PELLET SOFTENING TREATMENT: IS IT RIGHT FOR YOUR COMMUNITY?

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OUTLINE

• What is Pellet Softening?
• Background on MTJMA
• Pellet Softening at MTJMA
• Lessons Learned
• Questions
**HISTORY**

- Invented in 1938
- Used extensively in Europe for softening
- Existing installations range in size from 0.5 MGD to 95 MGD
- Manufacturers
  - WesTech – “Spiralater”
  - Tonka – “Spiraclear”
  - Roberts – “Spiractor”
  - Procorp – “Crystalactor”
  - Veolia – “Actina”

Source: DHV
THE BASICS

- Conical or cylindrical catalytic reactor for removal of calcium hardness
- Feed seed material (sand) to top of reactor
- Feed reagent (caustic or lime) to bottom of reactor
- Ca is removed by precipitation onto CaCO₃ crystals
- High loading rate, 35 gpm/sf allows for small footprint
THE BASICS

- Produces near anhydrous crystals (90% dry) “pellets”
- Pellets are removed from bottom of reactor
- Automated, continuous operation
- Mean crystal size is controlled by the frequency of seed removal and sand addition
ADVANTAGES

- Produces crystalline solid “pellet” with potential for beneficial use
- Precipitation occurs at a lower supersaturation, i.e. at lower pH and lower chemical dose, than conventional softening
- Small footprint
- No brine discharge, as compared with ion exchange
EXISTING SYSTEM

**MTJMA – Manor Township Joint Municipal Authority**
- Located Northeast of Pittsburgh, PA
- Water plant and water/sewer conveyance
- Serve 2,800 customers + consecutive system

**Existing WTP, built in 1957**
- 4 groundwater wells (total 1.3 mgd)
- Ion exchange
- No clearwell or high service pumps
- 2 booster pumps stations
- 3 water storage tanks
WHY BUILD A NEW FACILITY?

• Pennsylvania Department of Environmental Protection (PADEP) will not renew MTJMA’s permit which includes the discharge of brine into the Allegheny River

• New school

• Technologies considered
  • Membranes
  • Ion Exchange with dryer
  • Pellet Softening

• Goals
  • Simple
  • Automated
  • Intermittent Operations
REGULATORY ENVIRONMENT

- Conducted Pilot in 2012
- First Pellet Softening Plant in PA
- Equipment Procurement
PROCESS SCHEMATIC

WELL PUMP → REACTOR → FILTER → CLEARWELL

SAND & SODIUM HYDROXIDE
SULFURIC ACID
SODIUM HYPOCHLORITE

PUMPS
BACKWASH
HIGH SERVICE
REACTORS

• 2 pellet reactors with space for a future third
• Each pellet reactor sized at 0.7 mgd (486 gpm)
• Calcium removal
  • Influent -200 mg/L as CaCO₃
  • Effluent - 100 mg/L as CaCO₃
• Approximate diameter: 4 ft to 9 ft
• Approximate height: 14 ft to 28 ft
ANCILLARY EQUIPMENT

• Sand feed system
  • Slurry or pneumatic

• Chemical feed systems
  • Sodium hydroxide (caustic) or lime
  • Sulfuric acid or CO$_2$

• Pellet drainage & handling
ANCILLARY EQUIPMENT

• Polishing Filters
  • Open gravity
  • Enclosed (outdoor option)

• Filter backwash treatment & solids management
  • Sewer
  • Lagoon
  • Settling basin
LESSONS LEARNED

- **Design/Operational Considerations**
  - Start & stop operations – treat based on demand
  - Chemical feed
  - Upflow velocity – recirculation required?
  - Automation
  - Hydraulic profile
Building a world of difference.

Together

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