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NASTHA NIRMATHA

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***Abstract*—** Automation in any industry brings many changes along with it. From manufacturing smallest threads to big rockets, Automation and Mechatronics derive a new era of Technologies. We try deal with one of the basic amenities that is essential for lives of people- Food. Automation, which brought changes to several other industries, also brought tremendous wonders to the field of Food Processing also. The Huge factories, which produces large quantities of food items, are not rare today. Our Project aims to collaborate the Mechatronics with two of our South Indian Dishes. We try to investigate what if we can bring automation in production of IDLIs and String Hopper (or "Idiyappam"). What changes that can bring to the traditional way of Human Efforts meeting the Correct Recipe, which converts the batter to delicious Idlis and Idiyappam.

***Index Terms*— Arduino Microcontroller, SolidWorks**

1. INTRODUCTION

The project aims to automate the process of making the South Indian Breakfast dishes- Idli and Idiyappam. The project targets at consumers from a normal household to a busy restaurant, which the machine can help to produce dishes up to 200 at a time. The idea of automation in customary way of cooking improves several things like human labor reduction, standardization of food items, increased safety, less Wastage and effective use of raw ingredients.

The quality of dishes will increase precipitously with bringing the automation. Less snooping from a human means more safety from the work environment and pollutants. Each items produced in a single pass can be sufficiently increased with less amount of time. Thus being a general aim we try to show these advantages by automating the processes of making the Idli and String Hopper or Idiyappam.

A healthy breakfast should consist of a variety of Foods and especially the contents of it should have the ability to provide us energy to work until the Noon. Moreover, the research shows that eating a breakfast that contains slower burning carbohydrates helps us to maintain concentration and attention throughout the morning. Many food items lost their prominence and use with advances of time from the era of Civilizations, so if some food recipes are still there in use means, it should have some qualities and advantages for being in use.

In South India, the early records show that, a progenitor of the modern Idli was in use from about 900CE. Idli is a traditional and one of the most popular breakfast in South Indian households from early times. The vestiges of Idiyappam dates back in early 1st Century A.D. From time to time, various ingredients were added in recipe to make these two dishes more delicious as we seen it today.

These two dishes are very much popular and in use as breakfast in South Indian States, Sri Lanka, Malaysia, and some other regions in Indian Subcontinent. The methods we implement here make these dishes uniform and qualitative as well as more delicious with respect to the amount of ingredients used to make batter

2. BLOCK DIAGRAM

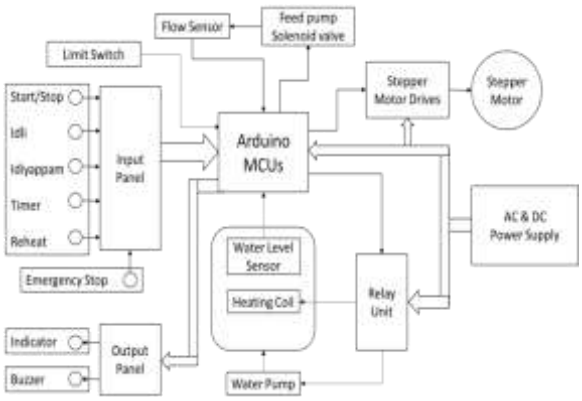

Fig 1 Block diagram.

The Fig 1 shows typical block diagram of the Prototype. Arduino Micro Control Units is a collection of 3 Arduinos, which is used to control the entire electronics part of the project. Input Panel consists of various controls that an Operator can use to provide criteria for making the desired food type.

Inputs are only schematic, in the real system the number of desired food items, Timer in case of calibration and special purposes, Reheat instruction for maintaining an ambient temperature in the Heating Chamber and Emergency Stop for any kind of predicaments that may arise.

With inputs from User, the equipment starts to work. Limit switches, Flow Sensors, Water level Sensors work

consequently to regulate the functioning of Project. These inputs from sensors are used to analyze various data and then MCUs manipulate Output signals to Solenoid, Relays, Stepper motor drives for correct positions and amount to Output dishes.

3. HARDWARE REQUIREMENT

The Components used for production of the project include

1. Arduino Board
2. Stepper Motor and Drive
3. Hall Effect Liquid Flow Meter
4. Liquid Level Switch
5. Progressive Cavity Pumps
6. Solenoid Valve
7. Power Supply Unit

4. ALGORITHM

A) Machine Run

STEP1: Turn the device ON
STEP2: Select between the food varieties and store the value
STEP3: Check for the tray. If NO turn ON, the Indicators and repeat this step, if yes go to next step
STEP4: Fill up the tray according to the variety selected
STEP5: Check for the filling completed indication
STEP6: Open the heating chamber
STEP7: Move the plate into the chamber
STEP8: Move tray until it reach to the dead end and close the heating chamber
STEP9: Turn on the timer and adjust the timer according to the selected verity
STEP10: Turn on the heating coil
STEP11: When the timer goes on turn off the coil and turn on the indicators
STEP12: Turn on the coil if reheat button is pressed up to the reheating time given
STEP13: Check if there are any change in inputs if no go to step 4

