VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JnanaSangama, Belagavi – 590018

A Project Report
On

"Design and Development of Semi-Automated In-House Sewage Water Treatment plant of 25KLD capacity"

Submitted in partial fulfillment of the requirements as a part of the curriculum,

Bachelors of Engineering in Mechanical Engineering

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CERTIFICATE

Certified that the project work entitled “**Design and Development of Semi-Automated In-house Sewage Water Treatment plant of 25KLD capacity”** is a bonafide work carried out by**, Mr. Kausheesh G, Mr. Nithin R, Mr. Busi Jaya Krishna, Mr. Nikhil Udupa L S** bonafide students of **CMR Institute of Technology** in partial fulfillment for of the requirements as a part of the curriculum, **Bachelors of Engineering in Mechanical Engineering,** of **Visvesvaraya Technological University, Belagavi** during the year **2019-2020**. It is certified that all correction/suggestion indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of the project work prescribed for the bachelor of engineering degree.

(Mr. Srinivas Reddy Mungara) **(Dr. Vijayanand Kaup)** **(Dr. Sanjay Jain)**

Signature of the Guide **Signature of the HOD** **Signature of the Principal**

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Name of the examiners **Signature with date**

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DECLARATION

We, students of Eighth Semester, B.E, Mechanical Engineering, CMR Institute of Technology, declare that the project work titled **"Design and Development of Semi-Automated In-house Sewage Water Treatment plant of 25KLD capacity** has been carried out by us and submitted in partial fulfillment of the course requirements for the award of degree in **Bachelor of Engineering in Mechanical Engineering** of **Visvesvaraya Technological University, Belagavi,** during the academic year 2019-2020.

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Date:

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ABSTRACT

Sewage is wastewater-carrying waste removed from residences, institutions, and commercial and industrial Establishments, together with such groundwater, surface water, and storm water as may be present. It is more than 99.9% pure water and is characterized by its volume or rates of flow its physical condition, its chemical constituents, and the bacteriological organisms that it contains.

Increasing volumes of domestic, hospital and industrial wastewater are being produced in cities around the world. Cities in developing countries lack resources to treat wastewater before disposal. Even where expensive wastewater treatment plants are Installed, only a small percentage of the total wastewater volume is treated before discharge resulting in rivers, lakes and aquifers Becoming severely contaminated. Therefore, there is great need to treat wastewater. We can treat such water by various methods. The contaminants in wastewater are removed by physical, chemical, and biological means. The individual methods usually are classified as physical unit operations, chemical unit processes, and biological unit Processes, Although these operations and processes occur in a variety of combinations in treatment systems, it has been found Advantageous to study their scientific basis separately because the principals involved do not change, In this paper, we are discussing how we are going to develop this system, what the basic theme of this system is and how our ideas will be applicable to the theme.

Design and Development of Semi-Automated In-House Water Treatment Plant of 25KLD Capacity

Table of Contents

CHAPTER 1

INTRODUCTION

Water is considered as the most important and priceless commodity on planet Earth. Water on earth moves continually through the water cycle of evaporation and transpiration, Condensation, precipitation and runoff, usually reaching the sea. It is one of the most essential things that is required for every living being. In order to develop a healthy and hygienic Environment, water quality should be monitored such that it lies within the respective Standards.

Wastewater is liquid waste discharged by domestic residences, commercial properties, Industry, agriculture, which often contains some contaminants that result from the mixing of Wastewater from different sources. Wastewater obtained from various sources need to be Treated very effectively in order to create a hygienic environment. If proper arrangements for Collection, treatment and disposal of all the waste produce from city or town are not made, they will go on accumulating and create a foul condition that the safety of the structures such That building, roads will be damaged due to accumulation of wastewater in the foundations. In Addition to this, disease-causing bacteria will breed up in the stagnant water and the health of the public will be in danger.

The principal aim of wastewater treatment is generally to allow human and industrial Effluents to be disposed of without danger to human health or unacceptable damage to the Natural environment. Therefore, in the interest of the community of the town or city it is most essential to collect, treat and dispose of all the wastewater of the city in such a way that it may not cause harm to the people residing in the town. The extent and the type of treatment required, however depends on the character and quality of both sewage and sources of disposal available.

The sewage after treatment may be disposed either into a water body such as lakes, streams, river, estuary and ocean or into land. It may be used for several purposes such as gardening conservation, industrial use or reclaimed sewage effluent in cooling systems, boiler feed, process water, reuse in agriculture, horticulture, sericulture, watering of lawns.

Design and Development of Semi-Automated In-House Water Treatment Plant of 25KLD Capacity

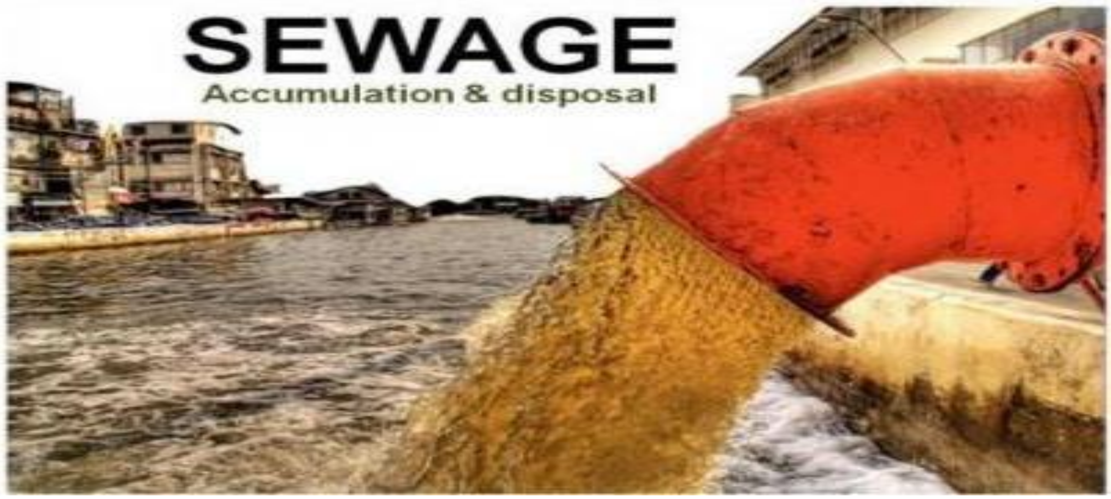


Fig.1 Sewage water source

1.1 NEED OF SEWAGE WATER TREATMENT

Increasing volumes of domestic, hospital and industrial wastewater are being produced in cities around the world. Cities in developing countries lack resources to treat wastewater before disposal. Institutional support and legislation for pollution controls weak. Even where expensive wastewater treatment plants are installed, only a small percentage of the total wastewater volume is treated before discharge resulting in rivers, lakes and aquifers becoming severely contaminated. Only 4000 of 17,600 MLD waste water generated in India is treated. Approximately 30,000 MLD of pollutants enter India's rivers, 10,000 milliliters from industrial units alone. According to the Central Pollution Control Board (CPCB), 16,000 MLD of wastewater is generated from class 1 cities (population > 100,000), and 1600 MLD from class 2 cities (population 50,000 - 100,000). Of the 45,000 km length of Indian rivers, 6,000 km have a bio oxygen demand (BOD) above 3mg/l (milligrams per litres), making the water unfit for drinking. Wastewater treatment involves breakdown of complex organic compounds in the wastewater into simpler compounds.

1.2 UNIT OPERATIONS IN SEWAGE TREATMENT

The contaminants in wastewater are removed by physical, chemical, and biological means.

Physical Operations:

Among the first treatment methods used were physical unit operations, in which physical forces are applied to remove contaminants. Today, they still form the basis of most process flow Systems for wastewater treatment. Some of the basic physical operations are Screening, Commenting, Flow equalization, Sedimentation etc. ……

Chemical Operations:

Treatment methods in which the removal or conversion of contaminants is brought about by the additions of chemicals or by other chemical actions are known as chemical unit processes. Precipitation and adsorption are the most common Examples used in wastewater treatment. In Chemical precipitation, treatment is accomplished by producing a Chemical precipitate that will settle.

