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RESEARCH ARTICLE

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## SEWAGE CLEANING MACHINE SYSTEM

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### ABSTRACT

The earliest method of sewage cleaning is manual scavenging. Manual scavenging is the hand excavation done by laborers which were moved down the manholes (a small covered opening in a paved area allowing access beneath, especially one leading to a sewer) for the clogged sewage lines. Sewage system is used for the disposal of wastes but due to manual scavenging there may be loss of human life while cleaning the blockages manually. Now a day's automation is necessary to reduce the human efforts and to provide the solution to all the problems by which chances of getting better accuracy will increase. But in the sewage cleaning system it is a challenging task to design the safe sewage cleaning system with optimum design and make it possible to get the better result. So this semi-automated sewage cleaning machine is used to reduce the manual scavenging or work. This is going to help the poor labourers to work safely and their health problems also be reduced to greater extent. They do have not go down the manholes for the cleaning and just control the machine from outside. Also by this machine we can do more work in less time.

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## INTRODUCTION

Manual scavenging is the most nauseating things to do; for others, it's the only way to make a living. From drains and sewers to tank and railway tracks, quite half a million manual scavengers across the country are cleaning, carrying and disposing human excreta. They go down into the blocked sewers and septic tanks; hang on for hours, scooping out filth with bare hands and bearing the stench of sewage.

Every year, hundreds of manual scavengers die by poisonous gases. Manual scavenging was banned 25 years ago with the passing of the utilization of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993, but it continues to seek out practitioners. There are structural problems as well, where machines can't reach, which force people to enter septic tanks. Septic tanks are designed badly. They have engineering defects which suggests that after some extent, a machine cannot clean it.

### TRADITIONAL METHOD OF SEWAGE CLEANING:

The Manual Scavenging is a traditional method of sewage cleaning which is define as manually cleaning, carrying, removing, or otherwise handling human excreta in an open drain or sewer or in a tank or a pit. Manual scavengers generally use hand tools such as buckets, brooms and shovels. The labors need to extract the excreta, using brooms and tin plates, into baskets, which they carry to disposal locations sometimes several kilometers away. These sanitation workers hardly have any personal protective equipment. The work is regarded as a dehumanizing practice. At times, sewage lines are connected to storm water drains which get clogged and demand human intervention. Open drains, are also badly designed, allowing people to dump solid-wastes into them, which accentuates the problem. The impurities present in water can cause hazardous and disease to the workers. As the draining system is taken into account the function of the most system is to gather, transport and eliminate the water through an outfall or outlet. Impurities in drainage water are often only like empty bottles, polythene bags, papers, etc. Sewer systems can be located above or underground, running parallel to streets, housing, commercial and residential structures. This

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series of pipes and culverts are engineered as gravity flow systems, built on a small grade to help material to flow. Sewerage is the infrastructure that passes sewage waste or surface runoff (storm water, melt water, rain water) using sewers. It includes components like receiving drains, manholes, pumping stations, storm overflows or sanitary sewers. Sewerage ends at the entry to a sewage treatment plants or at the purpose of discharge into the environment. It is the system of pipes, chambers, holes etc. that conveys the sewage or storm water. Due to the improper disposal of wastes like plastic bags and bottles, napkins and other materials clog the drains. Few people take up this lowly job, not knowing that human faces and urine harbor a variety of diseases. They may carry Hepatitis A, E. coli, Rota-virus, Nor virus, and pin-worms. It causes community risks infection by coming in contact with these wastes. In fact, repeated handling or extraction of human excreta without protection leads to respiratory and skin infection and diseases, anemia, jaundice, trachoma and carbon monoxide poisoning. The problem like Environmental pollution and spreading of viral diseases are dangerous. Automation of Sewage Cleaning System would scale back the danger of various diseases spread due to accumulation of waste. This Sewage Cleaning system will breakdown the waste and remove the waste which were clogging the sewerage which might allow the flow. A wastewater collection system is generally a network of pipelines, manholes, clean-outs, traps, siphons, lift stations and other required structures to gather all the wastewater from different areas and carry it to a treatment plant or disposal system. Some systems are "combined systems" that are designed to gather both sanitary wastewater and storm or surface water runoff. Sewage cleaning machine system proposed to overcome the real time problem. Due to the further expansion of industries, the problem of sewage water must be urgently resolved because of increasing sewage problems from industries of the encompassing environment. Our proposed system is to cleaning and controls the sewage problems using sewage cleaning system. It is necessary to maintain a clean and sanitary environment suitable for humans to live and work is common to municipalities around the world. This includes providing a system which is efficient moving both sewage and storm water along with solid materials through a collection system from the source to an environmentally safe place for treatment and disposal.

