

# “ COVER ENIGMA “

## Abstract :

Manholes can sometimes cause a lot of problems for both regular people and the officials who are responsible for cleaning them. If a manhole is open or not closed properly, it can be really dangerous and someone could fall in, especially when it's dark or when there are a lot of people around. Manholes that overflow with water can also lead to flooding, which might damage homes and the surrounding environment. The officials who clean manholes have their own difficulties too, they have to get down into these unsafe places and deal with things like dangerous gasses, chemicals, and unhygienic conditions. It's physically demanding and can make them sick. The way things are dealt now, with people reacting to problems instead of preventing them, it isn't very efficient or effective in keeping our manholes safe and clean. We need to create a system that keeps an eye on some important factors like the tilt, water flow, toxicity, and temperature of the drainage. We also aim to add an automatic cleaning system that checks the toxicity levels and cleans the drainage whenever needed. This way, we can make sure the drainage is functioning properly and help in keeping it clean without needing regular human effort.

## Introduction :

“Cover Enigma” is an IOT based manhole monitoring and cleansing system designed by us. It is as simple as a Manhole Lid which has an embedded system interfaced to it. The Lid is simple to set up , performs complex tasks and can also be controlled by the GHMC / Govt. officials.

This Lid consists of 3 compartments ,

## Compartment A :

This is the bottom most section of the lid. This section consists the following sensors ,

1. **Water-Level detecting sensor** - To monitor the overflow and level of the drainage
2. **LM35 Temperature sensor** - To monitor the Temperature inside the manhole
3. **Tilt Sensor** - To detect any tilt of the Lid . This basically checks if the lid is open or close

These sensors are interfaced to the **NodeMCU ESP8266** microcontroller which sends all the Real-Time data collected by these sensors to a **web server** . Local Govt/ GHMC authorities can easily keep an eye on each and every individual Manhole lid and take proper actions in case of Overflow or Opening of a lid, from this web server .



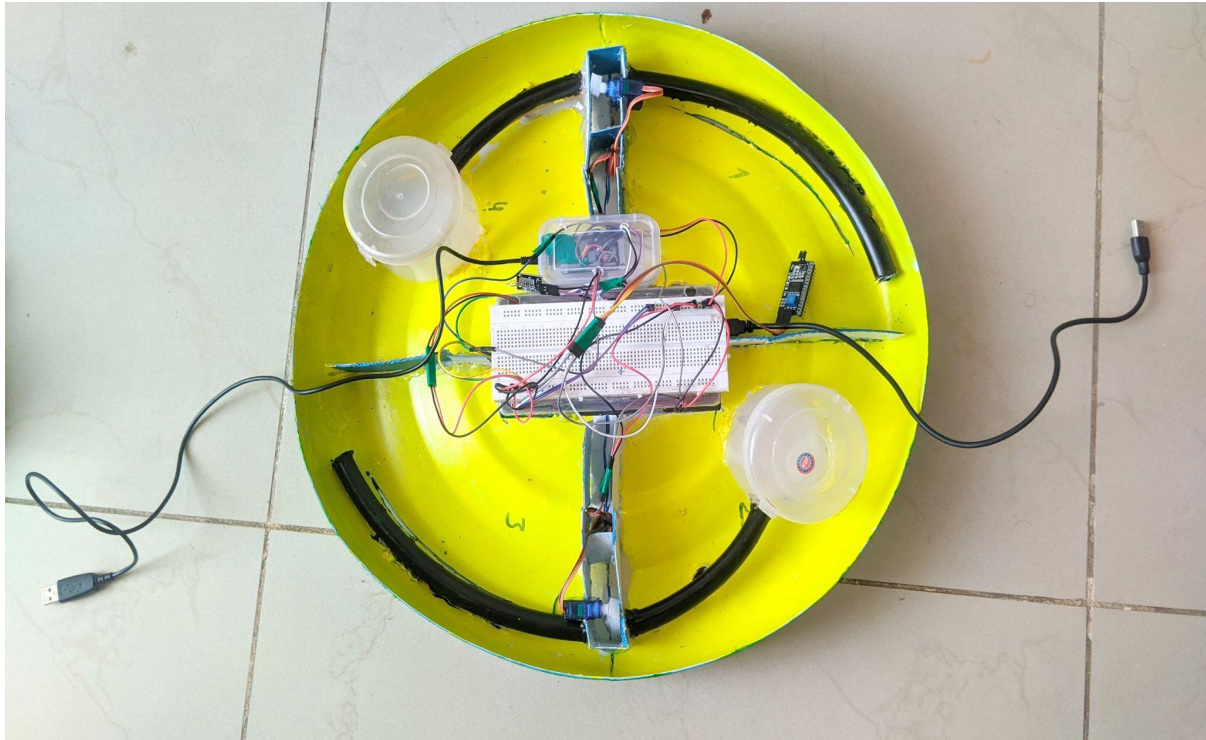
### Compartment B :

