# Application Note AN-D1

## *Dissolved Oxygen Measurement in a Wastewater Treatment Plant*

Breakdown of organic wastes entering a wastewater treatment plant is accomplished by using a biomass or blend of beneficial microscopic organisms, bacteria, and solids. This converts the non-settleable solids (dissolved and colloidal matter) into settleable solids, carbon dioxide, water, and energy. The biomass must be kept alive by maintaining the proper concentration of dissolved oxygen throughout the treatment process.

When not enough dissolved oxygen is present, at least some of the biomass will die, and the organic wastes will not be properly treated. If this happens, the plant may have to replace the beneficial "bugs" which, in most cases, proves to be very expensive and time consuming. Conversely, when there is too much dissolved oxygen, usually from over aerating, the treatment plant is needlessly wasting costly energy.

The "starred" areas in Figure 1 below show where typical applications for measuring and controlling dissolved oxygen are found in various stages of a wastewater treatment plant.

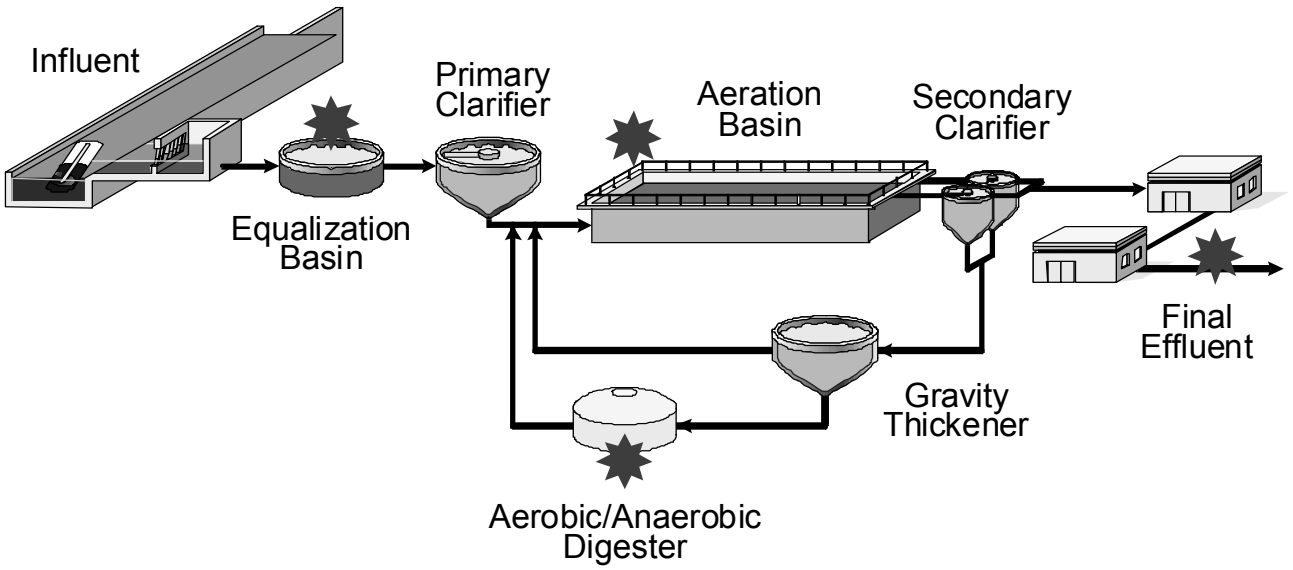
### Equalization Basin

The equalization basin provides a means of controlling the loading of the treatment process due to varying plant loads caused by erratic industrial discharges, storm water, diurnal variations, etc. It is important to monitor the dissolved oxygen content in the equalization basin stage to ensure that the incoming waste is not excessively loading the treatment plant. This measurement information provides the plant operators with a "starting point" for their process control.

### Aeration Basin

Aeration is a basic requirement in the secondary treatment of wastewater. Aeration ensures that proper sludge quality and biomass growth conditions exist. The dissolved oxygen added in the aeration basin, through the aeration process, provides the primary life sustaining element for the activated sludge microbes.

**Figure 1 Dissolved oxygen monitoring/controlling locations (star symbol) within a typical wastewater treatment plant**



## Aerobic/Anaerobic Digester

Most wastewater treatment plants have sludge handling facilities that use an aerobic or anaerobic biological process to treat the sludge, rendering it harmless. When using an aerobic digester the operator wants to ensure the presence of oxygen, similar to monitoring in the aeration basin. When using an anaerobic digester the operator wants to ensure the presence of nitrogen, which is directly correlated to the lack of oxygen.

## Final Effluent

When plant effluent is discharged into a lake or river, its dissolved oxygen level must be maintained to sustain the aquatic life near the discharge point. Also, measuring dissolved oxygen at this point ensures local permit compliance for the plant discharge.

## *Summary*

Monitoring dissolved oxygen is an important part of the activated sludge process. It assists in ensuring that there is sufficient dissolved oxygen in the process for the biological activity to take place, and helps to optimize energy usage through controlled air addition. In some cases, aeration accounts for between 2% and 3% of their annual energy costs.

Maintaining a proper level of dissolved oxygen can only be accomplished by using an on-line instrument that will accurately and continuously measure the dissolved oxygen concentration at the various stages throughout the treatment process.

### References

*Measurement of Dissolved Oxygen,* Michael L. Hitchman, August 1978

*Oxygen in Liquids (Dissolved Oxygen),* R.K. Kaminski, B.G. Liptak and G.J. Rorech

*Simplified Wastewater Treatment Plant Operations,* Edward J. Haller, 1995

*Basic Activated Sludge Process Control;* Water Environment Federation, 1994

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