Design And Fabrication Of River Cleaning Machine

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Abstract- *This project emphasis on design and fabrication of the river waste cleaning machine. The work has done looking at the current situation of our national rivers which are dump with crore liters of sewage and loaded with pollutants, toxic materials, debris etc. The government of India has taken charge to clean rivers and invest huge capital in many river cleaning projects like "Namami Gange", ''Narmada Bachao'' and many major and medium projects in various cities like Ahmadabad, Varanasi etc. By taking this into consideration, this machine has designed to clean river water surface.*

Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. Automation plays an important role in mass production. In this project we have fabricated the remote operated river cleaning machine. The main aim of the project is to reduce the man power, time consumption for cleaning the river. In this project we have automated the operation of river cleaning with help of a motor and chain drive arrangement. Some needs of automation are described below. Here using RF transmitter and receiver are to control the cleaning machine. Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation.

Keywords- Motor, chain drive, propeller, Conveyor, Collector, RF transmitter and receiver.

I. INTRODUCTION

The "River cleanup machine" used in that places where there is waste debris in the water body which are to be removed. This machine is consists of waterwheel driven conveyer mechanism which collect & remove the wastage, garbage & plastic wastages from water bodies. This also reduce the difficulties which we face when collection of debris take place. A machine will lift the waste surface debris from the water bodies, this will ultimately result in reduction of water pollution and lastly the aquatic animal's death to these problems will be reduced. It consists of Belt drive mechanism which lifts the debris from the water. The use of this project will be made in rivers, ponds, lakes and other water bodies for to clean the surface water debris from bodies. Similarly they are lots of problems of water pollution under Godavari River, Nasik which affect the acoustic, human life & beauty of Godavari River. The some photo graphs are shows the water pollution near Godavari River Nasik. 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. 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

II. LITERATURE REVIEW

M. Mohamed Idhris, M. Elamparthi, C. Manoj Kumar Dr.N. Nithyavathy, Mr. K. Suganeswaran, Mr. S. Arun kumar,
DESIGN AND FABRICATION OF REMOTE CONTROLLED SEWAGE CLEANING MACHINE[1]

The motive of the project is to automate the sewage cleaning process in drainage, to reduce the spreading of diseases to human. The black water cleaning process helps to prevent pest infestations by reducing the residues that can attract and support pests. It also improves the shelf life and sensory quality of food products. In the proposed system, the machine is operated with remote control to clean the sewage. Hence, this system avoids the impacts from the sewage waste

and its harmful gases. This helps to prevent the mosquito generation from the wastage. 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. Modern services are becoming polarized.

Mr.Abhijeet. M.Ballade, Mr. Vishal.S.Garde, Mr.Akash.S.Lahane and Mr.Pranav.V.Boob
Design & Fabrication of river cleaning system [2]

India is holy country & during lots of festival like ganesh visarjan, navratri durga puja & mainly Siahnsth kumbhmela there is lots of water pollution of Godavari River at Nashik. The water pollution is very important problem in rivers, ponds and water bodies near Godavari River at Nashik. Due to increase in water pollution in the form to waste debris; it is hampering the life of aquatic animal and make their life in danger. Similarly sometimes the aquatic animal tends to eats surface waste debris considering it as a food; which ultimately cause the death of animals. Due to polluted water many skin diseases to human kind are observed. So that to reduce the water pollution we are trying to make river cleanup machine.“River cleanup machine" a machine which involves the removing the waste debris from water surface and safely dispose from the water body. The river cleanup machine works on hydropower to extract waste water debris, plastics & garbage from Godavari river at Nashik

Mr. P. M. Sirsat, Dr. I. A. Khan, Mr. P. V. Jadhav, Mr. P.T. Date
Design and fabrication of River Waste Cleaning Machine [3]

