Akron's Drive to be Energy Neutral

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August 15, 2017

Overview of Presentation

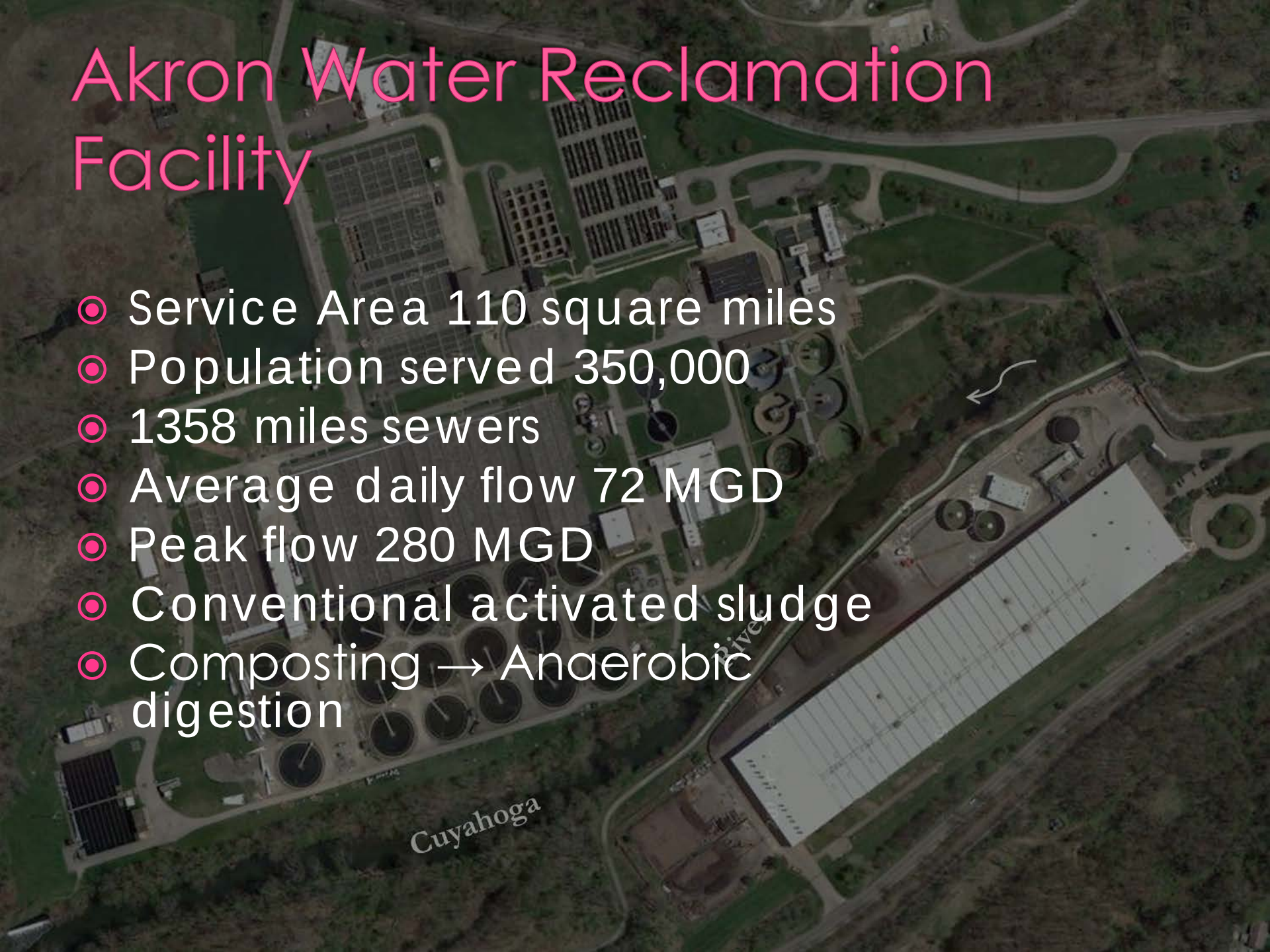
- Background on Akron
- Historical energy usage
- Energy-related projects
- Biosolids management
- Leveraging assets
- Conclusions
- Questions?

