3 WASTEWATER PLANT SITING CONSIDERATIONS

Wastewater plants should be located as far as possible from inhabited areas. A minimum distance of 1000 feet for uncovered plants is desired. Uncovered plants should be located downwind when a definite wind direction prevails. Foundation conditions need to be evaluated, as does the elevation of the water table. Elevation in relationship to the need for sewage pumping (and for dikes around the site) is relevant. Furthermore, the plant must be protected against flooding. 100-year storms are typically chosen as the design flood when designing dikes and similar facilities. Distance to the outfall and possible effluent pumping need to be considered.

Table 8.13 lists the approximate acreage for preliminary engineering estimates. Of course, an estimate of expansion is proper when evaluating acreage requirements.

Table 8.13
Treatment Plant Acreage Requirements

type of treatment	acres per MGD
activated sludge plants	2
trickling filter plants	3
aerated lagoons	16
stabilization basins	20
physical-chemical plants	1.5

14 PRETREATMENT OF INDUSTRIAL WASTES

Industrial wastes that would harm collection or treatment facilities or upset subsequent biological processes need to be pretreated. The guidelines which follow should be evaluated for applicability and conformance to local, state, and federal codes. If possible, eliminate the contaminants at their sources.

- **chromium removal**: If hexavalent chromium is greater than 2 mg/l in the influent, use chemical reduction followed by chemical precipitation.
- **heavy metal removal**: Use chemical precipitation if total heavy metals exceed 1 mg/l. If recovery of the metals is desired, use ion exchange methods.
- **cyanide removal**: Use chemical oxidation if the concentration exceeds 2 mg/l. Use electrolysis for high-strength, low-flow waste streams.
- **phenol removal**: Biochemical oxidation and chemical oxidation can both be used, although separate biological treatment for phenol may be uneconomical. Maximum concentration needs to be determined empirically.
- **pH adjustment**: The pH of water entering biological treatment should be between 6.0 and 9.0. Neutralize with acid or alkalai additives.
- **emulsified oil removal**: Use coagulation and flotation adsorption on activated carbon.
- **hydrogen sulfide removal**: Preaerate if sulfides exceed 50 mg/l.
- **oil separation**: Use gravity separation.

15 WASTEWATER PROCESSES

A. PRELIMINARY TREATMENT

Preliminary preparation of the wastewater stream is essentially a mechanical process. It removes large objects, rags, and wood from the flow. Heavy solids and excessive oils and grease are also eliminated. Damage to pumps and other equipment would be expected without preliminary treatment.

Screens: Trash racks or coarse screens with openings 2 inches or larger should precede pumps to prevent clogging. Screenings usually consist of paper, wood, and rags. Medium screens ($\frac{1}{2}''$ to $1\frac{1}{2}''$ openings) and fine screens ($\frac{1}{16}''$ to $\frac{1}{8}''$) are also used to relieve the load on grit chambers and sedimentation basins.[11] Screens are cleaned by automatic scraping arms. Screen capacities and head losses are specified by the manufacturer. In general, however, flow through screens should be limited to 3 fps or less.

Grit Chambers: Grit is an abrasive that wears pumps, clogs pipes, and accumulates in excessive volumes. A grit chamber (also known as *grit clarifier* or *detritus tank*) slows the wastewater down to approximately 1 ft/sec. This velocity allows the grit to settle out but moves the organic matter through. The grit can be manually or mechanically removed with buckets or screw conveyors.

[11] Fine screens are rare except when used with some industrial waste processing plants.