Company Profile

BioCleaner, Inc. was founded in 2010 with its Headquarters in Monterey Park, California. In just a few years, BioCleaner has grown larger, opening offices in China, and the Philippines. With the addition of a lab and research facility in San Francisco, BioCleaner is poised to bring an environmentally friendly water treatment solution to the world.

It was established as a common dedicated response by local professionals to the alarming degradation of the environment and natural resources, the rapidly development of technologies with uncertain effects and impacts, and the need for rapid and convenient long-term applications.

The common vision, commitment and strong bond among these professionals have inspired them to organize Biocleaner, Inc., which is governed by the basic precept of innovation.

Our mission at Biocleaner, Inc. is to provide technology driven, cost-effective biological solutions to environmental challenges facing our global community.

Since our inception, we have focused on developing a total biological solution for the treatment of contaminated open water and wastewater streams. Biocleaner Inc. has been involved in the complete design, build operations support services of wastewater treatment systems for industrial facilities, hazardous waste landfills, commercial establishments, municipalities and residential communities. Our mission engages us to expand our boundaries and assist the world.

The importance of protecting the environment has traditionally been a social and political cause. As the face of business economy has changed, so has the priority for protecting the environment. Biocleaner, Inc. is enthusiastic about the potential opportunity of working together with business, governments and communities alike to provide biological solutions for environmental challenges facing them today and in the future.

Biocleaner, Inc. has established itself with a base of well-trained personnel and highly competent engineers who are trained, supervised and guided by a team of officers with extensive experiences in wastewater and solid waste treatment.

Module A: BIOCLEANER Seeder Reactor

Technology Description

Biological water treatment processes are based on the exploitation of the concerted activity of microorganisms. Knowledge of the microbial community structure, and the links to the changing environmental conditions is therefore crucial for the development and optimization of biological systems by engineers. The advent of molecular techniques in recent decades quickly showed the inadequacy of culture-dependent methodologies to

unveil the great level of diversity present in sludge samples. Initially, culture-independent technologies and more recently the application of genomics in water microbiology, have drawn a new view of microbial diversity and function of water treatment systems. The current knowledge on the topic places emphasis on crucial microbial processes, carried out in biological water treatment systems driven by specific groups of microbes, which can selectively target certain algae, saprobic, and other microorganisms by design. BioCleaner's recent research and development has offered substantial insight into the diversity and ecophysiology of these bacteria never envisioned before, resulting in an immobilized consortium of microbes sourced from geobacters which are highly abundant throughout the world by seeding the colony in a housing unit supplemented by a delivery system for constant accelerated growth and propagation. This is a bioremediation technology that can treat toxic algae in site and without the deleterious effects of diffusely sprayed chemical or microbial treatments to upgrading existing wastewater facilities. Biocleaner proposes the ultimate use of its technology to enhance bioremediation by treating various types of wastewater constituents in sewage, industrial, and open waterways.

Biocleaner's microbiological treatment technology effectively remove BOD, COD, liquify organic sludge, and other wastewater constituents for the proposed wastewater application while having the lowest cost profile in the market. Biocleaner uses Facultative Anaerobes for BOD/COD removal. The behavior of the microbes depends on the depth and HRT. The microbes because of their ability to respire and ferment organic substances, these types of bacteria (facultative anaerobes), can continue growing in the presence or the absence of oxygen. For some of these organisms, particularly those that rely on oxygen for some of the biosynthetic reactions, growing is significantly affected in the absence of oxygen. Observing the microorganisms through an electron microscope is a method of determining changes in their physiology. Polyphenols have color pigments that are difficult to breakdown. The molecule has more than one hydroxyl group. They can be simple structures like phenolic acids or complex Tannins. Their structure is classified as either flavonoids or non-flavonoids. The facultative anaerobe breakdown the polyphenol molecule through fermentation. The amount of energy produced is less than aerobic phase treatment. Even if sealed if there is any gap or opening in the seal air can seep in and the air skimming the surface will increase some oxygen levels. If a pond/tank is swallow it takes more precision to convert it anaerobically the actual application the amount of volume and depth will require less precision at long as the PID is ideal, and the HRT is stated in the layout.

