

Analyzing the Performance of an Aerobic Digestion System

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Presentation Overview

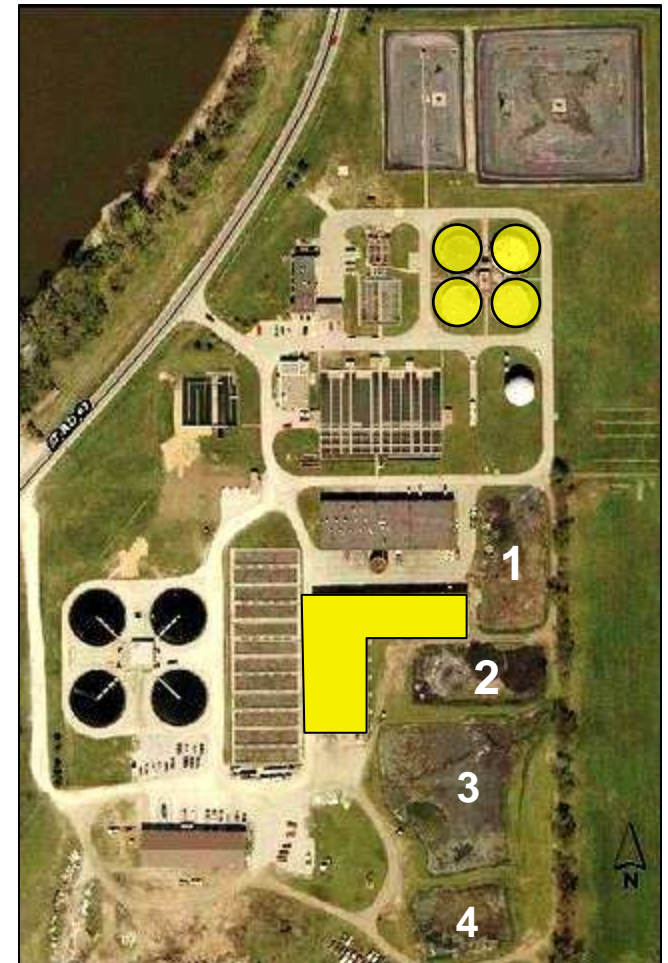
- **Terre Haute Biosolids Management Strategy**
 - Specific Challenges
- **Digester No. 4 Startup Period**
 - Lessons Learned
- **Development and Application of an Interim Operational Protocol**
- **Steady-state performance**
 - 6 Months Later

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Biosolids management strategy

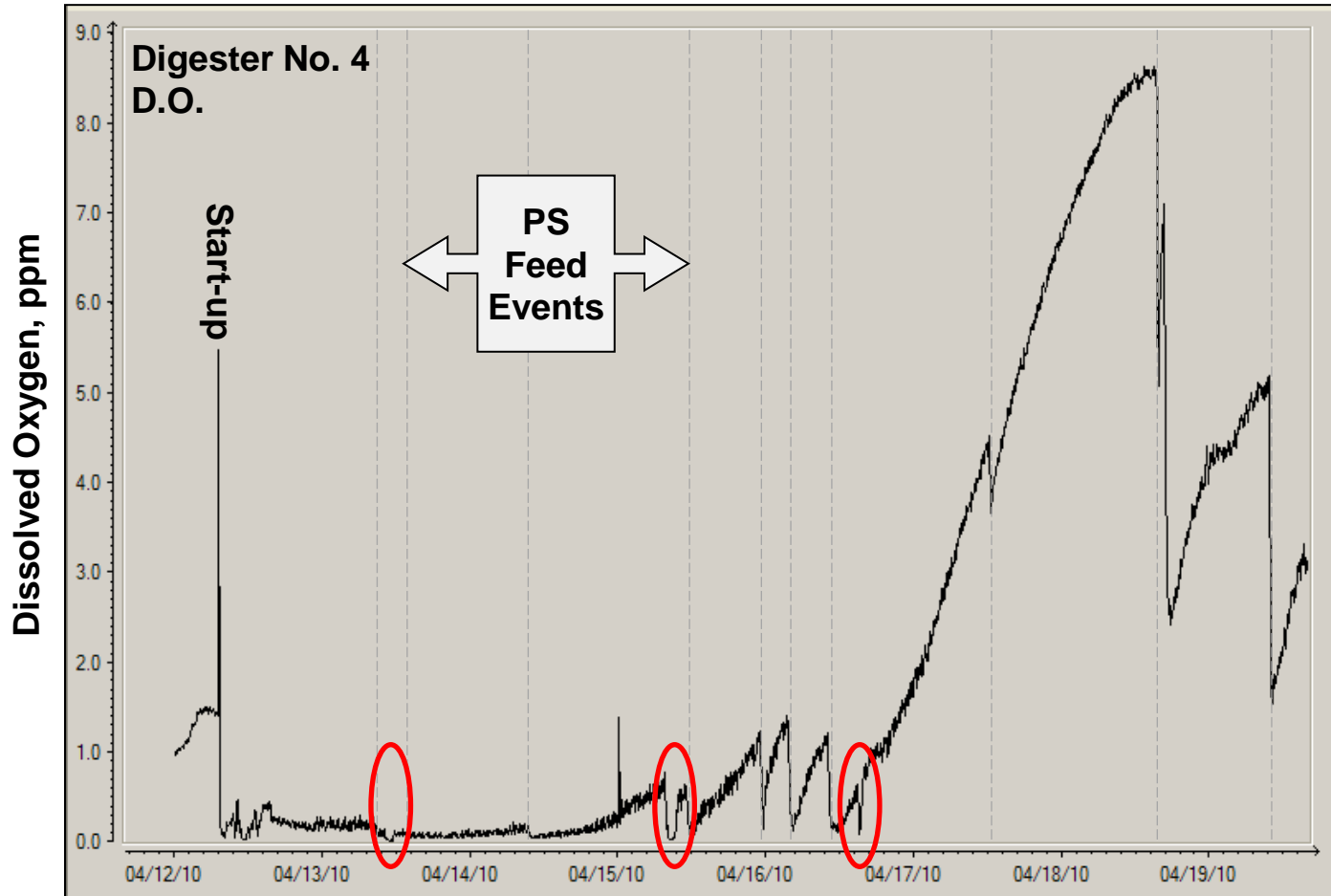
- **Separate Primary and Waste Activated Solids**
- **Aerobic Solids Digestion**
 - Average 34-Day SRT
- **Lagoon Storage**
- **Belt-filter Press Dewatering**
- **Class B Land Application**



