ONYX VALVE CO

The Pinch Valve Authority

David Gardellin, P.E.
President

Struvite

- **A DISCUSSION OF CORROSION PROBLEMS INCURRED AT THE BONNYBROOK WASTEWATER TREATMENT PLANT**

- By ARNY VANWIEREN, P.Eng. Mechanical Engineer
- Wastewater and Drainage City of Calgary

Struvite

- The Bonnybrook Wastewater Treatment Plant has experienced problems with new materials in its piping.

- The BNR process has increased the corrosive nature of various wastewater streams. The level of struvite developing throughout the plant in the sludge processes has created large maintenance problems.

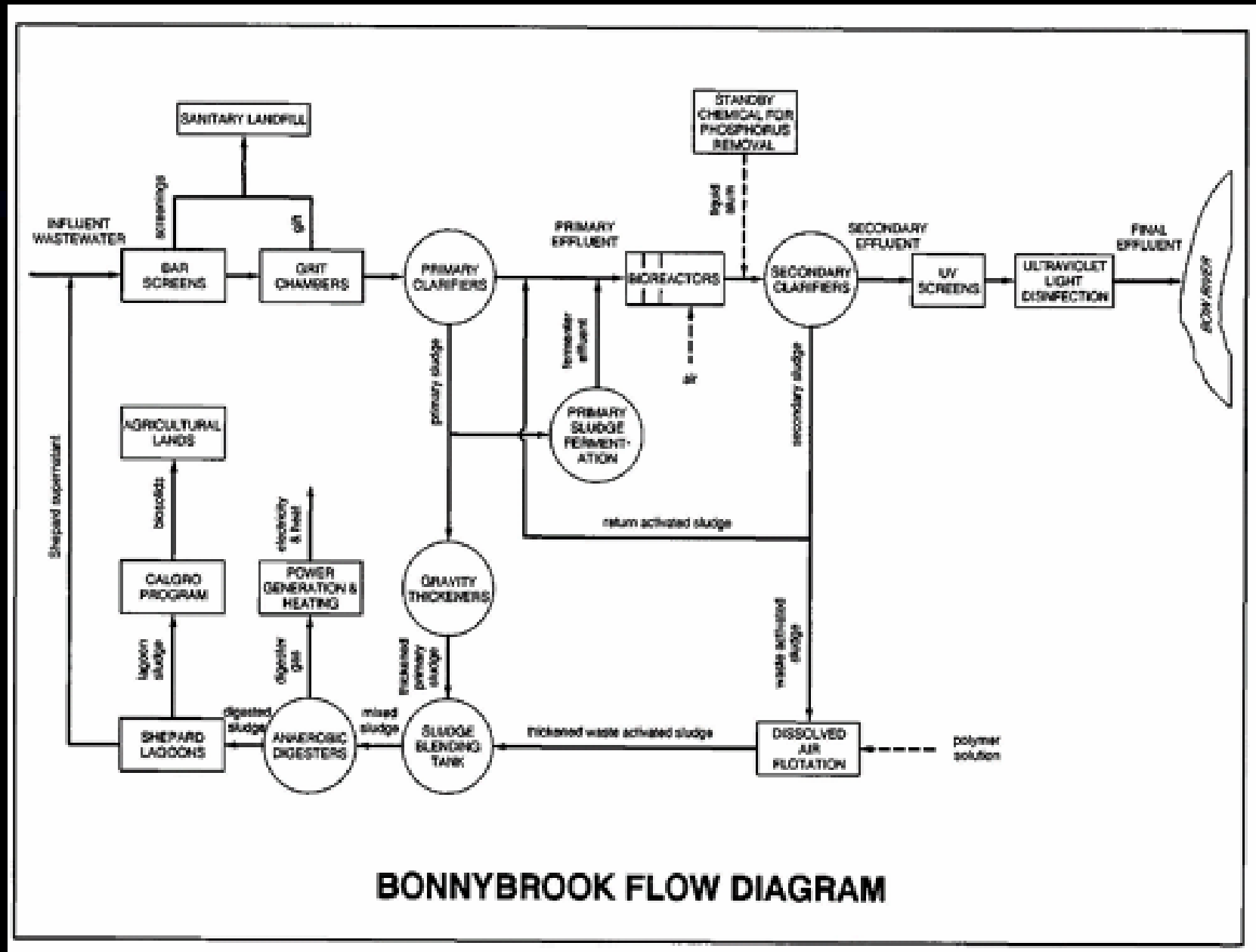
- The intent of this paper is to discuss some of the problems that our Plant has incurred and to show how the Plant developed a strategy to mitigate those problems.

Struvite

- The Bonnybrook Wastewater Treatment Plant has a nominal design capacity of 550,000 cubic meters per day. The Bonnybrook drainage area occupies approximately 435 square kilometers and represents about 65 percent of the city area.

