Water Treatment Cost Equations Summary

# Overview

The cost equations in this code are based on a small subset of US water utilities in the late 1990s/early 2000s, and therefore, it is not representative of the US as a whole nor is it necessarily reflective of modern costs. *These equations should be used for educational purposes only as a rough approximation of treatment costs.*

# Description of Equations

The cost equations are empirical (i.e., data-driven) models based on treatment plant parameters, such as average flow, peak flow, chemical usage, turbidity, activated carbon size and regeneration rate. Among the cost equations, there are two types: capital expenditures (CAPEX) and operation and maintenance expenditures (OPEX).

For example, the CAPEX equations for chemical addition are in the form of a power law:

(1)

There parameters for some example chemicals are shown in Table 1.

**Table 1.** Capital costs example parameters for chemical addition, where *Dose* is the chemical addition (mg/L), *Qpeak*is peak design flow of treatment plant (MGD), and *a* and *n* are empirical fitting parameters.

|  |  |  |  |
| --- | --- | --- | --- |
| Chemical | a | x | n |
| Chlorine | 0.0346 |  | 0.6059 |
| Alum | 0.0127 |  | 0.4840 |
| Sodium Hydroxide | 0.0072 |  | 0.6197 |
| Ammonia | 0.03589 |  | 0.465 |

OPEX costs for chemical addition take the form of linear model:

(2)

**Table 2.** Operations and maintenance costs parameters for chemical addition, where *Dose* is the chemical addition (mg/L), *Qavg*is average flow of treatment plant (MGD), and *a* and *b* are empirical fitting parameters.

|  |  |  |  |
| --- | --- | --- | --- |
| Chemical | a | x | b |
| Chlorine | 1905.59 |  | 28525 |
| Alum | 1009.03 |  | 4558.26 |
| Sodium Hydroxide | 1538.50 |  | 10584.98 |
| Ammonia | 1417.24 |  | 26181.39 |

Details about the cost equations for other aspects of the treatment plant can be found in the cost model source code.