Biological Operations:

Treatment methods in which the removal of contaminants is brought about by biological activity are known as biological unit processes. Biological treatments used primarily to remove the biodegradable organic stances (colloidal or dissolved) in wastewater. These substances are converted into gases that can escape to the atmosphere and into biological cell issue that can be removed by settling. Biological treatment is also used to remove nutrients (nitrogen and phosphorus) in wastewater.

CHAPTER 2

LITERATURE SURVEY

2.1 OVERVIEW

Water withdrawal statistics indicate that annual global water withdrawals have increased by more than six times and the rate of increase in developing countries is 8% Water is a very basic requirement for the well-being of human kind, vital for economic development and essential for the healthy functioning of all the world's ecosystems. Reasons for limited availability of resources to use for people include lack of distribution networks, excessive extraction of groundwater resource and risk from the contamination by the pollutants. Many freshwater resources have become increasingly polluted, resulting in the shrinking of freshwater availability. In some places, groundwater levels continue to fall and the options for increasing supplies have become costly and are often environmentally damaging**.** Water conflicts are worsening around the world, rivers are drying up and pollution is unabated. The root cause of these problems is poor water governance, which has often been neglected in the past. Rapid urbanization and industrialization has resulted in the squeeze on freshwater supplies for agricultural uses and this necessitates reliable, alternative sources of supply. Consequently, the water crisis has engendered new directions for water governance and development and use of urban wastewater as an alternative source of supply.

2.2 FRESH WATER AVAILABILITY

Exponential growth of population, rapid industrialization, urbanization, higher cultivation intensities, and poor water management practices over the past century has made freshwater availability a limiting factor in agricultural development. The options for increasing supply have become expensive and often environmentally damaging**.** "The insufficiency of water is primarily driven by an inefficient supply of services rather than by water shortages. Lack of basic services is often because of mismanagement, corruption, lack of appropriate institutions, bureaucratic inertia and a shortage of new investments in building human capacity, as well Water withdrawal statistics indicate that annual global water withdrawals have increased by more than six times and the rate of increase in developing countries is 8% Water is a very basic requirement for the well-being of human kind, vital for economic development and essential for the healthy functioning of all the world's ecosystems. As physical infrastructure water, managers and policy makers around the world are compiled to continually look for alternatives to supplement limited and depleting freshwater resources. In such situations, 'source substitution' appears to be the solution as it allows higher quality water to be reserved for domestic supply and poor quality water may satisfy less critical uses. Urban wastewater (treated) is now considered as a reliable alternative water source without compromising public health and wastewater management is prominent in the water management agenda of many countries .

Following are the key points which needs to be considered for water sector

- Key drivers: Demand-Supply gaps, Urbanization, Regulations
- Opportunities: Efficiency in water supply, reuse of waste water and energy from Waste
- Technical: Challenges, Lack of raw water, Changing water use patterns, Lack of adequate availability of technical expertise
- Financial Challenges: Capital intensive, Tariffs are too low

2.3 WATER SCENARIO IN STATE UNDERTAKEN FOR STUDY

The share of groundwater in the total supply is projected to decrease in future as large surface water schemes are commissioned, most notably the Sardar Sarovar-based Narmada Main Canal. The shortfall in urban areas is even more critical and requires substantial investment to develop new sources of water and strengthen the water supply distribution network. The demand for drinking water in the six municipal corporations is projected to outstrip the supply 986 MLD, calling for an investment of Rs. 8609 million by 2010. Additional investments are also required to rehabilitate the existing distribution network. In Central Gujarat, water availability can be challenging in future, so to meet with water requirement option of reuse has to be explored.

2.4 WATER CONFLICTS

Severe water shortages have already led to growing more number of conflicts across the country.90 percent of India's territory is drained by inter-state rivers. The conflict over the Cauvery river water between Karnataka and Tamil Nadu, the Godavari river conflict between Maharashtra and Karnataka and the Narmada water conflict between Madhya Pradesh and Gujarat are all ongoing conflicts. On the international front, India has clearlydemarcated water rights with Pakistan through the Indus Waters Treaty. Climate change projections show that India's water problems are only likely to worsen. With more rain expected to fall in fewer days and the rapid melting of glaciers – especially in the western Himalayas – India will need to gear up to tackle the increasing incidence of both droughts and floods. There is clearly an urgent need for taking action for the observed situation of water. First, India needs a lot more water infrastructure. Compared to other semi-arid countries, India can store relatively small quantities of its fickle rainfall. Whereas, India's dams can store only 200 cubic meter Of water per person, other middle-income countries like China, South Africa, and Mexico can store about 1000 cu.m. Per capita.

2.5 FACTORS TO BE ADDRESSED FOR REUSE OF WASTE WATER

Following are the important factors related to implement successful reuse of wastewater.

Design and Development of Semi-Automated In-House Water Treatment Plant of 25KLD Capacity

2.5.1 Water Governance Directions

Water governance is a significant aspect of the international development policymaking. The United Nations World Water Development Report recognizes that water crisis is largely a crisis of governance, outlines many of the leading obstacles to sound and sustainable water management. There is an increasing consensus on the need to improve water governance to achieve the Millennium Development Goals. Therefore, good governance, which often receives less attention than it merits, is an essential aspect of effective water resource management. The situation demands a change or shift in water governance – the process of managing water resources. It describes this shift or change as ‘the changing water paradigm’.

Some aspects of theory of governance are that, concerned not only with the State but also with relationships between the State and civil society and its private sectors. It was said, “Governance embraces the relationship between a society and its government”. The Dublin Water Principles, through its participation clause, states that water development and management should be based on a participatory approach, involving users, planners, the community, policy-makers at all levels. The same notion is stressed in The Hague Ministerial Declaration, and the Bonn Ministerial declaration.

2.5.2 Institutional Challenges

Wastewater collection, treatment and effluent use normally encompass a large range of interests at different levels of administration. Therefore, the scope and success of any reuse scheme will depend largely on the institutional organization. In any natural resource management regime, coordination complexity results in problems, due to the varying roles and responsibilities and overlapping concerns among the public agencies managing the resources. Previous studies related to wastewater use have identified similar conflicting agendas among water agencies: addressing water rights issues; dealing with opponents to recycling or reuse; modifying existing regulations; acquiring funding, are the institutional challenges facing successful development of this dependable resource.

2.5.3 Public Perceptions and Acceptance

For successful implementation of reuse schemes, public acceptance is a very important parameter that tendency of people to be motivated by a set of long-term goals, but to act in the short term towards those things that they control, is what affects wastewater reuse projects. Failure to gain public acceptance has led to vocal opposition, at times, has resulted in schemes being stalled. Public concerns about real or perceived risks are weighted against the use of reclaimed water. The following factors influence community’s acceptance of the reuse scheme.

- Disgust or ‘yuck’ factor
- The perception of risks associated with using recycled water
- The specific uses, cost of recycled water

- The sources of water to be recycled,
- Issues of choice
- Trust and knowledge
- Attitudes toward environment
- Socio-demographic factors

If wastewater resources are to become an integral component of water and waste management policies, the acceptance of reclaimed water must be comprehensively tackled; this is more critical if the application is for potable uses.

2.5.4 Community Participation

Wastewater reuse history is marked with the failure of reuse schemes mainly because of lack of community involvement. ‘Working with a community that does not have wastewater as a highest priority requires building participation through a combination of discussions about community outcomes, more detailed action steps of technology identification, design work, and management’. The lack of community participation results in a wide gap between what is desired from wastewater reuse and what is necessary to get there, inability to bridge this gap is the primary reason for failure of locally driven wastewater projects. Since it is public, who will be served by and pay for them, the policies on wastewater use and management must include the human dimension. For a reuse scheme to be sustainable, community involvement and/or participation are very important. Asano suggests that wastewater reuse project(s) should be built upon three principles:

- Providing reliable treatment of wastewater to meet strict water quality requirements.
- Protecting the public health.
- Gaining public acceptance.