A proper sewage system should be initiated everywhere, but the fact is that many cities do not have sewerage that covers the whole city. As already discussed, sewage lines are connected to storm water drains due to which sewerage get clogged and demand human intervention. Open drains, are also badly designed, allowing people to dump solid-wastes into them, which accentuates the problem. Improper disposal of plastic bags and bottles, napkins and other materials leads to the clogging of drains. Few people take up this lowly job, not knowing that human faces and urine harbor a variety of diseases. They may carry Hepatitis A, E.coli, Rota-virus, Nor virus, and pinworms. The manual scavenging leads to the high risk to life of workers, while coming in contact with the toxic wastes. And this is the reason why sewer workers die as young as 40, falling prey to multiple health issues: cholera, hepatitis, meningitis, typhoid and cardiovascular problems. In fact, repeated handling of human waste without protection results in respiratory and skin diseases, anemia, jaundice, trachoma and carbon monoxide poisoning. It is not possible to totally eliminate manual scavenging unless we create the right



**Figure 1. Manual Scavenging**

technologies. With proper use of technology, sewage cleaning machines can be built to save the lives of many workers who are doing their work without any fear. Using the right technologies might reduce the risk of our unsung hero's life. Currently vacuum tanker, sewage sucker, suction excavator or sucker truck is used for sewage cleaning.

**EXISTING METHOD OF SEWAGE CLEANING:** A vacuum truck or vacuum tanker is a truck that features a pump and a tank. The pump is designed to pneumatically suck liquids, sledges, slurry's, or the like from a location (often underground) into the tank of the truck. Vacuum Truck usually uses a low-volume sliding vane pump to create a negative atmospheric pressure. It throws high pressure of water to break up the blockage, scour the pipe walls and flush the debris down the sewage system to the vacuum hose. This safely and efficiently removes the solid wastes or blockage material from the sewer line. The vacuum system lifts the waste material into a debris body. There are several types of non-centralized sanitation systems which are served by vacuum trucks. They are mainly used to empty septage from cesspits, septic tanks, pit latrines, and communal latrines, for street cleanup, for sewer clean out, and for individual septic systems. The trucks are utilized in the cleaning of sanitary sewer pumping stations. Vacuum trucks can also be used to empty portable toilets and in commercial aviation, vacuum trucks are used to dispose waste from airplane toilets. Vacuum trucks discharge these wastes to the environmentally safe place or at the sewer stations, and further to a wastewater treatment plant.

## LITERATURE REVIEW

In this project the concept is to replace the manual work in sewage cleaning by semi automated mechanical system. These days even though automation plays a vital role in all industrial application in the proper disposal of sewages from industries and commercials are still a challenging task. To overcome this problem and to save human life we implement our design that is "Sewage cleaning Machine system". The process starts collecting the sewage wastes by using the arm to make slurry of waste to get easily sucked and which is collected by a suction pipe. Ganesh U L, et.al. He designed semi automatic drainage water cleaner to control the disposal of wastages and with regular filtration of wastages. Drainage from industries is treated through his project. The motive behind this project was to reduce manual work. Elangovan K., et.al. He reviewed about drainage cleaning to replace manual work to automated