Digester No. 4 startup and early operation phase

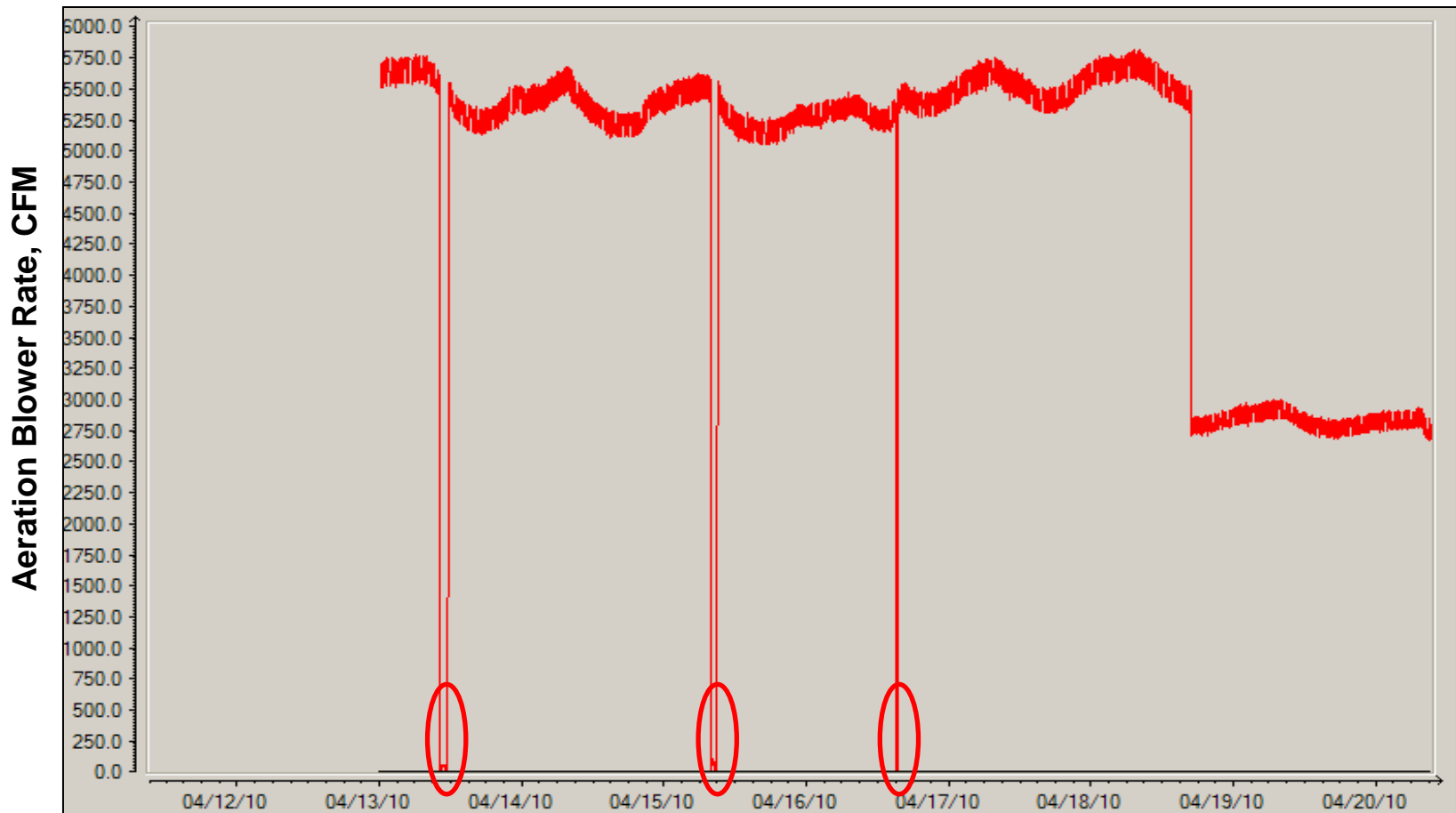


Dissolved oxygen rapidly rose to saturation over first week of operation

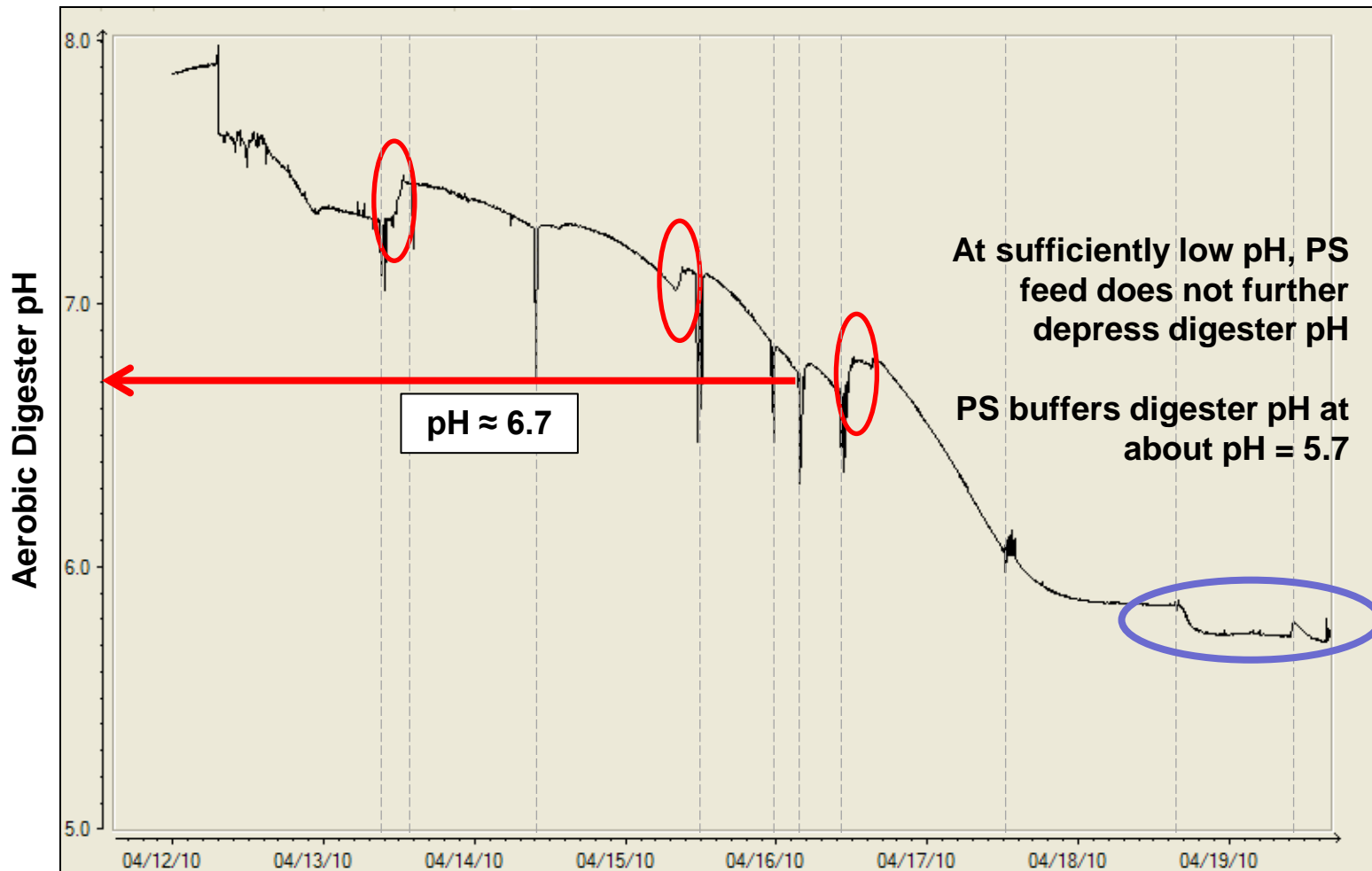


