Automatic Fish Scaler and Cutter with Utilization of Waste

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Abstract – *Fish is highly consumed in the world accounting around 80 million tonnes per year worldwide. The fish processing industry has increased leading to adapt the mechanical methods of processing fish to overcome the manual methods which are considered as a drawback to the quality of the fish .Designing of an automated machine for cleaning and cutting will pave way for reduced time consumption and hygiene handling of fish. The processing of fish could include the scaling, conveying, cutting of head and tail. It also includes the collection of the fish and utilization of the fish waste. The efficiency of the automatic processing when compared with manual processing is about 87-90%. The major advantage of this machine is to improve the recovery of the edible fish portion, reduce the time consumption of the processing and the overall quality and quantity of the fish. The waste utilization of the fish is done by collecting the waste as a combined process; the waste is collected grinded and dried to fine powder. This dried form could be used efficiently in various forms like fish silage, etc., which could be an environmental and economic benefit. Thus, the maximum efficiency of finished product and waste utilization can be obtained by the recent advancements and innovations.*

*Key Words***: Fish protein, silage, fertilizer**

1. INTRODUCTION

The substance of the paper is to deal with automated fish cutter cum cleaner and to facilitate the fish waste into organic feed maker. The global fish production of fish is 110.2 in 2016 and fish food consists of 80 million tons of total production. The global fish production has reached 46.8 per cent in 2016 by the production of aquaculture *(Mostafa Hossain., Nov 2018)*. There has been a compelling enlarge in the human exhaustion with around 80 million tonnes. Recent analytical data informs that the global per capita fish stock to about 16.7 kg per year. India is also a considerable producer of fish through aquaculture and place itself second in the world. The world-wide production of fish is expected to be high as compared in the below graph.
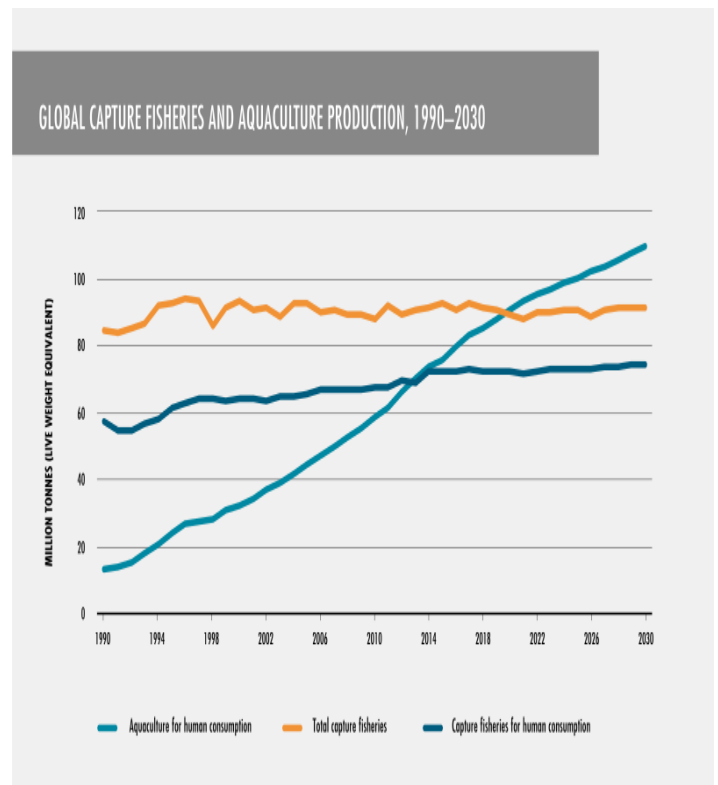

Fig 1: Global capture fisheries and aquaculture production reported by FAO, 1990-2030

The fish production and clarification have enlarged throughout the years due to both exhaustion and modernized manufacturing methods. As the manufacturing enlarge the overall process time, betterment and even quality should be preserve and enlarge contemporary. By 2028, the total production is 36% for the volume of fish product *(OECD-FAO agricultural outlook 2019-28).* The sardine and mackerel are easily available fishes in local market. Canning process helps in quality assessment in the sardine *(venesa losada et al., july2006)*. India mackerel is a small pelagic fish which has important role in the production of marine. Different region of mackerel has been conducted in Indian Ocean *(Gopakumar et al.1991)*. The manual clarification usually requires large man power, huge stationary contemporary, manufacturing and administration with the use of endemic tools and approach.

Thus to consent with all these the use of improved machinery in the clarification and manufacturing of the fish product is necessary.

Even though the wastes after processing of the fishes are still underused, the enlargements surrounding this issue are to be done. These desolation substances usually consist of the offal (inner organs of animal) which cannot be consumed by the humans, but which are of high enriching value is usually drain or depot as waste. This break down material can be used to produce various effective, beneficial products which has been utilised into the new trend and under consideration. The clarification of both acknowledgements above is the use of mechanical fish cleaners and waste usage of the decayed materials are produced. As this has both improved efficiency of work and economical.
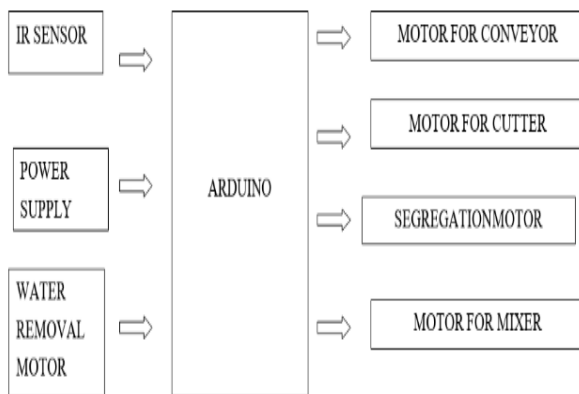
2. PROCESSING OF THE MACHINE

Fig 2: Processing flow of the machine

The fish used for this process are Sardine (*Sardina pilchardus*) and Mackerel (*Scomber scombrus*). These are generally the most commonly available fish in the local market.