system because manually cleaning system is harmful for human life and cleaning time is more also. So to conquer this problem they designed "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 and for the treatment of wastage, toxic regularly and non-toxic gases. Prof S.D.Anap, et.al. They showed blockage is the major cause of the pollution and flooding in the metro cities. They designed the drainage blockage detection system to clear off such problems. The system monitors the drainage condition and to inform authorities about it. To detect blockage and monitoring water level condition level sensor was used. They described the design of the cost effective, easy method to control the water level of the tank wirelessly and automatically. Ms T.Deepiga, defined the water monitoring systems such as Tank water pollution monitoring and water pipeline leakage sensing monitoring. They keep away the amount of water wasted by uncontrolled use of large apartments. They used the PID based water level monitoring to indicate the level of water in the tank and avoid the water wastage, power consumption and easily prevent the water for our generation. They used sensor based water pollution detector to check water quality by using the parameters such as PH level, turbidity and temperature. They also detect the leak by an increase in the LED meter and rushing sound will be heard in the headset. S D Rahul Bharadwaj, described 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, by which the water is treated before suspending in rivers. Firstly power is generated and then that power is used for waste water cleaning process. Nitin Sall, described the flow of used water from homes, business industries, and commercial activities is called waste water. 200 and 500 litres waste water is generated each person every day. So using waste water technology that removes pollutants in a drainage system. N.Prabhushankar, et.al. Stated dewatering of drainage is generally done using centrifugal pump, but using centrifugal pump is not much effective in complete removal of the suspended and heavy solids and also it absorbs a lot of electric power for its operation. The main focus of the proposed work was to remove drainage water by the pneumatic operated spring return reciprocating pump. It reduced the labour work required for the drainage cleaning activity. Rather than slider crank mechanism, the pneumatic and spring system with reciprocating cylinder was used which discharged the large sized drainage particles easily and there was no need of external power supply. Today automation plays a key role in all industrial application in the proper disposal of sewages from industries and commercials are still a challenging task. We designed our project to use this inefficient way to control the disposal of wastages and with regular filtration of wastage. The system has an anchor attached to a motor that starts running as soon as the set-up is switched on. The process starts collecting the sewage wastes by using the slurry pump and it throws back the waste into the sludge tank. There sludge and water is separated out by using 3 filtration net. There sizes are in decreasing format.

### OBJECTIVE OF SEWAGE CLEANING MACHINE SYSTEM

The objective of the proposed project is to design and fabricate a semi-automated machine for sewage cleaning in order to prevent humans from getting affected by various diseases from the infectious microbes present in the sewage while cleaning manually.

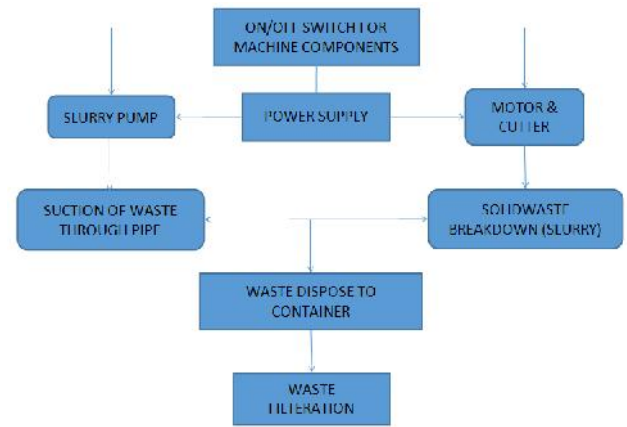


Figure 2. Methodology of Sewage Cleaning Machine System

Based on the survey, the product objectives are to construct a machine which is easy to use and movements of parts occur smoothly. Building a device which is durable as it should be free from rust, light weight and a compact machine. To build a machine which is safe in all aspects as it does not harm the interior of sewage. Machine should be economically design. Handling of machine must be easy so that no special skills required. Design should be like this that meets future challenges also to a greater extent.

### MAJOR COMPONENTS OF SEWAGE CLEANING MACHINE SYSTEM

- J **SLURRY PUMP:** This pump works on the tornado principle. Since there's no need for the rotor to pass close to the internal walls to generate pressure, very large solids can flow through without getting caught and causing a clog. The SLURRY pump's ability to handle slurry with up to 70% solids and a high viscosity makes it ideal for handling sewage. Even with low levels of water, the pump manages to maneuver an equivalent amount of solids of distances up to at least one mile.

Table 1. Slurry Pump Specification

Parameters	Specifications
Min Flow	250 GPM
Max Flow	2100 GPM
Head Range	Up to 160 ft
Discharge Size	4 inch
Suction Size	6 inch
Solid Handling	Solid up to 4 inches
Motor Speed	1800 RPM
Horsepower	50 HP

- J **MOTOR AND CUTTER HOUSING:** DC current motors are used in all industrial and any current application because it gives better result to ac current. DC motor produce continuous movement and whose speed of revolution can easily be control it makes them ideal. The system is run by a DC motor. This motor rotates the chain drive which is used for the breakdown of sewage waste materials in the sewage water. The specifications of the DC motor used are power 60 rpm. DC motor consists of two parts. Cutter is mounted on adjustable hose pipe which uses DC motor to work continuously. In this project cutter is used to breakdown the solid composite waste which cannot be sucked using suction pump, that's why it is necessary to break solid composite waste, which is done by using cutter.

