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Fabrication of Automatic Chakli Machine

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CHAPTER 1

INTRODUCTION

1.1Automatic Chakli Maker machine

India has a great heritage of traditional food products. There are many food products here which are likely to be made traditionally. But today's modern day to day life people have no time to spend in making their favorite fast food products. So, to overcome this clause and to make a self-employment we are trying to manufacture a machine which will produce multiple shape fast food products from one assembly.

The different types of shapes are Spiral, Thick long threads, Thin long threads etc. by which the finished and well hygienic fast food product will obtain. This project will explain the simple well designed Mechanical assembly which will produces a multiple shape fast food products at faster rate. Choosing a right machine is extremely important in any type of manufacturing business.

A wrong selection of machine may damage the quality and profitability of the product. A product development process is the set of activities beginning with the perception of a market opportunity and ending in the production, sale and delivery of a product.

Product development is an interdisciplinary activity requiring contributions from nearly all the functions of a firm, however marketing, design and manufacturing are almost always central to a product development. Design and development of fast food products making machine is best suited for massproduction.

1.2 Need of Self-employment

Being your own boss. This might be the first good reason for someone to choose self-employment route to success. Being your own boss would mean you will not have to deal with difficult higher-ups, who dictate and tell you to do everything.

Work from home. If you have some spare room in your home, you can transform the decor into a working space. Working from home means you will not have to worry about being late for work or get stuck in a traffic jam to commute to work every day. Additionally, self-employment offers you the comfort and flexibility of managing both professional and personal obligations such as taking care of children and family needs.

No more rush hour stress. Commuting to work and being stuck in the traffic for long, ends up consuming your productive man hours while draining you off energies, to get started for the day on a high note. Not to mention all the rush hour stress to reach office on time.

Earn more, spend less. Working for yourself means you can manage your own salary. Even better, your income won't get reduced by additional expenses, such as travel to work, health insurance, or even gas costs.

Work wherever you want. Being self-employed gives you the privilege of choosing your own workspace. You don't always have to stay at home. When you want some fresh air, you can work from your favorite cafe, local library, or even in the park.

No more uniform. Say goodbye to uncomfortable business suits and stifling ties. Being able to work wherever you want, allows you the comfort of stepping out in denims and sneakers without being bothered about sticking to a formal dress code. You are only required to dress up in formal professional attire when meeting clients face-to-face. Apart from which, you are free to choose anything you are comfortable donning.

Experience dynamic workflow. Now you can set your own working schedule, which means you don't have to deal with routine and tedious agenda.

Better work-life balance. If mountains of tasks are piled up, and this prevents you from joining a family gathering? Be rest assured. Self-employment will give you a better work-life balance, as you can manage your own schedule and workload more flexibly.

Choose your own clients. When you are an employee, you are obliged to serve the type of clients/customers you particularly dislike, but those who continue to be patrons of your employer brand. Sometimes you are also required to deal with dissatisfied clients or customers, who tend to burden you with additional responsibilities beyond your job scope. However, when you decide to go self-employed, you can choose your own clients that suit your working style and preferences.

No more drama. Some people find it easier to concentrate in solitude and silence. If you belong to this kind of personality type, then being self-employed is a great alternative. You don't have to be distracted by co-worker drama or trivial gossips.

CHAPTER 2

LITERATURE SURVEY

1. Amit B Solanki (2014) [1] proposed the detail design and development of automated fast food machine for large food industry applications. Automated fast food machine is a device that squeezing the duff mixture of fast food with following categorized efficiency such as time, human effort, safety, cleaning and quality during fast food making. In this design, it is mainly notified about cost of the machine as well as time efficiency. This designed machine can squeeze duff mixture using screw extruder with electric power, and extruded out using rotating conveyer from machine die to away as near to operator. Therefore, production rate of the fast food making machine is high compared with other manual and commercially available machines.

2. Prakash Dhopte (2019) [2]Designed a machine which is related to food Industry. It helps to reduce the labour cost as well as time. It will also reduce the work load. We are trying to manufacture a machine which will give maximum production of multiple shapes of fast food products such as Noodles, Sewai, Chakli, Gathiya, Namkeen etc. This machine will have high efficiency also the production rate as compare to the manual process

3. Yu-Chuan LeeThe [3] invented a Machine that provides a process including material feeding, frying, serving, pan washing, with a pneumatic control system and electronic control devices to produce quality Chinese food generally without help of a skilled cook. The present invention is further characterized by the present timing in material feeding, frying, serving and pan washing and a buzzer which will indicate at the end of the preset time completion of the frying step. The present invention is further characterized by a compressed air operated stirrer which can operate in the frying pan for mixing purpose. The present invention is further characterized by a pneumatic transmission system including micro switches so that the pan can be turned by 90' in order to transfer material to a dish or plate, as well as to a washing position for washing with water injected from water injector, and rotation of the stirrer for a preset time.

4. Vishal Wadagavi (2013) [4] have Studied food production domain one of the key task is to maintain the high production rate and hygienic. Considering the production of potato chips, it is time consuming task and also labor intensive if conventional method of producing chips is followed i.e. using separate machinery for each individual task. As more time is consumed while processing chips from one machine to another, we have concentrated into this factor.

