Water Resource Recovery

The Journey of Wastewater

What happens to water after we use it? Where does it go?

When we use the bathroom once we flush, the water is transported through the pipes to a municipal water resource recovery facility.

Some homes use a septic system, in which water goes into a large underground tank. When the tank is full, the water is pumped, and sent to a water resource recovery facility.

This water is known as wastewater. Wastewater is any water that has been used.

Click on thought bubble

Types of Wastewater

- Wastewater can be placed into 3 categories:

(1.) Wastewater comes from factories, mining, and other businesses. This is known as Industrial Wastewater.

(2.) Wastewater also comes from homes, schools, and many other facilities. This is known as Domestic Wastewater.

(3.) When surface runoff from rain or snow is collected in street drains it is also considered wastewater. This is known as Storm Runoff.

Click on picture

What is the type of wastewater that comes from schools?

DOMESTIC WASTEWATER: Wastewater from schools, homes, and other facilities that are not businesses is considered **domestic wastewater**.

Click on picture for answer

What is type of wastewater that happens when the snow melts?

STORM RUNOFF: When surface runoff from rain or snow is collected in street drains it is also considered wastewater. This is known as **storm runoff**.

Click on picture for answer

What is the type of water that comes from a factory?

INDUSTRIAL WASTEWATER: water that comes from factories, mining, and other businesses is considered **industrial wastewater**.

Click on picture for answer

How Did Water Treatment Plants Start?

- 50 years ago the Cuyahoga River in Ohio, caught on fire due to the harmful amount pollution.
- This led an agency known as the Environmental Protection Agency (EPA) to be created.
- The EPA passed a law known as the Clean Water Act.
- This law required that our waterbodies be kept clean through water treatment processes.

Primary Treatment Definitions

- Primary Treatment: The first process in wastewater treatment
- Bar Screen: First step in treatment. Bar screens catch rags, sticks, and other floatable objects.
- Grit Chamber: Sand, slit, small rocks, and other heavy items settle to the bottom and are removed.
- Primary Clarifier: In the primary clarifier the smaller solids that are left over are given time to settle.
- Sludge: The solids that settle at the bottom of the primary clarifier.
- Sludge Digester: The sludge digester further treats the sludge. Any oil or scum that is removed from the top of may be incinerated, sent to an approved landfill, or burned.

Secondary Treatment Definitions

- Secondary Treatment: The second process in wastewater treatment
- Aeration Tank: In the aeration tank, air is added to the wastewater and bacteria. Air helps the bacteria grow and decompose the waste.
- Secondary Clarifier: At the secondary clarifier waste and bacteria settle to the bottom.
- Activated Sludge: Some of the material that has sunk to the bottom in the secondary clarifier is now called activated sludge. Activated sludge is aerated sewage that contains microorganisms that help to break it down.
- Disinfection: The use of chlorine or ultraviolet light is used to kill any harmful microorganisms that maybe left.

Tertiary Treatment Definitions

- Tertiary Treatment: Advanced treatment process that may be used at certain facilities.

- Nutrients: Phosphorus and nitrogen are nutrients found in wastewater. Excessive amounts of these nutrients can harm aquatic life. They are removed or changed using various treatment.

- Suspended Solids: small solid particles that remain in suspension in water. Materials like fine sand or carbon, can be filtered out if needed.

The Water Treatment Process

Primary treatment is the first step in the water treatment process.

Secondary Treatment is the second step of the treatment process. This is where organic matter is broken down.

