# WASTEWATER TREATMENT TECHNOLOGIES COMPARISON CHART

MABAREX

## GROUP 1 - SUSPENDED GROWTH BIOLOGICAL PROCESSES

| TECHNOLOGY | PERFORMANCE | | | | ADDITIONAL COMMENTS | | FOOT PRINT | OPEX |
|---|---|---|---|---|---|---|---|---|
| | BOD | TSS | AMMONIA | PHOSPHORUS | BENEFITS | DRAWBACKS | | |
| **AERATED LAGOON** | Good | Good | Poor | Poor | • Very simple<br>• Minimal operational controls | • Requires aeration system<br>• Sensitive to cold climate issues<br>• Large footprint<br>• Sludge extraction periodically is a major operation |  | $$ |
| **ACTIVATED SLUDGE (AS)** | Good | Require separate system | Good | Poor | • Well known technology | • Requires high efficiency aeration system<br>• Continuous flow mode requires external stage following the AS unit<br>• Requires closely controlled operational conditions |  | $$ |
| **OXIDATION DITCH** | Good | Require separate system | Good | Poor | • Low energy for aeration | • Requires aeration system<br>• Requires external clarification stage following aeration<br>• Requires closely controlled operational conditions |  | $$ |
| **SEQUENCING BATCH REACTOR (SBR)**<br>**BIOCYCLE™** | Good | Good | Good | Poor | • Flexibility<br>• Does not require external clarification stage | • Requires high efficiency aeration system<br>• Requires closely controlled operational conditions<br>• Changes in loading require intervention<br>• Requires skilled operator |  | $$ |
| **MEMBRANE BIOREACTOR (MBR)**<br>**ULTIMO™** | Good | Very Good | Good | Good | • Tertiary quality effluent<br>• Operation easily followed remotely<br>• Retain bacteria such as E. Coli | • Requires pre-treatment<br>• Requires aeration system<br>• Performance closely linked to maintenance quality<br>• Risk of membrane fouling (redundancy required) |  | $$$ |



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## GROUP 2 - FIXED FILM BIOLOGICAL PROCESSES

| TECHNOLOGY | PERFORMANCE | | | | ADDITIONAL COMMENTS | | FOOT PRINT | OPEX |
|---|---|---|---|---|---|---|---|---|
| | BOD | TSS | AMMONIA | PHOSPHORUS | BENEFITS | DRAWBACKS | | |
| **TRICKLING FILTER** | Good | Require separate system | Poor | Poor | • Minimal operation and maintenance requirements | • Requires pre-treatment (primary settling)<br>• Sensitive to cold climate issues |  | $ |
| **ROTATING BIOLOGICAL CONTRACTOR (RBC)** | Good | Require separate system | Variable | Poor | • Low energy for aeration | • Requires external clarification stage following the RBC unit<br>• Requires electrical supply for shaft motor<br>• Requires closely controlled operational conditions<br>• Sensitive to environmental conditions and fluctuations in influent quality (e.g., temperature, pH, flow, concentrations, etc.) |  | $ |
| **AEROBIC SUBMERGED FIXED BEDS** | Good | Good | Variable | Poor | • Can have higher organic loading rates compared to trickling filters | • Requires aeration system<br>• High energy use |  | $$ |
| **AEROBIC SUBMERGED MOBILE BEDS** SMBR™ | Good | Require separate system | Good | Poor | • Flexibility<br>• Smaller footprint<br>• Adapt to various conditions and loading | • May require external clarification stage<br>• Requires aeration system (coarse bubble)<br>• Sensitive to cold climate issues for ammonia |  | $$ |
| **RECIRCULATING SAND FILTERS** | Good | Good | Poor | Poor | • Steady performances | • Requires pre-treatment unit<br>• Requires recirculation/dilution tank (backwash water)<br>• Sensitive to cold climate issues |  | $$ |
| **INTERMITTENT SAND FILTERS** | Good | Good | Poor | Poor | • Steady performances | • Requires pre-treatment unit<br>• Sensitive to cold climate issues<br>• Require significant backwash water |  | $$ |



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## GROUP 3 - OTHER BIOLOGICAL PROCESSES

| TECHNOLOGY | PERFORMANCE | | | | ADDITIONAL COMMENTS | | FOOT PRINT | OPEX |
|---|---|---|---|---|---|---|---|---|
| | BOD | TSS | AMMONIA | PHOSPHORUS | BENEFITS | DRAWBACKS | | |
| **CONSTRUCTED WETLANDS** | Fair | Good | Poor | Poor | • Minimal operation and maintenance<br>• No energy source required. | • Not applicable to cold weather<br>• Large surface area<br>• Surface flow wetlands are less effective in removing ammonia than subsurface or vertical flow wetlands<br>• Poor flexibility towards variation (hydraulic & loading) |  | $ |
| **ACTIVATED SLUDGE BIOREACTOR WITH POWDER ACTIVATED CARBON** | Good | Good | Good | Poor | • May not require external clarification stage if operated in SBR mode<br>• Improved dewatering of requirements waste sludge | • Requires frequent carbon addition<br>• Changes in organic loadings in the influent affects the operations time; increases control<br>• Require high efficiency aeration system |  | $$$ |
| **ANAEROBIC REACTORS** | Good | Good | Poor<br>(generate ammonia) | Poor | • Additional biogas recovery $<br>• Suited for high BOD loads<br>• Low sludge production | • Polishing phase (aerobic) required to discharge in the environment |  | $ |



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## GROUP 4 - OTHER PROCESSES

| TECHNOLOGY | PERFORMANCE | | | | ADDITIONAL COMMENTS | | FOOT PRINT | OPEX |
|---|---|---|---|---|---|---|---|---|
| | BOD | TSS | AMMONIA | PHOSPHORUS | BENEFITS | DRAWBACKS | | |
| **EVAPORATION** | Poor | N/A | Fair | Poor | • Low sludge volume | • Require skilled (certified) operators<br>• High energy consumption<br>• Subject to calcification<br>• High maintenance requirement<br>• Does not tolerate solids |  | $$$$ |
| **REVERSE OSMOSIS** | Good | Good | Good | Good | • High quality effluent | • Require extensive pretreatment<br>• Large volume of concentrate to dispose (30-50%) |  | $$$ |
| **VAPORISATION** | Poor | N/A | Good | Poor | • Very simple | • Odor and GHG generation<br>• Pollution return to pile<br>• Does not tolerate solids |  | $$ |



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