Croton Water Filtration Plant

Dissolved Air Flotation, Filtration, and UV Facility

October 15, 2013
Existing New York City Aqueduct System

- New Croton Reservoir
- Catskill Aqueduct (2,300 ML/d, 610 MGD)
- Jerome Park Reservoir
- Bronx Intermediate Service
- Bronx Low Service
- Manhattan Low Service
- Ashokan Reservoir
- Catskill Aqueduct (2,650 ML/d, 700 MGD)
- Kensico Reservoir
- Delaware Aqueduct (3,370 / 3,790 ML/d, 890 / 1000 MGD)
- Hillview Reservoir
- Delaware Aqueduct (6,050 ML/d, 1600 MGD)
- Van Cortlandt Valve Chamber
New Croton Aqueduct and Jerome Park Reservoir

- New Croton Lake and Dam
- Croton Lake Gate House
- New Croton Aqueduct (NCA)
  - Horseshoe Shaped 16 ft high
  - 48 km (30 miles) long
  - Gravity flow (mostly not pressurized)
  - Approx. 16 hour delay for flow changes at GH to reach JPR
- Jerome Park Reservoir (JPR)
  - Balances flow conveyed down NCA and WFP flow rate
  - Enables WFP to change flow rates to match system demands
  - Acts as settling basin during high turbidity events
Croton Water System History

- Croton Dam - Old Croton Aqueduct 340 ML/d (90 mgd), Reservoir in Manhattan 1842, decommissioned in 1950s
- New Croton Dam, New Croton Aqueduct 1,135 ML/d (300 mgd), Jerome Park Reservoir, 1906
- Unfiltered water - chlorine, fluoride, corrosion inhibitor, ~10% of 4,540 ML/d (1,200 mgd) average demand
- Safe Drinking Water Act 1974 mandated filtration
- Ozone / Diatomaceous Earth (DE) Filtration 1980s, pilot and design
- Ozone / GAC / DE Filtration early 1990s, demo and design
- DAF / Ozone / Dual Media Filtration late 1990s, pilot and design
- DAF / Filtration (DAFF) / UV, 2000 onwards, now under construction in The Bronx, NYC
- Completion of $2.1 billion construction project - late 2013
Croton Water Filtration Plant (WFP) is designed to be compact and to merge with Mosholu Golf Course, which is part of Van Cortlandt Park, in the Bronx.
**Croton WFP Process Schematic**

**Plant Capacity**
- Maximum: 1,100 ML/d (290 mgd)
- Minimum: 340 ML/d (90 mgd)

**High Service**
- High Pressure System (Cat/Del)

**Low Service**
- Low Pressure Gravity System

**Schematic Diagram**
- Raw Water
- 3 Stage Mixing
- Sulfuric Acid (Coagulant 1st)
- Coagulant Aid Polymer
- Coagulant 2nd
- Flocculation
- Filter Aid Polymer
- Dissolved Air Flotation
- Backwash Air Scour
- Filtration
- Sodium Hypochlorite (Fluoride)
- Sodium Hydroxide (Corrosion Inhibitor)
- UV
- Mix Weir
- Wet Well
- Solids Tank
- Sodium Hypochlorite
- Waste Water Tank
- Recycle to Raw Water Wet Well

**Legend**
- High Service
- Low Service
Pump Data

- Six Vertical Axial Flow - 1 Stage
- Capacity 12,580 m³/h (55,400 gpm, 80 mgd) at 14.0 m (46 ft)
- Motor – 750 kW (1,000 HP) Totally Enclosed Water-to-Air Cooled
- Variable Frequency Drive
Raw Water Pump Station

Croton WFP
Pump Data
- Six Vertical Axial Flow - 2 Stage
- Capacity 9,150 m³/h (40,300 gpm, 58 mgd) at 51.8 m (170 ft)
- Motor – 1,865 kW (2,500 Hp) Totally Enclosed Water-to-Air Cooled
- Variable Frequency Drive
Mixing
Number of Trains and Mixing Stations - 4 (2 per half plant), 3 stages per train
Dimensions - 4.57 m by 4.57 m in plan, 3.81 m water depth
Top entry turbine type, 3 in series - Radial flow impellers, adjustable speed
Hydraulic Detention Time (HDT) - 22 seconds at maximum flow
Mixing Intensity - $G = 1,000 \text{ sec}^{-1}$ maximum
**Flocculation (Close-coupled to DAF)**

Number of Trains and Stages - 48 (24 per half plant), 2 stages each

Dimensions - 3.96 m by 3.20 m, 3.66 m water depth

Top entry turbine type - Axial flow hydrofoil impellers, adjustable speed

Number of stages - 2 close-coupled to DAF

HDT - 2.4 min. per stage, 4.8 min. total

Mixing Intensity – \( G = 100 \text{ sec}^{-1} \) maximum
Dissolved Air Flotation - Above Filters
- Number of DAF Units: 48 (24 per half plant)
- Dimensions: 13.41 m long by 6.71 m wide, 4.48 m to top of media
- Loading Rate: 12.2 m/h (5 gpm/ft²)
- Floated Solids Removal: Rotating Skimmer
- Recycle Injection: 3 manifolds per tank, fixed orifice nozzles
DAF Recycle System

Notes:
1. Compressed Air must be oil free.
2. Rate Compressors at 50% Duty 125 PSI – Use SCFM.
3. Saturators are ASME VIII PUs rated at shut off head of DAF Pumps or 160 PSI whichever is greater.
4. Feed & Discharges must be hydraulically similar as saturators work in parallel.
5. Packing Longer Tru-Pak 80mm.

Croton WFP
Filtration and UV – Pipe Gallery
Filters, Media, Backwash and Underdrains

**Filtration (Located below DAF)**
- Number of Filters - 48 (24 per half plant)
- Dimensions - 10.97 m long by 6.71 m wide
- Loading Rate - 15.9 m/h (6.5 gpm/ft²)
- Media type and depth: 0.61 m anthracite and 0.30 m silica sand
- Filter Floor/ Underdrain - Concrete monolithic plenum with plastic nozzles
- Backwash - Air scour, air/low rate wash and high rate wash

Air Scour Blowers

Backwash Pumps
UV Disinfection – Trojan UV

Number of Units - 20 (10 per half plant)
Capacity and Size - 75.7 ML/d (20 mgd), 0.91 m dia. inlet and outlet
UV System Type - Low pressure high output – narrow spectrum
UV Transmittance > 95%
UV Reduction Equivalent Dose (RED) - 40 mJ/cm² > 2 log Cryptosporidium inactivation
Thank You - Questions