



FREQUENTLY ASKED QUESTIONS AND ANSWERS FOR MICROBE-LIFT® PRODUCT APPLICATIONS

Section

Topics

A..... ABOUT MICROBE-LIFT® TECHNOLOGY

B..... HOW MICROBE-LIFT® PRODUCTS WORKS

C..... APPLICATION OF MICROBE-LIFT®

A) ABOUT MICROBE-LIFT® TECHNOLOGY

A1	Question	:	What is MICROBE-LIFT® IND?
	Answer	:	<p>MICROBE-LIFT® IND is Ecological’s core technological product with over 40 year experience.</p> <p>MICROBE-LIFT® IND is a combination of many species of live bacteria that have been cultivated for compatibility, reproduction and growth to an adult state and used for the treatment of industrial, agricultural and residential, organically contaminated wastewater.</p> <p>All micro-organisms in MICROBE-LIFT® IND are non-toxic and non-pathogenic live bacteria suspended in a liquid medium that is non-offensive to humans, animals, plants and all types of aqua-culture.</p>
A2	Question	:	What types of bacteria does MICROBE-LIFT® IND contain?

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	Answer	:	<p>MICROBE-LIFT® IND contains over several hundred types of bacteria strains. The exact detail is proprietary information.</p> <p>The key strains and their function are:</p> <h3 style="text-align: center; color: #0056b3;">MicrobeLift IND Bacteria Mode of Action</h3> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e6f2ff;"> <th style="text-align: left;">Species</th> <th style="text-align: left;">Inferred function(s)</th> <th style="text-align: left;">Mechanism</th> </tr> </thead> <tbody> <tr> <td><i>Bacillus amyloliquefaciens</i></td> <td>Ammonia-nitrogen removal; Amine degradation; Protein degradation</td> <td>Nitrification: Oxidize ammonia-N to nitrite and nitrite to nitrate</td> </tr> <tr> <td><i>Bacillus licheniformis</i></td> <td>Ammonia-nitrogen removal; Protein degradation</td> <td>Nitrification: Oxidize ammonia-N to nitrite</td> </tr> <tr> <td><i>Bacillus subtilis</i></td> <td>Ammonia-nitrogen removal; Hydrocarbon degradation; Amine degradation; Protein degradation</td> <td>Nitrification: Oxidize ammonia-N to nitrite, Hydrocarbon degradation</td> </tr> <tr> <td><i>Clostridium butyricum</i></td> <td>E. coli inhibition; Complex organics degradation</td> <td>Antibiotics produced inhibit pathogens , LCFA degradation</td> </tr> <tr> <td><i>Clostridium sartagoforme</i></td> <td>Organic Nitrogen removal; Complex organics degradation</td> <td>Chitin degradation, LCFA degradation</td> </tr> <tr> <td><i>Desulfovibrio vulgaris</i></td> <td>Sulfur reducing; Toxic heavy metal removal</td> <td>Reducing sulfate to sulfide; Converting heavy metal to insoluble matter</td> </tr> <tr> <td><i>Desulfobrio aminophilus</i></td> <td>Sulfate reducing; Degradation of amino acid</td> <td>Reducing sulfate to sulfide; Converting heavy metal to insoluble matter</td> </tr> <tr> <td><i>Geobacter lovleyi</i></td> <td>Benzene-,toluene- or xylene- (BTX) degrading; Heavy metal removal</td> <td>Benzene Oxidation; Heavy metal oxidation</td> </tr> <tr> <td><i>Methanomethylorans hollandica</i></td> <td>Sulfur reducing; Odor control</td> <td>Utilization of dimethyl sulfide (DMS); Methylamines degradation</td> </tr> <tr> <td><i>Methanosarcina barkeri</i></td> <td>Nitrate reduction; Nitrogen fixation; Odor control</td> <td>Nitrogen-assimilating enzymes, denitrificationMethylamines degradation</td> </tr> <tr> <td><i>Pseudomonas citronellolis</i></td> <td>Ammonia removal; Phosphorous removal, complex organics degradation</td> <td>Nitrate reducing, Accumulating poly -P, Hydrocarbon degradation</td> </tr> <tr> <td><i>Rhodopseudomonas palustris</i></td> <td>Phosphorous removal; Odor control; Hydrocarbon degradation</td> <td>Accumulation of poly-P; Degradation of LCFA, cellulose</td> </tr> <tr> <td><i>Wolinella succinogenes</i></td> <td>Sulfur reducing; Odor control; Removalof toxic organics</td> <td>Oxidizes sulfide; Nitrate reduction; Oxidase benzidine</td> </tr> </tbody> </table>	Species	Inferred function(s)	Mechanism	<i>Bacillus amyloliquefaciens</i>	Ammonia-nitrogen removal; Amine degradation; Protein degradation	Nitrification: Oxidize ammonia-N to nitrite and nitrite to nitrate	<i>Bacillus licheniformis</i>	Ammonia-nitrogen removal; Protein degradation	Nitrification: Oxidize ammonia-N to nitrite	<i>Bacillus subtilis</i>	Ammonia-nitrogen removal; Hydrocarbon degradation; Amine degradation; Protein degradation	Nitrification: Oxidize ammonia-N to nitrite, Hydrocarbon degradation	<i>Clostridium butyricum</i>	E. coli inhibition; Complex organics degradation	Antibiotics produced inhibit pathogens , LCFA degradation	<i>Clostridium sartagoforme</i>	Organic Nitrogen removal; Complex organics degradation	Chitin degradation, LCFA degradation	<i>Desulfovibrio vulgaris</i>	Sulfur reducing; Toxic heavy metal removal	Reducing sulfate to sulfide; Converting heavy metal to insoluble matter	<i>Desulfobrio aminophilus</i>	Sulfate reducing; Degradation of amino acid	Reducing sulfate to sulfide; Converting heavy metal to insoluble matter	<i>Geobacter lovleyi</i>	Benzene-,toluene- or xylene- (BTX) degrading; Heavy metal removal	Benzene Oxidation; Heavy metal oxidation	<i>Methanomethylorans hollandica</i>	Sulfur reducing; Odor control	Utilization of dimethyl sulfide (DMS); Methylamines degradation	<i>Methanosarcina barkeri</i>	Nitrate reduction; Nitrogen fixation; Odor control	Nitrogen-assimilating enzymes, denitrificationMethylamines degradation	<i>Pseudomonas citronellolis</i>	Ammonia removal; Phosphorous removal, complex organics degradation	Nitrate reducing, Accumulating poly -P, Hydrocarbon degradation	<i>Rhodopseudomonas palustris</i>	Phosphorous removal; Odor control; Hydrocarbon degradation	Accumulation of poly-P; Degradation of LCFA, cellulose	<i>Wolinella succinogenes</i>	Sulfur reducing; Odor control; Removalof toxic organics	Oxidizes sulfide; Nitrate reduction; Oxidase benzidine
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A3	Question	:	Why is MICROBE-LIFT® IND so special?
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	Answer	:	<p>MICROBE-LIFT® IND contains over several hundred types of bacteria strains. As yet, no other company has been able to duplicate the MICROBE-LIFT® IND proprietary formulation. It is the manner in which the bacteria are grown. The difference between MICROBE-LIFT® IND and other bacteria water treatment products is that MICROBE-LIFT® IND is not made through the typical process. Once combined in the package the bacteria begin to grow and react synergistically to one other. They go through millions of reactions and pathways that produce a unique end product, named MICROBE-LIFT® IND.</p> <p>In layman terms, MICROBE-LIFT® IND accelerates nature. MICROBE-LIFT® IND contains only organisms that are already found in the environment yet are sometimes insufficient in population to fully process the contaminants in wastewater. The bacteria in MICROBE-LIFT® IND produce the necessary enzymes to successfully and safely breakdown organic contaminants typically found in wastewater. MICROBE-LIFT® IND essentially turbo-charges nature and allows it to process and recycle waste at higher levels and safely discharge to the environment.</p> <p>MICROBE-LIFT® IND effectively controls difference odors typical of polluted water by reducing the concentration of hydrogen sulfide, which is poisonous gas associated with untreated waters in lagoons and septic tanks.</p>
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A4	Question	:	What is the shelf-life of MICROBE-LIFT® products?						
	Answer	:	<p>Most MICROBE-LIFT® products have a 5 years shelf-life in unopened packing except MICROBE-LIFT® N1 which has 12 to 18 months shelf-life. Once opened, the product should be used within 6 months.</p> <p>Our packing come in standard marking of two or three years as most user use up the product within two or three years.</p>						
A5	Question	:	Can MICROBE-LIFT® IND cause harm to humans or animals?						
	Answer	:	No! MICROBE-LIFT® IND is approved by the USDA for use in beef and poultry processing plants. The product is non-toxic and non-pathogenic.						
A6	Question	:	What are the various bacteria count in MICROBE-LIFT® IND?						
	Answer	:	<p>The specs for the product are –</p> <table style="margin-left: 40px;"> <tr> <td>Aerobic heterotrophs</td> <td>- 1 x 10⁶ CFU/ml</td> </tr> <tr> <td>Anaerobes</td> <td>- 1 x 10⁶ CFU/ml</td> </tr> <tr> <td>Photosynthetic</td> <td>- 1 x 10⁶ CFU/ml</td> </tr> </table> <p>Note: We generally exceed spec by 5 to 10X.</p>	Aerobic heterotrophs	- 1 x 10 ⁶ CFU/ml	Anaerobes	- 1 x 10 ⁶ CFU/ml	Photosynthetic	- 1 x 10 ⁶ CFU/ml
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A7	Question	:	Is the organism spores type, and if not how do they remain dormant without dying?						
	Answer	:	<p>MICROBE-LIFT® IND generate hydrogen sulfide which gives the product its distinctive odor is in the product for two reasons:</p> <ol style="list-style-type: none"> 1. To provide the sulfide oxidizing organisms with an energy source; and, 2. Since hydrogen sulfide is a metabolic inhibitor it slows down the metabolism of the organisms, putting them in a state of “hibernation” until the product is added to the water at which time the hydrogen sulfide is diluted out and/or flashes off into the atmosphere. It’s like a patient being taken off of anesthesia - the bugs wake up and become active almost immediately. 						

