

# Optimum Design and Development of Mechanized Food Processing Machine with Oil Extractor

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**Abstract** – The goal of this research paper is propose the optimum design and development of mechanized food processing machine with oil extractor for domestic and food industries. This is device that squeezes the duff mixture of fast food and produce food strings and also this machine can extract the oil from various oleaginous seeds with categorized efficiency such as time, human effort, safety, cleaning and quality during the food making and oil extraction using screw extruder with fully automatic way. This mechanized food processing machine can produce food string from duff mixture of food using screw extruder using electric power and extruded out with help of rotating conveyor from machine die to away as near to operator and recovery of extracted oil and useful crush of seeds when oil extract with the help of additional heating device which provide required heating during oil extraction. Therefore the process will be low cost, high quality, high performance and also gives high production rate.

**Index Terms** – Mechanized fast food machine, electric heating, oil extractor, single screw extruder, string hopper making, 3D modelling

## 1. INTRODUCTION

This fast food making device is commonly made with a hand held hand-made wooden device consist of a small cup have a cylindrical through bore from to bottom.



Figure-1-Manual string hopper machine

A metal plate with a large number of pores formed there in is mounted with screw sat the bottom of the cup so that the bore forms a cylindrical tube there in for holding the dough mixer. The cup has two grips extending outwards from its two opposite sides. A wooden cylindrical plunger having corresponding size as the cylindrical tube is mounted on a carrier which also has two opposite side grip similar to the cup. The device is operated by placing the dough mixture into the cylindrical tube of the cup and then inserting the plunger into the cylindrical tube and squeezing the grip so the plunger and the cup tightly towards another by hands so as to extrude the dough through the plate with the plunger to the different form. While extruding the fast food, the operate or must also move the device. There are various kind of the problem face in these type of the fast food making machines which are Health issue as lead to hand pain in traditional method, repetitive work it cause dullness to operator, Low efficiency, Low productivity to solve this type of problems to made fast food with traditional way, and we need automation in this traditional machine. After we can use this new designed machine at public places like transportation hubs, functions, parties, much more.

### 1.1 Oil Extraction

There are various types of oil press machine available in the market in order not perishable food and extend the effective period hence they add several material attached because of quality of product not maintained and original product compromise also there will be waste oil contaminated or usage behavior resulting in oil quality and safety cannot given. Also configuration of press directly affect quantity and quality of oil there are various types of oil press available in market but due to uniform and uneven heating oil rate not

given to high and quantity cannot achieved in ideal situation. So it is necessary to design this product in optimum way.

## 2. LITERATURE REVIEW

Mr. Amol A. patil at el [1] reviewed of the oil expeller screw shaft in this review mainly concentrated on the failure occur in the oil expeller screw shaft due to uneven crushing load that is common problem occurred in the industry. This present work show the different techniques and method consider for design of oil expeller. The present review research also concentrated on finding out the optimum technique for reducing failure in oil Expeller.

Amalia Kartika at el [2] presented research on the extraction of sunflower oil by twin screw extruder the screw configuration and the operating condition had an important influence on oil extraction yield the energy input and quality of oil extracted during the extrusion of sunflower seed. There is observed that higher oil extraction yield and specific mechanical energy were reached as the reversed screw elements were moved with increase spacing between element and with smaller pitch element. A systematic increase in oil extraction yield was observed as the barrel temperature, the screw speed and feed rate were decreased. The highest oil extraction yield about 85% and best cake meal quality with residual oil content lower than 13% were obtained under operating condition of 75 rpm and 19kg/hr and 120 degree centigrade more over pirating condition produce good quality of oil.

BDN mendis at el [3] presented his research work on design of automated low cost string hopper machine for medium scale industry show that problem occurred in available machine in the market that are eliminated and also inability to stop mold rotator was eliminated for cleaning special die is designed to before compress it by the piston and it has made the string manufacturing easy task for medium scale industry.

Amit B. solanki at el [4] presented design and development of automatic fast food machine conclude that detailed design and development of automatic fast food making machine for large food industry application. This machine is that squeezing the duff mixture of fast-food with following categorized efficiency such as time human and effort safety cleaning and quality during the fast-food making in this design it is mainly notify about the cost of machine as well as time.

Sathyaprakash A at el [5] invented a new product design of the multi crank operated rice noodle maker this paper is discuss about the new product development using product development process to ease the work of extraction in much lesser price it uses crank operated has multi die altered feeding operation compared to conventional machine but much faster rate hence the feeding should be compensated with the automatic unit and collecting mechanism syned the speed perfectly and with a higher power motor larger volume

of extrusion is possible for every batch of feed for the serving customer demand. This machine fabricated as per customer requirement for domestic use and small scale catering service it also perfectly as desired with max production of 10 extrusion of rice ball into rice noodle per minute with operating cost 5 Rs./- per minute.

A.Rosental at el [6] presents the review of aqueous and enzymatic process for the edible oil extraction that for the extraction based on the aqueous extrusion media. This process is advantageous over solvent based process that are currently used and also for this processes further studies leading to development of more effective enzymes specific for each oil and also detailed investigate to select rational way, downstream process operation, the water recycling and enzyme reutilization also carried out. Systematic process engineering investigation and economic evaluation of the process are necessary.

