

國立臺北大學自然資源與環境管理研究所

103 學年度第一學期『環境工程科學概論』

課程講義(11、12)：水處理技術概要
Introduction to Water Treatment Technologies

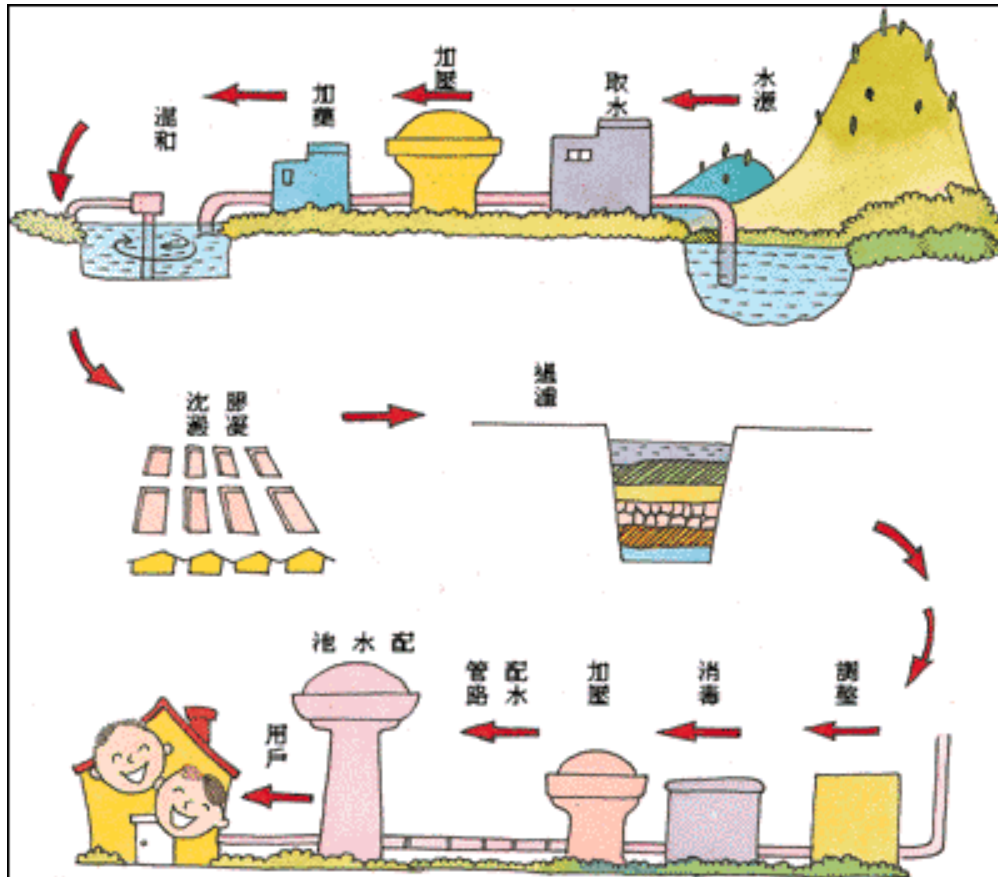
● INTRODUCTION

- Public Water Supply, Sewage Systems, Industrial Wastewater, Water Reuse
 - Tap Water vs. Drinking Water => 自來水、飲用水
 - ⇒ Infrastructure vs. Environmental Protection => Public Utility
 - ⇒ 社區自設公共給水設備、簡易自來水
 - Drinking Water Quality 飲用水水質 vs. Tap Water Quality Standard
 - ⇒ [Taiwan's Drinking Water Quality 飲用水水質標準](#)
 1. Bacterial standards 細菌性標準
 2. Physical standards 物理性標準
 3. Chemical standards 化學性標準：
 - A. Substances that impact health 影響健康物質
 - B. Substances with the potential to impact health 可能影響健康物質
 - C. Esthetic influential substances 影響適飲性物質
 - D. Limits on residual chlorine 有效餘氯含量
 - E. Limit range for pH index 氫離子濃度指數
 - ⇒ [自來水水質標準](#)
 - ⇒ 大高雄地區自來水後續改善工程計畫
 - The U.S. Environmental Protection Agency (EPA) sets two types of standards:
 - ⇒ Primary standards are set to provide the maximum feasible protection to public health. They regulate contaminant levels based on toxicity and adverse health effects. The goal of standard setting is to identify maximum contaminant levels (MCLs) which prevent adverse health effects.
 - ⇒ Secondary standards regulate contaminant levels based on aesthetics such as color and odor, which do not pose a risk to health. These secondary maximum contaminant levels (SMCLs) are guidelines, not enforceable limits. They identify acceptable concentrations of contaminants which cause unpleasant tastes, odors, or colors in the water. SMCLs are for contaminants that will not cause adverse health effects.
 - Drinking Water Regulations in Other Countries
 - Effluent Standards => Emerging Pollutants
 - Water Pollution Fee
- ### ● WATER SUPPLY ENGINEERING
- 自來水工程、給水工程、上水道工程
 - ⇒ 集水工程 Collection Works
 - ⇒ 輸水工程 Transmission Works
 - ⇒ 抽水工程 Pumping Works

