
VEOLIA
Nutrient Analyzers and Probes used in Wastewater Process Control
WATER TECHNOLOGIES

# Nutrient Analyzers and Probes used in Wastewater Process Control

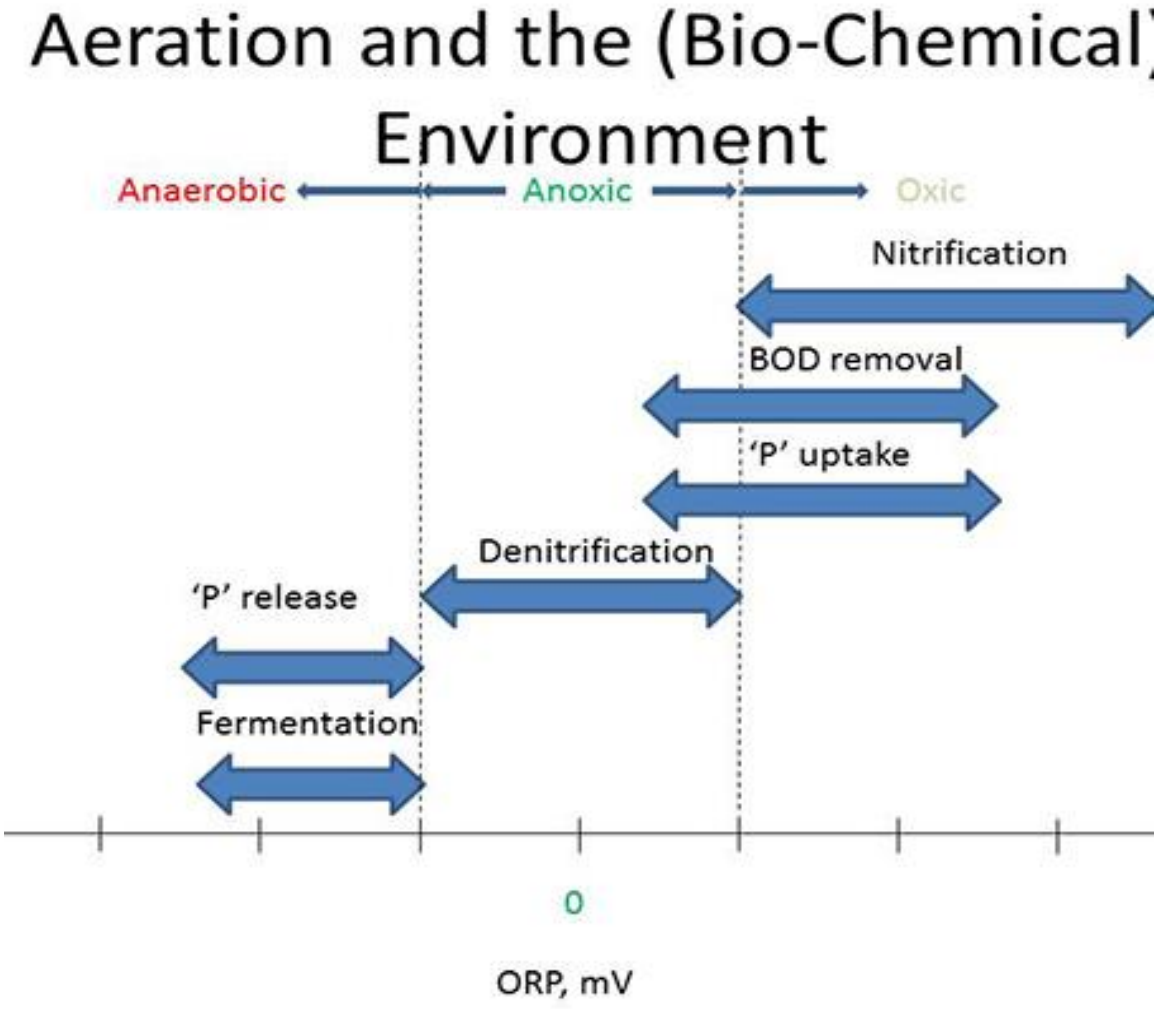
- Nutrient Analyzers and Probes
- BNR sample points
- Advanced Online Control

