

# CDMWCD -Closed Drainage Mud Waste Collecting Device

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**Abstract:** *In our present condition the closed drainage is not at all well maintained because of difficulty in removing the over slab . In present condition the way of cleaning the drainage is by manual or by the help of excavators. This causes traffic block and other problems to the public due to improper drainage cleaning .In order to reduce this type of problem we implement this device. CDMWCD (Closed Drainage Mud Waste Collecting Device) is proposed to be used in partially closed drainage system to collect mud and other waste materials. All the mechanical motions for collecting the waste and to scatter the bleaching powder on the floor base of the drainage can be done using this device. This is possible by the movement of forward and backward and it can be controlled by a remote. With the help of Arduino board and wireless camera the system can be monitored by giving a clear picture of the closed drainage so that system can check the cracks and can be used in NDT process*

**Keywords:** CDMWCD, NDT, Waste Management, High Torque Motor, Incline Conveyor

## I. INTRODUCTION

In the present conditions of the drainage systems in India, the closed drainage is not well maintained because of the difficulty in removing the over slab and the cleaning difficulties and maintenance. In the present scenario, the way of cleaning the drainage is by manual labor or by the help of medium scale excavators. This causes traffic Block and other problems to the society .In order to reduce these types of problems; we are proposing to implement the device “Closed Drainage Mud Waste Collecting Device”(CDMWCD) .CDMWCD mainly aims cleaning and bleaching a place which is more or less impossible for people to reach directly and remove waste materials that reaches corners through visual inspection. The CDMWCD is to be designed in such a way that it can move through the closed drainage even without removing all slabs over it. These devices have the capability to collect the mud and other waste inside open and closed drainage system, so that drainage can be kept clean. CDMWCD is also equipped with IR camera such that it can visualize the cracks and other defects within the drainage in that period of time. Thus it can be used also as a Non Destructive Testing (NDT) machine. The bleaching powder is scattered at the end of the process by the CDMWCD, which will aid in destroying bacteria that causes foul smell and diseases over that locality. This is done by the vibrating part of the device.

## II. SCOPE

This device can be used to collect mud and other waste materials from the closed drainage without removing the major slabs from there. The current drainage systems are closed model so the scope is more. It can be used as a NDT device and used to put bleaching powder. It can use all over the world and it is capable to adjust in customized level.

## III. COMPONENTS OF CDMWCD

CDMWCD works with the following major components- Inclined conveyor, vibrator, car jackie, remote and video transceiver, wheels, battery, collecting tank.

### 3.1 INCLINED CONVEYOR

During Conveyor design, there are key design parameters such as -Load, Pressure, and Torque. Some of these parameters have a great influence on the energy consumption of the conveyor. In the first place, a conveyor is designed to move towards a certain amount of material at a certain specific rate and time over a specific distance that can be sent remotely. This can be horizontal or vertical displacement of the material by the conveyor. Thus by using this mechanism we can collect waste material from one point to another. This conveyor is at a length of 30mm width and inclined at an angle of 60° horizontal this specification is given because this can contain the required load and have a stable movement with load to the collecting duct.

### 3.2 VIBRATOR

A vibrator is a mechanical device to generate vibrations. The vibration is often generated by an electric motor with an unbalanced mass on its drive shaft. There are many different types of vibrator. Some are the components of larger products such as cell phones. We are using shutter form vibrator kept below the storage tank of bleaching powder

### 3.3 CAR JACKIE

Scissor car jacks are usually used for attaining mechanical advantage thus enabling humans to lift a vehicle by manual force alone. The jack is made for a modern vehicle and the notch fits into a hard point of a unibody. The use of Jackie is to adjust the width of the wheels so that it stretches them to feel the side walls. The wheels are fixed over this Jackie and its adjusted a required.

### 3.4 REMOTE AND VIDEO TRANSCEIVER

In electronics, a remote control is a component of an electronic device used to operate the device wireless from a distance. For example, in consumer electronics, a remote control can be used to operate devices such as a television set, DVD player, or other home appliance, from a short distance. This remote control is primarily a convenience feature for the user, and can allow operation of the devices that are out of convenient reach, for direct operation of controls.

### 3.5 WHEELS

In our device we are using wheels for the motion. 80mm diameter wheels provide perfect motion and placement. The wheels are powered by electric DC motor. Here we are using high torque low rpm motor separately. Each motor have an specification of 15.6Nm torque and 1.2Amp capacity with an RPM of 42.

### 3.6 BATTERY

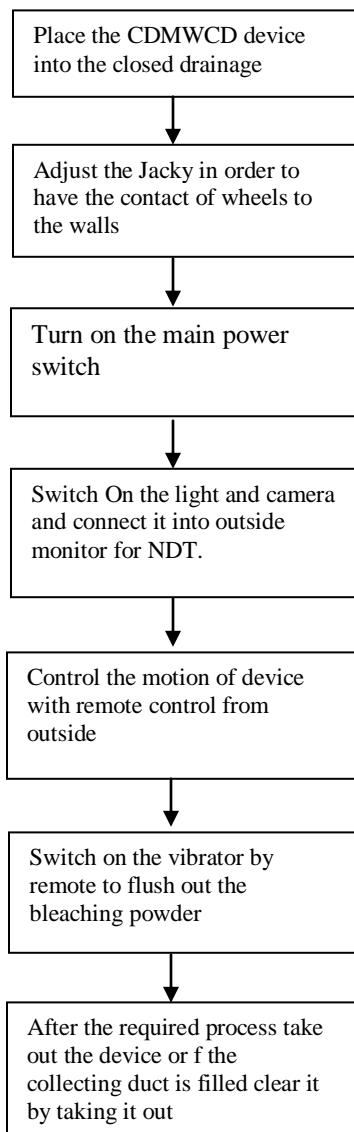
They are main source of power. All the electric components are operated by this input source. The battery has a rating of 35Ah. The battery is placed below the conveyor belt. It's to balance the weight of CDMWCD.

