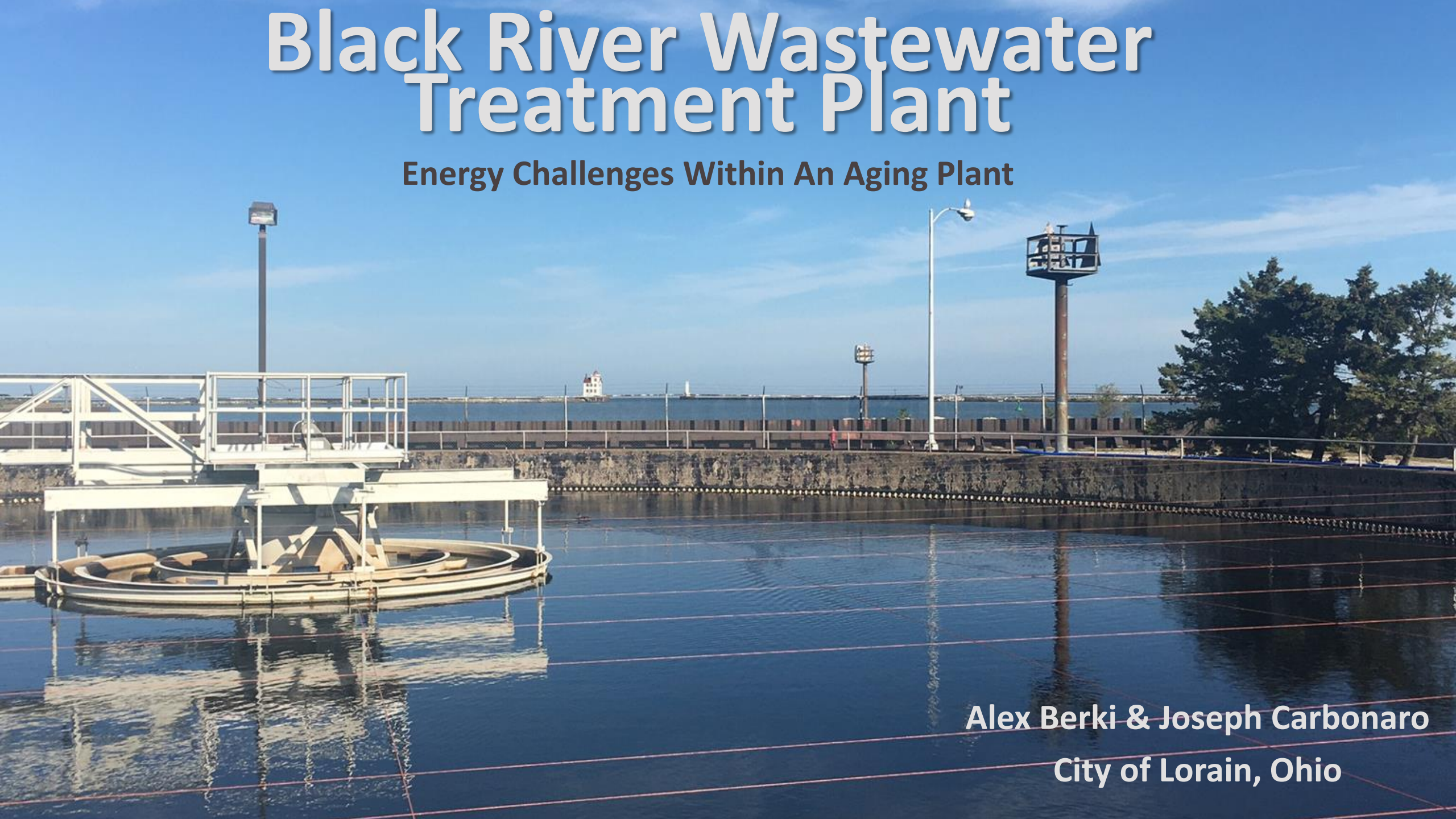
Black River Wastewater Treatment Plant

Energy Challenges Within An Aging Plant



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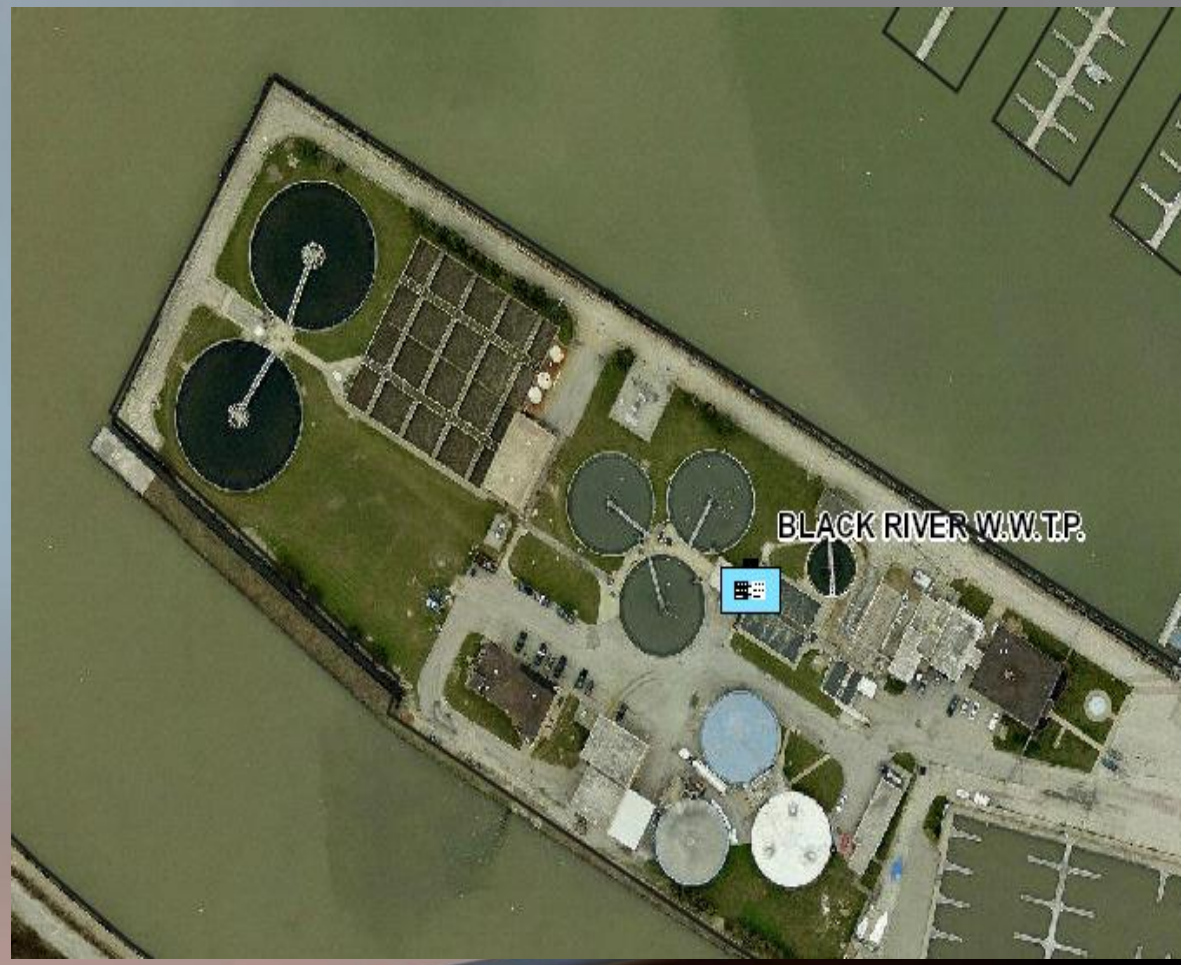
Background

- Built as a Primary Treatment Facility in 1955 with a design flow of 10 MGD
- Upgraded to a Activated Sludge Secondary Treatment Facility in 1972 with a design flow of 15 MGD
- In 1979, a sludge incinerator was put out of service and the facility processes all sludge through a thickener, primary and secondary digester before land application or landfill
- Located on Lake Erie, downstream of the mouth of the Black River