The City of Akron

- 62.4 Square Miles
- Total Population ≈200,000
- 2008 All-America City


River
Cuyahoga

Akron Water Reclamation Facility



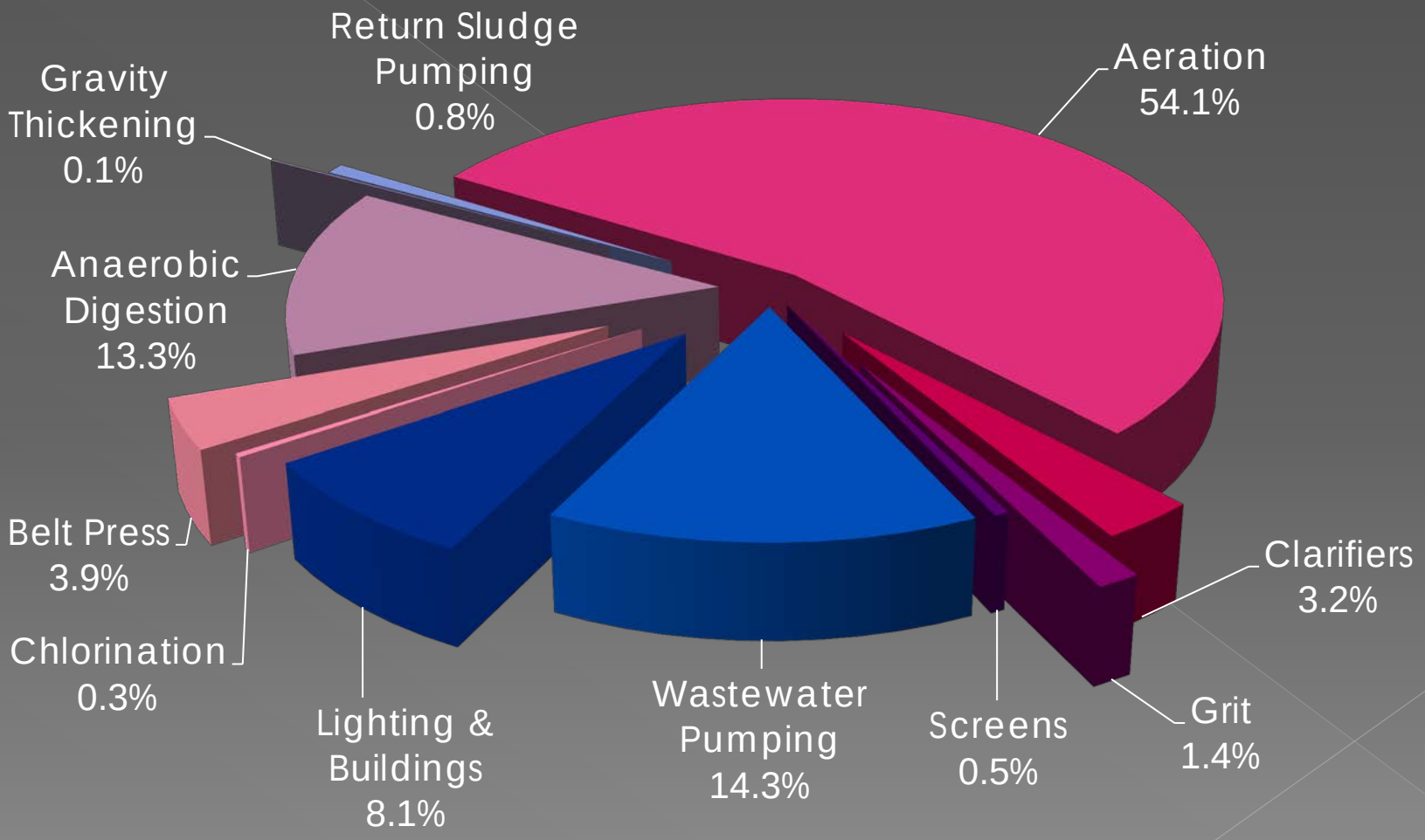
- Service Area 110 square miles
- Population served 350,000
- 1358 miles sewers
- Average daily flow 72 MGD
- Peak flow 280 MGD
- Conventional activated sludge
- Composting → Anaerobic digestion

Discharge to Cuyahoga River

Historical Energy Use

- Facility served by 69,000 v feed from utility
- City-owned substation
- Previous rate structure penalized for demand
- Historical monthly usage was 4,000,000 kWh in 1994
- Monthly electricity cost was about $220,000 (5.5 ¢/kWh)

Electricity Requirements for Activated Sludge Wastewater



Derived from data from the Water Environment Energy Conservation Task Force *Energy Conservation in Wastewater Treatment*

Energy-related projects

- Fine-pore aeration diffuser system
- Computerized Process Control
- DAF to GBT
- Liquid oxygen
- Pre-Aeration system shutdown
- Landfill gas to energy
- High speed blowers
- Anaerobic Digestion
- HVAC Upgrades & installation of LED fixtures