In order to reduce time consumption and labor intensity, we as a team came up with an idea of a product with integrated, effective and hygienic way of production of chips. Effort is made to come with better design in addressing the above problem.

The machine is divided into 3 units based on different working principles. The units are namely i) Chopping unit ii) Frying unit iii) Flavoring unit .The chopping unit has a container where the potatoes are loaded and these potatoes are pushed against the rotary cutter through the compressive force of spring attached inside the container and potato slices are obtained. Next, Frying unit consists of a heating panel and it is filled with oil .The slices are deep oil-fried with optimum temperature and it is soaked and flipped to flavoring unit using mesh pan. In the flavoring unit, the fried slices are flavored using box spray and are vibrated using oscillatory flavoring drum. All the units are controlled using PLC programming. Finally, the chips are prepared with less time consumption, human intervention and hygienic.

Keywords: potato chip, labor intensity, hygienic, chopping unit, frying unit.

5. Design & Development of Fast Food Machine by Amit B Solanki(2014) [5]

Goal of this paper is propose the detail design and development of automated fast food machine for large food industry applications. Automated fast

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food machine is a device that squeezing the duff mixture of fast food with following categorized efficiency such as time, human effort, safety, cleaning and quality during fast food making.

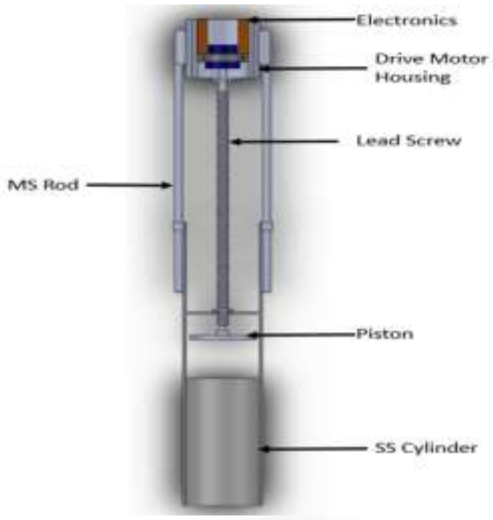
6. Fabrication of portable noodle making machine by Bharathraj M, Murali Kumar L(2017) [6] The popularity of noodle can be attributed to its sensory appeal, versatility, low cost, ease of preparation, nutritional content and excellent storage stability as well as increased consumer interest in ethnic foods in the western world. Noodles are a value-added item made from flour. As regular breakfast item. The raw material required for making noodles is available in the local market. It is widely used by school children for breakfast because it takes less time for preparation.

