EWCE 333
Wastewater Engineering and Sanitation

Lecture 8

Instructor

Lt Col Kazi Shamima Akter, Ph.D., Engrs

Associate Professor

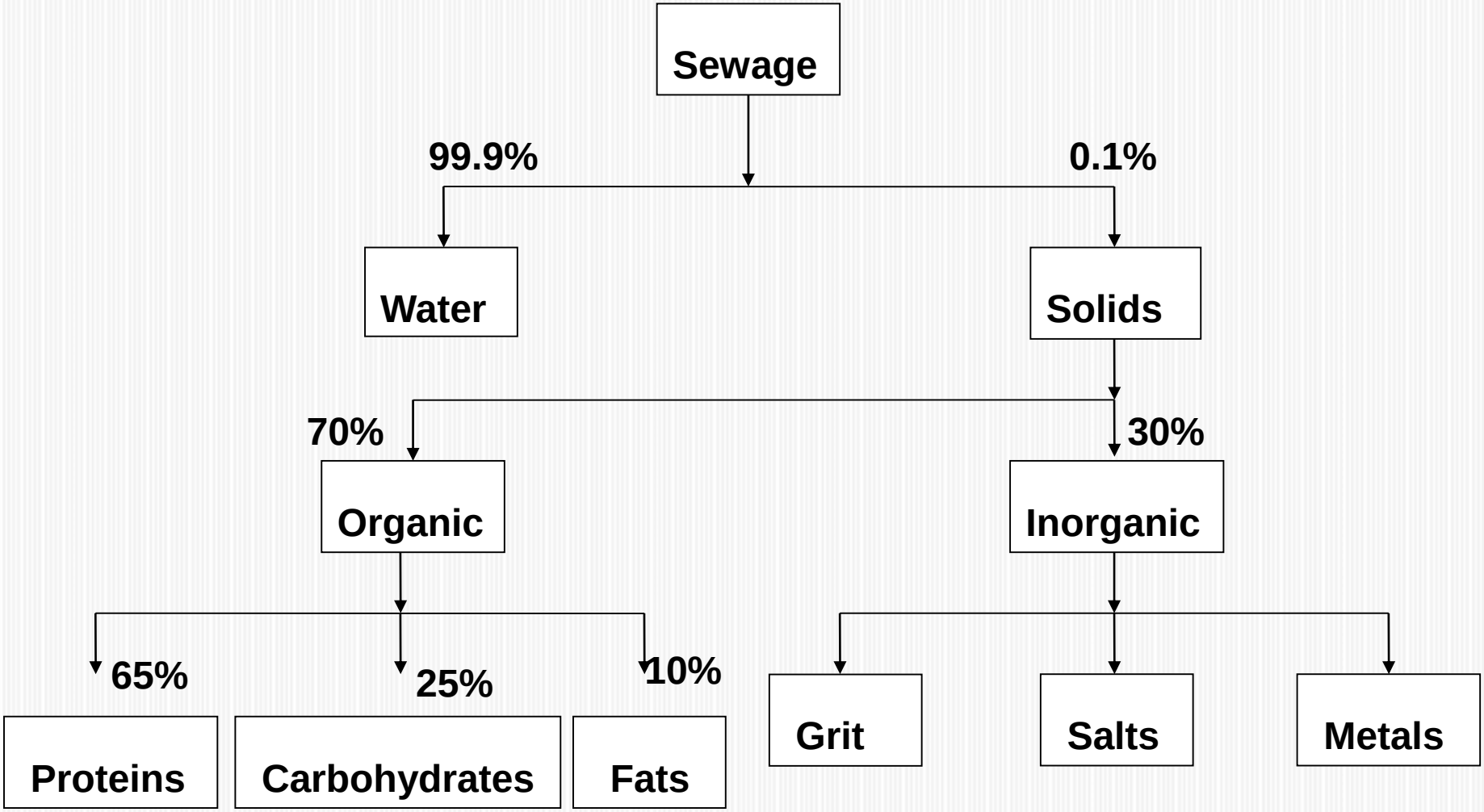
Department of EWCE, MIST

Lecture Outline

Topics	Reference
• Composition and types of sewage • Physical, chemical and biological characteristics of sewage • Environmental significance of contaminants • Sewage treatment – purpose, phases and unit operations	1. Water Supply and Sanitation - Feroz Ahmed and Mujibur Rahman ITN –BUET 2. Environmental engineering - Howard S. Peavy

Sewage Composition

Sewage is the wastewater of a community



Types of Sewage

Domestic Sewage:

- Also called sanitary sewage
- Results from residences, public buildings
- Composed of human wastes and sullage, which is the wastewater resulting from personal washing, laundry, food washing and cleaning of kitchen utensils.