This paper emphasis on design and fabrication details of the river waste cleaning machine. The work has done looking at the current situation of our national rivers which are dump with crore liters of sewage and loaded with pollutants, toxic materials, debris etc. The government of India has taken charge to clean rivers and invest huge capital in many river cleaning projects like “Namami Gange”, ‘’Narmada Bachao’’ and many major and medium projects in various cities like Ahmadabad, Varanasi etc. By taking this into consideration, this machine has designed to clean river water surface. Conventional methods used for collection of floating waste are manual basis or by means of boat, thrash skimmers etc. and deposited near the shore of rivers. These methods are risky, costly and time consuming. By considering all the parameters of river surface cleaning systems and eliminating the drawback of the methods used earlier, the remote operated river cleaning machine has designed which helps in river surface cleaning effectively, efficiently and eco-friendly. The “River waste cleaning machine” is used where there is waste debris in the water body which are to be removed. This machine consists of DC motors, RF transmitter and receiver, propeller, PVC pipes and chain drive with the conveyor attached to it for collecting wastage, garbage & plastic wastages from water bodies.

Pankaj Singh Sirohi, Rahul Dev, Shubham Gautam, Vinay Kumar Singh, Saroj Kumar
Review on Advance River Cleaner [4]

River water is used for irrigation which in return gives food to the people. They also maintain the ecology of region and bring prosperity. We made this project to clean the river. After implementing this project we can control the pollution of river it is very beneficial for our society. In this project turbine rotates by flow of river water and through the mechanical gear arrangement we arrange two conveyor belts. The first conveyor belt is used to pick solid waste from river and the second conveyor belt is used to draw solid waste out of river for solid waste management. Water is the source of life. It covers 70% of the Earth. But only a small portion of this precious natural resource is fit for human consumption. Out of the earth’s total water 97% is stored in oceans which are not fit for human consumption. The further 3% is stored in various sources like glaciers, rivers, lakes and under-ground aquifers. Rivers have a special place in the lives of the Indians. They consider rivers to be sacred, take holy dip during Amavasya (new moon), Purnamasi (full moon) and on other religious occasions. River water is used for irrigation which in return gives food to the people. They also maintain the ecology of the region and bring prosperity. An area without a river is considered to be poor. Unfortunately, during the past two decades water quality has deteriorated at a rapid pace. One of the major reasons for this is the solid waste being thrown to the rivers, turning them to be a dirty drain. The Ganga and the Yamuna, the two most sacred rivers of our country are no exception to it. Thousands of crores of rupees is being pumped to save the rivers through various plans. Now days we can see river pollution is biggest problem for our planet so we introduce our society with an advance river cleaner. This is an advance river cleaning system. We make this project for looking to clean river.

Ndubuisi c. Daniels

Drainage System Cleaner A Solution to Environmental Hazards [5]

The Drainage system cleaner is a machine which helps to protect the environment from different kinds of environmental hazards through the promotion waste management by the removal of garbage from the drainage system. These wastes when not removed end up settling in residential places where these wastes are burnt thereby causing climate change otherwise these wastes block the drainage systems thereby causing flooding. The machine is designed in such a way that it generates motion for its functions by itself through the action of running water thereby cutting out the dangers of the powering the machine by other sources of power because of the harshness of the rain on these other sources. The drainage system cleaner has three major parts which are the Propeller, the Cleaner and the Pan all make up for its effective functioning. The Drainage system cleaner was tested on three different days in the first day it rained in the months of September, October and November 2012 respectively. Based on the findings made after the test the Drainage system functioned well when there is maximum load. I therefore recommend the use of this system by various individuals, government companies and waste recycling companies for prevention of environmental hazards and also encouraging waste management. Drainage systems are blocked most times by garbage like nylon, plastic bottles, and empty cans which cluster together and find their way into the drainage systems. If these garbage are allowed to flow the will end up flowing down to recreational beaches used for tourism purposes making a scene not pleasurable to the eyes (Larsen et al 2009) else these garbage flow to residential sites where they are burnt in a way of getting rid of them, thereby causing climate change. Overflow of water drainage system occurs when there is a blockage of an end of the drainage system forcing the water to find its way elsewhere apart from the mapped out drainage system, therefore the running water spills over the horizontal height of the drainage systems spreading to regions alongside the drainage system, thereby causing problems such as pushing down of structures such as fences, water logging of farm lands and residential buildings etc

Osiany Nurlansa, Dewi Anisa Istiqomah, and Mahendra Astu Sanggha Pawitra

AGATOR (Automatic Garbage Collector) as Automatic Garbage Collector Robot Model [6]