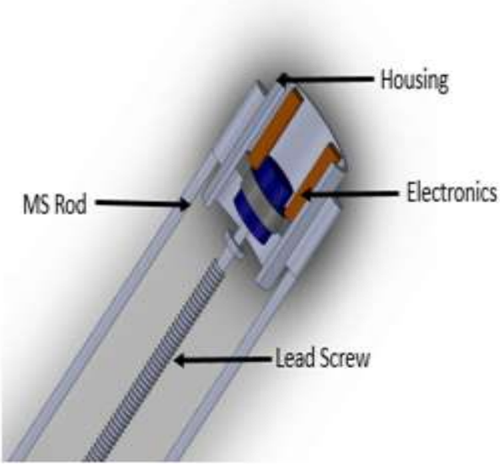
CHAPTER 3

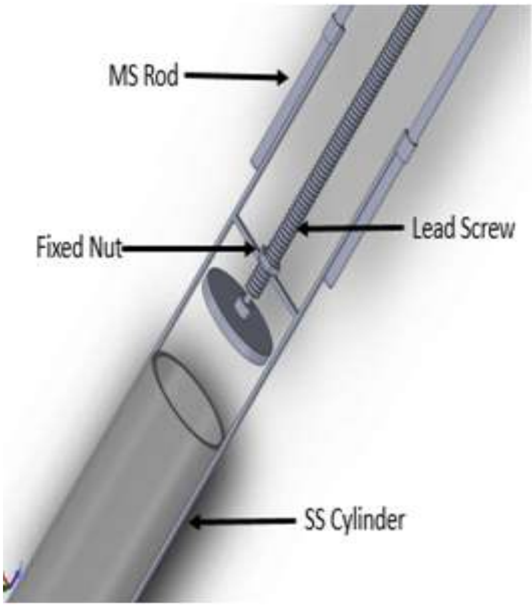
DESIGN AND FABRICATION

3.1DESIGN

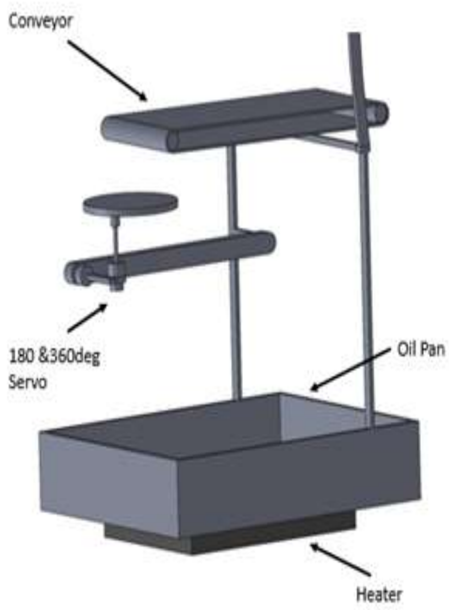
3.1.1CONCEPTUAL DESIGN







3.1.2 Motor Housing
3.1.3 Fixed Nut



3.1.4 Full Machine
3.1.5 Full Machine Bottom View

3.2 DESIGN SPECIFICATION

Microcontroller	ESP-82666 32- bit
NodeMCU Model	Amica
NodeMCU Size	49mm x 26mm
Carrier Board Size	n/a
Pin Spacing	0.9" (22.86mm)
Clock Speed	80 MHz
USB to Serial	CP2102
USB Connector	Micro USB
Operating Voltage	3.3V
Input Voltage	4.5V – 10V
Flash Memory/ SRAM	4 MB / 64 KB
Digital I/O Pins	11
Analog In Pins	1
ADC Range	0 – 3.3V

3.3 FABRICATION

Our Ultimate aim is to develop a Chakli maker which is a Simple in assembly and highly durable in life and high efficiency, Our machine should able to mix the duff and put it in the cylindrical container and able to produce a Duff threads with a help of the piston which is connected to the lead screw.
Produced duff food threads were then cut and fried with the help of the fryers

CHAPTER 4

MATERIAL SELECTION

4.1 MATERIALS

Mild steel (USED FOR FRAMES):

Mild steel is the most commonly used steel. It is used in the industries as well in the different everyday objects we use. Even the pans and spoons of the kitchen are sometimes made of mild steel. The mild steel is very important in the manufacturing of metal items. Almost 90% steel products of the world is made up of mild steel because it is the cheapest form of steel. Mild steel is the most widely used steel which is not brittle and cheap in price. Mild steel is not readily tempered or hardened but possesses enough strength.

Mild steel (USED IN FOOD CONTACTING PLACES):

Stainless steel is a generic term for a family of corrosion resistant alloy steels containing 10.5% or more chromium. All stainless steels have a high resistance to corrosion. This resistance to attack is due to the naturally occurring chromium-rich oxide film formed on the surface of the steel.

Although extremely thin, this invisible, inert film is tightly adherent to the metal and extremely protective in a wide range of corrosive media. The film is rapidly self-repairing in the presence of oxygen, and damage by abrasion, cutting or machining is quickly repaired.

4.2COMPOSITION:

Composition of mild steel:

Mild steel contains composition of following materials:
Carbon - 0.16 to 0.18 % (maximum 0.25% is allowable)
Manganese - 0.70 to 0.90 %
Silicon maximum - 0.40%
Sulfur maximum - 0.04%
Phosphorus maximum - 0.04%

Mildest grade of carbon steel or mild steel contains a very low amount of carbon - 0.05 to 0.26%. Mild steel usually contains 40 points of

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carbon at most. One carbon point is .01 percent of carbon in the steel. This means that it has at most .4 percent carbon. Most steels have other alloying elements other than carbon to give them certain desirable mechanical properties. 1018 steel, a common type of mild steel, contains approximately .6 percent to .9 percent manganese, up to .04 percent phosphorus, and up to .05 percent Sulphur. Varying these chemicals affects properties such as corrosion resistance and strength.

Composition of Stainless steel:
72% - Iron
17% - chromium
4.5% - nickel
6.5% - manganese

4.3PROPERTIES
Properties of mild steel:
Physical properties of mild steel:
The physical properties of the metals include luster, colour, size and shape, density, electric and thermal conductivity, and melting point. The following table shows the important physical properties of some pure metals. Mild steel has a density of .248 pounds per cubic inch. It melts at 2,570 degrees Fahrenheit. It has a specific heat of around .122 British Thermal Units (BTU) per pound, per cubic inch.

Mechanical properties of mild steel:
The mechanical properties of the metals are those which are associated with the ability of the material to resist mechanical forces and load. These mechanical properties of the metal include strength, stiffness, elasticity, plasticity, ductility, brittleness, malleability, toughness, resilience, creep and hardness. We shall now discuss these properties as follows:

Ductility:
It is the property of a material enabling it to be drawn into wire with the application of a tensile force. A ductile material must be both strong and plastic. The ductility is usually measured by the terms, percentage elongation and percentage reduction in area. The ductile material commonly used in engineering practice (in order of diminishing ductility) are mild steel, copper, aluminum, nickel, zinc, tin and lead.

A small amount of carbon makes mild steel to change it properties. Different amount of carbon produces different types of steels. There are small spaces between the iron lattices. Carbon atoms get attached to this spaces and makes it stronger and harder. The harder the steel the lesser the ductility.

Elasticity:
It is the property of a material to regain its original shape after deformation when the external forces are removed. This property is desirable for materials used in tools and machines. It may be noted that steel is more elastic than rubber. The modulus of elasticity calculated for the industry grade mild steel is 210,000 Mpa. It has a average density of about 7860 kg/m3.