Three occurrences where DO drop did not coincide with a feeding event

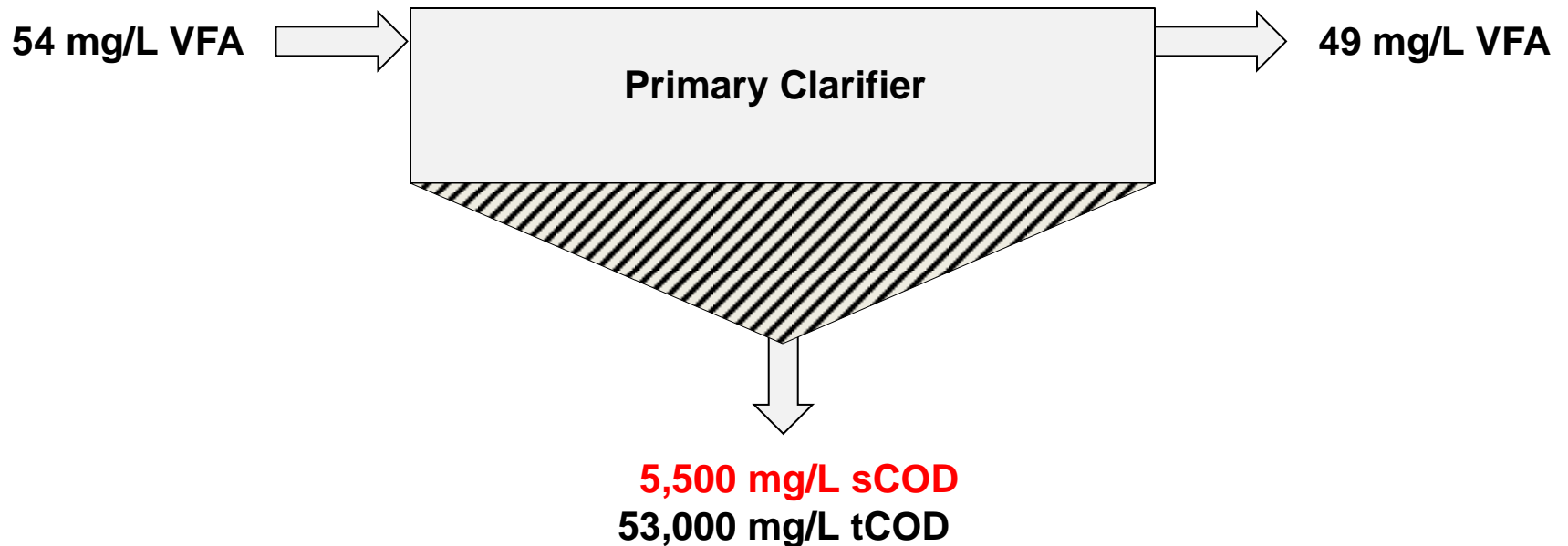
Anoxic conditions were achieved through short-term aeration stoppage