Nowadays, the environment problems arise in many towns in Indonesia. These problems come along by developing activities such as construction of houses, offices, and other business areas. The Environment problems occur due to several reasons; they are the low budget allocation on environment management and public awareness in protecting the environment. The Environment issue which comes up from year to year and still cannot be solved is about garbage and waste from various places dispose into rivers. Those garbages can clog water flow, induce the water become dirty, smelly, and often over flow so then give effect floods. This research aims to design and make AGATOR(Automatic Garbage Collector), a rotor robot model as automatic garbage collector to counter accumulation of garbage in the river which has no flow effectively and efficiently. The method of implementation is design and construction. This method includes the identification of needs, analysis of the components required specifically, hardware and software engineering, developing, and testing. The test results obtain data by specification of AGATOR includes IC ATMega16 with 5 Volt voltage and 1,1 ampere current, IC Driver with 12 Volt voltage and 1,2 Ampere current, and Limit switch as the controller. Support devices of the robot are mechanical robot, robot control system, sensor system, and actuator robot. The maximum load drives the garbage receptacle until 5 kg. The average speed of robot when take out the garbage is 0.26 m/s**.**

Basant Rai

Pollution and Conservation of ganga river In modern India [7]

According to a World Bank Sponsored Study (State of Environment Report- U.P.) (In: Mallikarjun, 2003), pollution levels in the Ganga are contributing 9-12% of total disease burden in Uttar Pradesh (U.P.). The coliform bacteria levels are in excess of 2 lakh MPN as against the national water quality standard of 5000 (Mallikarjun, 2003). The report estimated total health damage on account of water pollution in up to is around 6.4 million daily (Disability Adjusted Life Year).According to the CPCB survey report, the total municipal sewage generated in the identified 25 towns in 1985 was of the order of1340 million liters per day (mld). Apart from this sewage, 260 mld of industrial wastewater, runoff from 6 million tons of fertilizers and 9,000 tonnes of pesticides used in agriculture within the basin, large quantities of solid waste, including thousands of animal carcasses and human corpses were being released into the river every day. Out of this, works corresponding to 873 mld only (65%) were taken up under the first phase of GAP. The remaining sewage was to be taken up under the 2nd phase of GAP which is already in progress. The Action Plan primarily addressed itself to the interception and diversion for treatment of the targeted municipal sewage of 873 mld. According to report of Water Resources Planning Commission (May, 2009), the programme GAP and NRCP has been positive. Water quality monitoring

done by reputed independent institutions indicates some improvement in the water quality over pre-GAP period. The water quality analysis of samples collected at 16 stations on River Ganga during 1986 and 2008 shows improvement in Dissolved Oxygen (DO) levels at 4 locations namely up and down streams of Allahabad and Varanasi. All the 16 stations except Patna downstream and Rajmahal show reduction in Biological Oxygen Demand (BOD) values.

Huang Cheng, Zhang Zhi

Identification of the Most Efficient Methods for Improving Water Quality in Rapid Urbanized Area Using the MIKE 11 Modelling System [8]

The Liangtan River basin is shared by Jiulongpo, Shapingba and Beibei district in Chongqing, China. The Liangtan River pilot project comprised identification of key pollution sources leading the Liangtan River basin pollution and the most efficient projects and technology for improving water quality in rapid urbanized area using the MIKE 11 modeling system. Ammonia-N (NH4 -N) and chemical oxygen demand (COD) were found to be most illustrative representing nutrient load from municipal and diffuse rural sources and industrial sources, respectively. The scenario modelling for2015 shows that in terms of improving the water quality, the different sectors should be addressed in the following order: Urban wastewater, industrial pollution load, rural wastewater, livestock pollution load, domestic solid waste and fertilizer pollution load. The largest improvements to water quality by 2015 can be achieved by enhancing municipal wastewater treatment to meet higher wastewater discharge standards for nutrients and by supporting investment in clean technology at the 50 largest industrial enterprise

Emaad Mohamed H. Zahugi, Mohamed M. Shanta and T. V. Prasad

Design of Multi-Robot System For Cleaning Up Marine Oil Spill [9]