Industrial Sewage or Industrial Waste:

Results from the manufacturing or industrial processes

Storm Sewage or Storm Water:

Surface runoff, resulting during and following a period of rainfall

Physical Characteristics of Sewage

Color

- Color indicates the freshness of sewage
- Domestic sewage is initially greyish brown
- Becomes stale when entire oxygen is exhausted
- Dyeing industries sewage may add various color

Source: Dyeing industries, natural decay of organic matters

Odor

- Fresh sewage has an earthy but inoffensive odor
- When oxygen is completely depleted, hydrogen sulphide (H_2S) is produced as a by-product of anaerobic decomposition

Source: decomposing wastewater

Physical Characteristics of Sewage

Turbidity

- Stronger the sewage, higher the turbidity

Source: soil erosion, domestic and industrial substances

Solids

- Solids may be in solution or suspension
- Include organic matter

Organic and inorganic solids - total solid (TS)

Suspended solids (TSS) can be filtered out

Dissolved solids (TDS) can be removed by evaporation

Settleable solids settle down in the sedimentation basin

Physical Characteristics of Sewage

Temperature

- Slightly higher temperature then normal supply water
- More temperature, less dissolved oxygen

Has affect on-

- ✓ Biological activity
- ✓ Solubility of gases
- ✓ Viscosity of sewage

Source: Bathroom/kitchen hot water, cooling water

Contaminants	Environmental Significance
Biodegradable organic	Deletion of dissolved oxygen May add color, odor May cause undesirable condition
Suspended solids	Effect on natural aquatic life Sludge deposition causes decomposition (O_2 depletion)
Pathogens	Transmit diseases
Nutrients (P, N)	Eutrophication (Algal bloom)

Contaminants	Environmental Significance
Refractory organics	Resistant to biodegradation Lead to persistent foam in water Toxic Cause Odor and Taste problem
Heavy metals	Toxic, Effluent Reuse problem
Color and turbidity	Aesthetic problem

Contaminants	Environmental Significance
Oil, floating material	Produce unsightly condition
Volatile materials	Cause air pollution
Dissolved inorganic solids	Reuse problem of effluent

Sewage Treatment Process

- Sewage treatment is an artificial process -
  - ❑ to remove or alter the objectionable constituents from sewage and
  - ❑ to render it less dangerous or offensive

- Sewage treatment is a combination of physical and biological processes; occasionally chemical processes are employed additionally.

Purpose of Sewage Treatment

- To stabilize the sewage without causing odor or nuisance and without endangering public health
- Removal of suspended and floatable materials
- Reduction of biodegradable organics
- Elimination of pathogens

