

Fabrication of Manhole Cleaning Machine

Kunal Nimkar¹, Sudip Pidkalwar², Krunal Zade³, Abhish Giradkar⁴, Sarvesh Neware⁵, Prof. Mr. .Vaibhav Titarmare⁶, Nilesh Sonare⁷

^{1,2,3,4,5} Student Department of Mechanical Engineering, NIT Polytechnic, Nagpur

⁶ Faculty, Department of Mechanical Engineering, NIT Polytechnic, Nagpur

⁷ Head of Department of Mechanical Engineering, NIT Polytechnic, Nagpur

Abstract- Manhole cleaning machine is the machine which cleans the manhole without entering man into it. Manual scavenging is a problem in whole world, due to which thousands of sewer workers dies each year. The 2011 Census of India found 794,000 cases of manual scavenging across India. The state of Maharashtra, with 63,713, tops the list with the largest number of households working as manual scavengers, followed by the states of Madhya Pradesh, Uttar Pradesh, Tripura and Karnataka. According to the survey it is found that 50% of sewer workers die before age of 50.[1] The manhole cleaning machine is efficient in cleaning the manhole as it requires less time for cleaning manhole. The working principle of manhole cleaning machine is Archimedes screw under the cylinder the screw rotate along its axis in the cylinder as the solid particles present in the manhole goes upward and then collected into chamber .By fabricating this machine we are going to solve the major Problem of manual scavenging faced by sewer worker.

Index terms- Manhole scavenging, Sewer workers.

INTRODUCTION

Manhole scavenging is practice in various regions in India as well as in other country there is no proper and appropriate way to clean the man hole, without entering of man into it. The earliest form of sewer cleaning was hand excavation whereby laborers loaded sediment into barrows which were moved down the sewer and then lifted out at manholes by bucket. The work is not only dirty, unpleasant and dangerous. For these reasons it is now only considered when all other methods are not possible for one reason or another. In extreme situations, silt and debris may have to be removed by open excavation to the sewer and removal of a section of the pipe or brick to gain access to the interior of the sewer.

LITERATURE SURVEY

For fabrication of manhole cleaning machine the existing technologies for sewer cleaning and manhole cleaning should be studied.

“SEWER AND CATCH BASIN CLEANER” This machine works by creating vacuum in the chamber then this chamber sucks all the waste and water from the manhole we can call it as a huge vacuum cleaner mounted on the truck [6]. It has some major problems such as larger in size, sucks more water than solid waste, it emits toxic gasses of manhole to the atmosphere and it is so expensive about 27-35 lakhs.

“DEVICE FOR AUTOMATICALLY CLEANING MANHOLE RIMS” This device is used for cleaning only manhole rims [3].It has saver problems such as it can only clean the rims of the manhole, not so efficient in cleaning and time consuming.

“BANDICOOT” MANHOLE SCAVENGING ROBOT BY A STARTUP GENROBOTICS It combines electric and pneumatic actuators, it is so designed that to make possible the safe and good way for cleaning manholes in a short time. Infrared cameras helping in live internal inspection. It is so expensive about 17 lakh also it usage complicated mechanism [].

“AUTOMATIC FLUSHER FOR SEWERS OR DRAINS MANHOLE CLEANER” This project automatically cleans the water in The drainage system is any wastage appears and this form and efficient & easy way of cleaning the drainage system and preventing the blockage. This device only remove blockage not removes the solid particles from manhole so it is not so efficient method or machine more over it requires a man to position the flusher inside the sewer [5].

“SEWER CLEANING APPARATUS WITH ROTARY HYDRAULIC CLEANING TOOL

This cleaning apparatus uses a pressurize water i.e. hydraulic jets delivered from the front part that simultaneously projects into a sewer and rotated by a reeling-feeding machine positioned externally of a manhole. It only opens the blockages Present in the sewer lines .The solid waste remains present in the manhole which can further create blockages .It means it is the temporary solution for opening blockages in sewer lines [4].

Manhole cleaning machine:- The manhole cleaning machine is a machine, which will goes in deep hole and remove the garbage and hazardous solid particles which blocks the sewer lines, at the bottom of the manhole there are solid particles and garbage this machine will not only clean, the manhole but drain out all the liquid and separate a solids and liquid .Liquid then drawn to the sewer and only solid remains collected .This machine will clean manhole efficiently and without entering of man into it. It is easy to handle and easy to operate more over its cost is very less as compare to the other machines. The working principle of machine is, an Archimedes screw rotates in a closed pipe and the solid and garbage trapped in the blades of screw goes upward.



Fig.1.1 Manhole cleaning machine

Principle Parts

The Manhole cleaning machine consist of following principle parts

1. Driving mechanism
2. Archimedes Screw
3. A hollow Cylinder Frame

1. Driving mechanism

A driving mechanism transmits the required force from hands of the sewer worker to the Archimedes screw. The driving mechanism consists of following parts.

