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AUTOMATIC SEWAGE CLEANING SYSTEM

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Abstract-*In this project the proposal concept is to replace the manual work in drainage cleaning by automated system. We know that water has a great importance in human being life, the water flow in drain full of wastes like polythene, bottles etc. The drains get blocked due to these wastes in water. Now a day's even through mechanical machine plays a vital role in all industrial applications in the proper disposal of sewages from industries and commercials are still challenging task. Drainage are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockage in the drainages. The government also spends too much money to clean the drainages. To overcome this problem and to save the human life we implement design "Automatic sewage cleaning system". We designed our project to use this inefficient way to control the disposal of wastages and with regular filtration of wastages. The system has a wiper motor that starts running as soon as the set-up is switched on. Two power window motors are connected to the wheel and it is driven with the help of the remote control set-up. The process starts collecting the sewage wastes by using the arm and it throws back the waste into the bin fixed in the machine at the bottom. An arm is used to lift the sewage and in turn a bucket is used to collect them. The set-up runs even in sewage area with water (limited to a particular amount) so that the wastages which floats on the water surface also gets collected. The garbage which affects the drainage is also picked up and removed. This system has limited human intervention in the process of cleaning and in turn reduces spreading of diseases to mankind.*

Keywords—*Automated system, 12volt DC gear motor, bearings, Shaft, sewages.*

I. INTRODUCTION

The Drainage water cleaner system are used to clean wastes from water like polythene,bottles etc. present in water .This can be used to overcome the problem of filtration of wastes from water and it save the time and cost that spend on cleaning the drainage. As the industry setup increase in the environment the water coming from industries are full of wastes like polythene, bottles, and other materials and that water mix with the other water that are used by people and we know that that water is not good for the for health of people. So to overcome from these problems we can filter the water drainage water before it mix with other water. This type of filtration of water is called primary filtration. In this project we use DC or AC motor to run the system when power supply is available& the Equipment we used are motor, chain, driver, bucket, frame, wheel, sprocket gear, solid shaft etc. Water is a basic necessity of human and all living beings. There is a plenty of water on earth that is not suitable for human use. The impurities present in water can cause hazardous diseases. Waste water is defined as the flow of used water from homes, business industries, commercial activities and institutions which are subjected to the treatment plants by a carefully designed and engineered network of pipes. The biggest impact of cleaning the chemical wastes can cause respiratory diseases and it plays a challenging issue for the municipality officers. Water damage is classified as three types of contaminated water. They are clean water, gray water and black water. Clean water is from a broken water supply line or leaking faucet. If not treated quickly, this water can turn into black water or gray water, depending on length of time, temperature, and contact with surrounding contaminants. Gray water is contaminated water that causes discomfort or illness. It includes washing machine overflow; toilet overflow with some urine, and dishwasher overflow. Black water is grossly contaminated and could cause severe illness or death if ingested and avoided such as flooding from rivers or streams, water from beyond the toilet trap, water from the toilet bowl, or standing water that has begun to support microbial growth.

A drainage ditch is a narrow channel that is dug at the side of a road or field to carry away the water. Nowadays, even though automation plays a vital role in all industrial applications in the proper disposal of sewages from industries and sewage cleaning is still a challenging task. Drainage pipes are used for the disposal of sewage and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. The municipality workers are only responsible to ensure that the sewage is clean or not. Though they clean the ditches at the side of buildings, they can't clean in very wide sewages. The municipality workers need to get down into the sewage sludge to clean the wide sewage. It affects their health badly and also causes skin allergies. With the continued expansion of industries, the problem of sewage water must be urgently resolved due to the increasing sewage problems from industries to the surrounding environment. To

overcome this problem and to save the human life this design of sewage cleaning machine is proposed. In the proposal concept, the manual work in drainage cleaning is replaced by an automated system. The existing system is designed in order to reduce the load of workers and to make clean India.

