUCTION

Catering or nutrition preparation is the skill, expertise, science and ability of preparing nutrition for consumption. Catering procedures and materials vary broadly across the domain, from grilling nutrition over an exposed fire to using plug-in cooktops, to roasting in various types of cookers, reflecting exclusive ecofriendly, financial, and cultural civilizations and styles. The ways or types of catering also depend on the talent and type of preparation separate cook has. Catering is done both by persons in their own residences and by specialized cooks and cooks in cafeterias and other nutrition establishments.

Making nutrition with high temperature is an action exclusive to persons. It may have happening everywhere 2 million ages past, though archaeological mark for it reaches no extra than 1 million ages past.

The development of farming, market, employment, and carriage between peoples in dissimilar areas offered cooks numerous new elements. New creations and knowledges, such as the creation of terracotta for holding and hot liquid, expanded catering procedures. Some current cooks apply progressive systematic procedures to nutrition groundwork to further improve the taste of the plate attended.

Heaviness catering is the procedure of catering nutrition, using liquid or other catering liquid, in a closed container known as a pressure cooker. This put on the things of extensive steaming within a smaller period.

Practically any nutrition that can be prepared in vapour or liquid-created fluids can be prepared in a pressure cooker.

The cooker mechanisms by catching the vapour produced from boiling the catering liquid private the container. This causes internal heaviness and high temperature to increase rapidly. After use, the vapour is gradually out so that the container can be unlocked securely.

The existing catering assurances in our payment. It could assurance upcoming expertise when it approaches customer pleasant. The bound liveliness is shifted and unwell kept. This decreases the complete effectiveness of the expedient. The period required to prepare the nutrition is decrease by using cumulative cooker. The current investigation of using cumulative cookers for food cooking in domestic use and to provide the industrial community with a database for important parameters and the thermal performance of such type of cookers. The project is concerned with reviewing the different types and designs of cookers and then selecting the suitable design.

The increasing expenses of catering gas or LPG have been broken hearted the financial side of all family. Once promoted by the administration, LPG has viewed an enormous point in amounts after being freed. While the judgement is out on the quantity of promoted containers single family would get individually year, one thing is pure that the increasing expenses are going to increase a hovel in the pocket of the public man. It is healthier to accept some simple instructions in protecting LPG that may assistance protect gas as well as reduce the monetary load on the pocket. To overcome these main difficulties, a new plan has been devised to high temperature professionally using the cumulative cooker and as well as the other shadowy conditions. This device not only handovers liveliness professionally and equipment it for unceasing practice. This assistances in dropping the gas intake to a superior to overcome the pollution as well as to a greater food production.

Catering is dynamic and it has to be prepared in very residences. Liveliness mandatory for this process is only from whichever LPG or power. Difficulties will be tackled in the making of both LPG and power. So the operational catering is also done by the substitute capitals similar to cumulative cooker. The main intact unit consists of Cooker with safety valve, idli pots, Hoses. Cumulative cooking has to be one of the simplest and attractive options for fuel saving. In design cumulative cooker is very simple and efficient. It is a familiar statement that a cumulative pressure cooker cook's nutrition at a pressure greater than that of ambient heaviness, thus demanding appropriate protection essential in planning, engineering and use of cumulative pressure cooker to defence in contradiction of calamities in the scullery.

The Cumulative Pressure Cooker, is a unique effective cooker system to save fuel consumption and time wasting in cooking the food like Idli, Dhokala, rice, etc. The success can be attributed to the simple, but concept of using the cooker to cook the idli is effectively using the problem to create the solution. By using the simple idli cooker it is not possible to make the large production of idli at time, so Cumulative Pressure Cooker is best option for cooking at this time. As future view the cumulative cooker is efficient cooker to save fuel as well as time.

2. LITERATURE REVIEW

In present chapter the contribution made by different researcher and authors in the field of burnishing were enlist in short. It includes the methods of, Mathematical modelling, Software, different input parameters as well as their output results. This section represents new definitions of product design and development with respect to sustainable design parameters, life cycle design and ecology design. This section also gives ideas about the related studies done in the similar field of surface roughness and explores new fields to work on.

A kitchen without pressure cooker is like a human being without sole. Because nowadays it is not only the fashion but also it works with hand in hand with the working woman. This is because of saving in time & energy. Also, the demerits of elliptical inner lid shapes are overcome by the hybrid shape of circular and elliptical i.e. circular shape having straight edges at the edges, as one of the alternatives. The modification suggested here is also serving the all purposes elliptical pressure cooker. [1]

In huge measure turmeric steaming the conservative florae is rummage-sale with numerous cooker and container get-together located on trolley. The houseplant is on condition that with heating system, condensate withdrawal device, full pressure containers and movable houseplant. Here in steaming, the turmeric stems are located in the cooker and the vapor is delivered from the reservoir to the pressure cooker and the turmeric is cooked [2].