Fine-pore Aeration

- Replaced existing coarse bubble diffusers
- 365,000 kWh /mo reduction
- $1.4M capital cost
- 6 year payback
- Project completed in 1995
- Included DO control of air

Computerized process control

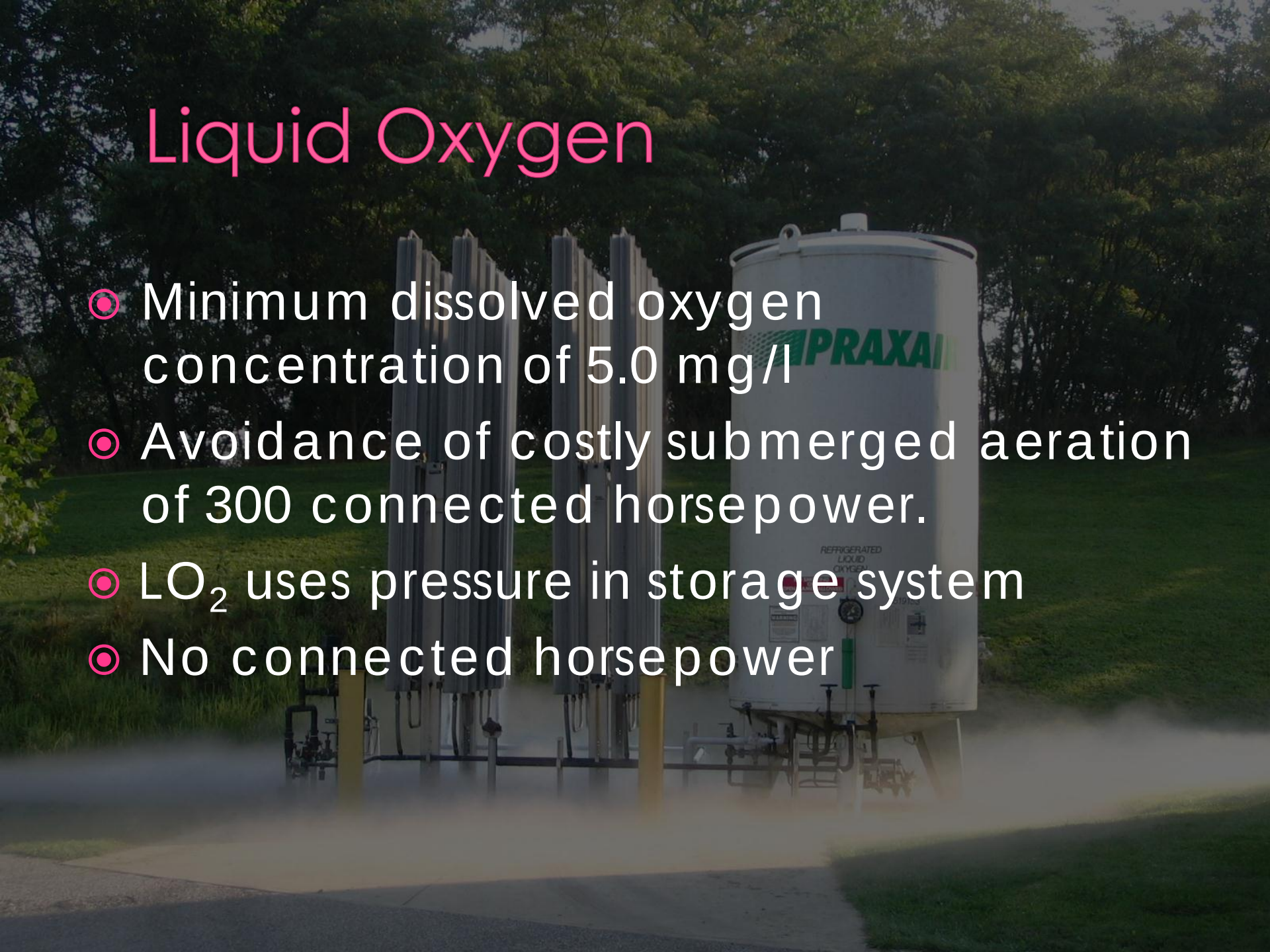
- Replaced “islands” of automatic control
- Rapid data transmission with fiber optic highway
- DO control of aeration blowers
- Project completed in 1995
- Stimulus project in 2010 replaced much of the hardware and software