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A8	Question	:	Some customers are afraid of the hydrogen sulfide toxicity in MICROBE-LIFT® IND. Do you know what's the level of hydrogen sulfide in the products and what's level is consider toxic?
	Answer	:	<p>When the bottle of product is being open the bottle will release about 1-4 ppm of hydrogen sulfide that will dissipate with air in matters of second.</p> <p>As for the toxicity of hydrogen sulfide, here is the information I found:</p> <ul style="list-style-type: none"> • 0.0047 ppm is the recognition threshold, the concentration at which 50% of humans can detect the characteristic odor of hydrogen sulfide, normally described as resembling “a rotten egg”. • Less than 10 ppm has an exposure limit of 8 hours per day. • 10–20 ppm is the borderline concentration for eye irritation. • 50–100 ppm leads to eye damage. • At 150–250 ppm the olfactory nerve is paralyzed after a few inhalations, and the sense of smell disappears, often together with awareness of danger, • 320–530 ppm leads to pulmonary edema with the possibility of death. • 530–1000 ppm causes strong stimulation of the central nervous system and rapid breathing, leading to loss of breathing; • 800 ppm is the lethal concentration for 50% of humans for 5 minutes exposure (LC50). • Concentrations over 1000 ppm cause immediate collapse with loss of breathing, even after inhalation of a single breath.
A9	Question	:	Does MICROBE-LIFT® IND contains gram negative or positive bacteria?
	Answer	:	The MICROBE-LIFT® IND contains mostly gram negative bacteria because they are the best organic degraders. There are a few gram (+) organisms as well.

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A10	Question	:	<p>Some bottles of MICROBE-LIFT® IND were found bloated. Is the product still useable?</p>
	Answer	:	<ul style="list-style-type: none"> • The most logical explanation for the bloated bottles is Boyle's Ideal Gas Law, $PV = nRT$, which states that pressure in a sealed container will increase with increasing temperature since V, n and R are constants. If I take a container of milk out of the refrigerator and let it warm up 5 oF. it will become bloated with no changes in the milk. There may also be some gas generation, like H₂S, at the higher temperatures as the higher temperatures counteract some of the inhibitory effects of the H₂S and there is some additional activity. <p>I do not think there is any problem at all with using the product.</p>
A11	Question	:	<p>What is the BOD concentration of MICROBE-LIFT® IND ?</p>
	Answer	:	<p>450 mg/l</p>
A12	Question	:	<p>We received complaint from our customers on MICROBE-LIFT® IND:</p> <ol style="list-style-type: none"> 1. Color change: The color changed from pink - dark pink to clear 2. Volume change: the consistency of volume level, some gallons has the level to up neck. <p>Our QC manager has investigated this lot and reported that the color is really changed to clear liquid when compare with the previous lot (red to purple). We also found the erosion of bio film on the wall dropped off the bottom of gallon.</p>
	Answer	:	<p>1: Color Change</p> <p>First of all, there is no specification for color since there is no direct correlation between color and performance. It is not paint. The product is a living thing and the color is caused by the pigment from photosynthetic bacteria.</p> <p>The color is an important indicator of the progression of growth in the fermentation process. However, the photosynthetic growth is only the first stage of the process. The photosynthetic bacteria need the pigment when they are actively growing. When they go dormant they do not need and will not expend the energy to express the pigment. Since these pigments are organic in nature, they can be utilized as a substrate to sustain the maintenance energy requirements during the dormant phase, which is low, but is still required during a long storage period.</p> <p>Would it be nice if the color were consistent and stable? Of course. However, it is part of a dynamic system, not a static system. As a result, we will have these variations, and, as I mentioned earlier, does not directly correlate with performance. The clear liquid does not in any way imply there is no photosynthetic bacteria.</p>

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	Answer	: There are also cases where the purple colored biofilm drop off from the inner side of the bottle wall to the bottom of the bottle. The bottle then appeared clear giving an impression the liquid is clear. If you compare a darker bottle where the biofilm is still intact, there is actually no difference to the liquid color. 2. Volume Change The air space inside the bottle varies due to different uptake of oxygen amount and release of other gases from the bacteria growth. The air volume difference compressed or expand the bottle slightly. The actual volume of liquid is the same for different bottle but will not appear at same level for different bottle.
A13	Question	: MICROBE-LIFT® N1 specification specified product is pinkish in color. I received one batch of product that is only 4 months old. The product is clear without pinkish color. Is the product still good?
	Answer	: The red color comes from iron dependent cytochrome systems used in metabolism. When the organism is not actively metabolizing, it does not need these cytochromes, so it does not maintain them nor synthesize more of them until they are needed. As the cell sacrifices them for an energy source to satisfy cell maintenance energy, the color dissipates. It does not mean that the nitrifiers are no longer alive. We used to add some pink coloring to the product so the product looked pinkish. However, the color disappeared after some time. We have stop adding the pink color now.
A14	Question	: Why is there dark residue in container?
	Answer	: The residue is bacterial cells that attach to the walls and form films. Over time these films fall off the wall and aggregate to form this residue. They are darkly pigmented since the bacteria that tend to grow on the walls are the photosynthetic organisms, which have the most pigmentation. They grow there because that is where the light is strongest.
A15	Question	: You can help to sort the bacteria group according to the livelihood of the products of MICROBE-LIFT® IND as classified group of aerobic anaerobic and photosynthesis.