This article defines the ecofriendly and fitness effects of poisonous discharges from the liveliness routines for catering along with request of humble quantum mechanics with complete investigational lessons on processes of decreasing "On-cooktop period" and catering with lowest Liveliness (Heat) using a different inventive liveliness effective catering practice with a guileless low-priced isolation case. [3]

The native heaviness cooker is one of the most important catering instruments used in galleys universal. It confirms that the nutrition is ready in period, and still preserves the nutritive importance of the elements castoff. [4]

Complete investigational readings on processes of decreasing "On-cooktop period" and catering with smallest Liveliness (Heat) using fresh liveliness effective catering procedures have been accepted. The effects found are predictable to support develop innovative catering gadget to prepare with the lowermost expanse of liveliness and thus preserve nutrition nutrient liveliness and defend surroundings by decreasing CO2 and other poisonous discharges related with all types of cooktops/cookers. [5]

This study work related with floating of an idea about conversion of reclaimed thermal energy from domestic cooking system into the electrical power. In this work, new methods were advised, in order to reduce the losses of thermal energy from the system. It would open the venue for researchers to promote this new idea in near future. [6]

This article goals to extant an investigational information which evidently founds the thinkable liveliness and gasoline reserves in the conservative LPG cooktop heating richly used in catering of nutrients. The high temperature harms happening in pressure catering by LPG fuel cooktop outline are unhurried. [7]

The current learning contains of mechanical pressure controller means for pressure cookers. This system operates the straight up indication of deceased mass of pressure controller during hooting. This has been realized by handling the pathway and trend of vapor movement from cooker to nearby. The most important benefit is the pressure hoot track jams could not ever have occurred with this method. [8]

This article share out with the design and modelling of a movable paraffin pressure-cooker. The current cookers and the difficulties connected with them were examined. Using the philosophies of fluid dynamics, this effort is capable to found that the command of the cooker is 3.12 KW. [9]

Pressure cooker is an instrument which support us to chef the nutrition by using liquid and catering fluid. Pressure cooker supports us to chef a nutrition quicker than extra instrument and it munches a smaller amount liveliness and supports us to protect LPG, Power and greatest significant entity is a period. It decreases catering struggles. In this work we are executing such a method that incessant observer position of cooker. [10]

The global world requirements for solutions towards nutrition and food production problems for rural and remote areas are in constant growth. The limitation of resources remains its weakest points, water, food and energy are inextricably linked. In the present work, an experimental study conducted to deal with the problem of energy resources lack for food cooking and water boiling for drinking in remote area providing a technique that uses solar energy. The solar cooker provides a yearly thermal energy of around 317.63 kWh. A 127.05 kg of wood could be saved

which corresponds to equivalent CO2 emissions of 123.87 kg per year. [11]

2.1 Problem Definition

The problem for use simple idli cooker is known, simple idli cooker need more fuel consumption for cooking large number of idli. This simple idli cooker used for basically domestic as well as restaurants use, but the capacity of this cooker very much less i.e., 12-16 pieces in domestic idli cooker and 36-50 in restaurant idli cooker at time. So for large production this cooker is not efficient.
At the time of any event or in any restaurant we need large number of idli need, but by using simple idli cooker it is not possible to cook idli. For cooking the large number of idli cooker need large fuel consumption as well as lot of time also consuming for cooking the idli.

2.1 Objective

This research is aimed to saving in fuel consumption which is used in cooking. The implementation of Cumulative Pressure Cooker is very beneficial to cooking the idli at kitchen. The purpose of a Cumulative pressure cooker is to fuel saving and save the time consuming.

1. Design a cumulative pressure cooker properly for saving Fuel and Time.
2. Calculate the time saved by using a cumulative pressure cooker to make a recipe compared to a regular conventional cooking method.

3. WORKING PRINCIPLE

In this system we have designed a cumulative pressure cooker for cooking large number of idli in minimum fuel and less time, for the comparison of idli making time and fuel consumption with conventional method we perform the four testing to cook idli.

1) Conventional Method.
2) Cumulative Method without Insulation.
3) Cumulative Method with Insulation.
4) Cumulative Method with Insulation and Plate.

3.1 Conventional Method

Conventional method is regular method of cooking the idli. In this method we cook the idli by the conventional method to cook idli and record time and fuel for the cooking the idli.