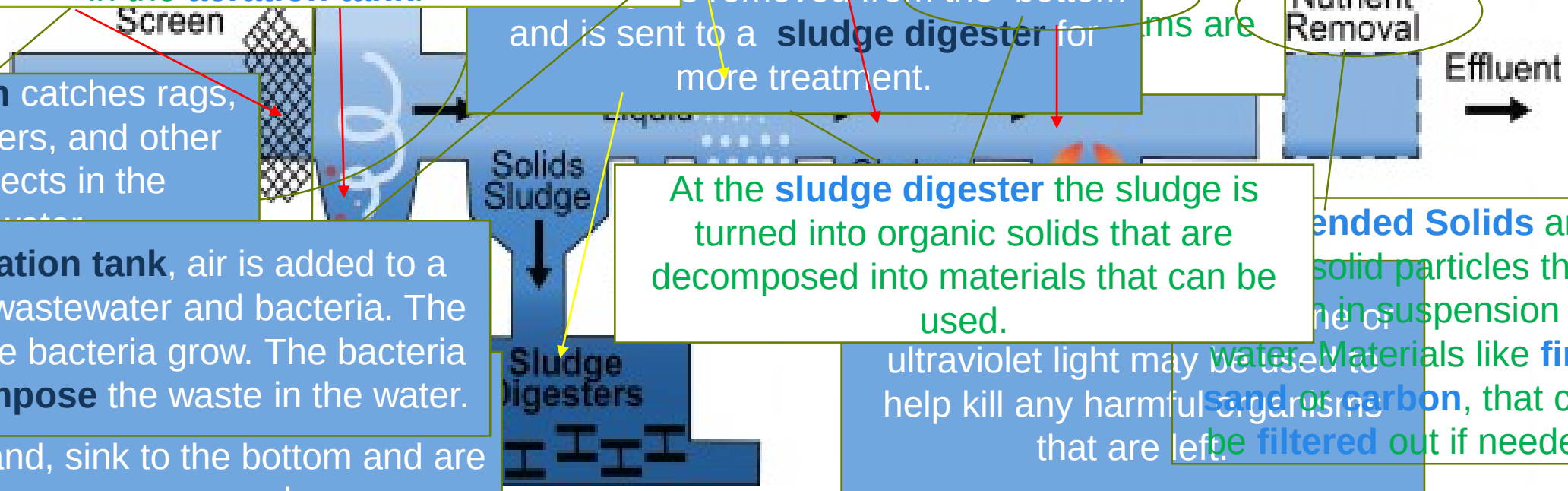
Tertiary Treatment is an extra treatment step that some plants may use to remove **nutrients** or **suspended solids.**

Primary → Secondary → Tertiary

At the **Secondary Clarifier**, the waste and bacteria sinks to the bottom. Some of the sludge(called **activated sludge**) is sent to the **sludge digester** for treatment. The rest is reused in the **aeration tank**.

Large amounts some of **nutrients**, such as **nitrogen** and **phosphorus** and other ...ms are ...

...s removed from the bottom and is sent to a **sludge digester** for more treatment.



The **bar screen** catches rags, sticks, containers, and other floating objects in the ...

In the **aeration tank**, air is added to a mixture of wastewater and bacteria. The air helps the bacteria grow. The bacteria help **decompose** the waste in the water.

sand, sink to the bottom and are removed.

At the **sludge digester** the sludge is turned into organic solids that are decomposed into materials that can be used.

ultraviolet light may be used to help kill any harmful organisms that are left.

...ended Solids are ...solid particles that ...n in suspension in ...ne or water. Materials like **fine sand or carbon**, that can be filtered out if needed.

Click on each step of the process to get definition

Why is water treatment important?

Without water treatment we can get sick from the harmful bacteria and viruses.

After the treatment process there is many resources that are recovered.

Remember the **sludge** in the **sludge digester**?

