

## Scientific Hub of Applied Research in Engineering & Information Technology

Received: 30.01.2021 Revised: 15.02.2021 Accepted: 24.02.2021

# Research Article Design and Development of Automatic Sewage Cleaning Machine

B. Babu<sup>\*1</sup>, P. Raja<sup>2</sup>, A. Anand Jayakumar<sup>3</sup>

<sup>1</sup> Department of Mechanical Engineering, Amrita college of Engineering and Technology, Nagarcoil, India.

<sup>2</sup> Department of Mechanical Engineering, Kongunadu college of Engineering and Technology, Trichy, India.

<sup>3</sup> Department of Mechanical Engineering, Sri Ramakrishna institute of Technology, Coimbatore, India.

Traditional method for disposal sewage waste is carried over by manual scavengers where they get inside the

maintenance whole pit. It has been estimated 1.24 million scavengers in the country are involved in the sanitation of our surroundings. In Manual scavengers mainly used for basic tools such as a bucket lined with a sack and a handle. The worker then carries the waste manually in bare hands and takes it to the disposal sites. Here scavengers are subjected to gases such as carbon (IV) oxide, hydrogen disulfide, methane and ammonia. Lengthy contact to hydrogen disulfide can take the lead to death by asphyxia. In individual may go through epileptiform convulsions and may fall self and soon after die. The gas is also connected with visual acuity. To eradicate this condition, manual scavenging is replaced by machines. This machine removes solid waste and again to suck away the liquid sewage. The primary function of the sewage cleaning machine is to gather, transport expertly as to discard of the rigid void in the void tub by the assist of claws. Rigid void in garbage contains futile containers, sack, papers etc. The continuously cleaned in the drainage with the assist of a model utilizing this drive system to remove the rigid void and threw it into a void bucket.

Keywords: Scavenger unit, electrical sewage cleaning system, disposal sewage system.

## 1. Introduction

The wastewater cleaning method is utilized to immaculate debris out-of the water like plastic bags, containers, and so on. available within water. Mainly it may be utilized to solve the issue of purification of debris throughout the water, and it retrieve the period and rate that allocate on sanitation the sewage. Mainly trade apparatus is used to increases the habitat, the liquid oncoming out of organisations are full of wastes like plastic bags, containers, including alternative things, as well as that water combined with the additional water that is utilised closeby humans, and

Correspondence should be addressed to B. Babu; <u>babubhaskaran@amrita.edu</u>

© 2021 SHAREit, ISSN (0) 2583-1976



This work is licensed under a Creative Commons Attribution 4.0 International License.

we understand that water is not suitable for the wellness about humans. In the direction of overwhelm these issues, we can purify the water sewage water prior to it mixes along with fresh water.

This kind of purification of water is known as central purification. As demonstrated, we use DC or AC motor to operate the unit while the energy is obtainable& the tools we used are motor, chain, driver, bucket, frame, wheel, sprocket gear, solid shaft, etc. In human life Water is a base requirement of all creatures. There is abundance of water on planet which is not appropriate for mortal use. The infections existing in water can produce dangerous disorders. Wastewater is described as the run of utilized water from homes, work production, merchant activities, and institutions that are exposed to the remedy works by a wisely engineered and invented pipenetwork. The most important effect of cleaning the contaminated materials can trigger inhaling infection, and it take a part in tough issue for the district officials. Water damage can be divided into three types of polluted water. They are sewage water, clean water and waste water. In pure water is also known as a destroyed duct or not watertight valve.

In this method is not healed superficially, this water can convert towards sewage water or waste water, hanging on the hour span, centigrade, and connect with neighboring impurities. Waste water is stained water that sources cramp or infection. It contains washerdryer overspill, toilet overspill with some pee, and washbasin overspill. Sewage water is extremely infected and perhaps produce danger infection or murder if consumed and ignored, similarly flooding from rivers or streams, water from behind the toilet trap, water from the toilet bowl, or vertical water that has start to assist bacterium extension. A sewerage dump is a confined ducts which is drive at the edge of a highway or lea to agitated water. At present, despite mechanization rest a key part in all commercial supplications in the right destruction of drainage from fabrication and garbage rinsing is yet a demanding piece of work. Sewage pipes are used for the shifting of garbage, and woefully, at times, there may be drop of mortal life while wiping the stoppages in the garbage pipes. The district laborers are narrowly in charge for checking that the garbage is clean or not. However they wash the gutters at the edge of constructions, they are unable-to wash in very broad sewages. The district laborers have to come down into the sewage mud to wash the whole garbage. It hits their wellness poorly and also produces dermal disease. With the extend growth of construction, the trouble of garbage water need to be necessarily sort out due to the raising sewage problems from production to the local territory. Get the better of this mess and to rescue mortal life, this plan of garbage rinsing machine is initiated. In the approaching idea, the physical task in garbage cleaning is put back by a mechanized unit. The enduring unit is map out to deduce the stuff of laborers and to produce pure India.