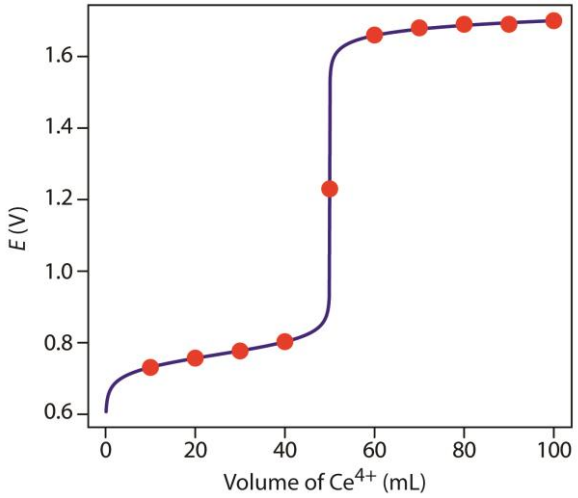
# Nutrient Analyzers and Probes

# Nutrient Analyzers and Probes used in Wastewater Process Control and Monitoring

- *ORP Probe*
- *Nitrate*
  - *UV Detection Probe*
  - *Ion Selective Probe*
- *Ammonium*
  - *Wet Chemistry*
  - *Ion Selective Probes*
- *Phosphate*
  - *Wet Chemistry*
- *Total Phosphate and Nitrogen*
  - *Wet Chemistry*

# ORP – Oxidation Reduction Potential in Wastewater



# ORP Probe

**FACT**

- Measure the Redox Potential (-500mV – 500 mV)
- Not an actual concentration, but more an indication of which process condition you are in (Aerobic, Anoxic or Anaerobic)
- Normally placed in tanks with anaerobic or anoxic process conditions
- Used often for IMLR Control
- Cheap compared to actual nutrient analyzers and probes
- Difficult to use for control as setpoint is more a range and will depend of the day. Rain, temperature ect.

**CONCLUSION**

- Difficult to use for process control
- If You Want to Control Process Chemistry, You should Measure the Actual Parameter than a surrogate Parameter such as Redox potential that wont give you direct information about the nutrients

# Ion Selective Probes

# Ion Selective Probes

**FACT**

- Used for measuring Ammonium and Nitrate in Wastewater
- Are placed directly in the process tank no need for filtration
- Cheap compared to actual nutrient analyzers
- Lots of interference from other “stuff” in the wastewater. Calibration will drift
- Potassium and Chlorine compensation electrodes
- Maintenance Intensive
- Difficult to use for process control in the aeration tanks as the accuracy is not acceptable under 5 mg/L.
- Probe will “fall a sleep” at low concentrations. Need to replace cartridge more often at low concentrations

**CONCLUSION**

- Can be used to measure ammonium in the INFLUENT for process control in BNR-Systems
- Cannot be used for control when placed directly in process tank.
- Can be used for control of side stream ammonium removal

# Nitrate probe

**FACT**

- Measure Nitrate
- Placed in Process Tanks
- Used for Process Control. IMLR, External Carbon addition and Phasing in aeration tanks
- Based on UV measurement
- Placed Directly in the basin
- No need for filtration can be placed directly in MLSS, but filtration will improve the readings of the probes
- Very reliable
- Low Maintenance

- CONCLUSION
- Highly recommended for use for on-line Control of BNR-systems

# Ammonium Analyzer

**FACT**

- Used for measuring Ammonium in Wastewater
- Wet Chemistry will require reagents
- Will require filtration of the MLSS
- Expensive compared to probes
- Very reliable down in very low concentrations
- Self calibration
- Can be placed by the process or inside buildings depending on filtration system
- Service agreement is recommended
- Used for  DO and Phase Process Control
- Use of proprietary reagents