Short-term anoxic conditions result in pH recovery

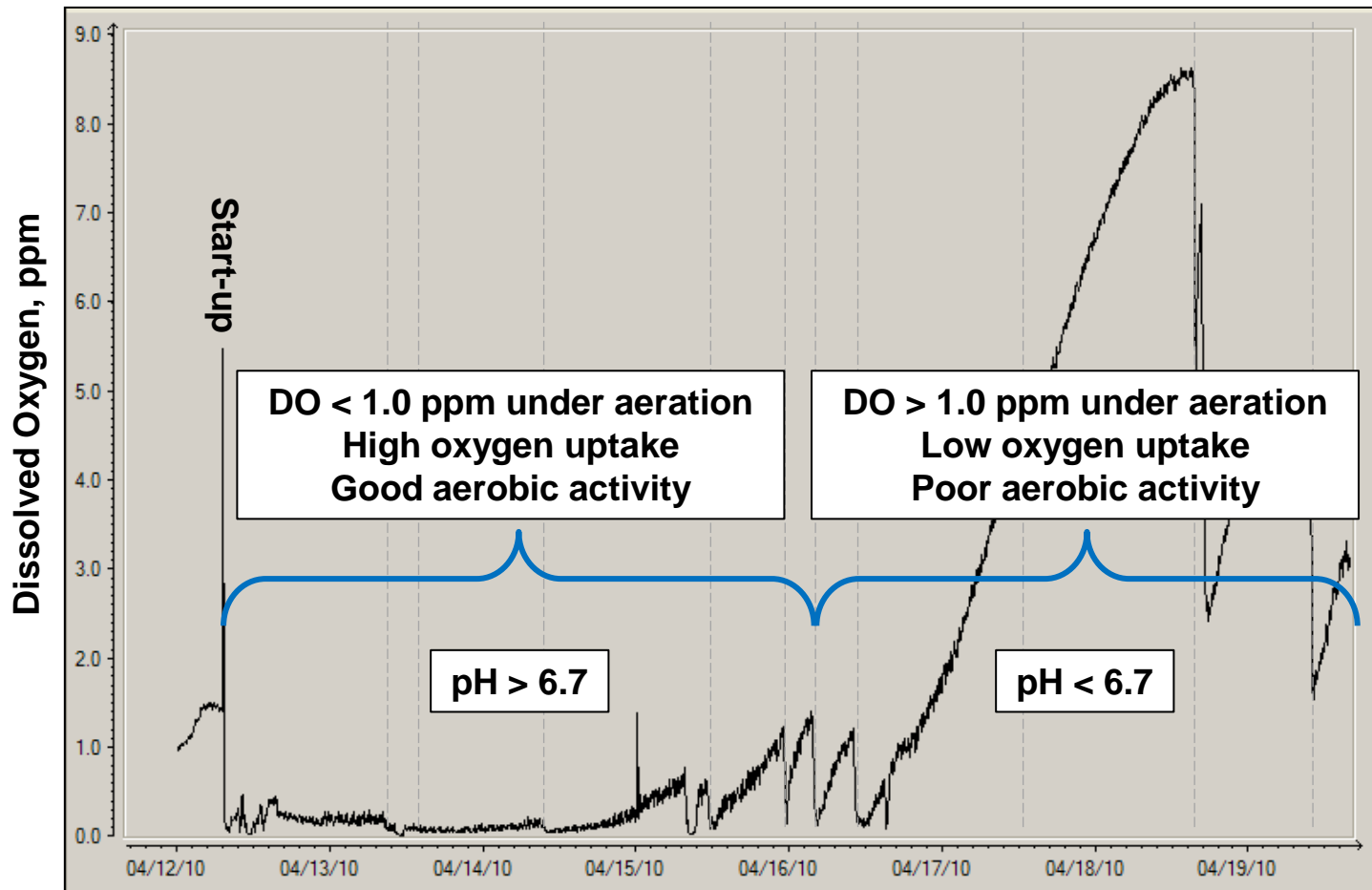


High VFA levels in raw influent impart low characteristic pH on digesters



Take home messages: **Highly acidic influent**
Indication of fermented PS (before reaching plant)

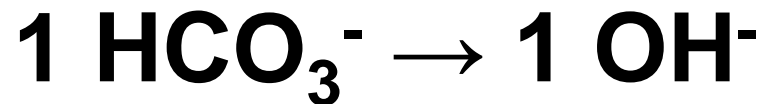
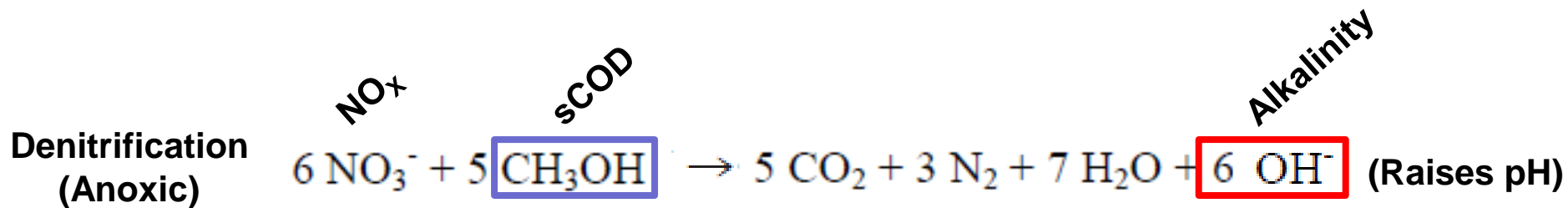
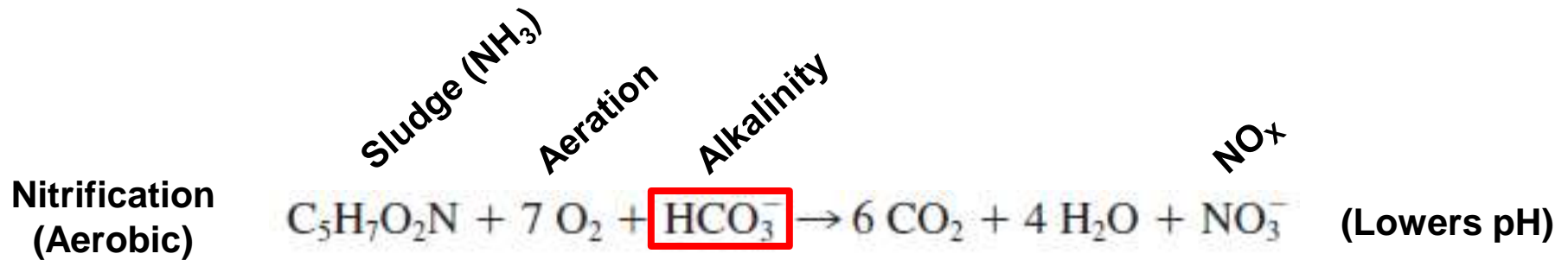
A pH above ~ 6.7 appeared to be a threshold for aerobic activity



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The case for aerobic-anoxic cycling: Operational pH control



Take home message: **If aeration is cycled on/off, alkalinity is preserved**

Development of aerobic digestion interim SOP

- **Operational strategy**
 - Aeration cycles and rates
 - Feeding cycles and volumes (PS and WAS)
 - Wasting cycles and volumes
- **Monitoring and Analysis**
 - Lab analyses
 - Daily operator log
- **Operator training**

Development of aerobic digestion interim SOP

Digester No. 1

Aerate 0000-1800 @ 1200-1400 cfm
Waste (22500 gallons) @ 0500 to Lagoon
WAS (15000 gallons) @ 0600
PS (7500 gallons) @ 1200

Digester No. 2

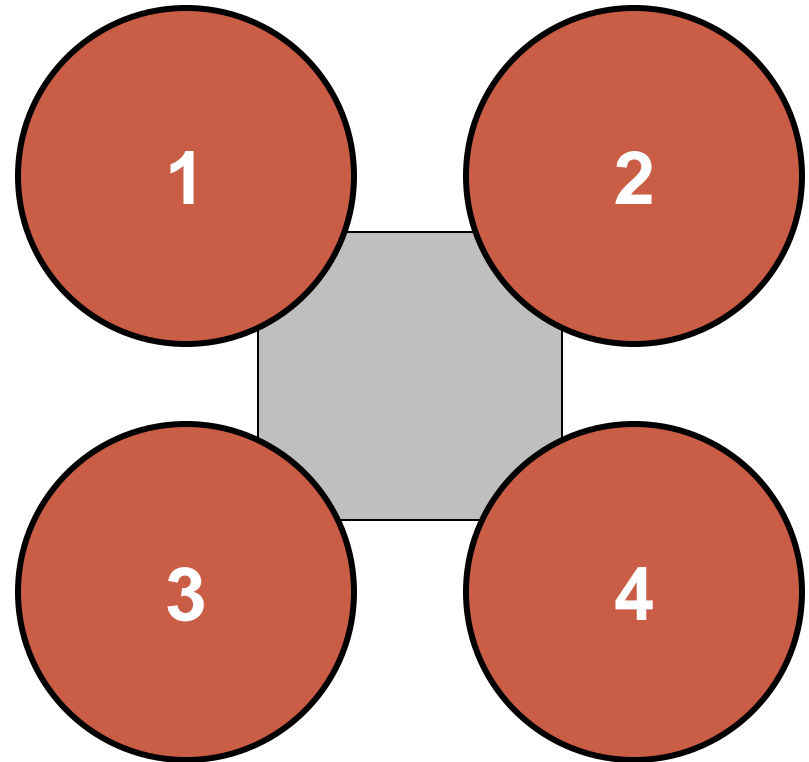
Aerate 0600-0000 @ 1200-1400 cfm
Waste (22500 gallons) @ 1100 to Lagoon
WAS (15000 gallons) @ 1200
PS (7500 gallons) @ 1800

