

# DESIGN AND FABRICATION OF AUTOMATIC SEWAGE CLEANING SYSTEM

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## ABSTRACT

Nowadays automation gives the solution to all the problems and increases the chances of getting better accuracy in all industrial applications. But still it is not possible to get the better result in the issue of industrial and domestic drainage system with optimum design. Drainage pipes are used for the disposal and unfortunately sometimes they may lead to loss of human life while cleaning the blockages in the drainage pipes. To avoid this risk and reduce the time of cleaning the drainage automated sewage cleaning system is designed based on the problems faced by the people. In this work, automation approach will be used instead of normal cleaning method which will be designed to control the disposal of wastage in an effective manner. For control, the wastage regular filtration method may be used. Here, Internet of Things (IOT) is used and when the dustbin gets filled up, a SMS message is sent to the registered mobile number of the person. So, cleaning of dustbin is done at the right time.

**Keywords:** Sewage Cleaning, welding, fabrication, microcontroller

## 1. INTRODUCTION

In this Project, the proposed concept is to replace the manual work in drainage cleaning by automated system. Now a days in all industries the work takes place automatically this is necessary to all the industries without any system efforts. The work is going on by using automatic technique. In present days however automation plays an important role in all industry applications. Disposal of sewage waste from industries is a difficult job. This is one challenging task in industries and commercials. In older days people were using drainage pipes because they use to remove sewage water. There is a disadvantage in which may be loss of human life when work in that drainage pipes is going on while cleaning the block. To reduce this problem and to save human life some external work is done in this project. The device is placed across drain so that only water flow through lower grids contain waste bottles paper etc are lifted by

# DESIGN AND FABRICATION OF AUTOMATIC SEWAGE CLEANING SYSTEM

teeth which is connected by chain. The chain drive is used for lift up the see waste from the drain to ‘waste storage tank. Power is supplied to the chain drive by the dc motor. –the “waste materials is separated by bucket and are in stored in the waste storage tank whenever the bucket is lifted up from the drain, with the help of dc motor. Dc motor control plays a major role in many applications. Whenever the motor is run automatically drainage water cleaning overcome all the short of drainage problem and promote blockage free drain progress continuous flow of drain water. In the modern era there have been sufficient sewage dross problem when cross water need be separated to clean surrounding area. The waste and gases produced from the industries are very harmful to human beings to the environment Methodology used for whole processing of drainage cleaning machine is given below; this methodology gives way about how work is to be carried out in systematic direction. It is standard process of describing process, how it is done in simplest manner. Automatic is mandatory to handle all type of system. It is made possible by embedded design which is a combination of both computer and mechanical system, often with real time computing constraints. In today’s world, it is common to control most of the device, by automation since it optimizes by reducing the size and cost of product and increase the reliability and performance. Embedded systems are based on microcontroller and their application range from portable devices to large installations and it also extends to large complex system.

## 2. PROBLEM IDENTIFICATION

### 2.1. MOTIVATION & OBJECTIVE

The problem of water logging due to plastic, thermocole and metal leads to pest growth and it favors diseases like malaria, typhoid etc.. This is unsafe for human life and hence the idea of this project emerged. The objective of the proposed project is to design and fabricate an automated machine for drainage cleaning in order to prevent humans from getting affected by various diseases from the infection microbes present in the sewage while cleaning manually. This proposed system is to minimize or overcome the problem faced while using man operated machine and to minimize the increased dumping rate of waste.

