

DESIGN & ANALYSIS OF BOILED EGG PEELING MACHINE

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ABSTRACT

the purpose of this research has been to study hardness of boiled egg and temperature of boiled egg so that we could find the most efficient way to peel the hard boiled eggs peeling of boiled eggs is very difficult task for cook or chief. That's why we are going to make a machine which does the above job easily. Eggs peeling machine is equipment which is used to peel the boiled eggs in mass quantity. Basically our machine is totally based on the manual method used in hotels to peel the egg i.e. Shake the egg in a glass of water. This machine is useful for college hostels, restaurants, big hotels where mass quantity of eggs required. The machine is portable and easy to carry. Very simple mechanisms are used in this machine. A dc motor, circular disc, binary links etc, this operation also can be done by less skill worker. The machine is made to reduce the human effort and complete the job efficiently.

I. INTRODUCTION

Eggs are packed with protein, especially the whites. When those proteins are exposed to heat, like when an egg is being cooked. The proteins coagulate, or turn from liquid to solid. Coagulation is a good thing, because it means you get to eat a solid egg instead of a gross, goopy mess. But the process also makes boiled eggs difficult to peel. Proteins are very sticky. When the egg white cooks, it can bind to the membrane and the shell And you end up with a torn, pockmarked egg.

An egg's pH also plays a role. Egg white proteins that contain more acid are especially sticky. Fresher eggs tend to have a lower pH, which is why the eggs from your local farmer's market tend to be more stubborn than the ones from the grocery store

Most commonly used method is shaking of egg in a glass of water. The boiled eggs are peeled by using a glass of water and some human efforts. The working of this method is depends on the reciprocating motion same as our machine, but it requires the human efforts. The working of this method is, Firstly we have to put the boiled egg in the glass but before that we have to add some water into the glass. After this hold the glass horizontally in a way that close the open mouth of the glass with hand. After this we have to oscillate it with our hand very rapidly, once the work will done, the peeled egg can be taken out from the glass with the peeled extra. The big disadvantage of this

method is, we can't use multiple eggs at a time. Another is we required extra human efforts to get the desired output.

PROBLEM STATEMENT

The main problem regarding to peeling of Boiled Eggs is that the boiled eggs are very hot having temperature in range of 70-100 deg. Celsius that is practically very difficult to handle and peel the boiled egg in minimum time. Our Project tries to overcome this problem.

II. EXPERIMENTATION

2.1 Start hot and finish cold

Dropping an egg into boiling Pot water instead of starting the egg in a pot of cold water. That's because adding eggs directly to hot water helps them cook faster and keeps the egg whites from reaching too high a temperature, which seems to make it harder for the membrane to stick to the shell. Plunging the eggs into an ice water bath once they're done stops the cooking, further preventing a sticky situation.

This wasn't totally foolproof, but it nixed about 95 percent of peeling problems. It might've been even better if we chilled the eggs longer, but in the interest of time.

2.2 Steam the eggs

Steaming is gentler than boiling. Suppose this makes it harder for the whites of the eggs to get too hot and make the proteins ultra sticky. It was the other cooking method. Just like after boiling, we plunged the cooked eggs in ice water for a few minutes to help them cool down.

2.3 Use older eggs

Older eggs have a higher pH than fresher ones. And if you're buying them from the supermarket, you can check the carton to see when your eggs were actually packed. Problem is there's no official definition for what "old" actually is. My eggs were packed three weeks before I brought them home, and they weren't any easier or harder to peel than other supermarket eggs I'd bought in the past. But if you buy very fresh eggs from the farmer's market, it might be worth seeing whether letting them sit for at least a few days makes for easier peeling.

2.4 Boil eggs with baking soda.

Baking soda is alkaline, so adding a sprinkle to your cooking water will raise its pH which, theoretically, will raise the pH of your egg and make it easier to peel. But for this to actually work, the baking soda would need to pass through the egg shell and come in contact with the egg white before the proteins start to coagulate. So we used a pin to prick tiny holes in the top and bottom of the egg to make sure the baking soda could get inside.

2.5 Use the one-hand rolling technique.

Gently rolling the cooked egg on a cutting board (or other hard surface) with the palm of your hand makes lots of cracks in the shell, which supposedly helps to detach the membrane from the egg white. So after dropping the egg into boiling water and chilling it in an ice bath, we gave it a try instead of our usual one big crack.

There's no one foolproof trick to perfectly peel a boiled egg. Instead, it's a combination of how you cook the egg, how you cool it, and how you crack the shell afterward. So start your eggs in already-boiling water or steam them,

cool them quickly in ice, and roll them gently to make lots of cracks in the shell before peeling. Or, if you're a daredevil, go ahead and shake it up in a cup.

Table No. 2 Demerits of common method

There is one more trick used in reputed hotels to peel the boiled egg

Shake the egg in a glass of water- putting an egg in a glass cup, adding a little bit of water, covering the mouth of the cup with his hand, and then shaking vigorously for 20 seconds. The combination of the water and the shaking seems to cause the shell to detach from the membrane in one giant piece.

Common Methods	Demerit
<i>Start hot and finish cold.</i>	It is not a full proof hence not work every time.
Steam the eggs.	It required more time, can't easily applicable.
Use older eggs.	It is not convenient, because everyone want fresh food
Boil eggs with baking soda.	It is also not convenient, because it required pin to prick hole.
Use the one-hand rolling technique.	It is injurious to roll the hot egg with hand. One or two eggs can process at a time.