DAF to GBT

- Waste activated sludge thickening
- Replaced dissolved air floatation with gravity belt thickeners
- Power consumption was reduced by about two-thirds/ polymer reduced 2/3rds & went to unmanned operation
- Annual power savings of $45,000/ with 33% thicker sludge
- Project completed in 1999

Liquid Oxygen

- Minimum dissolved oxygen concentration of 5.0 mg/l
- Avoidance of costly submerged aeration of 300 connected horsepower.
- LO_2 uses pressure in storage system
- No connected horsepower



Pre-aeration System Shutdown

- Provided grease separation, grit removal, and DO enhancement
- Energy savings of $120,000 annually
- Project completed in 2004 at a cost of $175,000
- Payback less than 2 years

Landfill Gas to Energy

- Closed municipal landfill across street
- Private investment with federal grant money for renewable energy projects
- Negotiated reduced rate for power
- 1.1 MW Waukesha Enginator CHP
- Provides 500,000 - 700,000 kWh/mo or 25 - 40% of total facility load
- City has right to excess gas and engine heat

High Speed Blowers

- plant aeration load was 950,000 kWh/mo or 50% of the total facility load
- 4 new 540 HP blowers are 20% more efficient than existing centrifugal blowers
- Units operate between 38% – 100% output
- Magnetic bearings…non-contact, non-wear, frictionless
- Units cost $250k each
- Received $108 K in Utility Rebate payments

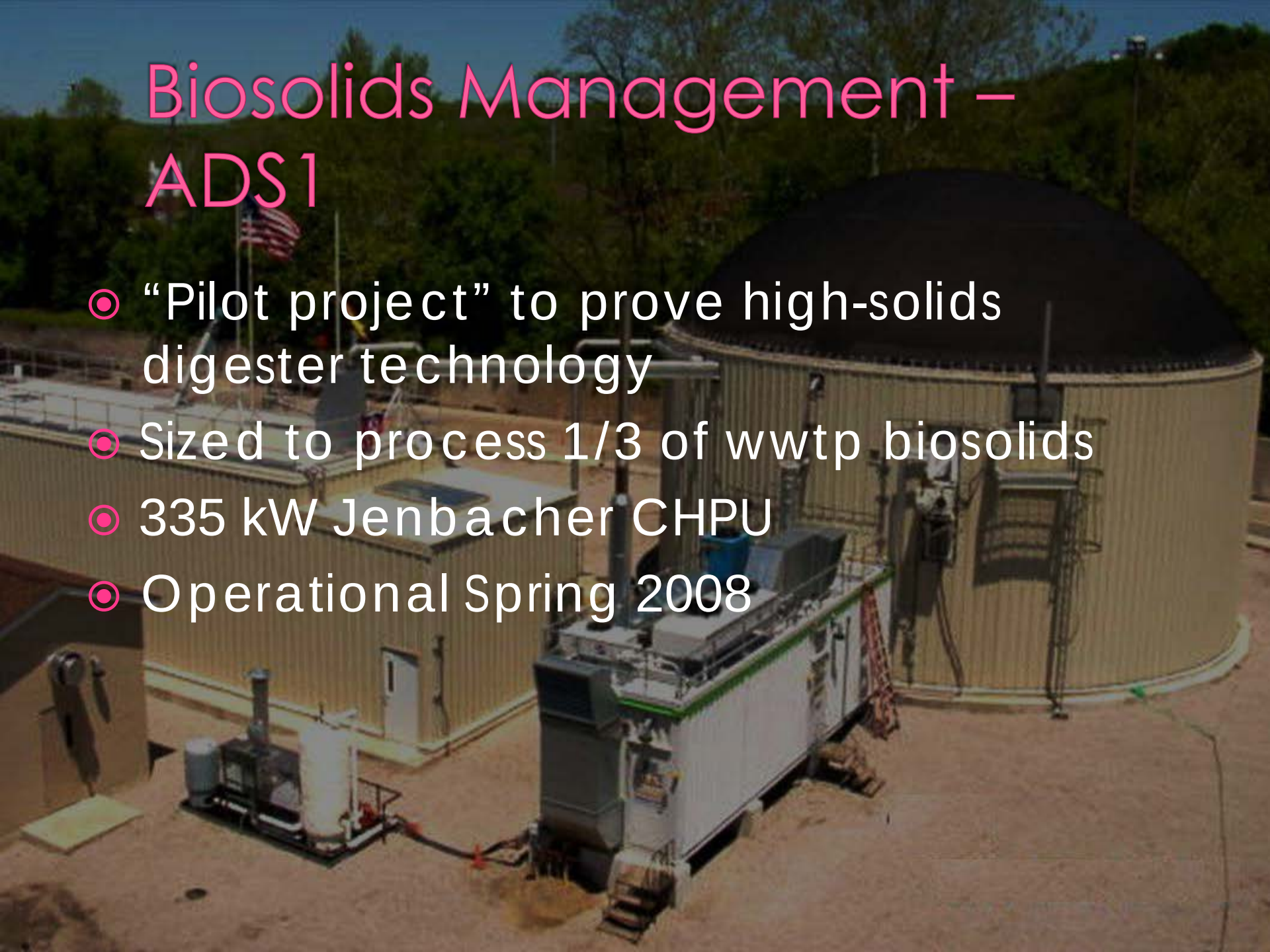
Installation of LED Lighting Fixtures in Plant