II. Literature Review

1. Ganesh U L, showed the usage of mechanical drainage cleaner to replace the manual work required for drainage cleaning system. Drainage pipes are very dirty. Sometimes it is harmful for human life while it is need for cleaning drainage system. To overcome this problem, they implemented mechanical semi-automatic drainage water cleaner and so the water flow is efficient because of regular filtration of wastages with the help of that project. Different kinds of environment hazards reduced with the help of Drainage system machine. [1]
2. James C. Conwell, G. E. Jhonson proposed the design and construction of a new test machine configuration that offers same advantages over the traditional one. The new machine and attendant instrumentation provide more realistic chain loading and allow link tension and roller sprocket impact monitoring during normal operation. The incorporation of idle sprocket allows independent adjustment of test on length and preload.[2]
3. S D Rahul Bharadwaj, Proposed with the automatic cleaning of waste water in order to prevent global warming and melting of glaciers. The results emphasize the need of waste water treatment plants, through which the water is treated before suspending in rivers. Firstly power is generated and that power is used for waste water cleaning process . [3]
4. Balachandraetal, Reviewed about drainage cleaning to replace manual work to automated system because manually cleaning system it is harmful for human life and cleaning time, is more so to overcome this problem they implemented a design “Automatic drainage water pump monitoring and control system using PLC and SCADA”. PLC and SCADA were designed. In this project to use efficient way to control the disposal of wastage regularly, treatment of disposal in different way toxic and nontoxic gases. PLC controller from Siemens was used in the treatment system of drainage wastewater control by the stepper motor, compressor, gas exhauster, pressure valve and the liquid level, flow and other analog variables to achieve automatic control of sewage waste water treatment. [4]
5. Dr .k.kumaresan explained manual work converted to automated system. Drainage pipe using for disposal and it may be loss for human life while cleaning the blockage in the drainage pipes. To overcome this problem they implemented “Automatic Sewage Cleaning System”. They designed their project different way clearance of gaseous substance are treated separately so the flow of water efficiently. This project may be developed with the full utilization of men, machines, and materials and money. They made their project economical and efficient with the available resources. They used automation technology reletated with his application of mechanical, electronics, computer based systems to operate and control production. [5]
6. R.Sathiyakala, explained E bucket (electronic bucket) use for drainage cleaning system because E-bucket lifted a sewage and used evaporation treatment for this sewage wet sewage was converted into dry matters, with the of ARM board (ARDUINO) this process was performed. After this process they were add this waste a government bank without any kind of affection of the bacteria. [6]
7. Nitin Sall, explained flow of used water from homes, business industries, commercial activities is called waste water. 200 and 500 liters wastage water are generated each person every day. So using waste water technology that removes, rather than destroys, a pollutant in a drainage system. [7]
8. NDUBUISI C. Daniels, et.al. Showed the Drainage system cleaner machine used to remove garbage and sewage automatically which helped to protect the environment from different kinds of environmental hazards. The drainage system cleaner has three major parts which are the Propeller, the Cleaner and the Pan all makes up for its effective functioning. [8]

III. Objectives

The major objectives of the proposed work are, Design of mechanical drainer, taking into account the various factors that might affect the functionality of the equipment. Fabrication of the model and Assembling of the model carried out, then process are studied and optimized for effective semi-automatic drainer for sewage water treatment for floating materials.
Basically during fabrication of the model the basement part is prepared by welding the metal bars by electric welding. Then the supporting rods are welded at an angle of 90degree from the basement, the pillow block bearings are fixed to the supporting rod and the front part of the basement. Hollow cylindrical shafts are fixed to the bearings and also chain drive are also fixed to the shaft in order to fix the shafts the factor of safety of the chain is calculated. The lifters are fixed to the chain by gas welding at an equal distance from each.

IV. Problem Identification

4.1. Motivation and 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 infectious 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.

4.2. Existing method

The existing system is completely a mechanical based project. It is a stationary system, simply kept in the sewage area to collect the wastes passing over it. The chain and sprocket is used for conveyor movement, which has fitted fork plates to collect the wastes from the sewage. The rotation of the chain along with the plates will collect the floating wastes and put off the wastes in the bin that is placed at the backside of the system.

V. Construction Of The Components

5.1 .Motor:-

For the proper running of the model, we require high power motor with sufficient amount of torque. So it can be lift an amount of sewages such as polythens, bottles' and other sewages which is comes in the contact of lifter.The power and torque of the DC motor is depends on the its RPM.If any motor have less revolution then the capacity of the motor is high.For the high weight liften we use 12 volt DC gear motor having near about 200rpm, such type of motor can carry 8kg of weight.

The shaft of the motor is centrally mounted.