Conductivity:
Mild steel is a great conductor of electricity. So it can be used easily in the welding process.

Malleability:
It is a special case of ductility which permits materials to be rolled or hammered into thin sheets. A malleable material should be plastic but it is not essential to be so strong. The malleable materials commonly used in engineering practice (in order of diminishing malleability) are lead, soft steel, wrought iron, copper and aluminum. Because of its malleability, mild steel can be used for constructing pipelines and other construction materials. Even domestic cookware are made of mild steel. It is ductile and not brittle but hard.

Magnet-ability:
Mild steel can be easily magnetized because of its ferromagnetic properties. So electrical devices can be made of mild steel.

Machinability:
It is the property of a material which refers to a relative case with which a material can be cut. The machinability of a material can be measured in a number of ways such as comparing the tool life for cutting different materials or thrust required to remove the material at some given rate or the energy required to remove a unit volume of the material. It may be noted that brass can be easily machined than steel. Mild steel is very much suitable as structural steel. Different automobile manufacturers also use mild steel for making the body and parts of the vehicle.

Mild steel is especially desirable for construction due to its weld ability and machinability. Because of its high strength and malleability, it is quite soft. This means that it can be easily machined compared to harder steels. It is also easy to weld, both to itself and to other types of steel. It takes on a nice finish and is polishable. However, it cannot be hardened through heat

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treatment processes, as higher carbon steels can. This is not entirely a bad thing, because harder steels are not as strong, making them a poor choice for construction projects.

Hardness:

It is a very important property of the metals and has a wide variety of meanings. It embraces many different properties such as resistance to wear, scratching, deformation and machinability etc. It also means the ability of a metal to cut another metal. The hardness is usually expressed in numbers which are dependent on the method of making the test. The hardness of a metal may be determined by the following tests:
(a) Brinell hardness test,
(b) Rockwell hardness test,
(c) Vickers hardness (also called Diamond Pyramid) test, and
(d) Shore scleroscope.
Mild steel can be easily machined in the lathe, shaper, drilling or milling machine. Its hardness can be increased by the application of carbon.

Corrosivity:

Mild steel is very much prone to rust because it has high amount of carbon. When rust free products are needed people prefer stainless steel over mild steel. Mild steel has a high proportion of iron to carbon, which means that it is very susceptible to corrosion. Corrosion is brought on by exposure to oxygen, moisture or salt and manifests in brownish red deposits on the surface of the material which is commonly referred to as 'rust'. This rust comes away from the surface of the metal, exposing more of the material to that which is causing it to corrode. Therefore, if left untreated, corrosion in mild steel will eventually lead to the total decay of the material.

It is therefore not suitable for use in marine environments or in other demanding applications, and wherever mild steel is used outside it is recommended that it is protected with paint or by galvanizing it. Galvanizing is the preferred method of rust prevention in steel. The process bonds a layer of zinc to the outside of the metal with electrolysis, providing an inert protective layer which will not weaken over time unlike paint which may be undermined by water or other external factors.

Strength:

It is the ability of a material to resist the externally applied forces without breaking or yielding. The internal resistance offered by a part to an externally applied force is called stress.Mild steel is very strong due to the low amount of carbon it contains. In materials science, strength is a complicated term. Mild steel has a high resistance to breakage. Mild steel, as opposed to higher carbon steels, is quite malleable, even when cold. This means it has high tensile and impact strength. Higher carbon steels usually shatter or crack under stress, while mild steel bends or deforms.

Mild steel is a relatively ductile material as it contains a smaller amount of the hardening alloy – carbon – than other carbon steels. It has a low tensile strength of around 400MPa. Like tensile strength, yield strength is measured in Pascals (Pa) or megaPascals (MPa). Mild steel as an approximate yield strength of 250MPa.

Brittleness:

It is the property of a material opposite to ductility. It is the property of breaking of a material with little permanent distortion. Brittle materials when subjected to tensile loads, snap off without giving any sensible elongation. Cast iron is a brittle material. Mild steel is less brittle than stainless steel.

Properties of Stainless steel:

Corrosion Resistance

All stainless steels are iron-based alloys that contain a minimum of around 10.5% Chromium. The Chromium in the alloy forms a self-healing protective clear oxide layer. This oxide layer gives stainless steels their corrosion resistance. The self-healing nature of the oxide layer means the corrosion resistance remains intact regardless of fabrication methods. Even if the material surface is cut or damaged, it will selfheal and corrosion resistance will be maintained. Conversely, normal carbon steels may be protected from corrosion by painting or other coatings like galvanizing. Any modification of the surface exposes the underlying steel and corrosion can occur.

The corrosion of different grades of stainless steel will differ with various environments. Suitable grades will depend upon the service environment. Even trace amounts of some elements can markedly alter the corrosion resistance. Chlorides in particular can have an adverse effect on the corrosion resistance of stainless steel.Grades high in Chromium, Molybdenum and Nickel are the most resistant to corrosion.