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Answer	:		
		Bacterial Species	Classification
		Anaerobacter polyendosporus	Anaerobic
		Bacillus amyloliquefaciens	Aerobic
		Bacillus licheniformis	Aerobic
		Bacillus subtilis	Aerobic
		Clostridium butyricum	Anaerobic
		Desulfovibrio aminophilus	Anaerobic
		Desulfovibrio vulgaris	Anaerobic
		Pleomorphomonas oryzae	Aerobic
		Pseudomonas citronellolis	Facultative aerobic
		Methanomethylovorans hollandica	Anaerobic
		Rhodopseudomonas palustris	Facultative aerobic
		Wolinella succinogenes	Anaerobic

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B) HOW MICROBE-LIFT® PRODUCTS WORKS

B1	Question	:	Will MICROBE-LIFT® IND be effective only when it is added to a stagnant and full septic tanks, or also if MICROBE-LIFT® IND is added into the tank while the waste liquid is being filled up gradually?
	Answer	:	The bacteria can be added as the wastewater is being filled up in the tank. In this manner the bacteria will have a jump-start on the treatment by increasing retention time and should stabilize the wastewater quickly.
B2	Question	:	What happens to the bacteria after they have performed their functions in reducing compounds and substrates, and then die off?
	Answer	:	When the bacteria die, their remains are basically made of carbon. This carbon then gets digested by the living bacteria and converted back to CO ₂ and flushed off into the atmosphere. Any purification process can easily handle any cellular residue from dead bacteria.
B3	Question	:	If retention time of the wastewater is short the bacteria will have less time to grow before they are flushed out. So, if you add up the dosage, i.e. adding in more bacteria how will that help?
	Answer	:	The bacteria work immediately. It is necessary to have a certain minimum population in the system at all times in order for the bacteria function to be effective. It is necessary to add MICROBE-LIFT® IND to the wastewater more frequently to short retention systems so that we can guarantee a certain minimum population in the system at all times. Adding good quality biomedica will be of great help for system with very low hydraulic retention time.
B4	Question	:	How do I apply the MICROBE-LIFT® IND?
	Answer	:	Apply directly to the lagoon or to the wastewater biological treatment tanks. If the lagoon or tank has a problem with solids buildup the product should be applied as far away from the pumping station as possible. When MICROBE-LIFT® IND is added to a contaminated solution, the bacteria which remain in the adult state after manufacture, immediately revive themselves and begin to feed, reproduce and attack the organic wastes in the water.

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B5	Question	:	If the bacteria could multiply, then what is the necessity to continue adding MICROBE-LIFT® IND to a lagoon or to a large septic tank, etc on a periodic basis?
	Answer	:	<p>The addition of bacteria is to maintain an optimal (mix) of strains to combat all substrates. Depending on the particular compounds in the waste, the bacteria will produce the necessary enzymes to break them down, process them and recycle them safely to the environment. The problem is that wastewater tends to be very inconsistent in its makeup.</p> <p>When a certain substrate is not present in the wastewater for over 18 hours, the bacteria that produce the enzymes specific to that compound will begin to die. However, compounds/substrates can reappear in the waste components may not be sufficiently present and the waste will go undigested until the bacteria population rebuilds itself, which could take a few days.</p> <p>Hence, it is always recommended to maintain a small regular maintenance dosing as recommended.</p> <p>The best gauge is to use visual judgment to ascertain how frequent and how much dosage should be added. Biological treatment always involves trial-and-error.</p>
B6	Question	:	When the bacteria had cleaned up (digest) the residues in the solution, will it die immediately or will they continue to survive for a few more hours? days? weeks?
	Answer	:	In the absence of food i.e. compounds or substrates, the bacteria will go into endogenous respiration stage where they will begin to use their stored energy. This will last for about 18 hours. After 18 hours, the population will begin to die if no food is present.
B7	Question	:	What is the temperature range that MICROBE-LIFT® IND bacteria will be most effective?
	Answer	:	<p>MICROBE-LIFT® IND bacteria multiply faster in warmer waters, so application of MICROBE-LIFT® IND in tropical climate is ideal.</p> <p>The adequate temperature range will be 5°C to 45°C.</p> <p>Ideal temperature is 30°C to 40°C. The bacteria growth rate reduced to 50% at 20°C and 25% 10°C. Growth will come to practical standstill at 5oC and below.</p> <p>If the temperature limit of 40°C is exceeded, say 45°C, some bacteria will die in the short term, but will be regenerated very quickly. It is not a concern.</p>

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B8	Question	:	What happens if the pH will be lower then 4 or higher then 9?
	Answer	:	<p>First, 95% of all wastewaters amenable to biological treatment fall into this range (4 to 9). Microbelift will function reasonably well down to a pH around 3.5 and up to around 10.5. Outside of these ranges there may be some activity observed but efficiency will be reduced as the acidic and alkaline environments have adverse effects on the function of most enzymes and can denature or destroy certain other cellular components.</p> <p>Ideal pH should be 5 to 8.5. It is the consistency of same pH level that is important rather than the pH range. Nitrification also required pH above 7 .</p>
B9	Question	:	What Fertilizer effect does MICROBE-LIFT® IND have?
	Answer	:	<p>MICROBE-LIFT® IND substantially dissolves organic solids to a liquid form to facilitate and reduce the frequency of pump out required. The liquid then has a higher value of N, P & K and can be used as fertilizer. Odors and insects will be either reduced drastically or eliminated in the treated area.</p>
B10	Question	:	How does MICROBE-LIFT® IND bacteria tolerate salinity?
	Answer	:	<p>The Microbelift can tolerate up to 4% salinity (40PPT or 40,000PPM). Between 3% and 4% there is some slowing in activity.</p>
B11	Question	:	I have a sugar manufacturing plant waste with 7% TDS, can MICROBE-LIFT® IND works in such high TDS?
	Answer	:	<p>Some of this depends on whether the TDS comprises salts, or sugars. If the TDS comprises primarily salts, the product might be inhibited by 4% to 11% TDS, so you would be right in the middle of that range. However, if it is primarily sugars that make up the TDS, then the bacteria will usually tolerate TDS levels well above the 7%. Since it is a sugar mill, I would say that there is a good chance that the TDS is primarily sugars and that the product will function just fine.</p>
B12	Question	:	How will I know that the MICROBE-LIFT® IND is working after I apply it?
	Answer	:	<p>A gray covering on the water will form, and bubbles and foam may appear. Floating pieces of solids may appear. Odor elimination within few hours of application is the first indication the bacteria is working. However, odors may increase after few days when the bacteria begin to degrade the harden solids accumulated inside the system as the production of gases increases from dissolved solids.</p>

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B13	Question	:	In the event if the treatment plant uses its own cultivated-microbes, how would MICROBE-LIFT® IND bacteria co-exist with bacteria cultivated naturally by the plant itself, or will MICROBE-LIFT® IND bacteria demolish those bacteria cultivated independently?
	Answer	:	The bacteria already in the plant will have some common organisms as the MICROBE-LIFT® IND. MICROBE-LIFT® IND will work with and augment the good organisms and digest the ineffective organisms. It's a "win-win" situation since only the strongest organisms survive which are the ones that can effectively treat the waste. The ones that do not survive are ineffective anyway.
B14	Question	:	The unique MICROBE-LIFT® IND water treatment product contains bacteria that are applicable to many types of wastewater influents. Will it not be better to develop specific bacteria groups that will treat specific waste-water influents from different and separate industry types? In other words, choose your bacteria for each particular application.
	Answer	:	<p>The consortium interconnecting pathways occur at the same time within the ecosystems environments resulting in improvement in aerobic, anaerobic and anoxic function representing the driving force in ecosystem restoration.</p> <p>Ecosystem enhancement requires the reduction of multiple target substrates, in various temperatures and pH, these factors often limit natural biological processes.</p> <p>These combined processes contribute to ecosystem recovery by reducing organic matter, assuring nitrification, denitrification, hydrogen sulfide reduction and bio control of pathogens.</p> <p>Although not all bacteria strain will be utilized in any system, there may be required in another time as environment and waste composition changes. You will require an experience microbiologist at site full time to check and decide which strain of bacteria to use. There will be too many product types to stock. It is very complex and not economical.</p>
B15	Question	:	Will MICROBE-LIFT® IND bacteria perform well in a chlorinated waste solution?
	Answer	:	<p>Chlorine is relatively unstable and gases off quickly.</p> <p>For disinfectant purposes, a 2 mg/L (ppm) chlorine residual is usually required.</p> <p>In general, there is no need to worry about chlorine content in normal applications.</p>