Detergent and other cleaning agents that are meant to kill bacteria are washed down into the STP. These cleaning agents will kill most of the microbes from the BioCleaner. However, under normal usage, since there is a constant production of microbes, there is little effect on the treatment and no upsets. We also can take care of industrial and toxic waste. As mentioned earlier, we have a big depository of microbes where we can draw from and therefore can just choose what form of microbe to use for the waste stream.

Our units are efficient, and the footprint can be as small as 50% of existing technologies, saving space for other uses and can also be retrofitted in other existing systems. The

BioCleaner has a uni-directional flow that mixes the wastewater in the tank or lagoon, increasing the oxygen transfer. This is a very clean and green technology. BioCleaner provides economic and environment friendly solutions to wastewater problems. Water infested with a thick layer of sludge can be removed entirely, even making it capable of sustaining aquatic life.

THE SEEDER REACTOR

By using a minimal amount of material, our units focus on the SeederTube which contains a BioSix Microbial Consortium for the most effective cleansing ability and strength.

FIGURE 1: SEEDER REACTOR UNIT

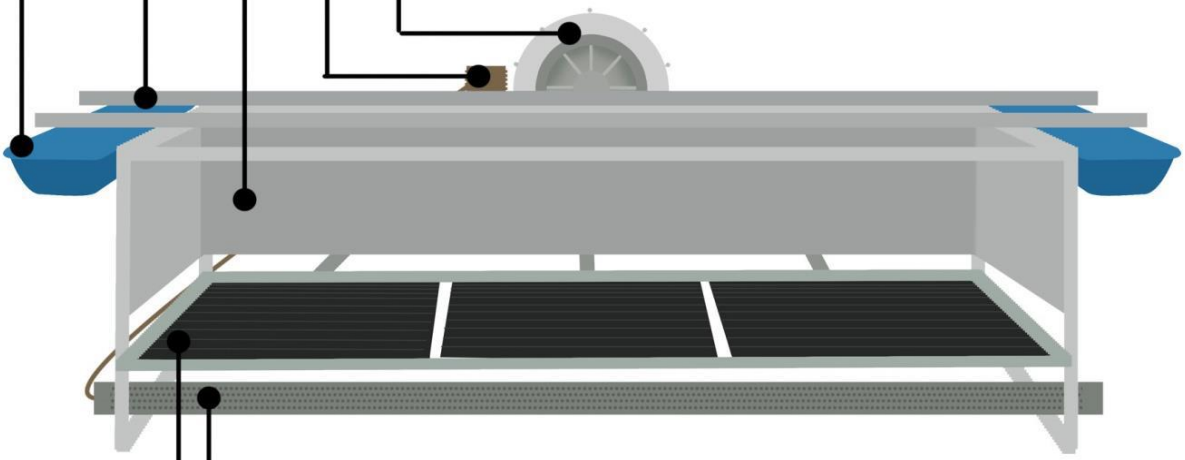
Floater - Made of PE plastic that is 61 inches in length, 12 inches in width and 8 inches in height. This will provide buoyancy to the Biocleaner, making it mobile and use less power.

Fiber glass angle bar - Framings that are 2inch x 2inch x 3mm in size. This is light weight and heavy duty bars that can be submerge in to almost any contaminant water.

PE plastic walls - Are to cover about ¾ of the lift, it is composed of four sheets that is 3.28ft x 2ft x 2mm. This is to provide water direction and suction.

55 watts air blower - attached to the Biotube

Air Blower - a single phase motor that uses 1.75kW of power. It can transport 240m3 air/hr. Approximately 3.65 kg O2/hr is transferred in to the surrounding water.