## 2. Literature Review

Ganesh U L [1] demonstrated the use of a water purifier to reinstate the physical labor needed in the water purification system. Dirty drainage pipes. Sometimes it is dangerous to human health when it is needed to clean the garbage unit. To conquer this issue, they use a mechanical semi-drainage water purifier so the out spill works well due to the normal waste filter with the assist of that function. Various types of environmental threats are deduced by the use of the garbage system machine.

SD Rahul Bharadwaj [2] Recommended mechanized rinsing of wastewater to restrain climate changing and dissipate iceberg. The solution underscore the requirement for wastewater remedy plants, where water is purified over being suspended in rivers. First, energy is produced, and that energy is utilized in the process of purifying wastewater.

Balachandra et al [3] Reviewed about sewage cleaning to swap physical work to the mechanized structure because the physically spring-cleaning method it is destructive to man life and rinsing hour, is longer so to overwhelmed this issue, they applied a structure "Mechanical garbage hydraulic ram observing and power unit using PLC and SCADA." PLC and SCADA were constructed. In this system, to utilize ancost effective way to regulate the discarding of wreckage habitually, remedy of confiscation in various method harmful and harmless gases. PLC device from Siemens was utilized in the remedy scheme of garbage water authorized by the compressor, servo motor, pressure valve, gas drainer, and the water line flow, and other equivalent variable quantity to reach mechanical management of wastewater remedy.

Dr.K.Kumaresan [4] described about the manual labor transformed into automated systems. Drainage pipe used for destruction, and may be a dropping of man life during cleaning the garbage pipes. To conquer this issue, use the "Mechanized Drainage Cleaning Unit." They planned their forecast in a distinct way to remove the vapor material healed individually, so the water flows methodically. The forecast could be invented with full use of equipment, and building matters, etc. They utilize mechanization correlated to its supplication of mechanical, electronics, device-based unit to utilize and power fabrication.

R.Sathiyakala [5] described E bucket (electronic bucket) use for the sewage rinsing unit because Ebucket uplifted sewage and utilized vaporization remedy for this drainage, wet drainage was turned among dry matters, with the ARM board (ARDUINO), this procedure is executed. After this procedure, they would join the waste to a government bank in need of being infected.

Nitin Sall [6] described the flow of used water from households, industrial enterprises, and commercial activities as wastewater. 200 to 500 wasted water is produced per person daily. Therefore, using wastewater technology to remove, rather than destroy, impurities in the drainage system.

NDUBUISI C. Daniels [7], et.al. Demonstrated a Sewage structure cleaner that is used to automatically extract waste and garbage, that has aided to defend the surroundings from a variety of natural hazards. The sewage structure cleaner has three key components, namely Propeller, Cleaner, and Pan, all cosmetics to work effectively.

## 3. Problem Identification and Formulation

## 3.1. Problem identification

The complication of water moist anticipated plastic, thermocol and metal conducts to the gain of insects, and it harvests disorders such as malaria, typhoid, etc. This is not secure for human health, which is why the plan for this forecast came up. The aim of this advanced forecast is to draft and develop an automatic drainage cleaner to prevent people from being exposed to various infectious diseases that occur in the feces while cleaning in person. This is a proposed program to reduce or eliminate the problem faced by man-made equipment and to reduce waste disposal.

#### 3.2. Existing Method

The enduring program is a fully automated devise. It is a dry method, which is directly stored in a drainage system to gather waste. The chain and sprocket are utilized for carrier movements, which include fork plates to gather waste from the field. Surrounding the chain, along with the plates, will collect floating debris and remove debris from the bin placed behind the system.