2.5.5 Market Imbalance

The best application for the use of wastewater after treatment is in agriculture and use of this water for agriculture purposes can relieve a great deal of pressure on fresh water resources. This implies that the largest market for reclaimed water is in the agriculture sector. Although there is a market for this valuable resource, it is imbalanced, as is explained by “The market for reusable water is unbalanced it is due to a growth on the supply side of the market, revealed by increasing number of wastewater treatment plants and stagnancy on the demand side revealed by the substantial proportions of resource being discharged without proper utilization”.

2.5.6 Financial Feasibility and Technicality

Financing a reuse scheme is a challenge because acquiring funds to develop water Re use scheme is an onerous task. "More often than is usually believed, individually rational behavior is compatible with the socially desirable outcomes". Therefore, public perceptions and acceptance of wastewater, community participation and willingness to pay are all interlinked. Willingness to pay for reclaimed water is also influenced by the tariff structure, which should be such that community being served should perceive it to be appropriate, as well as taking into account the long-term viability of the service provider. Sound technicality is another factor to be considered while implementing reuse projects. This is important because the effluent should be treated to a quality acceptable to the end-user and matched to particular application.

2.5.7 Economics of Water Reuse

Reuse projects initiated by the private sector are often driven by need for water or a perceived marketing edge. Projects initiated by the wastewater utility are often driven by a need to meet reuse target and to avoid water-based disposal as per Environmental Protection Authority (EPA) guidelines. The client base must be developed by the wastewater utility. This has led to a number of reuse projects where reuse water was priced at a considerably lower level than the potable water. One of the potential outcomes of this type of pricing strategy is the over-use of reuse water. In a first best world, whenever prices are set at less than full cost, efficiency considerations dictate that the rationale for doing this needs to be revealed and a process for returning to full cost pricing needs to be put in its place.

2.5.8 Global Trends Open Up New Investment Opportunities

Adequate water quality supply and insufficient quantities is one of the major challenges facing the modern society. In many countries, the available water reserves are now being over exploited to such an extent that the negative consequences can no longer be ignored. The situation will become even more critical in years ahead. Demand for water is increasing to an extent that it would not be available for basic requirements of individuals. Major investments will therefore be required in the short term to upgrade ageing water mains and sewer systems in particular, higher standards for water quality. Solution also needs to be found out to meet the fresh challenges arising from new micro pollutants that are becoming a problem in industrialized countries. Climate change will cause significant variations in the hydrological regime in many regions, culminating in the water crisis in some areas. These mega trends will intensify the pressure to manage existing water resources far more efficiently in the years ahead. This situation opens up attractive opportunities to all businesses offering products and services for the treatment, supply or use of water.

2.5.9 Reuse of Waste Water: Impact on Water Supply Planning

A procedure for analyzing water reuse alternatives has been prescribed within a framework of regional water supply and wastewater disposal planning and management by modelling. He also suggested that planners should address the question of when and in what context wastewater should be upgraded for reuse as additional sources of supply. water from several origins or categories of supply can be allocated to satisfy the demand of various water using sectors or destinations the concepts of water reuse, fits closely the format of the transportation or trans-shipment problem from linear programming as applied by Bishop and Hendricks to evaluate water reuse potential within the framework of water supply availabilities and water demands of a region and waste water management considerations. A waste treatment plant may be the destination of municipal effluent, while at the same time it becomes an origin for treated wastewater available for reuse purpose. Optimal (least cost) solutions can be generated which contain following information:

- Allocation from primary water supply sources to satisfy user demands
- Operating levels for water treatment plants for municipal supplies
- Capacity levels for the use of waste water treatment plants
- Capacity timing reuse of waste water
- Specific reuse made of effluent supplies

2.5.10 Key Objectives for Water Reuse Concepts

Scientists working closely on the issues of water reuse are far from having solved all concerns related to the practice. From Decision Support Systems to the simplest analytical tools, all knowledge is valuable. Detailed studies must be undertaken to identify necessary technologies, schemes, control tools. As public health concerns are normally among the main constraints for reuse, any scenario will need to include detailed risk assessments. Once the basic calculations were performed, after that a final decision whether the scheme can be implemented should be based on three phases of risk assessment; analysis, calculation and communication. This will allow fulfilling the key objectives of reuse of wastewater increasing the amount of water resources available, under an acceptable risk with a public full knowledge. Although wastewater reclamation and reuse has gained approval as a necessary tool to be included in sustainable integrated water resources management, there are still several key points to be developed for safe use of the resource. Among the most important items to be developed by adequate research and development (R&D), the risk approach appears to be paramount at present for several reasons.

- It could finish the old controversy on restrictive or not so restrictive standards
- It can allow qualifying a reclamation treatment depending on quality of water obtained
- It is a good tool to define the acceptable risk for a given society with its particular Conditions [13]

2.6 FACTORS RESPONSIBLE FOR REUSE OF MUNICIPAL WASTE WATER

Reuse of municipal wastewater reuse was "inadvertent reuse" or the unplanned addition of the wastewater to water supply. Due to the vastness of knowledge and communications in modern societies, this inadvertent reuse is seldom the case. In modern societies almost all reuse is planned and takes the form of either "indirect reuse" or "direct reuse." Throughout the past two decades, the United States and much of the world have witnessed a growing awareness of the concept of water reuse. Baumann and Dworkin attribute the awareness to four factors, which has taken place in the recent history as below:

- The increasing urbanization and industrialization which have resulted in a Scarcity of freshwater in many areas.
- More and more communities have been forced to turn to polluted sources to Meet their need of water supply (i.e., indirect reuse)
- The cost of wastewater disposal has been growing because of the desire to Limit the amount of pollutants released into our nation's existing water sources
- Technological developments in advanced wastewater treatment have lowered the actual costs of treating water.

2.7 IMPORTANCE OF QUALITY OF WASTEWATER FOR AGRICULTURAL USE

Parameters of health significance Organic chemicals usually exist in municipal wastewaters at very low concentration sand ingestion over prolonged periods would be necessary to produce detrimental effects on human health. The principal health hazards associated with the chemical constituents of wastewaters, therefore, arise from the contamination of crops or ground waters. Hillman has drawn attention to the particular concern attached to the cumulative poisons, principally heavy metals, and carcinogens, mainly organic chemicals. World Health Organization guidelines for drinking water quality (WHO1984) include limit values for the organic and toxic substances based on acceptable daily intakes (ADI). Pathogenic organisms give rise to the greatest health concern in agricultural use of Wastewaters, yet few epidemiological studies have established definitive adverse Health effects attributable to the practice. Shovel et al reported on one of the earliest evidences connecting agricultural wastewater reuse with the occurrence of disease. It would appear that in areas of the world where helminthic diseases caused by Ascaris and Trichuris spp. They are endemic in the population and where raw untreated sewage is used to irrigate salad crops and/or vegetables eaten uncooked, transmission of these infections is likely to occur through the consumption of such crops. Indian studies, reported by Shuval et al., have shown that sewage farm workers exposed to raw wastewater in areas where Ancylostoma (hookworm) and Ascaris(nematode) infections are endemic have significantly excess levels of infection with these two parasites compared with other agricultural workers in similar occupations.In respect of the health impact of use of wastewater in agriculture, Shuval et al. rank pathogenic agents in the order of priority.

2.8 ENVIRONMENTAL ASSESSMENT OF URBAN WASTEWATER REUSE:

Treatment Alternatives and Applications:

The main function of a Wastewater Treatment Plant is to minimize the environmental impact of discharging untreated water into natural water systems. Wastewater Treatment Plant may get a resource from wastewater carrying out a tertiary treatment on the treated wastewater, which can be reused in non-potable applications. Water reuse strategies are intended to address problem of water scarcity without aggravating other environmental problems, thus reflecting the need of their environmental assessment. Comparison of environmental impact was done of producing one m3 of water for non-potable uses from reclaimed water, potable water and desalinated water sources. The calculation has used the current operating data from a Wastewater Treatment Plant located in the Mediterranean area, although the results can be applied to any other plant with similar technology. The zonation and zonation plus hydrogen peroxide disinfection treatment technologies have similar environmental profiles. Most of the indicators are about 50% higher than the ultraviolet disinfection, except for the acidification (100% higher) and photochemical oxidation (less than 5%). Non-potable uses (both agricultural and urban uses) of reclaimed water have environmental and economic advantages.