Oil or "black gold" is still the largest source of power used by the industry sector. The demand for oil is increasing day-by-day and is substantiated by expanding submarine oil pipelines, distribution of oil and its derivatives by using tankers to carry it to many destinations. This leads to increased chances of oil leakage in the sea either by leakage from submarine oil pipelines or accidents with the tankers. In the past, such mis-happenings lead to major disasters of oil leakage in the high seas. Oil spills threaten the wildlife in the sea and hence, there is necessity for research on cleaning up oil spill quickly and efficiently has become very important issue by researchers and companies concerned. Last such disaster was the British Petroleum (BP) oil disaster in the Gulf of Mexico in USA during April 2010

Prof. N.G.Jogi,Akash Dambhare, Kundan Golekar, Akshay Giri, Shubham Take

Efficient Lake Garbage Collector by Using Pedal Operated Boat [10]

The most sacred river in the world and the national river of India "Ganga River." Ganga is the soul of India and is Holly River in India. If we look at current status of our national river it is very shocking we dump about 29 crore liters of sewage in Ganga which is loaded with pollutants, toxins.[9] We also dump tones of municipal solid waste. The government Of India takes charge to clean rivers Ahmadabad, Varanasi, etc. All of us know about the Ganga Abhiyan. Similarly, The villages in all state of India which joint with small & big lake and maximum villages does not use the water of lake for farming as well as drinking and daily uses due to the maximum amount of garbage present in the lake water by taking this into consideration. Our main motive is to clean the lake water for that purpose we are making efficient lake garbage collector by using pedal operated boat. In this we are using pedal operated boat with the conveyor attached to it for collecting garbage from the lake. Several companies offer equipment to garbage out of river lakes and harbors .The water surface trash collection boat can work in river or lake, it can collect the floating garbage and some other equipment for weed cutting, it harvest the aquatic weed from lake. This is really a good solution for the aquatic weed management. Many says they could build larger dustcarts for the sea and ocean, if there was a demand of them those seen here may not be ideal for collection on large scale but it is food for thought. We are making the boat which is operated by pedal and clean the waste present in the lake. In this boat the conveyor collect the waste present in lake and then collect it in box like structure present in lower side of the boat. We are trying to collect the waste like polythene, food material, and the waste occurs due to religious festival

Ankita B.Padwal, Monica S. Tambe, Pooja S. Chavare, Reshma K. Manahawar, Mitali S. Mhatre

Review Paper on Fabrication of Manually Controlled Drainage Cleaning System [11]

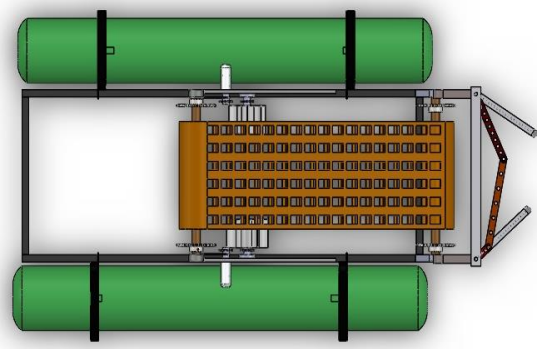
The problem of flooding and climate change has become outrageous because of its recent trends in our environment today. This has become a cause of major concern to the world, especially the developing countries. Water running through a water drainage system mostly carries along waste materials most which are non biodegradable which not only cause flooding but also climate change. Overflow of

water drainage system occurs when there is a blockage of an end of the drainage system forcing the water to find its way elsewhere apart from the mapped out drainage system, therefore the running water spills over the horizontal height of the drainage systems spreading to regions alongside the drainage system, thereby causing problems such as pushing down of structures such as fences, water logging of farm lands and residential building, etc. The impurities present in water can cause hazardous and disease. As long as the draining system is considered the function of the main drainage system is to collect, transport and dispose of the water through an outfall or outlet. Impurities in drainage water can be only like empty bottles, polythene bags, papers, etc. This paper focuses more on Automation of Drainage Cleaning System. There is a problem of mobility and space, to overcome this problem Automation of the system is necessary. Our concept is to use this in efficient way to control the disposal of wastages and with regular filtration of wastages. Introduction of autonomous vehicle is been done to make the system mobile. The system does require man power only to control the motion of the system.

