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Design of Sewage Treatment Plant by Act Method

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Abstract: Baran city is located at 24025' North latitude and 76012' east longitude and 262M above MSL. Being located on South East corner of Rajasthan and it is adjacent to Shivpuri and Guna districts of Madhya Pradesh. The land slopes gently northward from the high table land of Malwa in Madhya Pradesh [7].

The population of City is 78,665 souls as per Census 2001 and it will be increased by 178000 till 2035.there will be an increase not only economically but also there will be rise in population along with infrastructural works So there is a basic need of construction of a Sewage Treatment Plant with a view of sufficient capacity to treat the sewage. A sewage treatment plant is quite necessary to receive the domestic and household waste and thus removing the materials which creates harms for general public.

Its basic aim or objective is to produce an environmental safe atmosphere by treated effluent or sludge which will be suitable for disposal or reuse.

The project mainly deals with design of STP and its stages or components which are responsible for the sewage treatment like screening, grit chamber, skimming tank, sedimentation tank, secondary clarifier, activated sludge tank and sludge drying beds. The projects covers the various dimensions of components such as which would cover an approximate population of 178000 for a maximum period of time. By the execution of the project the entire sewage of the proposed area can be treated effectively and efficiently.

Keywords: Benefit, Need to Study, Plant Design, study, Treatment Process, etc.

I. INTRODUCTION

Water is most important part of development of any activity in the world. Due to the increment in population, using of water resources is more and availability is less. due to increase population day by day citizens face many environmental problems because sewage treatment plant of Baran constructed in 1994 it's been 25 year so that district need new treatment plant and its not sufficient to clear all discharge coming from households' industries commercial palaces and public palaces, so we need to design new treatment plant by the using of new technologies so that its decrease in air pollution and treat all sewages from city. It includes screening to stop solid objects and sedimentation by gravity to remove suspended solids. This level is used to as "Mechanical Treatment" although chemicals are often used to accelerate the sedimentation process.

Primary treatment can decrease the BOD of the wastewater by 20-30% and the TDS by some 50-60%. Primary treatment is the first stage of sewage treatment.

The secondary treatment removes the dissolved organic matter that escapes primary treatment. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. It requires a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.

Tertiary treatment is sometimes is defined as anything more than primary and secondary treatment in order to allow ejection into a highly sensitive or fragile ecosystem. Tertiary treatment can remove more than 99% of all the impurities from sewage, producing an effluent of almost drinking water quality. Treated water is sometimes disinfected chemically or physically prior to discharge into a stream, river or wetland.

II. NEED TO STUDY

Baran districts in way to developing and due to increase population day by day citizens face many environmental problems because sewage treatment plant of Baran constructed in 1994 its been 25 year so that district need new treatment plant and its not sufficient to clear all discharge coming from households industries commercial palaces and public palaces, so we need to design new treatment plant by the using of new technologies so that its decrease in air pollution and treat all sewages from city

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III. TREATMENT PROCESS [6]

The treatment of sewage is one of the important measures, which aims in the removal of BOD, phosphorous, nitrogen, solids and bacteria.