2.9 QUALITY ISSUES OF WASTEWATER REUSE

Despite a long history of wastewater reuse in many parts of the world, the question of safety of wastewater reuse remains an enigma mainly because of the quality of reuse water. Public health concern is the major issue in any type of reuse of wastewater, be it for irrigation or non-irrigation utilization, especially long-term impact of reuse practices. It is difficult to delineate acceptable health risks and is a matter that is still hotly debated. Adequate treatment schemes must always be designed to eliminate, or at least minimize the potential risks of disease transmission. Consideration of hydro-geologic conditions helps to compare the reuse water quality and the quality of alternative sources intended for the same kind of use.

2.9.1 Pathogen Survival

Public health concerns center on pathogenic organisms that are or could be present in wastewater in great variety. Survival of pathogens in wastewater and in environmental conditions other than their host organisms (mainly humans) is highly variable. Other water quality parameters of concern in wastewater reuse have been toxic metal accumulation and salinity of wastewater. The availability of heavy metals to plants, their uptake and their accumulation depend on a number of soil, plant and other factors. The soil factors include, soil PH, organic matter content, cation exchange capacity, moisture, temperature and evaporation.

2.10 TREATMENTS OF DOMESTIC WASTE WATER

Sewage can be treated close to where it is created by centralized system. A decentralized system like septic tanks, bio filters or aerobic treatment systems can be collected to municipal treatment plant. Sewage collection and treatment is typically subject to local, state and federal regulations and standards. Industrial sources of sewage often require specialized treatment processes (see Industrial wastewater treatment). Sewage treatment generally involves total three stages, called primary, Secondary and tertiary treatment.

 Primary treatment consists of temporarily holding the sewage in a quiescent Basin where heavy solids can settle to the bottom while oil, grease and lighter Solids float on the surface. The settled and floating materials are removed and the Remaining liquid may be discharged or subjected to secondary treatment.

 Secondary treatment removes the dissolved and suspended biological matter. Indigenous, water-borne microorganisms in a managed habitat typically perform secondary treatment. Secondary treatment may require a separation process to the microorganisms from the treated water prior to discharge or tertiary treatment.

 Tertiary treatment is sometimes defined as anything more than primary and secondary treatment in order to allow the rejection into a highly sensitive Ecosystem (estuaries, low-flow Rivers, coral reefs) Treated water is sometimes Disinfected chemically or physically (for example, by lagoons and microfiltration) Prior to discharge into a stream, river, bay, lagoon or wetland, or it can be used for The irrigation of a golf course, green way or park. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes. [17]

2.11 DISINFECTION

The purpose of disinfection in the treatment of wastewater is to substantially reduce the number of microorganisms in the water to be discharged and back into the environment for the later use of drinking, bathing, irrigation, etc. The effectiveness of disinfection depends on the quality of the water being treated (e.g., cloudiness, PH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time) and the other environmental variables. Cloudy water will be treated less successfully, since solid matter can shield organisms, especially from ultraviolet light or if contact times are low. Generally, short contact times, low doses and high flows all militate against effective disinfection. Common methods of disinfection include ozone, chlorine, ultraviolet light, sodium hypochlorite. Chloramine, which is used for drinking water and it’s not used in the treatment of waste water, because of its persistence EPA, Washington (2004). Chlorination is the most common method for disinfection. One disadvantage is that the chlorination of residual organicmaterial can generate chlorinated-organic compounds that may be carcinogenic or harmful to the environment. Residual chlorine or chloramines may also be capable of chlorinating organic material in the natural aquatic environment. Because residual chlorine is toxic to aquatic species, the treated effluent must also be chemically chlorinated, adding to the complexity and cost of treatment. Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. Because no chemicals are used, treated water has no adverse effect on organisms that later consume it, as may be the case with other methods. UV radiation causes damage to the genetic structure of bacteria, viruses, and other pathogens, making them incapable of reproduction. The key disadvantages of the UV disinfection are the need for frequent lamp maintenance and replacement and the need fora highly treated effluent to ensure that the target microorganisms are not shielded from the UV radiation (i.e., any solids present in the treated effluent may protect micro-organisms from the UV light). In the United Kingdom, UV light is becoming most common means of disinfection because of the concerns about the impacts of chlorine in chlorinating residual organics in the wastewater and in chlorinating organics in the receiving water. Some sewage treatment systems in Canada and the US also use UV light for their effluent water disinfection. Ozone (O3) is generated by passing oxygen (O2) through a high voltage potential resulting in a third oxygen atom becoming attached and forming O3. Ozone is very unstable and reactive and oxidizes most organic material it comes in contact with, thereby destroying many pathogenic microorganisms. Ozone is considered to be safer than chlorine because, unlike chlorine which has to be stored on site (highly poisonous in the event of an accidental release), ozone is generated onsite as needed. Ozonation also produces the fewer disinfection by-products than chlorination. A disadvantage of ozone disinfection is the high cost of the ozone generation equipment and the requirements for special operators.

2.12 SEWAGE TREATMENT IN DEVELOPING COUNTRIES

In many developing countries, the bulk of domestic and industrial wastewater is discharged without any treatment or after primary treatment only. In Latin America about 15% of collected wastewater passes through treatment plants (with varying levels of actual treatment). In Venezuela, a below average country in South America with respect to wastewater treatment, 97 percent of the country’s sewage is discharged raw directly into the environment. In a relatively developed Middle Eastern country such as Iran, the majority of Tehran's population has totally untreated sewage injected to the city’s groundwater. The construction of major parts of the sewage system, collection and treatment, in Tehran is almost complete, and under development, due to be fully completed by the end of 2012. In Isfahan, Iran's third largest city, sewage treatment was started more than 100 years ago. In Israel, about 50 percent of agricultural water usage is provided through the reclaimed sewer water.

2.13 DEVELOPMENT OF ANALYSIS TOOLS FOR SOCIAL ECONOMIC AND ECOLOGICAL EFFECTS OF WATER

A decisive factor to achieve a higher percentage of the water reuse is the establishment of effective incentives, which in many instances will be of either an economic or a regulatory nature. The limiting factor for the water reuse can in many circumstances be the quality of the water available linked to the treatment processes (technology) and potential hazards for secondary users.

Its economic viability needs a careful cost-benefit analysis for various parties involved to be carried out. However, some water reuse implementation projects have failed because some other key factors, such as social awareness or associated ecological effects, were not accounted.

2.13.1 Wastewater Use in Irrigated Agriculture Management Challenges in Developing Countries

Cities in developing countries are experiencing unparalleled growth, rapidly increasing water supply and sanitation coverage, which will continue to release growing volumes of wastewater. In many developing countries, untreated or partially treated wastewater is used to irrigate the cities' own food, fodder, and greens paces. Farmers have been using untreated wastewater for centuries, but greater numbers now depend on it for their livelihoods. The diversity of conditions is perhaps matched only by the complexity of managing the risks to human health and environment that are posed by this practice. An integrated stepwise management approach is called for, one that is pragmatic in the short- and medium terms and that recognizes fundamental economic niche and users' perceptions of the comparative advantages of wastewater irrigation that drive its expansion in urban and peri-urban areas. Comprehensive management approaches in the longer term will need to encompass treatment, regulation and farmer user groups, forward market linkages that ensure food, consumer safety and effective public awareness campaigns.

2.13.2 Waste Water Reuse in India

For ages, the marginalized communities in India have relied on the indirect use of wastewater to grow vegetables, fruits, cereals, flowers, fodder, In recent years, as a result of rapid population growth, massive industrialization and the growing number of cities that dispose of large amounts of sewage into bodies of water, the indirect use of wastewater has increased even further. Most wastewater irrigation, in the peri-urban and rural areas of India, occurs along the rivers that flow through such rapidly growing cities. The Musi River in Hyderabad is one such river, where around 250 households within the city use wastewater directly from drains or from the river to irrigate their lands. One of the latest crises of modernity is water scarcity. It has been established that this crisis is not a true water scarcity problem but a crisis of governance. More recently, wastewater management and use is considered seriously as an integral part of water management policy in many water-scarce countries. Wastewater from point sources, such as the sewage treatment plants and industries, provides an excellent source of reusable water and is usually available on a reliable basis, has a known quality, and can be accessed at a single point. Urban wastewater use reduces the amount of waste discharged into watercourses and hence improves the environment. It also conserves water resources by lowering demand for freshwater withdrawal.

