## SAMPLE CALCULATIONS: Chlorine Feed Rate

Chlorine is added to water to kill any disease-causing organisms which may be present in the water or may enter the water as it travels through the distribution system. The two expressions most often used to describe the amount of chlorine added or required are milligrams per liter (mg/L) and pounds per day (lbs/day). To convert from mg/L to lbs/day, or vice versa, the following equation is used:

$$(\text{mg/L } Cl_2)\ (\text{MGD flow})\ (8.34 \text{ lbs/gal}) = \text{lbs/day } Cl_2$$

Below are sample problems to determine the chlorine feed rate.

**Determine the chlorinator setting (lbs/day) needed to treat a flow of 3 MGD with a chlorine dose of 4 mg/L.**

First write the equation. Then fill in the information given:

(mg/L $Cl_2$) (MGD flow) (8.34 lbs/gal) = lbs/day $Cl_2$

(4 mg/L $Cl_2$) (3 MGD flow) (8.34 lbs/gal) = 100 lbs/day $Cl_2$

**A flow of 875,000 gpd is to receive a chlorine dose of 2.7 mg/L. What should the chorinator setting be (in lbs/day)?**

(mg/L $Cl_2$) (MGD flow) (8.34 lbs/gal) = lbs/day $Cl_2$

(2.7 mg/L) (0.875 MGD) (8.34 lbs/gal) = 19.7 lbs/day

**A chlorinator setting is 35 lbs per 24 hours. If the flow being chlorinated is 1.15 MGD, what is the chlorine dosage expressed as mg/L?**

(mg/L $Cl_2$) (MGD flow) (8.34 lbs/gal) = lbs/day $Cl_2$

(x mg/L)(1.15 MGD)(8.34 lbs/gal) = 35 lbs/day

Now solve for x:

$$x = \frac{35}{(1.15)(8.34)}$$

$$x = 3.6 \text{ mg/L}$$

## Chlorine Dose: Demand and Residual

The chlorine dose required depends on two considerations: the chlorine demand and the desired chlorine residual.

Dose, mg/L = Demand, mg/L + Residual, mg/L

The **chlorine demand** is the amount of chlorine used in reacting with various components of the water such as harmful organisms and other organic and inorganic substances. When the chlorine demand has been satisfied, these reactions stop.

In some cases, such as perhaps during the initial phase of treatment, chlorinating just to meet the chlorine demand is sufficient. In other cases, however, such as at the end of the treatment process, it is desirable to have an additional amound of chlorine in the water available for disinfection as it travels through the distribution system. This additional chlorine is called the **chlorine residual**.

**A water is tested and found to have a chlorine demand of 1.9 mg/L. If the desired chlorine residual is 0.8 mg/L, what is the desired chlorine dose in mg/L?**

Chlorine Dose = Chlorine Demand + Chlorine Residual

Chlorine Dose = 1.9 mg/L + 0.8 mg/L

Chlorine Dose = 2.7 mg/L $Cl_2$

**What should the chlorinator setting be (lbs/day) to treat a flow of 2.46 MGD if the chlorine demand is 3.1 mg/L and a chlorine residual of 0.8 mg/L is desired?**

First calculate the chlorine dose in mg/L:

Chlorine Dose = Chlorine Demand + Chlorine Residual

Chlorine Dose = 3.1 mg/L + 0.8 mg/L

Chlorine Dose = 3.9 mg/L

Then calculate the chlorine dosage (feed rate) in lbs/day:

(mg/L $Cl_2$) (MGD flow) (8.34 lbs/gal) = lbs/day $Cl_2$

(3.9 mg/L)(2.46 MGD)(8.34 lbs/gal) = 80 lbs/day Chlorine