Biotubes - microbial bioreactor made of perforated stainless steel cylinder. It is 3 meters in length and 4 inches in diameter. This Biotubes are filled with "medias" that are full immobilized microbes. Aeration diffusers are also located in the entire length of the Biotubes to provide oxygen to the microbes with 55 watts air blower.

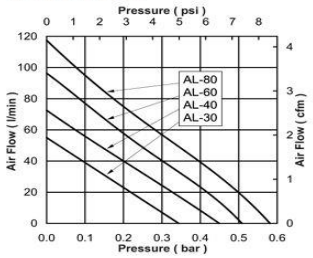
Aerogrid is made of injection molded HDPE plastic and comes with 60 feet of Aerotube aeration tubing attached using stainless steel clamps.The size is 1m x 1.2m.

FIGURE 2: SEEDER REACTOR UNIT DESCRIPTION

FIGURE 3: SEEDER TUBE LINER BLOWER

ALITA® Linear Air Pump (AL-40, 60, 80)

Nominal Performance

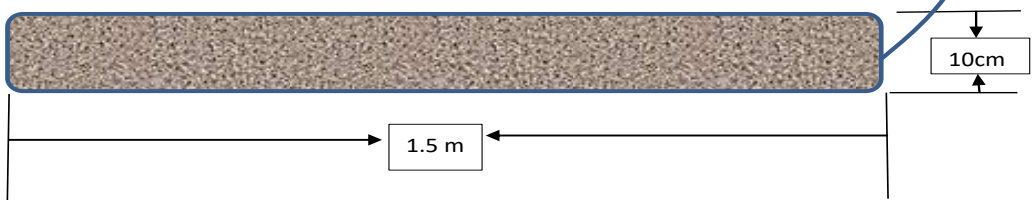


Specification

Model	AL-40	AL-60	AL-80
Voltage	AC 110/115/120V or AC 220/230/240V		
Frequency	50 / 60 Hz		
Rated Pressure	0.15 bar, 2.18 psi		
Rated Performance	48 lpm, 1.7 cfm	68 lpm, 2.4 cfm	85 lpm, 3.0 cfm
Rated Power	46 W	60 W	85 W
Sound Level	36 dB	38 dB	39 dB
Discharge O.D.	18 mm, 5/8 in		
Weight	5.6 kg, 12.5 lb	6.5 kg, 14.4 lb	6.5 kg, 14.4 lb

AL-40 - normal continuous operating range: 0.05 - 0.20 bar
AL-60, 80 - normal continuous operating range: 0.05 - 0.25 bar
Specifications are subject to change without notice

Note: Augmentation Unit shown is 1.5m length actual is 3m in length.



Air Blower *- The Air Pump provides a flow of air to the Unit. The pump is approximately two (2) horsepower and requires only a minimal amount of energy and power to work.*

Linear Blower *- The Air Pump provides a flow of air to the Unit. The blower provides 30-60 Watts requires only a minimal amount of energy and power to operate the Seeder Tube.*

SeederTube *- The SeederTube contains the consortium of Facultative Anaerobes that have constant accelerated growth activated by a single layer of microbe from the media. Within the SeederTube we use a consortium of microbes.*

This consortium of microbes work together to provide the most efficient team of waste eating bacteria without any additional production of waste or sludge. The microbes are in a special patented immobilized state in the form of media. Immobilized state means that the microbes are dormant when media or microbes have oxygen and nutrients available, it then activates and will start multiplying. It is the newly produced microbes that will occupy the entire pond and treat and remove exogenous bacteria and waste.