Cryogenic (Low Temperature) Resistance

Cryogenic resistance is measured by the ductility or toughness at subzero temperatures. At cryogenic temperatures the tensile strengths of austenitic stainless steels are substantially higher than at ambient temperatures. They also maintain excellent toughness. Ferrite, martensitic and precipitation hardening steels should not be used at sub-zero temperatures. The toughness of these grades drops significantly at low temperatures. In some cases this drop occurs close to room temperature.

Work Hardening

Work hard enable grades of stainless steel have the advantage that significant increases to the strength of the metal can be achieved simply through cold working. A combination of cold working and annealing stages can be employed to give the fabricated component a specific strength.A typical example of this is the drawing of wire. Wire to be used as springs will be work hardened to a particular tensile strength. If the same wire was to be used as a bendable tie wire, it would be annealed, resulting in a softer material.

Hot Strength

Austenitic grades retain high strength at elevated temperatures. This is particularly so with grades containing high levels of chromium and/or high silicon, nitrogen and rare earth elements (e.g. grade 310 and S30815). High chromium ferritic grades like 446 can also show high hot strength.The high chromium content of stainless steels also helps to resist scaling at elevated temperatures.

Ductility

Ductility tends to be given by the % elongation during a tensile test. The elongation for austenitic stainless steels is quite high. High ductility and high work hardening rates allows austenitic stainless steels to be formed using severe processes such as deep drawing.

High Strength

When compared with mild steels, stainless steels tend to have higher tensile strength. The duplex stainless steels have higher tensile strengths than austenitic steels.
The highest tensile strengths are seen in the martensitic (431) and precipitation hardening grades (17-4 PH). These grades can have strengths double that of TYPES 304 and 316, the most commonly used stainless steels.

Magnetic Response

Magnetic response is the attraction of steel to a magnet. Austenitic grades are generally not magnetic although a magnetic response can be induced in the lowaustenitic grades by cold working. High nickel grades like 316 and 310 will remain non-magnetic even with cold working. All other grades are magnetic.

Stainless Steel Families

Although the corrosion resistance of stainless comes from the presence of Chromium, other elements are added to enhance other properties. These elements alter the microstructure of the steel.
Stainless steels are grouped into families based on their metallurgical microstructure. The microstructure may be composed of the stable phase’s austenite or ferrite, a “duplex” mix of these two, martensitic or a hardened structure containing precipitated micro-constituents.

Austenitic Stainless Steels Austenitic stainless steels contain a minimum of 16% chromium and 6% nickel. They range from basic grades like 304 through to super austenitic such as 904L and 6% Molybdenum grades. By adding elements such as Molybdenum, Titanium or Copper, the properties of the steel can be modified. These modifications can make the steel suited to high temperature applications or increase corrosion resistance. Most steels become brittle at low temperatures but the Nickel in austenitic stainless makes it suited to low temperature or cryogenic applications.
Austenitic stainless steels are generally non-magnetic. They are not able to be hardened by heat treatment.
Austenitic stainless steels rapidly work-harden with cold working. Although they work harden, they are the most readily formed of the stainless steels.
The principal alloying elements are sometimes reflected in the name of the steel. A common name for 304 stainless steel is 18/8, for 18% chromium and 8% nickel.

4.4. ANALYSIS OF CORROSION RATE IN MILD STEEL

The simplest and longest method to determine the corrosion loss is weight loss analysis.

A weighted sample of the metal is introduction the process and later removed after a reasonable time interval. The sample is then cleaned of all corrosion products and is reweighted.

Corrosion rate (CR)= $$\frac{W_b - W_a}{A * T}$$

Where,

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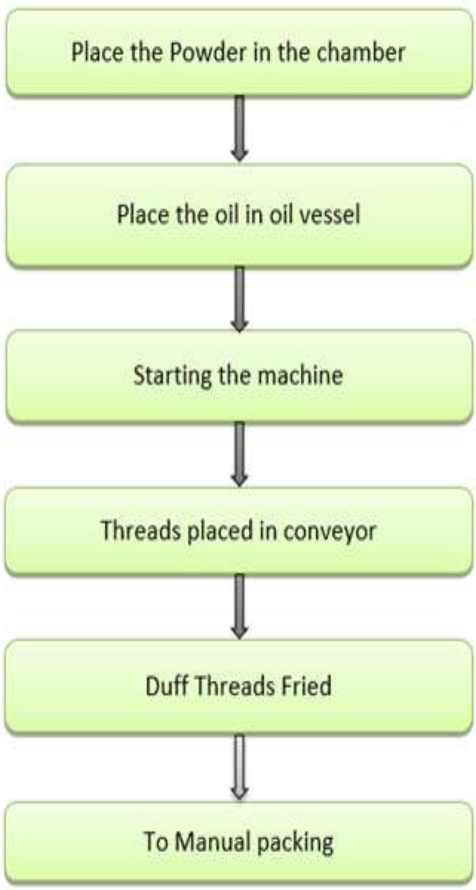
CR = Corrosion rate,
Wb = Weight before process, (g)
Wa = Weight after process, (g)
A = Exposed area, (mm^2)
T = Exposure time (hr)

CHAPTER 5
METHODOLOGY



CHAPTER-6
Material Description & Calculations
6.1. FACTORS DETERMINING THE CHOICE OF MATERIALS
The various factors which determine the choice of material are discussed below.