### 2.2. PROCESS CHART

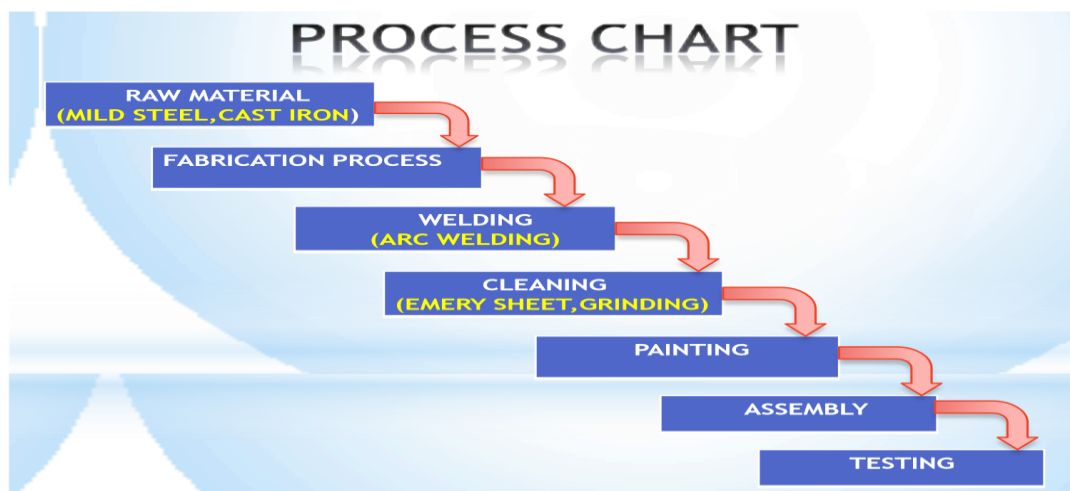


Figure 1 process chart

### 3. DESIGN CALCULATION

The general steps to be followed in designing the machine are as followed,

Testing of the machine and for functioning

Motor power=0.5 H.P=746 x 0.50 = 373 N-m/s

Speed of motor =3250 rpm

Power of motor (P) = 373 watts.