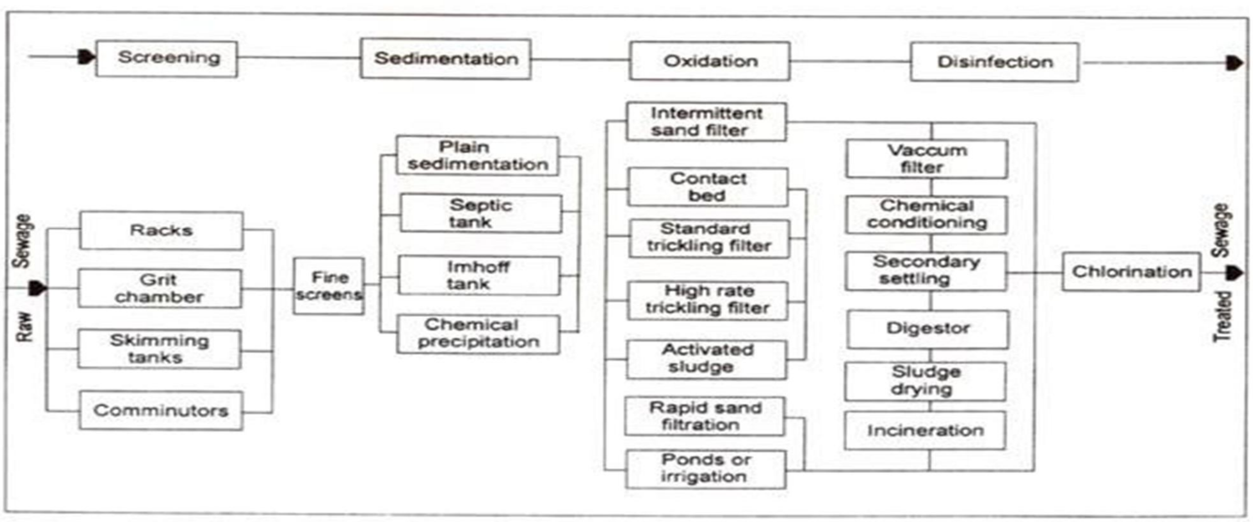
A. Primary Treatment

Primary treatment consists of removing floating and suspended solids by mechanical means. More than half of the suspended solids can be removed by primary treatment

In this process, first, the large solids are screened out and grease and scum are removed. Screening is done through metal bars first spaced 25 to 50 mm apart and may range down to 0.8 mm openings. Sand and other coarse material is removed by grit chambers. After screening and removal of grit, the waste water is run directly into settling or sedimentation tanks, the process by which the suspended solids are removed by gravitational setting.

Primary sludge is a problem because it is bulky and must be removed. It also contains 94 to 99 per cent water. In some cases, sludge is dried in beds with some water removed by filtration. A report of the American Chemical Society indicates that primary treatment reduces 60 per cent suspended solids, 35 per cent BOD, 30 per cent COD (Chemical Oxygen Demand), 20 per cent nitrogen and 10 per cent phosphorus.

Figure 8.3
Sewage Treatment Process



B. Secondary Treatment

Secondary treatment of waste involves the biological degradation of organic material by micro-organisms under controlled conditions.

The usual method is to bring about the biological oxidation of the organic material under aerobic conditions, in which the waste is aerated to supply oxygen for the micro-organisms. The degraded material settles out in secondary settling tanks and afterwards removed by sedimentation. The clarified waste water is discharged in the outfalls to rivers, lakes or oceans

C. Tertiary Treatment

Tertiary treatment aims at further purification of waste water and also for its recycling.

The number of methods used for tertiary treatment is:

1) Chemical coagulation and
2) filtration,
3) Adsorption
4) Chemical oxidation.
5) Desalination, and
6) Oxidation ponds.