The potential benefits of water recycling, water conservation have been identified as two of the greatest challenges. Most wastewater reuse studies in the past have adopted a scientific and biophysical approach and the dearth of institutional studies using a combination of social, quantitative and qualitative methodologies impedes the formulation of recommendations that could enhance the benefits and ease the concerns of all groups involved with wastewater reuse.

2.13.3 Status of wastewater generation and treatment in India

Urban centers in India lack infrastructure for sanitation and the wastewaters generated are not managed appropriately The Central Pollution Control Board carried Out studies to assess the status of wastewater generation and treatment in Class I cities (population > 100,000) and Class II towns (population between 50,000 and 100,000) During 1978-79, 1989-90, 1994-95 and 2003-04. The latest study indicates that about26 254 million liters per day (Ml/d) of wastewater are generated in the 921 Class I cities and Class II towns in India (housing more than 70% of urban population). There is urgent need to plan strategies and give thrust to policies giving equal weighting to augmentation of water supplied and development of wastewater treatment facilities. The future of urban, as the treated wastewater of upstream urban centres will be the source of water for downstream cities [189,191]. In India, because of rapid population growth and massive industrialization, the growing number of cities as well as large amounts of sewage is disposed into bodies of water. According to UNDP's World Water Development Report (2003), 70 percent of industrial wastes in developing countries are dumped into waters without treatment, polluting the usable water supply. Over the past two decades, wastewater use in agriculture has increased significantly. With the growing population and increased industrial use of water, use of wastewater for irrigation is going to increase even further. However, these unregulated wastewater irrigation practices reveal a range of associated problems that outweigh the benefits. This highlights the failures of Policies and lack of agricultural extension services.

2.13.4 Waste Water Reuse in Major Cities

Wastewater reuse is already in consideration. Following are some references for reuse of wastewater in India.

Bengaluru

With a population of 5,686,000, Bangalore is India's fifth largest city. As per estimates of the Bengaluru Water Supply and Sewerage Board (BWSSB), the total demand of water is 840 million liters per day (MLD) (assuming a population of 6 million and a supply rate of 140 liters per capita per day [lPCD]). The demand works out to be 1200 MLD, at standard rate of 200-lpcd set by the Bureau of Indian Standards (BIS) for water. According to the latest census, India's population is about 1020 million, which is projected to go up to 1333 million by AD 2025 and further to 1640 million by AD 2050. It is projected that per capita water availability in India may reduce to about 1200 m^3/year by 2047.

2.14 WATER SCENARIO IN INDIA

India is the second country in the world having the highest amount of precipitation. In our Country 85% of water is used for farming, 10% for industry and 5% for domestic use. The competition between these is increasing day by day. Due to increasing population and pollution due to human activity, the supply of water is reducing. As per the World Water Institute, India will be a highly water stressed country from year 2020 onwards. The meaning of water stress is that less than 1000 cubic meter of water will be available per person per annum (water scenario in India proceedings of Tomboy symposium on desalination and water reuse, 2007). On an average the rainfall received in our country is 1200 mm, with maximum of 1100 mm in Cherrapunji and the minimum average rainfall in West Rajasthan of @ 250-300mm.The urban water supply and sanitation sector in the country is suffering from inadequate levels of service, an increasing demand-supply gap, poor sanitary conditions, deteriorating financial and technical performance. According to Central Public Health Engineering Organization (CPHEEO) estimates, as on 31stMarch, 2000, 88 per cent of urban population has access to a potable water supply. But this supply is highly erratic and unreliable.

2.14.1 Indian Water Technology Systems

In most of the cities, centralized water supply systems depend on surface water sources like rivers and lakes. Chennai, for instance, has to bring in water from a distance of 200 km whereas Bangalore gets its water from the Cauvery River, which is only 95 km away. Where surface water sources fail to meet the rising demand, groundwater reserves are being tapped, often to unsustainable levels. Delhi: The nation’s capital is perpetually in the grip of a water crisis; more do during the dry season, when the situation gets particularly worse. As demand-supply gap widens, more groundwater is being exploited. Of the water supplied by the municipality, approximately 11 per cent comes from the groundwater reserves and remaining from the Yamuna River. It is, however, difficult to establish the total quantity of groundwater extracted because of a large number of tube wells (owned by individuals, industries and bottled water companies) remain unregistered. The main sources of public water supply in the city are the three reservoirs – Pound, Red hills and Cholavaram – with an aggregate storage capacity of 175 MCM. Even when the reservoirs are not full, they get inflows from intermittent rains. On the other hand, losses due to the process of evaporation from the reservoirs result in the effective availability being lower than the storage.

2.15 STEPS TO MEET WATER REQUIREMENTS

Following are the steps to meet water requirement.

- Educate to change consumption and lifestyles
- Invent new water conservation technologies
- Recycle the wastewater
- Improve irrigation and agricultural practices
- Appropriately price the water
- Develop energy efficient desalination plants
- Improve water catchment and harvesting
- Look to community-based governance and partnerships

CHAPTER 3

CONSTRUCTION

3.1 COMPONENTS USED:

1. Dosage tank or mixing tank
2. Filtration tank 1&2
3. Collecting tank
4. Sludge collecting tank
5. Filtration materials
6. Pipes, Valves & Connectors
7. Motors with Automatic level controller.

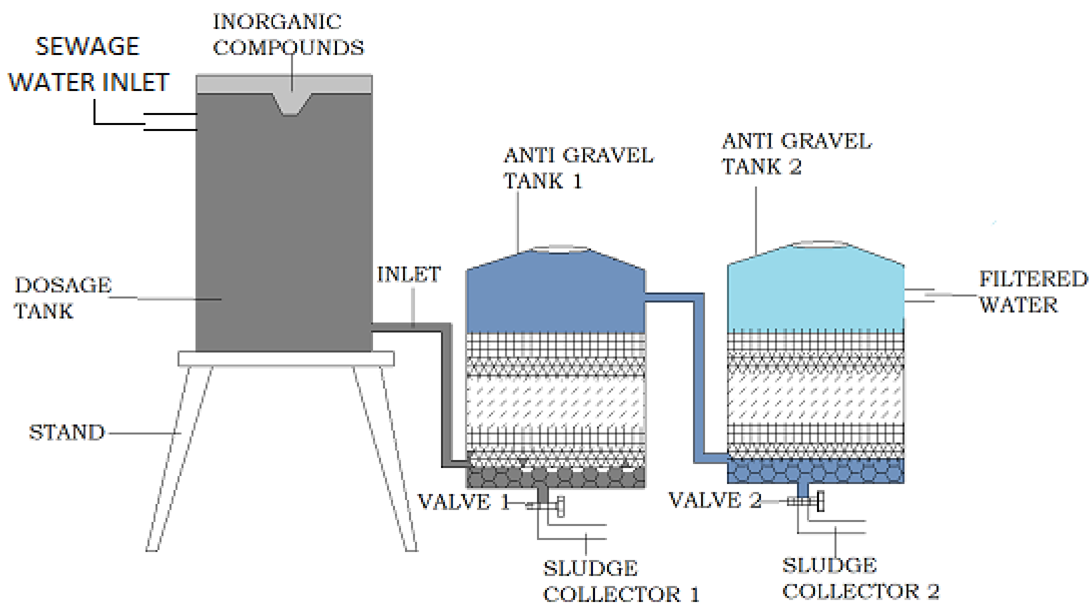


Fig.3.1 schematic representation of STP

1. Dosage and collecting Tank:

The water that needs to be treated is directed from the sewage into this tank that has a capacity of 1000 liters, once a certain
volume of water is collected the necessary chemicals and are added based on the pre-calculated ratio. A mixer is provided in order to help distribute the agents mixed evenly all throughout the tank. After some time, the sewage water and chemicals mixed evenly and the heavier particles settle down at the bottom of the tank. The outlet water valve is opened manually the water enter to the filtration tank at a constant rate of flow.