Background

- Equipment has been maintained and repaired since 1972 with very little being fully replaced
- Five (5) 125 HP Hoffman Blowers are still used to supply air to four (4) aeration basins
- A two (2) meter belt filter press was installed in the early 2000s, allowing the BRWWTP to haul sludge as a Class B biosolid
- Since the 1970s, biogas from the digester is utilized to reduce natural gas consumption by powering heat exchangers, pre-aeration blower, and influent pumps

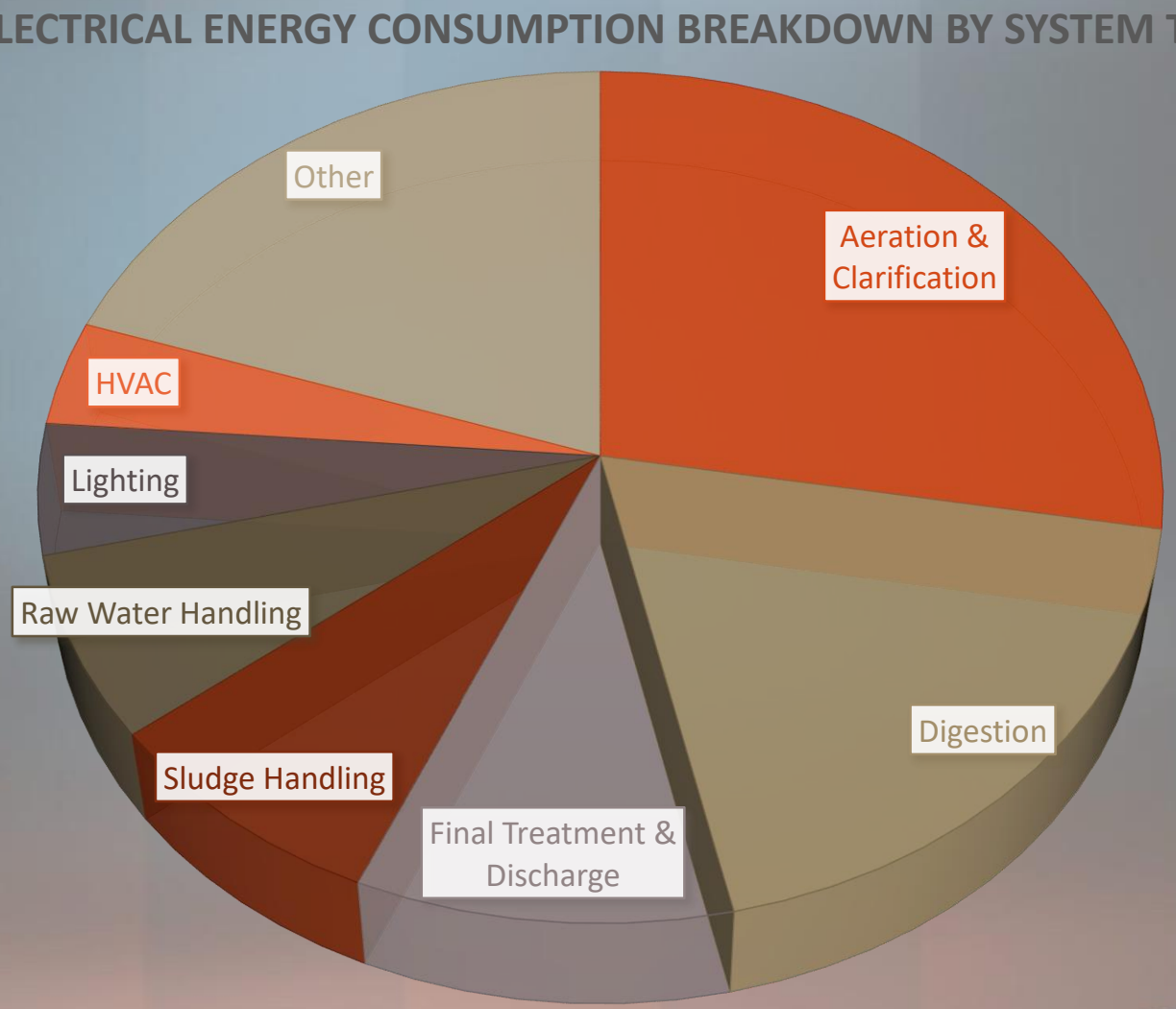
Energy Consumption at BRWWTP

Electric Energy Consumption By System Type

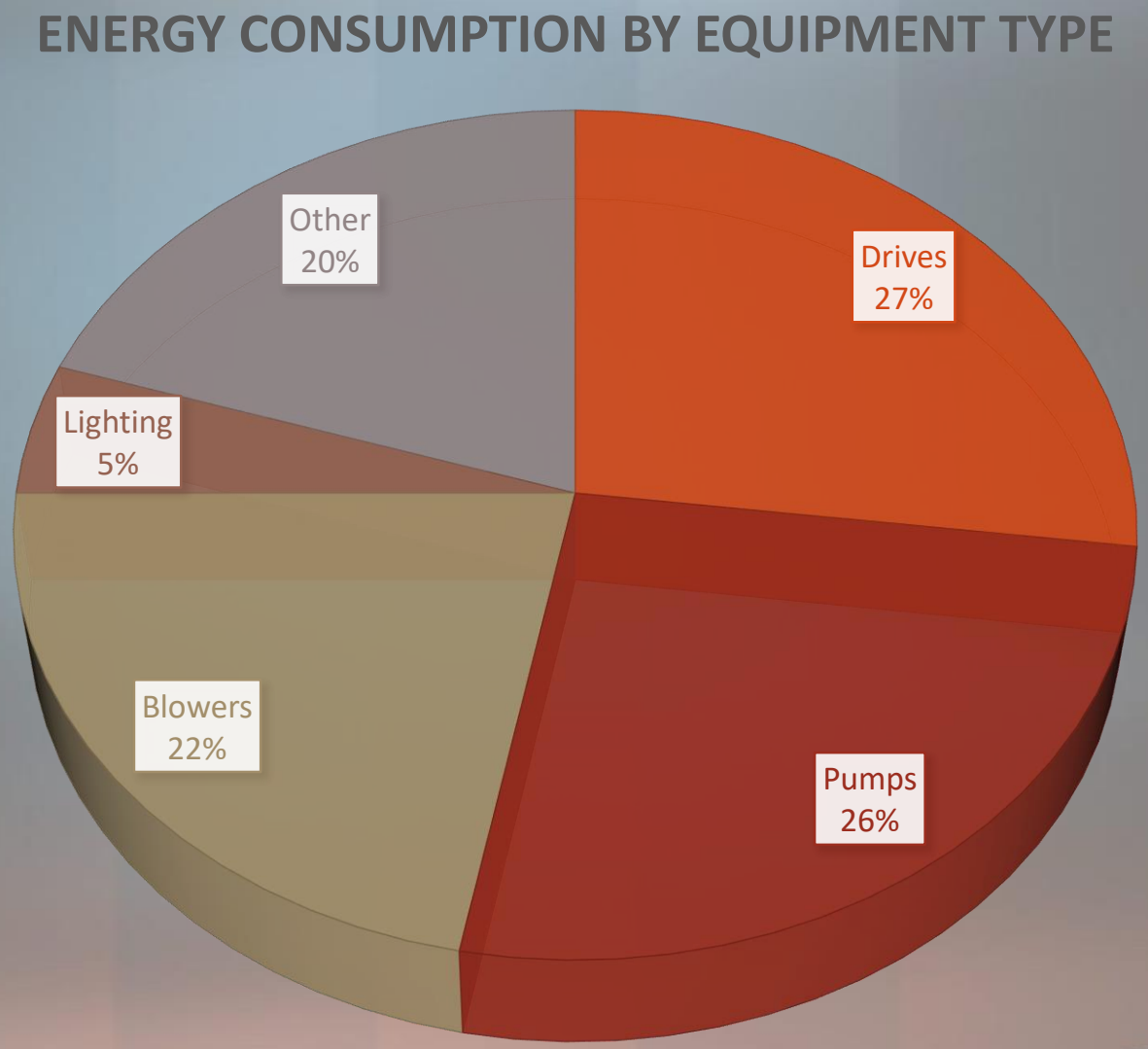
System	Annual kWh	Annual Cost	Percentage
Aeration & Clarification	740,873	$56,822	28%
Digestion	517,204	$39,668	19%
Final Treatment & Discharge	258,580	$19,832	10%
Sludge Handling	206,429	$15,832	8%
Raw Water Handling	175,106	$13,430	7%
Lighting	139,635	$10,710	5%
HVAC	99,186	$7,607	4%
Other	518,886	$39,797	20%
Totals	2,655,899	$203,698	100%

