PROCESS DESIGN AND HYDRAULIC PROFILING OF SEWAGE TREATMENT PLANTS

A GUIDE TO DESIGN

Dr S N TIRTHAKAR

PUBLISHERS

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Process Design and Hydraulic Profiling of Sewage Treatment Plants

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FIRST EDITION

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Table of Contents

Preface

Acknowledgement

	2.5.2 Physical Unit Operation	
	2.5.3 Biological Unit Processes	
	2.5.4 Process selection and design of Process Flow Sheets	
	2.5.5 Land and Power Requirement	
	2.5.6 Treatment plant capacity	
	2.5.7 Selection of a Treatment System	
	2.5.8 Functions of Treatment Units	
	2.5 9 Design Period	
	2.5.10 Estimation of Sanitary Sewage and Design flows	
	2.5.11 Flow variations	
	2.5.12 Flow Ratios	
	2.5.13 Sizing of Treatment Units	
	2.5.14 Flow Equalization	
	2.5.15 Capacity of Equalisation Tank	
	2.6 Biological waste water treatment: Principles	
	2.6.1 Sewage Treatment: Rate of Reaction	
	2.6.2 Basic kinetic equations	
	2.7 Biological treatment kinetics of waste	
	2.8 Micro Biological Growth Kinetics	
	2.9 Treatment Reactors	
	2.9.1 Flow Patterns of Reactors	
	2.9.1.1 Complete –mix Flow Reactors:	
	2.9.1.2 Ideal plug flow reactors	
	2.9.1.3 Batch reactors	
	2.9.1.4 Fluidized Bed Reactor	
	2.9.1.5 Packed Bed reactor	
	2.9.1.6 Plug Flow with Dispersed Reactors or arbitrary flow reactors	
	2.9.2 Flow Scheme	
	2.10 Unit design considerations	
	2.11 Sewage Treatment by Activated Sludge Process	
	2.11.1 Coarse Screens	
	2.12 Preliminary Treatment	
	2.12.1 Medium Screens	
	2.12.2 Fine Screens	
	2.12.3 Degriting	

	2.13 Flow Measurement	
	2.13.1 Primary flow device	
	2.13.2 Parshall Flume	
	2.13.3 Drop	
	2.13.4 Electromagnetic Meter	
	2.13.5 Thermal Mass Flow Meter	
	2.13.6 Rotameter	
	2.13.7 Flow Sensors	
	2.14 Flow Distribution Box (Splitter box)	
	2.15 Primary Treatment/Primary sedimentation	
	2.15.1 Inlets and Outlets of sedimentation tanks	
	2.15.2 Scum Trough/Oil and Grease Removal	
	2.15.3 Clarifier Mechanism	
	2.15.4 Problems of primary sedimentation tanks	
	2.16 Secondary Treatment (Biological Treatment)	
	2.16.1 Suspended Growth System	
	2.16.2 Attached Growth System	
	2.17 Treatment Processes	
	2.17.1 Activated Sludge Process	
	2.17.2 Modifications of activated sludge process	
	2.17.2.1 Step-aeration sludge process	
	2.17.1.2 Tapered aeration	
	2.17.1.3 Complete –mix activated sludge process	
	2.17.1.4 Extended aeration	
	2.17.1.5 Contact stabilization	
	2.18 Aeration Tank Loading Criteria	
	2.19 Completely mixed-cellular recycle system	
	2.20 Design Consideration of activated sludge process	
	2.20.1 Aeration Basin	
	2.20.1.1 Volume of Aeration Tank	
	2.20.1.2 Oxygen Requirement of Aeration Tanks	
	2.20.1.3 Influent Structure	
	2.20.1.4 Effluent Structure	
	2.20.1.5 Aeration Facilities	
	2.20.2 Aeration Systems	
	2.20.2.1 Surface Aerators	