Description of motor used:-

Supply:- 12volt DC supply

Power:- 20kg-cm torque

Rpm:- 100

Weight:- 145gm

Figure 5.1 12 volt DC gear motor

5.2 Chains driven conveyor

Most often, the power is conveyed by a roller chain known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned, and this pulls

the chain putting mechanical force into the system. Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects. In other situations, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear. Though drive chains are often simple oval loops, they can also go around corners by placing more than two gears along the chain; gears that do not put power into the system or transmit it out are generally known as idler wheel. By varying the diameter of the input and output gears with respect to each other, the gear ratio can be altered. For example, when the bicycle pedals gear rotate once, it causes the gear that drives the wheels to rotate more than one revolution.
For the lifting of the sewages we require conveyor belt like construction for such purpose we used chains of the motorcycles. A chain conveyor system is a type of conveyor system which is used for moving material through production lines. The chain driven conveyor the belt is bolted to a series of cross-members, the ends of which connects to chains running down each side of the conveyor. The chains connect to the motor via a sprocket.The main benefit that the chain driven belt conveyor provides, pure power, without slipping.
Dimensions of chain drive:-

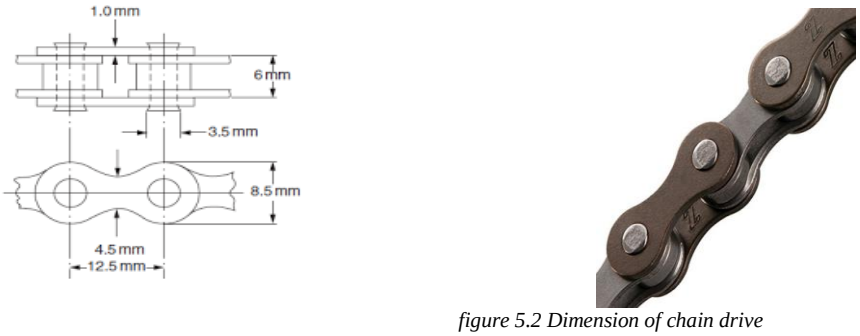


figure 5.2 Dimension of chain drive

5.3 Sprocket

A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles.

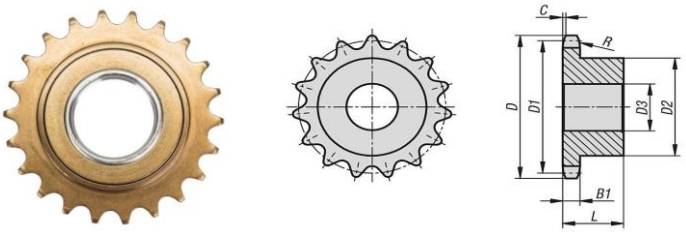


Figure 5.3. Sprocket

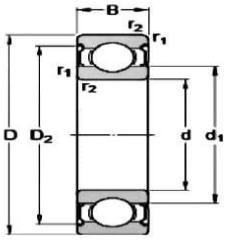
5.4 Ball Bearing

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races.
The purpose of a ball bearing is to reduce rotational friction and support and axial loads. It achieves this by using at least three races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower than if two flat surfaces were sliding against each other.
Ball bearings tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

Figure 5.4 Ball Bearing

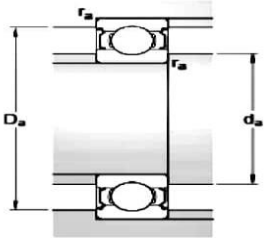
5.4.1 Bearing Specification

Dimensions



d		25	mm
D		62	mm
B		17	mm
d_1		36.6	mm
D_2		52.7	mm
$r_{1,2}$	min.	1.1	mm

Abutment dimensions



d_a	min.	32	mm
d_a	max.	36.5	mm
D_a	max.	55	mm
r_a	max.	1	mm

Calculation data

Basic dynamic load rating	C	23.4	kN
Basic static load rating	C_0	11.6	kN
Fatigue load limit	P_u	0.49	kN
Reference speed		24000	r/min
Limiting speed		13000	r/min
Calculation factor	k_r	0.03	
Calculation factor	f_0	12	

Mass

Mass bearing		0.23	kg

Figure 5.4.1 Bearing Specifications

5.5 Hollow Shaft

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power.[1] The various members such as pulleys and gears are mounted on it. Transmission shafts are used to transmit power between the source and the machine absorbing power; e.g. counter shafts and line shaft. Machine shafts are the integral part of the machine itself e.g. crankshaft The material used for ordinary shafts is mild steel. When high strength is required, an alloy steel such as nickel, nickel-chromium or chromium-vanadium steel is used. Shafts are generally formed by hot rolling and finished to size by cold drawing or turning and grinding.