**CONCLUSION**

- Highly recommended for use for on-line Control of BNR-systems

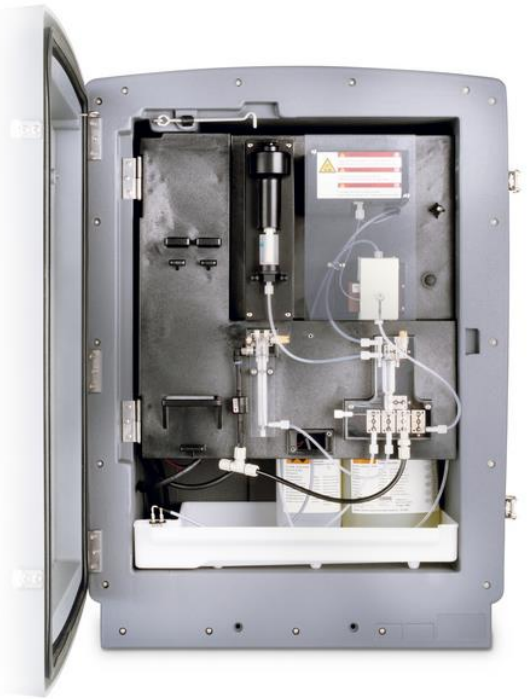
# Phosphate Analyzer

**FACT**

- Used for measuring Phosphate in Wastewater
- Wet chemistry will require reagents
- Will require filtration of the MLSS
- Only Possibility
- Very reliable down in very low concentrations
- Self calibration
- Can be placed by the process or inside buildings depending on filtration system
- Service agreement is recommended
- Use of proprietary reagents
- Used for process control of BIO-P and Chemical precipitation

**CONCLUSION**

- Highly recommended for use for on-line Control of BNR-systems



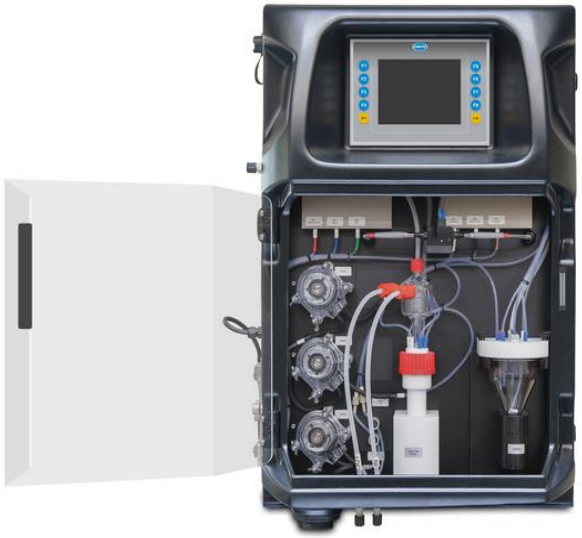
# Total Phosphor and Nitrogen Analyzer

**FACT**

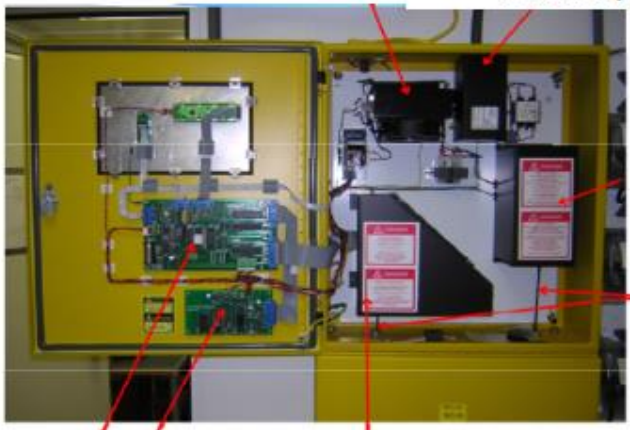
- Used for measuring Total Phosphor and Nitrogen in Wastewater
- Wet chemistry and “digestion”
- Will require filtration of the MLSS
- Only Possibility
- Very reliable down in very low concentrations
- Self calibration
- Can be placed by the process or inside buildings depending on filtration system
- Service agreement is recommended
- Used for process monitoring only!!
- Use of proprietary reagents