Biocleaner Microbial Consortia

Biosix Consortia Specifications	**Chem 5 Consortia Specifications**
Optimal Temperature 25-32 C For every degree below or above the optimal range the efficiency drops by 5%	Optimal Temperature 25-32C For every degree below or above the optimal range the efficiency drops by 5%
Optimal pH 6-8 For every pH below or above the optimal range the efficiency drops up to 30%	Optimal pH 6-8 For every pH below or above the optimal range the efficiency drops up to 30%
Breakdown BOD, TSS, FOG, Cyanobacteria, and nutrients Ammonia Removal	Breakdowns polyphenols, hydrocarbons, pesticides, surfactants, bitumen, petroleum products, and color Ammonia Removal
Commissioning required to propagate the microbes to stabilize treatment and prevent shock-loading. Commissioning time can range from 1-4 weeks	Commissioning required to propagate the microbes to stabilize treatment and prevent shock-loading. Commissioning time can range from 2-5 weeks NPK (nutrients) required during commissioning
Survives in salinity only up to brackish water levels	Survives in salt water up to 80,000 ppm salinity
Respiration Rates up to 300ppm COD/hr in high strength biological wastewater	Respiration Rates up to 300ppm COD/hr in high strength wastewater
Maximize efficiency by amount of aeration provided	Maximize efficiency by amount of aeration provided

BioCleaner

PERFORMANCE

The Biocleaner System operates as a portable modular bioreactor. There are several variables to consider in the maximum performance ranges of the unit.

EVALUATION AND VALIDATION OF THE PROCESS FOR TREATMENT OF WASTE WATER AND BIOLOGICAL SLUDGE WITH BIOREMEDIATION TECHNOLOGY BASED ON IMMOBILIZED BIORECTOR SYSTEM (IBS)

(Patented by M/s BioCleaner Inc, US Patent No. US 8,066,873 B2)

BACKGROUND:

M/s BioCleaner Inc have patented a waste water treatment process based on Immobilized Bioreactor System (IBS) vide US Patent No. US 8,066,873 B2 dated November 29, 2011 titled "Floating Bioreactor System.

The patented technology involves use of immobilized non genetically modified organisms (Non GMO) classified by the US Center for Disease Control and Prevention (CDC) as Biosafety Level 1.

The Biocleaner Bioreactor consists of following components:

- **Aerogrid**: Made of injection molded HDPE plastic and comes with 66 feet of Aerotube aeration tubing attached using stainless steel clamps. The size of this grid is 1m x 1.2m.

- **Biotubes**: Microbial bioreactor made from perforated stainless steel pipes. They are 3 meters in length and 4 inches in diameter. This Biotubes are filled with "media" that are immobilized microbes.

- **Fiber glass angle bars**: These are light weight and heavy duty bars that can be submerge in to almost any contaminant water.

- **HPDE plastic walls**: These are composed of four sheets and are used to cover about 3/4th of the lift. This is to provide water direction and suction.

- **Floaters**: Made of PE plastic which provide buoyancy to the biocleaner, making it mobile with less power.

- **Air Blower**: A single phase 2 hp blower that uses 1.6kW of power. This motor transfers 145m3 air/hr. Approximately 3.65 kg O2/hr are transferred in to the surrounding water.

BioCleaner Bioreactor Unit

The immobilized microbes paired with aeration grid containing 20 meter patented tubing with micro-pores creates significantly higher surface area resulting in much higher oxygen transfer and increasing efficiency of the system. The increased volume of fine bubbles can help in effective vertical mixing and the design helps in strong directional flow

M/s BioCleaner have replicated this technology for treatment of both industrial and domestic waste water globally including Secondary Sludge Treatment at Kuantum Papers Ltd, Saila Khurd, Punjab, India, an integrated pulp & Paper Industry. In view of successful implementation of the technology for pulp and paper mill secondary sludge, BioCleaner Inc have proposed to replicate and widen the

scope of this technology in India, in other sectors including starch, food, distillery besides domestic and sewage treatment, to contribute towards environmental protection with cost effective treatment..