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B16	Question	:	<p>Please comment on Augmentation Chemistry vs. Stoichiometric Chemistry.</p>
	Answer	:	<p>Many engineers and operators are accustomed to having precise application information when using chemical products in chemical process systems. This is usually not the case with biological systems and biological products like MICROBE-LIFT® IND.</p> <p>The reason for this is quite simple. Chemicals are non-living things and act in predictable stoichiometric ratios used on molecule for molecule interactions. A good example is pH which is the measure of [H⁺] ions or [OH⁻] radicals in solution. To neutralize a solution which is either too acidic or too alkaline requires the addition of the reciprocal ions or radicals which combine in a direct one to one ratio to form water. For example, if a solution of hydrochloric acid, HCl, is added to an alkaline solution of sodium hydroxide, NaOH, the [H⁺] ions and [OH⁻] radicals will react to form water with the residual ions to form salt (NaCl) in a predictable, quantifiable reaction.</p> <p>In biological systems, the dynamics are biochemical as opposed to chemical, and the active agents are living entities. Where one would have to increase the quantity of chemical proportionally to deal with a higher load of reactant, in a biological system the biological additive can grow to help compensate for increased loadings. While small increases in dosage may be required with increased loading, proportional increases are not required. The organisms in MICROBE-LIFT® IND grow in response to higher loads, so that the benefit is multiplied which makes biological additives much more cost effective than chemical additives. It also makes for dosage programs that do not seem to properly compensate for loading changes, as MICROBE-LIFT® IND has an inherent ability to adjust to loading changes.</p> <p>Bio-augmentation dosage problems typically follow a descending application schedule to accommodate that fact that the benefits of the addition are multiplied. These programs usually involve a “purge” or “inoculation” dosage to establish the required MICROBE-LIFT® IND population quickly.</p> <p>The “purge” or “inoculation” is followed by an intermediate maintenance dosage to support the development of the required population. Finally, a regular maintenance addition is used to maintain the required population to maintain the biochemical improvements, which have been realized through the “inoculum” and “intermediate maintenance” dosages.</p>

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Answer	:	<p>On occasion, when a biological system experiences shock loads, either hydraulic or organic, it may be necessary to return to the “intermediate maintenance” dosages for a week or two to fortify and stabilize the MICROBE-LIFT® IND population.</p> <p>We have a comprehensive program of application schedules for every application of MICROBE-LIFT® IND : grease traps, septic tanks and industrial biological waste-water treatment systems etc. While they vary in size and level of technology, they are all biological systems that can benefit from the unique ecosystem in MICROBE-LIFT® IND.</p> <p>From a chemical standpoint, enzymes are proteins and not living, hence they do not reproduce. All breakdown of waste, which bacteria mediate, is done through the activity of numerous enzymes that they produce. Enzymes can help “jump start”, a biological system, but the overall benefits are limited, since it takes many enzymes to completely breakdown waste. Usually the enzymes wash out or are destroyed and have to be added in relatively large doses to provide an ongoing benefit.</p> <p>Bacterial Additives – Since these products are in some ways “Intangibles” and a lot of inferior products are on the market, these additives have developed a dubious reputation. Many products available from respected manufacturers represent significant advances in biotechnology. Unfortunately, they suffer from guilt by association with the less reputable manufacturers. While larger companies produce some of the better known brands, one commonly used dry product in particular from a large consumer products company is nothing more than sodium chloride, better known as table salt.</p> <p>A good biological additive for a septic tank should have a broad spectrum of aerobic, facultative, and anaerobic bacteria to provide the maximum benefit. Many products contain strictly aerobic bacteria and therefore, offer limited benefit. A healthy bacterial population will produce the full complement of enzymes required for the complete digestion of the waste and eliminate the need for supplementary enzyme addition. This will often involve more than fifty enzymes being produced by the microbial consortia. The advantage of bacterial additives is that they will multiply in the system and reduce the maintenance addition to once every few weeks or even months for the better products.</p> <p>Often times, these bacterial products are derisively referred to as “superbugs” but in a way, they actually are when compared to the</p>
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Answer	:	<p>capabilities of most populations. This would be like calling many of the new biotech pharmaceuticals that represent significant advances in technology, “superbugs”, when they are in fact addressing illness that were previously untreatable.</p> <p>Many people are advised to add yeast to a septic tank to aid in the function of the tank. While yeast can grow in the tank, they have relatively limited metabolic capabilities and are best at breaking down simple compounds like sugars and certain starches. These compounds rarely present a problem in septic systems.</p> <p>The septic system is a biological process. Like any living thing, it has certain nutritional requirements to function properly and functions best in a suitable environment. There is a scientific basis for many of the additives, although some require vigilant monitoring and addition. However, the best first step.</p> <p>While many trade organizations, consumer groups, and state agencies lambaste biological additives, they refute their claims with little or no evidence, often citing decades old studies performed before many of the newer, more effective products were introduced. They also fail to acknowledge the results that have been obtained in well-documented field studies with biological additives.</p> <p>In Summary</p> <p>When considering the addition of a bacterial additive, look for several things. First, find a product which has the full complement of organisms needed for efficient septic tank operation including aerobes, facultative anaerobes and anaerobes. Second, pick a product from a company, which has been in business and has a track record of successful application of their product and not just a company, which has a lot of marketing dollars to throw into advertising. Third, use a product that is available through septic tank professionals who are the real “experts” when it comes to your septic system. Fourth, read the ingredients! Last, consider the source when you begin reading information. Determine if the provided of the information has their own agenda.</p>
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B17	Question	:	<p>What are the benefits of applying MICROBE-LIFT® IND versus chemicals?</p>
			<p>Every application is different. In general, so long as the objective is to remove organic constituents, biological treatment is the most effective and most economical. Biologically, we can usually get BOD down to 1 or 2 parts per million with a successful treatment, yet certain applications require further reduction down to parts per billion levels. For this extreme reduction, chemical treatment would be necessary. For instance, biological treatment will never yield potable water. This must be achieved with chemical treatments like ozone and chlorine.</p> <p>Most applications consist of a primary, secondary and tertiary treatment. The primary being mostly physical like filtration settling, etc. The secondary is typically a biological treatment to organics. The tertiary treatment is a final, polishing and clarification treatment. It is typical that the tertiary treatment would incorporate some chemicals like polymers to aid in flocculation.</p> <p>In certain applications where there are no organics, it is appropriate to only use chemical treatment. For instance, a metal plating factory has only metals in the water. Bacteria will do nothing and a hydroxide must be used to chemically interact with the metal compounds and flocculate out.</p> <p>Activated carbon is a typical chemical treatment for final polishing of water. Polymers are used to further flocculate and settle colloidal solids. In certain applications in the past, the use of MICROBE-LIFT® IND has allowed customers to significantly reduce the amount of polymers being used in the final treatment without effecting solids settling characteristics. This will net a huge costs savings to the customer.</p>
	Answer	:	<p>In general, most applications should incorporate a biological treatment. This treatment is usually good in most applications for discharge to the sewers or rivers. In most applications, chemicals can be used as polishers in the tertiary treatment. Chemical only treatments are only applicable in waters that have no organics, a situation which is very rare.</p>
B18	Question	:	<p>Can we stop the maintenance dosage if there is no new inflow of wastewater?</p>
	Answer	:	<p>Yes, the maintenance dosage can be stopped as long as there is no new inflow of wastewater at all.</p>