This is the middle hollow compartment of the lid. The hollow place inside the Lid is further divided into 4 sections in which 2 sections are used to store cleaning acids and powders . There are caps provided on the upper part of the lid which can be opened to place acids / powders inside the lid. These acids get automatically released in the manhole through the walls when the toxicity inside the manhole increases.

This compartment consist ,

1. **Servo Motors** - To Stimulate the opening / closing mechanism to pass the acids in the manhole whenever necessary
2. **MQ-136 Gas detecting sensor** - This gas sensor is used to measure the quality of the air inside the manhole prominently Hydrogen Sulphide (  $H_2S$  ) which is the most abundant and toxic gas in the manhole. This sensor is placed at the bottom of the lid with other sensors.
3. **20\*4 LCD Display** - To continuously display the Air quality values detected by the gas sensor. It is interfaced on the top section of the lid.

These components are interlinked to each other and connected together with an **Arduino Uno** microcontroller. When the toxicity sensor detects high values the servo motors operate and the acids are sent inside the manhole .



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## Cover Enigma | MARK 1 Details

### Temperature Data

Index	Timestamp (IST)	Temperature (Celsius)
0	21:24:04	19.55
1	21:24:05	19.55
2	21:24:06	19.55
3	21:24:07	24.44
4	21:24:08	24.44
5	21:24:09	24.44
6	21:24:10	19.55
7	21:24:11	58.65
8	21:24:12	19.55
9	21:24:13	58.65

### Water Overflow:

Water Flow Detected: 0

### Tilt Detection:

Tilt Detected: 1

## Use Case :

Our customized manhole lids will not only help in monitoring the manhole but will also help in cleaning it, thus reducing the human effort to a large extent.

