International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 11 | Nov 2020 www.irjet.net p-ISSN: 2395-0072

Review Article : Study of Automatic Fish Descaling, Be-Heading and Slicing Machine

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Abstract - *Fish grading and descaling is considered as one of the most important operation during pre-processing of fish. The removal of fish scale is called as descaling. These scales are removed traditionally using knife, this operation consumes time and also cause harm and wound to the hands of person involved in removing the scales of the fish. The machine has been developed with the concept and combination of detecting the quality, removing the scales, head and cleaning the fish. Designing of fish de-scaler is the best way for reducing the human work and also hygienic handling of fish. Sensors are used to detect the quality and water pump system is provided to clean the fish. This machine components can be easily operated.*

Key Words: **Fish, grading, descaling, quality, hygienic handling, sensor**

1. INTRODUCTION

The coastal line of India is about 8129km and is the second largest producer of fish. The total fish production during 2018-19 is estimated to be 13.7 million metric tonnes of which nearly 65% is from inland sector and about 50% of the total production is from culture fisheries and constitutes about 6.3% of the global fish production. Fish undergoes series of pre-processing operations such as washing, cutting of fins, descaling, beheading, evisceration, deskinning, etc.

The number of factors that are currently driving the consumption of fish in India.

- Based on the fish type, the market has been segmented as inland fishes, marine fishes. The inland fish dominate the market, holding the largest share.
- Based on the product type, the market has been segmented as fresh, frozen, canned and others.

Fish provides a good source of high quality protein. A fresh hygienically cleaned, well scaled fish with minimum distortion are preferred by the consumer for further operation in making various food preparations.

In this fabricated machine the initial process is to detect the quality of fish using pH sensor. Design and development of a fish descaling and beheading machine is very necessary not only to hygienically handle food but also to increase the speed of the process, reduce the drudgery and to improve the safety of operation.

2. RELATED WORK

2.1 Fish de-scaler

Fish postharvest processing includes several pre- processing operations such as washing, cleaning, cutting of fins, descaling, beheading, deskinning, filleting. Scales are removed using stainless steel brush style fish de-scaler. The de-scaler is moved forward from the tail to the head to scrape off the scales on either side. The device generally consisting of power batteries, descaling tool and a transparent cover to prevent the scattering of fish scales. The unique properties deformation mechanisms and a specialized manner in which cracking and failure occur in order to absorb energy and protect the fish.

There are different methods of descaling

- Knife edge technique
- Stainless steel brush style fish de-scaler
- Automatic or electric fish scaler

2.2 Evaluation of a prototype fish descaling machine with proposal for a commercial processing line

A prototype heading and cleaning machine for fish was evaluated under commercial conditions. It is an automatic descaling and beheading machine with minimum wastage. The rotary scaler is used in the machine to remove the scales. Wheels and serrated roller are fixed to remove black belly lining. There is an adjustable size grader which separates the fish into three size ranges ranging from 6-10 inches, 10-14 inches and 14-18 inches. To increase the production and efficiency three machines were used together in a system.

2.3 Design, Development and Performance Evaluation of Fish Descaling Machine

The design and development of fish descaling machine was evaluated by the performance of descaling. The major

components of developed machine are descaling head, flexible shaft, prime mover, AC drive. Four different types of innovative designs of descaling heads such as diamond shaped, inverted 'V' shaped, thirteen slots descaling head, twenty six slots descaling heads were tested at different speed for the capacity, efficiency and energy consumption. The performance of fish descaling machine was evaluated with two fish species Catla and Silver carp, at three different rotation speeds 1440, 2000, 2800 rpm and for four different types of descaling heads and evaluated that the effect of individual factors on descaling, efficiency was significant whereas all interaction between species and type of descaling tool.

2.4 Detection of Freshness of Fish by Different Methods

Different techniques were used to decide the fish freshness, three of which are connected with shape and other is identified with the shading. When fish is spoiled, a chemical substance histamine is released naturally by dead fish. The presence of histamine is detected using volatile amine with an ultrasonic process electrode capped organic gas sensor system technique. A detecting frame work containing an ultrasensitive amine gas sensor to identify the unpredictable amine gas from the spoiled fish. Torry-meter instrument is used for assessing the freshness of fish. The evaluation was dependent on changes in the dielectric properties of the fish as it ages.

3. METHODOLOGY

Development, designing and fabricating of descaling and beheading with the combination of grading and cleaning is used for the pre-processing of fish in small scale industries. Fish is one of the prominent food that has witnessed strong growth in both domestic consumption and export promotion purposes. The art of descaling is complicated by the physical transformation and different sizes of fish. The time affects the ease of separation of scales and when the fish is spoiled and rotten the texture changes. To solve such complications that are associated with characteristic changes a robust and effective sensor is needed to solve the problems. An automatic descaling and beheading machine makes quick work for all type of fishes. The automatic fish de-scaler and be-header is a great choice that combines economy and efficiency for all varieties of fishes. The new automatic fish descaling machine is wholly made up of stainless steel blade that can remove the fish scales cleanly without damaging the fish body. This de-scaler is made up of power assisted tools that takes away all the scales of the fish. The de-scaler consists of blades that can remove the scales, fins and also de-heading can be done.