Fig 3: Sardine (*Sardina pilchardus*)

Fig 4: Mackerel (*Scomber scombrus*)

2.1 MATERIALS

Arduino UNO
Arduino UNO is a microcontroller of open source on board based on the microchip ATmega328P.It is employed as microcontroller. The purpose of this device to incorporate servo motor in order to regularly feed the fish. The ability of the system is to collect and sense the reading task correctly.

IR Sensor
Infrared technology is used in a wide variety of wireless applications which includes sensing and remote controls. Simple infrared sensor used for the removal fish scaling process and which detect fish passing at the particular period.

Proximity Sensor
It is a sensor used to detect the presence of nearby objects without any physical contact. It emits an electromagnetic field or beam of radiation and identifies change in the fields and detect the object.

Motor Drive
L-298 is an Integrated Circuit (IC) is a dual full bridge driver with capability to withstand high voltage and high current. It receives basic TTL (Transistor-Transistor Logic) logic levels that can operate different loads such as DC motors, stepper motors, relays etc.

DC Motor
An electric motor is defined as a machine which converts an electrical energy to mechanical energy. Here we are using 12V DC, 18 watts 30 rpm with shaft diameter of 15mm.

AC Motor
An AC motor is also called as induction motor or asynchronous motor. Here the power is supplied by the means of electromagnetic induction to the rotor. In a DC motor, the power is supplied to the armature directly from a DC source, while in an induction motor it is induced in the rotating device. These motors have the same general construction.

2.2 METHODS

Descaling
The descaling is the removal of the scales present on the fishes. The descaler brushes are present in the mid-way curve of the hopper. The fish is feed into the hopper perpendicularly into the hopper in such a way that the eye of the fish is parallel to the descaler brush.

Cutting
The fish after descaling comes down on the holder. As soon the IR sensor detects the presence of the fish on the holder.

Conveyor Belt
The conveyor belt moves as the motor starts and reaches the position. Then the cutting of the fish is done with the help of the rotating blades with speed of 100 rpm.

Grinding
The fish head and tail are obtained in a particular amount. The waste should be size reduced into a finer particle. This process is facilitated with the help of the manual operation of the control grinding. This is done so that the dehydrating process can be done efficiently.

Dehydrating
The dehydration is done to remove the water content of the food. Here after grinded waste has become into a paste like structure. Then due to the dehydrating process the water removal can be done easily when the air is blown on it thus allowing the water content to evaporate from the product. Thus after the process the dried form is obtained which can be obtained as the organic feed.

Waste Utilisation
The dried size reduced fish waste is obtained from the process are used as an organic feed for the cultivation purpose at the agriculture production or it can be used for by product development like fish silage, etc as these are dried from and can be transported , used effectively in various process and forms.

3. RESULTS AND DISCUSSION

The fish taken are generally of the length 10-15 cm. The fish taken for the analysis are Sardine (*Sardina pilchardus*) and Mackerel (*Scomber scombrus*).

Sample	Raw fish (in grams)	Weight after Descaling (in grams)	Weight after cutting (in grams)	Time taken (seconds)	Initial weight of the Waste (in grams)	Final weight of the Dried Waste Powder (in grams)
Sardine	100	91	65	240	35	4.8
Mackerel	100	288	203	300	92	5.8

Table 1: Manual processing of fish-Descaling and Cutting

Sample	Raw fish (in grams)	Weight after Descaling (in grams)	Weight after cutting (in grams)	Time taken (seconds)	Initial weight of the Waste (in grams)	Final weight of the Dried Waste Powder (in grams)
Sardine	100	94	87	120	30	5.1
Mackerel	300	294	270	250	70	5.5

Table 2: Automated processing of fish-Descaling and Cutting

The efficiency rate of this model is interpreted from the experimental data by calculating the efficiencies of the descaling cum cutting and the dehydrator. Thus, comparing their respective efficiencies with manual methods .The overall efficiency for the automated process is the 87-90%.
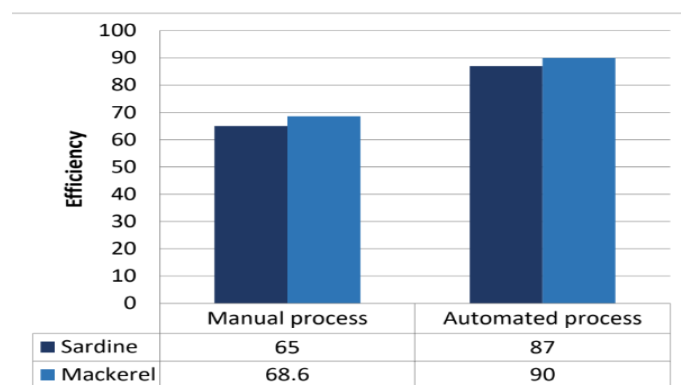

	Manual process	Automated process
Sardine	65	87
Mackerel	68.6	90

Fig 5: Comparative analysis of Manual and Automated Process

4. CONCLUSION

The research paper gives information about the fabrication of the machine using the combination of the above unit operations in the one single machine. The machine to be fabricated is done to undergo certain steps like descaling, cutting of the fresh fish and use of the waste in the form of dried powder. The advantage of this is to improve the fish pre-processing by improving the fish quality, the reduction in the time consumption of the overall process.

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