Digester No. 3

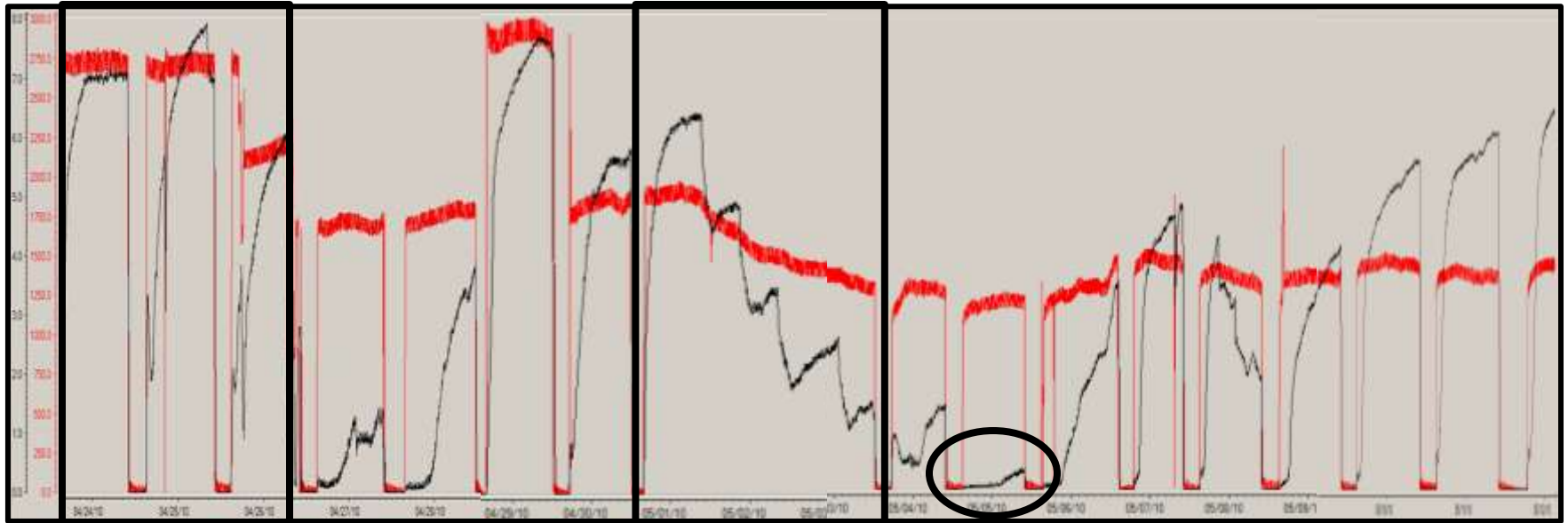
Aerate 1200-0600 @ 1200-1400 cfm
Waste (22500 gallons) @ 1700 to Lagoon
WAS (15000 gallons) @ 1800
PS (7500 gallons) @ 0000

Digester No. 4

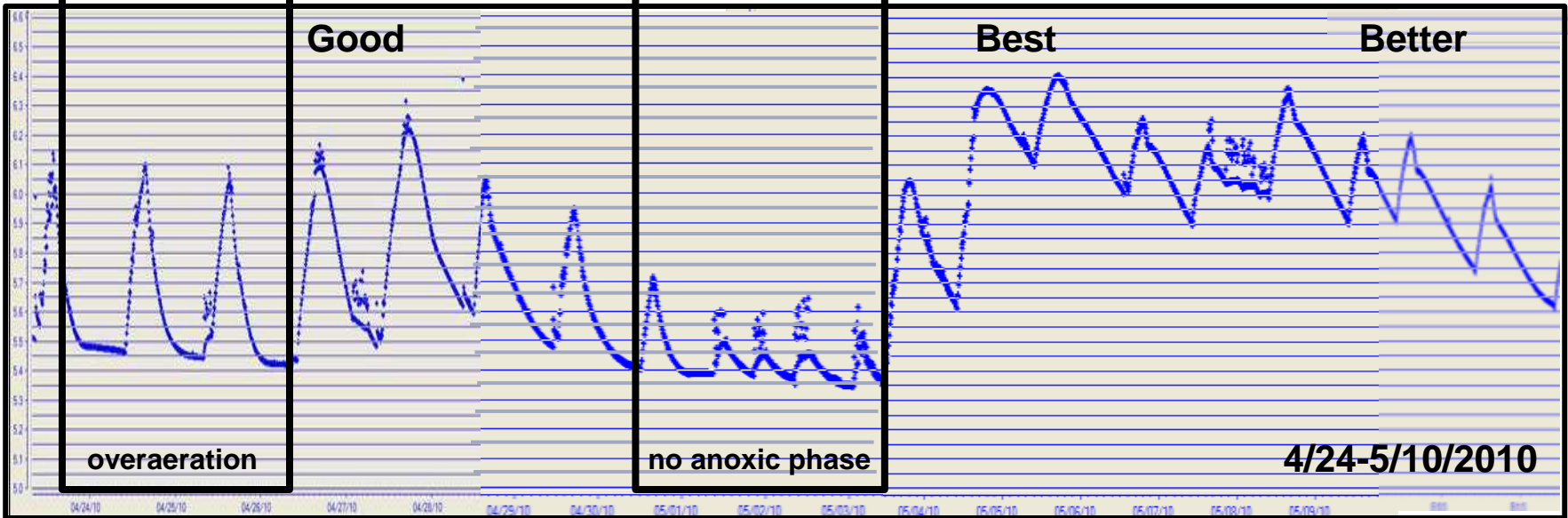
Aerate 1800-1200 @ 1200-1400 cfm
Waste (22500 gallons) @ 2300 to Lagoon
WAS (15000 gallons) @ 0000
PS (7500 gallons) @ 0600



