Municipal Wastewater for Indirect Potable Reuse

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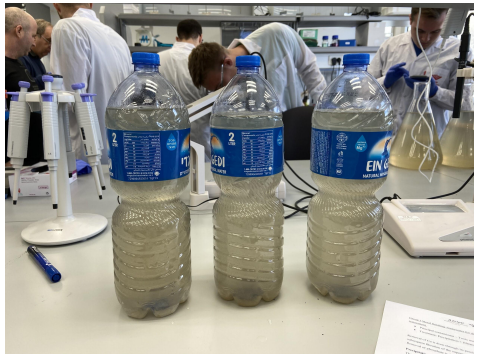
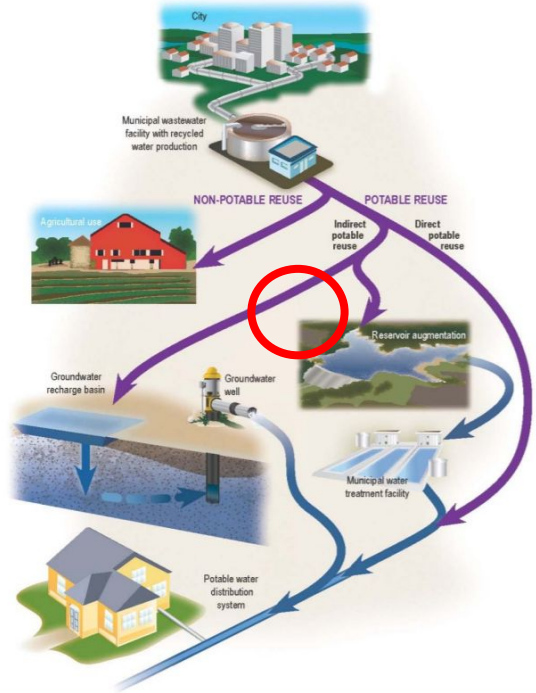
What is municipal wastewater?

Municipal wastewater is that which comes from residences and is discharged into sewage systems. Its primary component is human waste.



What is indirect potable reuse?

Indirect potable reuse uses an environmental buffer, such as a lake, river, or a groundwater aquifer, before the water is treated at a drinking water treatment plant.



Analyzing Municipal Wastewater

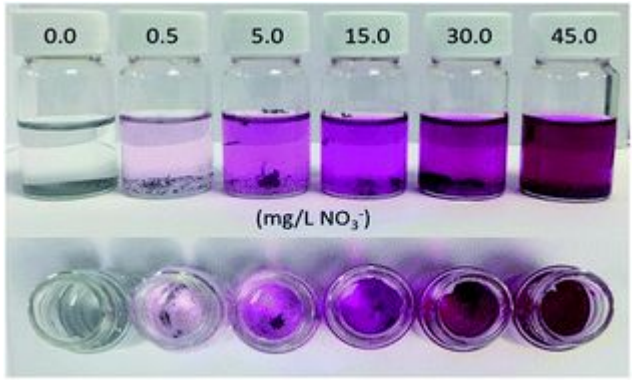
Physical 	Chemical 	Microbial 

• Suspended and Dissolved Solids
• Turbidity
• Color/Odor
	• Inorganics:
	  ○ Metals, salts, ions, nutrients, gases
	• Organics:
	  ○ Natural organic matter, digested food, man-made chemicals
		• Bacteria
		• Protozoa
		• Viruses

Physical Analysis

- **pH** - Measure hydrogen protons (H+) with pH meter
- **Turbidity** - Measure suspended particles with turbidity meter
- **Total Suspended Solids (TSS)** - Pass volume through filter and weigh filter
- **Total Dissolved Solids (TDS)** - Measure electrical conductivity of water

Chemical Analysis

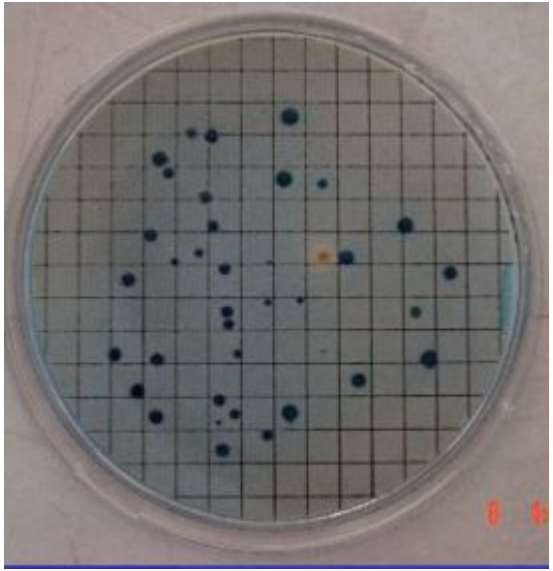


- **Inorganics:**
  - **Salts** - Known from TDS
  - **Nutrients** (from urine and food extract)
    - Phosphorus - using ion chromatograph
    - Ammonia - using colorimetric analysis
- **Organics:**
  - **BOD** - Measure initial and final oxygen concentrations after adding bacteria
  - **COD** - Measure initial and final dissolved oxygen concentrations

Microbial Analysis

Measure **indicator organisms**

- Fecal Coliform Bacteria
- Bacteria monitoring process
  - Push volume through filter
  - Add filter to chosen medium bacteria and incubate
  - Number of colonies are indicative of coliform bacteria

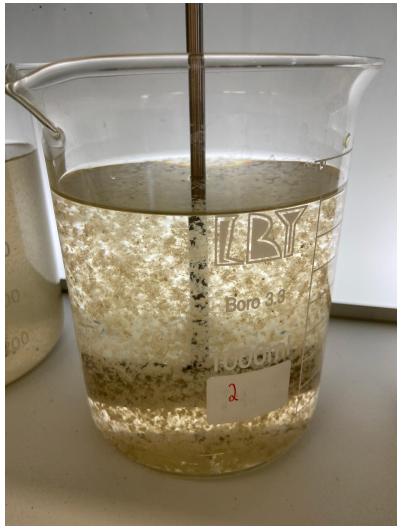


Results

- **Main contaminants in the sample**
  - Physical
    - High turbidity (151 NTU)
    - High levels of suspended solids (431 mg)
  - Chemical
    - High chemical oxygen demand (990 mg/L)
  - Microbial
    - Coliform bacteria above detection limit

Treating the Municipal Wastewater

- Coagulant
- Aerobic Biological Treatment
- Activated carbon



Treating the Municipal Wastewater

- **Coagulant - Polyaluminum Chloride (PAC)**
  - Add varying levels of coagulants
  - 50 µL of PAC deemed most effective dosage
- **Aerobic Biological Treatment**
  - Sample added to a “bubbler” which fed the “good” organisms to better allow them to eat the “bad” bacteria
- **Activated Carbon**
  - Used synthetic wastewater
  - Add varying levels of carbon
  - 8 g of activated carbon deemed ideal quantity for our sample

Applications in Israel & CA

- San Diego treats municipal wastewater from neighboring Tijuana before releasing it into the ocean
- “If California treated 85% of its water (like Israel), then they wouldn't need desalination technology at all”- Abraham Tenne (former Head of Desalination Division for Israeli Water Authority)

Thank you!

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