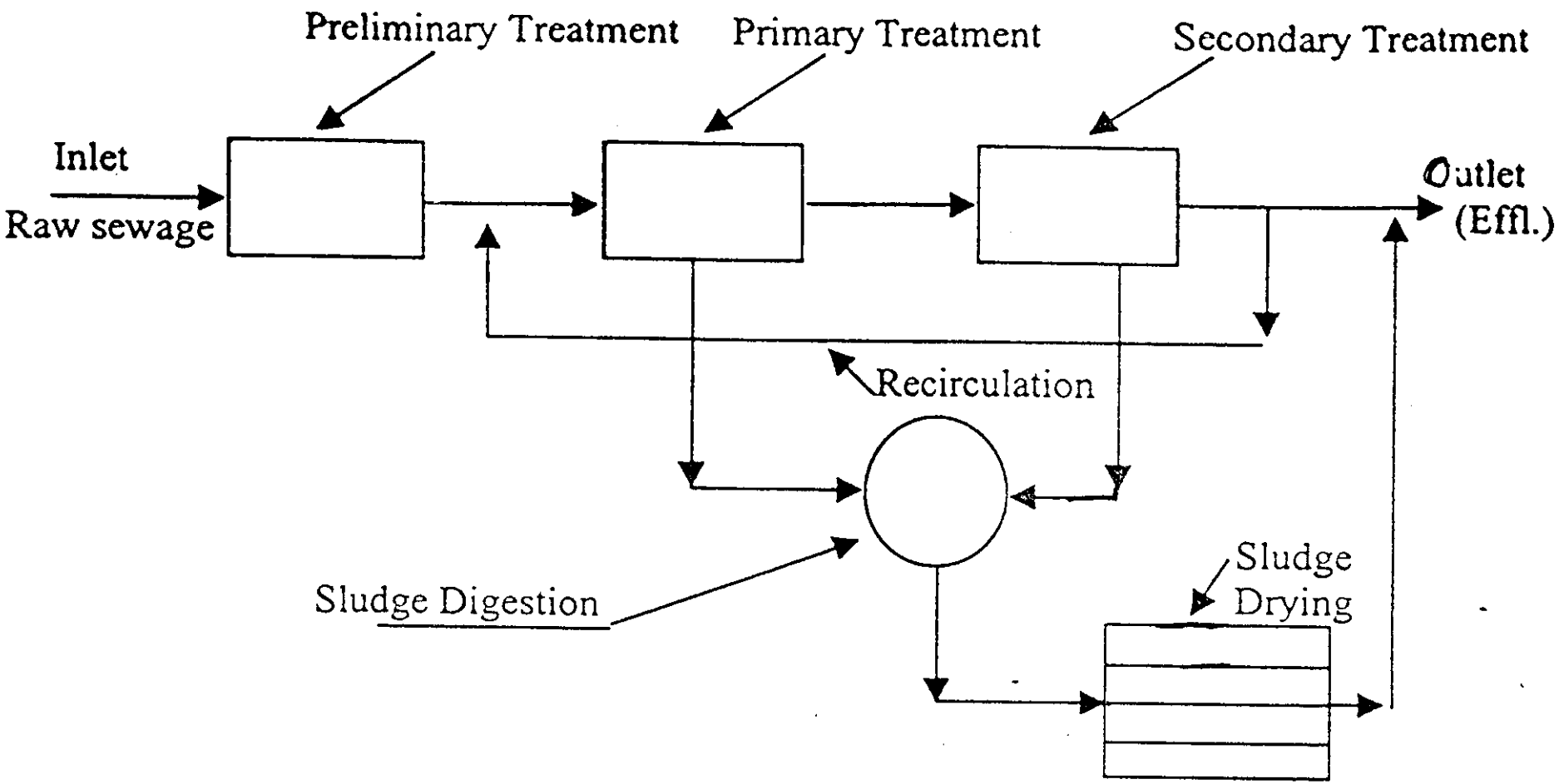
Purpose of Sewage Treatment

- Removal of N_2, P and toxic compounds
- Removal of refractory organics, heavy metals and inorganic dissolved solids
- To prevent the damages to receiving water i.e., rivers, canals, coastal waters or tidal estuaries etc.