4. BLOCK DIAGRAM

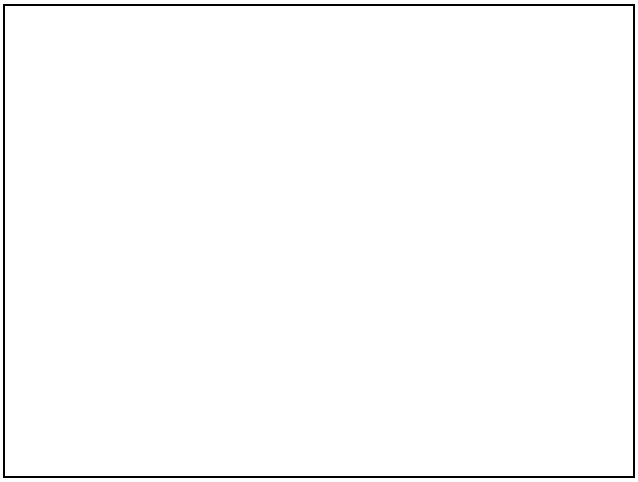

FIG 4.1 Block Diagram of the fabrication

5. MATERIAL S AND METHODS

5.1 ARDUINO UNO

The Arduino Uno is an open source micro controller board based on the microchip AT mega328P microcontroller. These pins provide the flexibility and ease of use to the external devices that can be connected through these pins. Only 5V is required to turn the board on, which can also be powered directly off a USB port without any external power. Arduino boards are able to read inputs-light on a sensor, a finger on a button, and turn it into an output- activating a motor, turning on a LED. Atmega 328 microcontroller is placed on the board. Arduino boards are used for developing sensors and instruments. All the components are connected with the Arduino board for controlling different process and working of the fabrication.

5.2 SENSOR

Freshness detector is an embedded based application that help in determining the freshness based on pH level using a ready-market pH sensor. This system consists of Arduino microcontroller, pH sensor, LCD and switches. The microcontroller is core of the application that receives the input from the pH sensor and send the signal to a dedicated LCD to show the output. The microcontroller is programmed using Arduino programming for this application pH sensor has been chosen to have as the range of the indicator from 0.00 and till 14.0. The decimal places that can be catered by the sensor is small. Any small differences of pH value can be accepted. pH value for fish is between 5.5-7. The average pH value for fresh fish is 6.2, though it may vary according to the type of fish.

5.3 SWITCH MODE POWER SUPPLY

Electrical power is converted efficiently that is incorporated by a switching regulator and it supplies electronic power. The pass transistor is a switching mode supply continually switches between low dissipation and this minimizes the energy wastage. The DC output voltage from the DC input voltage is achieved by the power supply.

5.4 MOTOR

The direct current electrical energy is converted into mechanical energy. A DC motor is a mechanically commutated electric motor powered from direct current (DC). The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current.

5.5 *DRIVER*

The drive is an electronic device that harnesses and controls the electrical energy sent to the motor. The drive feeds electrical into the motor in varying frequencies and also it indirectly controls the motor's speed and torque. It uses electrical motors a prime source of energy. The prime mover supplies the mechanical energy to the drive for motion control. The major parts of the electrical drives are power modulator, motor, controlling unit and sensing units.

5.6 SUCTION PUMP

The partial vacuum is created by raising the piston and the atmospheric pressure outside forces the water to enter into the cylinder and escapes through the outlet valve when it is permitted. The water is forced by the suction force and cleans the fish. The blood strains are washed away from the fish.

6. RESULT AND DISCUSSION

In the automatic fish descaling, beheading and slicing machine four different process takes place automatically. Different varieties of fishes that are above 10cm in length can be descaled, cut and cleaned. We have developed a lab model for the purpose of fish sellers and small-scale industries. The automatic fish descaling machine can also be used for household purpose. It does not require manpower and ensures minimal wastage of fish. The fishes above 10cm such as Rohu, Cat fish, Ladyfish, Catla, King Fish, Malabar Trevally, Ribbon fish, Pomfret, Mackerel, Sardines, Salmon, Tuna etc., can be majorly used for descaling, cutting and cleaning.

7. CONCLUSION

The final design procedure is the fabrication of the machine which consists of hardware units. The automatic fish descaling cum cleaning machine will be an aid to the fish-sellers, small scale industries and for domestic purpose as it reduces manpower. It is developed to increase the hygienic handling of fish and reduces drudgery. Hence the Automatic machine fulfills the increasing demand for selling of fish in the market.

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