



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

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

**Problem of the Day
2015.Jul.24**

Problem of the Day

The process control engineer has calculated that a total of 55,300 pounds of solids must be wasted today to maintain a 6.5-day SRT. The TSS concentration of the WAS is predicted to average 5,800 mg/L. Calculate the needed WAS flow rate in MGD.

Introduction

Different from the MCRT, the SRT calculation does not include the solids in the secondary clarifier. This is fine as long as the strategy is to maintain a minimum sludge blanket in the secondary clarifier, which should be the objective of all activated sludge wastewater treatment plant operators. It is important to realize that the operator in today's problem has already figured out how many pounds need to be wasted, so whether we're talking about MCRT or SRT, it doesn't matter.

Solution

The list of "givens" expressed in the units used by WWTT:

1. Pounds to be wasted = 55,300 lb TSS/d
2. WAS TSS concentration = $TSS_{WAS} = 5,800 \text{ mg TSS/L}$
3. SRT target = 6.5 d (irrelevant to the problem)

This is another "reverse pounds calculation." Like yesterday's problem, we are given pounds and concentration and we need to calculate flow rate. Today's problem, though, is two steps shorter on the solution bridge due to the units asked for, Mgal/d. These units are put between heavy vertical lines, as always, followed by the equals sign and the blank solution bridge.

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Mgal	=			
d				

The solution bridge is started by putting the units d, needed in the answer, in the denominator.

Mgal	=	55,300 lb TSS		
d		d		

The unit lb in the numerator is canceled by entering the density of water "upside down."

Mgal	=	55,300 lb TSS	gal		
d		d	8.34 lb		

The unit TSS in the numerator is canceled by entering the TSS_{WAS} concentration in the denominator.

Mgal	=	55,300 lb TSS	gal	L		
d		d	8.34 lb	5,800 mg TSS		

Whenever mg/L are entered on the solution bridge (unless you're solving for mg/L), they are canceled using M·mg/L entered so mg and L cancel.

Mgal	=	55,300 lb TSS	gal	L	M·mg		
d		d	8.34 lb	5,800 mg TSS	L	mg	

Since all the unwanted units have now canceled and only the units needed in the answer remain (Mgal/d), we know the solution bridge is complete. The arithmetic gives the answer.

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Mgal	=	55,300 lb TSS	gal	L	M·mg
d		d	8.34 lb	5,800 mg TSS	L

$$55,300 \div 8.34 \div 5,800 = \underline{\underline{1.14 \text{ Mgal/d}}}$$

Discussion

Readers of Problem of the Day have no doubt noticed I do not identify the individual problems as being appropriate for any specific grade exam. This is on purpose. While I know this drives many of you crazy, my reasoning is that the solution bridge is a process for solving problems. Being able to apply that process to any problem is what makes you a professional. As I often say in our Operator Certification and Math Review classes, do not memorize problems but understand the process. The process that is the solution bridge is the same no matter what grade of certification exam you may be taking. The complexity of the problem doesn't matter if you know the process.

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.