**Table 2. Motor Specification**

Parameters	Specifications
Nominal Voltage	12 V
Nominal Power	50 W
Nominal Current	1.0-1.5 A
High Speed	75-76 RPM
Low Speed	50 RPM
Rotational Output	CW/CCW

) **BATTERY:** A battery is a power source consisting of one or more electrochemical cells with external connections for powering electrical devices. In this project battery used is alkaline, Nizn, NiMH, NiCd and lithium battery. It is a rechargeable battery. It is commonly available in market.

**Table 3. Battery Specification**

Parameters	Specification
Voltage	12V
Current	7.2A
Works	2 hours

## WORKING OF SEWAGE CLEANING MACHINE

We used SOLIDWORKS modeling to develop 3D CAD model of the project. At the initial stage, the software is used for planning, visual ideation, modeling, feasibility assessment, prototyping, and project management. The software is then used for design and building of mechanical, electrical, and software element. In this project the proposed concept is to replace the manual work in sewage cleaning by semi automated system. The system has a slurry pump and a dc motor that is connected to a battery. This battery gets recharged by a separate motor that is connected by gear mechanism to the shaft which is powering slurry pump also. This slurry pump works on the tornado principle. The process starts collecting the sewage wastes by using the slurry pump and it throws back the waste into the sludge tank. Inside the sludge tank, due to its declined arrangement, water is separated out from the sludge slurry with the help of filtration net. There are 3 filtration net situated inside the tank. All 3 are of different sizes. First one is having large pores, ext one is having smaller the previous, and the last one is having smaller pores so that only water gets separated out. There is partition in the sludge tank where this water gets stored (70% sludge, 30% water storage). This water is used for the proper breakdown or formation of sludge slurry from composite waste and in this way the whole process continues.

**ADVANTAGES:** The Sewage cleaning machine is more efficient in the technical field, Quick response is achieved. It is simple in construction and easy to maintain and repair. The Cost of the unit is less when compared to the other equipments also the operational cost is less. Continuous operation is possible without stopping

**Table 4. Comparison between sewage cleaning machine system and existing method**

Sewage cleaning machine system	Existing method/system
Semi automatic machine.	Manual scavenging method is used.
Life risk reduced to greater extent.	Labour deal with number of health diseases.
Working time reduced.	Consumes more time.
Easy to operate as no special skill is required.	

## APPLICATION

It can be use for removing the waste from the sewage automatically to prevent blockage of sewage.

- ) It can be use for the breakdown of solid composite waste.
- ) It is used almost in all types of drainage (Large, Small, and Medium).

## CONCLUSION

In the sewage cleaning system, waste water control by the machine. Sewage contaminants and sludge from domestic and industries is extracted through this project to, with stable operation, low cost and good effect. The cleaner functions more effectively during the heavier rains which have 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. This project is 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.

## FUTURE SCOPE

We have done has a good future scope. The main constraint of this device is the high initial cost but has low operating cost and can be adopted any where across the country at any time, any conditions for cleaning the sewers. Our project is simply a sewage cleaning machine system. Following different modification can be done to improve the output and efficiency. The device affords plenty of scope for modifications, further improvements & operational efficiency, which should make it commercially available & attractive. If taken up for commercial production and marketed properly, we are sure it will be accepted in the industry. It has plenty of scope if the device is made larger in size. These cleaners are easy ad cheapest way to fix sewage problems, easy to operate as no special skill is required. Reduction of labor oriented method of cleaning, thus upgrading dignity of labor. Light weight and easily portable. Reduces health issues faced by labors and also time consumption reduces.

## REFERENCES

- Prof. Fanindra Katre, Mahendra Thakre, Shubham Warkade, Gunjan Khursange, Aniket pragat, Swapnil Katkar, A Review Paper on "Fabrication of Automatic Sewage Monitoring System", International Research Journal of Engineering and Technology , Vol.- 07, Issue: 02, Feb 2020.
- Prof.S. Ramanathan, R.Sudharshan, Karthik B, A.Mohammed Suhail, S.Chiranjeev, "Sewage Cleaning Machine", International Journal of Research and Analytical Reviews, Vol.- 06, Issue: 03, July 2019.
- Jayasree, Dr. Smt. G. Prasanthi, "Fabrication of Automatic Sewage Cleaning System", International Journal for Research in Engineering Application & Management, Vol.-04, Issue: 06, Sep 2018.
- Harshvardhan Baria, Mackwan Akash, Nirav Makwana, Raj Parmar, Mr. Sharad Chhantbar, A Review Paper On "Automated Drainage Cleaning System", International