III. CONSTRUCTION

i. CAD Model of River Cleaning Machine:

ii.



CONSTRUCTION

The project consists of a motor operated water wheel to run the project. It has four DC Motor of 12V, 7.6 Ampere. The device which is running the project is chain drive coupled having collecting plate. The project consists of two main shafts balancing and hoisting the sprocket of chain drive. The components are rest on frame serve as main body of the project. The steel pipe with pressurize air generates pressure head to run the project on water surface. The fabricated storage tank is used to store the waste fulfilling the purpose of the project.

WORKING PRINCIPLE

In this project the main aim of this machine is to lift the waste debris from the water surface and dispose them in the tray. Here we are fabricating the remote operated river cleaning machine. The collecting plate and chain drives are rotating continuously by the motor. The collecting plate is coupled between the two chain drives for collect the waste materials from river. The collected wastages are thrown on the collecting tray with the help of conveyer. Our project is having propeller which is used to drive the machine on the river. The propeller is run with the help of two PMDC motor. The total electrical device is controlled by RF transmitter and receiver which use to control the machine remotely.

IV. ASSEMBLY OF MACHINE

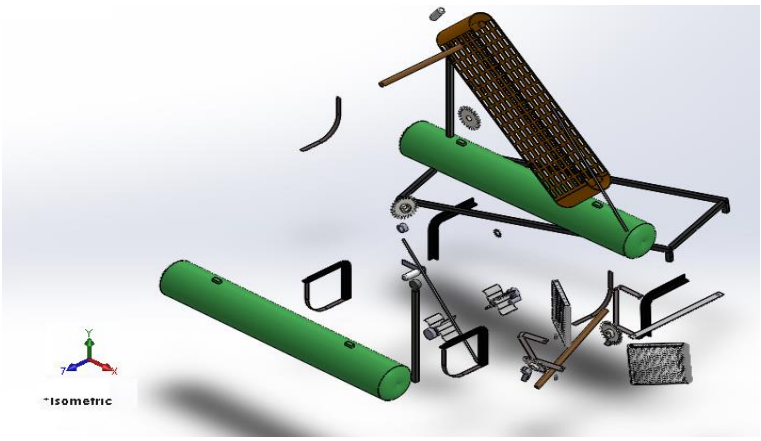


Figure- Exploded View of River Cleaning Machine

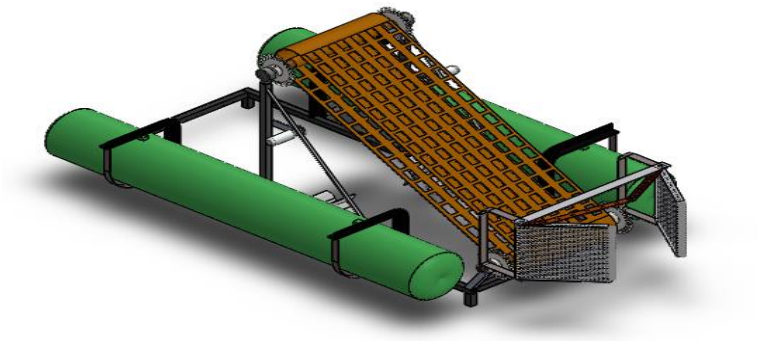


Figure-Assembled View of River Cleaning Machine

1. Base Frame
2. Hollow Pipe 2
3. L- Section 4
4. Inclined Section 2
5. T- section 2
6. Shaft 2
7. Motor 4
8. Gear 2
9. Sprocket

10. Bearing
11. Collecting Mechanism
12. Chain
13. Carrying Belt
14. Water Wheel
15. Battery
16. Nut and Bolt
17. U- section 2
18. Connecting Link

