

# DESIGN, MANUFACTURING AND FABRICATION OF WAFER CUP BAKING MACHINE USING FORM TOOL

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## ABSTRACT

Study has been devoted to change the conventional method of machining of the tapered component using boring tool on lathe machine and designing the tool of the products form and specification using it n non conventional milling machine.

Today consumption of disposable products are breaking records, it has been a great negative impact in food industries as their products are being sold in a plastic cup though they are durable but simultaneously harmful for the consumer, so as to reduce the waste the idea of converting plastic cups to wafer cups have been developed. The idea of replacing the plastic cup with a wafer cup will create a great impact to the manufacturer, seller and also consumer which indirectly eliminate the harmful pollutants in plastics, solid waste.

Manufacturing of the machine is done by using specially designed form tools so as to produce a desired end product on a horizontal milling centre (CNC) by generating a program manually as per the dimensions and various sizes of tools.

Tool was manufactured by using an end mill of diameter 80mm which is standard dia for the End mill and this tool was grinded to form flutes with the helix considering tool geometry and was sent for hardening by performing heat treatment i.e tempering to relieve internal stress which will cause this tool to break during the machining process and to achieve super finish under high speed and feed rates to lessen cycle time for manufacturing.

This machine comprises of a bottom die plate which will be acting as a female part of the machine and the top die to which male part will be attached, these dies are fabricated so as to move in the aligned direction for a smooth drop of wafer cup.

This thesis deals with manufacturing of tool and also die which directly lessen the waste and increase taste and texture of the end product which is being produces and will hav the great impact. This product can be used initially in a bakery items like desserts, semisolid items, high selling items.

**Keyword:** - wafer cup baking machine design, form tool machining, non conventional machining example

## 1. INTRODUCTION

With the advancements in technology and ever-increasing need for new products, the field of mechanical engineering has gained much more popularity. The need for optimization and reliability at much faster rates needed in the production, one requires a CNC machine which can do work without much human interference. As we are

enabled with the latest technology, utilization is in our hands for creating new products which can influence in saving the environment and making it feasible.

India has large food business sector which has achieved remarkable success over the decades. Unprocessed foods are susceptible to spoilage by biochemical processes, microbial attack and infestation. The right post harvest practices such as good processing techniques, and proper packaging, transportation and storage (of even processed foods) can play a significant role in reducing spoilage and extending shelf life. Nourishment handling in India is one of the greatest businesses it positions fifth as far as creation, utilization, trade and expected development. Though India is one of the major producers of food globally, it accounts for only 1.7 per cent of world trade in this sector.

The government has introduced several steps to enhance the growth of food processing industry. In order to further enhance investment in the food processing industry, several policy initiatives have been initiated in the recent past. The Indian government has formulated a Vision 2015, to triple the size of the food processing industry, from the current \$ 70 b to around \$ 210 b, enhancing her global share to 3%, increasing value addition to 35%, from the current 20% and raising the level of processing of perishables to 20%. India having an advantage of a strong agricultural base should tap this potential favourably and become a preferred sourcing destination for food products globally.

Utilizing the equipments and technology both, the wafer cup baking machine is being manufactured so as to influence the solid waste management and reduce plastics upto some extent. This machine was mainly influenced by cone baking machine by giving it the shape of the cup instead of cone but by using special techniques related to tool design and manufacturing processes.

### **1.1 Need for cup baking machine**

Frozen treats are a mass utilization thing. A frozen treat or cornet is a dry, cone-molded baked good, generally made of a wafer comparative in surface to a waffle, which empowers dessert to be held in the hand and eaten without a bowl or spoon. Ice creams are available in many varieties and flavors and are served in many ways such as cups, cones, bricks, candies, slices etc. With the change in life style ice creams are now consumed round the year. The most popular method of serving ice cream perhaps is in cones as it is neat & clean, easy to store, and does not have any disposal problem. Different sorts of incorporate wafer (or cake) cones, waffle cones, and sugar cones.

