

# Biological Nutrient Removal Applications for Monitoring Oxidation Reduction Potential

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Audience: Operators, environmental engineers, process-control technicians, facility managers

Primary Use: Educational presentation for process optimization and operations

**Topics:** ORP, BNR, process control, intermittent aeration

## Executive Summary

An educational process-control presentation showing how oxidation-reduction potential supports biological nutrient removal through redox science, intermittent-aeration strategies, continuous-flow applications, and sensor-care practices.

## Key Points

- ORP fundamentals: measures electron donating/accepting ability, quantifies oxidizing/reducing potential of the mixed liquor
- Process zone identification by ORP: Oxic ( $\geq +100$  mV), Anoxic ( $-100$  to  $+100$  mV), Anaerobic ( $\leq -100$  mV)
- Intermittent aeration control strategy: ORP high setpoint  $+250$  mV turns off aeration; low setpoint  $0$  mV triggers 40-minute anaerobic timer for phosphorus release
- Demonstrated results: effluent TP consistently  $< 1$  mg/L, TMDL requirements met, zero chemical addition required
- Continuous-flow applications: effluent ammonia control upstream of chloramination, aeration optimization, simultaneous nitrification/denitrification at low DO
- Extended aeration case study: ORP maintained  $-270$  to  $-200$  mV, ammonia  $1$ - $3.5$  mg/L, nitrate  $< 1$  mg/L, minimal aeration and chlorine usage

- Sensor care: one-point offset calibration with Zobel solution (231 mV at 25°C), pH-style cleaning, 6-month online / 1-year handheld electrode warranty

## Citation

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