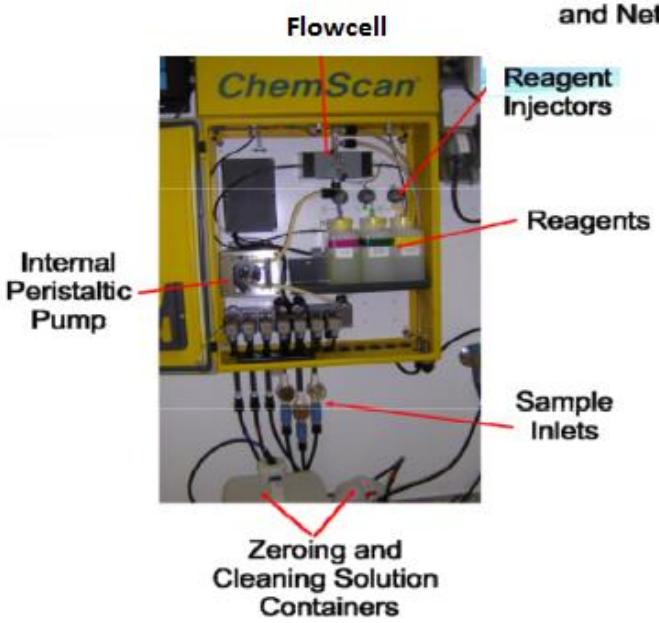
**CONCLUSION**

- Cannot be used for process control in BNR systems
- Can be used for monitoring effluent for compliance. Will not give a lot of Process information



# Chemscan –All in One

# Chemscan – All in One

**FACT**

- Used for measuring Ammonium, Nitrate and Phosphate in Wastewater
- One Analyzer to operate and maintain
- More simple to operate than most wet chemistry analyzers
- High Capital Cost
- Central maintenance
- Low Maintenance cost
- Mix your own reagents
- Needs sample header, valves and pumps
- Depending of parameters and number of sample locations the cycle time is normally longer than for convential systems (15 to 60 min)

**CONCLUSION**

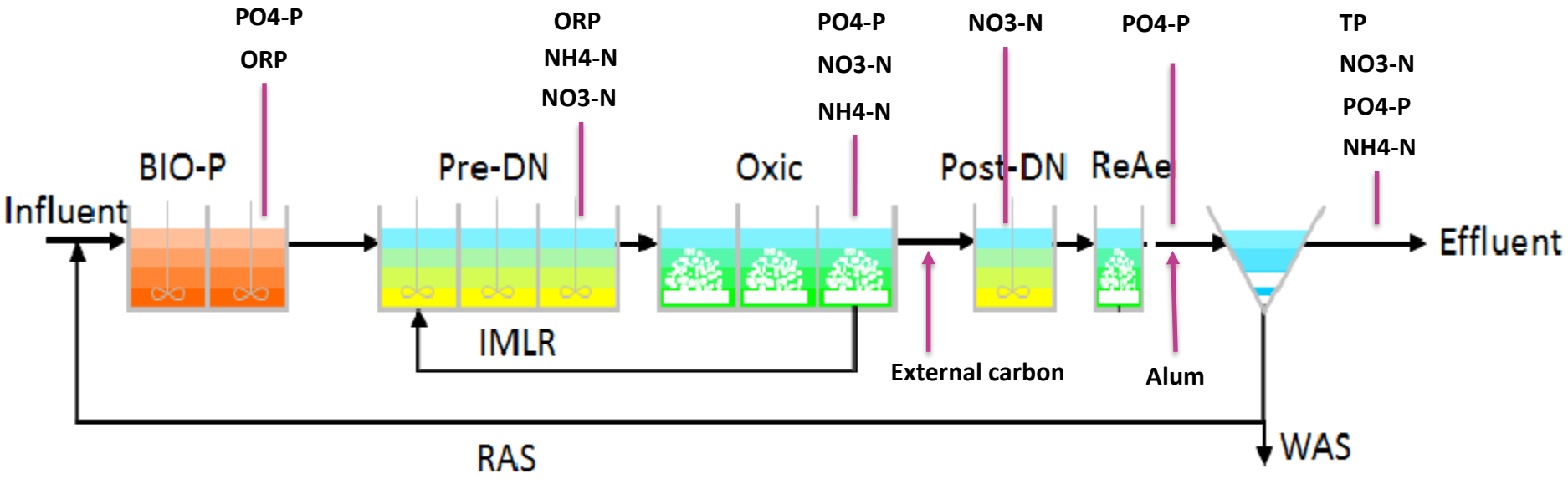
- Highly recommended for process control in BNR-Systems

Neither wind, not rain, nor heat , nor driving snow or dark of night shall deter staff from getting the job done