- Plant is converting over to LED lighting using in-house staff to perform work
- After fixtures are installed plant applies for utility credit for the installation of energy efficient lighting
- Rebates are approximately 30% of purchase costs.
- Will take approximately 5 yrs to complete.

Biosolids Management

- Incentive-based utility reimbursement
- From significant energy user to net-energy producer
- ADS1
- ADS2

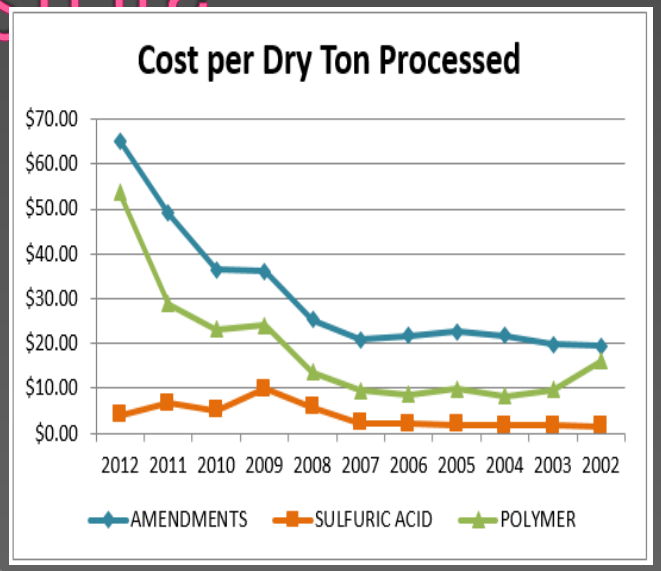
Biosolids Management – ADS1

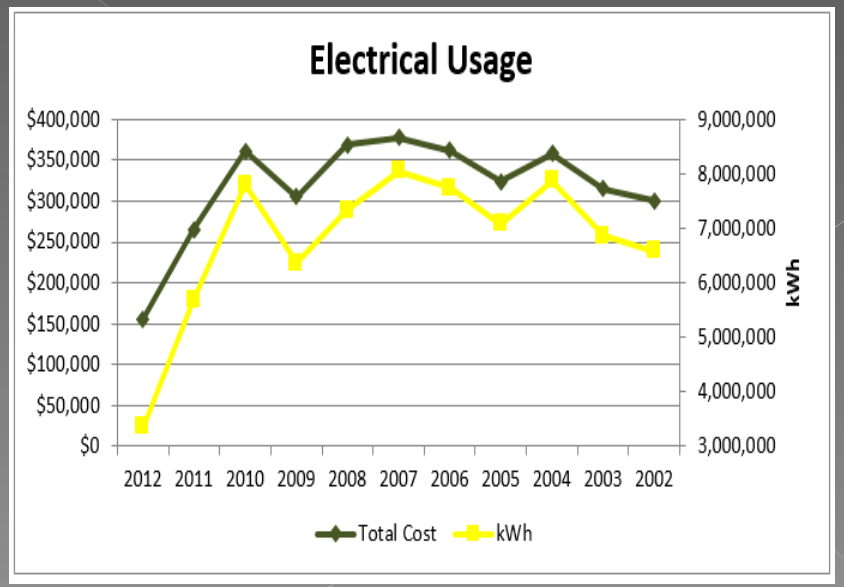


- "Pilot project" to prove high-solids digester technology
- Sized to process 1/3 of wwtp biosolids
- 335 kW Jenbacher CHPU
- Operational Spring 2008

Was the Shift in Disposal Methods Successful?

