## Ben's Design Tip Corner

*By: Ben Movahed, PE, BCEE*

If you have a tip or a suggestion for a future design article, please contact Ben Movahed at
(240) 780-7676
movahed@watek.com

# Similar to Other Wastewater Treatment Systems, MBR Requires Optimization of the Biological Process

Although Membrane Bioreactor (MBR) is a relatively new technology, the biological principals have to be implemented just like the oldest wastewater treatment technology, referred to as Conventional Activated Sludge process.

MBR is a combination of suspended-growth activated sludge biological treatment and membrane filtration process, performing the critical solid/liquid separation function that is traditionally accomplished using secondary clarifiers and polishing filters. To achieve Enhanced Nutrient Removal (ENR) level of treatment, MBR needs to include a high performing Nitrogen removal system, such as the four-stage Bardenpho process.

One of many advanced activated sludge (AAS) configurations is the four-stage Bardenpho process. This biological process typically consists of four reactor/selector basins: 1) pre-anoxic, 2) pre-aeration, 3) post-anoxic, and 4) post-aeration. Traditional return activated sludge streams and internal recycle streams are utilized based on the expected level of nutrient removal. Typically, this process can accomplish ENR goals with high biological Nitrogen removal and limited biological Phosphorus removal. Additional Phosphorus removal can be achieved through chemical precipitation or biological degradation. In smaller plants, it is usually more efficient to remove Phosphorus by chemical precipitation by addition of an iron salt such as Alum.

In addition to the above considerations, more stringent effluent TN and TP limits also requires chemical additions, including Soda Ash for Alkalinity adjustments, and supplemental Carbon source for denitrification. A typical two train MBR with four-stage Bardenpho process is shown in the Figure below.

While the membranes utilized in the MBR can certainly accomplish the best filtration and produce high effluent quality, the biological process upstream of the membrane has to be optimized and no short cuts can be taken in the optimization of this highly sensitive critical biological process. ■