Assembling Procedure of Machine

1. The basic step is to assemble base frame of the project by using hand cutting machine and electric welding machine to withstand the model and its operation. The base frame is made of M.S angle.
2. Hollow pipe is assembled at the base frame with the help of L- section through nut and bolt. It is made of tin sheet by using rolling and tapping operation. The purpose of this pipe is to float on water, carrying the project weight as compressed air is placed in pipe creating a differential pressure head, causing the machine to float on water.
3. L- Section is welded in base frame which is used to hold the hollow pipe with the help of nut and bolt.
4. Inclined section is welded on base frame to support the bearing and shaft.
5. T- Section is assembled on base frame by welding. It is used to support the larger chain drive with the help of bearing and shaft.
6. Shaft is used to transmit the torque from motor to chain drive. There is two shaft assembled in machine. Shaft 1 is mounted at the front chain drive of machine and shaft 2 is mounted at the rear chain drive with the help of inclined selection and T- section respectively.
7. The drive source of our project is an electric motor having 12V and 7.6 ampere current which is used to drive gear train, water wheel and collecting mechanism. Here we are used 4 motor. 1 motor is mounted on garbage collector, 2 and 3 motor is mounted on left and right water wheel and 4 motor is mounted on carrying belt with the help of gear train and chain drive mechanism.
8. Gear drive is welded on shaft with the help of connecting link and T- section. Gear drive is power transmission drive used to transmit the power from motor to chain drive as required to carry a load as desirable to complete the project objective.
9. There is 8 sprocket used in the project in which 1,2,3,4 are of same dimension is mounted on shaft of carrying belt with the help of chain and Remaining 5,6,7,8 are used to drive the water wheel which is used to float the machine in water.
10. Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and Motorcycles. It is also used in a wide variety of machines besides vehicles. The power is conveyed by a roller chain, known as the drive 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.
11. Collecting Mechanism is used in our project to overcome real time issue as due to water tension garbage is difficult to collect. By using this four bar mechanism, it rotates at a particular angle intended to collect the garbage for the model. It has two window open and close as user wishes using remote to ON and OFF the mechanism.
12. Water wheel is bolted on shaft which is placed on base frame. The purpose of water wheel is to move the machine forward or backward on water. Motor is used to rotate the water wheel with the help of chain drive mechanism

V. CALCULATION AND SPECIFICATION

1) Base Frame:
Length= 1220mm
Width= 480mm
Square pipe of 20mm
Thickness= 2m

2) L-section*04:
Height= 8inch (203mm)
Width= 7.5inch (190.5mm)
Plates of 1 inch (25.4mm)
Mounted at 230mm from ends

3) Stand:
Height= 520mm
Fixed at 500mm from 1 side

4) L – support at a height of 40 inch to main end

5) Motor support:
Fixed at the height of 340mm
Length= 10cm
Width= 1cm

6) Dc motor
Rpm= 30
Shaft= 20mm

7) Main shaft:
Diameter= 25.4mm

8) Table Small chain drive Sprocket *2:

Sprocket	Radius
Teeth	27
Addendum circle	2.88cm
Base circle	2.74cm
Pitch circle	2.8cm
Centre distance	30cm
Pitch , Revolution	8mm, 30/min

9) Tube:

Length=47.5 inch =1206mm

Diameter = 9cm (90mm

10) Table -Large chain drive Sprocket *2**:**

Sprocket	Radius
Teeth	24
Addendum circle	5.5cm
Base circle	4.8cm
Pitch circle	5.35cm
Centre distance	90cm
Revolution	10/min

11) Table - Small chain drive Sprocket **:**

Sprocket	Radius
Teeth	28
Addendum circle	3cm
Base circle	2.5cm
Pitch circle	2.75cm
Centre distance	30cm
Revolution	23/min

12) Water wheel:

Diameter of water wheel= 16cm

CALCULATIONS

1) Motor calculation:

Type: - DC Motor

Power= V×I

Where, Volt= 12V

Amp=7.6 amp

Power= 12×7.6

Power= 85 watt

2) DESIGN OF SPUR GEAR

Design power

$Pd=P_R \times Ki$

Where Ki=1.25 for light shocks (8 to 10 hrs a day)

Pd=85×1.25

Pd=106.25 watt

3) Total Load:

Total load Ft=Pd÷Vp

Where,

Ft= tooth load

Vp= pitch line velocity

4) Vp= (πDpN)/ (60*1000)