- Odor
  - Less complaints (zero)
- Amendments
  - 2008 savings of 5,000 yds
  - 2009 savings of 9,500 yds
  - 2010 savings of 10,000 yds
- Chemicals
  - 3,000 to 5,000 gallons less of sulfuric acid
  - Polymer usage went up by 11,000 gallons
- Utilities
  - Approximately 1,500,000 kWh less

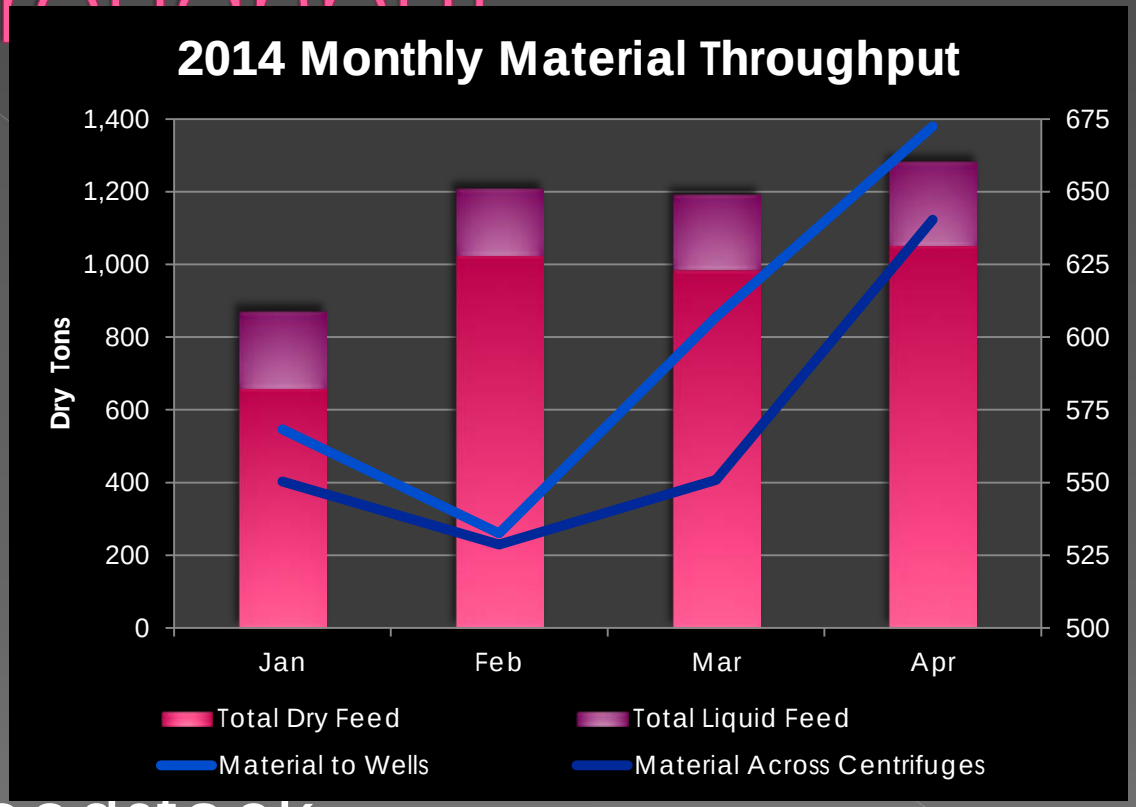




