# Introduction to the Respirometry

It is well known that it cannot be a common criterion of controlling the activated sludge waste water treatment plants. This is due to the fact that, besides the different types of treatment plants, the biological process of the plant not only depends on the nature of the waste water but also on the nature of the activated sludge microorganisms and their bioactivity. Just from this evidence, it becomes apparent the necessity to show plant operators what is actually happening in the activated sludge process.

The measurements, only related with the nature of the water or with the physical behaviour of settling and solids in the mixed liquor, do not combine enough decisive data for a complete characterisation of the biological process.

How is possible to learn what is happening in a biological process by only performing physical/chemical tests? We have to take into account that the activated sludge is a living and breathing process, and a lack of bioactivity information might cause serious confusion about control criteria and have repercussions on the effluent quality (out of standards) and energy consumption (higher than necessary). For this reason, to get bioactivity information in a timely manner through the respiration analysis would be a real breakthrough in better process control.

BM respirometry analysers have demonstrated that, in a very fast and practical manner, by making use of the actual genuine activated sludge of the aeration tank, can provide the treatment plants operator the essential information to help determine the ways to protect and control the biological process of the plant

The respirometry is a technology that measures the oxygen consumption rate and accumulated oxygen consumed from the bacteria contained in a specific activated sludge or micro-organism culture. This oxygen uptake could come from the bacteria survival phase (endogenous) and from the biological oxidation of the biodegradable materials (exogenous). Therefore the respirometry could be seen from two sides: analysis of the own mixed-liquor without the addition of any sample, and analysis of the effect of one specific sample in the activated sludge.

In any case the respirometry is taking advantage of the following points:

- Sludge is more active when it respires faster.
- The more substrate to oxidize the more oxygen to consume.
- Oxygen uptake rate is proportional to sludge activity.
- The oxygen consumed by the activated sludge for organic substrate oxidation, is proportional to the eliminated biodegradable fraction of COD.
- It exist a specific oxygen uptake rate for the Nitrification process.
- The operational parameters of the biological treatment process are direct or indirectly related with the bacteria respiration.
- Denitrification rate is proportional to the biodegradable COD utilization rate.
- Under standard conditions, the reduction or absence of oxygen consumption by the bacteria may signify the presence of a toxicity or inhibition compound specifically approached to the bacteria of the sludge: just the bacteria we want to protect and control.

In a biological treatment plant we may utilise the own reactor activated sludge, in order to perform a representative respirometry that will directly reflect the actual activity of the treatment process.

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