B) Tray filling

STEP1: Collect the details about the variety selected
STEP2: Adjust the number of filling points and the distance between the points to the pre-calibrated values according to variety
STEP3: Set the greatest matrix value Xn_{max} and Yn_{max} according to variety selection
STEP4: Set the value of incrimination XI and YI asper the pre- calibrated value according to variety.
STEP5: Set the position value Xn = 1 and Yn = 1
STEP6: Move to the position Xn and Yn
STEP7: Fill the tray with the selected variety.
STEP8: Increment the value of Yn by 1 and move YI distance
STEP9: Repeat the steps 7 and 8 until $Yn \leq Yn_{max}$
STEP10: Set Yn=1 and move to initial Y axis position
STEP11: Increment the value of Xn by 1 and move XI distance
STEP12: Go to the step 7 until $Xn \leq Xn_{max}$
STEP13: Provide the filling completed indication

5. MODEL

A) Designed Model

The design of the model is done based on the project objectives and the design constraints. The major design constraints were Size, Production Capacity, Energy Consumption, Cost of Production, Material Selection, User Compactness and so. These constraints were considered and attempted to reduce using different design tools.

The process of designing was carried out in SolidWorks. Inc. 2016©. SolidWorks is a solid modelling computer aided design (CAD) and computer aided engineering (CAE) computer program that runs on Microsoft Windows, which is published by Dassault Systems. SolidWorks is a solid modeler and utilizes a parametric feature based approach to create models and assemblies.

The model creation was an iterative procedure. All the design constraints were equally considered and evaluated during the procedure. The initial models were prepared as free hand drawings and later adopted to SolidWorks. All the designs thus produced are assembled and analyzed using SolidWorks.

Designing phases of some basic elements are depicted below in Fig 2 and Fig 3

Fig.2: Elements of Design Phase

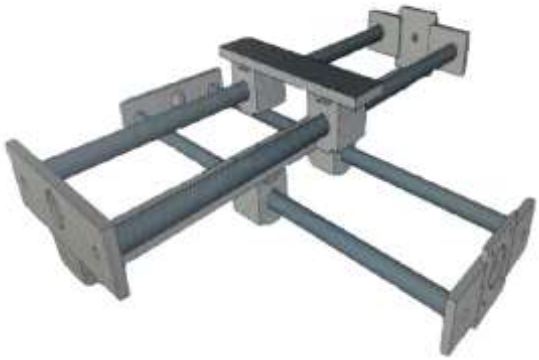

Fig. 3: Design of Cross-Slide

B) Actual Model

The actual model is the real world model of the project. The actual model has some quintessential modifications from the proposed model. The major modifications include the changes in frame and sub structure, size etc. The changes are introduced to the system in order to incorporate the components like Stepper Motor, Motor Drives, Power Supply Unit, and Arduino Microcontroller etc. There are other changes in case of the components like Cross-Slide, Idiyappam Press, and Steaming Chamber etc. All the modifications over the designed model were done and analyzed using the SolidWorks. Inc. 2016. Phases during Productization are depicted below in Fig 4,Fig 5,Fig 6

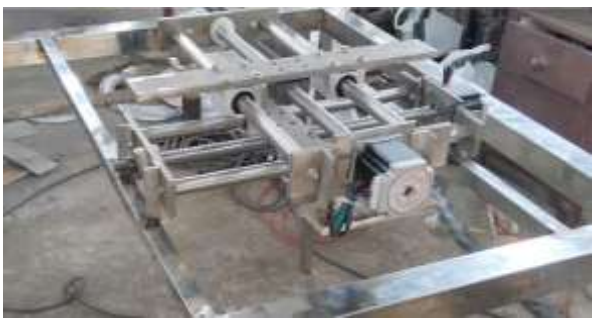

Fig. 4: Phases of Prototype- 1

Fig. 5: Phases of Prototype- 2

Fig. 6: Phases of Prototype- 3

6. RESULTS

Thus, the project has been completed and we could prototype the hardware designs into a model and successfully put it to work. The Project aimed at designing a base model for the prime concept of automating the Food Processing techniques available, and at launching the concept of Mechatronics into design of Food Producing Methodology.

With results from the study of Market available for such a product, we could understand the support and easiness that these kind of machines can provide to humans and the impact of such a machine in nearby future. These results must be utilized and analyzed thoroughly to produce compact and better equipment that can help humans in a number of ways and thus must be made available for bulk manufacturing.

7. CONCLUSION AND FUTURE SCOPE

The Nastha Nirmatha is a mechatronics application of in field of Food Processing. The Project aims on improvising the quantity and a quality of food processing. It also promotes the application of automation in small scale food industry. The project instigates an automated mechanism for producing the South-Indian dishes like Idli and Idiyappam in specific quantity as per the given input.

Automation in Food Processing can make tremendous changes in lives of many. Our Project has capabilities to automate process of making our South Indian Dishes like Idli, Idiyappam now. In our broader concept and goal, our product can make all South Indian dishes like Dosa, Chapatti, Puttu, and more completely automated.
Major constraints that we faced during our work include financial constraints and scarcity of workshops that have special instruments and can put work on some distinct materials.

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