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# Identification and Control of Heavy Metals in Sea Food Material Using an IoT

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***Abstract***
*The concept is to identify and reduce the heavy metals produced in sea food. In this process, we use infra-red thermal sensor that senses the heavy metal in a certain sea food item and its location is determined by thermal imaging camera in future. Induction coil is used to provide heat to the sea food and once the metals are segregated the sea food is moved onto the conveyor belt by using a Servo Motor.*
***Keywords:*** *Servo Motor, Induction Coil, Thermal Sensor, Thingspeak Application.*

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## I. INTRODUCTION

In today's world there are many contaminations of heavy metals in the food during export. Due to many industrial pollution water are contaminated with the industrial waste and it is mixed with the rivers and sea water. The industrial waste is mixed with the water bodies and causes the health issues to both the human being and then to the organism in the water bodies. So when the organism in the water are affected then it is consumed by the human being it causes many health effects.

The Heavy metals can be toxic and are often associated with health risk. It can damage and alter the function of many organs including the brain, kidneys, lungs and liver. Many heavy metals discharged as waste can bioaccumulate in tissues of resident fish, oysters, crabs, shrimp, seaweed, and shellfish. Within the wide range of environmental contaminants, heavy metal ions have received paramount concern owing to their persistence in ecosystems and severe effects on the human metabolic system due to bioaccumulation at trace levels. So the heavy metals in the sea food can be identified by using the infra-red thermal sensor.

Notwithstanding, these contaminants are from anthropogenic activities, being also natural components in the earth's crust, with some of them essential in minute amounts for particular biochemical processes and, without exceptions, harmful at high concentrations. So the heavy metals in the sea food can be identified by using the infra-red thermal sensor. The fish is a basic and important food for human nutrition such as fatty acid in fish that can reduce the risk of heart diseases and stroke due to their contribution in lowering the cholesterol levels in blood and also provides minerals and vitamins. The present of heavy metal in fish gives impact to the human health. Besides, fish is a very suitable bio indicator of heavy metal contamination.

### 1.2 PROPOSED SYSTEM

The monitoring of heavy metals in the sea food material is very important for the preservation of the environment and prevention of negative impacts that it can have on human health. Fish is a basic and important food for human nutrition such as fatty acid in fish that can reduce the risk of heart diseases and stroke due to their contribution in lowering the cholesterol levels in blood and also provides minerals and vitamins. The present of heavy metal in fish gives impact to human health. Hence, it is important to identify the level of heavy metal contents in fish.

### 1.3 WORKING

In this project we are trying to build and design a model which will help us for identification and control of heavy metals in sea food material using an IoT solution. The monitoring of heavy metals in the sea food material is very important for the preservation of the environment and prevention of negative impacts that it can have on human health. The growing concern for sustainability and environmental preservation has increased the demand for reliable, fast response to monitor the existence of heavy metals in water resources.

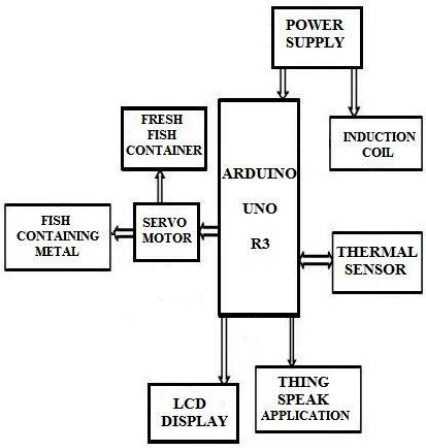


**Figure 1: Block Diagram**

### 1.3.1 Thermal Sensor

A thermal or temperature sensor is a device used to measure temperature. This can be air temperature, liquid temperature or the temperature of solid matter. In this project we are using thermal sensor to measure the variations in the temperature the fish which will come to environment temperature faster as compared to the fish which will take more time will come under fish containing metals and for this purpose we are using thermal sensor here.

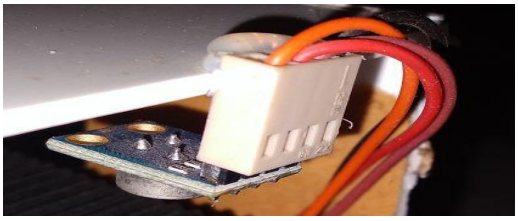

**Figure 2: Thermal Sensor**

### 1.3.2 Induction Coil

The induction coil will be used to heat the metals that are being present in the sea food. It can be used to heat the metal according to the atmospheric temperature. The fish will be allowed to pass through the coil for the heavy metal in the sea food to be identified.

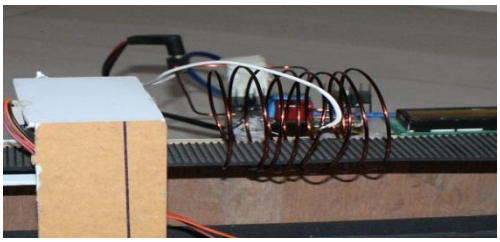

**Figure 2: Thermal Induction**

### 1.3.3 Servo Motor

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. The purpose of the servo motor is used to swipe the fish into the particular heavy metal container. The servo motor will be used to rotate to degree of $90^0$ or $180^0$. There are two servo motor designed for the different heavy metals to be swiped.