Struvite

- The secondary sludge created a problem beginning in the anaerobic digesters.
- Since Bio 'P' bacteria release phosphorus under anaerobic conditions, secondary sludge fed to the digesters releases phosphorus into the Shepard lagoons. The phosphorus reacts with ammonia and magnesium in the digested sludge to form **struvite**. (The source of the magnesium is Calgary's hard water.) The majority of the struvite settles in the Shepard lagoons to be utilized as slow releasing fertilizer in the digested sludge.
- Unfortunately not all the phosphorus is removed and some is recycled back to the plant along with other ionic compounds. Although struvite is a nuisance, it is essential for the removal of phosphorous.



BONNYBROOK FLOW DIAGRAM

Struvite

- Concentrations of the ions NH_4^+, PO_4^{3-}, and Mg_2^+ found in the effluent results in the deposition of the crystalline mineral struvite, NH_4MgPO_4 throughout effluent and sludge lines.

Struvite

- Struvite, which looks like cement, blocks pipes, pumps, valves, and nozzles. Struvite build-up occurs frequently where there is turbulent flow.
- Previously hydrated aluminum sulfate, a flocculent chemical, works effectively to bind the phosphorous without compromising the plant piping but is expensive.

Struvite

- Although struvite is not corrosive, it has a large impact on process piping degradation due to lost capacity.
- The Shepherd pump house was rebuilt approximately five years ago, utilizing PVC piping. Within two years heavy struvite buildups were seen on the piping. In addition the PVC piping did not last very long because surge pressures caused the line to fail catastrophically a number of times.

Struvite

- The piping was replaced with glass lined ductile iron pipe and fittings three years ago, and has proven very successful. The pipe was examined in October and it was observed that there was no struvite buildup inside the piping.

Struvite

- The plug valves were also a problem. We observed that struvite tended to build up on the nickel seat. Consequently, the struvite would tear the Buna rubber on the plug, eventually making the valve inoperable in a short time period.

- Typical Struvite in Plug Valve

Struvite

- Boston Harbor WWTP at Deer Island encounters struvite problems on sludge systems. Magnesium originates in the salt air environment.

Onyx series DAC

- Onyx model DAC:
- Full Round Full Port dual pinch on Center Line.
- Maintenance free actuator.
- Stem and rods stainless steel.

Onyx series DEC
Electric Actuated Pinch Valves

- Full Round Dual Pinch Configuration
- Sizes from 1/2” to 30”
- On / Off or Modulating Service.
- Stainless steel stem and rods.

Onyx Valves and Pressure Sensors Work on Waste Water

Model DEC Throttles Raw Waste Water

- Model DEC diverts raw waste water from Burlington Twp to Burlington City during periods of peak load.
- Range = 100 to 1000 gpm, with flow accurate to 5 gpm.

Struvite

The valves at the Shepherd pump house have been switched from motorized plug valves to motorized pinch valves because:

- 1. Valve closes to center, preventing debris build up around the stem as it typically does with the plug valves.
- 2. There is no tearing action created by the rotating Buna-N coated plug on the struvite built up on the valve seat.

Struvite

The valves at the Shepherd pump house have been switched from motorized plug valves to motorized pinch valves because:

- 3. The valve operator is less likely to be jammed causing the electric operator to fail early.
- 4. Movement of the rubber sleeve causes crystalline struvite to break up.

Struvite

The valves at the Shepherd pump house have been switched from motorized plug valves to motorized pinch valves because:

- 5. Valve can digest rocks, iron scrap, rags, from the Shepard dump station.

Struvite

The valves at the Shepherd pump house have been switched from motorized plug valves to motorized pinch valves because:

- 6. The fully enclosed rubber sleeve by the iron body allows the valve to handle high surge pressures.