1. Properties:
The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied
Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.
The following four types of principle properties of materials decisively affect their selection
a. Physical
b. Mechanical
c. From manufacturing point of view
d. Chemical
The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.
The various Mechanical properties Concerned are strength in tensile,
Compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.
The various properties concerned from the manufacturing point of view are,
- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

2. Quality Required:
This generally affects the manufacturing process and ultimately the material.
For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

3. Availability of Material:
Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed.
The delivery of materials and the delivery date of product should also be kept in mind.

4. Cost:
As in any other problem, in selection of material the cost of material plays an important part and should not be ignored.
Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

6.2. DC MOTOR
The d.c generators and d.c motors have the same general construction.

MOTOR PRINCIPLE:
An electric motor is a machine which converts an electrical energy to mechanical energy.All D.C machines have five principal

components (i) Field system (ii) armature core (iii) armature winding (iv) Commutator (v) brushes

(i) **Field system**:

The function of the field system is to produce Uniform field within which the armature rotates.it consists of a number of salient poles(of course, even number) bolted to the inside of circular frame (generally called yoke).the yoke is usually made of solid cast steel whereas the pole piece are composed of stacked laminations. Field coils are mounted on the poles and carry the d.c exciting current. The field coils are connected in such a way that adjacent poles have opposite polarity.

The m.m.f. developed by the coils produces a magnetic flux that passes through the pole pieces, the air gap, the armature and the frame. Practical d.c machines have air gaps ranging from 0.5mm to 1.5mm.since armature and field systems are composed of materials that have permeability, most of the m.m.f.of field coils is required to set up flux in the air gap. By reducing the length of air gap, we can reduce the size of field coils (number of turns).

(ii) Armature core:

The armature core is keyed to the machine shaft and rotates between the field poles. It consists of slotted soft-iron laminations (about 0.4 to 0.6mm thick) that are stacked to form a cylindrical core. The laminations are individually coated with a thin insulating film so that they do not come in electrical contact with each other. The purpose of laminating the core is to reduce the eddy current loss. The laminations are slotted to accommodate and provide mechanical security to the armature winding and to give shorter air gap for the flux to cross between the pole face and the armature "teeth".

(iii) Armature winding:

The slots of the armature core hold conductors that are connected in a suitable manner. This are known as armature winding. This is the winding in which "working" emf is induced.

The armature conductors are connected in series-parallel: the conductors being connected in series so as to increase the voltage and in parallel paths so as to increase the current. The armature winding of a D.C.machine is a closed –circuit winding, the conductors being connected in a symmetrical manner forming a closed loop or series of closed loops.

(iv) commutator;

A commutator is a mechanical rectifier which converts the alternating voltage generated in the armature winding into direct voltage across the brushes. The commutator is made of copper segments insulated from each other by mica sheets and mounted on the shaft of the machine. The armature conductors are soldered to the commutator segments in a suitable manner to give rise to the armature winding. Depending upon the manner in which the armature conductors are connected to the commutator segments, there are two types of armature winding in a.d.c. machine viz (a) lap winding (b) wave winding.

Great care is taken in building the commutator because any eccentricity will cause the brushes to bounce, producing unacceptable sparking .the sparks may burn the brushes and overheat and carbonize the commutator.

(v) Brushes:

The purpose of brushes is to ensure electrical connections between the rotating commutator and stationary external load circuit. The brushes are made of carbon and rest on the commutator, the brush pressure is adjusted by means of adjustable springs. If the brush pressure is Very large, the friction produces heating of the commutator and the brushes. On the other hand, if it is too weak, the imperfect contact with the commutator may produce sparking.

STATOR:

The stator is the stationary part of an electric generator or electric motor. The non-stationary part on an electric motor is the rotor.

Depending on the configuration of a spinning electromotive device the stator may act as the field magnet, interacting with the armature to create motion, or it may act as the armature, receiving its influence from moving field coils on the rotor.

The first DC generators (known as dynamos) and DC motors put the field coils on the stator, and the power generation or motive reaction coils are on the rotor. This was necessary because a continuously moving power switch known as the commutator is needed to keep the field correctly aligned across the spinning rotor. The commutator must become larger and more robust as the current increases.

The stator of these devices may be either a permanent magnet or an electromagnet. Where the stator is an electromagnet, the coil which energizes it is known as the field coil or field winding.

ROTOR:

The rotor is the non-stationary part of a rotary electric motor or alternator, which rotates because the wires and magnetic field of the motor are arranged so that a torque is developed about the rotor's axis. In some designs, the rotor can act to serve as the motor's armature, across which the input voltage is supplied.

ELECTROMAGNETIC COIL:

An electromagnetic coil is formed when a conductor solid copper wire is wound around a core or form to create an inductor or electromagnet. One loop of wire is usually referred to as a turn, and a coil consists of one or more turns. For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are often coated with varnish and/or wrapped with insulating tape to provide additional insulation and secure them in place. A completed coil assembly with taps etc. is often called a winding.