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B19	Question	:	<p>Typically, what is retention time required for MICROBE-LIFT® IND? Can we calculate retention time according to the tank size and the rate of inflow, for instance, if the tank size is 10 m³ and the wastewater inflow is 1 m³ per day, can we consider the retention time is equivalent to 10 days?</p>
	Answer	:	<p>The ideal retention time for MICROBE-LIFT® IND is 7 days minimum, and depending on the nature and quantity of substrates.</p> <p>Mathematically, that would seem correct if the tank was empty to begin with. However, realistically it may not be the case. It is always advised that when there is outflow, MICROBE-LIFT® IND should always be added to the bottom on the tank. Still, a percentage of bacteria population will float to the top of the tank and flow out continuously. In that sense, the tank will have a retention time of less than 10 days.</p> <p>When there are more substrates at the top of the tank for the bacteria to concentrate on degrading, then there will more outflow of bacteria as well. Therefore, maintenance dosage in this case is definitely required.</p> <p>For system with biomedica, bulk of the bacteria population stay on the biomedica.</p> <p>For activated sludge system, the bacteria are retained via return activated sludge (RAS).</p>
B20	Question	:	<p>Can we stop the aeration after using MICROBE-LIFT® IND, since MICROBE-LIFT® IND has a lot of anaerobic bacteria?</p>
	Answer	:	<p>Yes, aeration can be stopped. However, degradation will be much faster if there is aeration. In addition, the aerobic bacteria will not work efficiently or at all. And when the oxygen level is down to a level that does not sustain the aerobic bacteria population, these bacteria will die.</p> <p>It is advisable to maintain some level of aeration, e.g. for half hour every 2 hours. This way, the electricity costs will still be reduced by 75%.</p> <p>It is advisable to compare the expected cost saving verse electricity cost from trial-and-error to obtain the most optimum operation.</p>
B21	Question	:	<p>How does the Sun and weather effect the process?</p>

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	Answer	:	If the aeration basins are open i.e. not covered and there is abundant sunlight, then the system will derive more benefit from the photosynthetic bacteria.
B22	Question	:	What is the ideal HRT for municipal sewerage treatment?
	Answer	:	<p>Without a System Survey Form to know the loading, clarifier capacity (which dictates solids handling capacity), aeration capacity, etc. this is hard to say.</p> <p>In general, with a typical domestic sewage (BOD = 175 - 250) a 98% removal efficiency can usually be achieved in < 12 hrs. However, if there is industrial contribution there may be compounds that add disproportionately to the strength of the waste and may also not be as readily biodegradable. In almost any case we can accelerate the process kinetics allowing the system to do more with almost any type of waste.</p>
B23	Question	:	From your experience, what is the typical the amount of sludge we are able to reduce in most wastewater treatment system?
	Answer	:	<p>There are two ways in which we can alleviate the cost and other logistical issues involved with sludge handling. First, we lower the yield coefficient which results in less sludge produced in the process. This is somewhat specific from plant to plant depending on design parameters, etc. In most cases we have been able to reduce sludge generation from 25 - 40% with a best case of close to 70%.</p> <p>The second way we can reduce sludge handling costs and logistical issues is to improve the efficiency of digestors. Whether you can take digestors out of service depends on how the digestors are designed e.g. if there are numerous small digestors or one or two very large digestors. If there are six or eight small digestors it may be possible to take one or two out of service. If there are two big ones it may not be able to reduce the demand enough to take one (half the capacity) out of service.</p>
B24	Question	:	How does the existence of heavy metal effect the biological process?
	Answer	:	Most heavy metals can be inhibitory or toxic at some level but that varies from metal to metal. Many of the heavy metals found in Industrial processes, like zinc or lead, have little or no effect on the bacteria at concentrations below 20 mg/L. Only a few, like hexavalent chromium, are inhibitory or toxic at low concentrations. In my experience the biomass in most biological systems can function well at levels well above what is reported to be inhibitory in the available literature.

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Threshold concentrations of pollutants inhibitory to activated sludge from available literature are as follows:-

Pollutants	Concentration (mg/L)	
	BOD Removal	Nitrification
Aluminum	15 to 28	-
Ammonia	480	-
Arsenic	0.1	-
Borate (Boron)	0.05 to 100	-
Cadmium	10 to 100	-
Calcium	2500	-
Chromium(hexavalent)	1 to 10	0.25
Chromium (trivalent)	50	-
Copper	1.0	0.005 to 0.5
Cyanide	0.1 to 5.0	0.34
Iron	1000	-
Lead	0.1	0.5
Manganese	10	-
Magnesium	-*	50
Mercury	0.1 to 5.0	-
Nickel	1.0 to 2.5	500
Silver	5	-
Sulfate	-	500
Zinc	0.08 to 10	0.08 to 0.5
Phenols:	-	-
Phenol	200	4 to 10
Cresol	-	4 to 10
2-4 Dinitrophenol	-	150

* Insufficient data

B25 Question

: The pilot river treatment proposal by Cinotech has only one and half hour retention time and Cinotech intend to introduce lots of biomedica into the river to circumvent the extreme short retention time. How can this work?

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	Answer	:	<p>In trickling filters the HRT is often less than one hour yet removals of 85 – 90% are regularly achieved with sewage (BODs around 200 mg/L) due to the amount of biofilm.</p> <p>It may take a few weeks to develop an adequate biofilm, but I am confident that it will be possible to achieve 80%+ organic removal with the correct surface area even with a two hour retention time in Zone 1 and thirty minute retention time in Zone 2. During low temperatures operating periods (below 4 degrees C) it may be harder to achieve 80% reduction but 60% should be possible. Remember that we are not shooting for potable water quality.</p>
B26	Question	:	Regarding odor measurement, Is there a more technical way to measure odor beside simple human nose?
	Answer	:	<p>Depending on the chemicals causing the odors there are some quantitative means of measuring them. For example, there are hydrogen sulfide sensors that will monitor ambient hydrogen sulfide levels. Hydrogen sulfide and certain other compounds, like mercaptans, can also be measured in solution and then the partial pressures calculated for different temperatures and atmospheric pressures to estimate the relative amount of chemical in the air at those concentrations. The same can be done with other putrefacting agents like butyric acid, skatole, etc.</p> <p>Odor mitigation and elimination has been one area where we have succeeded 98% of the time.</p>
B27	Question	:	Which MICROBE-LIFT® product is suitable for the treatment of epichlorhydrin and Chloralkali waste?
	Answer	:	<p>MICROBE-LIFT® IND is suitable for the epichlorhydrin waste but chloralkali waste is not organic and requires some form of physical/chemical treatment. However, I am confident that we can substantially reduce the BOD, but likely to reduce to <20ppm.</p>
B28	Question	:	What is the difference between (Bacillus, Enzyme, aerobic) Products and MICROBE-LIFT® IND?

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	Answer	<p>:</p> <p>The main difference between the MICROBE-LIFT® IND and other bacterial and enzyme products is that the MICROBE-LIFT® IND contains a broader spectrum of vegetative cells, i.e. cells that are viable, active cells whose activity is suppressed by the hydrogen sulfide in the product that acts as a metabolic inhibitor for the bacteria allowing them to survive in a bottle for two years. In much the same way an anesthetic puts a patient asleep for surgery, the hydrogen sulfide puts the bacteria into a type of anaesthetized state. It is still alive, but its metabolic rate is slowed down to almost nothing. Once the hydrogen sulfide flashes off and dilutes into the water, the bacteria "wake up" and become active again within minutes. Using this technology allows us to utilize many organisms that could not readily be preserved, limiting the genus and species from which selections could be made relative to metabolic capabilities.</p> <p>Bacillus species are used in many products because they form spores that will maintain viability under storage for long periods of time. A spore is like a seed for a plant. It can resist dry conditions, heat, and many other conditions that would adversely affect an organism. Once the spore is introduced into an environment suitable for growth, it germinates into a vegetative cell. This process may take several hours so it takes longer to see results from these products. The main limitation to spore-based products is they limit you to Bacillus and Clostridia genera. The Bacillus are primarily aerobic while Clostridia are anaerobic.</p> <p>Enzymes provide limited benefit since they are very specific in nature. They can help accelerate one rate limiting step, for example the use of a lipase to accelerate the solubilization of fats so they can be degraded faster. However, while the enzymes are catalysts that can catalyze reactions over and over, they are also protein molecules that are subject to chemical and biological breakdown, so their benefit is short lived. Also, since they are not living things, they do not reproduce like bacteria.</p> <p>Another factor that makes bacteria superior is that they are enzyme factories and will produce the wide array of enzymes required to catalyze many different biochemical reactions.</p>
B29	Question	<p>:</p> <p>Can MICROBE-LIFT® IND break benzene ring? If yes, how does it work?</p>
		<p>Yes, MICROBE-LIFT® IND can cleave benzene ring through the activity of dioxygenase enzymes certain organisms in the product synthesize. Once the ring is open, it is like breaking down a straight chain compound. This is fairly easy to demonstrate. This is the same enzyme that plays a key role in the ring opening of phenol and other substituted aromatic rings as well. These pathways are documented and can be verified easily.</p>