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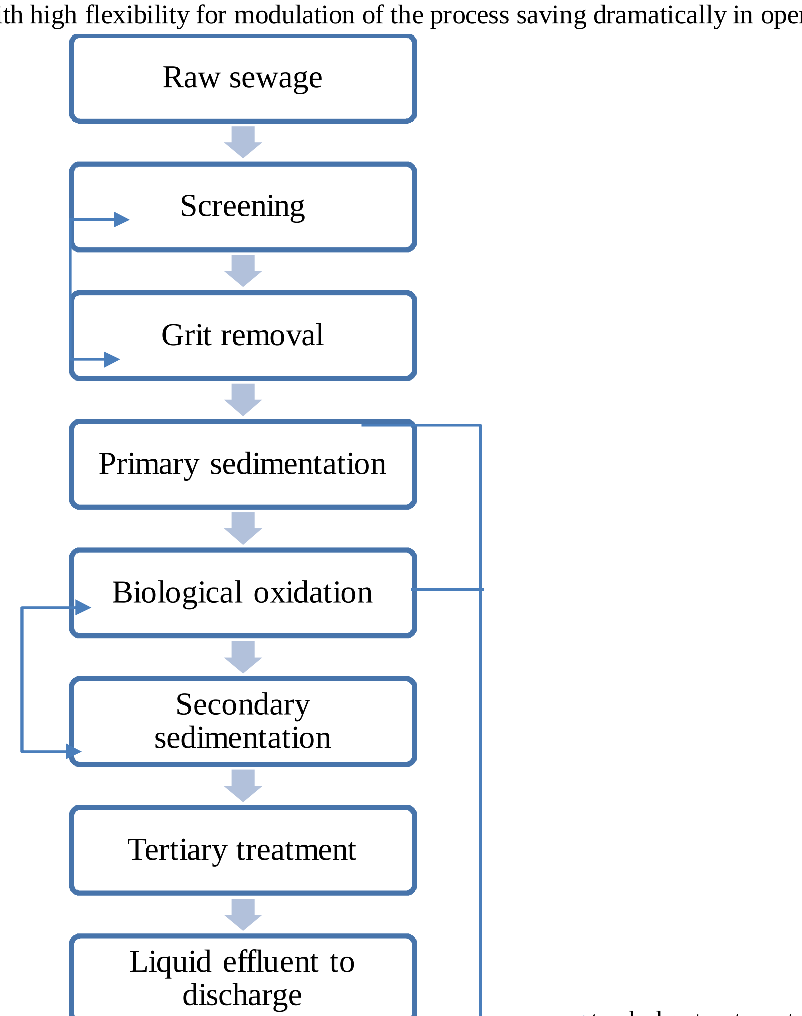
However, there is a growing need for advanced procedures that will provide a product capable of being reused for various purposes. The recycled waste water can be used for irrigation, mainly for non-food crops such as grasslands, lawns, play grounds, etc. The renovation of waste water to a quality that would permit its reuse for a variety of purposes is a major objective of current research in this field.

D. Automated Chemostat Treatment™ (ACT) 1

Automated Chemostat Treatment is a novel method in the treatment of sludge. Given below is a brief description of this treatment.
Automated Chemostat Treatment™ (ACT) Overcomes Sludge Disposal and Handling Problems
BPC has pioneered a new, powerful, ecological solution for a range of waste water treatment challenges: ACT – Automated Chemostat Treatment™. The process is flexible and easy to integrate, fully automated, controllable and significantly more efficient than current practices. The results are a virtually sludge-free output of water which can be returned directly into the environment or processed further.
The Innovative Concept: Automated Chemostat Treatment™ (ACT)
The scientific concepts behind ACT are the application of an appropriate bacterial cocktail for a given type of polluted water, and an innovative chemo state. The process is maintained in a balanced state of bacterial growth and organic compound degradation. Because of the low concentration of bacterial cells, no aggregates are formed, and each bacterium acts as a single cell which increases the surface available for the process and enables biodegradation at a much higher efficiency. The BPC-ACT™ operates as a continuous flow reactor without using activated sludge. The bioreactor can thus be applied on site while using available infrastructure with high flexibility for modulation of the process saving dramatically in operational and maintenance costs.



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IV. RESULT AND DISCUSSIONS

Parameters	Inlet	Outlet
pH	7.8	7.4
COD	901 mg/l	182 mg/l
BOD	603 mg/l	26 mg/l
OIL AND GREASE	24±5 mg/l	7±3 mg/l
TSS	245 mg/l	80 mg/l
TDS	3300 mg/l	2500 mg/l

