

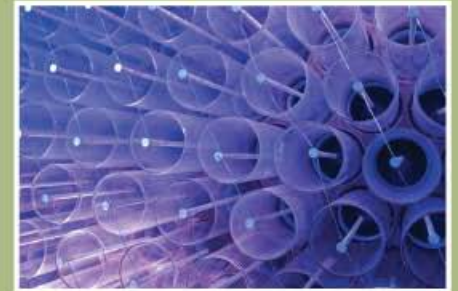


AMERICAN WATER

Communications Orientation Program

Drinking Water Treatment 101

**Alton, Illinois
September 2008**





High-quality Drinking Water

- Elements in providing continuous high quality drinking water:
 - ◆ **Water Sources** - Select the best sources to produce drinking water
 - ◆ **Treatment Processes** - Assemble and balance treatment processes to meet or exceed regulatory standards
 - ◆ **Distribution Systems** - Deliver ample and quality water to customers 7 days a week, 24 hours a day, and 365 days a year
 - ◆ **Monitoring and Control** - Monitor and control treatment process and distribution system for quality and reliability



Sources of Drinking Water

- The cleaner the source water, the simpler the treatment process
- Drinking water sources include
 - Surface Water
 - Ground Water
 - Purchased Water





Sources for Drinking Water

- **Surface water means water from:**
 - Rivers & streams
 - Lakes & reservoirs
 - Oceans





Sources for Drinking Water

- **Surface Water**
 - Advantages
 - ◆ Plentiful and accessible in United States
 - ◆ Rivers and lakes are dynamic systems and can recover if contaminated
 - Disadvantages
 - ◆ Affected by weather – soil run-off, temperature
 - ◆ Affected by land use – agriculture, mining run-off
 - ◆ Susceptible to chemical spills – pipelines, barges
 - ◆ Challenging flora and fauna – algae, zebra mussels



Sources for Drinking Water

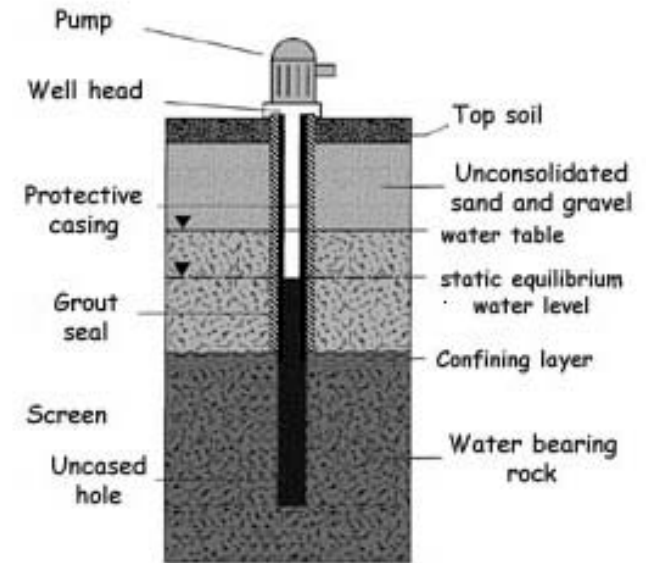
- **Ground Water (Wells)**

- Advantages

- ◆ Consistent water quality
- ◆ Consistent temperature
- ◆ “Natural filtration”

- Disadvantages

- ◆ Smaller volume of water available from wells
- ◆ Water is “hard” (high levels of calcium and magnesium)
- ◆ Harder to contaminate, but once contaminated hard to clean up





Drinking Water Treatment Processes

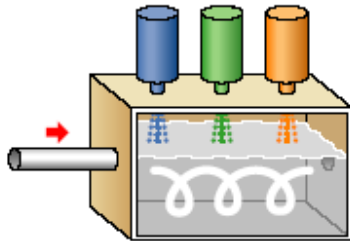
- **Goal – Deliver a reliable supply of drinking water for our customers that meets all state and federal drinking water standards.**
 - Drinking water that meets state and federal standards reduces risks for
 - ◆ Diseases – cholera, typhoid
 - ◆ Toxic reactions – lead, arsenic
 - ◆ Cancers & mutagens – digestive cancers, genetic damage
 - ◆ Endocrine disruptors – hormone imbalance, birth defects