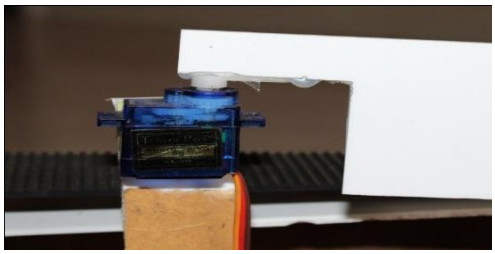

**Figure 3: Servo Motor**

**1.3.4 DC Motor**

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current in part of the motor.

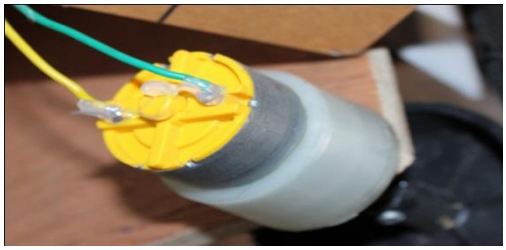

**Figure 4: DC Motor**

## II. RESULT AND DISCUSSION

The concept of our project is to identify and control the heavy metals produced in sea food. So, here first we use infrared thermal sensor that senses the metal inside the sea food item. Induction coil is used to provide heat to the sea food and once the metal is detected the sea food is moved onto the conveyor belt by using a servo motor.

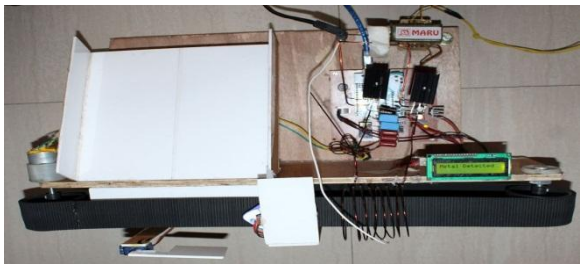

**Figure 5: Metal detector in Sea Food Material**

If the sea food contains no metal it will be stored in the fresh container. First of all, a sea food item is heated using induction coil. The sea food may contain several heavy metals. When the certain melting point of a metal is reached, we can identify that metal is present in the sea food by the infra-red thermal sensor. If the sea food contains heavy metal then it will get heated and once the presence of metal is detected buzzer will give indication of it. And it will be displayed on LCD screen.


**Figure 6: Working on LCD Display**

In this way; we can segregate all the metals in the sea food and segregate them into individual boxes. Once the sea food is fully free from the heavy metals it is sent through a conveyor belt with the help of servo motor. We also use an open source database called "Thing Speak" which is based on IoT. By making use of machine learning, we could generate statistical report on metal is present in the sea food items.

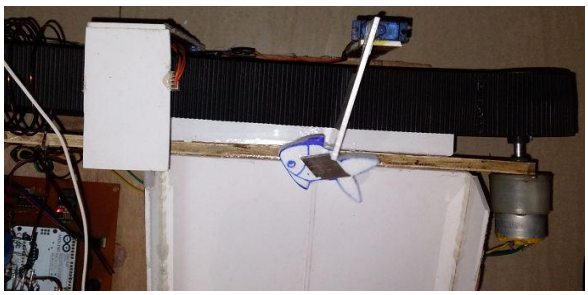

**Figure 7: Metal Detected in Fish**

The thing speak application will be used to analyse and then collect the data about the heavy metals present in the sea food using IOT. The thing speak is the open source application and can work using the IOT. They will be used to display the data in the graphical representation for each heavy metal.

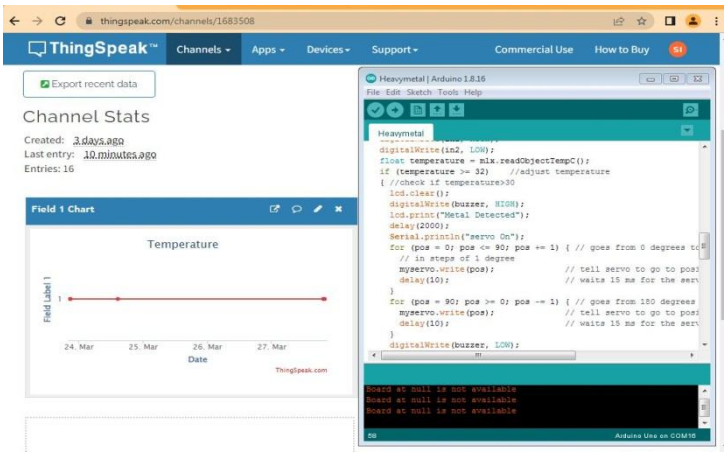


**Figure 8: Statistical Representation of Detection of Metal**

## III. CONCLUSION

Heavy metals were tested in different organs like gills, livers, kidneys and flesh tissues of the fish enduring in natural water system. And most of the metals are present in edible portion of fish. Humans are also affected by eating fish and can cause a few of health problem. In this project we identify the heavy metals present in the sea food using the thermal sensor. Many metals can be analyzed and can be identified in future by using the "Thing speak" open source application. By using this open source application, the quantity of the fishes and presence of heavy metals can be analyzed.

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