$P = 2$

Where, N=Rpm of motor=3250

T=Torque transmitted

$373=2$

$T=1.0959$  N-m

$T=1.0959$  N-mm

### 4. POWER OUTPUT WITHOUT LOAD

$$P = 2\pi NT/60$$

$$D1=70 \text{ mm} \quad \text{Motor rpm (N1)} =3250 \text{ rpm}$$

$$\text{Pulley (D2)} = 180 \text{ mm}$$

$$N1 D1 = N2 D2$$

$$N2 = N1 D1 / D2 = (3250 \times 70) / 180$$

$$N2 = 1263.8 \text{ rpm}$$

#### 4.1. Torque Transmitted

$$P=2\pi NT/60$$

$$T = (P \times 60) / 2\pi N = (373 \times 60) / (2\pi \times 3250)$$

$$T = 1.0959 \text{ N-m}$$

$$T = 1.0959 \times 10^3 \text{ N-mm}$$

#### 4.2. Power Output

$$P = (2\pi N2T) / 60$$

$$P = (2\pi \times 1263.8 \times 1.0959 \times 10^3) / 60$$

$$P = 145036.69 \text{ W or } 145.03669 \text{ KW}$$

## 5. EXPERIMENTAL SETUP

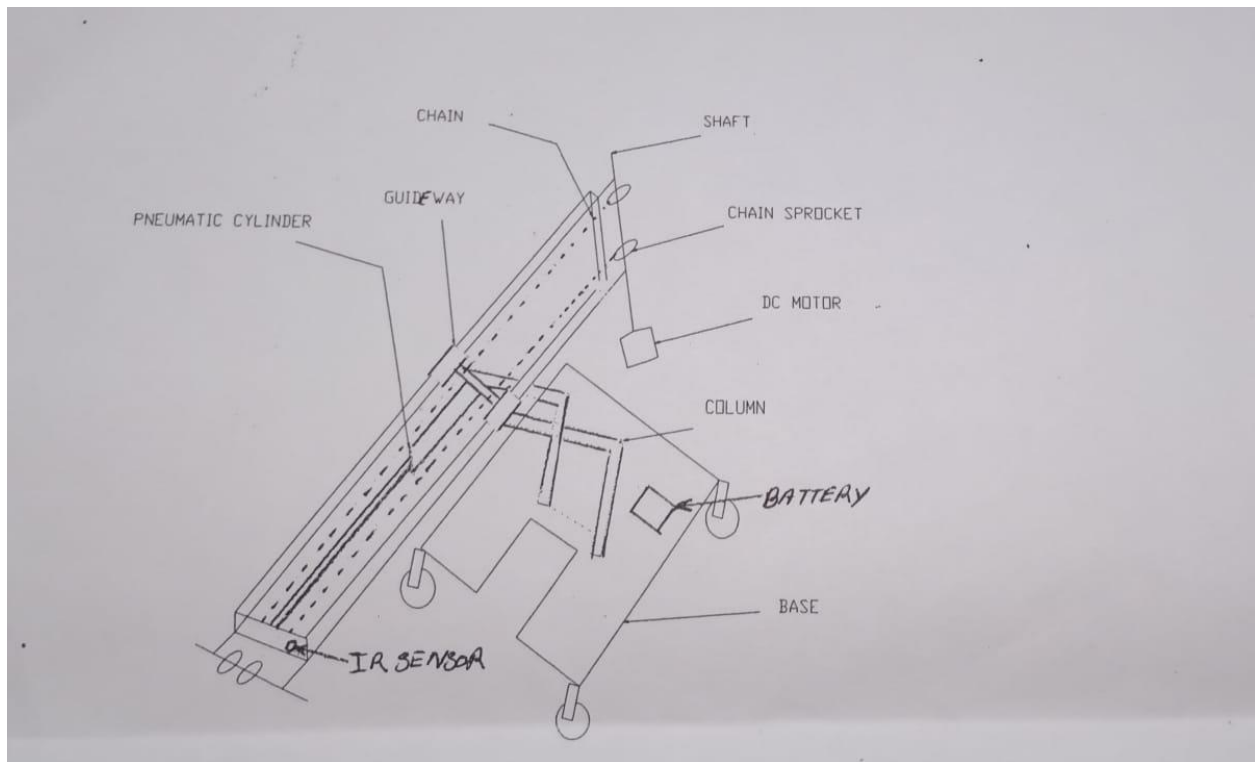


Figure 2 Block diagram of sewage cleaning system

## 6. CONSTRUCTION DETAILS

### 6.1. BASE

It is made up of mild steel square tube material. L-shaped column with conveyor and collecting tank is engaged with the base. All the parts for drive in this mechanism are mounted on base.

### 7. CONVEYOR CHAIN

Chain conveyors are used for moving products down an assembly line and/or around a manufacturing or warehousing facility. Chain conveyors are primarily used to transport heavy unit loads, e.g. pallets, grid boxes, and industrial containers. These conveyors can be single or double chain strand in configuration.

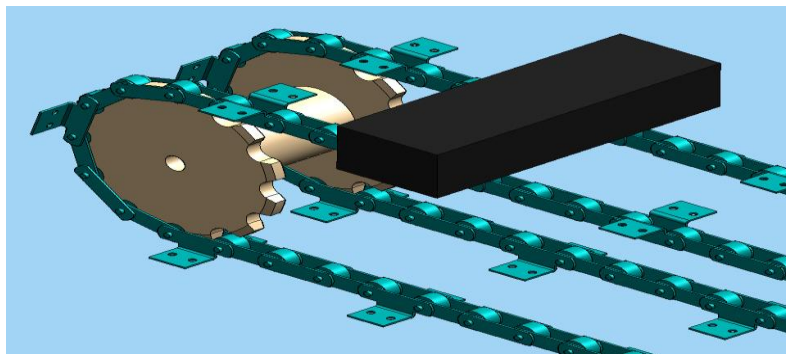


Figure 3 Conveyor chain

## 8. SPROCKET

Sprocket are used in bicycles, motorcycle, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gear are unsuitable or to impart linear motion to a track, tape etc



**Figure 4** Sprocket

## 9. DC MOTOR

- When a current passes through a conductor, lines of magnetic force (flux) are generated around the conductor. The direction of the flux is dependent on the direction of the current flow.
- If you are thinking in terms of conventional current flow (positive to negative) then, using your right hand point your thumb in the direction of the current flow and your fingers will wrap around the conductor in the same direction of the flux lines.
- If you are thinking in terms of electron current flow (negative to positive) then you must use your left hand. If we look at the air gap between two magnets that have their opposite poles facing each other, we would see magnetic lines of force (flux) from the N to S poles.



**Figure 5** DC motor

Now, if we place a current carrying conductor in the air gap of two magnets, the lines of flux in the air gap will be affected.

- On the side of the conductor where the lines of flux oppose each other, the magnetic field will be made weaker. On the side of the conductor where the lines of flux are not

## DESIGN AND FABRICATION OF AUTOMATIC SEWAGE CLEANING SYSTEM

opposing each other, the magnetic field will be made stronger. Because of the strong field on one side of the conductor and a weak field on the other side, the conductor will be pushed into the weaker field.