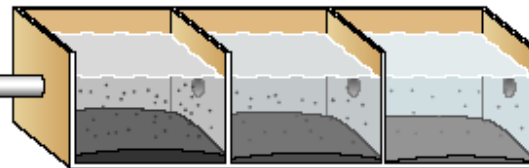
Drinking Water Treatment Processes

Coagulation/Flocculation

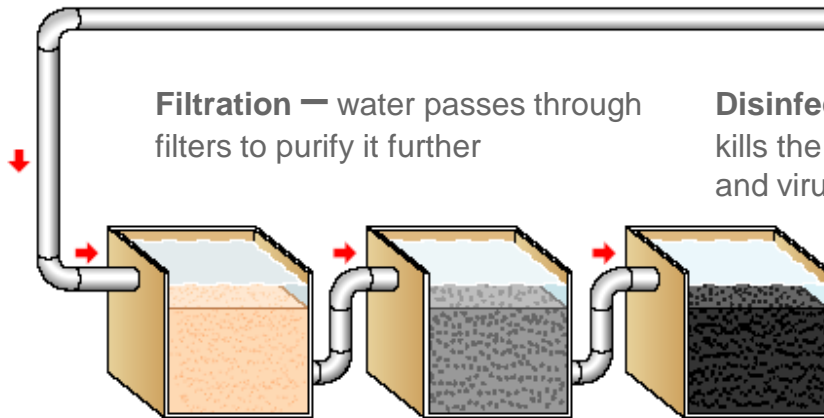
– special chemicals help remove the solids from the water



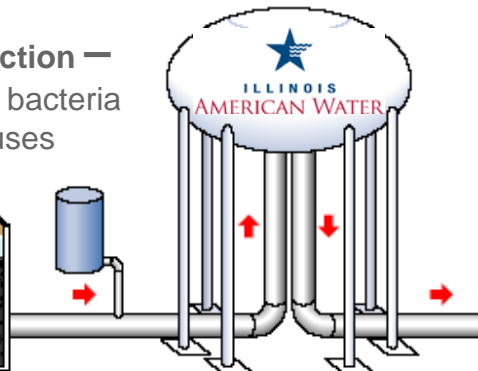
Sedimentation – the solids settle to the bottom and the water becomes cleaner



Filtration – water passes through filters to purify it further



Disinfection – kills the bacteria and viruses





Drinking Water Treatment Processes

- Coagulation and Flocculation
- Sedimentation
- Filtration
- Disinfection





Drinking Water Treatment Processes

- **Removing solids (turbidity) from water**
 - Solids in drinking water are aesthetically unpleasant and can harbor harmful disease-causing organisms. They are typically removed with these steps with the aid of treatment chemicals.
 - ◆ Coagulation
 - ◆ Flocculation
 - ◆ Sedimentation/Separation
 - ◆ Filtration





Drinking Water Treatment Processes

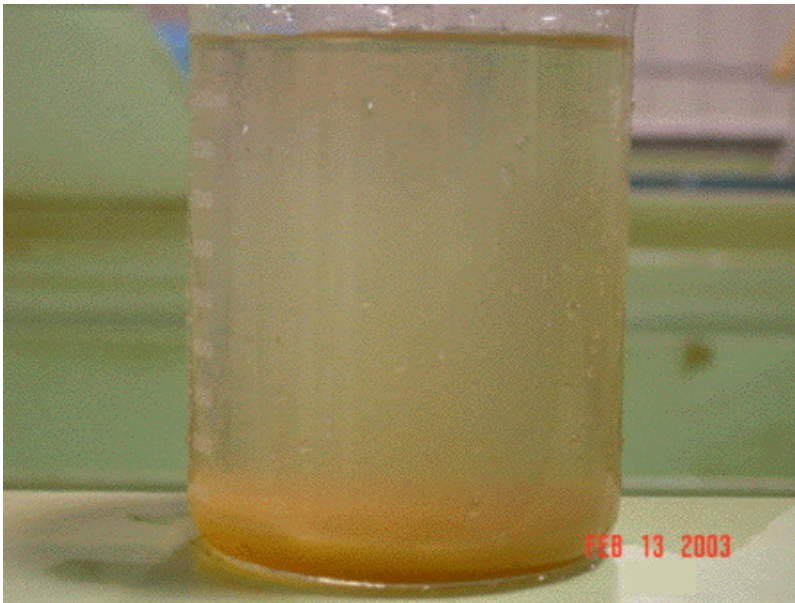
- **Coagulation**
 - Destabilizes particles in water so they start to stick together
 - ◆ Special chemicals are added and mixed into raw water to start coagulation