Dimensions of the tank:
Length-1200mm
Breadth-1200mm
Height-1400mm
Diameter of the outlet- 2 inch

Fig.3.2 Dosage and storage tank

2. Antigravity Filter Tank 1 & 2:

The antigravity filtration is the water flowing bottom to top. In this tank different layers of filter materials used like river sand and coarse aggregate, at the bottom of the tank small slit is provided to collect the sludge due to the water flowing in antigravity way the heavier particles settle down. After that the water flowing in filter media 80% of particles filtered in tank 1 and remaining 20% of particles filtered at the filtration tank 2. In this tank different layers of filter materials used, the layers shown in fig (3.1). After 5 to 6 batches of water filtered the sludge is collected at the bottom of the tank and back wash should be done to cleaning the filtration tanks for next use.

3. Collecting tank: The tank used for storing the filtered water and this water used for gardening, flushing purpose, car washing etc.

4. Sludge collecting tank: this tank used for collecting the sludge coming from filtration tank 1&2. This thick sludge used as a partial replacement in making of cement paver blocks, these blocks good strength and used in parking lots, footpaths, walkways etc.

5. Filtration materials: the materials used in the filtration tank such as river sand and coarse aggregates. The river sand size should be in 600 microns to 2.36mm. the sand should be free from clay particles, dust, organic waste. The sand should be cleaned using water. Also coarse aggregate cleaned and removed from the dust particles, the aggregate size should be in range of 4.75mm to 12mm. these materials laid in layer by layer, at the bottom the coarse aggregate layer thickness should 0.2m above that the sand layer thickness of 0.3mm and the last layer is coarse layer 0.1mm thick to control the out flow of sand particles, the layers should be same in both the tanks.

Fig.3.5 Coarse Aggregate **Fig.3.6 Fine Aggregate**

6. Pipes, Valves & Connectors: The pipes are used for flow of water throughout the system, we used cpvc pipes , Ball valves, L bows ,collars etc.

7. Motors with Automatic level controller: The water level indicator is defined as a system which gets the information about the water level in tank . By using the water level indicator we can overcome the overflow of water from the tankers automatically without human intervention.

Fig.3.8 Water Level controller **Fig.3.9 2 HP & 1HP Motor**

3.2 ADDITIONAL EQUIPMENTS FOR PROCESS SIMPLIFICATION

We can use programming language to automate and simply our process through microcontroller.

1. Arduino mega board

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years, Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for Iota applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Specification:
Uses Atmel ATmega2560 Microcontroller
- Operating Voltage: 12V
- Digital I/O Pins: 54 (15 pins provide PWM output)
- Analog Input Pins: 16
- CH340 for USB Communication

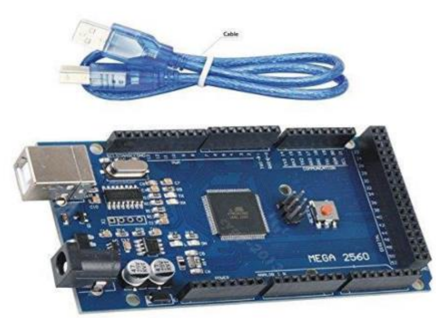


Fig.3.10 Arduino mega board

2. Solder fewer breadboards: The purpose of this activity is to familiarize the reader with solder-less breadboards. A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted. The holes are most commonly spaced 0.1“apart to accommodate standard DIP components.

A typical breadboard that includes top and bottom power distribution rails is shown below:

Specifications

- Solder less Breadboard
- Terminal Strips 630PTS
- Distribution Strips 200pts
- ABS housing
- Completely reusable

Fig.3.11 Solder fewer breadboards

3. Voltage Regulator 7805: All voltage sources cannot able to give fixed output due to fluctuations in the circuit. For getting constant and steady output, the voltage regulators are implemented. The integrated circuits, which are used for the regulation of voltage, are termed as voltage regulator ICs. Here, we can discuss about IC 7805. The voltage regulator IC 7805 is actually a member of 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is 12V DC regulated power supply. This regulator IC also adds a provision for a heat sink. The input voltage to this voltage regulator can be up to 35V, and this IC can give a constant 12V for any value of input less than or equal to 35V, which is the threshold limit.

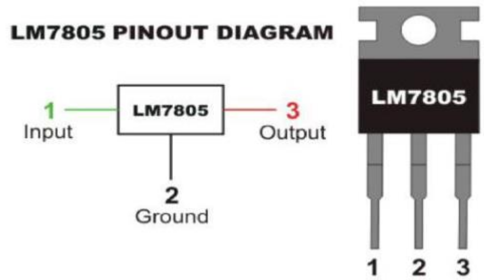


Fig 3.12 Voltage Regulator 7805

4. Adraxx HC-SR04 Ultrasonic/Sonar Distance Measuring Sensor:

The HC-SR04 ultrasonic sensor uses sonar to measure distance to an object. It offers excellent range accuracy and stable readings in an easy-to-use package. It operation is not affected by sunlight or black material like Sharp range finders are (soft materials like cloth can be difficult to detect).

Module main technical parameters:

- Working Voltage: 12V(DC)
- Static current: Less than 2mA.
- Output signal, Electric frequency signal, high level 12V, low level 0V.
- Sensor angle: Not more than 15 degrees.
- Detection distance: 2cm-450cm.
- High precision: Up to 0.3cm
- Input trigger signal: 10us TTL impulse
- Echo signal: output TTL PWL signal Mode of connection: 1.VCC 2. trig (T) 3. echo(R) 4.GND

the basic operation principle is below: use IO port TRIG to trigger ranging. It needs 10 us high level signal at least Module will send eight 40 kHz square wave automatically, and will test if there is any signal returned. If there is signal returned, output will be high level signal via IO port ECHO. The duration of the high level signal is the time from transmitter to receiving with the ultrasonic.

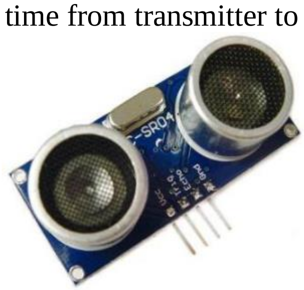


Fig.3.13 Adraxx HC-SR04 Ultrasonic/Sonar Distance Measuring Sensor

5. 12V DC adopter: An DC adapter or DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Other common names include plug pack, plug-in adapter, adapter block, domestic mains adapter, line power adapter, wall wart, power brick, and power adapter. Adapters for battery-powered equipment may be described as chargers or rechargers (see also battery charger). AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from mains power. The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply. External power supplies are used both with equipment with no other source of power and with battery-powered equipment, where the supply, when plugged in, can sometimes charge the battery in addition to powering the equipment.

Fig.3.14 12v dc adopter

CHAPTER 4

WORKING

Antigravity gravel based filtration comprises of different layers of coarse aggregate and fine aggregate (River sand). It consists of mainly three valves i.e. inlet valve, outlet valve and backwash/sludge collecting valve.

Sewage water from Sewage tank is pumped to Dosage using water level controller system, which sense the level of water present in both tank, There are two motors used in the process, once the water from tank is started to fill Dosage tank through motor 1, the second motor 2 will start to run when the dosage tank attains 25% of sewage water ,Now the required inorganic compounds which are used to remove unwanted minerals and helps in treating the sewage water, the main function of motor 2 is to mix these inorganic compounds with sewage water , then both motors will shut down automatically when the water get filled to highest level. Now the valve connected to dosage tank is opened slowly allowing the sewage water to flow to the following antigravity gravel based filters, Here the water is allowed to flow into tank from Bottom to Top i.e., against the gravity.