A. Operating Parameters of CETP

1) *Total Suspended Solid:* Inlet total suspended solid lies between 220 mg/l to 260 mg/l. Outlet chemical oxygen demand varies between 75 mg/l to 90 mg/l.
2) *Total Dissolve Solid:* Inlet Total Dissolve Solid varies between 3000 mg/l to 3300 mg/l. Outlet chemical oxygen demand varies between 2200 mg/l to 2700 mg/l.
3) *pH:* Inlet pH data lie between 7.9 to 6.2. Outlet pH data lie between 7.5 to 7.00. Industries use alkaline base solutions for their process therefore there are variations in inlet pH. Also various chemicals like caustic soda, hypochlorite's etc. are used for processes like bleaching, scouring in textile industries that also cause variations in inlet pH.
4) *Biochemical Oxygen Demand:* Inlet biochemical oxygen demand varies between 500 mg/l to 650 mg/l. Outlet COD varies between 18 mg/l to 25mg/l.
5) *Chemical Oxygen Demand:* Inlet chemical oxygen demand varies between 800 mg/l to 1600mg/l. Outlet chemical oxygen demand varies between 65 mg/l to 200mg/variations in inlet chemical oxygen demand is due to the chemical consumption of industries is varies according to their process requirement.
6) *Oil and Grease:* Inlet oil and grease value varies between 26 mg/l to 18 mg/l. Outlet oil and grease value is <10 mg/l. Oil consumption of industries is varying according to their process requirement therefore there are variations in inlet oil and grease value.

DESIGN PERAMETER	DESIGN VALUES	STANDARD VALUES
Dimension of screen	Width = 8mm Depth = 50mm Bars = 6mm Spacing = 36mm	Width = 6mm – 20mm Depth = 30mm – 80mm Bars = 6mm – 12mm Spacing = 6mm – 40mm
Grit chamber	Numbers = 1 Length = 15m Width = 1.5m Depth = 1m	Length = 7.5m - 20m Width = 1m - 7m Depth = 1m - 5m
Skimming tank	Length = 0.83m Width = 0.8m Depth = 1m	Length = 0.6m – 1.2m Width = 0.5m – 1m Depth = 1m -1.5m
Sedimentation tank	Length = 76m Width = 18m Depth = 4m Free board = 0.5m	Length = 90m (max) Width = 30m (max) Depth = 2m (min) Free board = 0.6m (max)
Trickling filter	Dia = 41.5m Depth = 1.8m	Dia = 30m - 60m Depth = 1.2m - 1.8m
Aeration tank	Numbers = 10 Length = 85m Width = 10m Depth = 3.6m	Length = 30m – 100m Width = 5m – 10m Depth = 3m – 4.5m
Sludge drying beds	Length =30.3m Width = 15m Depth =0.5m	Length =30 m-45m Width = 6m -15m Depth =0.5 m

V. BENEFITS

A. Automated chemo state treatment easy process to decrease chemical usage and bio sludge and as well as decrease black sludge creation.

B. Act's compatible and modularity start to manage low and high capacities and contamination, to be used for fresh and salt water as well as to be easy modify and increase capacities.

C. Output is imaginary sludge-free.

D. This trailblazing “green” process is simple to modify and can be used in different sites, including oil refineries, oil storing farms, drilling sites

E. Full control on every point by automatically

F. The fully self-working system is comprised of a variety of on-line sensors which feed the control unit data on various parameters such as: TPH, and temperature, dissolved oxygen nitrogen, TOC and temperature. The controller ensures to maintain optimum process balance between the flow rate, bacterial growth, additives and organic compound degradation.

VI. CONCLUSION

A. The project deal with all design aspects to be used in designing.

B. The design has been done for expected population of 25 years (2011-2036).

C. Although the project design and the information helps in DESIGN OF SEWAGE TREATMENT PLANT in future.

D. The sewage treatment plant is designed perfectly to reach the needs and demands of appropriate 178265 population with a very large time period.

E. The treated waste water is further used in field of agriculture in irrigation, fire shield, industrial and commercial buildings and if it is sufficiently clean, it can be used for ground water recharge.