D.O. and Blower CFM



Aerobic Digester pH



Summary of aerobic-anoxic cycled operation to-date

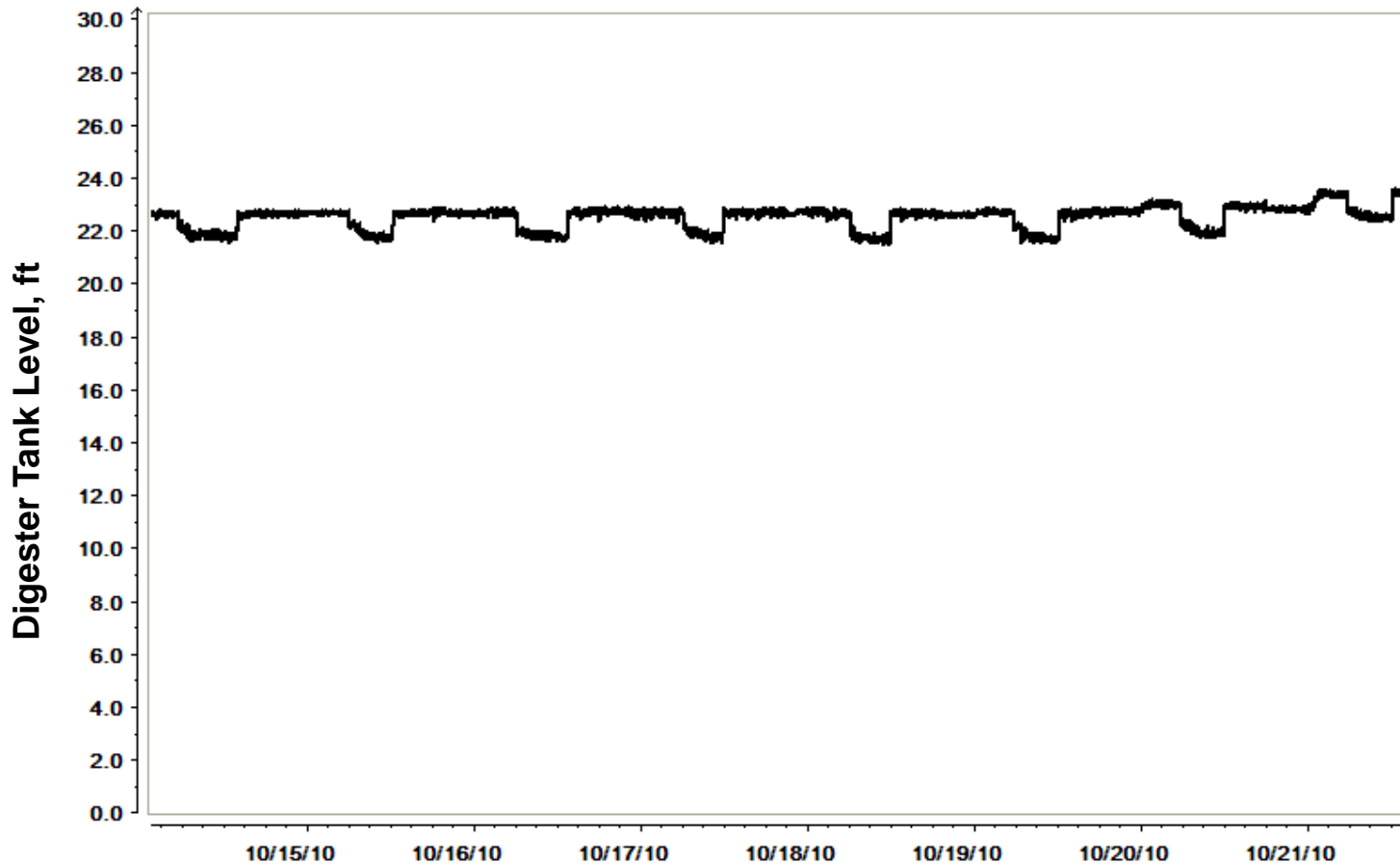
- **Operational strategy is able to consistently achieve desired pH (> 6.7); adequate interim strategy**
- **Need to track solids mass balance to determine level of stabilization during aerobic digestion**
- **Lagoons provide a safety factor for stabilization**
- **Required aeration rate is 1200-1400 cfm; blowers sufficient for interim operation**
- **Inconsistent aeration, cycling, feeding, etc. is detrimental**
- **Future considerations:**
 - **Pre-thickening of solids to increase available SRT**
 - **2-stage operation of aerobic digesters**

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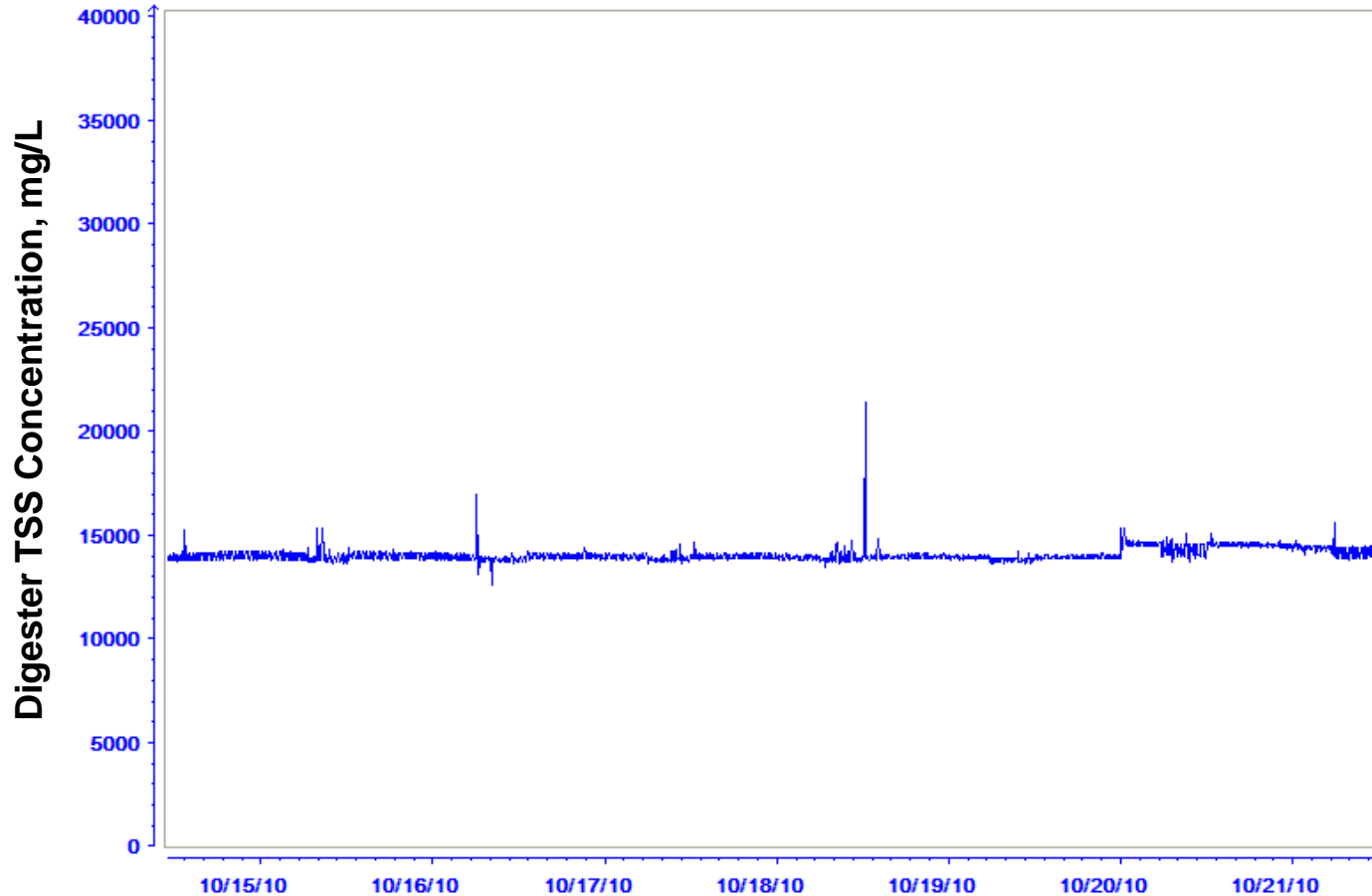
Digester No. 3 Operation