# Filtration Systems

# BNR Sample Points

# BNR Sample Points



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# Advanced On-Line Control

WATER TECHNOLOGIES

# Why Advanced Controlling?
*- Primary Benefits*

- Reduced operation costs:
  - Reduced energy consumption
  - Increased energy production
  - Reduced chemical consumption

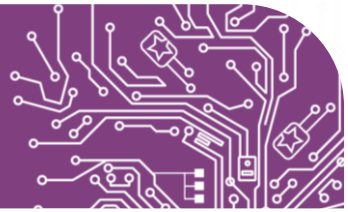
- Increased hydraulic capacity
  - Increased flow through existing plant
  - Reduced overflow/by pass

- Increased biological capacity
  - Increase biological load
  - Improved effluent quality

# Why Advanced Controlling?
*- Secondary Benefits*

- Operational stability
- Operational safety
- Remote access and support
- Understanding of the system
- Motivation of the staff
- Data handling and reporting


# Advanced Online Control possibilities



Energy
mixers

Energy
max. rotor/blower
rotor submersion

Dosing
Carbon, N, P

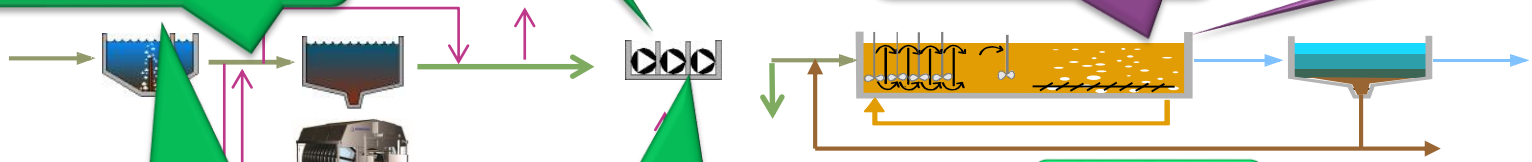
BioP safe

BioP focus

N/DN phase
DO setpoint
Dry weather/rain

Pre-precipitation
Polymer

Precipitation



Grit chamber
aeration

LowLoad

Flow distribution
To biological lines
To/from settling tanks
To different treatment units
e.g. AS/Biostyr