Figure 5.5 Hallow Shaft

The following stresses are induced in the shafts.
Shear stresses due to the transmission of torque (due to torsional load).Bending stresses (tensile or compressive) due to the forces acting upon the machine elements like gears and pulleys as well as the self weight of the shaft.Stresses due to combined torsional and bending loads. Battery usedA rechargeable battery, storage battery, secondary cell, or accumulator is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. It is composed of one or more electrochemical cells. The term "accumulator" is used as it accumulates and stores energy through a reversible electrochemical reaction. Rechargeable batteries are produced in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network. Several different combinations of electrode materials and electrolytes are used, including lead–acid, nickel–cadmium (NiCd), nickel–metal hydride (NiMH), lithium-ion (Li-ion), and lithium-ion polymer(Li-ion polymer).
Nominal battery voltage is 12V.
7Ah capacity at 20hr rate to 1.75VPC.
Standard dimension of 151mm x 65mm x 97.5mm (L x W x H with terminal)
Charging temperature range from -15°C to 50°C.
Discharging temperature range from -20°C to 60°C.
Battery weight is 2.2Kg.
5 years life at 20°C.

Figure 5.6 Battery Used

5.6 Lifter

Lifting equipment, also known as lifting bin, is a general term for any equipment that can be used to lift loads. This includes sewages like polythene , plastic bottles , wastage which generally occurs in the water , thermocol, and other dusty and sewage partials which comes in the contact with that equipment.In our project we used two lifter for better performance, and it also help for balancing the model.
The dimension of the lifter are as follows
Lifter of width-12.7cm,Total length of lifter-60cm,Weight of lifter-150gram,Thickness of lifter-2cm

Figure 5.7 lifter

5.7 Collecting Bin

Collecting bin is the rectangular hollow box which is situated behind the model. It is used for the purpose of collecting the sewages which is comes in the contact of the lifter. When the lifter completes its cycle it reaches to the bin and removes all sewage in the collecting bin. The collecting bin made up from sheet metal.

Dimension of the collecting bin
Width of collecting bin-30cm
Depth of collecting bin- 38cm
Length of collecting bin-75cm

Figure 5.8 collecting bin

5.8 Bush

The bush is the mechanical equipment used for the fitting of the sprocket. It is an hallow part in which the sprocket and three wheel is fixed. It is an important element of the project because it give proper fitting to the sprocket. While running of the model it creates an vibration the bush is used to protect the sprocket and the three wheel form the vibration the bush is well welded on the shaft. It is made of iron material having high strength.

For the proper adjustment of the bush and sprocket the dimension of the bush and the shaft is equally matched because the bush is fitted over two horizontal shaft which is shown in the model diagram of the project.

The dimension of the bush
Length of the bush-5cm
Outer diameter of the bush-3.2cm
Inner diameter of the bush-2.5cm

Figure 5.9 Bush

VI. Results And Discussions

While conducting the experiment the parameters considered are uniform flow rate of water, depth of the channel is 1feetand height of the channel is 3feet, rate of disposal of waste is uniform, lifter speed and motor speed is constant. Cost of the machine is economic and it requires only12-24 volts of current.
These cleaners are easy cheapest way to fix drainage problems. Easy to operate as no special skill is required. Reduction of labor oriented method of cleaning, thus
Up grading dignity of labor's. Light weight and easily portable. Large amount of garbage will collect which can be remanufacturable.

VII. Conclusion

In the treatment system of drainage Waste water control by the motor, roller chain and sprocket, lifter and the collecting bin to achieve semi-automatic control of sewage waste water treatment. Drainage from industries is treated through this project to meet the national emission standards, with stable operation, low cost and good effect. Drainage wastewater control is treated by this method to irrigate plants, clean toilets, etc. The cleaner functioned move effectively during the heavier rains which had more volume of running water with garbage and high velocity. 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 Automatic Sewage 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 was 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 Automatic Sewage Cleaning system.

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