This Antigravity gravel based filters comprises layer of 30-40 mm coarse aggregate/gravel ,15-18 mm coarse aggregate /gravel, on top of it, 8- 12 mm coarse Aggregate/gravel, on top it 4-6 mm coarse aggregate, on top of it river sand and on it 4-6 mm of coarse aggregate/gravel and the final layer 8-12 mm coarse aggregate/gravel. So basically here the sand layer is sandwiched between the coarse aggregate and which is whole responsible for the micron level filtration of sewage sludge. Once the sewage water starts to flow in antigravity fashion through these layers, almost all the solid particles, unwanted small particles will get stuck in between the gravel and sand, and following to next step, this treated water is floated up in the filter tank, this is passed through the next filter tank which contain same layers of gravel and sand, this is done because for secondary level of purification to encounter the particles missed in filter tank 1. Now the water coming out of this filter tank-2 is subjected to analysis and found to be suitable for secondary water usage, such as gardening, Domestic use etc.

The sewage sludge that is settled down at bottom in these filtration tanks is collected from the backwash valve/sludge collecting valve. After several trails run the filter tanks are backwashed by allowing the water to flow from top to bottom where the dust or solid particles stuck in layers of gravel and sand are removed, and these layers will be washed simultaneously, here to the inlet valve and backwash valve an inlet mesh and backwash valve mesh is covered respectively. These mesh prevents the back flow of aggregate which can block the valve.

The Solid sludge collected from the system, the initial focus is for utilization of sludge generated from our process for making bricks.

The two approaches we followed for brick making are conventional Cement concrete and the second is geopolymer concrete. In general, we felt the paver block applications are most suitable and for utilization of sewage sludge and these blocks contain large usage in market and hence large consumption.

CHAPTER 5

DESIGN AND CALCULATIONS

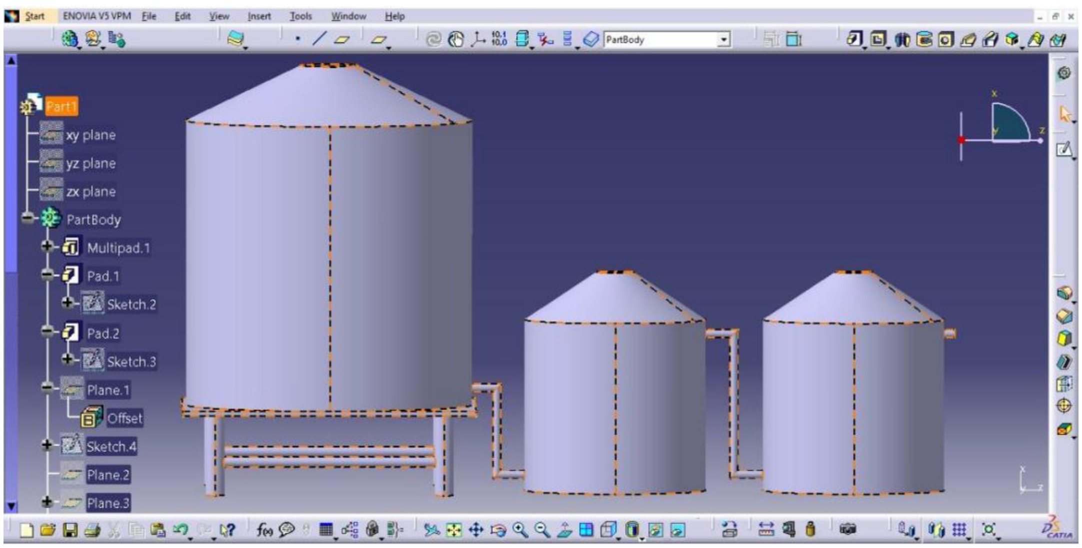


Fig.4.1 Right side view of Setup

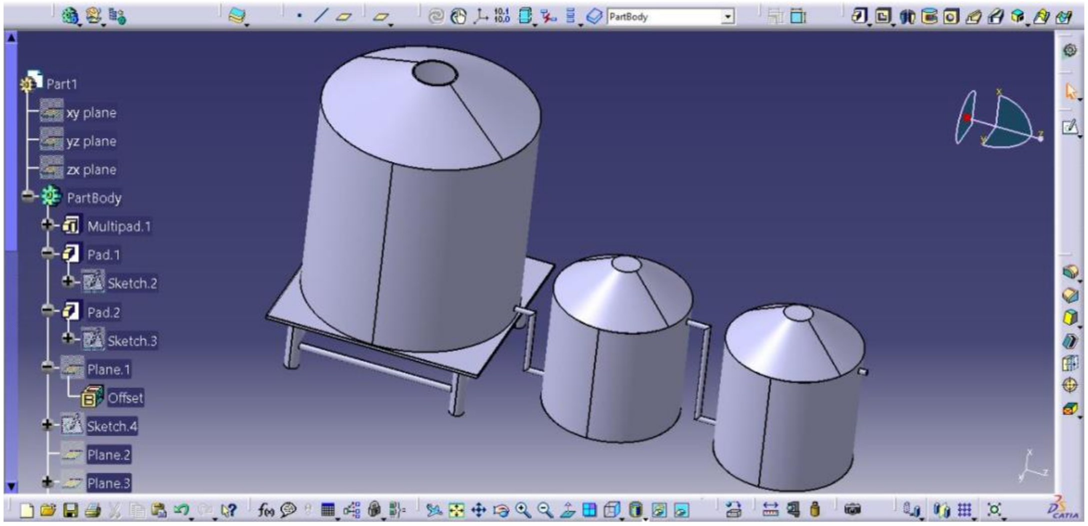


Fig.4.2 Top view of Setup

Apartment population Forecasting:

1. Number of houses in apartment = 60 (5 blocks,4 floors, Each floor 3 houses)

2. One person = 135lit/day (Indian standards) (75%waste)135*0.75=101.25litres

3. Sewage collected per day = 101.25*4*60 = 24300 liters/day

4. Quantity of sewage = (24300)/ (60*60*60*1000) = 0.001125m^3/sec

5. Maximum sewage discharge = 3*Quantity of sewage = 3*0.001125=0.003375

=0.33 MLD (1m^3/sec = 86.4 MLD)

Main Plant capacities:

1. Dosage tank = 2000litres

2. Processing tank = 1000+1000litres

3. Total space available = 5meters

Mechanical parameters used

1. Q_1 - Discharge of dosage tank in litre

2. Q2 – Discharge from main tank to processing tank in litre

3. V1 – Flow velocity of water to collect dosage tank in(m/s)

4. V2 – Flow velocity of water to collect processing tank in(m/s)

5. D – Diameter in meter

6. H – Height in meter

Design based on discharge calculation:

Q_1 = 25000litres/day
=25000/24 = 1041.66 liters/hr
=0.2893 liters/sec
$Q_1 = A_1*V_1$
=3.142/4*$(0.1018)^2$xV1
=35.58/60*60 = 0.009878litres/sec
$Q_2 = A_2*V_2$

9.8782 =3.14/4$(0.1.018)^2$xV_2
V2 = 12158.075m/s

Plant Geometry:

1. Processing tank area – 14400 cm^2 (1.2m*1.2m)
2. Filtration tank 1&2 area – 8147.26cm^2 (101.8cm dia)
3. Total setup area – 87500 cm^2
4. Total plant height – 3meters

Data collected:

- Peak flow = 25000 liters/day
- Avg. flow = 6000 liters/day
- Pipes of 2 inches are used.
- 1000 liters' pf water processed per hour.
- Antigravity coarse aggregate and river sand is enough to stuck the solid content.

CHAPTER 6

FABRICATION

To make fabrication we made discussion with outside fabricators and Guide to clear our doubts about prototype model fabrication, following are the some of the pictures during fabrication of the modal.

Fig 5.1: the filtration layers in the tank

Fig 5.2: Team working on the setup

Fig 5.3 : 2 HP Motor

Fig 5.4 : Sewage water collected

CHAPTER 7
RESULTS AND DISCUSSION

Through this project, we got filtered sewage water at economical cost, the water which we got filtered was approved by government board, and given approval that, this water is good for domestic purpose.

EXPECTED OUTCOME

• Through this research, we intend to purify polluted water bodies without using expensive and sophisticated equipment.

• Through this plant we can filter one liter of sewage water at cheaper price.