- Now, let's apply this principle to the operation of the DC motor. The armature of the motor is a loop of wire (current carrying conductor) which is free to rotate. The field magnets are permanent or electro magnets with their N and S poles facing each other to set up the lines of flux in the air gap.

### 10. GEAR

Bicycle gearing is the aspect of bicycle drive train that determines the relation between the cadence, the rate at which the rider pedals, and the rate at which the drive wheel turns.

On some bicycles, there is only one gear and the gear ratio is fixed. Many contemporary bicycles have multiple gears and thus multiple gear ratios. A shifting mechanism allows selection of the appropriate gear ratio for efficiency or comfort under the prevailing circumstances: for example, it may be comfortable to use a high gear when cycling downhill, a medium gear when cycling on a flat road, and a low gear when cycling uphill. Different gear ratios and gear ranges are appropriate for different people and styles of cycling.



**Figure 6** External & Internal Spur Gear

External gear makes external contact, and the internal gear (right side pair) makes internal contact.

### 11. BEARING

A bearing is a machine element that constrains relative motion between moving parts to only the desired motion. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may *prevent* a motion by controlling the vectors of normal forces that bear on the moving parts. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts. The term "bearing" is derived from the verb "to bear" a bearing being a machine element that allows one part to bear (i.e., to support) another. The simplest bearings are bearing surfaces, cut or formed into a part, with varying degrees of control over the form, size, roughness and location of the surface. Other bearings are separate devices installed into a machine or machine part. The most sophisticated bearings for the most demanding applications are very precise devices; their manufacture requires some of the highest standards of current technology.

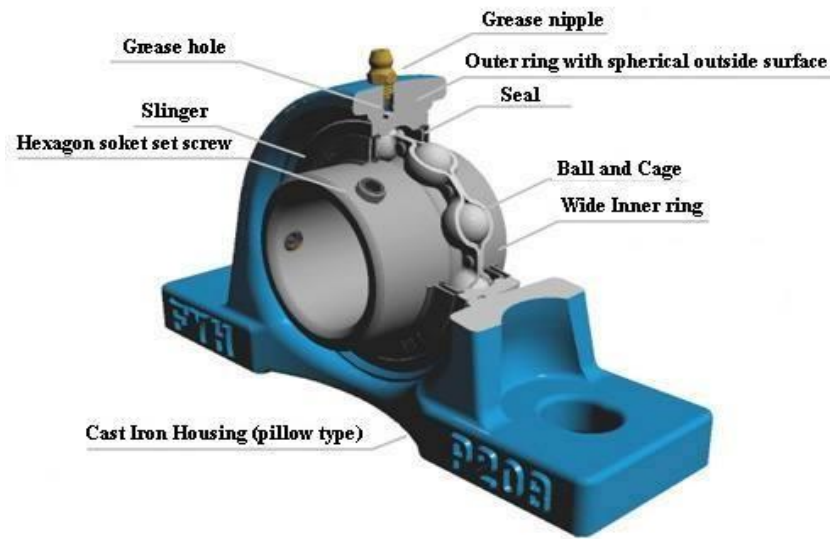


Figure 7 UCP 205 Bearing

## 12. BATTERY

Battery converts chemical energy into electrical energy by a chemical reaction. Usually the chemicals are kept inside the battery. It is used in a circuit to power other components. A battery produce direct current.



Figure 8 Battery

## 13. IR SENSOR

An infrared sensor is an electronic instrument which is utilized to detect certain attributes of its surroundings by either emanating or potentially distinguishing infrared radiation. Infrared sensors are additionally equipped for estimating the warmth being discharged by a question and distinguishing movement. Infrared innovation discovers applications in numerous ordinary items. TVs utilize an infrared indicator to decipher the signs sent from a remote control. The key advantages of infrared sensors incorporate their low power prerequisites, their straightforward hardware and their convenient highlights.