In view of the above, M/s BioCleaner approached Department of Biotechnology, Himachal Pradesh University for seeking third party independent validation of the patented process/technology with respect to evaluation of the performance and operational reliability under varying environmental conditions prevailing in different industries and parts of India

EVALUATION OF THE TECHNOLOGY:

The following documentation/data were provided by M/s BioCleaner Inc to Department of Biotechnology, Himachal Pradesh University, for evaluation and validation of the patented technology:

- United States Patent No. US 8,066,873 B2 dated November 29, 2011
- Biocleaner Technology Details implemented at M/s Kuantum Papers Ltd.
- Technical Specifications of BioCleaner Bioreactor
- Mass Balance details of the process along with operating parameters
- Fish Bioassay test as evidence of non-pathogenicity of the microbes used in the technology.
- Biotubes with immobilized microbes for Laboratory and bench scale evaluation

The technology was evaluated on laboratory scale (1 Ltr), bench scale (20 Ltr) and industrial scale (1000 m3). The industrial scale technology was evaluated over a period of 8 months at M/s Kuantum Papers Ltd, whereas laboratory and bench scale evaluation was done over a period of three months.

The following globally accepted protocols were used for evaluation and validation of the data and performance of the technology

a) USEPA (United States Environmental Protection Agency) Protocols

• Protocol for the Verification of Residential Wastewater Treatment Technologies for Nutrient Reduction, ETV program, November 2000.
 Verification Protocol for Secondary Effluent and Water Reuse Disinfection Applications,

ETV program, October 2002. Page **5** of **9**

b) ISO (International Organization for Standardization) Protocols

- ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- ISO 5667-10:1992 Water Quality -- Sampling-- Part 10:
- Guidance on sampling of waste waters

c) BNQ (Bureau de normalisation du Québec) Protocols:

- CAN/BNQ 3680-600/2009 Onsite Residential Wastewater Treatment Technologies (National Standard of Canada for conformity assessment program)

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d) Canadian ETV Program - General Verification Protocols

e) Standard Methods for the Examination of Water and Wastewater, APHA (American Public Health Association)

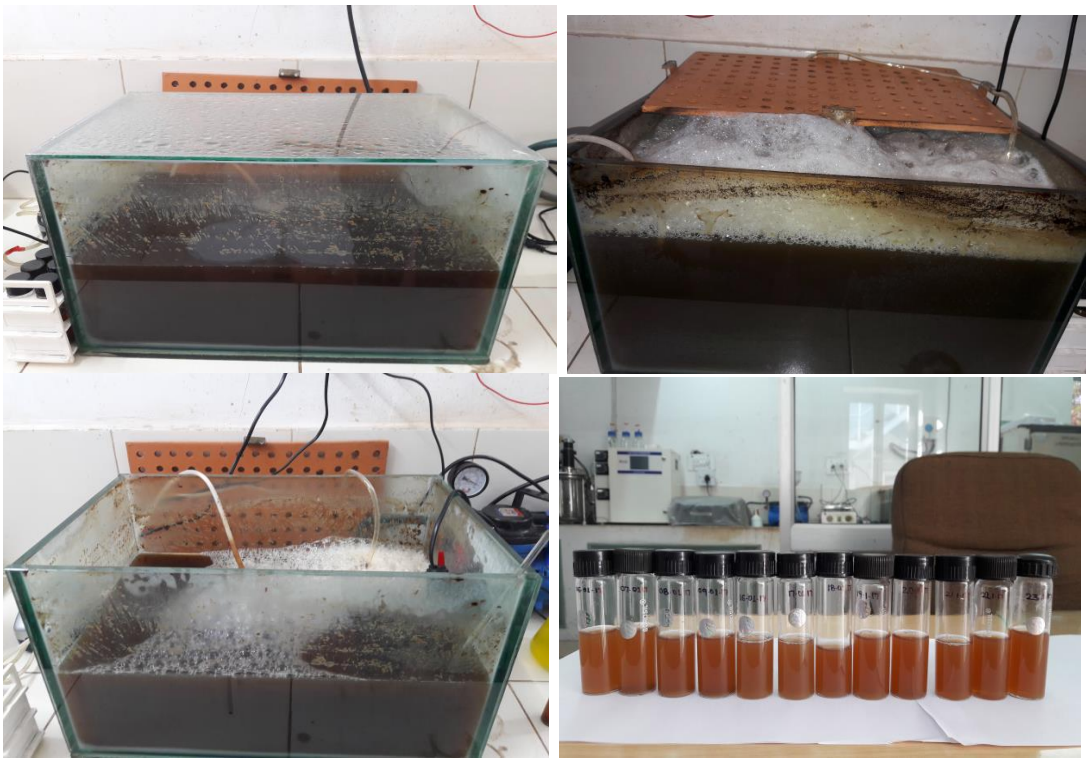
f) Standard Methods for isolation of microbes and optimization of culture conditions.