	2.20.2.2 Diffused Air Aeration or Pneumatic System	
	2.20.2.3 Air Blowers	
	2.20.2.4 Air Blower Power Requirement	
	2.21 Secondary Sedimentation	
	2.21.1 Sludge production and process Control	
	2.21.2 Sludge Volume Index(SVI)	
	2.21.3 Sludge Recycle	
	2.21.4 Excess Sludge Wasting (q_w)	
	2.21.5 Nitrification	
	2.22 Operation of Plant	
	2.22.1 Bulking Sludge	
	2.22.2 Rising Sludge	
	2.22.3 Foaming	
	2.22.4 Operational problems and remedies	
	2.23 Tertiary Treatment	
	2.23.1 Filtration	
	2.23.2 Disinfection	
	2.23.2.1 Chlorination	
	2.23.2.2 Ultraviolet radiation	
	2.24 Material Mass Balance Analysis for the Treatment System	
	2.25 Sequencing Batch Reactor(SBR)	
	2.26 Attached growth system-Trickling filters and Bio Towers	
	2.27 Moving Bed Bio-Reactor (MBBR)	
	2.28 Up-flow Anaerobic Sludge Blanket (UASB) Process	
	2.29 Fluidized bed bio-film reactor(FBBR)	
	2.30 Rotating Biological Contactor(RBC)	
	2.31 Package Sewage Treatment Plant	
	2.32 Advanced Wastewater Treatment	
	2.32.1 Wastewater Reclamation Process	
	2.33 Oxidation Ponds	
	2.33.1 Types of oxidation ponds	
	2.34 Treated Effluent Disposal	
	2.35 Sludge Management	
	2.35.1 Sludge characteristics	
	2.35.2 Volume of solids	
	2.35.3 Variation of volume of sludge with its moisture content	

	2.36 Sludge Processing	
	2.36.1 Gravity Thickening	
	2.36.2 Centrifugation	
	2.36.3 Air Floatation	
	2.37 Anaerobic Digestion	
	2.38 Sludge Conditioning	
	2.28.1 Chemical conditioning	
	2.38.2 Physical Conditioning	
	2.38.2.1 Elutriation	
	2.38.2.2 Heat treatment	
	2.39 Centrifugation	
	2.40 Sludge Dewatering	
	2.40.1 Sludge Drying Beds	
	2.41 Operating power requirement of treatment plants	
	2.42 Staffing	
	2.43 SCADA in wastewater treatment plants	
	2.44 Construction Aspects	
	2.45 Mechanical/Electrical Erection Requirements	
	2.46 Commissioning of the new plant	
	2.47 Operational problems and remedies.	
	2.48 Operation and maintenance aspects	
	2.49 Routine operation and maintenance	
	2.49.1 Aeration Basins	
	2.49.2 Secondary Clarifiers.	
3	**PLANT SITING, LAYOUT AND FACILITIES**	
	3.1 Reactor and Separators	
	3.2 Plant Siting	
	3.3 Plant Layout	
	3.4 Treatment Facilities	
	3.4.1 Access platform, staircase and railing	
	3.5 Future expansion	
	3.6 Shape of Tanks	
	3.7 Plant Redundancy	
	3.8 Operational Flexibility	
	3.9 Maintenance	
	3.10 Recruitment of staff and training	

	3.11 Administration Building and laboratory	
	3.11.1 Plant Illumination	
	3.11.2 Plant Utilities	
	3.11.3 First Aid Kits	
	3.11.4 Occupational Health and Safety	
	3.11.5 Communication	
	3.12 Instrument/Alarm Annunciation Panel	
	3.13 Earthing Works	
	3.14 Erosion Control During Construction	
	3.15 Grading and Landscaping	
	3.16 General Layout Considerations	
4	**TREATMENT PLANT HYDRAULICS**	
	4.1 Introduction	
	4.2 Hydraulic profile	
	4.3 Flow rates	
	4.4 Unit process liquid Levels	
	4.5 Free board	
	4.6 Free fall	
	4.7 Unit Process Redundancy: Hydraulic Overload	
	4.8 Flow Distribution	
	4.9 Minimum and maximum Velocity of Liquid Flow	
	4.10 Plant Head loss	
5	**FUNDAMENTALS OF HYDRAULICS AND APPLICATIONS**	
	5.1 Introduction	
	5.2 Laminar and Turbulent flow	
	5.3 Continuity Equation	
	5.4 Flow rate or Discharge	
	5.5 Hydraulic Heads	
	5.6 Hydraulic Gradient and Total Energy Line	
	5.7 Bernoulli's Theorem	
	5.8 Pressure Flow	
	5.9 Bernoulli's Equation and Flow Through Pipes	
	5.9.1 Major Head loss Through pressures Pipes	
	5.9.1.1 Darcy-Weisbach Equation	
	5.9.1.2 Hazen-Williams Equation	
	5.10 Gates and Valves	