#### 3.3. Problem Formulation

The aim is to design and develop an economical drainage cleaning machine that will assist drainage cleaners to remain healthy instead of manual cleaning. In view of beyond issues, we are proceeded to plan and invent this kind of a unit which will terminate the bulk of the cases from formerly obtainable physically cleaning, so the mortal strain is decreased and obtaining other effective and reduce health issues.

- 3.4. Concepts used
  - Initiating economical mechanization was to engulf troubles with the remaining physical standard technique.
  - The theory of the work is, Follow the manual procedures to recognize the critical task changing.
  - Compute the analytical technique.
  - Prototype development and automation system to control all the processes.
  - Produce a requirement for a low-cost automated system.
  - The machine fabrication and refined design of the device, as a large role in the rural area for its performance.
  - From this, a semi-automated machinery was designed to handle high volume which switches the manual process.

## 3.5. Objective

Design and develop an automated drainage cleaner to prevent people from being exposed to a variety of infectious diseases in the feces while cleaning in person.

To overcome the problem faced by the use of man-made equipment and to reduce the growing rate of waste disposal.

## 4. Working Principle

The sewer cleaner unit assist us to clean tiny or large sewage along its automatic construction and performing. This unit includes of parts equally as motor, handle, chain, sprocket, lifter, collecting bin, etc. While we permit power to this unit, at that time motor starts working, that provides revolving to the handle, and by the help of the handle, the sprockets that are arranged to the handle rotates. Because of the rotation of the sprocket, the chain attached to the sprocket rotates. When the chain rotates, the two lifters, which are attached to the chain at half-length of the chain, start rotating as well. While one lifter finished one round from bottom to top direction, it grabs all the trash stuffs like waste containers, ductile, jars, etc., on the mesh and puts it in the collecting basin connected at the rear side. Until now there are two lifters, the gathering rate of

trash will be increased. This is especially this unit assist us clean drainage or any trash from the water. The tools are placed around drain so that only water runs through lower mesh, waste like a container, Etc. Drifting in the gutter is lifted by the tines of lifters that are attached to the chain. A gear-driven by a motor connects this chain. When the engine runs, the chain starts to circulate, making teeth to lift. The waste materials are raised by teeth and are stored in a waste storage tank.

## 5. Plan Portrait

The design embraces the usage of the analytical principle, distinctive input, and innovative power for the development of advanced integrant to achieve respective magnitude accompanied by all furthest prudence and efficiency. Thus, vigilant contour address should be enfolded. The cluster target dated division among two sections.

- Structure layout
- Automation layout

## 5.1. Structure Layout

Structure layout is, for the major part, covers the various material obstructions and ergonomics, volume necessity, the contest aim of various portion on the shell at support, man-mechanism combination, no. of commands, arrangement of power, organization, of maintenance, the area of exchange, mass if the apparatus through the base level, join up to the force of the device and importantly other.

## 5.2. Automation Layout

In automation layout, the elements are indexed over and hoard based on their procurement. The automation layout stage is authoritative along with the viewpoint of the inventor as the total gaining of the drift depends on the correct idea inspection of the concern. Various fundamental choices are destroyed among this period. Inventor should have adequate instruction about the tangible belongings of the raw material, mass pressure, and distress.

So, the creator also need to confess all internal and external capacity backing up on unit components.



**Fig.1. Front View** 



Fig.2. Back View



Fig.3. Side View

## 6. Scope of the Project

Now the project dated based on the idea of integrating the advantages for human wellness, societal distress, and national disinfection policy. For that reason, it enfolds many segments of consistent gain to all discipline of our current life.

#### 6.1. For Academics

Sewage Cleaning Unit is a bundle of the necessary mechanical ingredient which we have gone across conservatively throughout our ended four years of the schedules. Every single essential element which particularly contains the Chain drives, Bearings, Welding, Turbine, etc. elements are elegantly combined to fabricate a materially easy forecast. Besides, the final adjoin the forecast to permit a border result controlling of the circulate spark of the sewage provides the forecast with the required upcoming span of utilization of the continual assets.

## 6.2. For Industry

Presently as a nation, India purposefully focuses on two critical things. Firstly, as a young and fast-growing nation, we are concentrating on pulling out the maximum from our manufacturing sector with a touch of Start-ups as a thing of sub-topic focus. Our Forecast, as existence advanced in the trade system, do produce the dealers the necessary plans to merge the automation with communicative convenience and rule the merchandise. Secondly, as a kingdom, we are elevating on the public subsidies in policymaking and delivering the environment safety and employment to the young generation. While being a high-market budding project supports the profit for the industry section with the further of supplying the corporate social allowances.