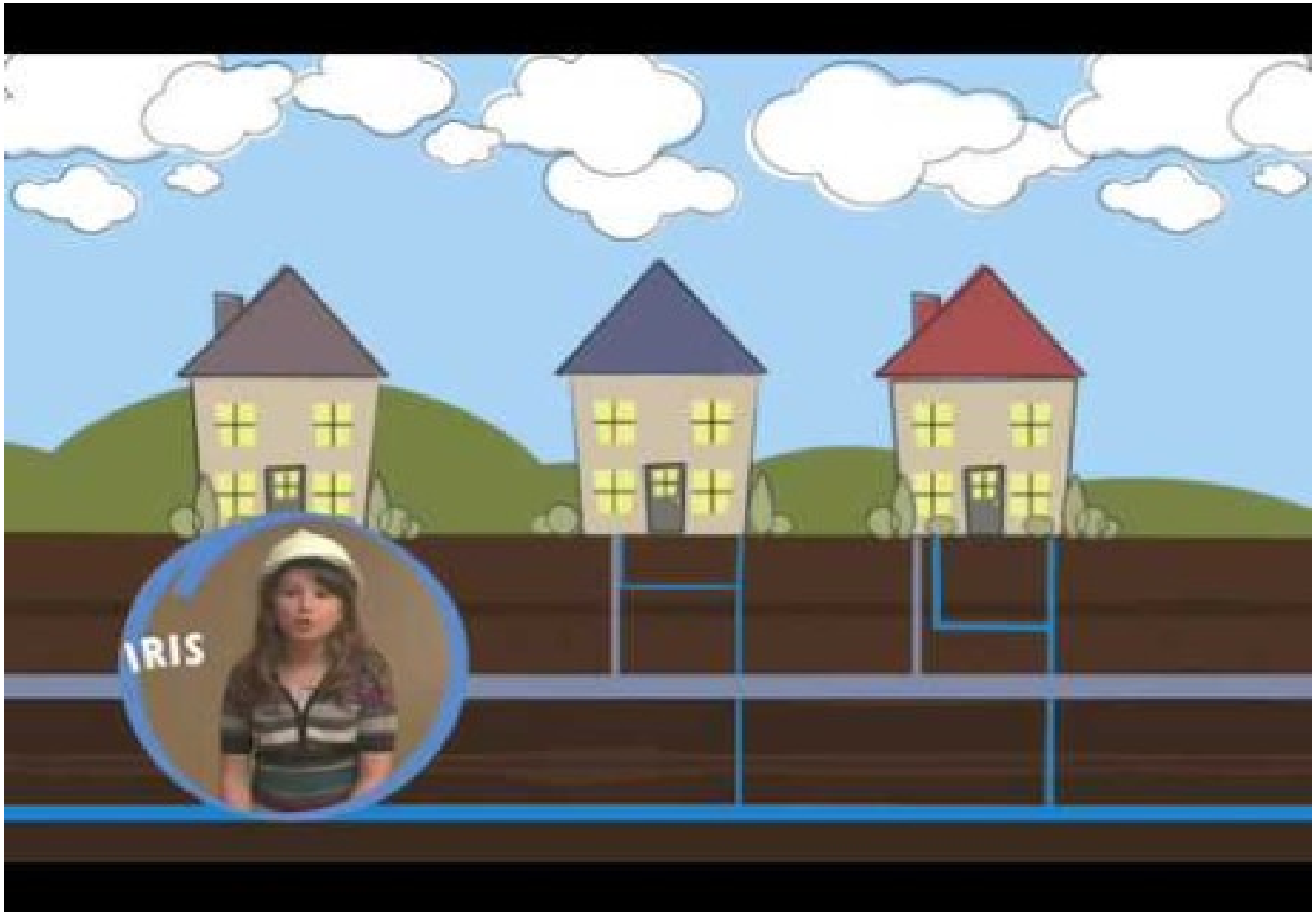
That sludge is turned into fertilizer for plants or burned to make methane gas for **energy**.

What happens after water is created?

- After the treatment process the water is clean enough to be **discharged** or sent to a near by waterbody, where the process happens all over again!
- To make sure that the water is clean and safe, it is continuously being **monitored.**
- Water monitoring is done to test the quality of water by looking at the **salinity** (saltiness), **turbidity** (cloudiness), bad odors, and other parameters.

The Water Treatment Process

- Here is a video that show the wastewater treatment process in motion!



PSA From: Commissioner Frank Avila of the Metropolitan Water Reclamation District of Greater Chicago

Activity Time

- “Is it safe to drink?” Activity
- In groups of 3, you will work together to build a water filtration system and answer the questions on the worksheet.
- **What you will need:**
  - 2-liter bottle with base cut off and no cap
  - 2" x 2"piece nylon stocking or cheesecloth
  - rubber band
  - 4 oz cup coarse sand
  - 4 oz cup aquarium gravel
  - small coffee filter
  - large bowl
  - empty 12 oz cup, to be later filled with dirty water

This activity is from the Teach Engineering website by Adventure Engineering, Colorado School of Mines:
https://www.teachengineering.org/activities/view/csm_amazon_lesson5_activity1_tg

Thank you, we hope you now know more about water resources recovery.

NYWEA

LEADING THE WAY IN
WATER QUALITY MANAGEMENT

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