* Information from July 2015 Graphet Report titled, “ODSA Energy Efficiency Program for Manufacturers”

Energy Consumption at BRWWTP



Energy Consumption at BRWWTP

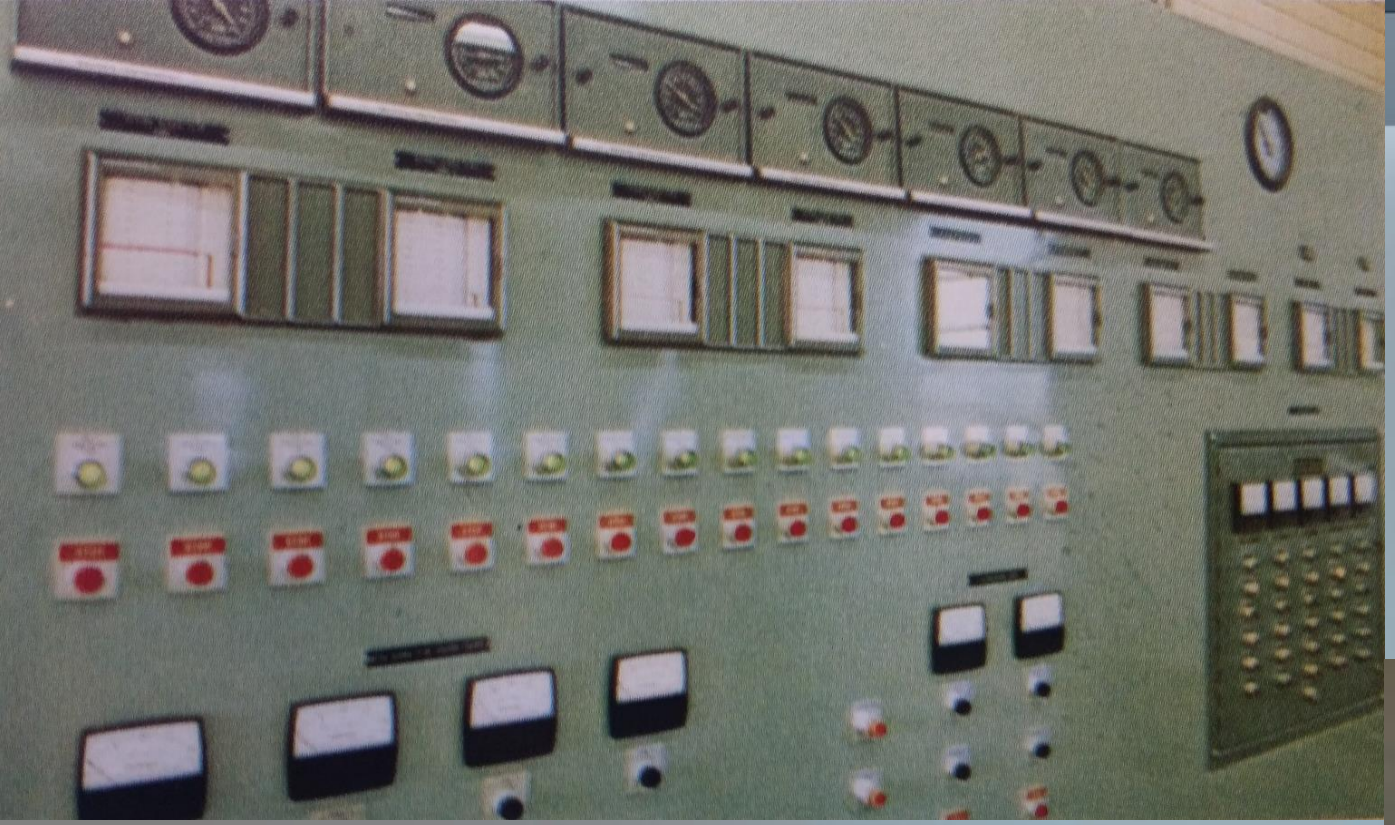


Energy Challenges

- WWTP no longer being thought of as “mothballed”
- Halt “old mentality” of minimal repair and replacement
- Use energy efficient repairs and replacement parts
- Determine sound “order of succession” to bring WWTP up-to-date with necessary repairs
- Understand the costs associated with undertaking certain projects as direction may change unexpectedly
- Minimize compromising the quality of effluent when making energy decisions

- Upgrade existing lighting systems to more energy efficient equipment
- Proper adjustment of aeration basin blowers to achieve maximum energy efficiency AND effluent quality
- Make energy conscience operational adjustments
- Replace motors and equipment with NEMA premium efficiency equipment during next replacement cycle keeping cost in mind
- Consider properly sized equipment to increase efficiency (i.e. digester mixer pumps)

Identify “Low Hanging Fruit”



1971

2016


Mag 7000

Energy Management Plans

- Plans generated from list of Energy Conservation Measures (ECMs) provided/recommended by Graphet:
  - Replace throttling valves on aeration basin blowers with VFDs
  - Reduce air flow to aeration basins to target DO of 3.0 mg/L, thus reducing air flow by 10-50%
  - Purchase and install properly sized mixer pump for digestion tank with NEMA premium motors
  - Purchase LED lighting fixtures to replace current fluorescent lighting system
  - Operate three aeration basins in parallel to achieve required flow (post-VFD)

Turning Plans into Action

SIMPLE

- Upgrade the current lighting system to LEDs
  - Straightforward
  - Obtained three quotes for complete upgrade (i.e. housings, bulbs)
  - Installation and maintenance will be handled “in-house” which will aid in cutting cost and see larger ROI
  - Project anticipated to be completed by end of 2016
  - Anticipated ROI in 1 year

COMPLICATED

- Replace throttling valves on aeration blowers with VFDs
  - Not so straightforward