Steering: It is a member which is used to provide rotation motion to the shaft.

The steering is a comfortable way to provide rotation motion to any shaft with the help of hand and more over it is not so much expensive in terms of money as well as time.

Universal coupling:-universal coupling is used to transmit torque between two inclined shafts and if the pair of two universal shafts is used then the power transmitted does not reduced. The manhole cleaning machine requires a power transmission from any angle as suitable to sewer worker hence, a pair of universal joint is used as used in the conventional vehicle to transmit rotation motion from steering to the bevel gear.



Fig.1.2 Universal Coupling

Shaft:-Shaft is defined as the rotating member which is used to transmit rotation motion from one place to another.

Extension shaft or variable shaft:-The extension shaft is used to transmit power from one member to another .The extension shaft can be extending as per requirement when the machine has to go deep in the manhole. It is the combination of hollow shaft and the solid shaft. The solid shaft can travel under the hollow shaft and can be reduce length and can be extend according to requirement.

Bearing:-The ball bearing is used to provide support to the rotating member i.e. shaft.

Screw shaft:-It is basically a hollow shaft on which the groove like structure is welded for fabrication of Archimedes screw.

Bush type support:-The weight of the screw is heavy so to balance the weight the support at the bottom is needed hence, bush type support is provided.

2. Archimedes Screw:-The Archimedes screw is the heart of manhole cleaning machine. The rotating screw under a hollow pipe gives the upward motion to the particles present in the manhole. The Archimedes screw is made up of mild steel plate welded on the hollow shaft such as grooves formed on the screw.



3. Hollow cylinder frame:-

The frame is made from the hollow cylindrical pipe cut out having the thickness of 5mm. The cut section of a small arc of a cylinder is used to make a collecting chamber. The collecting chamber is fixed such that it can be removed easily by sliding it on its supporting angles.



Figure 2. Hollow cylinder body

Problem:-Manual scavenging is the problem which affects many human lives around the world this is a major issue and it is a question for question of death or life for those person for those authority force the swear workers to perform such a dangerous operations.{1}

- The major problem in manual scavenging is the health issues faced by the workers and more over the cleaning is done by human beings because of earning.
- Asphyxia occurs when the sewer worker does not get enough oxygen to sustain his life. It may be due to low oxygen level in the atmosphere or high concentration of hazardous gas.
- Difficult to work in any climate such as rainy season.
- More than 3 workers are required for one manhole cleaning.

METHODOLOGY

The method we followed to Complete the project is as follows

Collecting research paper:-Collecting research paper from the internet on the prefabricated machines or system for carry manhole cleaning operation. Collecting research paper on fabrication of Archimedes screw collecting research paper on design and parameters of Archimedes screw.

Project proposal:-Making a project proposal for the selection of project and experiencing our ideas with project incharge and getting suggestions and implementing that suggestion and submitting the project proposal to the project incharge.

Selecting area of work:-After project finalization we have to decide and area of work for fabrication of manhole cleaning machine.

Making CAD model and animation of machine:- Making and CAD model of machine for explaining all the concepts related to the machine. Making the animation of machine for explaining the working of machine.

Finding resources:-Resources should be fined for fabrication of machine it requires some pre-fabricated parts which are readily available in market also the complex parts such as telescopic rod and Archimedes screw should be fabricated from various workshops

finding the materials and work piece for fabricating those parts.

Collecting different components:-After fabrication and purchase of all the components all the components should be collected from various locations at the workplace.

Assembly:-Assemble all the components of machine as according to CAD model and animation and make sure that is relative motion between parts is efficient and the mechanism used in machine is properly working.

WORKING

Telescopic rod is adjusted according to the deepness of the manhole (maximum thickness can be achieved by the telescopic rod is 9 feet from ground level) the solid waste removing system (storage tank, cylinder and Archimedes screw) enters into the manhole. As it reaches the bottom of manhole the steering is rotated with the help of man. This is connected to the connecting rod, which transfers rotational motion of steering universal coupling. Universal coupling is connected to the telescopic rod which is the Archimedes screw of waste removing system, as screw rotates at the bottom of the manhole, hazardous solid waste particles present in the manhole get trapped into the screw cylinder arrangement and moves upward to the solid waste storage tank. The length of telescopic rod reduces and hence, the waste removing system comes at its initial position in this way, the solid waste from the manhole is removed by manhole cleaning machine.

CONCLUSION

The manhole cleaning machine is the best solution for removing the solid waste such as plastic, papers, bottles which creates the blockage in manhole. It can be attached to any vehicle for transportation and operation purpose with the help of some fittings. The cleaning rate of manhole cleaning machine is quite impressive as there is no delay after entering of solid waste in cylinder. The cost of man hole cleaning machine is very low as compare to other technologies which are in practice. The operating linkages can be adjusted as per the depth required.

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