III. CONSTRUCTION OF MACHINE:

3.1 Tray

This is the main component of the project. The main function of the tray is to hold the egg and shake it under the stream of water. We designed the tray which is able to hold three eggs at a time and shake it.

On one side of tray there is a provision for fixing the water pipe and another side there is a provision for water outlet.

3.2 Bearing

Bearing is mainly used to allow the motion between stationary and rotating part. Here two bearings are used. First bearing used is in between the circular disc and connecting rod. Second bearing is used in between another end of connecting rod and tray.

3.3 Connecting rod

The main function of connecting rod is to convert rotary/oscillating motion into linear motion. Here connecting rod convert rotary motion of circular disc to reciprocating motion of egg containing tray.

3.4 Circular disc

The circular disc is work as crank . The function of crank is to transfer motion from prime mover to the connecting rod for further operation. Here the circular disc having eccentricity at which rotary motion of disc is converted into linear motion of connecting rod.

3.5 Guide way

The function of guide way is to provide space for constrained linear motion. Here the linear motion of egg containing tray is guided by the guide way also it is supporting the respective structure.

IV. WORKING:

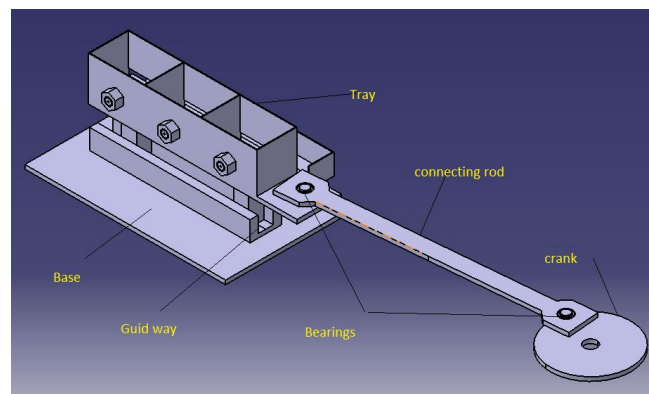


Fig No.4 Cad Model Of Machine

Above figure shows the assembly of the machine. Machine is works on the motor. The circular disc is driven by the motor. Disc having small offset to act as a crank. As the rotor rotates ,Circular disc transmit the power to the tray through the connecting rod, here rotary motion is converted into linear motion.

There is a bearing provided in between circular disc and connecting rod to allow the motion of disc is rotory and the motion of rod is oscilating. Similarly another bearing is provided in between another end of connecting rod and hook of tray to allow oscilating motion of connecting rod and linear motion of tray.

V. MATERIAL SELECTION

5.1 POLYVINYLIDENE CHLORIDE (PVDC):

Chemical formula of the plastic is $(C_2H_2Cl_2)_n$. It is commonly known as PVDC. This type of plastics is used in food packaging and food preservation. These plastics are not chemically reacting with food items. the strength of this plastic is in the range of 100 - 110 Mpa. The plastic have density of 1.8 grms/cm^3 to 1.9 grms/cm^3 . As it is plastic material so, it does not affected by water which we are injected on boiled eggs. It is light weight as well as does not heart to eggs physically and chemically.

5.2 STAINLESS STEEL:

Stainless is composition of ferrite and chromium. The amount of Cr in the solid solution form is less than 13% where as Carbon in the range of 0.15 to 0.18%. Various properties of stainless steel are;

- It is high corrosion resistance
- High ductility.

- Good weld ability
- Good machine ability.
- Excellent surface and appearance.
- It has ultimate tensile strength of 505Mpa (yield stress=336Mpa).

VI. ADVANTAGES

6.1 Less time required

The conventional method used for peeling the eggs is very time consuming, the time required to peel one egg conventionally is approximately equal to time required to peel three eggs by using this machine.

6.2 It is difficult to hold hot boiled eggs for removing shells but with the use of this machine, it becomes more convenient.

As we know that boiled eggs are very hot, it is injurious to our hands to do it and it is necessary to hold the boiled eggs to peel it for desired application.

6.3 Normal temperature water is sufficient to peel the eggs.

In some other methods, Refrigerated water is used to peel the eggs but in this machine, normal temperature water is sufficient

6.3 Less floor space area required.

Firstly, the space area of this machine including base plate is less that is the floor space area acquired by this machine to peel multiple eggs is very less.

6.4 Multiple eggs can be peeled at a time.

In conventional method, only single egg is peeled at one time, we can't peel multiple eggs at a time but by use of this machine, we can peel multiple eggs at a time.

VII. DISADVANTAGES

7.1 Initial cost is high.

The set-up of this machine is costly because the linkages are used as well as motor and other costly components are used in this machine.

7.2 Electricity must be required for desired output.

The working of this machine depends upon the rotation of the disc and to rotate this disc that is connected to motor shaft to operate this motor, electricity is must require.

VIII. CONCLUSION

After completing the research we find various properties of egg when it is boiled at certain temperature, also the behavior of egg white under different condition applied on it. We come to know that what is the procedure should follow for developing any product. We also come to know that what are the parameters should take under consideration.

During project we came across market survey in practical. We get experience that how to develop product to make it user friendly. Also we get the information about material in market and how to choose better option without any loss.

We successfully select the material and actual dimensions of parts which are we going to use in our egg peeling machine. We get idea that how the analysis software used in practical application.

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