  - Laundry list of upgrades needed before VFDs can even be purchased for project
  - Most work will be handled and completed “in-house” to save on costs of equipment and labor
  - Uncertain of ROI and timeframe, depends on complexity of project

Turning Plans into Action

- Before VFDs can even be purchased, a number of upgrades must be completed;
  - Replace Magnetic flow meters on Return Sludge Line to monitor flow
  - Purchase and install Insertion Magnetic flow meters on settled sewage line entering aeration basins
  - Repair/Replace pressure valve to regulate air flow from blowers to aeration basins
  - All this done to know flows being sent to aeration basins so proper operation of VFDs can be established

Unexpected Issues

- While attempting to shut off flow through line, it became obvious that the Plug Valves were not fully closing, approximately 2000 gpd still flowing through line
- The valves in place were the original mechanisms installed in 1972
- This is where **Asset Management** is **IMPORTANT**

Lessons Learned

- Budgeted project of replacing Mag meters and installing VFDs no longer to take place
- Amount set aside to be completely used for purchase and replacement of all Plug Valves
- Proper maintenance could have avoided larger time intensive project of full updating of valves and meters
- Money spent on new valves could have been used toward updating of digestion tank mixer
- Project to enhance energy efficiency of digester pushed back further due to increased current project needs
- Despite planning (i.e. 5-Yr Plans & Budgetary Plans) unexpected discoveries can derail important energy projects

Efficiency Vs. Sustainability

- Operate Aeration Tanks to meet top effluent quality, minimum Ammonia concentration.
- Adjust air to maintain DO in Aeration Tanks and meet best effluent quality.
  - BRWWTP aims to maintain DO concentration of 3.0 mg/L.

- Operate Aeration Tanks to meet minimum effluent quality levels and operate at a maximum Ammonia concentration below the given limit.
- Adjust air to Aeration Tanks to operate blowers at maximum efficiency, using least amount of energy (i.e. electricity)
  - Installation of VFDs


Questions?