- Conference on Current Research Trends in Engineering and Technology, Vol.- 04, Issue: 05, 2018.
- A.Nagadeepan, J.Hersha himlan, J.Guruyogeshwaran, S.Balaji, "Automatic Drainage Cleaning System", International Journal of Engineering, Science and Mathematics, Vol.- 07, Issue: 04, April 2018.
- Ahmed W, Hamilton KA, Lobos A, Hughes B, Staley C, Sadowsky MJ, *et al.* Quantitative microbial risk assessment of microbial source tracking markers in recreational water contaminated with fresh untreated and secondary treated sewage. *Environ Int.* 2018.
- Ahmed, M. B., Zhou, J. L., Ngo, H. H., Guo, W., Thomaidis, N. S., & Xu, J, Progress in the biological and chemical treatment technologies for emerging contaminant removal from wastewater: A critical review. *Journal of Hazardous Materials*, 2017.
- Eswaramoorthy.C, Anguraj.T, Jagathish.S, Karthikkraja.J.K, Balamurugan.S, "Automatic Sewage Cleaner", *Advances in Natural and Applied Sciences*, May 2017.
- Ankita B Padwal, Monica S Tambe, Review paper on "Fabrication of manually controlled drainage cleaning system", *International Journal of Scientific and Engineering Research*, Vol. No- 08, Issue:03, March 2017.
- 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, Issue:07, Jul-2016
- Dr. Rajesh Kanna S.K., Ilayaperumal K. and Jaisree A.D, "Intelligent Vision Based Mobile Robot for Pipe Line Inspection and Cleaning", *International Journal of Information Research and Review* Vol. -03, Issue: 02, February, 2016.
- Dr. K. Kumaresan *et al.*, "Automatic Sewage Cleaning Equipment", *International Conference on Explorations and Innovations in Engineering and Technology*, 2016.
- Sathiyakala R. *et al.*, "Smart Sewage Cleaning System" *International Journal of Innovative Research in Computer and Communication Engineering*, Vol.- 04, February 2016.
- Nitin Sall *et al.*, "Drain Waste Water Cleaner" ,*Global Journal of Researches in Engineering: J General Engineering* Vol.- 16, 2016.
- Prof.NitinSall, Chougale Mohammed Zaid Sadique, Prathmesh Gawde, Shiraz Qureshi and Sunil Singh Bhadauriya, Vol.- 04 Issue: 02, February 2016.
- Dr .K.Kumaresan., ph.d.Prakash S, Rajkumar. P, Sakthivel.C, Sugumar.G, Conference on Explorations and Innovations in Engineering and Technology, 2016.
- Pooja Shrivastava, M.K.Verma and Meena Murmu, "Modelling of Sustainable Urban Drainage System by using SWMM software," *International Journal of Control Theory and Applications*, Vol.9, number 40, 2016.
- Baah K, Dubey B, Harvey R, Mcbean E. A risk-based approach to sanitary sewer pipe asset management, *Science of the Total Environment*, 2015.
- Muhammed Jabir.N. K, Neetha John, Muhammed Fayas, Midhun Mohan, Mithun Sajeew, Safwan.C. N, "Wireless control of pick and place robotic arm using an android application", *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization)* Vol.- 04, Issue: 04, April 2015.
- Design of machine elements (DME-II) by K Raghavendra .first edition, 2015.
- Balachandra, *et.al.* "Automatic Drainage Water Pump Monitoring and Control System Using PLC and SCADA" *International Journal of Innovative Research in Technology*, Vol.- 01, 2014.
- NDUBUISI C. Daniels, "Drainage System Cleaner A Solution to Environmental Hazards", *International Referred Journal of Engineering, IJRAR1AVP026 International Journal of Research and Analytical R*, March 2014.
- N. Yashaswini, *et.al.* , "Design And Optimization of Bucket Elevator Through Finite Element Analysis", *International Journal of Mechanical Engineering*, Vol.- 02, September 2014.
- International journal of innovative research in technology, IJIRT Volume 1 Balachandra.G1, Karthikeyan.S2, Elangovan.K3, and Divya.N4. 1,2,3B.E/EEE Final year, Knowledge Institute of Technology, Salem, India4Assistant professor, Department of EEE, Knowledge Institute of Technology, Salem, India, 2014.
- Flood Mitigation of Yangon City Downtown Areas, "Design Report on Storm Water Drainage," *National Engineering & Planning Service*, 2014.

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