
TECHNOLOGY SHEET

ACCELERATED BIOLOGICAL TREATMENT

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Packaged, skid-mounted wastewater treatment plants offer many advantages which includes lower installation cost, easy to locate at the site with quick turnaround, simple operation with low manpower requirements, low maintenance, user friendly, produces water that is regulatory compliant, long service life and can be designed for a specific application. Traditional treatment plants include aerobic treatment using suspended cultures, followed by clarification and tertiary treatment. Major issues with this conventional biological treatment are: (1) large footprint, due to slower biodegradation rates, especially in colder climates; (2) significant power consumption due to aeration requirements; (3) incapable of treating recalcitrant compounds; and (4) generation of waste sludge that has to be disposed.



PRD Tech's Accelerated Biological Treatment (ABT) system differs significantly from conventional aerobic biotreatment in the following ways: (1) it utilizes a combination of anoxic and aerobic treatment, to breakdown compounds that otherwise would be difficult to biodegrade aerobically; (2) uses immobilized cultures rather than suspended, which increases the solids retention time from a few hours to several days, thereby reducing waste sludge production and stabilizing the treatment performance, even if the influent loading and flowrate varies significantly; (3) decreases the footprint significantly by increasing biomass concentration by several orders of magnitude; (4) uses high surface area biomedium, which decomposes organics, and also removes ammonia nitrogen and phosphorus within the anoxic regions of the biofilm; (5) less power consumption since it does not require a compressor to aerate the water; (6) uses membranes to separate the biomass rather than a standard clarifier, thereby producing a significantly higher water quality; and (7) allows chemical oxidation to be used synergistically with biological treatment.

The Accelerated Biological Treatment (ABT) system uses venture aeration, which requires no compressors to create very fine air bubble in the wastewater. Ozone, generated from air can be mixed with this aeration air to achieve chemical oxidation, prior to biological treatment. There is dual stage aeration system followed by a ceramic membrane ultrafiltration system, which recovers the biomass and recycles it back to the inlet of the system. Specially designed, high surface area biomedium is used to create large concentrations of active biofilms, which accelerates the biological treatment

rates. The main benefits of using media in biological treatment are:

- Higher effective biomass within the system, which allowed biomass concentrations to be well above the 2,500 mg/L limit for conventional activated sludge plants, thereby increasing treatment rates of BOD;
- Enhanced nitrification, especially during cold weather conditions, due to excess biomass present and presence of anoxic conditions within the interior of the biofilms;
- Resistant to organic and hydraulic shock loads, since the biomass was immobilized on the submerged media, it could not easily washout of the system, when the hydraulic load increased, and biofilms were less susceptible to influent BOD shocks;
- Improved process stability due to increase in bacterial population and stability of biofilms on the media;
- Improved **Sludge Volume Index (SVI)**, which results in a more concentrated sludge in the clarifier, thereby improving the process operation;
- Reduced sludge production due to higher sludge retention times (SRT), due to the immobilization of biomass on the media, which did not leave the system; this significantly reduced the sludge handling, drying and landfilling that most plants had to use for sludge disposal;

PRD Tech, Inc. has developed a **Multi-Pollutant, High Rate Biomedium (MPHR Biomedium)**, which is a novel suspended media for improving the performance of currently operating activated sludge wastewater treatment plants (WWTP). It offers all the benefits of IFAS systems, without any of the disadvantages of fixed media.

The performance characteristics of this media in an operating activated sludge system are as follows:

Plant Loading (kg BOD/m ³ .day)	0.96
Media Volume (%)	40
BOD ₅ Influent: 200 mg/L	Effluent: 2 mg/L
COD Influent: 320 mg/L	Effluent: 18mg/L
TKN Influent: 37 mg/L	Effluent: 3 mg/L
Total P Influent: 8 mg/L	Effluent: <1mg/L
Specific Removal Rate (kg NH ₃ -N/1000 m ² .day)	0.92

ABT systems can treat wastewater in the field from 3,000 GPD (16 ft x 8 ft x 10 ft; 6000 lbs dry weight) to 100,000 GPD (35 ft x 10 ft x 10 ft; 57,000 lbs dry weight) and are designed in standard ISO containers.

For more information and to get a water sample tested, contact Dr. Rakesh Govind, PRD Tech, Inc.
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