	5.10.1 Minor Losses in Pipes	
	5.10.2 Interconnecting Pipes	
	5.10.2.1 Pipes in Parallel	
	5.10.2.2 Pipes in Series	
	5.11 Head losses in air pipes of diffused aeration System	
	5.12 Open Channels	
	5.12.1 Flow in Open Channels	
	5.12.2 Head loss Open channel Flow	
	5.12.3 Minor Losses in Open Channels	
	5.13 Non Uniform Flow	
	5.14 Specific Energy	
	5.14.1 Relationship Between Specific Energy and Depth	
	5.14.2 Critical Depth	
	5.15 Channel Bed Slopes	
	5.16 Channel Transitions	
	5.17 Weirs	
	5.17.1 Rectangular weir	
	5.17.2 V- Notch / Triangular Weir	
	5.18 Control Points	
	5.19 Flow Distribution	
	5.19.1 Distribution Channels and Pipe Manifolds	
	5.20 Weirs in Sewage Treatment Plants	
	5.21 Head Over the Weirs/ Control Structures	
	5.21.1 Rectangular Weirs	
	5.21.2 Thomson Formula	
	5.21.3 V-Notch/Triangular Weir	
	5.21.4 Side Discharge Weirs	
	5.21.5 Distribution Channels and Rectangular Weirs	
	5.22 Inlet and Outlet Hydraulics	
	5.23 Depth of Effluent Trough/ Launder	
	5.23.1 Thomas-Kamp Formula	
	5.24 Hydraulics of Distribution Headers and Channels	
	5.25 Orifices, Laterals, Mouthpiece	
	5.26 Unit Operation Bypassing	
	5.27 Drains	
	5.28 Unit Process Hydraulics	

	7.1 Description of Site	
	7.2 Layout Development	
	7.3 Planning of Pumping Station	
	7.4 Design of pre-coarse screen	
	7.5 Design of coarse screen	
	7.6 Pumping station design	
	7.7 Power Requirement	
	7.8 Design of Continuous Flow Stirred Tank(complete mix) Type Activated Sludge Process	
	7.8.1 Design of Inlet Chamber	
	7.8.2 Design of Approach Channel	
	7.8.3 Design of Medium Screen-I	
	7.8.4 Design of Grit Chamber	
	7.8.5 Design of Parshall Flume	
	7.8.6 Design of Medium screen-II	
	7.8.7 Design of Distribution Chamber-I	
	7.8.8 Design of Primary Sedimentation Tanks	
	7.8.8.1 Diameter of Central Feed Pipe	
	7.8.8.2 Design of Hoper Bottom/Sludge Pit	
	7.8.8.3 Diameter of Sludge Removal Pipe	
	7.8.8.4 Scum quantity	
	7.8.8.5 Design of Effluent Structure	
	7.8.8.6 Design of Effluent launder	
	7.8.8.7 Design of sump and pump house design: Primary sludge and excess sludge	
	7.9 Design of open channel connecting 4/PSTs – Aeration tanks	
	7.10 Hydraulic design parameters for aeration basin.	
	7.10.1 Design of Influent channel to aeration tanks	
	7.10.2 Inlet flow distribution	
	7.10.3 Design of Influent channel to aeration tanks	
	7.11 Design of Biological Reactor(Aeration Tank)	
	7.11.1 Compute the quantity of air required for aeration, Q_{air}	
	7.11.2 Power required for surface aeration system	
	7.11.3 Compute recycle ratio, F/M ratio and volumetric loading	
	7.12 Effluent Weir	
	7.13 Design of outlet launder/channel of aeration tank	
	7.14 Design of pipe connecting outlet well and distribution chamber-II	

Disclaimer: Author during his teaching and practicing career, has referred many technical journals, manual of practices, design guide, notes of practicing engineers and text books. The design criteria and methods adopted for design calculations are, therefore, based on such references. The subject theory, equations stated and the design criteria suggested in this book can be found in textbooks and reference books on the subject. Adoption of the design criteria stated and design procedure followed is the reader's discretion.

PREFACE TO FIRST EDITION

It gives an immense pleasure to author while publishing a concise design guide on sewage treatment and disposal. Waste water treatment is a vast and interdisciplinary subject. Waste water treatment plants are very complex hydro-technical facilities. It requires thorough studies of environmental engineering, microbiology, chemistry, civil engineering and essential knowledge of mechanical and electrical engineering disciplines. In fact project planning and design team of wastewater treatment plants comprises engineers from all three mother branches of engineering and expertise from control systems.

