Operator Quiz Corner

Be Mindful of Water Age in Storage Tanks

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The primary purpose of most water storage tanks is to provide the distribution system with enough water to meet the system's fluctuating demands as well as ensure adequate pressure. Generally 1 to 2 days of a system's average day demand should be provided. This will vary somewhat based upon the characteristics of the system (residential/commercial/industrial) and fire fighting needs. Water pressure throughout the system should not drop below 20 psi under all conditions – including fighting a fire.

For many years it was common practice to try and keep storage tanks full as much of the time as possible. This provided operators with a certain level of peace of mind knowing that there will be a good supply of water at the ready in the event of an emergency. However, this approach has become less desirable as we have learned a great deal more about how water age plays a significant role in water quality. Elevated levels of disinfection byproducts, loss of chlorine residual, bacterial growth and the buildup of sediments are all reasons to try to keep water in storage tanks as fresh as possible.

Several strategies have been employed to reduce stagnant water in tanks. These include:

- Changing the SCADA setpoints to allow the tank level to go up and down over a wider range.
- Install separate inlet and outlet pipes at opposite ends of the tank to help minimize dead zones.
- Install baffling devices that force the water to move throughout the entire tank when it is emptying and filling.
- Install mechanical mixers or recirculating pumps to minimize dead zones in the tank.

Routine water quality monitoring (temperature, chlorine residual, pH) of the water in a tank can also provide useful information when evaluating tank characteristics or performing troubleshooting measures. The newer technologies of hydraulic modeling and thermal imaging can be great tools to identify issues with water age.

1. Which of the following types of tanks is not typically used to provide storage to meet fluctuating system and fire flow demands?
    a. Surge tank
    b. Clearwell
    c. Elevated tank
    d. Ground level tank

2. The longer water sits in a storage tank the more likely it is that it will form layers caused by temperature differences of the stored water. This is known as _________
    a. Haunching
    b. Pressure gradient
    c. DBP formation
    d. Thermal stratification

3. The presence of ___________ and ____________ in the stored water are the primary reasons for the formation of ______________.
    a. Organics, chlorine, Total Coliform Bacteria
    b. Organics, chlorine, trihalomethanes

c. Total Coliform Bacteria, chlorine, trihalomethanes
d. Organics, ozone, Haloacetic acids

4. Which of the following would be the least desirable method of reducing water age in a storage tank?
    a. Separate inlet and outlet piping
    b. Establishing a wider range of tank 'high' and 'low' level settings
    c. Weekly flushing of hydrants downstream of the tank
    d. Installing mechanical mixers

5. Calculate how many gallons of water are in each foot of a circular storage tank that has a diameter of 25 feet and a height of 30 feet.
    a. 491
    b. 1968
    c. 3670
    d. 14,719

Solution:
Volume of a cylinder = 0.785 X D^2 X H
Where D = 25 feet
H = 1 foot
Volume = 0.785 X (25' X 25') X 1' = 490.625 ft^3
Convert to gallons: 490.625 ft^3 X (7.48 gal / ft^3) = 3,669.875 gallons