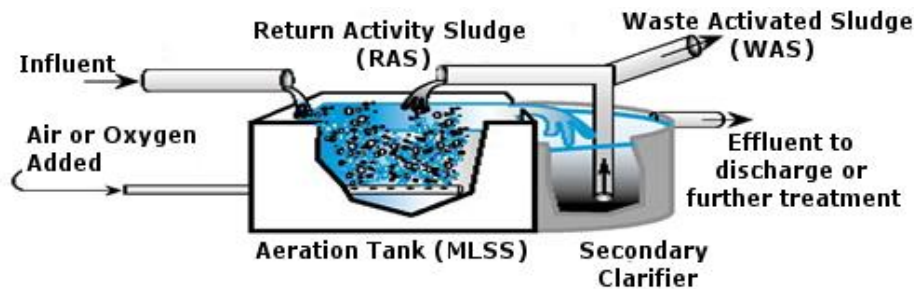


Wastewater Package Plants

Package plants are pre-manufactured treatment facilities used to treat wastewater in small communities or on individual properties. They are usually designed to treat flows between 10,000 and 250,000 gallons per day. The most common types of package plants use biological aeration processes: extended aeration, sequencing batch reactors, or oxidation ditches. The basic process consists of several interrelated components: aeration tank, aeration source that provides oxygen and mixing, a clarifier tank, and a means of collecting the solids to either return them to the aeration tank or remove them from the process.



Type	Advantages	Disadvantages
Extended Aeration	<ul style="list-style-type: none"> • Easy to operate and install • Odor free • Better at handling flow fluctuations • Low sludge yield 	<ul style="list-style-type: none"> • Unable to achieve denitrification or phosphorus removal • Limited flexibility in response to changing effluent requirements • Large energy requirement
Sequencing Batch Reactors	<ul style="list-style-type: none"> • Able to achieve nitrification, denitrification, and phosphorus removal • Few operation and maintenance problems • Able to be operated remotely 	<ul style="list-style-type: none"> • High energy consumption • Difficult to adjust cycle times for small communities • Frequent sludge disposal
Oxidation Ditches	<ul style="list-style-type: none"> • Moderate energy requirements • Well suited for treating typical domestic waste • Low sludge yields 	<ul style="list-style-type: none"> • Noisy and odiferous if not operated correctly • Unable to treat toxic waste streams • Relatively large footprint

Costs

Costs are site specific and depend on the flow rate and wastewater characteristics. Extended aeration plants designed to treat less than 20,000 gpd approximately cost between \$6-12 per gallon. Sequencing batch reactors treating flows between 10,000 and 50,000 gpd approximately cost \$3-10 per gallon. The approximate cost estimate for an oxidation ditch treating flows between 30,000 and 60,000 gpd is \$3-4 per gallon. These costs have been adjusted to January 2020 dollars.

Source

- United States Environmental Protection Agency – Wastewater Technology Fact Sheet September 2000, “Package Plants” https://www3.epa.gov/npdes/pubs/package_plant.pdf
- National Small Flows Clearinghouse – Pipeline Spring 2003 Issue, “Explaining the Activated Sludge Process” http://www.nesc.wvu.edu/pdf/ww/publications/pipline/pl_sp03.pdf

Other Links

- United States Environmental Protection Agency. Oxidation Ditches Technology Fact Sheet https://www3.epa.gov/npdes/pubs/oxidation_ditch.pdf
- United States Environmental Protection Agency. Sequencing Batch Reactors Technology Fact Sheet https://www3.epa.gov/npdes/pubs/sbr_new.pdf
- United States Environmental Protection Agency. Aerobic Treatment Technology Fact Sheet https://www.epa.gov/sites/production/files/2015-06/documents/aerobic_treatment_0.pdf