Ajao KR at el. [7] presented the research paper on the design and development of the groundnut oil expelling machine in which result suggest that performance of the machine is highly depend on the speed of the electric motor and quantity of the material passing through it. And in its first test show that without heating no oil yield produce and hence heating is necessary to produce the oil yield.

## 3. FUNCTIONAL ANALYSIS

The following figure shows the functions of string type food squeezing device which can automatically getting the string hopper after feeding the dough to machine. These functions can be performed different ways which are showed in following morphological chart[4]

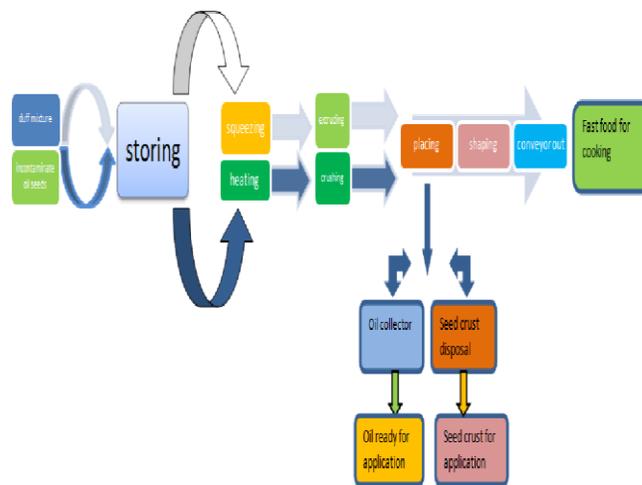


Figure 2- Function analysis of Mechanized Food Processing Machine with Oil Extractor

Function	Concept 1	Concept 2
Storing	Hopper With Feed Screw	Hopper With Press
Crushing	Screw Extruder	Screw Conveyor
Heating	Electric Heating	Manual
Oil Collection	Filter	Grid
Crust Collector	Barrel	Barrel
Cooling	Air Cooling	Water Cooling
Power Source	Electric	Electric

Table 1- Concept generation For Oil Extraction

Function	Concept 1	Concept 2
Storing	Hopper With Feed Screw	Hopper With Press
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Table 2- Concept generation For Food Processing Machine

Storing	Hopper with screw feeder
Squeezing	Screw extruding
Heating	Electric heater
Oil Collection	Oil filter
Crust Collection	Bowl
Cooling	Air cooling
Food Extrusion	Die and die holder

Table 3- Final Concept selection For Oil Extraction and Food Processing Machine

Sr. no	Parts name	Specification of part and quantity	Cost (Rs./-)
1	Electric motor	230v 3000rpm	1 3000
2	Spider coupling	standard	1 300
3	Extrusion pipe	42mm Stainless steel	1 600
4	Heating plate	1mm thick S.S	2 200
5	filter	S.S , di =42mm	1 400
6	bearing	Ball bearing	2 300
7	hopper	Mild steel/cast iron D = 100mm	1 500
8	die	copper	4 300
9	Die holder	copper	1 800
10	Wooden top	L*b*h 57cm*36cm*1.6cm	1 200
11	Angle plate	L*b*h 55cm*35cm*35cm	8 400
12	Nut bolts	standard	26 225
13	extruder	40mm Stainless steel	1 2000
14	Switch board	fiber	1 60
15	Electric wire	copper	1 100
16	Crust oil collector	tin	1 200
17	Heating device	700watt	1 1500
18	Elbow	Fiber di = 40mm At angle 90	1 200
		<b>Total cost estimation</b>	<b>11285</b>

Table 4- Specification, Size and Cost of the Components with total cost estimation [4]

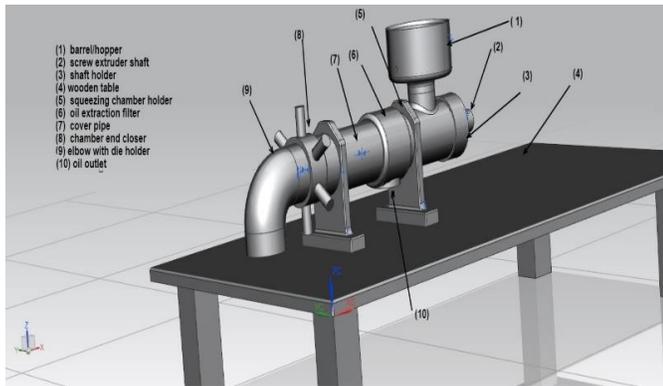


Figure 3- Conceptual design and Development of Mechanized Food Processing Machine with Oil Extractor

#### 4. CONCLUSION

The optimum design of mechanized food processing machine with oil extractor is machine that it can squeeze the dough mixture of fast food and also it can extract oil from the various edible oil seed with the following categorized efficiency such as time, human effort, and safety, cleaning during fast food making and oil extraction with low cost, more productivity. This machine works on two function that are fast food making and edible oil extraction from the groundnut, sesame etc. In this design, it is mainly notified about cost of the machine as well as time efficiency. Therefore, production rate of the Fast food making machine is high compared with other manual and commercially available machines.

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