### **1.2 Aim of Thesis**

The aim of this thesis is to design manufacture and fabricate the cup cone baking machine, mounted on a mobile platform, which can be controlled with the help of a manual control. The features of the baking machine can be summarized as follows:

- Simple design
- Easy and precise control
- Economically sound

### **1.3 History**

The first ice cream cone was produced in 1896 by Italo Marchiony. He invented his ice cream cone in New York City. The very first cone was a waffle type which is a rolled wafer which in presence of sugar, when rolled in hot state was taking the shape of roller and within minutes become crisp in which ice cream was being served. Later in mid 90's after industrial revolution, the dies were being manufactured as the demand was being increased.

## 1.4 Organization of Thesis

The thesis is logically divided into three parts. An introduction to the thesis is given in Chapter 1. This is followed by aim of the thesis, synopsis of previous work- emphasizing on other methods used in manufacturing. This is followed by technical approach to the progress and the problems solved in this project.

The first part has the second chapter which is about the mechanical structure and stress analysis of the machine. The structuring part includes the complete design of the chassis and different mechanisms involved in the machine using the designing software Solid Works®. The stress analysis deals with the calculation of load on the plates and eventually calculation of the ohms for electric heaters.

The next part which has the third and fourth chapter is about all the mechanical and hardware components involved. The third chapter is about the hardware description. This chapter deals with the explanation of the types of the sensors used, tools, machine..

The last part of the thesis has the fifth chapter which deals with the software. It includes register description and initialization of internal peripherals viz. ADC, Timers etc. It also contains sample programs which were used in the initial stages to fully understand and study each aspect of the project independently. Finally we have the algorithms and flowcharts for the programs implemented in this project for servo control and locomotion.

## 1.5 Machine specification

- **Height: 1000mm**
- **Total weight:30 kgs**
- **Heater: 1000w coiled**
- **Temperature: upto 140c**

## 2. EXPERIMENTAL INVESTIGATION

- Division elaborates the investigational works executed out in analysis. This division has been isolated into 2 divisions. To begin with division come across with analysis performed on the materials , second division come across with the tests performed on wafer cup.

Grade	C	Cr	Mo	W	V	Co	Mn	Si
M1	0.8	4	8	1.52	0.8	-	-	-
M2	0.95	4	5	6.2	2.1	-	-	-
M42	1.1	3.2	9.1	2	1	7	-	-
M50	0.85	4	4.25	10	1	-	-	-
T1	0.6-0.75	4	-	18	1	-	0.3	0.5

## 2.1 Hardness test:

Rockwell hardness test was performed and found the hardness value as 64.

## 2.2 MATERIAL REMOVAL RATE:

<b>SPEED</b>	350RPM
<b>FEED</b>	20mm/min
<b>DEPTH OF CUT</b>	1mm per pass (DWELL)

## 3. TESTS PERFORMED ON WAFER:

- Wafer was made by using following ingredients all-purpose flour, salt, sugar, eggs, milk, butter, vanilla extract.
- Wafer was made of 2mm thickness with dimension as Dia 75 by length 65.
- It was made hardened by sugar.
- Drop test from 6ft height.
- Water absorption test.
- Crispyness test

All the above mentioned tests were performed on various samples which are tabulated below.

Sample	Drop test Height			Water absorbtion	crispyness
	Height	Pass	Fail	Time	24hrs
	30	Ok	-	5mins	24hrs
	60cm	Ok	-	-	-
	180cm	Ok	-	-	-
	200cm	-	yes	-	-
	-	-	-	-	-

## 5. CONCLUSION

. The ever increasing demand for ice cream have lead to few machines, less productivity and high demand so as to overcome the scarcity of production, the rate of production of cup making machine can increase with reduction in cost in a effective way which is mainly help decrease the plastics which the whole world is aiming for.

As the innovation in every industry is the hot topic through which the customers are attracting to that industry, it will get a major impact as the eatable ice cream with cup and also spoon which is made of wafer.

This initiative will make impact on people to get aware about how much plastic is dangerous for which the steps are being taken.

This project can further be renovated compacting its size by redesigning.