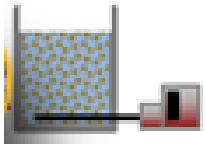
Return sludge
Dry weather/rain

Sludge age

Excess sludge

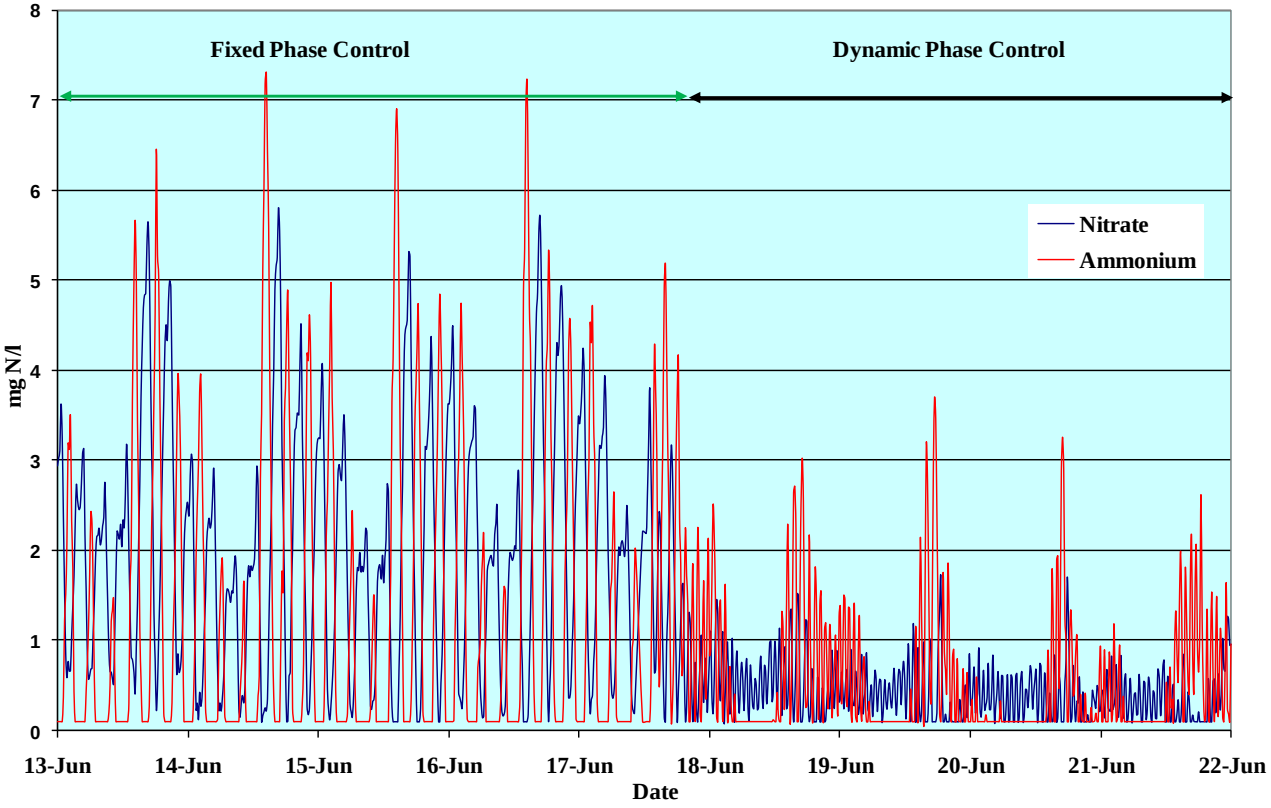
Nitrate recirculation
Dry weather/rain

AnitaMox
Aeration



Key figures

# Case Study – North Cary WWTP



