

**COMPARISON OF DIFFERENT PROCESSES VS BIOPIPE**

	<b>Sequencing Batch Reactor (SBR)</b>	<b>Membrane Bio Reactor (MBR)</b>	<b>Moving bed Bioreactor ( MBBR)</b>	<b>Rotating Biological Contactor (RBC)</b>	<b>Biopipe</b>
<b>Process Type</b>	Batch	Continuous	Continuous	Continuous	Batch
<b>Flow Equalization:</b>	Preferred ( not mandatory ). Large size SBRs are without flow equalization and accordingly flow and pollutant shock loads are well absorbed in SBR reactor itself	Preferred as membranes are sensitive against shock loads (flow and pollutant)	Preferred ( not mandatory )	Preferred as Biofilms are sensitive against shock loads (flow and pollutant)	Preferred
<b>Effluent Quality</b>	High effluent quality direct after SBR which matches all standards reuse and discharge norms	High treated effluent quality	Good effluent quality direct after MBBR which matches standard reuse and discharge norms	Good effluent quality direct after RBC which matches standard reuse and discharge norms	High treated effluent quality
<b>Treated Sewage Effluent Quality</b>	TSS < 10 mg/l BOD < 15 mg/l TN < 10 mg/l TP < 2 mg/l Gaurantee on virus reduction , Intestinal Nematode Eggs & Giardia	TSS < 5 mg/l BOD < 5 mg/l TN ( no gaurantee) TP ( no gaurantee) Gaurantee on Virus reduction , Intestinal Nematode Eggs and Giardia	TSS < 10 mg/l BOD < 15 mg/l No Gaurantee on virus reduction , Intestinal Nematode Eggs & Giardia	TSS < 10 mg/l BOD < 15 mg/l No Gaurantee on virus reduction , Intestinal Nematode Eggs & Giardia.(Advanced tertiary treatment required to achieve control on pathogens and viruses)	BOD: < 10 mg / lt COD: < 30 mg / lt TSS: < 10 mg / lt pH: 6 - 9
<b>Tertiary Filtration</b>	Required to polish effluent below BOD / TSS < 10 / 5 mg/l.	Not required	Required to polish effluent below BOD / TSS < 10 / 5 mg/l	Required to polish effluent below BOD / TSS < 10 / 5 mg/l	Not required
<b>Process Sensitivity</b>	Strong against process upset	Weak against process upset	Moderate strength against process upset	Weak against process upset	Strong against process upset
<b>Footprint</b>	Moderate	Low	Low ( depends on media fill factor in MBBR tank, type of liquid solid separation unit e.g. settling tank versus DAF unit etc )	Low	Low
<b>Fat , Oil and Grease Tolerance</b>	High	Low	High ( MBBR system may tolerate higher FOG concentration when it is compared to MBR system )	Low	High
<b>Control</b>	Simple	Complicated	Simple	Simple	Simple
<b>Effluent Reliability / Quality Consistency</b>	High	Low	High	Low	High
<b>Pretreatment</b>	Fine screening 6 - 8 mm along with Grit & grease removal unit ( moderate level )	Fine screening 1-3 mm along with Grit & grease removal unit ( high level )	Fine screening 6 - 8 mm along with Grit & grease removal unit ( moderate level ). Hence lower cost on pretreatment	Fine screening 6 - 8 mm along with Grit & grease removal unit ( moderate level ). Hence lower cost on pretreatment	Fine screening 6 - 8 mm along with Grit & grease removal unit ( moderate level )
<b>Septic Sewage Handling Capabilities</b>	High	Low	High. Process is relatively stronger against shock load like handling different quality of septic sewage	High	High
<b>Human Hair / Fiber Intrusion</b>	No problem	Problem observed due to high human hair intrusion ( hair stick above / around the membrane surface and seriously hamper permeability)	No problem	Problem observed due to high human hair intrusion	No problem
<b>Waste sludge Concentration</b>	Moderate (concentration : 10,000 - 15,000 mg/l)	High (concentration : 12,000 - 18,000 mg/l)	Moderate (concentration : 10,000 - 15,000 mg/l)	Moderate (concentration : 10,000 - 15,000 mg/l)	NA - No Sludge Production
<b>Cost of sludge treatment</b>	Cost on sludge treatment (digestion , thickening / dewatering) : Moderate	Cost on sludge treatment (digestion , thickening / dewatering) : Low	Cost on sludge treatment / disposal (digestion , thickening / dewatering , tankering etc ) : Moderate	Cost on sludge treatment (digestion , thickening / dewatering) : Low	NA - No Sludge Production
<b>Operational Flexibility</b>	High	Low	High	Low	High
<b>Operational Cost</b>	Low	High	Low	Low	Relatively lower. (No blower)

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