



**WASTEWATER TECHNOLOGY  
T R A I N E R S**

*Transforming today's operators into tomorrow's water quality professionals*

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**Problem of the Day  
2015.Dec.20**

**Problem of the Day**

A 96-acre pond system serves a population of 14,500 people. The influent BOD concentration is 205 mg/L and the influent flow is 1.5 MGD. Calculate the organic loading to this pond system.

## Introduction

Organic loading to a pond is a very straightforward pounds-per-day calculation. The only thing you have to remember is that once you've calculated the pounds of BOD per day going to the pond system, you have to divide by the surface area of the pond system in acres.

## Solution

The following information is given in the problem statement or assumed.

1. Influent flow = 1.5 Mgal/d
2. Influent BOD concentration = 205 mg BOD/L
3. Density of influent (water) = 8.34 lb/gal (assumed since not given)
4. Pond surface area = 96 ac
5. Population served = 14,500 people (not used in problem)

Today's problem asks to calculate the organic loading to the pond system. Organic loading to ponds is **always in units of lb BOD/d·ac**. These units, then, are put between heavy vertical lines, as always, followed by an equals sign and the blank solution bridge.

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$$\frac{\text{lb BOD}}{\text{d}\cdot\text{ac}} = \underline{\hspace{10em}}$$

As always, the solution bridge is populated with the units needed in the answer, then the unwanted units are cancelled. There is nothing in the list with the units lb BOD, but there is mg BOD (No. 2). To get the units BOD in the solution bridge, this is entered first as shown in bold.

$$\frac{\text{lb **BOD**}}{\text{d}\cdot\text{ac}} = \frac{205 \text{ mg **BOD**}}{\text{L}} \underline{\hspace{10em}}$$

It's just habit for me, but as soon as I enter mg/L of anything in the solution bridge, I cancel mg and L with one of my favorite conversion factors.

$$\frac{\text{lb **BOD**}}{\text{d}\cdot\text{ac}} = \frac{205 \text{ mg **BOD**}}{\text{L}} \frac{\text{L}}{\text{M}\cdot\text{mg}} \underline{\hspace{10em}}$$

To get d needed in the denominator of the answer, flow is entered next (No. 1) so d are in the denominator of the solution bridge, as shown in bold. Note the Ms cancel.

$$\frac{\text{lb **BOD**}}{\text{d}\cdot\text{ac}} = \frac{205 \text{ mg **BOD**}}{\text{L}} \frac{\text{L}}{\text{M}\cdot\text{mg}} \frac{1.5 \text{ Mgal}}{\text{d}} \underline{\hspace{10em}}$$

In order to get the units lb needed in the numerator of the answer, the density of water is entered (No. 3). Note the gals cancel.

<b>lb BOD</b>	=	205 mg BOD	ℓ	1.5 Mgal	8.34 lb	
<b>d·ac</b>		ℓ	M·mg	d	gal	

Finally, to get the units ac needed in the denominator of the answer, the total surface area of the pond system is entered in the denominator of the solution bridge, shown in bold.

<b>lb BOD</b>	=	205 mg BOD	ℓ	1.5 Mgal	8.34 lb	
<b>d·ac</b>		ℓ	M·mg	d	gal	<b>96 ac</b>

Since all the units have now canceled except those needed in the answer, **lb BOD/d·ac**, we know the solution bridge is complete. The arithmetic gives the **answer**.

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<b>lb BOD</b>	=	205 mg BOD	ℓ	1.5 Mgal	8.34 lb	
<b>d·ac</b>		ℓ	M·mg	d	gal	<b>96 ac</b>

$$205 \times 1.5 \times 8.34 \div 96 = \underline{\underline{26.7 \text{ lb BOD/d·ac}}}$$

### Discussion

You don't have to memorize equations or pie charts if you just believe in the units!

**Happy calculating! Let us know, by leaving a comment, if you want us to do a specific problem, if you see a mistake, or if you have a question on any of the Problems of the Day you are looking at.**