



Solutions for real-time process optimization

# BIOS

## Bioprocess Intelligent Optimization System



- Aeration energy savings of 15% to 40%
- Improved ammonia and nitrate removal
- Enhanced process control and stability
- Increased treatment capacity



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### **Description of the Myratek BIOS**

The Myratek BIOS is a monitoring and control system that utilizes on-line ammonia and nitrate measurements to determine real-time operational conditions that will optimize ammonia and nitrate removal while minimizing the amount of energy consumed by the biological wastewater treatment process. Major components of the BIOS include:

- State-of-the-art ammonia and nitrate analyzers
- Fully integrated communication and control system
- Advanced simulation & control algorithm

The BIOS enables a wastewater treatment facility to base its operations on the underlying biological activity occurring in its bioreactor. This delivers many benefits that significantly enhance the treatment capabilities of the facility.

### **Benefits of the Myratek BIOS**

- Improved ammonia and nitrate removal
- Aeration energy savings of 15% to 40%
- Enhanced process control and stability
- Increased treatment capacity

## How the Myratek BIOS Works

The BIOS utilizes a feed-forward algorithm to simulate the biological reactions and hydraulic conditions in the bioreactor. Biological reactions are simulated based upon a customized version of the well known and widely accepted Activated Sludge Models developed by the International Association on Water Quality. Using real-time ammonia, nitrate, flow, DO, and aeration measurements, the BIOS conducts iterated biological and hydraulic simulations that predict nitrification and de-nitrification reaction rates under different DO concentrations and/or internal recycle flow (IRQ) rates.

The iterative calculations determine DO levels necessary to reduce ammonia to required treatment levels while preventing excessive aeration, which wastes energy and for facilities with IRQ capabilities causes residual DO to be present in the IRQ stream. The presence of residual DO in the IRQ stream can inhibit the development of the anoxic conditions necessary for proper nitrate removal in the anoxic zone of the bioreactor.

The BIOS also calculates real-time IRQ rates that will maximize nitrate removal in the anoxic zone by ensuring the optimal amount of nitrate is delivered to the anoxic zone by the IRQ. IRQ rate determinations consider the level of de-nitrification possible in the anoxic zone based on biological conditions as well as how IRQ flow rates will impact reaction rates through dilution of ammonia concentrations and decreasing of hydraulic retention time in the bioreactor. In this way, optimal DO set-points and IRQ rates are calculated in real-time based on the changing characteristics of the wastewater. Compared to conventional approaches of providing a constant aeration level or maintaining a constant DO set-point and/or IRQ rate, the innovative approach of the Myratek BIOS enables superior ammonia and nitrate removal while reducing energy consumed by aeration blowers.



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**To discuss how the BIOS  
can benefit you  
or your clients  
contact us at:**

**610-265-8620  
sales@myratek.com**

**Myratek, Inc.  
100 Ross Road, Suite 201  
King of Prussia, PA 19406  
www.myratek.com**