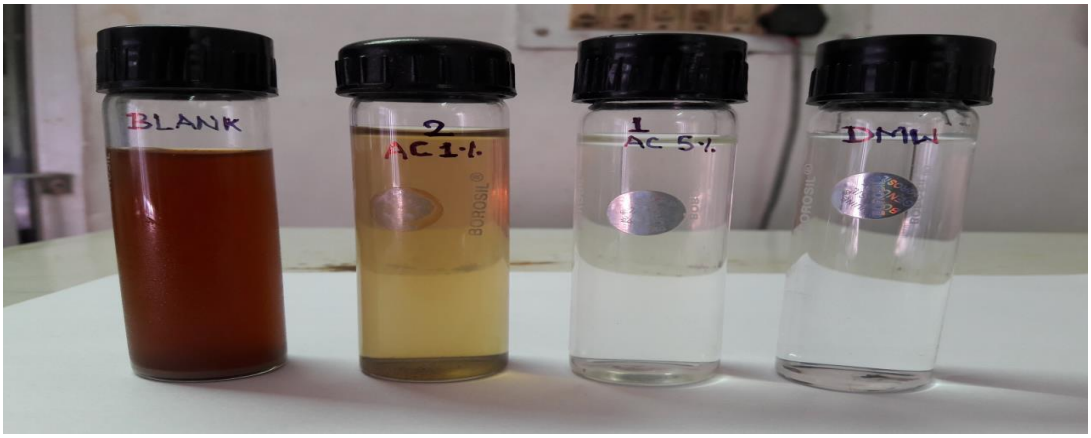
Industrial Scale Evaluation involved flow measurement, sampling, recording sample data and sampling log, monitoring all operating parameters and recording the conditions. Analysis was followed by preparation of test reports, analysis & interpretation of results w.r.t operating parameters and impact of the same on water quality and mass balance of the parameters viz. COD, BOD, TSS, Nitrogen, MLSS, MLVSS, Sludge generation and decomposition etc.

BioCleaner Industrial Scale Installation at Kuantum Papers Ltd, Saila Khurd, Punjab, India

Laboratory and Bench Scale evaluation involved used of aquariums of different capacity with controls for various parameters, to simulate various conditions prevailing in different types of process industries. Samples were drawn at different intervals followed by analysis, data recording and evaluation and process optimization to achieve desired results.

Laboratory and Bench Scale Set up for BioCleaner Technology Evaluation Showing Different