Drinking Water Treatment Processes

- **Flocculation**
 - A slow stirring process so the destabilized solid particles collide and stick together to form larger heavier particles (floc)





Drinking Water Treatment Processes

- **Sedimentation**

- Decreases the velocity of the water so the floc can settle to the bottom and be removed from the process, leaving clarified water





Drinking Water Treatment Processes

- **Filtration**
 - Clarified water is then passed through filters usually made of several feet of fine sand or fine carbon. This removes even smaller particles that did not settle earlier in the process.
 - Filtration removes particles that can harbor bacteria, viruses and protozoa.

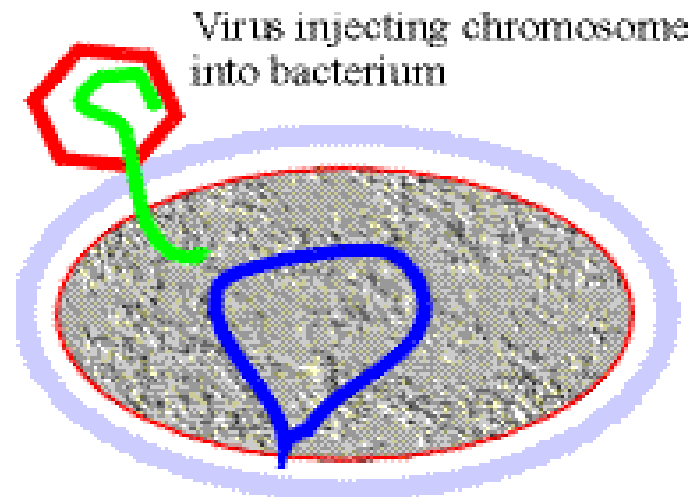
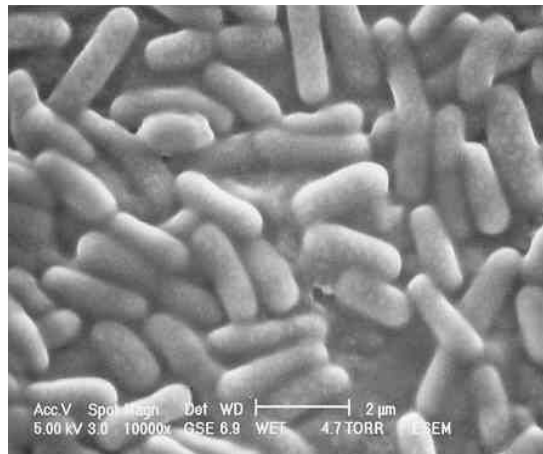




Drinking Water Treatment Processes

- **Disinfection**

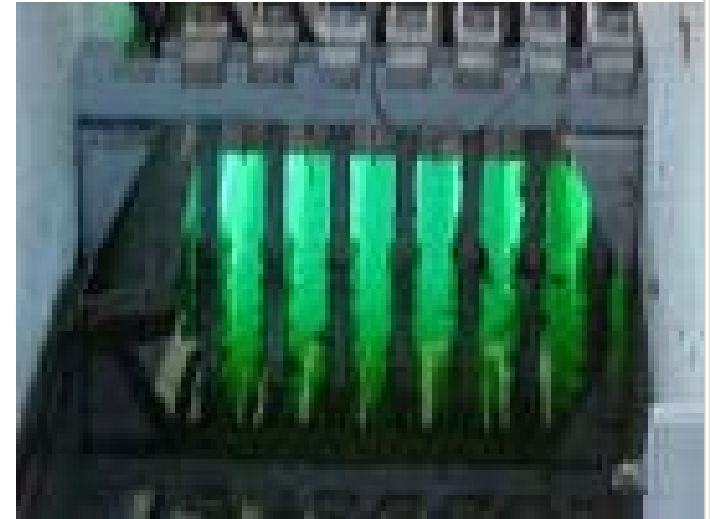
- The selective destruction or inactivation of pathogenic (disease-causing) organisms such as bacteria and viruses
 - ◆ Disinfection is not “sterilization”
 - ◆ Disinfection chemicals are added in sufficient quantity and given sufficient time to insure pathogens have been inactivated effectively.