Fig -1: Conventional Method

Table -1: Conventional Method Test

Particulars	Test 1	Test 2	Test 3
Weight of idli pot with water	1 kg	1 kg	1 kg
Weight of water	0.5 kg	0.65 kg	0.65 kg
Initial weight of cylinder	3.93 kg	3.89 kg	3.86 kg
Initial water temperature	22 ℃	79 ℃	84 ℃
Final water temperature	79 ℃	84 ℃	92 ℃
Time required	20 mins	16 mins	13 mins
Final weight of cylinder	3.89 kg	3.86 kg	3.836 kg
Weight of idli pot after test	0.84 kg	0.71 kg	0.78 kg

3.2 Cumulative Method without Insulation

In the cumulative method we design the cumulative pressure cooker for the cooking idli. In this method we connect the two idli pot with pressure cooker by using the hoses.

Fig -2: Conventional Method without Insulation

Table -2: Conventional Method without Insulation Test

Particulars	Test 1	Test 2	Test 3
Weight of idli pot with water	1.5 kg	1.5 kg	1.5 kg
Weight of water	1 kg	1 kg	1 kg

Initial weight of cylinder	3.83 kg	3.78 kg	3.74 kg
Initial water temperature	24 ℃	85.6 ℃	89.1 ℃
Final water temperature	85.6 ℃	89.1℃	97.3 ℃
Time required	23 mins	19 mins	17 mins
Final weight of cylinder	3.78 kg	3.74 kg	3.71 kg
Weight of idli pot after test	1.3 kg	1.19 kg	1.14 kg

3.3 Cumulative Method with Insulation

In this method we provide the insulation to the system on the hoses to reduce the heat losses in system.

Fig -3: Conventional Method with Insulation

Table -3: Conventional Method with Insulation Test

Particulars	Test 1	Test 2	Test 3
Weight of idli pot with water	1.5 kg	1.5 kg	1.5 kg
Weight of water	1 kg	1 kg	1 kg
Initial weight of cylinder	3.71 kg	3.66 kg	3.66 kg
Initial water temperature	26℃	84.3 ℃	88.3 ℃
Final water temperature	84.3℃	88.3 ℃	95.7 ℃
Time required	21 mins.	18 mins.	15 mins
Final weight of cylinder	3.66 kg	3.63 kg	3.63 kg
Weight of idli pot after test	1.21 kg	1.15 kg	1.1 kg

3.3 Cumulative Method with Insulation and Plate

In this method for the increase efficiency of system we add the aluminium plate in the system for increase heat holding capacity of pressure cooker.

Fig -4: Conventional Method with Insulation and Plate

Table -4: Conventional Method with Insulation and Plate Test

Particulars	Test 1	Test 2	Test 3
Weight of idli pot with water	1.5 kg	1.5 kg	1.5 kg
Weight of water	1 kg	1 kg	1 kg
Initial weight of cylinder	3.63 kg	3.59 kg	3.55 kg
Initial water temperature	26℃	85.7℃	90.1℃
Final water temperature	85.7℃	90.1 ℃	97.5℃
Time required	19 mins	17 mins	16 mins
Final weight of cylinder	3.59 kg	3.55 kg	3.53 kg
Weight of idli pot after test	1.2 kg	1.1 kg	1.05 kg

4. RESULT AND DISCUSSION

We taking different four types of tests are conventional method, Cumulative Method without Insulation, Cumulative Method with Insulation and Cumulative Method with Insulation and Plate type. In each type of test we taking three trials. So total we taking twelve number of trials and we calculating or analysis the different result such as Total number of idli's, Total time consumed, Total fuel consumption and efficiency.

4.1 Total Number of Idli's

From graph (Chart. 1) in conventional method in each trial we make only twenty idli's so total we make sixty idli's in total three number of trials. In remaining three method such as Cumulative Method without Insulation, Cumulative Method with Insulation and Cumulative Method with Insulation and Plate type in each trial we make fourty number of idli's so total we make the one hundred and twenty number of idli's in total three number of trials.