A transformer is an electromagnetic device that has a primary winding and a secondary winding that transfer's energy from one electrical circuit to another by magnetic coupling without moving parts. The term tickler coil usually refers to a third coil placed in relation to a primary coil and secondary coil. A coil tap is a wiring feature found on some electrical transformers, inductors and coil pickups, all of which are sets of wire coils.

The coil tap are points in a wire coil where a conductive patch has been exposed. As self-induction is larger for larger coil diameter the current in a thick wire tries to flow on the inside. The ideal use of copper is achieved by foils. Sometimes this means that a spiral is a better alternative. Multilayer coils have the problem of interlayer capacitance, so when multiple layers are needed the shape needs to be radically changed to a short coil with many layers so that the voltage between consecutive layers is smaller.

6.3. PRINCIPLES OF OPERATION:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

Every DC motor has six basic parts -- axle, rotor (armature), stator, commutator, field magnet(s), and brushes. In most common DC motors, the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.

The geometry of the brushes, commutator contacts, and rotor windings are such that when power is applied, the polarities of the energized winding and the stator magnet(s) are misaligned, and the rotor will rotate until it is almost aligned with the stator's field magnets. As the rotor reaches alignment, the brushes move to the next commutator contacts, and energize the next winding. Given our example two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a "flip" of the rotor's magnetic field, driving it to continue rotating.

In real life, though, DC motors will always have more than two poles (three is a very common number). In particular, this avoids "dead spots" in the commutator. You can imagine how with our example two-pole motor, if the rotor is exactly at the middle of its rotation (perfectly aligned with the field magnets), it will get "stuck" there. Meanwhile, with a two-pole motor, there is a moment where the commutator shorts out the power supply. This would be bad for the power supply, waste energy, and damage motor components as well. Yet another disadvantage of such a simple motor is that it would exhibit a high amount of torque "ripple" (the amount of torque it could produce is cyclic with the position of the rotor).

So since most small DC motors are of a three-pole design,

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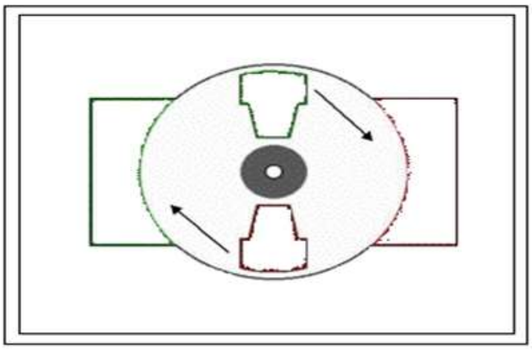
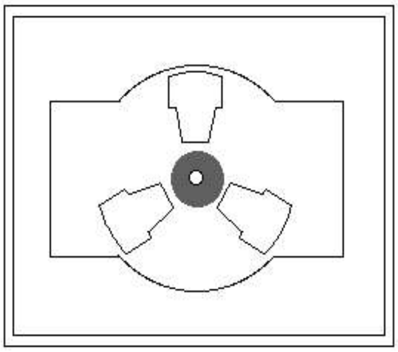
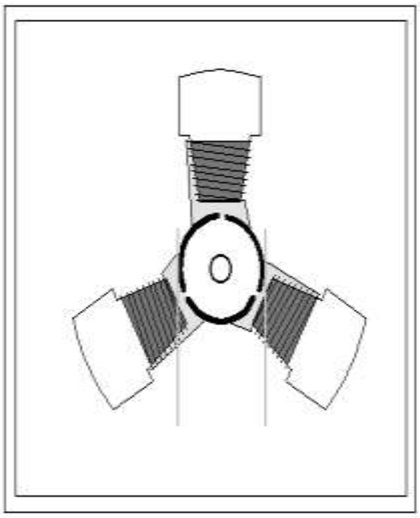




A few things from this -- namely, one pole is fully energized at a time (but two others are "partially" energized). As each brush transitions from one commutator contact to the next, one coil's field will rapidly collapse, as the next coil's field will rapidly charge up (this occurs within a few microsecond). We'll see more about the effects of this later, but in the meantime you can see that this is a direct result of the coil windings' series wiring:



There's probably no better way to see how an average DC motor is put together, than by just opening one up. Unfortunately this is tedious work, as well as requiring the destruction of a perfectly good motor.

The guts of a disassembled Mabuchi FF-030-PN motor (the same model that Solarbotics sells) are available for (on 10 lines / cm graph paper). This is a basic 3-pole DC motor, with 2 brushes and three commutator contacts.