## 6.3. For Society

In the progressive society where amenity has become a requirement in rural and regional areas, there lies a segment of the inhabitants that still lives on skimpy just enough to fulfill their hand to mouth demands. Sanitation is one of the important amenities essential for the primary staying of a human and delivering with such an economical and technological implement that can transform the piteous sewerage state of the cities and town of mediocre India. With such a possible mechanism of employment creation in the society out of industry co-operation, these inventions land you in the welfare of the people.

## 7. Result and Discussion

Garbage Rinsing Unit is a social incentive forecast where we tried to produce a much better process to keep our void clean and thus giving the way to cleaner and safer environment. We executed the following test, and solutions are being considered as follows:

- We tried to present the model where the model is successfully able to lift the 5 Kg
- As the layout which performs magnificently on the restriction surroundings that has been planned because of the original life void condition, we try to give the void with the base rate of 30- 50rpm.
- Time taken by each lifter to uplift all part from inversely is 14sec.
- The weight of void gathering in the collecting bin is nearly 8-9 kilogram.

## 8. Conclusion

In drainage treatment system, engine wastewater control, roller chain and sprocket, elevator, and collection tank to reach automated power of wastewater treatment. Industrial water supply is managed by this forecast to reach domestic criteria, with strong performance, economical, and noise. Drain water management is managed by this technique of irrigating crops, cleaned lavatory, etc. The cleaner operated successfully in the time of heavy rain, that had a large capacity of storm water runoff and top speed. Automation is a machine that deals with the use of machinery, electronics, and device-based structure to work and power presentation. This program is used to use the Electronic Sanitation Program. This gadget can be created with the complete installation of equipment, building materials, and funds. Also, we have closely accompanied the movement of time movements and construct our forecast more reasonable and logical with obtainable assets. The unit was planned, built, and analysed to show satisfactory results. We expect this to be a very flexible situation, in the future. Therefore, we can implement Automatic Sewage Cleaning system.

## REFERENCES

[1] Ganesh U L, et.al. "Semi-Automatic Drain for Sewage Water Treatment of Floating Materials," International Journal of Research in Engineering and Technology, Vol No- 05, Jul-2016.

[2] S D Rahul Bharadwaj, Shraddha R Jogdhankar, "Automatic Wastewater treatment process to reduce global warming" International Journal of Environmental Science: Development and Monitoring, Vol No- 2 (2013).

[3] Dr. K. Kumaresan et al., "Automatic Sewage Cleaning Equipment," International Conference on Explorations and Innovations in Engineering and Technology, 2016.

[4] R.Sathiyakala et al., "Smart Sewage Cleaning System" International Journal of Innovative Research in Computer and Communication Engineering, Vol No- 4, February 2016.

[5] Nitin Sall, et al., "Drain Waste Water Cleaner," Global Journal of Researches in Engineering: J General Engineering Vol No- 16, 2016.

[6] Gregor Burger, et al., "Designing and Implementing a Multi-Core Capable Integrated Urban Drainage Modelling Toolkit: Lessons from CityDrain3", Advances in Engineering Software 100, 2016.

[7] Design of machine elements (DME-II) by K Raghavendra. first edition 2015.

[8] NDUBUISI C. Daniels, "Drainage System Cleaner A Solution to Environmental Hazards," International Refereed Journal of Engineering and Science (IRJES)ISSN (Online) 2319-183X, (Print) 2319-1821Volume 3, Issue 3 (March 2014), PP.54-60.

[9] Mohamed Idhris, M. Elamparthi, C. Manoj Kumar, N. Nithyavathi, S. Arunkumar, and K. Suganeshwaran, "Design and Fabrication of Remote Controlled Sewage Machine," IJETT,vol.45,no.2,mar.2017.

[10] Vieno, N., Tuhkanen, T. and Kronberg, L. "Elimination of pharmaceuticals in sewage treatment plants in Finland." Water Res. 2007, 41: 1001–1012.

[11] Design and Data handbook for Mechanical Engineers by K Mahadevan and K Balaveerareddy. Fourth edition 2013.