Most of the structured courses in Environmental Engineering give stress on process mechanisms, control variables and prepare the students fairly well in process design but in pieces. Unfortunately, the hydraulic design of water and waste water treatment plants is grossly ignored in most engineering curricula and thus makes the students handicap. In fluid mechanics and hydraulics subjects emphasis is given to fundamentals of fluid mechanics, introduction to problems of pipe and open channel flow, turbines and pumps. The bridge capsule between hydraulics and its application in water and waste water engineering is not devised. Many graduates are not familiar with the hydraulic design and hydraulic profiling of wastewater treatment plants, since this aspect is normally not included in engineering course. Also, there exist a huge gap between competency level of the beginner and experienced design professionals, resources available in the field. One of the reasons of academic curricula lagging in hydraulic design and profiling could be the limited professional interaction with water and wastewater industry field personnel. To the other side, some of the reasons are lack of competency of students, inconsistent efforts and lack in continuity required for integration of various practical aspects in to process and hydraulic design of large sewage treatment plants.

A lot number of books on waste water treatment covering all scientific, process details are available. There are a quite few books available covering process and hydraulic designs as well. Such reference books are voluminous, bit cumbersome to the students of Environmental Engineering, beginners in planning and design of waste water treatment plants.

The concept of planning and design of waste water treatment plants through concise book should be easily assimilative to beginners. Once concepts are understood and reasonably enough confidence of process and hydraulic design of wastewater treatment process are gained then one can acquire specific details of design from different sources and can handle even planning and design of large capacity sewage/wastewater plants to different site conditions and layouts.

Therefore, the author felt to address the shortcoming of curriculum and attempted to write a design guide/book which would help to build the confidence of the post graduating engineers in Environmental Engineering/wastewater engineering and beginners in process and hydraulic design. The theory of treatment processes is covered in short as that is available in other sources, whereas much stress is given on process design, plant hydraulics, hydraulic design, and hydraulic profiling of plants. The basic hydraulic concepts are same weather they are used for design of elements of sewage treatment plant or industrial waste water treatment.

A pilot project on design of 125 MLD capacity sewage treatment plant has been exercised in order to integrate process design, hydraulic concepts, control points in plant and hydraulics of various components/units that must operate compatibly to provide the desired flow profile. The SI units of measurement are used throughout the book and in design calculations. Drawings in this book are not to the scale but are proportional. As a prerequisite it is presumed that the beginners in design of wastewater treatment have adequate theoretical background of chemistry and microbiological aspects normally useful in the process design of wastewater treatment plants.

Author hope that, the book will be useful to post graduate students of environmental engineering. Also, it will be handy design guide to the beginners in process & hydraulic design of wastewater treatment plants. A great deal of emphasis is given to the planning and design of continuous flow stirred tank (complete mix activated sludge process) based sewage treatment plant. In this book, in depth design coverage is not given to other treatment processes is like attached growth reactors, stabilization ponds and other advanced wastewater treatment processes. Author strongly believes that the planning and designing steps explained here in this guide can be easily tailored and extended for designing any other treatment process of a new plant.

This book is a design guide. A portion of the material presented in this guide has been derived/processed from work of others, factual field observations, notes of author and field engineers. Their contribution is greatly acknowledged. The recommendations of various Indian standards and manual on Sewerage and Sewage Treatment of CPHEO under Ministry of Urban Development, New Delhi have been followed.

Utmost care has been taken to ensure the correctness of computations. The author welcomes the communication of errors, useful suggestion for improvement in subsequent editions of the book.

Place: Pune Dr S N Tirthakar

Date:

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The book is divided into 8 chapters which include around 100 diagrams, tables, equations, 15 small size photographs from STP contractor and 2 large size diagrams - 1 plant layout drawing double size of A4 size -horizontal, 1- hydraulic profile (Triple size of A4 size- horizontal), appx tables. The text is prepared in Arial, 12 font size. The engineering design diagrams have been drawn in AutoCad. The JPEG/screen shot of AutoCad diagrams are pasted in the text content of book. Total numbers of pages of book are about 510. More than 100 % manuscript writing work is completed.

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