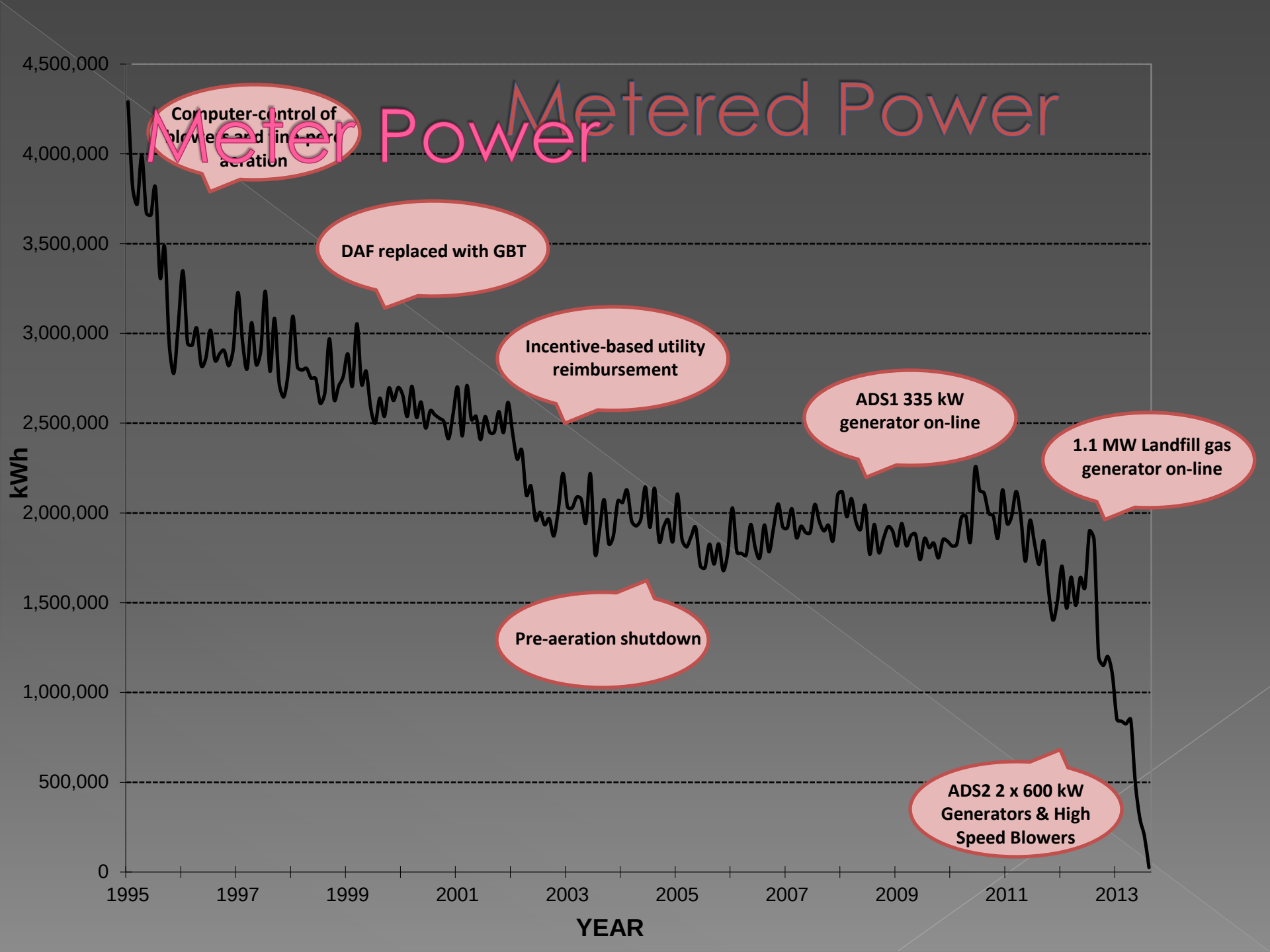
Biosolids Management – ADS2

- Full-scale project to replace composting
- Sized for 15,000 dry tons per year
- 3 x 600 kW 2G Cenergy packaged CHPUs
- Exhaust heat recovery for sludge dryer - 400ºF thermal fluid, 92% dry solids output
- Operational Fall of 2013