**Figure 9** Infrared sensor

#### **14. FABRICATION & WORKING PRINCIPLE**

In drainage pipes when the water is flowing, place the device, then it work automatic they remove waste material like bottle, paper etc and also external work is IOT. The chain drive is used to lift up the waste from the drain to waste storage tank. Power is supplied to the chain drive by the dc motor. The waste material is separated by bucket and is in stored in the waste storage tank whenever the bucket is lifted up from the drain. In automatic drain cleaner the lifting pans are lifted by the chains which are in line with the sprockets. This mechanism is known as chain drive mechanism.

#### **15. WORKING PRINCIPLE**

IOT means internet of things. So here Aurdino software is used. Using the coding, input and output are got form starting point. The drainage process is the input and the output is when the bin was fully loaded then it the sensor indicates the alarm sound. This is done output. In IOT process microcontroller arduino is used for easy hardware and software usage. Research work smart dustbin consists of various modules like IR sensor and microcontroller the IR sensor is connected to microcontroller. Whenever the IR sensor is detected which means the dustbin is filled with waste the IR sensor detects and the signals are sent to the microcontroller and then the GSM will be active with the help of certain sets of codes and programs. The GSM will be activated thus sending alarm sound through the system.



**Figure 10** fabrication mould



## 16. MATERIAL SELECTION & ITS SPECIFICATION

### SPECIFICATIONS:

- Stroke Length : 900mm
- Cylinder type : Double Acting cylinder
- Compressor pressure : 10 bar
- cylinder operating pressure : 1 bar
- Function Of IR sensor : 5V DC (To detect the motion of conveyor belt)
- Function of Ultrasonic sensor :5V DC (To check the quantity of sewage in collecting tank)
- DC Motor : 230V, 0.5HP , 3250 RPM

### RAW MATERIALS

S.NO	PART NAME	MATERIAL	QUANTITY	DESCRIPTION
1	FRAME	MILD STEEL	1	I SECTION 710 X 610 X 4mm
2	SHAFT	MILD STEEL	2	DIA 25 X 450 mm
3	MOTOR	STANDARD	1	0.25 hp, 1440 rpm
4	SPROCKET	CAST IRON	5	DIA 250 mm & 35 mm
5	BEARING	CAST IRON	4	P205
6	CHAIN	MILD STEEL	2	A-61
7	PNEUMATIC HOSE	PLASTIC	6m	DIA 8mm*30m
8	SOLENOID	ALUMINIUM & PLASTIC	1	5/3dcv
9	PNEUMATIC CYLINDER	ALUMINIUM & PLASTIC	2	Double acting cylinder
10	NUT,BOLT,WASHER	MILD STEEL	12	M10

**Table 1** Raw materials and its specifications

## 17. MERITS, DEMERITS & APPLICATION

### ADVANTAGES

- Easy maintenance.
- All type and forms of sewages can be cleaned using this system.
- Reduce man power.
- The drainage cleaning system is more efficient in a technical field that will be more helpful to the society.
- Quick response is achieved.

## DESIGN AND FABRICATION OF AUTOMATIC SEWAGE CLEANING SYSTEM

- The shape is small and light so easy to carry anywhere

### DISADVANTAGES

- i. Small vibration occurs due to wire brush wheel attachment.
- ii. In order to avoid vibration the machine should be properly foundation with the floor.

### 17.1. APPLICATIONS

It is used almost in all types of Sewage cleaning system (Large, Small & medium). This device is suitable to hold flat type plate. (Maximum length 1.5 feet)

### 18. CONCLUSION

In the treatment system of drainage, waste water control by the machine and the collecting bin to achieve automatic control of waste water treatment. Drainage from domestic and industries is treated through this project to meet the national emission standards, with stable operation, low cost and good effect. The cleaner functions more effectively during the heavier rain which has more volume of running water with garbage and high velocity. Risk of Labors catching infections or poisoning due to large amounts of waste and chemicals will be reduced. Automation is a technology concerned with his application of mechanical, electronic and computer based systems to operate and control production. This system is used To Operate Automated Gutter Cleaning System. This project may be developed with the full utilization of men, machines, and materials and money. Also we have followed thoroughly the study of time motion and made our project economical and efficient with the available resources. This system is Designed, Fabricated successfully and also tested. It works satisfactorily. We hope that this will be done among the most versatile and interchangeable one even in future. Thus we can able to obtain following through Automated sewage Cleaning system.

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