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C) APPLICATION OF MICROBE-LIFT®

C1	Question	: What are the proven successes of MICROBE-LIFT® IND in waste-water management for industries, institutions, and households?
	Answer	: MICROBE-LIFT® has been very successful in treating the following industries and wastes: Chemical Waste: Phenols, alcohols, straight chain alkanes and aromatic compounds Septic Tanks Grease Traps: Hotels and Restaurants Fish & Shrimp Farms: Decrease mortality, better crop yield Slaughterhouses Animal Farms Decorative Ponds: Koi Fish, reduce filter size and eliminate the need for constant filter cleaning. Degrade sludge on rocks and bottom surface. Eliminate the need to physical cleaning. Pharmaceuticals: Phenols, ammonia, hydrogen sulfide, oils and greases Refinery Waste: Phenols, ammonia, hydrogen sulfide, oils and greases Steel Manufacturing: Phenols. Cyanide, thiocyanate, ammonia and rolling oils Tanneries: Vegetable tanning waste Textile: Surfactants, starches and organic dyes used in textile mills Wine/Alcohols: Sugars, tannins and alcohols Beverages: Liquid sugars, high fructose corn syrup and flavorings. Dairy: Fats and whey Confectionery: Sugar waste and chemicals Halogenated Aromatics: Chloro and di-chloro phenol Detergent: Surfactants and other components of detergents Fish Farms: Organic components of fish wastes and fish food Food Processing: Reduction of BOD and odors Petrochemicals: Petroleum hydrocarbons, straight and branched alkanes, BTX Paper/Cellulose: BOD reduction and odor control Because MICROBE-LIFT® IND is so easy to use, it is an ideal application in markets and industries that do not have unlimited resources available to treat their wastewater. Since MICROBE-LIFT® IND is a live bacteria, it grows very quickly and can therefore be used in small quantities. Requirements for successful treatment with MICROBE-LIFT® IND are also minimal and include a tank or lagoon system to provide minimal retention time (min 3 hours), adequate pH between 4 & 9, and adequate temperature level of between 5°C and 40°C.

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		<p>MICROBE-LIFT® IND has also provided many customers huge savings in their waste processing by reducing the production of sludge which is very costly to handle and dispose.</p> <p>Another extremely interesting market for MICROBE-LIFT® IND is Aqua Culture. When added to fish and shrimp ponds, MICROBE-LIFT® IND improves the environment of the pond so significantly that we have shown significant reductions in mortality as well as increases in populations and final harvest weights.</p> <p>Biological treatment and MICROBE-LIFT® IND specially are the most economical wastewater treatments available today. Most of the world's public water has become undrinkable, and unless something is done now to restore the environment and curb pollution, the future will be very challenged in terms of meeting the world's water demands.</p>
C2	Question	: Is MICROBE-LIFT® IND bacteria actively effective on refinery wastes?
	Answer	<p>: MICROBE-LIFT® IND has excellent results in treating refinery wastes and degrading the hydrocarbons and phenols which contribute to BOD. Sludge and solids will be reduced. Other odors will be eliminated. BOD and suspended solids will be reduced.</p> <p>Furthermore, MICROBE-LIFT® IND converts the corrosive H₂S to non corrosive elemental sulfur. Therefore MICROBE-LIFT® IND will prevent corrosive at the bottom of the tank.</p>
C3	Question	: Will MICROBE-LIFT® IND bacteria activate themselves in salty sea water?
	Answer	<p>: No. Any solution that exceeds 4% in salt content will inhibit bacteria activity.</p> <p>Likewise, the pH of the water should be between 4 to 9, for MICROBE-LIFT® IND to function efficiency and correctly. If pH level is below 4, the bacteria will still work but will lose a lot of activity and effectiveness.</p>
C4	Question	: Can MICROBE-LIFT® IND works in household fish aquarium?

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	Answer	:	<p>For fish tank aquarium, we recommend 30ml MICROBE-LIFT® IND per 20 gallons of water as the initial dose. (400 ppm) For a tank size that holds around 200 litres of water, the dosage should be as follows:</p> <p>Day 1: 60 mg (300 ppm) Next 4 weeks: 40 ml per week (200 ppm) Next 4 weeks: 20 ml per week (100 ppm)</p> <p>It will take at least 10 days to see results. With proper application, MICROBE-LIFT® IND will keep the tank water clean and significantly reduce the frequency of which you need to clean the tank. It works very well for undersized bio filter that clog very often.</p>
C5	Question	:	Will MICROBE-LIFT® IND be particularly effectively in wastewater with large areas of grease, fats and oils?
	Answer	:	<p>MICROBE-LIFT® IND is perfect for such applications because a part of its bacteria activity specialized at digesting the grease, fats and oils.</p> <p>In a lagoon system, which has a high retention time, MICROBE-LIFT® IND will be the perfect water treatment product.</p>
C6	Question	:	If a pond or a large septic tank contains hardened waste materials at the bottom, can MICROBE-LIFT® IND effectively dissipate the waste materials, and then clear the bottom. In other words, can MICROBE-LIFT® IND bacteria “eat-into” the hardened wastes, then soften it, and clear it off?
	Answer	:	<p>Absolutely. It is because of this that in many pond systems, the conditions in a lagoon get worse after MICROBE-LIFT® IND is applied in the short term. MICROBE-LIFT® IND will break down solids at bottom and release them into the pond. Until these solids get digested by the bacteria, they will increase the BOD and TSS. Sometimes customers call after application and complain that the conditions are worsening. For us, this is always a good sign because it means that there is plenty of bacterial activity in the pond and that it is just a matter of time before the conditions start improving.</p> <p>The most concerning comments from customers are when they do not see any changes, for better or for worse, because this means there is no bacterial activity. Luckily, this rarely happens but when it does there is always a concrete scientific explanation for it. Usually there is something in the pond that we don't know about that is inhibiting the bacterial growth.</p>

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C7	Question	:	Will MICROBE-LIFT® IND has an effect on the thick solid covering over a lagoon?
	Answer	:	Yes! The solids will be dissolved and will eventually disappear. If the area to be treated has a thick solid covering, the initial application of MICROBE-LIFT® IND should be increased.
C8	Question	:	Should I be concerned about the purple looking covering in a lagoon?
	Answer	:	No. This is an ideal situation for MICROBE-LIFT® IND. A positive sign that purple bacteria is growing well.
C9	Question	:	After using MICROBE-LIFT® IND, are they still need to use the aeration blowers? Is digester and other equipment in any existing system that can be removed after using MICROBE-LIFT® IND?
	Answer	:	<p>This can vary from system to system. The reason is that there are two criteria for sizing the aeration equipment in a biological treatment system. The first is the oxygen demand exerted by the biomass in the aeration basins; the second is the mixing energy required to keep the mixed liquor suspended solids (MLSS) in suspension.</p> <p>In some cases it may be possible to cycle aerators off and on if the aeration equipment is sized on the basis of oxygen demand (one of the criteria mentioned earlier, the one that requires the greater aeration capacity is the governing design parameter) then it may be possible to take advantage of the fact that the photosynthetic bacteria will take some load off the aerobic heterotrophs thus allowing the system to save on the energy required to run the aerators or blowers.</p> <p>It is important to maintain enough mixing energy to keep the solids in suspension. If you don't the solids can settle out in the basins and go anaerobic causing a number of problems e.g. floating sludge as gas generated in the settled solids releases and floats sludge to the top.</p>
C10	Question	:	Please describe in a paragraph or two the effects of MICROBE-LIFT® IND in grease and phenols in petroleum production.

