

Comparing MBR and SBR Technologies

Although Treatment Equipment Company places a great deal of focus on MBR, it is important to note that we represent an industry-leading SBR technology, and over the past two decades, we have provided more than 20 SBR systems ranging in size from 30,000 GPD to over 2 MGD.

While there are similarities between MBR and SBR (both are forms of the activated sludge process), there is one fundamental difference – the method of separating the mixed liquor from the treated wastewater. SBR technology relies on gravity settling (or phase separation), while MBR technology uses the membrane as a physical barrier for separation. On the surface this may seem like a subtle difference, however, by using a physical barrier for separation, MBR technology provides numerous advantages.

Reduced Footprint

One of the benefits of MBR technology over other activated sludge processes is its ability to operate at high biomass concentrations (MLSS). A typical Enviroquip MBR design will operate at an MLSS of 12,000 mg/l, while a typical SBR design will have an MLSS in the range of 3,000 mg/l. This difference in biomass concentration leads to much smaller process basins for MBR technology, and results in the MBR system having an overall plant footprint 50 – 70% smaller than an SBR system. Further, because it relies on phase separation, the SBR cannot operate at elevated biomass concentrations, as the sludge loses its ability to settle into distinct layers once the MLSS gets above 6,000 – 8,000 mg/l. Settling characteristics are not relevant with MBR technology because it utilizes a physical barrier for separation.

Superior Effluent Quality

During operation, the effective opening of the Kubota membrane is less than 0.1µm. The membrane achieves 6-log removal of bacteria and 3-log removal of virus without disinfection. Effluent turbidity is < 0.2 NTU. SBR technology, even when followed by tertiary

Parameters	Typical Values - MBR	Achievable Values - MBR
BOD	< 2.0 mg/l	Non-Detect
TSS	< 2.0 mg/l	Non-Detect
Total Nitrogen	< 10.0 mg/l	< 3.0 mg/l
NH ₃	< 1.0 mg/l	< 0.3 mg/l
Phosphorus	< 1.0 mg/l	< 0.03 mg/l
Fecal Coliform	< 2.2 CFU / 100 ml	Non-Detect

filtration, won't achieve values this low. The typical opening for most tertiary filters is on the order of 10µm, 100x larger than the membrane. In this regard, MBR technology reduces the burden on the final disinfection system (typically UV or Chlorine).

Reduced Sludge Production

An MBR system will produce less waste sludge than an SBR system. The reason for this is the MBR's ability to operate at much longer sludge retention times (SRT). Again, the reason an SBR can't operate at longer SRTs is the negative impact on the settling of sludge.

Ease of Operation

Ease of operation is often the least appreciated aspect of MBR technology. Put simply, eliminating phase separation (sludge settling) from the process greatly reduces the operator oversight required to keep the system running efficiently. Most operators of activated sludge facilities will tell you they spend the majority of their time focused on the settling characteristics of the sludge at their plant. There are many factors that impact settling characteristics and these can change from one day to the next. Not only does this require time spent in the lab analyzing sludge samples, but also subsequent adjustments to the plant (i.e. adjusting process cycles in an SBR) to maintain good settling characteristics. If the sludge doesn't settle into a distinct layer, the plant runs the risk of compromised effluent quality. Again, this lab and plant adjustment work is greatly reduced with an MBR system since settling of sludge is not an issue.

To achieve reuse quality water, the SBR system will need to be followed by a tertiary filtration system. Treatment Equipment Company has sold over 20 tertiary filtration systems in our territory – both sand and cloth media. To meet the requirements for CA Title 22, OR Level 4, and WA Class A, a polymer system will also need to be added to dose the secondary effluent from the SBR prior to the filters. This adds additional mechanical equipment (capital, O&M) as well as the need to supply, store, and handle polymer. Finally, the addition of polymer will be variable based on the quality (suspended solids) of the SBR's secondary effluent. This will require additional operator attention.

By comparison, MBR technology does not require tertiary filtration, polymer addition, or any further treatment processes to meet WA, OR, and CA standards for suspended solids and turbidity. This reduction in the number of unit processes further improves system reliability and reduces process oversight by the operator. Further indicating the ease of operation, many of our MBR installations on the West Coast are monitored and maintained from a remote location, utilizing the full SCADA control system that Enviroquip supplies with every project.

Summary

There is nothing wrong with the SBR / Chemical Addition / Tertiary Filtration approach; Treatment Equipment Company has successfully marketed those technologies for the past 2 decades. If there are no reuse considerations on a project, and no footprint constraints, then SBR technology can be a cost-effective choice. However, the majority of our clients on the West Coast appreciate the reduction in unit processes and lower operational requirements for the Enviroquip MBR, and know that the high quality effluent and reduced footprint will help them meet future growth and permit requirements better than any other technology on the market.