Operator Quiz Corner

Storage Tank Inspections

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Water storage tanks are a critical component of a public water system. They help provide a steady flow of water to the customer during periods of fluctuating demand. They are vital in times of emergency - such as water main breaks, source water interruptions and fighting fires. Storage tanks can either be 'atmospheric' or 'hydropneumatic'. Hydropneumatic tanks are generally small tanks that are completely sealed and are under pressure. Atmospheric tanks, which are discussed below, are different than hydropneumatic tanks in that they are typically much larger and have an overflow pipe and a vent. This allows air to enter and exit the tank as it fills/empties with water.

Atmospheric storage tanks come in a variety of shapes and sizes and can be constructed from several different materials. The most common tanks are clearwells (used to store water at a treatment plant), ground level tanks, elevated tanks and standpipes (height is greater than the width). Widely used tank material is steel (either welded or bolted plates) and concrete.

Regardless of the type of tank and the material it is important that they are regularly inspected to verify proper operation and ensure protection from contamination. Inspections can be classified as either routine, periodic or comprehensive. Routine inspections are those daily or weekly visual checks conducted by the water utility staff. MassDEP requires that records be kept for all routine inspections (See MassDEP tank inspection checklist: https://www.mass.gov/doc/pws-monthly-storage-tank-inspection-log/download). Periodic inspections a more thorough inspection that often involves climbing on the tank to check things like roof hatches, vents and overflows. Comprehensive inspections are usually done by a qualified 3rd party and involves a more thorough evaluation of the interior and exterior tank components and materials. The American Water Works Association and MassDEP recommends that comprehensive inspections be done every 3 to 5 years.

The following are important things to look for when conduction tank inspections:

- Signs of cracking or deterioration of the foundation
- Excessive vegetation/limbs around or over the tank
- Perimeter fencing condition
- Damage/deterioration of the tank material
- Vents and overflows have screens in good condition
- Overflow pipes and pads are clear of debris
- Hatches have gaskets, are tight fitting and equipped with a lock
- Access ladders and railings are in good condition

Watch this video for the important aspects of conducting a tank inspection:
https://www.youtube.com/watch?v=33iNMcYZ6lE

1. During a routine inspection of a water storage tank a water operator notices that the roof hatch on the storage tank is open. What is the first step that should be taken?
    a. Climb the tank and close the hatch.
    b. Determine the volume of water in the tank
    c. Contact the proper authorities and take the tank out of service.
    d. Collect a water sample

2. True or false? Use of a drone is an acceptable method of inspecting the condition of the storage tank roof vent.
    a. True
    b. False

3. It is possible to see indications of faulty tank level sensors/controls during a routine inspection if which of the following is observed during a tank inspection?
    a. Low chlorine residual
    b. Flowing water, or signs of flowing water, on the overflow splash pad and associated drainage swale
    c. Signs of vandalism to the perimeter fence
    d. All of the above

4. Which of the following is considered to be an acceptable method of conducting an interior tank inspection?
    a. Qualified diver
    b. Remotely operated vehicle (ROV)
    c. Drain the tank to allow for inspectors to enter
    d. All of the above

5. An empty rectangular concrete water storage tank measures 20 feet long by 15 feet wide and has an overflow pipe located 12 feet above the tank floor. If the tank is filling at a rate of 75 gallons per minute (gpm), how many hours will it take to fill the tank to the level of the overflow pipe?
    a. 6
    b. 48
    c. 359
    d. 26,928

Math Solution:
Formula for Detentions Time: Detention Time = Volume / Flow (Note units for flow and volume must be compatible)
Volume = L X W X H = 20ft X 15ft X 12ft = 3,600ft^3
Must convert 3,600ft^3 to gallons: 3,600ft^3 X (7.48gal/ft^3) = 26,928 gallons
Where Flow = 75 gpm
Detention Time = 26,928 gallons / 75 gpm = 359 minutes
Must convert 359 minutes to hours: 359 minutes X (1hr/60min) = 5.9 hours