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	Answer	<p>: Our experience in treating waters from the petroleum industry for residual greases and phenolics is very good. Several years ago a chemical company in Canada, Chemecol, tried treating a phenolic waste that they were having trucked out at a cost of over UD\$245,000/yr. with MICROBE-LIFT® IND, they were able to treat to below sewer discharge limits and began disposing to the sewer saving almost USD\$225,000/yr. (The MICROBE-LIFT® IND Cost them about \$20K/yr.)</p> <p>The key organisms in the MICROBE-LIFT® IND for degrading the hydrocarbons are the Rhodopseudomonas and the Pseudomonas fluorescents. Hydrocarbon breakdown, particularly of straight chain (aliphatic) hydrocarbons is not that difficult for the bacteria in Microbelift. The key is the higher rate and resistance to cell loading which often causes inhibition in hydrocarbon breakdown. I will forward some lab results documenting these metabolic capabilities.</p> <p>The Pseudomonas fluorescents are also a very good phenol degrader. The key step in this reaction is the ring cleavage which is mediated by the dioxygenase enzyme produced by the P. fluorescents. Once the ring is cleaved the subsequent steps are not very difficult to carry out.</p>
C11	Question	<p>: Is MICROBE-LIFT® AlgAway toxic to plant roots and can it be applied in pond with fishes?</p>
	Answer	<p>: MICROBE-LIFT® AlgAway 60 will NOT damage aquatic plant roots. We have phytotoxicity data to support this. The toxicity threshold for aquatic plants is in the several thousand ppm range and should not even be an issue. However, in the 5 ppm range it does kill duckweed (Lemna gibba) which a lot of people want to kill.</p> <p>We are currently using MICROBE-LIFT® AlgAway 60 at La Cantera Golf Club in San Antonio, TX with excellent results. La Cantera is a high profile club and is the site if the Valero Texas Open, a PGA Tour Event, which is being played this weekend.</p> <p>The MICROBE-LIFT® AlgAway 60 has rarely failed on filamentous or mat algae. It does take a little longer to work on planktonic algae that causes the green water. There is a toxicity threshold for fish. To avoid toxicity, prepare by adding one fluid ounce (29.5 ml) in 15 fluid ounces (442.5 ml) to make up one gallon (3.78 L) of product. Apply at the rate of one gallon of the diluted mixture per 38,000 gallons (145 m³) of water. The product can be applied directly to algae floating on the top of the water with a sprayer. It will usually kill the algae within three days. This rate is closer to 2 ppm. Applying at a much higher rate can not only cause toxicity to the fish but reduce the effectiveness of the product.</p>

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			<p>The keys to avoid toxicity for fish is to dilute before addition since the material is viscous and takes a while to disperse in its concentrated form. If a fish swims through a “hot spot” and its gills get coated, it may die. The effect is not due to intoxication but due to formation of a barrier on the gills, which inhibits the transfer of oxygen through the gills so the effect is more mechanical than toxic.</p>
C12	Question	:	<p>My distributor in UAE is currently negotiating a project for dissolving oil spills into water ponds, and sand.</p> <p>The project contains the following parts.</p> <ul style="list-style-type: none"> - 3 ponds, for one million cubic meter of polluted water each. Total Three million cubic meter. - As open polluted area (25 million m2) Oil amount to 35,000 mg/L into the ponds, and 20% w/w in the sand (each one kilogram of sand contains 200 gm of oil)
	Answer	:	<p>For each of these ponds I would recommend applying 1,000 gallons of MICROBE-LIFT® FDG lipophilic surfactant, applying from a boat using a sprayer system to spray the product over the surface. I would then apply 1650 gallons of MICROBE-LIFT® IND using the same application method. Following the application of the surfactant and bacteria, I would recommend application of 2,000 lbs. of a combination of 50% diammonium phosphate and 50% urea or 2,000 lbs of a lipophilic nutrient that we can recommend.</p> <p>After two weeks, the application would be repeated with the quantities of the various agents adjusted based on condition of the ponds. Applications would be repeated monthly thereafter with quantities adjusted based on results.</p> <p>The best thing to do would be to bulldoze the contaminated sand out of the tidal zone so it is easier to manipulate and will not further pollute the water. Using a windrow machine or similar equipment, apply the lipophilic surfactant at a rate of 10 mg/L, the bacteria diluted 1:25 with water at a rate of 1 gallon/10 m³, and either the lipophilic nutrients or the combination of DAP and urea to give the appropriate C:N:P ratio. The material should be turned over weekly and, as above, the products applied again at two weeks and then at monthly intervals.</p> <p>Please contact our distributor for detail.</p>
C13	Question	:	<p>Ecological Laboratories Inc., has a product call MICROBE-LIFT® Compost. What is the retail price and how does it work on compost manufacturing?</p>

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Answer	:	<p>Composting can be done with MICROBE-LIFT® IND. Ecological Laboratories Inc., has a product called MICROBE-LIFT® COMPOST-PLUS, but MICROBE-LIFT® IND will work just as well, if not better. Therefore, no need to complicate your inventory. MICROBE-LIFT® Compost-Plus is a liquid spore product...it is quite stable, but MICROBE-LIFT® IND still has the benefit of broad spectrum of bacteria. Dosage of MICROBE-LIFT® IND can be stretched from a heavy application of 1:50 dilution in water to 1:100 on the light side. You can determine based on the Composting Method being used....and how often you will be able to re-inoculated.</p> <p>You need to know which method the client is using to compost, and what materials are being degraded.</p> <ol style="list-style-type: none"> 1. Heap Method <p>Just piling leaves and grasses. In this case, MICROBE-LIFT® IND should be sprayed on the pile as it is created, in order to get more even distribution. This is a slow method, unless the client periodically turns the pile, and if they do...you should re-spray as it is being turned.</p> 2. In Vessel Method <p>Like a Bio-Reactor, the compost is tumbled in a container, or more periodically moved from one container to another. This mixes the compost, aerates and allows for settling, and MICROBE-LIFT® IND can be applied when the compost is being moved...or agitated.</p> 3. Wind Rows Method <p>Using tractor-like machines, the compost is chopped and mixed...as the machine moves over the compost, leaving piled rows. Usually these have a sprayer attachment, which can apply MICROBE-LIFT® IND to the rows as they are being formed. The compost is usually turned periodically, allowing reaction similar to In Vessel.</p> 4. The general goal for Composting is to get the pile to Temperature (60 to 75 °C / 140 to 175 °F), which then leads to Volume Reduction as the organics degrade and gas-off, leaving the hard to degrade Carbons and Nutrients (N, P, and micros)... eventually reaching a stage of Stabilization.
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	Answer	<p>: System effectiveness is measured in three manners:</p> <ul style="list-style-type: none"> A. one looks to speed up getting to Temperature B. then shortening the time it takes for Volume Reduction C. and finally, evaluating the Quality of the Stabilized Material Fertilizer. <p>As such, Heap Method can take many months...up to a year, depending on the composition. For instance, if you only piled up grass clippings...the reaction would end up with a slimy, moist gooey mess due to lack of air. Therefore they usually bulk-up the pile with coarse material (like wood chips) to allow air circulation.</p> <p>Wind Row method takes 45 to 90 days, again depending on the composition of the pile...but also how often the piles are turned.</p> <p>In Vessel can be as short as a month....</p> <p>If you apply MICROBE-LIFT® IND, two to three times in the process...you should expect to reduce the time for composting In Vessel by 20 to 25%... for Wind Row a reduction of 30 to 40%....and in a Heap, by some 50%.... though turning the piles is important to final results.</p> <p>The issue of quality is similar to MICROBE-LIFT® IND's effect on Swine Lagoons...and results in a better fertilizer</p>
C14	Question	<p>: Balancing N-P-K can enhance performance. How does addition of urea help in balancing N-P-K?</p>
	Answer	<p>: Urea is just your run of the mill agricultural fertilizer...but can work if you target correctly to a 5:1 ratio of N to P.</p> <p>To better assist, it is always better to know more about the strength of the waste and the type of waste in question. For example, if it is a meat processing waste, they typically need more P than anything else since they get the N from the breakdown of protein.</p> <p>Typically you would need to have three different nutrient blends - one for N, one for P and one for a combination of N & P, in order to target nutrient ratio based on the load. Some people would say why do you need three? Just use the N & P blend for all applications. Well, it sounds like the simplest way of doing it, but all you really need is N, then using the Combo N & P could cause problems with Permit Limit for P, as regulated by most Municipalities now. In this case, adding the Combo-Nutrients could hurt more than they help.</p>

