

Operator Quiz Corner  
Alex, I'll Take "Distribution System Flushing" for \$600  
(Dan Laprade, Training Coordinator)

This edition of the Operator Quiz Corner pays tribute to the recent passing of Alex Trebek – the long time host of the popular TV game show Jeopardy. Trebek hosted the show for 37 years and filmed over 8,200 episodes. In keeping with the true Jeopardy format all answers to the "Operator Quiz Corner" are given in the form of a question.

There are many reasons for conducting a flushing program whether it be frequent flushing of problem areas or routine flushing of the entire distribution system. Below are just some of the more common reasons for conducting distribution system flushing:

- Remove sediment
- Scour any biofilm or tubercules for the pipe walls
- Minimize problems associated with stagnant water (chlorine residuals, disinfection byproducts, taste/odor)
- Collect flow and pressure data
- Identify problem hydrants and/or valves

The following video, produced the Rural Community Assistance Partnership (RCAP), is a good overview of key components of instituting a hydrant inspection, and flushing program:

<https://www.youtube.com/watch?v=0uAN3UDjq0A>

Answers to the following questions can be found by going to the MWWA website and clicking on the "Education" tab and click the link under the heading "Answer to Distribution Flushing Practice Problems".

- 1) In general, flushing velocities should be at least ..... and unidirectional flushing velocities should be .....
  - a) What is.... 5.0 ft/sec, 2.5 ft/sec?
  - b) What is.... 2.5 ft/sec, 5.0 ft/sec?**
  - c) What is.... 5 ft/sec, 10 ft/sec?
  - d) What is.... 10 ft/sec, 5 ft/sec?
  
- 2) The term \_\_\_\_\_ refers to a systematic flushing of the distribution from the \_\_\_\_\_ and working \_\_\_\_\_
  - a) What is... unidirectional flushing, last hydrant, toward the source or storage?
  - b) What is... water hammer, pump station, toward each hydrant?
  - c) What is... unidirectional flushing, source or storage, outward into the system?**
  - d) What is... bidirectional flushing, source or storage, in two separate directions into the system?
  
- 3) The following is/are important steps when conducting a flushing program?
  - a) What is... notifying the customers in advance?
  - b) What is... having an accurate map of the pipes, valves and hydrants?
  - c) What is... having the proper equipment: hydrant wrenches, valve key, dichlorination/diffuser equipment, flow and pressure gages, chlorine test kit, logbook or tablet?
  - d) What is... all of the above?**
  
- 4) The primary reason for opening and closing a hydrant slowly is to....

- a) What is... prevent the risk of stripping the operating nut?
  - b) What is... minimize water hammer?
  - c) What is.... allow any unflushed sediment to settle to the bottom of the pipe?
  - d) What is ....all of the above?
- 5) The flow (gallons per minute) that is needed to achieve a water velocity of 5 feet per second in an 8-inch diameter pipe.
- a) What is 2.0?
  - b) What is 251?
  - c) What is 348?
  - d) What is 783?

Solution: Use ABC Formula Sheet for calculating Flow Rate:  $\text{Flow Rate, ft}^3/\text{sec} = (\text{Area, ft}^2) \times (\text{Velocity, ft/sec})$

Where Area is found by using the ABC Formula for the Area of a Circle =  $.785 \times (\text{Diameter})^2$

Where the Diameter of the 8 inch pipe must be converted to feet:  $8\text{in} \times (1\text{ft}/12\text{in}) = 0.667\text{ft}$

$\text{Area} = .785 \times (0.667)^2 = 0.348\text{ft}^2$

$\text{Flow Rate, ft}^3/\text{sec} = (0.348\text{ft}^2) \times (5\text{ft}/\text{sec}) = 1.74\text{ft}^3/\text{sec}$

$1.74\text{ft}^3/\text{sec}$  must be converted to gallons per minute (gpm) by using the conversion factor of 448.8

$\text{gpm} = 1\text{ft}^3/\text{sec}$  from the ABC Formula Sheet

$1.74\text{ft}^3/\text{sec} \times (448.8\text{gpm}/1\text{cfs}) = \underline{782.9\text{gpm}}$