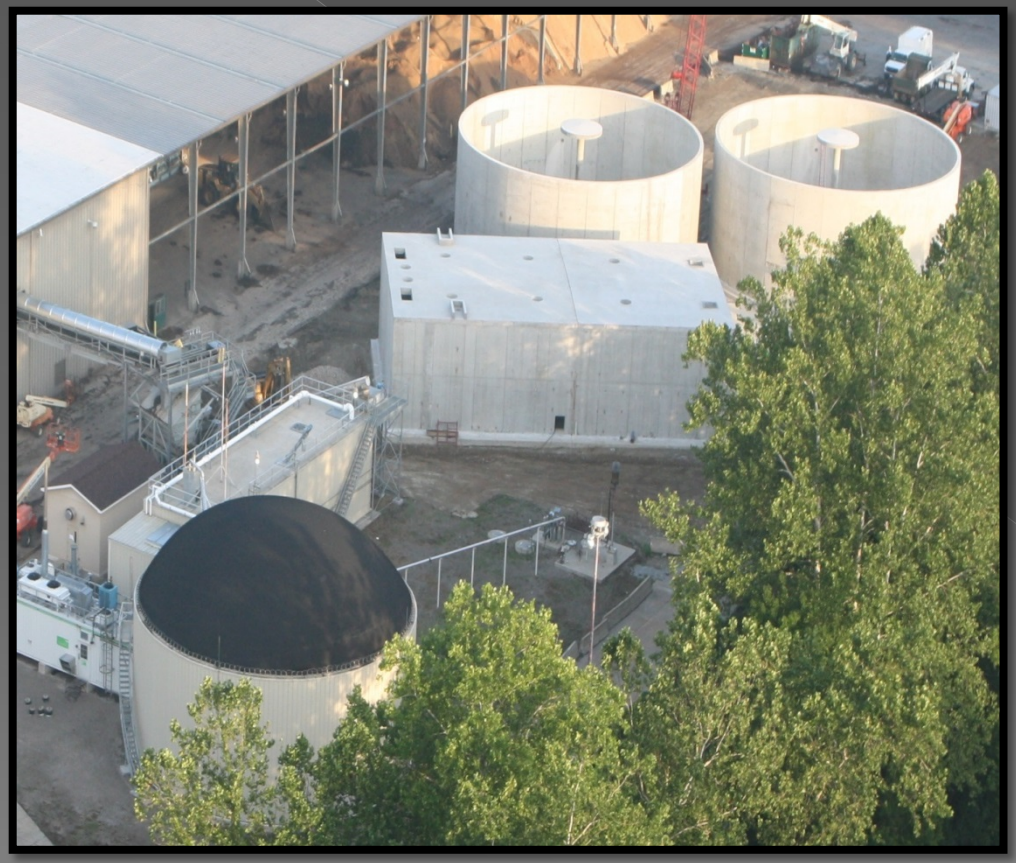
Phase II – Material Throughput



- Feedstock
  - Between 1,150 to 1,250 dry tons/month
    - 20% being the raw liquid
- Digested Solids
  - Roughly 50% across the centrifuges


Meter Power
Metered Power
Computer-control of
aeration
DAF replaced with GBT
Incentive-based utility
reimbursement
Pre-aeration shutdown
ADS1 335 kW
generator on-line
1.1 MW Landfill gas
generator on-line
ADS2 2 x 600 kW
Generators & High
Speed Blowers
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
kWh
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
YEAR

Phase II – Operational Design



- Feed Rate
  - 35,000 gal/day of 5% solids
  - ~120 WT/day of 28% solids
- Digested Solids
  - 65,000 gal/day of 9% solids removed
- CHPU
  - 30,000 kWh/day produced
  - 5.37 MMBTU/hr produced
- Dried Solids
  - 35 to 40 yds/day of 90%± pellet-like material

Leveraging assets

- Real-time Pricing
- Demand response

Real-time Pricing

- 24 hourly prices quoted the day ahead
- Range was $0.017 to $2.01 per kWh
- Customer Baseline Load (CBL)
- Ideal candidates are significant users, stable load, ability to generate or curtail
- Participated in 1999 and 2000
- Ended program due to declining load from major plant modifications

Demand Response

- Load reduction program during times of grid emergency or peak demand
- Compensation for reducing load weekdays, Jun – Sept, Noon – 8PM
- 1 hour notification for 1 – 6 hour event
- Maximum10 events per year
- Capacity Pricing

2011/2012	$40,273 / MW-year
2012/2013	$6,008 / MW-year
2013/2014	$10,121 / MW-year
2014/2015	$45,797 / MW-year
2015/2016	$111,491 / MW-year

Administration Building HVAC Upgrade

- Existing 1993 Building thermostats stopped working
- Used State Pricing Contract to develop specifications with local HVAC contractor to replace VAV boxes and controls along with installing VFD on fan and master control set back system
- Upgrade resulted in monthly KWH savings of 50% to heat the administration building
- Plant has continued using this program to modify our Training Facility and other buildings to reduce energy used in heating the facility.

Next Steps

- ADS3 – Modify ADS1 as a merchant facility to accept FOG, organics, POTW sludge
- Exporting Power
- Sale of RECs from ADS to local utility for $150 K/ yr. SB 310 allows for Heat Recovery RECS
- Applying for rebates & Gov. funding of projects.

Lessons Learned

- Measure your facility's electric load
- Assign a person or team to review your utility usage an develop a strategy
- Start with the low hanging fruit / light controls, HVAC ventilation controls, DO control
- The activated aeration process is usually 50% of the facility's electric load, so it is a good place to start.
- Look for government / utility funding for energy projects.
- Look at using your facility's emergency generators to back up the utility

Resources

- Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities (USEPA)
- Water and Wastewater Energy Best Practice Guidebook (WERF)
- Evaluation of Energy Conservation Measures for Wastewater Treatment Facilities (USEPA)
- Case Studies in Residual Use and Energy Conservation at Wastewater Treatment Plants (USEPA, National Renewable Energy Laboratory)

Conclusions

- It's never too late to start thinking about energy conservation/efficiency
- Even a little savings now will compound over time
- There are a lot of resources on the subject
- Know your system…you can't fix or improve what you don't know
- Too much of a good thing sometimes isn't good
- Start on small simple projects and the work to larger ones.

Questions?

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