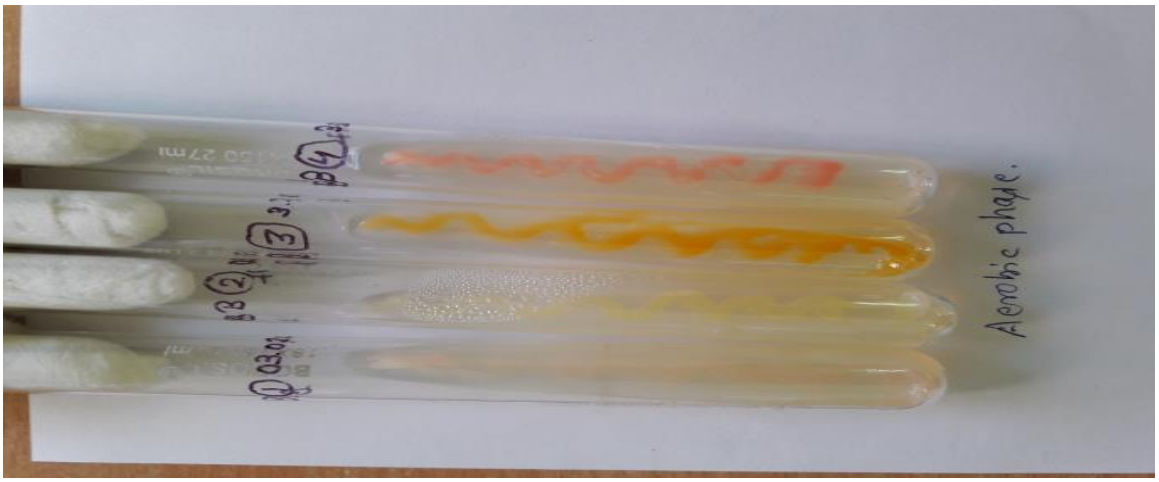


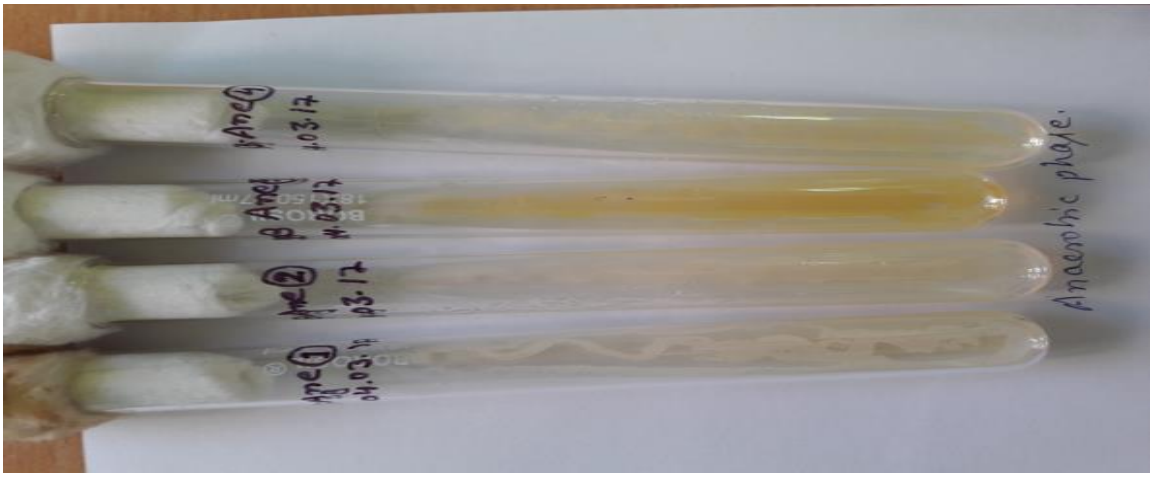


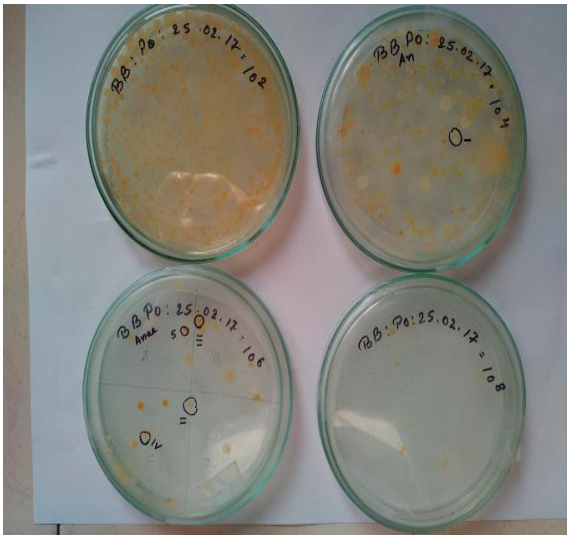
Laboratory and Bench Scale Set up for BioCleaner Technology Evaluation Showing Different Stages of Treatment Process.