⇒ 淨水工程 Purification Works

⇒ 配水工程 Distribution Works

□ 中水道工程：雨水收集利用、建築物污水回收再利用



自來水到我家：取水、導水、淨水、送(配)水
(http://www.water.gov.tw/05know/kno_b_main.asp?bull_id=495)

● WATER TREATMENT ENGINEERING (PURIFICATION WORKS)

□ Water Treatment Units

⇒ Gas Transfer; Ion Transfer; Solid Transfer

⇒ Solute Stabilization ⇒ Desalination

⇒ Sanitation, Hygiene and Aesthetical Considerations (Potability)

□ Water Treatment Components (Steps)

⇒ Gridding and Screening

⇒ Coagulation (混凝) and Flocculation (膠凝) ⇒ PAC

⇒ Sedimentation ⇒ Primary and Secondary (even Tertiary sedimentation)

⇒ Filtration and Disinfection ⇒ THM (Tri-Halogen Methane)

□ Advanced Water Treatment: Potability and other Aesthetical Considerations

⇒ Ion Exchange

⇒ Reverse Osmosis (RO)

⇒ Ultra-filtration: Membrane

⇒ UV & O₃

- SEWAGE ENGINEERING

- Sewage Systems or Sewers: Sanitary Wastewater and Stormwater Runoff
- Combined vs. Separate Sewage Systems
- Pipelines vs. Channels: Pipe Flow vs. Open Channel (Open Surface) Flow
- Sewage Engineering (Works):
Collection and Treatment of Wastewater as well as Disposal of Sludge
- Sludge and Bio-solid: Integrated Wastewater Treatment Plant; Cogeneration of Heat and Power, Water Reclamation (Recovery) Center => Newwater
- Treatment of Industrial Wastewater => Obligation of Private Sector

- WASTEWATER TREATMENT ENGINEERING

- Wastewater Treatment Units
 - ⇒Physical and Physico-Chemical Mechanisms
 - ⇒Biological Mechanisms
 - ⇒Chemical Mechanisms
- Classification of Wastewater Treatment Plants
 - ⇒Primary Treatment 一級處理
 - ⇒Secondary (Biological) Treatment 二級 (生物) 處理
 - ⇒Tertiary (Advanced) Treatment 三級 (高級) 處理
- Biological Treatment
 - ⇒Suspend Growth Treatment: Activated Sludge (活性污泥)、Membrane Bioreactors (MBR)、Aerated Lagoons and Oxidation Ponds (氧化塘)
 - ⇒Attached Growth Treatment: Trickling Filters (滴濾池)、Rotating Biological Contactor (RBC 生物旋轉盤)
 - ⇒Hybrid Systems 組合生物處理法—A/O、兩級 A/O、A2/O、UNITANK
 - ⇒Constructed Wetland (人工濕地) and Ecological Engineering
 - ⇒Anaerobic Treatment to Retain Biomass and Water Reclamation
- Sludge Treatment
 - ⇒Anaerobic Digestion; Dewatering and Drying => Water Content; Disposal
- Advanced Wastewater Treatment and Water Reuse
 - ⇒Nitrogen and Phosphorus Removals; Removal of Heavy Metals
 - ⇒Removal of Dissolved Solid and Sea Water Desalination

- WATER POLLUTION FEE

- Regulatory History
- Pollutants Regulated: BOD, SS, Heavy Metals, and Toxicants
- Collection Scheme
 - ⇒Three Stages: Phase 1, the third year, the fourth year
- Management and Uses of the Fund