CITY OF BAY CITY SOLIDS HANDLING IMPROVEMENTS
EXISTING SYSTEM

- 18 MGD Plant, receives 60 MGD+ in storm conditions
- CSO sewers
- 5 RTBs in System
- Fine screening, grit removal, primary clarifiers
- Trickling filters, secondary clarifiers
- Tertiary filters, UV disinfection
EXISTING SOLIDS HANDLING

- Four primary clarifiers
EXISTING SOLIDS HANDLING

- Primary sludge and secondary sludge co-settled
- Wasted to 3 storage tanks with limited volume that requires sludge presses to operate most days
EXISTING SOLIDS HANDLING

- Sludge pumped from storage tanks mixed with ferric chloride then lime addition
- Plate and frame presses (1970s) for dewatering
EXISTING PROBLEMS

- Chemical (lime and ferric chloride) and Landfill costs keep going up
- Fouling of filter clothes shut process down
- Lime system is difficult to operate
- Ventilation system non-functional
EXISTING PROBLEMS

- Building systems failing (roof, windows)
- High labor cost to operate system
- Motor control centers difficult to get parts
EXISTING PROBLEMS

- Financially, the City had bonded for significant plant improvements in 2000 for MDEQ mandated upgrades
- No ability or political will to bond for further improvements at the WWTP
- Needed to fund/justify improvements via operational cost savings
STUDY PHASE

- Study to determine most cost effective option
- Examined:
  - Belt Filter Press
  - Centrifuge
  - Screw Press
  - Fan Press
STUDY PHASE

- Pilot tested Fan press and Screw Press
- Sludge feed is highly variable depending on operation of CSO system. Solids percent of feed sludge can range from 2% to 10%.
- Tested for solids percent capture and polymer usage. Measure feed solids and cake solids.
PILOT RESULTS

- **Solids Percent Capture**
- **Polymer Usage**
- **Cake Solids**
- **Feed Solids**

Graph showing comparisons between FKC, Huber, and Prime Solutions.
EQUIPMENT PROCUREMENT

- Bid FKC vs. Huber screw presses
- Evaluated bid based on capital cost and operational costs over 10 years based on pilot test results
- Chose FKC screw press based on lower overall maintenance costs and effort to operate
ODOR ISSUES

- Primary sludge has significant odor. Without ferric chloride and lime feed systems, new presses would create significant odor problems in the existing building.
- Examined treating the air in the building and also examined making the building smaller to better manage the air volume.
- Elected to use vertical high velocity exhaust fans on the roof to “push” the odors away from occupied uses.
- Provided sodium permanganate feed system into liquid sludge prior to dewatering as optional use.
NEW SCREW PRESSES

- Two new 700 lbs/hour FKC screw presses
NEW SCREW PRESS (HEAD TANKS)
SLUDGE PRESS

- Dedicated Polymer feed
SLUDGE PRESS

- New sludge pumping, controlled by presses
SLUDGE PRESS

- New moveable chute system for sludge distribution into dumpsters below
Final Effluent Water Booster System. Existing system did not provide enough pressure or flow for the new spray wash system on the new presses (retrofitted existing system).
HVAC IMPROVEMENTS

• New system
  ▪ Four roof top upblast exhaust units
  ▪ New rooftop MUA, variable speed
  ▪ New ductwork, gas detection equipment
CAPITAL COSTS

- $2,250,000.00 total project cost
- $420,000.00 associated with costs not directly related to process improvement (e.g., roof replacement)
- $1,830,000.00 total cost associated with process upgrade
OPERATIONAL COSTS

- 2013 Operational Cost (prior to project)
  - Sludge processed: 4.59 MG
  - Chemical cost: $98,207.54
  - Landfill cost: $193,564.00 (434 dumpsters)
  - Total cost: $291,771.54
OPERATIONAL COSTS

- 2015 Operational Cost (after project)
  - Sludge processed: 4.63 MG
  - Chemical cost: $50,832.66
  - Landfill cost: $127,512.00 (322 dumpsters)
  - Total cost: $178,344.66*

*Labor cost to operate the new system is less but not easily quantifiable
LESSONS

- Sludge disposal processes tend to change every couple decades at larger plants due to changing technologies, etc.
- At Bay City, they went from incineration to plate and frame press disposal to the new screw press dewatering over the last multiple decades.
- Retrofitting existing buildings/infrastructure to accommodate new processes can be challenging
- Need to examine multiple options for modifications to the existing infrastructure to determine the most cost effective solution
DEWATERING RESULTS

- Cake coming off of press is 30 - 45% depending on feed sludge solids percentage
- Manage odors with ventilation and quick removal of dumpsters from the site
- Landfill loads have decreased 25%
- Chemical/Landfill costs have decreased 40%
- Labor costs have decreased due to lower maintenance requirements of new system (not included in cost comparison)
- Rotary lobe feed pumps have shown signs of excessive wear due to fibrous/gritty feed sludge
QUESTIONS