PRELIMINARY AND PRIMARY TREATMENT OF WASTEWATER

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2.1 Overview of Treatment Processes

- **Preliminary & Primary Treatment**
- *Physical / chemical processes to prepare wastewater for biological treatment*
- *Removal of solids mainly*
- *Usually cheaper/ easier than secondary processes*
- *Examples:*
  - *a. equalisation (flow and load),*
  - *b. neutralisation,*
  - *c. settling of solids,*
  - *d. flotation of oil and grease,*
  - *e. filtration etc*

2.1 Overview of Treatment Processes

- **Secondary Treatment**

- *Biological removal of biodegradable, mostly soluble organic compounds (carbon removal)*
- *Aerobically*
  - *activated sludge plants,*
  - *aerated ponds*
  - *trickling filters etc.*
- *Anaerobically*
  - *non-aerated ponds,*
  - *high rate anaerobic (biogas) plants*

2.1 Overview of Treatment Processes

- **Tertiary Treatment**
- *Removal of specific pollutants with physical, chemical and/or biological methods*
- *Examples:*
  - *a. adsorption of organics by activated carbon*
  - *b. precipitation or flocculation of phosphate etc.*
  - *c. biological nitrogen removal*
  - *d. disinfection*
- *In general, costs increase with increasing degree of treatment*

Outline

- 1. Overview
- 2. Flow Considerations
- 3. Solid Removal
- 4. Chemical Treatment
- 5. Physico-chemical Treatment

2.2 Flow considerations

- Flow and load data essential for design and operation/performance
- Dynamic quantities - monitor continuously to establish daily, weekly and seasonal variations
- Main types of flow sensors:
  - Open channels: ultrasonic devices – no contact with the sewage/water
  - Pipes: electromagnetic/ ultrasonic sensors - less maintenance and no head loss

Equalisation

- Minimize flow surges to treatment systems when production process stopped/started
- Provide damping of organic load fluctuations
- Enable pH control and minimize chemical requirements for neutralization
- Allow continuous feed to biological systems
- Provide capacity for controlled discharges of wastes to municipal systems
- Prevent high concentrations of toxic materials from entering biological process

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Practical Exercises Equalisation Design

- A dairy has collected the following 24 hour influent profile data.

COD_{in} Q → [tank] → COD_{out} Q
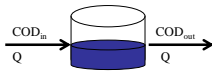
		COD (mg/l)	Q - Flow Rate (l/hr)
1	9:00 AM	4550	20000
2	10:00 AM	10100	34000
3	11:00 AM	8410	34000
4	12:00 PM	6790	41000
5	1:00 PM	6840	39000
6	2:00 PM	7320	46000
7	3:00 PM	6000	24000
8	4:00 PM	3910	39000
9	5:00 PM	4500	20400
10	6:00 PM	20100	21800
11	7:00 PM	5880	17300
12	8:00 PM	5150	16500
13	9:00 PM	4460	24500
14	10:00 PM	4130	46700
15	11:00 PM	4910	39800
16	12:00 AM	2080	27000
17	1:00 AM	1290	16000
18	2:00 AM	1590	12000
19	3:00 AM	2150	12000
20	4:00 AM	2730	16500
21	5:00 AM	1550	15500
22	6:00 AM	4140	18000
23	7:00 AM	10300	26000
24	8:00 AM	5390	36000

COD Daily variation

THANK YOU