Vp= (πDpN)/ 60

Where,

Dp=m×tp

tp= pinion teeth=24

Vp= (π× m×24×30)/ 60

Vp=0.03769 m

5) Ft=Pd ÷Vp

Ft=106.75÷0.03769m

Ft=2832/m

6) Bending strength by Lewis equation,

F_B= So×Cv×b×y×m

Where So=Basic strength Mpa

So=245Mpa SAE 1045 heat treated

Cv=0.4(assume)

b=Face width= 10m

Modified Lewis factor

20^o full depth

Yp=0.485-(2.87/tp) for pinion

Yp= 0.3667

Yg=0.485-(2.87/tg) for gear

Yg= 0.42583

F_B= So×Cv×b×y×m

F_B= 245×0.4×10×m×0.3667×m

F_B= 359.36m^2

Using criteria,

F_t= F_B

2832.31/m=359.36m^2

m=1.99 mm

m=2 mm Recommended or preferred table XVI-7

Dp=48mm

Dg=96mm
F_B= So×Cv×b×y×m
b=1993.75/245×0.4×0.3255×2

b= 20mm

b=10*m=20
Now, checking face width
F_t= F_B
F_t= 2832.31/m= 1416.15N

F_t= 1416.15N

F_B=359.36m^2

F_B=1438.75N

F_t< F_B
.:Design is safe

7) Dynamic load:
Fd= Ft+(21Vp(Ceb+Ft)/ 21Vp+√Ceb+Ft)
Vp=0.02827*m

Vp=0.075m/sec

Where,
C=Deformation Factor table XVI-4
C=11800-(20° full depth)
b=1
e= *error* in profile= 0.05
Fd= 1416.15+ (21×0.075(11800×0.05×20+1416)/
×21*.075+√11800×0.05×20+1416)

Fd=1595 N
Fd>Ft

8) Limiting wear strength
Fw=Dp×b×k×Q
Q = 2tg/tg+tp
= 2×48/48+24
Q =1.33

Fw =48*20*k*1.33

Fw=1276K

Using Criteria,
Fd=Fw
1594=1276K
K=1.24
BHN core=350
For pinion 20° full depth involute profile
Fw=1276×1.24

Fw=1582 N

Fd>Fw
Design is safe.

9) Endurance strength
Fen =Seb×b×Yp×m
Where Seb= 596mpa
Yp=0.3667
b=20
m=2
Fen =596×20×0.3667×2

Fen= 8742 N

∴ Fen> Fd
∴Hence design is safe.
10) Gear ratio:
N1/N2=T2/T1
Where,
N1=rpm of pinion
N2 = rpm of gear
T2=teeth of gear
T1 = teeth of pinion
30/N2=48/24
N2=15RPM
Power= 2πNT/60
Torque T=1416×0.048=67.96 N
Power =2×3.14×15×67.96/60
Power= 106.75Watts
Hence Design is safe.

- **DESIGN PROCEDURE OF CHAINDRIVE & SPROCKET**

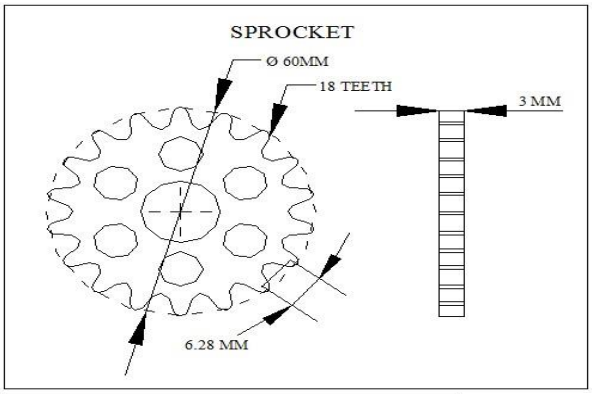
1) Determine the velocity ratio of the chain drive
Velocity ratio = N1/N2
So, N1/N2 = T2/T1, velocity ratio = 1