• Installation and maintains cost of equipment is very less compare to present available STP

DISCUSSIONS

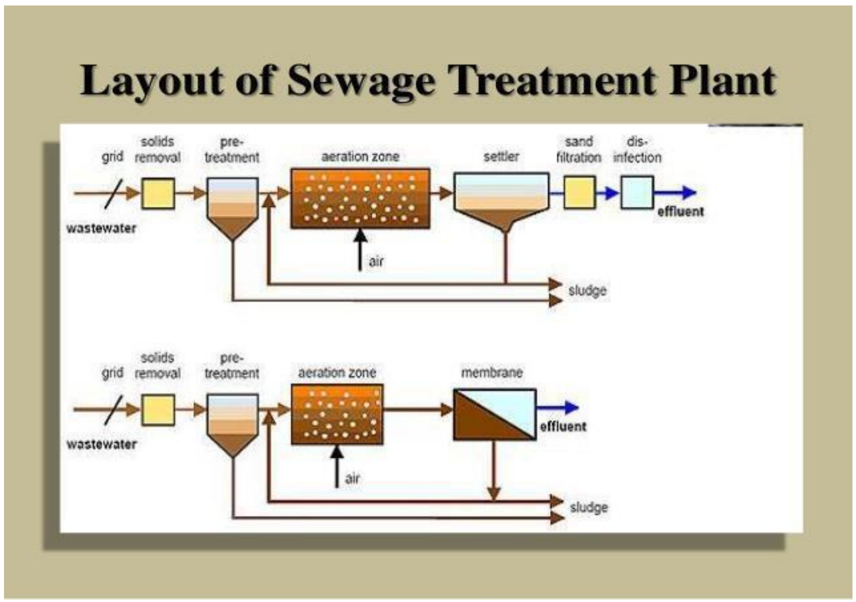
At end stage of this project we made discussion, about how to increase the capacity of plant and make it fully automated for uninterruptible process, and to help the society in water scarcity problem, and now a day's government also encouraging people to adopt STP, due to this government policies we expecting our plants to be implemented in all areas, we made many discussion with experts to know what actually society needs and what their demand, in implementing STP'S in their houses, due to all our efforts we are hoping our work on project will give good result in developing countries.

Table.6.1 Comparing Available STP and Our STP

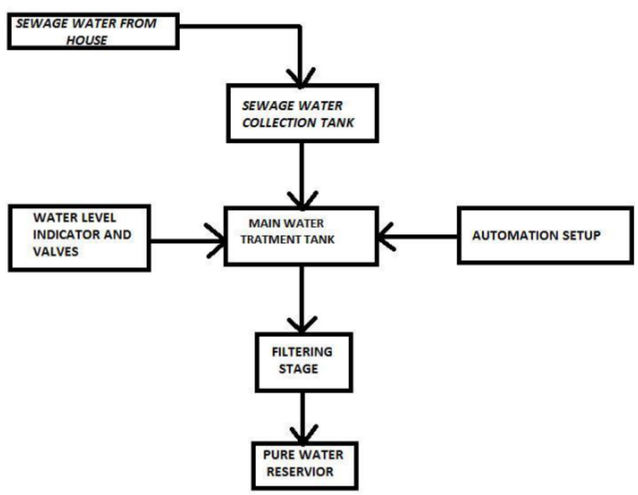
PRESENT AVAILABLE STP	OUR STP
More time for filtration	Less time for filtration
Plant works using pumps	plant works using antigravity
Maintenance is high	Comparatively less Maintenance
Complex in design	Simple in design
Installing cost is high	Installing cost is low

7.1 COMPARSION OF PRESENT AVAILABLE STP AND OUR STP

1. PRESENT AVAILABLE STP



2. **OUR STP**



7.2 GRAPHS BASED ON CALCULATION

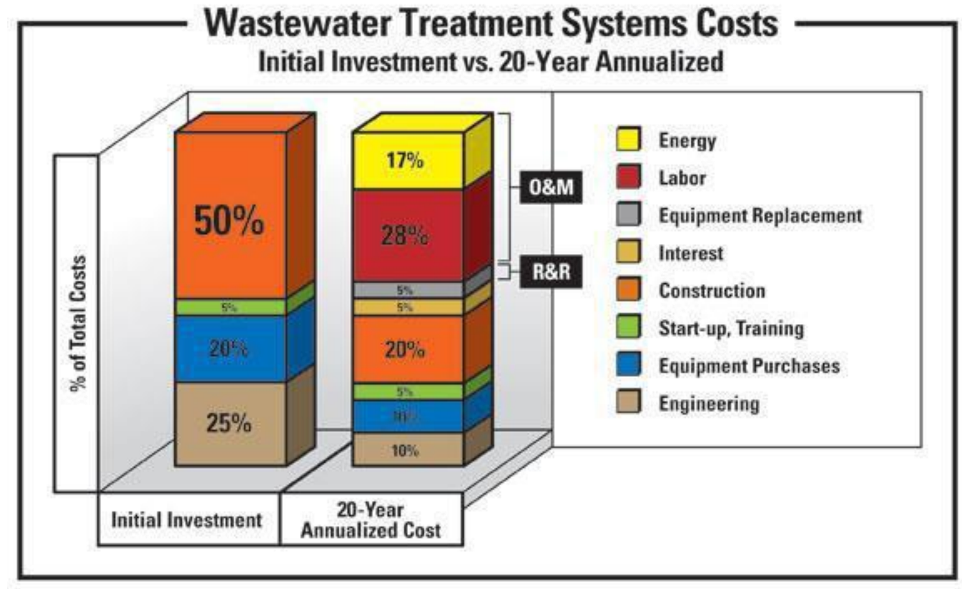
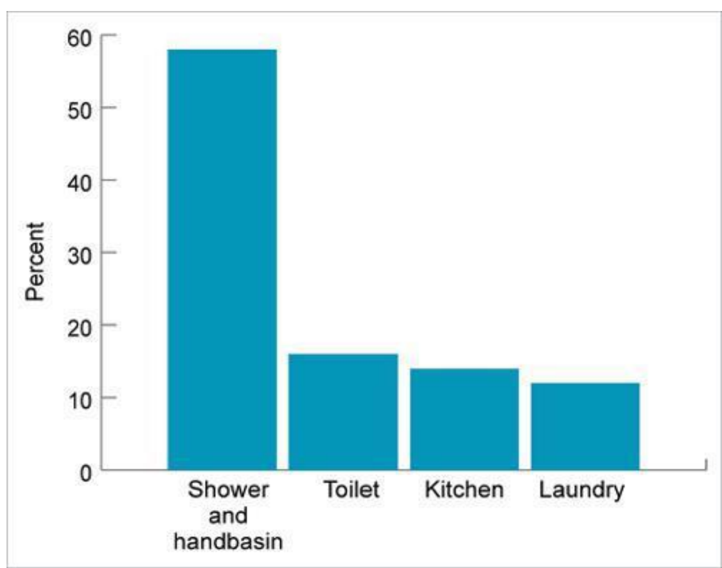


Fig.6.3 Bar graph

REGULAR COLLECTION OF SEWAGE WATER IN HOUSE



Advantages of STP

1. Completely maintenance free
2. High efficiency cleaning.
3. Low operating costs.
4. High quality treated water.
5. Operation without odor and noise.
6. Long life wastewater treatment plant.
7. Simple installation.

Dis-advantages of STP

1. Public Perception.
2. Health Concerns.
3. Cost increases

Applications

1. Domestic purposes we can use this water.
2. Gardening.
3. Etc.

CHAPTER 8

CONCLUSION

This project work as provided as an excellent opportunity and experience, to use our limited knowledge. We gained a lot of knowledge regarding, planning, purchasing, assembling, and machining, while doing this project work. we feel that the project work is good solution to build the gates between the institution and industries.

The outcome of this project is to decrease the time required for filtering water and even to minimize the labor cost and power. The use of automated plant is to reduce the time for water filtration and will reduce the need of human labor. The cost of human labor is more when compared to automated plant on a long-term basis. It is mainly helpful for small and medium sized houses. For industrial purpose, large capacity plant requires.

We are proud that we have completed the work with the limited time successfully. The **Design and Development of Semi-Automated In-House Water Treatment Plant of 10KLD Capacity** is working with satisfactory condition. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities.

Design and Development of Semi-Automated In-House Water Treatment Plant of 25KLD Capacity

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