

# Wastewater Treatment Plant (WWTP) Hydraulics



Training

## Introduction

The functional design of a wastewater treatment plant (WWTP) mainly involves process design and hydraulic design, the latter of which has received much less attention in wastewater treatment literatures. Meanwhile, to meet increasingly challenging environmental requirements, especially those due to Climate Change, WWTP Designers have been adopting innovative treatment processes with more stringent hydraulic requirements. This Course is aimed to bridge these knowledge gaps in hydraulic design of WWTP. The Course will be conducted in three Modules on three Wednesdays at biweekly interval, which may be selected to suit the job needs and knowledge background of the participants.

Date and time

Module 1 Wed, 20 Nov. 2024 9:30 - 17:30  
Module 2 Wed, 04 Dec. 2024 9:30 - 17:30  
Module 3 Wed, 18 Dec. 2024 9:30 - 17:30

Venue

Inno Network, 1/F., HKPC Building

Medium

Cantonese with English terminology

Course fee

\$2,400 per module

Remarks

Participants who have fulfilled 75% attendance will be awarded an e-certificate of attendance issued by the Hong Kong Productivity Council

## Course Description

This course brings together the commonly used hydraulic elements with specific applications to WWTPs. The Course begins with an overview of wastewater engineering and the layout planning of WWTP with the development of hydraulic profiles. The Harbour Area Treatment Scheme is addressed as a case study. Climate Change challenges are then addressed. The Course then deals with hydraulics in pipe and open channel flows with worked examples, before addressing Sludge Flows and Flow Measurements, Dilution and Dispersion by Oceanic Outfalls, Self-cleansing Velocity Design and Sedimentation Processes.

### WHO SHOULD ATTEND?

This course is targeted at civil and environmental engineering professionals, responsible for planning, project management, investigation, design, construction, operation and management of wastewater infrastructure. It is also relevant to hydraulic researchers engaged in optimising wastewater treatment plant design.

### Supporting Organisations (In arbitrary order)

**CIWEM** Chartered Institution of Water and Environmental Management  
Hong Kong Branch

**HKIE** THE HONG KONG INSTITUTE OF ENGINEERS  
香港工程師學會  
Environmental Division  
環境分部



The HK Chapter of the International Association for Hydro-Environment Engineering and Research

## Course Outline

### Module 1 - Introduction to WWTP Hydraulics

#### Lecture 1 – Overview

- Development of Wastewater Engineering
- Water Pollution Control
- Nexus between management of wastewater, water supply and stormwater
- Evolving Wastewater Treatment Technologies

#### Lecture 2 – Planning Issues

- Flows and Loads, Effluent Standards
- Unit processes and Flow Charts
- Plant Siting and Layout
- Head Requirements, Flow Splitting Problem and Hydraulic Profile

#### Lecture 3 – Harbour Area Treatment Scheme

- Project Management Aspects
- Hydraulic Aspects

#### Lecture 4 – Climate Change and Wastewater Treatment

- Background of Climate Change
- Greenhouse Gas Emissions from Wastewater Management



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### Module 2 - Elements of WWTP Hydraulics

#### Lecture 1 – Pipe Flows Losses

- Frictional Losses
- Local Losses
- Supplements for Manhole Losses

#### Lecture 2 – Manifold Hydraulics

- Dividing Flow Manifolds
- Multiport Diffuser Outfall
- Miller's Generalised Treatment

#### Lecture 3 - Open Channel Flows

- Uniform Flows
- Gradually Varied Flows
- Rapidly Varied Flows

#### Lecture 4 – Spatially Varied Flows

- Increasing Discharges
- Decreasing Discharges
- Side Weirs



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## Course Outline

### Module 3 - Advanced Topics in WWTP Hydraulics

#### Lecture 1 – Sludge Flows & Flow Measurements

- Rheological Properties of Sludge (Non-Newtonian Fluid)
- Head Loss in Laminar, Transitional, Turbulent Flows
- Wastewater Flow Measurements

#### Lecture 2 – Oceanic Outfalls

- Initial Dilution of Buoyant Jets
- Subsequent Dilution and Dispersion
- Hydraulic Modelling Studies

#### Lectures 3 - Self-Cleaning Velocity Design

- Empirical Approach
- Sediment Transport Approach
- Experience from HATS tunnels

#### Lecture 4 - Sedimentation

- Gravity Settling Theory
- Means to enhance settling
- Hydraulic Modelling for Clarifier Optimisation



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## TRAINER

Ir Prof. CHAN Pak-Keung taught a 2-day CPD course “Sanitary Sewers: Principles and Applications” for HKPC in July 2019, a 1-day course “An Introduction to Wastewater Treatment Plant (WWTP) Hydraulics” in August 2021, a 2-day course “Intermediate WWTP Hydraulics” in September/October 2022, a 2-day course “Training on Hong Kong Sewerage System” in February/March 2023 and a 1-day course on “Sewer Hydraulics” in December 2023.

Ir Prof. CHAN has over thirty years of experience in Civil and Environmental Engineering. He has spent sixteen years working as a Chief Engineer / Assistant Director in Drainage Services Department (DSD) amongst flood management, major wastewater engineering projects, the Research & Development initiatives of DSD as well as operation and maintenance for sewerage & drainage systems. Since 2015, Ir Prof. CHAN has been active in teaching university programmes and CPD courses.

## Enrolment Method

1. Scan the QR code(s) in the above course outline to complete the enrolment and payment online.

OR

2. Mail the crossed cheque with payee name "Hong Kong Productivity Council" in HK dollar and the application form should be mailed to Hong Kong Productivity Council, 2/F, HKPC Building, 78 Tat Chee Avenue, Kowloon (ATTN: Ms Mandy LAM). **Please indicate the course name and course(s) code on the envelope.**