Drinking Water Treatment Processes

- **Disinfection**
 - Physical Means
 - ◆ Irradiating water with ultraviolet light
 - ◆ Boiling Water
 - Chemical Means
 - ◆ Ozone
 - ◆ Chlorines





Drinking Water Treatment Processes

- **Disinfection**
 - Disinfectant levels are closely monitored in the treatment process and the distribution system





Drinking Water Distribution Systems

- Key components
 - Pumps
 - Transmission Mains
 - Storage Tanks
 - Control and Monitoring System





Drinking Water Distribution Systems

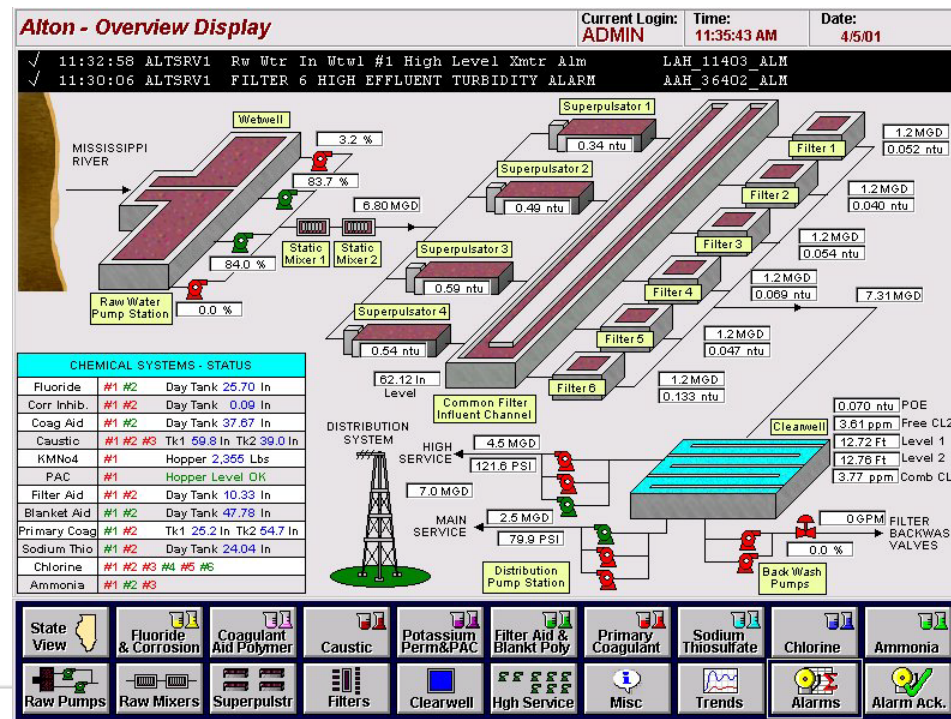
- Engineered networks to meet capacity and pressure needs of customers
 - Pumps
 - Transmission mains
 - Storage tanks
 - Control and monitoring system





Monitoring and Controlling Processes and Distribution

- Our processes are delivering quality water to customers 7 days a week, 24 hours a day, and 365 days a year.
 - System needs to be monitored constantly and adjusted
 - Production staff and computerized equipment help maintain processes
 - “SCADA” - Supervisory Control and Data Acquisition





Water Treatment 101 - Summary

- Elements in providing continuous high-quality drinking water:
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The glue that holds it all together: Our people!

