### Conversion Table

<table>
<thead>
<tr>
<th>Shape</th>
<th>Area (ft²)</th>
<th>Volume (ft³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circle</td>
<td>π × diameter = 3.14 × d × d</td>
<td>n/a</td>
</tr>
<tr>
<td>Cylinder</td>
<td>n/a</td>
<td>0.785 × d × d × height</td>
</tr>
<tr>
<td>Rectangle</td>
<td>length × width</td>
<td>length × width × height</td>
</tr>
<tr>
<td>Circumference</td>
<td>π × diameter = 3.14</td>
<td>d = diameter</td>
</tr>
</tbody>
</table>

### Basic Formulas - Ponds

**Population Loading, Person/Acre** = Population Served, Persons / Pond Surface Area, Acres

**Organic Loading, Lbs, BOD/Day/Acre** = \( \frac{(Flow, MGD) × BOD, mg/L × 8.34}{Area, Acres} \)

**Organic loading, Activated Sludge** = \( \frac{Flow, MGD × 8.34 × BOD, mg/L}{Vol in Aeration Tank, 1,000 ft³} \)

**Organic loading, Tr. Filter** = \( \frac{Flow, MGD × 8.34 × BOD, mg/L}{Vol of Filter media, 1,000 ft³} \)

**Organic loading, RBC** = \( \frac{soluble BOD, applied lbs/day}{surface area of media, 1,000 ft²} \)

**Oxygen Uptake Rate (OUR)** = \( \frac{(DO1 – DO2)}{(Time 1 – Time 2)} × 60 \) \( \text{mg O}_2/\text{hr}/\text{g} \)

**Specific Oxygen Uptake Rate (SOUR)** = \( \frac{OUR}{MLVSS (mg per L) × 60 × 1000} \)

**Detention Time (Days)** = \( \frac{vol, mg}{flow, MGD} \)

**Detention Time (Hrs)** = \( \frac{tank vol, ft³ × 7.48 \text{ gal/ft³} × 24 \text{ hrs/day}}{flow, gpd} \)

**Sludge age, days** = \( \frac{lbs MLSS in aeration basin}{lbs/day TSS in influent} \)

**MCRT, days** = \( \frac{lbs, MLSS in secondary system}{lbs/day SS wasted + lbs/day SS in effluent} \)

**Solids applied, lbs/day** = (flow, MGD + RSF, MGD) × 8.34 × MLSS, mg/L

**Solids loading, lbs/day/ft²** = \( \frac{solids applied, lbs/day}{surface area, ft²} \)

**Percent reduction in volatile solids** = \( \frac{\text{in} – \text{out}}{\text{in} – (\text{in} × \text{out})} × 100\% \)

**Dry solids, lbs** = raw sludge, gal × 8.34 × raw sludge, %

**Return Sludge Rate, MGD** = total flow, MGD × settleable solids, %

**Digester loading, lbs/day/ft³** = \( \frac{VS added, lbs/day}{digester vol, ft³} \)

### Wastewater Treatment Basic Formulas

**Pounds of BOD or TSS = flow, MGD × 8.34 × Concentration, mg/L**

**BOD, mg/L** = \( \frac{(initial DO – final DO) × BOD bottle vol, ml}{sample, ml} \)

**Percent removal** = \( \frac{influent – effluent}{influent} × 100\% \)

**F/M Ratio** = \( \frac{Flow, MGD × 8.34 × BOD, mg/L}{vol of Aeration Tank, Mgd × 8.34 × MLVSS, mg/L} \)

**Hydraulic or surface loading, gpd/ft²** = \( \frac{flow, gpd}{surface area, ft²} \)

**Detention Time (Days)** = \( \frac{vol, mg}{flow, MGD} \)

**Detention Time (Hrs)** = \( \frac{tank vol, ft³ × 7.48 \text{ gal/ft³} × 24 \text{ hrs/day}}{flow, gpd} \)

**Sludge age, days** = \( \frac{lbs MLSS in aeration basin}{lbs/day TSS in influent} \)

**MCRT, days** = \( \frac{lbs, MLSS in secondary system}{lbs/day SS wasted + lbs/day SS in effluent} \)

**Solids applied, lbs/day** = (flow, MGD + RSF, MGD) × 8.34 × MLSS, mg/L

**Solids loading, lbs/day/ft²** = \( \frac{solids applied, lbs/day}{surface area, ft²} \)

**Percent reduction in volatile solids** = \( \frac{\text{in} – \text{out}}{\text{in} – (\text{in} × \text{out})} × 100\% \)

**Dry solids, lbs** = raw sludge, gal × 8.34 × raw sludge, %

**Return Sludge Rate, MGD** = total flow, MGD × settleable solids, %

**Digester loading, lbs/day/ft³** = \( \frac{VS added, lbs/day}{digester vol, ft³} \)

### Pounds Formulas and Purity

**lbs chemical** = \( \frac{flow, MGD × 8.34 × ppm}{\% purity} \)

**ppm** = \( \frac{lbs chemical fed × \% purity}{MGD × 8.34} \)