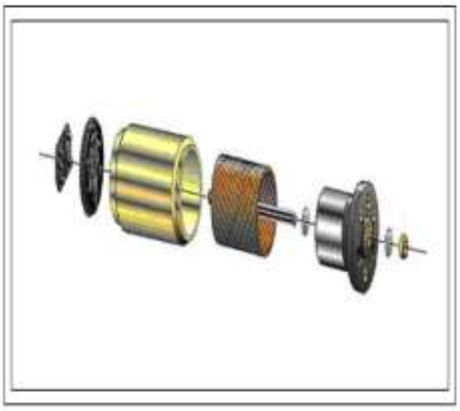
The use of an iron core armature (as in the Mabuchi, above) is quite common, and has a number of advantages. First off, the iron core provides a strong, rigid support for the windings -- a particularly important consideration for high-torque motors. The core also conducts heat away from the rotor windings, allowing the motor to be driven harder than might otherwise be the case. Iron core construction is also relatively inexpensive compared with other construction types.

But iron core construction also has several disadvantages. The iron armature has a relatively high inertia which limits motor acceleration.

This construction also results in high winding inductances which limit brush and commutator life.

In small motors, an alternative design is often used which features a 'coreless' armature winding. This design depends upon the coil wire itself for structural integrity.

As a result, the armature is hollow, and the permanent magnet can be mounted inside the rotor coil. Coreless DC motors have much lower armature inductance than iron-core motors of comparable size, extending brush and commutator life.



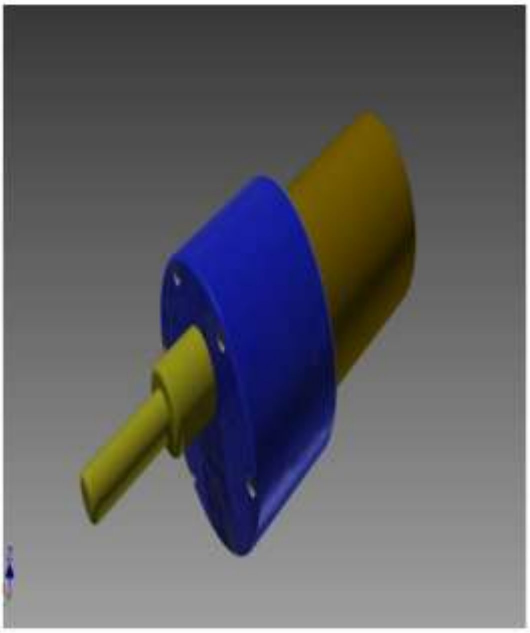
Brushed Motor

The coreless design also allows manufacturers to build smaller motors; meanwhile,

due to the lack of iron in their rotors, coreless motors are somewhat prone to overheating. As a result, this design is generally used just in small, low-power motors. Beamers will most often see coreless DC motors in the form of pager motors.
Again, disassembling a coreless motor can be instructive -- in this case, my hapless victim was a cheap pager vibrator motor. The guts of this disassembled motor are available (on 10 lines / cm graph paper). This is (or more accurately, was) a 3-pole coreless DC motor.

6.4. LIMITAION OF THE DC MOTOR:
We never aim at achieving maximum power due to the following reasons:
The armature current under this condition is very large – much excess of rated current of the machine. Half of the input power is wasted in the armature circuit. In fact, if we take into account other losses (iron and mechanical), the efficiency will be well below 50%.

DC MOTOR USED



Design of 5Kg-cm DC Motor
Features,
- 100RPM 12V DC motors with Gearbox
- 4mm shaft diameter with internal hole
- 125gm weight
- Same size motor available in various rpm
- 5kgcm torque
- No-load current = 60 mA (Max), Load current = 300 mA (Max)

6.5. DESIGN OF LEAD SCREW

CHAPTER 7
RESULT AND DISCUSSION
Our project is based on Fabrication of Automatic Chakli maker. It is fabricated with Mild Steel (MS) and Stainless Steel (SS). We had planned to do this project as a Semi- Automatic at first, but the company instructed us to do as a fully Automatic. After that we changed the design and made as a fully Automatic Chakli maker. We have uploaded the full details of the machine in You Tube, many viewers sent a query about it. Some of the viewers around three members ordered this project.

CHAPTER 8
COST OF ESTIMATION

S.NO	Material	Cost (in rupees)
1.	Electronic Components	5,000/-
2.	Fabrication	15,000/-
3.	Stepper Motor	10,000/-
	TOTAL	30,000/-

CHAPTER-9
CONCLUSION
The project carried out by us made an impressing task in the field of mechanical department. Reduction of time is main aspect of this project which in turn increases the production of the company.
This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available.

ACKNOWLEDGEMENT
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Dr.S.Rajalakshmi, Correspondent and **Dr.S.NalinVimal Kumar**, Technical Director who have always encouraged us to give for the best in all our efforts and endeavours.

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We express our gratitude to our family and friends for being our moral
Support throughout the project work.

SYNOPSIS

Goal of this paper is propose the detaileddesign and development of automated fast food machine for large food industry application and for a Self-Employment. Automated fast food machine is a device that squeezing the duff mixture of fast-food with following categorized efficiency such as time, human effort, safety, cleaning and quality during fast-food making. In this design, it is mainly notified about cost of the machine as well as time efficiency. This designed machine can squeeze duff mixture using screw rod with electric power.

This machine can also make a huge self-employment opportunities for the home makers, and many unemployed peoples.

CHAPTER-10

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