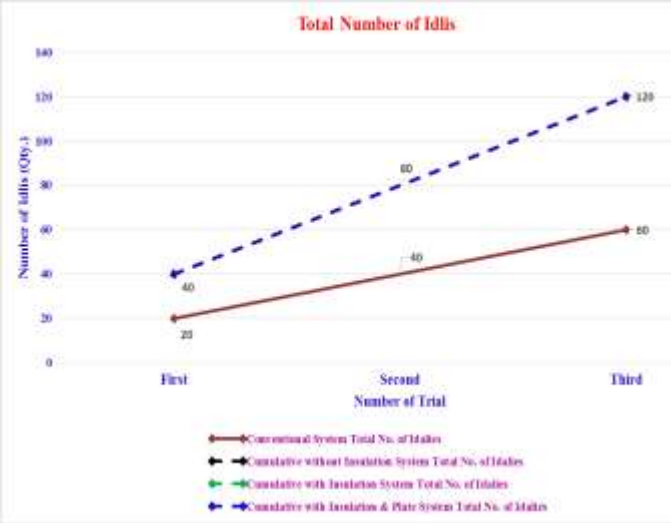

Chart -1: Total Number of Idli's

4.2 Total Time Consumed

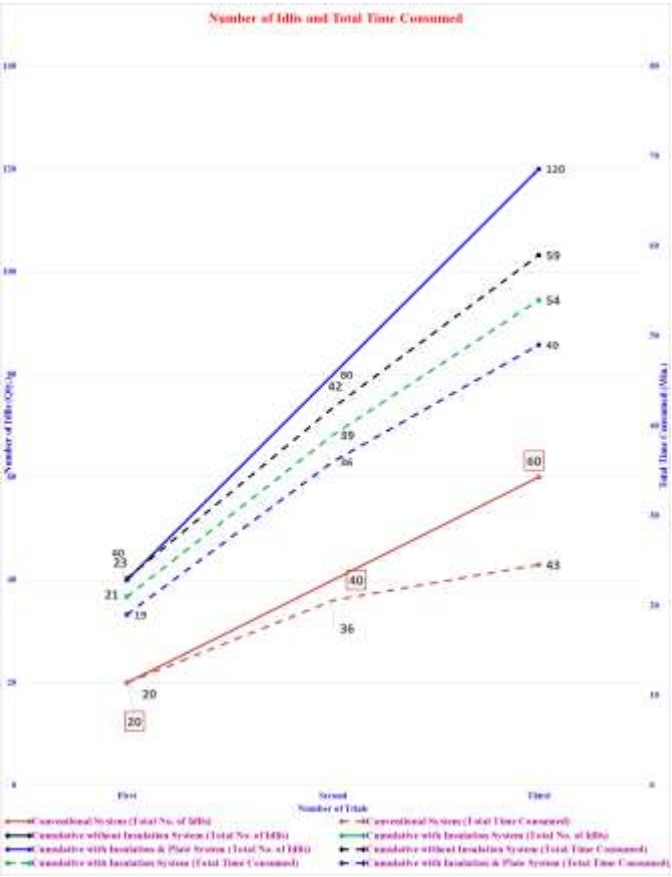

Chart -2: Total Number of Idli's and Total Time Consumed From above graph (Chart. 2) in conventional method total sixty idli's we make in total three number of trials. In each trial we make twenty number of idli's. So for that we requires total time is fourty three minutes.

In cumulative method without insulation type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that we requires total time is fifty nine minutes.

In cumulative method with insulation type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that we requires total time is fifty four minutes.

In cumulative method with insulation and plate type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that we requires total time is fourty nine minutes.

From above four different type of methods we concluded that double number of idli's with almost same time we can make in Cumulative Method without Insulation, Cumulative Method with Insulation and Cumulative Method with Insulation and Plate type.