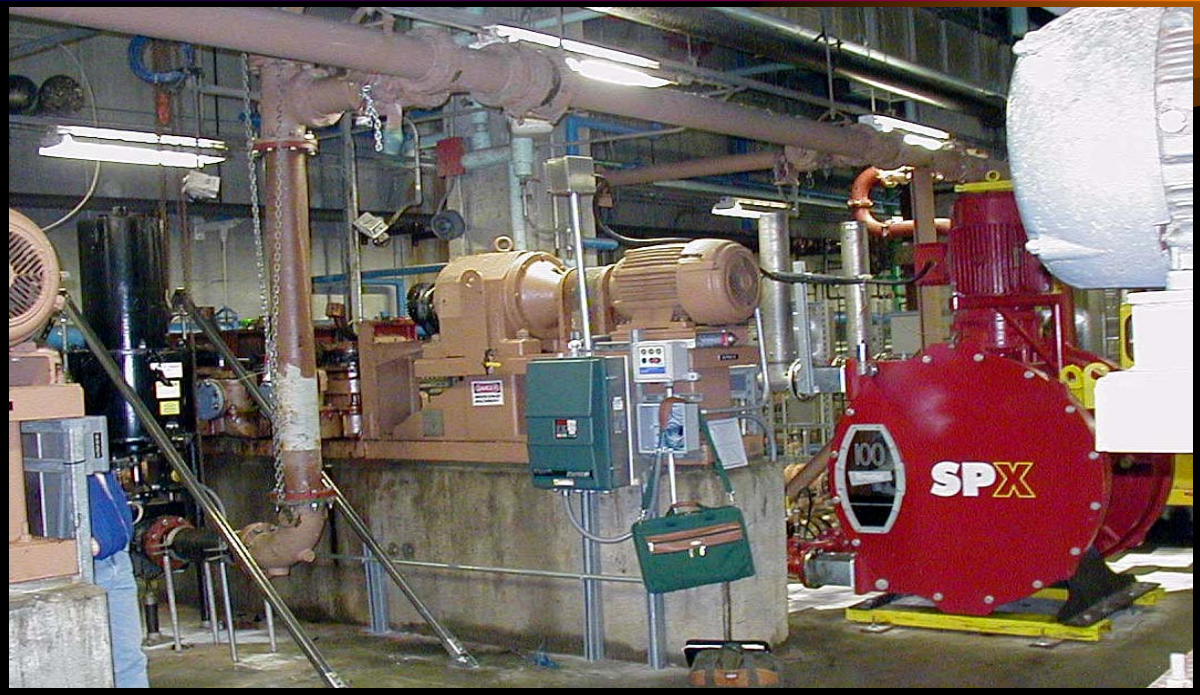
Struvite

- Boston Harbor WWTP at Deer Island encounters struvite problems on sludge systems. Magnesium originates in the salt air environment.

Struvite

- Onyx DHC pinch valves effectively control sludge feed to digesters at 500 ft head pressure.

Struvite



- Watson Marlow Peristaltic hose pump feeds sludge into egg shaped digesters.

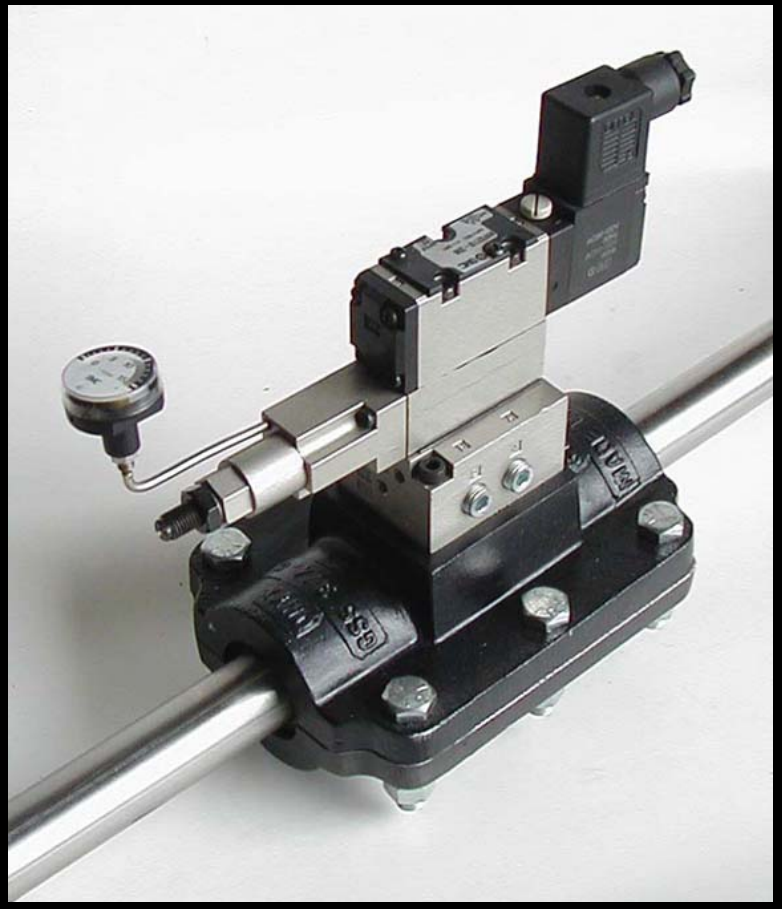
Onyx model DAC at Back River WWTP in Baltimore MD.

- 6” DAC with Fail Closed Pneumatic actuator Controlling Raw Activated Sludge and Waste Activated Sludge.

Onyx Valve Co. Compression Molded Sleeves

- Superior dimensional control. Wall thickness +/- 0.005”
- Superior bond strength between rubber and fabric.
- Method of choice for all modern tires.
- Less labor intensive so replacement sleeves cost less.

Series GSF, GSD and GSS
Shell & Tube type Pinch Valves



- Available with flanged connections
- Available with slip-on connection (no threads or grooves).
- Available with integrally mounted solenoid valve and pressure regulator.

Throttling service

- Why size pinch valves?
  - Longer sleeve life
  - More accurate flow control
- Why are pinch valves better in throttling service than other valves?
  - Change system capacity with a simple sleeve change. No need to replace entire valve and actuator as with ball, butterfly, globe, plug style valves.
- Pneumatically Operated pinch valve w/ Fisher Positioner.