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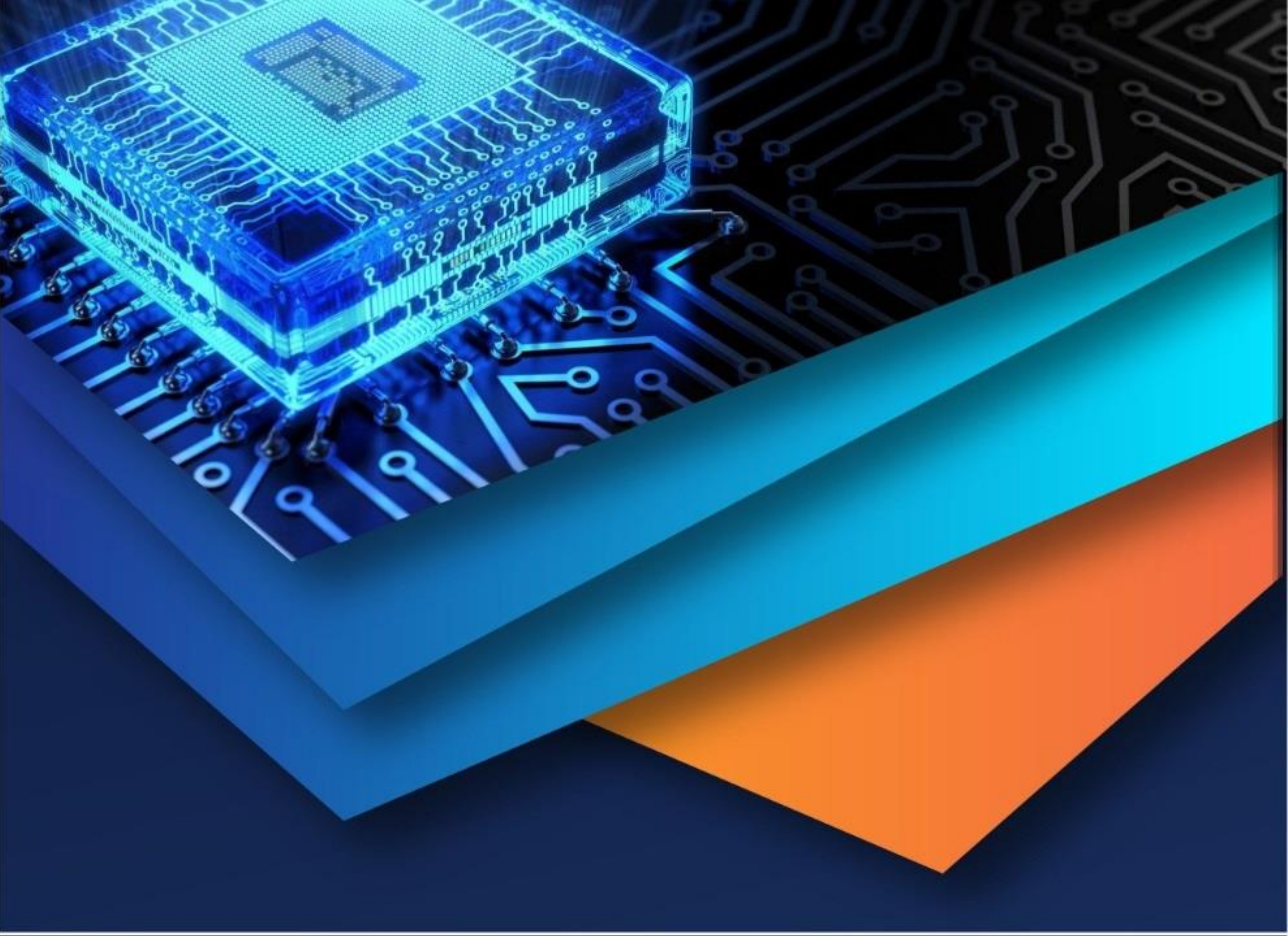

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