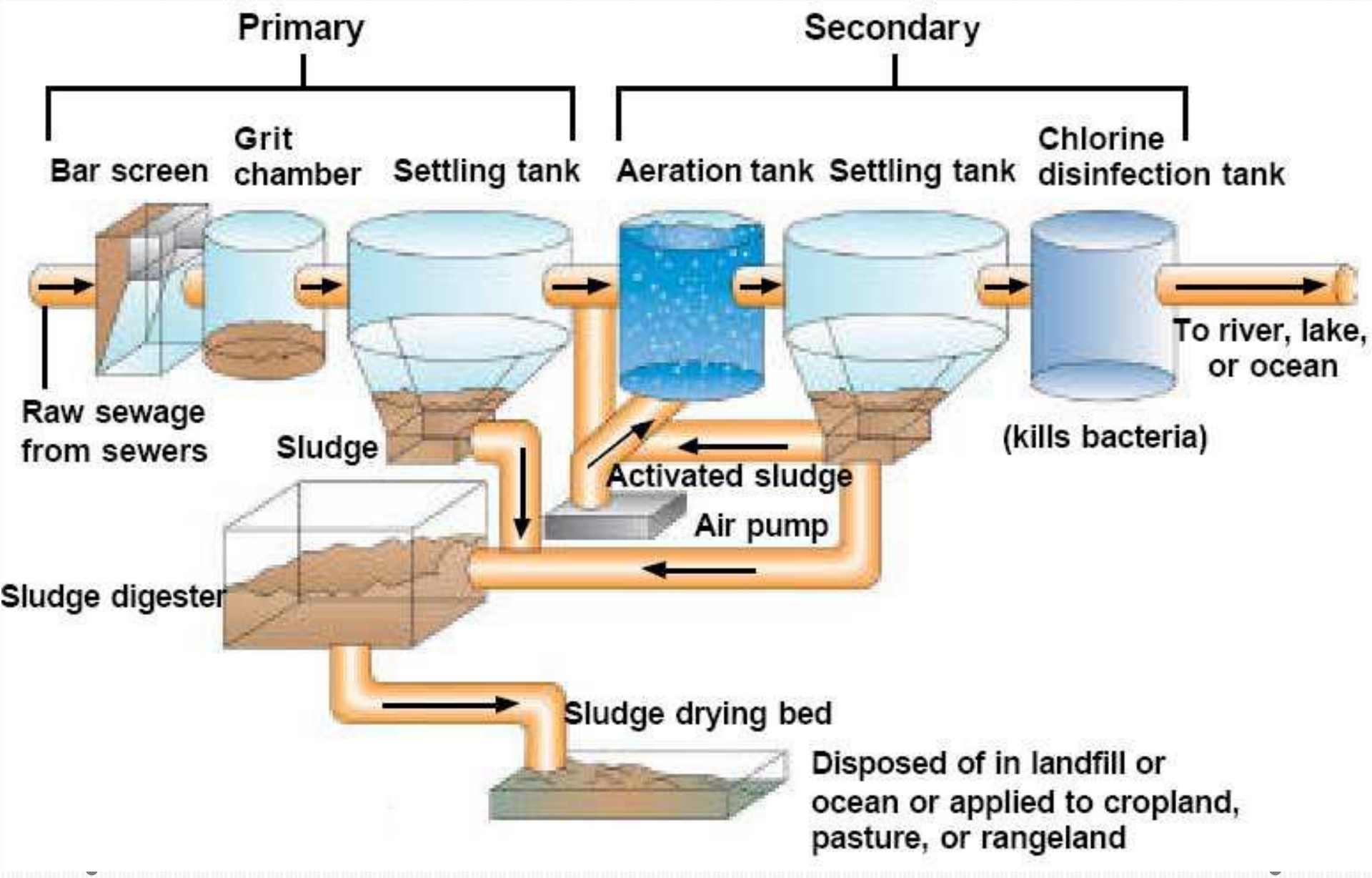
Phases of Sewage Treatment

- Preparatory / Preliminary treatment: To remove coarse suspended and floating matters, oil or grease.
- Primary / Physical treatment: To remove settleable and suspended solids.
- Secondary / Biological treatment: To remove organic solids through biological process.
- Tertiary /advanced treatment: To achieve additional removal of suspended solids, colloidal particles, removal of nutrients, refractory organics and further reduction in faecal coliform.

Sewage Treatment Plant – Typical Flow Diagram



Sewage Treatment Plant – Typical Flow Diagram



Unit Operations in Sewage Treatment

Physical Unit Operations:

- Treatment methods, in which the application of physical forces predominates, are known as physical unit operations.

- These operations remove coarse solids, suspended and floating solids and grease.

- Sedimentation, floatation, filtration are typical physical unit operations.

Unit Operations in Sewage Treatment

Chemical Unit Operations:

- Removal or conversion of contaminants is brought about by the addition of chemicals or by chemical reactions.

- These unit operations remove suspended and colloidal solids, eliminate pathogens and control odor.

- Precipitation, adsorption and disinfection are the most common chemical unit processes.

Unit Operations in Sewage Treatment

Biological Unit Operations:

- Removal of contaminants is brought about by biological activity.

- These unit operations remove biodegradable organics and nitrogen.

- Activated sludge process, trickling filter, waste stabilization ponds are important biological unit processes.

Dasherkandi Sewage Treatment Plant



The eco-friendly Dasherkandi Sewage Treatment Plant in Khilgaon, Dhaka, is the largest of its kind in South Asia. Photo: TBS

- Sewage treatment capacity of 5,00,000 tons per day.
- The largest individual sewage treatment plant in South Asia.
- First modern large-scale sewage treatment plant in Bangladesh incorporating sludge incineration plant.