

Sewage Treatment

The wastes generated by some 60% of the U.S. population are collected in sewer systems and carried along by some 14 billion gallons (~53 billion liters) of water a day. Of this enormous volume, some 10% is allowed to pass untreated into rivers, streams, and the ocean. The rest receives some form of treatment to improve the quality of the water (which makes up 99.9% of sewage) before it is released for reuse.

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Biochemical Oxygen Demand (BOD)

The BOD is an important measure of water quality. It is a measure of the amount of oxygen needed (in milligrams per liter or [parts per million](#)) by bacteria and other microorganisms to oxidize the organic matter present in a water sample over a period of 5 days. The BOD of drinking water should be less than 1. That of raw sewage may run to several hundred. It is also called the "biological" oxygen demand.

Primary Treatment

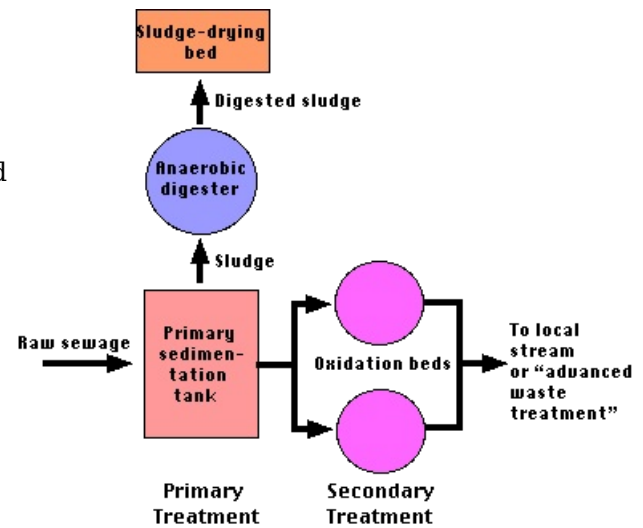
The simplest, and least effective, method of treatment is to allow the undissolved solids in raw sewage to settle out of suspension forming **sludge**. Such **primary treatment** removes only one-third of the **BOD** and virtually none of the dissolved minerals.

Attempts to use digested sludge as a fertilizer have been hampered by its frequent contamination by toxic chemicals derived from industrial wastes.

Secondary Treatment

However, many treatment plants in North America then pass the effluent from primary treatment to **secondary treatment**. Here the effluent is brought in contact with oxygen and [aerobic](#) microorganisms. They break down much of the organic matter to harmless substances such as carbon dioxide.

Primary and secondary treatment together can remove up to 90% of the BOD. After [chlorination](#) to remove its content of bacteria, the effluent from secondary treatment is returned to the local surface water.



Advanced Waste Treatment

The combination of primary and secondary treatment removes most of the organic matter in sewage and thus lowers the BOD. However, most of the **nitrogen** and **phosphorus** in sewage remains in the effluent from secondary treatment. These inorganic nutrients can cause [eutrophication](#) of surface water receiving the effluent causing blooms of algae. To avoid this, a few communities add a third stage of treatment called tertiary or advanced waste treatment.

Several techniques are available to remove dissolved salts from sewage effluent, but all are quite expensive.

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