Then & Now:

Changes in Tank Design and Operations to Maintain Chlorine Residuals

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1994 TANK RULES
1. Bigger is better
2. Single inlet/outlet
3. Keep the tank full

THE RULES HAVE CHANGED
Outline

1. Regulations
2. Water Quality
3. Understanding Tanks
4. What is the Problem?
5. Case Studies
6. What’s Everyone Else Doing?
1. Regulations

PA DEP Requirements

Currently:
SW/GUDI sources
Disinfectant residual in system: 0.02 mg/L

Starting April 29, 2019:
New Disinfection Requirements Rule from Chapter 109
Disinfectant residual in system: 0.2 mg/L
2. Water Quality

• Deteriorates with increasing water age
• Two ways to reduce water age:
  1. Increase demand (i.e. flushing)
  2. Reduce volume in the system
3. Understanding Tanks
Tank Design  Then...

- Hydraulic requirements
- Equalize pressure
- Balance water use during the day
- Emergency storage, fire protection
- Bigger is better
- Future growth
Tank Design  Mixing

EASY  HARD

Reservoirs  Standpipes
Inlet Pipe

Outlet Pipe

Standpipe
Tank Design Now...

- Hydraulic requirements
- Equalize pressure
- Balance water use during the day
Tank Design Now...

- Find alternate solutions for fire protection.
- Right sized is better
- Demo old tanks
- Elevated tanks, not standpipes
- Don’t build assuming future growth, usage still decreasing
Mixers Then...
Mixers What can they do?

- Move water in the tank
- Inject chemicals
- Prevent or minimize freezing
- Reduce water age

Don’t Forget Your PA DEP Permit!!

- Permit for mixer
- New higher fees
- Permit for changes in treatment
Mixers Now...

- In most tanks
- Passive and active
- Costs have gone down
- Options have grown*
- Still in its infancy
Operations  Then...

- Keep the tanks full
- Keep them in service
Operations Now...

- Cycle the tanks more
- Varies for each tank
- Consider how and when pumps run to fill tanks
- Inspect tanks regularly
- Drain and clean out as needed
4. What is the Problem?

Start with Data

- Temperature, Chlorine Residual, pH
- Over time
1.5 MG and 3.0 MG Reservoirs
2.0 MG Reservoir
Too Much Storage?

- Non-Consecutive System
- 300,000 gal. + 1,500,000 gal.
- Daily Usage: 300,000 gal.
- Need Data
Best Practices

Water Quality in Distribution Systems
Capacity & Water Age

• Determining Capacity
• Determining Water Age
• Ways to Balance Capacity and Water Age
• Best Practices
• Case Studies
• References
Help from the PA DEP

Justin Blashaw –
PA DEP Technical Assistance Program
Distribution System Optimization Program
• Assistance to systems to improve water quality
• Focus on operational changes and best management practices

Data
• In-tank water quality & temperature loggers
• Continuous disinfectant residual monitoring

IT’S FREE!!!
5. Case Studies

1.0 MG Gallon  
No Mixer

0.25 MG Gallon  
With Mixer
Entech Engineering was NOT the mixer designer.
Pump: 350 gpm

1.0 MG Gallon
No Mixer

0.25 MG Gallon
With Mixer
What’s Important?  Mixer Design

• Accurate Design Data
• Select the Right Mixer for Your Tank
• Qualified Installer & Inspection
Case Study #2
TTHM Issues

1. Obtain & Analyze Data
2. Hydraulic Modeling
3. Evaluate All Water Quality Issues
4. GridBee mixers with spray aeration
5. Multiple Owners report seeing more than 60% reduction
6. Make specification and contract Performance Based
Case Study #3

- Cleaning with Floran
- Smooth vs. Rough Surface
- Minimize potential for biofilm growth
Case Study #4

1.25 MG Standpipe
6. What’s Everyone Else Doing?

**Western PA**
- Full-time distribution system flusher
- Incrementally increasing chlorine dose at key points
- Sodium hypo at 5 pump stations without it

**Central PA**
- Raised chlorine levels at plant a tiny bit; monitoring changes for at least a month
- Discount

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[Map of Pennsylvania highlighting various counties and cities]
6. What’s Everyone Else Doing?

Central PA
- Automatic flushers on hydrants near most of their tanks, flush 3 million per month.

Eastern PA
- Installed new mixer, but shut off until chlorine injection system functional.
What Are YOU Doing?
What’s Everyone Else Doing?

Turn a Standpipe Into an Elevated Tank
What’s Everyone Else Doing?

Turn a Standpipe Into an Elevated Tank
Conclusions

• Can’t design or operate tanks like we did 25 years ago.
• Know what problem you are solving.
• Get accurate data, over a period of time.
• Tank mixing on its own does not improve water quality.
• Help is out there
  • PA DEP – Justin Blashaw
  • AWWA M-68
  • Your colleagues
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Questions?