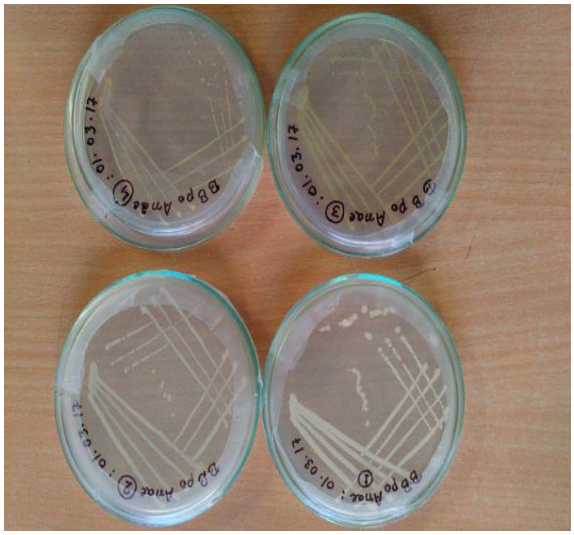
The microbes survived under optimum condition in Laboratory/bench scale and industrial scale set-ups were isolated in the microbiological lab, followed by maintenance of pure cultures. These isolated pure cultures were subjected to varying conditions of nutrients, pH,

Temperature, retention time and different substrates for evaluation of their capability to survive under diverse conditions to as to validate the suitability of the patented technology for various types of waste waters.









Microbiological Evaluation of Biocleaner Technology

Summary of the Evaluation and Conclusion:

With the laboratory & Bench Scale trials and Industrial scale implementation & evaluation of the Bioremediation Technology based on Immobilized Bioreactor System (IBS) developed and patented by M/s BioCleaner Inc vide US Patent No. US 8,066,873 B2 namely “Floating Bioreactor System”, it is summarized as follows:

 The BioCleaner technology is making use of natural facultative anaerobic non-pathogenic micro-flora capable of performing well under both aerobic and anaerobic conditions.

- This technology makes use of a combination of anaerobic and aerobic stages thereby reducing the aeration demand by more than 50% when compared to conventional treatment system, without need for installation anaerobic reactors with special reference to the effluents with low degradability and very low potential of biogas generation, thereby reducing the capital cost substantially.

- The evaluation of the industrial scale installation on secondary sludge have shown that the microbe used in the Biocleaner technology are capable to liquefy the bacterial sludge leading to conversion to simpler components thus facilitating decomposition during treatment process and hence eliminating the need of sludge wasting to the tune up to 90%

- Further, since the microbes being used in BioCleaner Technology are capable of Liquefaction of microbial sludge generated as part of treatment process, the nitrogen concentration in system goes us, thus eliminating the need of adding nitrogen as nutrient for microbes making it economically attractive solution especially for the industrial effluents where nitrogen content in the effluent stream is negligible.

- The combination of anaerobic-aerobic treatment with immobilized microbes has demonstrated reduction of biologically degradable COD and BOD to the tune of more than 90% and 95% respectively under varying operating conditions with different substrates, thereby making this technology suitable for wide spectrum of effluents generated from different types of process industries.

- Since this technology if capable of liquefaction of sludge within the system, odor from the effluent treatment plants and the treated effluents is completely eliminated.

- The laboratory and bench scale evaluation has also demonstrated the application of this technology for nutrient removal (N & P) from the effluent for safe discharge to natural streams.

- Since the microbes used in this technology are immobilized, they are capable of regeneration and restabilizing the process, in case any unfavorable condition leads to temporary destabilization

Therefore, in conclusion, I am of the considered opinion that that the BioCleaner technology can be safely applied to a wide variety of biologically degradable effluents and sludge for removal of Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), recalcitrant organic compounds and nutrients for compliance of environmental norms.