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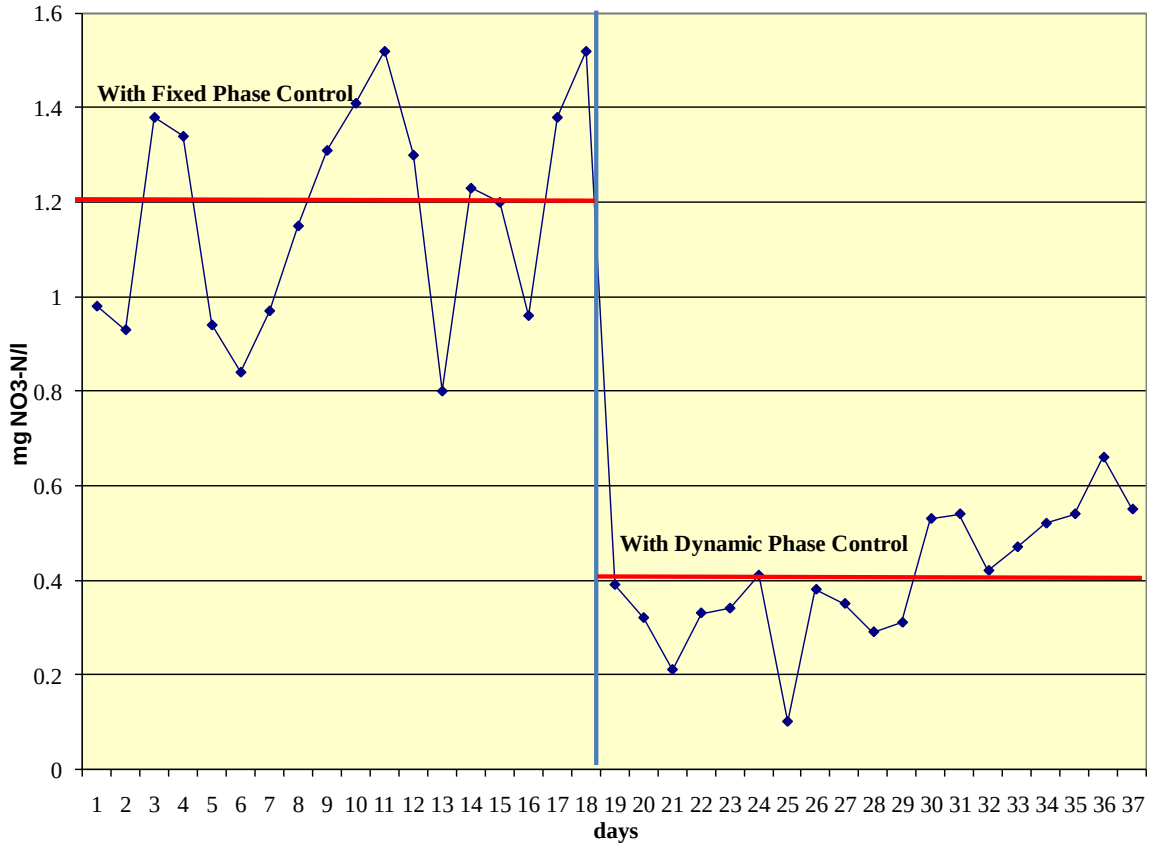
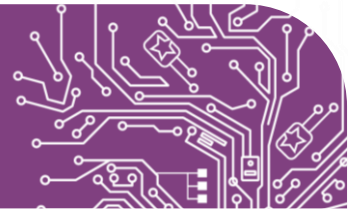
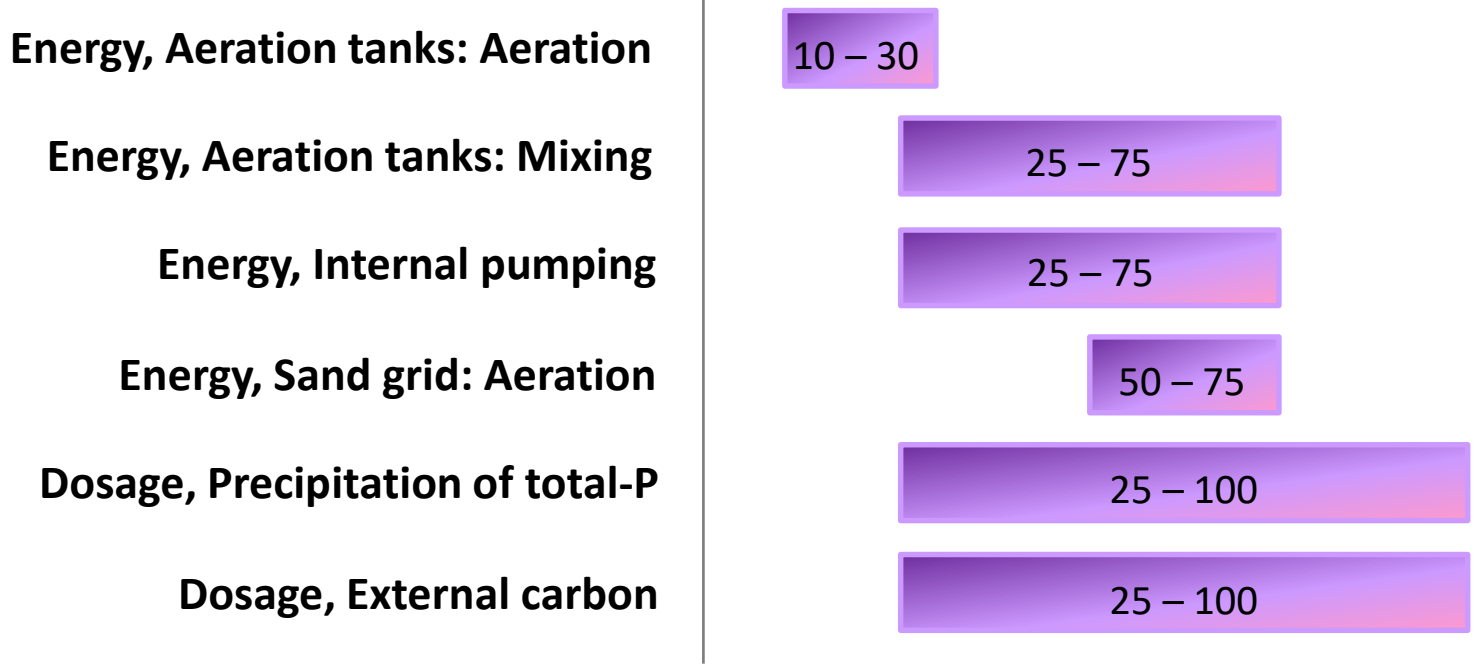


# Operation savings






**Extra achievements:**
- **Lower chemical sludge production**
- **More biogas production**