4.3 Total Fuel Consumed

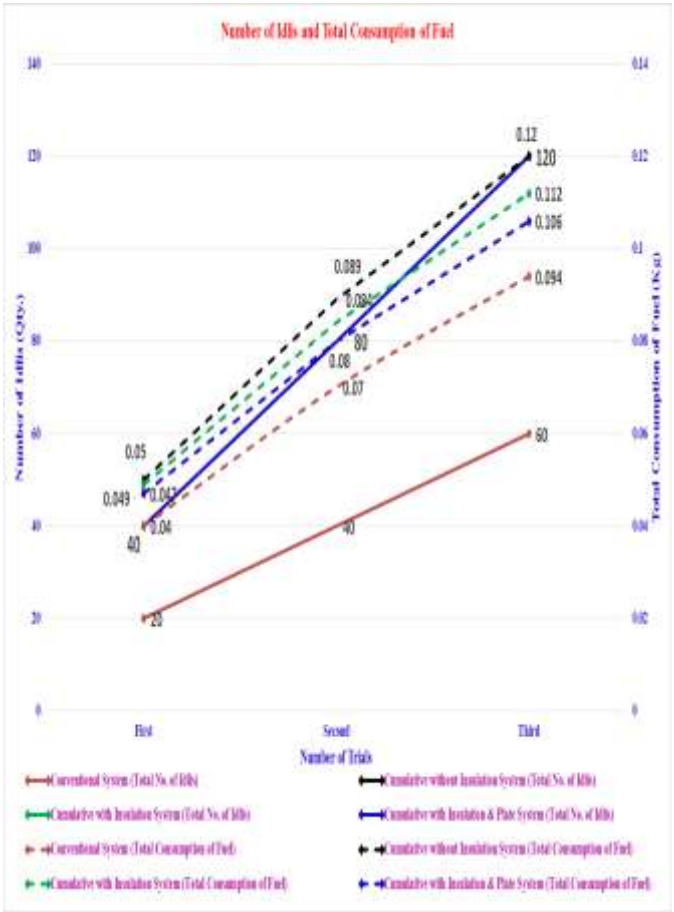

Chart -3: Total Number of Idli's and Total Fuel Consumed

From above graph (Chart. 3) in conventional method total sixty idli's we make in total three number of trials. In each trial we make twenty number of idli's. So for that we requires total fuel is 0.094 kg.

In cumulative method without insulation type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that we requires total fuel is 0.120 kg.

In cumulative method with insulation type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that we requires total fuel is 0.112 kg.

In cumulative method with insulation and plate type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that we requires total fuel is 0.106 kg.

4.4 Efficiency

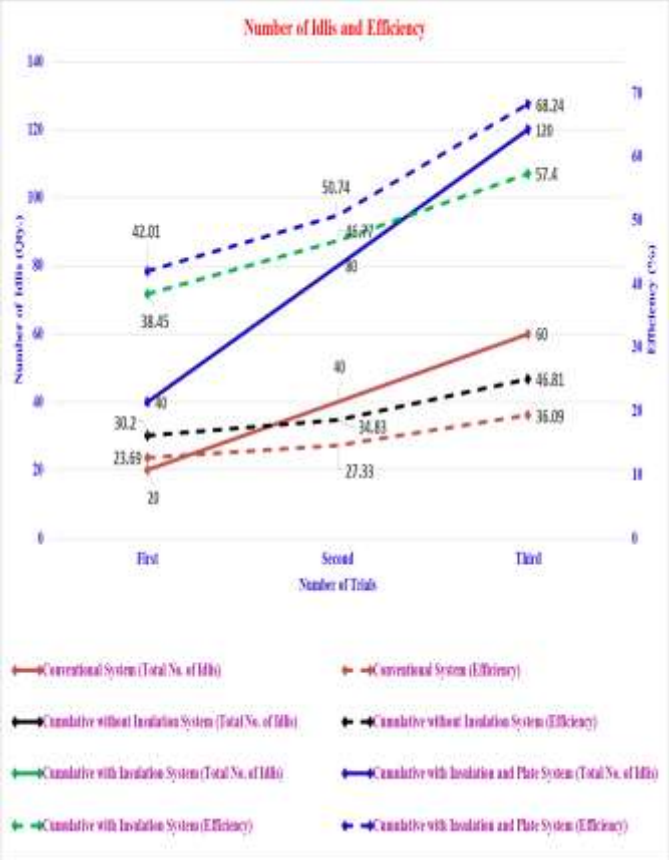

Chart -4: Total Number of Idli's and Efficiency

From above graph (Chart. 4) in conventional method total sixty idli's we make in total three number of trials. In each trial we make twenty number of idli's. So for that efficiency of the system is 36.09 %.

In cumulative method without insulation type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that efficiency of the system is 46.81 %.

In cumulative method with insulation type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that efficiency of the system is 57.40 %.

In cumulative method with insulation and plate type we make one hundred and twenty number of idli's in total three number of trials. In each trial we make fourty number of idli's. So for that efficiency of the system is 68.24 %.

5. CONCLUSIONS

The above research was performed for solving the identified problem of making large no. of idli's in minimum possible time and minimum fuel consumption.

In the research we have seen that conventional method uses minimum time and fuel as compared to cumulative cooker, but the no. of idli's produced are less in number than that of the cumulative method.

Cumulative cooker method produces double no. of idli's with very small increase in fuel and time consumption that even can be negligible.

Thus cumulative method is more efficient method than that of the conventional method.

In cumulative method three different tests were performed for identification of the most efficient process with minimum fuel and time consumption and with maximum efficiency. From the above four tests, cumulative with insulation and plate, shows the best result than the other two tests. Time consumed in this method is 49 minutes, fuel consumed is 0.106 kg, and the efficiency is 68.24%

As the aluminium plate has slots the surface area of the plate decreases and increases the thermal efficiency and as the result increases the efficiency of the cumulative system.

Thus according to results the cumulative system with insulation and plate shows the best results and they can be adapted as the cumulative cooking methods for the problems discussed of saving of fuel, saving in time and saving of money.

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