

DEPT. OF COMPUTER ENGINEERING

SMART TOILET SYSTEMS

BY

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OBJECTIVE

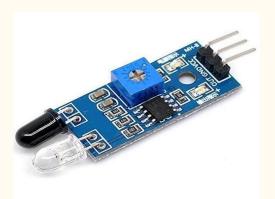
- To design a smart toilet which is equipped with sensor transceiver and ethernet connectivity.
- Remotely monitors cleanliness status of restrooms.
- ☐ Cleaners can be dispatched when needed instead of fixed intervals.
- Allow building owners and Facility Management(FM) and cleaning companies to manage usage across multiple restrooms.
- Using data to plan resources ahead of time based on usage patterns.

COMPONENT LIST

- 1. MQ-135 AIR QUALITY SENSOR(detects NH3 in air)
- 2. ARDUINO UNO
- 3. IR SENSOR
- 4. 16*2 CHARACTER LED DISPLAY
- 5. BREADBOARD







MODEL WORKING

- 1. MQ-135 GAS SENSOR attached to Arduino detects the ammonia level present in the air and displays the ammonia level in ppm on the LED display.
- 2. IF ammonia level is more than 1.5 ppm then green led is switched on indicating to start the fan
- 3. IF ammonia level is greater than 2.5 ppm then red led is switched on giving an indication to clean the toilet because the smell is unbearable.
- 4. Also, if a person enters and leaves the toilet the usage count is detected by IR sensor and is incremented by one.

CODE

```
* Program to measure gas in ppm using MQ sensor
* Dated: 03-03-2019
*/
#include<LiquidCrystal.h>
#define RL 20 //The value of resistor RL is 47K
#define m -0.263 //Enter calculated Slope
#define b 0.42 //Enter calculated intercept
#define Ro 76.63 //Enter found Ro value
#define MQ sensor A0 //Sensor is connected to A4
int avg value, n=0;
int fan=7,clean=8,ir=10;
int count=0;
int cnt=20;
LiquidCrystal lcd(12,11,5,4,3,2);
void setup()
```

```
pinMode(fan, OUTPUT);
pinMode(clean, OUTPUT);
pinMode(ir,INPUT);
Serial.begin(9600); // sets the serial port to 9600
Serial.println("NH3 in PPM"); //Display a intro message
//delay(2000); //Wait for display to show info
analogWrite(6,cnt);
lcd.begin(16,2);
void loop()
// count person with ir sensor
if(!(digitalRead(ir)))
  count++;
  Serial.print("Count=");
  Serial.println(count);
  Serial.print("Total=");
   Serial.println(count/2);
   digitalWrite(LED BUILTIN, HIGH);
  delay(1000);
```

```
//ppm levels check with MQ-135 and controlling fan, clean msg
float VRL; //Voltage drop across the MQ sensor
float Rs; //Sensor resistance at gas concentration
float ratio; //Define variable for ratio
VRL = analogRead(MQ sensor)*(5.0/1023.0); //Measure the voltage drop and convert to 0-5V
Rs = ((5.0*RL)/VRL)-RL; //Use formula to get Rs value
ratio = Rs/Ro; // find ratio Rs/Ro
float ppm = pow(10, ((log10(ratio)-b)/m)); //use formula to calculate ppm
Serial.print("NH3 (ppm) = ");
Serial.println(ppm);
//Serial.print("Voltage = "); //Display a intro message
//Serial.println(VRL);
if(ppm>2.0 && n!=2)
  n=2;
  digitalWrite(fan, HIGH);
  digitalWrite(clean, HIGH);
else if(ppm>1.2)
  n=1;
  digitalWrite(fan, HIGH);
  digitalWrite(clean, LOW);
else
```

```
n=0;
  digitalWrite(fan, LOW);
  digitalWrite(clean, LOW);
//lcd printing
lcd.setCursor(0,0);
lcd.print(String("Count=")+String(count/2));
//lcd.print(count/2);
lcd.setCursor(0,1);
lcd.print(String("NH3 ppm=")+String(ppm));
//lcd.print(ppm);
```

DEVICE OUTPUT

Device performs various tasks based on the ammonia level present in the restroom as follows

DETECTED AMMONIA LEVEL IN PPM	TASK PERFORMED
0 - 1.5	No Significant Smell(No task performed)
1.5 - 2.5	Bearable Smell (Put fan on)
2.5 and above	Unbearable smell (Clean toilet urgently)

☐ IR sensor increments the person count by one when a person enters and leaves the restroom. Thus, track of toilet usage is monitered .

For more details visit

bit.ly/smart-toilet-system

Thank You!