Daily Draw-Fill



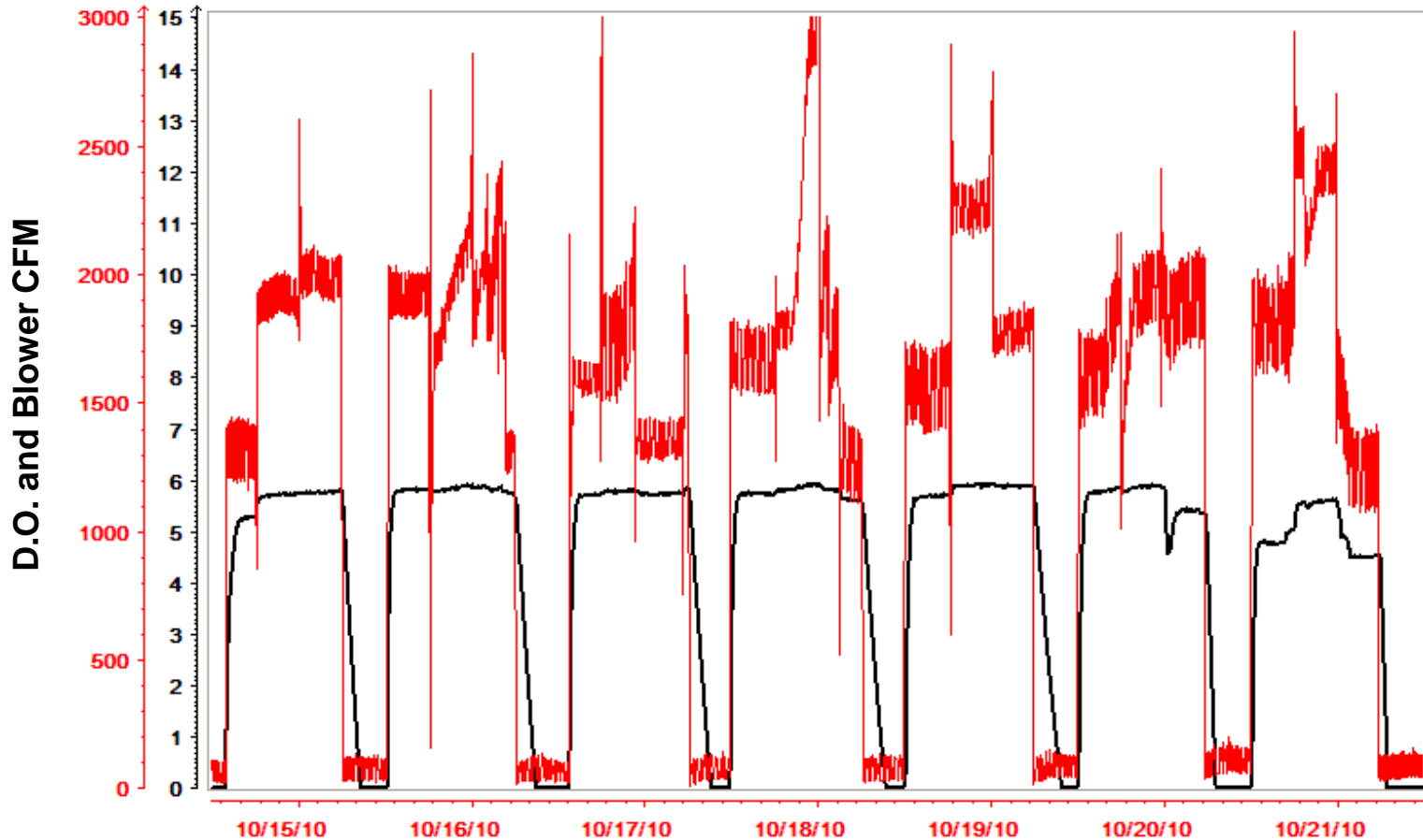
Digester No. 3 Operation

Steady-state solids balance

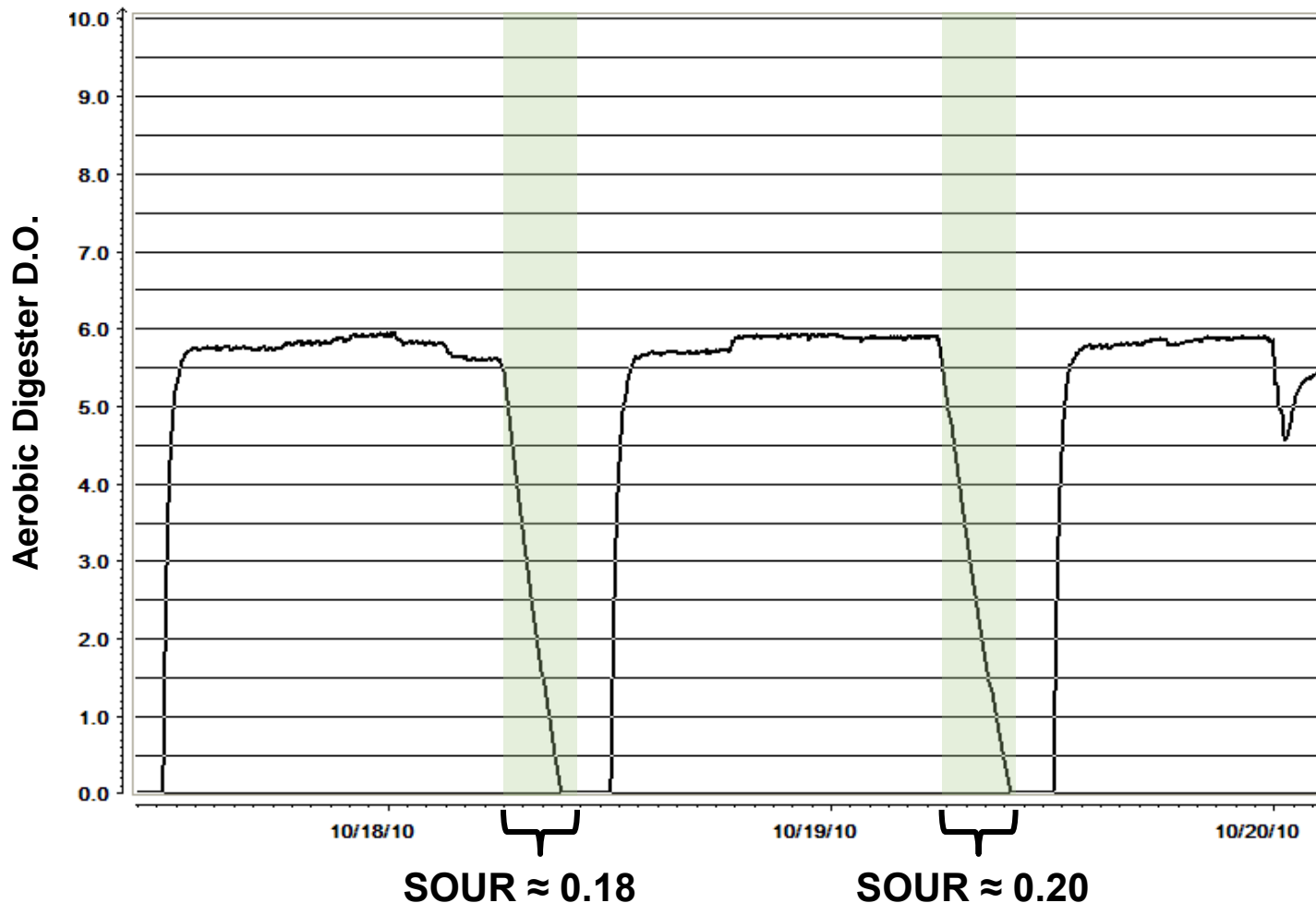


Digester No. 3 Operation

Blower Cycling and DO Trends



Oxygen uptake at end of aerobic cycle is indicative of well-stabilized biosolids

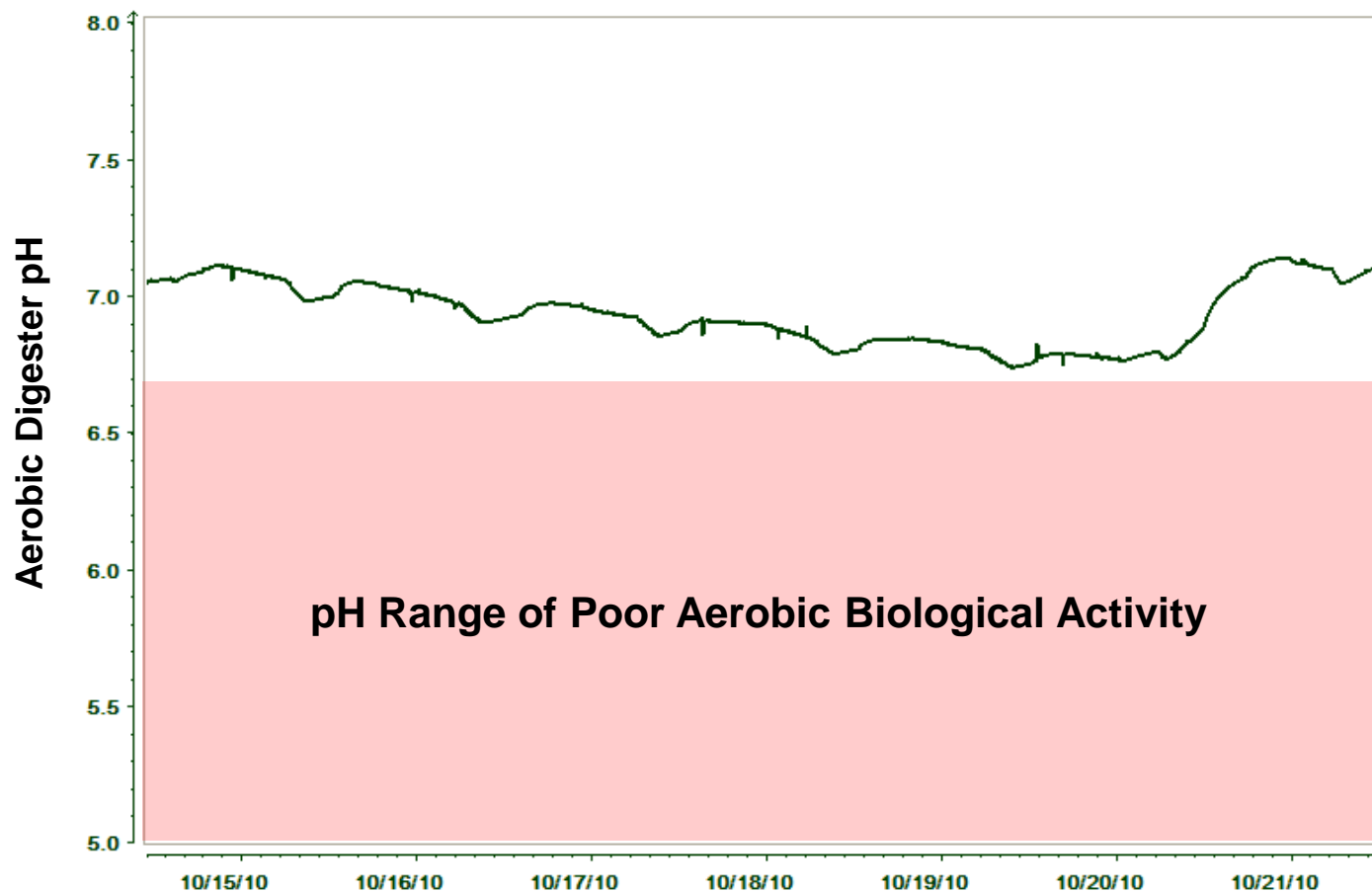


EPA 503 Regulations
for Vector Attraction
Reduction Require
SOUR below

1.5 mg O₂ /hr-gram TS

Digester No. 3 Operation

Operational pH Control



Conclusions

- All four aerobic digesters can be operated with existing blower capacity and reactor configuration
- Highly acidic plant influent is problematic for aerobic digester performance
- Tight control of digester system operation is critical to achieve acceptable interim process performance
- pH can be controlled operationally through aerobic-anoxic cycling
- Analysis and optimization during interim period will help to develop basis for future upgrades

Questions?



GREELEY AND HANSEN