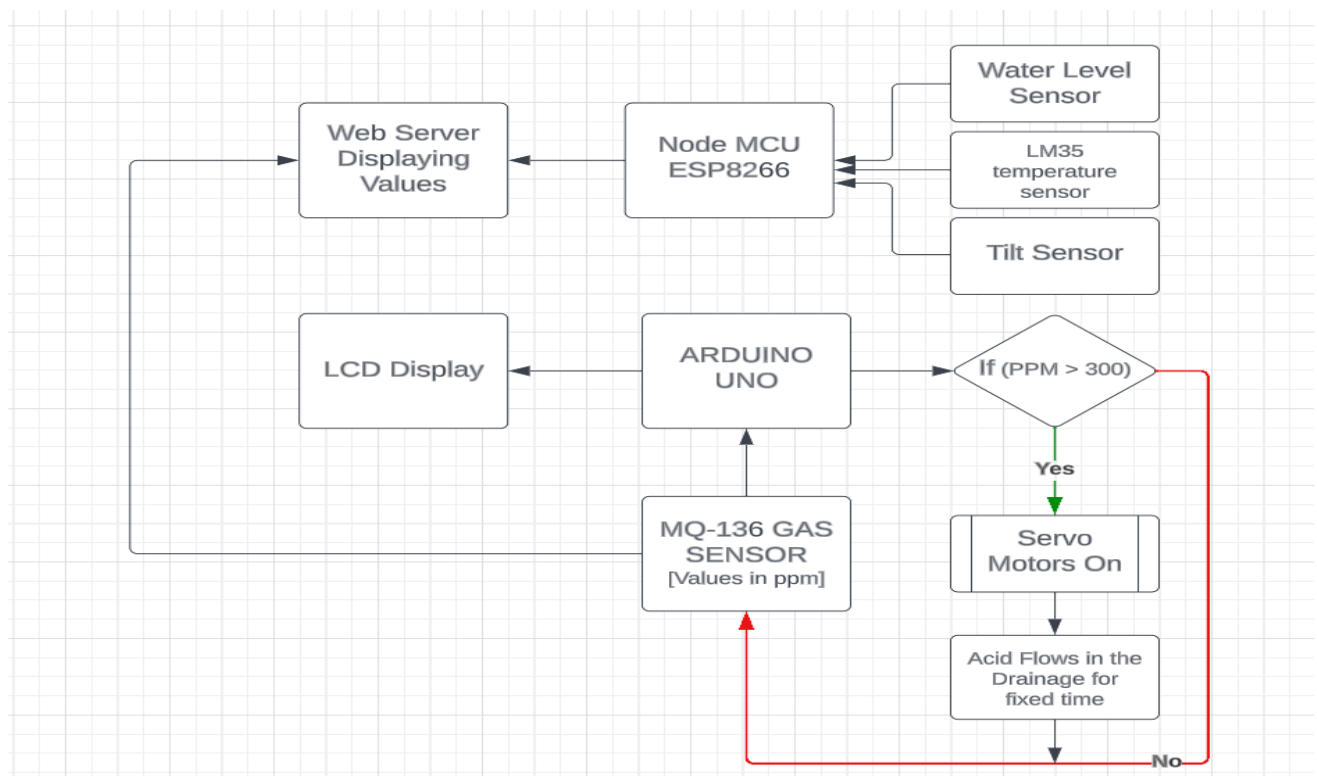
It is an upgrade to the already existing manhole covers and the best part is that it is affordable and efficient.

The sensors like tilt,temperature,water level detecting will help in monitoring the important factors inside a manhole which can be very helpful for cleaning them.

It will also help in reducing the frequency of manual cleaning, by providing features which help in the automatic cleaning of the manhole i.e; The cleansing acids/powders can be poured without actually getting inside of the manhole.