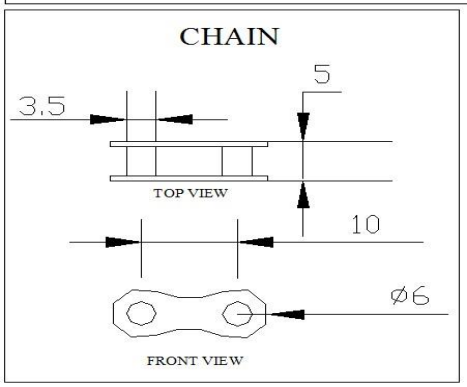
2) Select the minimum number of teeth on the smallest sprocket

or pinion Minimum Number Of Teeth On The Sprocket = 18

3) Determine the design power by using the service factor, such that
Design power = Rated power x Service factor (K_s)
= 106.25 x Service factor (K_s)
= 106.25 x (Load factor(K_1) x (Lubrication
factor (K_2)x Rating factor (K_3)
= 106.25 x (1.5 x 1 x 1.25)

Design power = 0.20kW





4) Choose the type of chain, number of strands for the design

power and RPM of the sprocket

Types of chain = simple roller chain (06B)

Power rating (in kW) = 0.25

Speed of sprocket or pinion (RPM) = 30

5) Note down the parameters of the chain, such as pitch, roller

diameter, minimum width of roller.

ISO chain number = 06B (35) Bd Shivalkar

Pitch (mm) = 9.525

Roller diameter (mm) = 6.535

Minimum width (mm) = 5.72

Braking load (simple type roller chain) in k N = 8.9

6) Determine the load (W) on the chain by using the following relation,

Pitch line velocity = ΠdN/60

= (3.14 x 0.06 x 30) / 60

Pitch line velocity = 0.0942 m/s

W= Rated power/pitch line velocity

W = 0.25/ pitch line velocity

W= 0.25 / 0.0942

W = 2.65KN

Load on the chain W= 2650N

7) Calculate the factor of safety by dividing the breaking load (W_B) to the load on the chain (W). This value of factor should be greater than the value.

Factor of safety = (W_B/W) = 8.9/2.65

Factor of safety = 3.358

- **WATER WHEEL CALCULATION**

8) Power of Motor is(P): 85 watt

Diameter of water wheel(d):160 mm

Velocity: πxdxN/60

A calculated RPM is 30

V=0.255 m/sec

9) Torque:

Power=2πNT/60

T=85x60/2πx30

T=27.05 Nm

VI. ADVANTAGES AND APPLICATIONS

ADVANTAGES

1) It is a non-conventional river cleaning system.
2) It's initial & maintenance cost is low.
3) Skill Worker not required to drive the system.
4) Environment friendly system.
5) Easy in operation.

APPLICATIONS

1) It is applicable to reduce water pollution in rivers & ponds.
2) It is useful to remove the sediments present in swimming pool to keep it clean.

VII. CONCLUSION

This project is fabricated on the basis of literature and research on different journal and paper relevantly available and fabricated in accordance so it can provides flexibility in operation. This innovation is easy and less costly and has lot of room to grow more economical. This project "Remote Operated River Cleaning Machine" is designed with the hope that it is very much economical and helpful to river and Pond cleaning. On the basis of it design and estimating cost and availability it is very cheap and very useful for the society.

On Calculating and Experimenting the result are very satisfactory. Given motor has a power of 80 watt having 7 ampere/hour and providing battery of 85 watt having 7.6 ampere/ hour, it is estimated that project can work up to 1 hour 10 min on it full capacity but on real time working as seen the project can work up to 45 min after than it is required to charge the battery again. This drawback can overcome easily by using high power battery. As we can say by taking time ratio the project is working at 64.28 % from its design criteria which can be accepted as more research can be done in future to overcome with these problems.

On the basis of these result we can conclude that it is an innovative method of minimizing manual stress and thus very much reliably stabilizing the in the pond. The project carried out by us made an impressing task in the environmental purpose and it is very useful for the small scale works. Although this system able to collect the garbage from the lake with human intervention. The objective of the project was successfully achieved.

VIII. FUTURE SCOPE

In future this project can be improved to sort more categories of waste. In this system we can use advance conveyor system and conveyor material for increasing the efficiency of collection of garbage. We can use the solar panel for providing power to the boat instead of battery operation. To modify the size of boat according to its waste collecting capacity is increases. This project makes only for small lake by doing some modification in its size and capacity it can use in big lake and river like Ganga.

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