### 3.7 COLLECTING TANK

The collecting tank has a side specification of 60 cm depth and 40cm width with 80cm length.

#### IV. WORKING

The CDMWCD works as semi automatic. The device is installed or kept in to the closed drainage by removing the two removable slabs. The device is full operated by a remote with a visual device on it. The CDMWCD is installed with a IR camera so that it can sense at dark condition .This camera help us to find the cracks and deformities formed in the drainage after a period of time. The inclined conveyor belt with cups help to collect the mud and other waste in the closed drainage .The the collected waste will be dropped into the collecting tank in the device. The wheel on the either sides give mechanical power to drive the device and the wheels under the device helps to reduce the friction while moving. The width of the device can be adjusted by the help of mechanical car jack. The motor used is high torque DC 12V motor and which is powered by the means of 35Ah car battery. At the last portion, when the device moves the last cabin which carries the bleaching powder that is used to kill the bacteria. It is scattered with the help of the vibrator.



Here we are using wheels for the motion as mentioned above and the wheel size used are 80mm diameter in size and there are 4 of such wheels connected with high torque low RPM motor separately. Each motor have a specifications of 15.6 Newton Meter torque and 1.2 Amp capacities with an RPM of 42. The schematic working layout is as shown in figure (1).

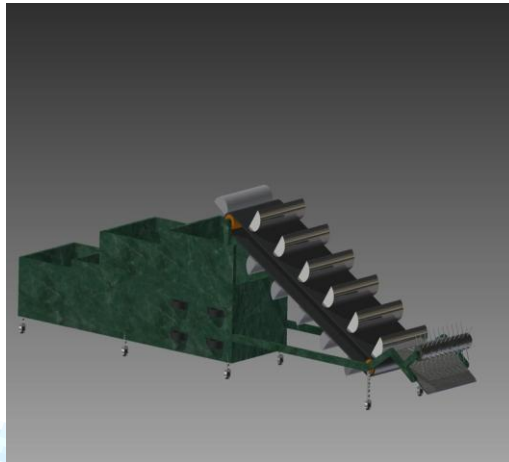


Figure1: Schematic working layout of CDMWCD

## V. METHODOLOGY

### 5.1 DESIGN

This CDMWC device is designed with the help of inventor software like Fusion 360 and others. There are different parts in this device which has to be designed separately in inventor software and each of the parts is joint together with the help of assembly option in this software. The different parts are joint together to form a single unit which is our final outlook of the device

### 5.2 FABRICATION

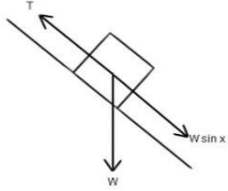
For the Fabrication of this device the most convenient material is stainless Steel because it is corrosion resistant and low weight with good material strength. Each part of the device has its own function with different loads acting on it. In that case it is best to use stainless Steel. And an another reason for using this is we are inserting this device in to the closed drainage so there maybe some amount of water which may cause rust in such cases it's all better to use stainless steel

### 5.3 TESTING

This device is tested by implementing this in a drainage system by removing 1 or 2 slabs. There is a rolling spike model roller for throw the waste materials to back side and a conveyor belt which collect this waste and take them to the collecting duct. This device is capable to travel through this drainage system by controlling it from outside. The different parts are joint together by hinges for the availability of turning. There is a camera fitted on this device which can be used for path tracker and a NDT method. At the back we can implement a vibrator which can help to put bleaching powder at the end.

## VI. FORCE ANALYSIS ON CONVEYOR BELT

Consider a conveyor belt of thickness 30mm incline at an angle  $x$  to the horizontal. The belt is loaded by a weight  $W$ . There is a tension force acting on the belt in a direction of the torsion of the motor which rotates the conveyor belt. The tensile force acting on the belt is equal to torsion force of the motor; it is because the tensile force is provided by the torsion of the motor. There will 2 components for weight vector, one will be horizontal and other is vertical. The horizontal component is  $W \sin(x)$



Let us neglect the effect of friction between the motor roller and conveyer belt. Now we are equating the horizontal components of forces.

$$\text{ie, } T = W \sin(x)$$

$$\text{ie, } W = (T / \sin(x))$$

Here in our case we are taking the torque of motor as 15.6 Nm and inclination angle  $x = 60^\circ$ . So,  $W = (15.6 / \sin(60)) = 18.0133 \text{ N} = 1.838 \text{ Kg}$

While we consider the friction, there will be some more loss, the maximum weight that can lift will be reduce than 1.838Kg.

## VII. EXPECTED OUTCOME

On inspection it has been observed that there are many defects and irregularities on the inner surface of the drainage which is a major cause that affect the smooth flow of the waste .Also a pile of waste get build up over time if the drainage is not cleaned and maintained periodically. CDMWCD can be used economically in removal of waste material accumulated consume in drainage systems. Also it utilities less man power and produce no pollution to the environment and society .This is expected to performed better than the excavator which uses decentralized Hydraulics [4].

## VIII. CONCLUSIONS

CDMWCD device can be used in all over the country to clean drainages in 4 to 6 months of interval, So that we can reduce the diseases spread over the country and cleaning the affected zone. This device can be computerized, so that the human effort can be reduced .The main points are, this device can reach and collect the waste from both open and closed drainage. It is designed in such a way that it can move through the closed drainage even without removing all the slabs. The control is done by wireless remote control. The present condition of the drainage is monitored by IR cameras.

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