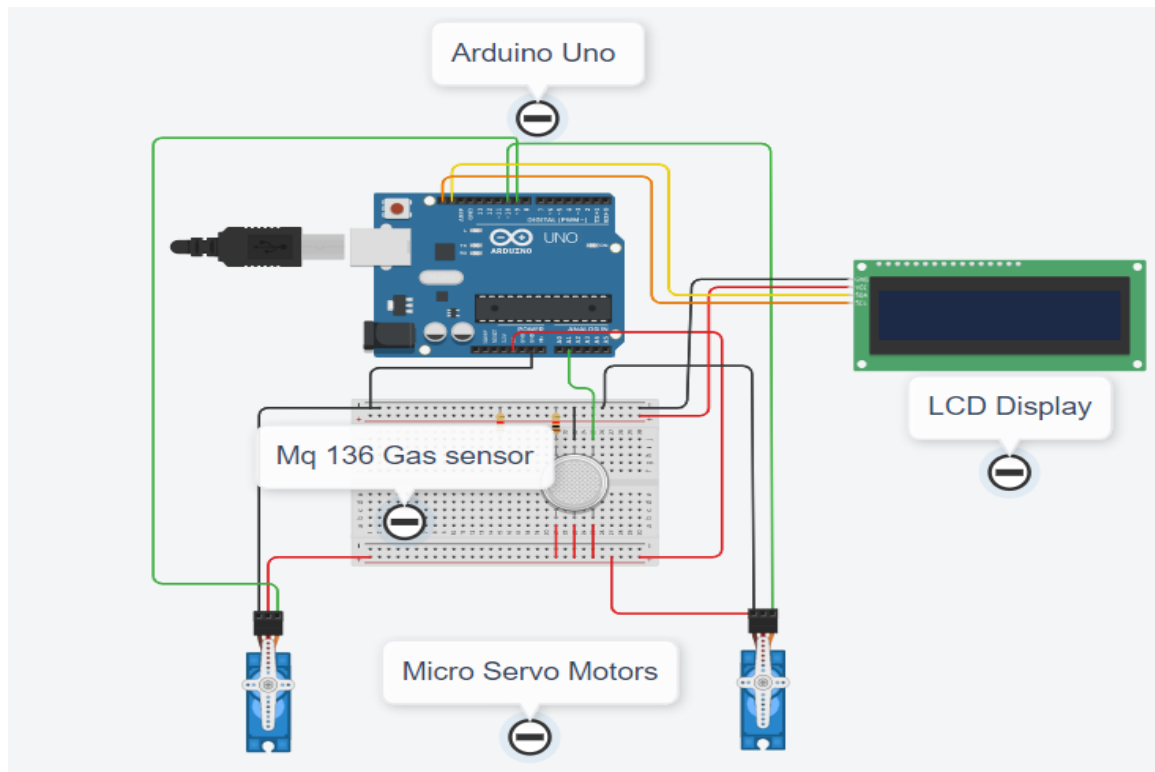
This customized manhole lids is mainly designed to improve the quality and lifespan of our manhole systems and ease the lives of people cleaning them.

## Block Diagram :

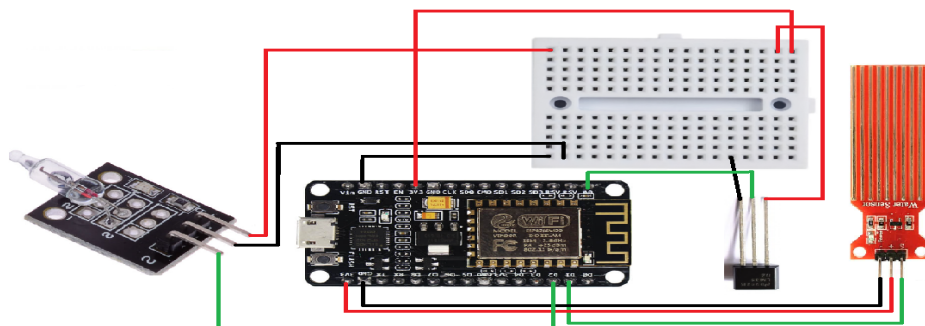


## Simulation :

1. The Gas Sensor takes inputs and the air quality is displayed on the lcd display in ppm.
2. If the air quality value increases more than 300 ppm then the servo motors rotate and the acids are passed in the drainage through pipes



3. Meanwhile the different sensor values collected from water sensor , tilt sensor and temperature sensor which are interfaced to Node MCU ESP8266 are sent to a web server





## **Final Product :**



## **Conclusion :**

In conclusion, the development of such kind of lids will not only help in monitoring key aspects like overflow of water , toxicity and temperature inside the manhole and tilt of the lid but will also a decontamination system which can be useful to both public and officials.

With real time monitoring the system provides data for better decision making and proactive maintenance. It ensures timely cleaning of drainage, reducing human labor and minimizes health risks.

Overall this idea enhances safety , cleanliness and efficiency especially in urban areas. It reduces accidents , property damage , and health hazards while improving operational efficiency for officials. It is very simple to set up while the manufacturing cost is very less, near to Rs.4000 for each lid.