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	Answer	:	<p>I have found the best sources of N and P are:</p> <p>Urea for N...Diammonium Phosphate (DAP) for the Combo of N and P.. And another phosphate salt for only P.</p> <p>By blending you can get the right 5:1 ratio of N to P required for most applications, but each situation must be evaluated and then treated accordingly. Increased loads and variations in influents must be reviewed in order to adjust the nutrient dosage.</p> <p>While we can supply these products, they are really commodities that are locally available.</p>
C15	Question	:	State the bacteria group/s in MICROBE-LIFT® IND that attack FOG
	Answer	:	The species involved in the breakdown of the FOG are the: Rhodopseudomonas sp., Flavobacter sp., and Bacillus sp.
C16	Question	:	MACDEC, a rubber processing factory in Malaysia has an aerated wastewater pond with high AN and TN problem. The pond achieved a drastic reduction of AN and TN three months after MICROBE-LIFT® IND treatment, however, there is a gradual drop of pH from mid 7 to 5.67 in Dec 2006. What is the likely course of the drop in pH?
	Answer	:	<p>They should be very pleased with the results. I can't imagine that we could have done much better than reducing both the unfiltered and filtered ammonia nitrogen to non-detectable levels and the filtered and unfiltered total nitrogen to the low single digits.</p> <p>The pH lowering is easy to explain. First of all, there are two potential mechanisms for ammonia removal. These are heterotrophic uptake (assimilatory) and chemotrophic utilization or nitrification (dissimilatory). If all of the ammonia removal were due to heterotrophic uptake, that is the utilization of the nitrogen as a nutrient in the breakdown of organics to CO₂, water and cells, there would have been little or no drop in ammonia except for the production of fatty acids in the process of breaking down the waste. This may account for some of the pH drop.</p> <p>However, the bulk of a drop of this magnitude is likely due to the nitrification process where ammonia is converted to nitrite and nitrate. The resulting nitrate (NO₃) goes into solution as nitrous acid, lowering the pH. It is very common in wastewater plants the nitrify to see a drop in pH as a result of nitrification, especially if alkalinity is low. In fact, there are 3.78 mg of alkalinity consumed for every 1 mg of ammonia nitrogen converted to nitrate.</p>

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			<p>If they would like to get the pond pH back up to the mid 7 range, they can add some soda ash or other cheap alkaline material. I wouldn't worry about this as the system should be able to function well in this pH range. Unless they have a pH discharge parameter they have to meet or they see the pH continuing to drop or the performance deteriorate, I wouldn't worry about it.</p>
C17	Question	:	What are the types of gases likely to emit from sugar ethanol plant wastewater pond? Please recommend a good method of measurement of these gases.
	Answer	:	<p>In addition to ethanol, the liquor from ethanol production from corn also contains acetic acid, propionic acid, a mixture of higher boiling or non-volatile hydroxylated, dicarboxylic, amino and other nitrogenous acids. The bad odor emanating from this kind of waste is likely from propionic acid, an organic acid that gives the distinct odor and taste to Swiss cheese (Propionibacter is used in Swiss cheese production) in addition to acetic acid.</p> <p>Samples can be taken for gas chromatographic analysis since most of the acids are volatile acids. They can also be detected in solution. Based on the concentration in solution and partial pressure of the compound the odor generated by the mixed liquor can be determined.</p>
C18	Question	:	Why does addition of MICROBE-LIFT® IND cause an increase in BOD at after about two weeks?
	Answer	:	<p>Some other explanations for the increase in BOD might be solubilization of particulate BOD and the inherent inaccuracy of the BOD test itself (+ or - 15%). Another reason BOD occasionally goes up when bacteria are added is that the bacteria are more capable of breaking down the organics in the test than the bacteria that are used in the seed for the test.</p>
C19	Question	:	Why normal products do not work usefully in the seawater?

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	Answer	:	<p>In order to main homeostasis, a bacteria functions best in what is called an iso-osmotic environment, where the salt concentration in the cell is similar to the environment in which it is living. When the salt concentration outside the cell is much higher than the salt concentration in the cell, water passively diffuses out of the cell to the external environment. This can result in dehydration of the cell and loss of viability. This is why honey does not spoil. The sugar concentration makes for a hyper-osmotic environment in which bacteria cannot grow.</p> <p>In order to survive in a hyperosmotic environment, like salt water, the bacteria have to develop the ability to actively pump water back into the cell to maintain homeostasis, or the correct balance of water and electrolytes in the cell. Certain cells, like marine organisms, have the ability to do this effectively. This allows them to survive and dominate in marine environments. Many marine organisms have probably developed this capability over generations of evolution. Through gradual adaptation, many non-marine organisms can be made to tolerate salt water environments as they establish these pumping mechanisms.</p>
C20	Question	:	Why MICROBE-LIFT® IND can work in sea water?
	Answer	:	The organism have shown the ability to adapt to the hypersosmotic environment in salt water as described in Question C19.
C21	Question	:	The best breeding methods of Shrimp against WSS (White spot disease)
	Answer	:	<p>As with any organism, providing a healthy environment that helps to maintain a higher level of resistance in the individual organisms is the best way to prevent diseases. The MICROBE-LIFT® IND does this.</p> <p>With many bacterial infections, the MICROBE-LIFT® IND can reduce the incidence of these infections through competitive exclusion, as they compete with the bacterial pathogens for domination of the ecosystem. However, since White Spot Disease is caused by a virus, there is no control through competitive exclusion, at least that we know of or have documented.</p>

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C22	Question	:	<p>Angeline has requested for ammonia removal for the shrimp pond test. This is for a newly developed recreational shrimp pond development in Singapore. The mature shrimp are brought in and placed in a 20 cu m holding pond before gradually being transferred to the fishing pond for recreational fishing. The owner is conducting a water conditioning test on a 1.5 cu m (400 gallon) fiber glass tank to test for suitable water conditioning products. I used MICROBE-LIFT® IND in this tank. The water improved on day 2 and 3. On day 4, nitrite and nitrate content increased drastically, and the shrimp died. We will be running a test with the Ammonia removal which can remove the ammonia much faster than the MICROBE-LIFT® IND.</p>
	Answer	:	<p>Nitrite and nitrate are by-products of the nitrification process i.e., these indicate that the biological ammonia removal process is working. These constituents follow ammonia removal by the nitrification process → biological ammonia removal → via nitrifying microbes, to nitrite → then to nitrate. Nitrate must be removed by plants, water change or by biological denitrification (best way). Our cultures have this capability.</p> <p>I believe toxic nitrate levels for shrimp are above 50ppm.</p> <p>The nitrate must now be removed by a process called denitrification where our core technology MICROBE-LIFT® IND can use the nitrate and convert it to nitrogen gas in an anaerobic environment. Unfortunately, this process will only take place in an anaerobic/anoxic environment.</p> <p>Therefore, if the shrimp tanks do not have a filter or bio media, where anaerobic/anoxic possesses can take place the nitrate would have to be removed by water change. If this is the case, add MICROBE-LIFT® IND along with a large amount of bio balls, or other media to allow bio films to develop. You may also add a second non aerated tank with bio balls or filter media and reticulate the water through this chamber to remove nitrate via denitrification.</p> <p>While ammonia remover is a product that can be used to reduce high levels of ammonia our core technology will provide a better solution by removing slow to degrade protein and fat that is repressive to the biological nitrification process. However, keep in mind that they will have to closely watch the carbonate alkalinity to maintain nitrification (ammonias removal) in these systems as they feed high levels of protein that will result in high levels of ammonia.</p>

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C23	Question	:	<p>One of my client asked me this question after reading about our MICROBE-LIFT® OX product:-</p> <p>According to the wastewater treatment technology, they use underground tank as an anaerobic tank, thus the disintegration of waste is totally done by fastidious microorganism. We use MICROBE-LIFT® IND to put more fastidious microorganism to facilitate the disintegration only. If we add OX to increase the dissolved oxygen in water to stimulate the development of aerobic microorganism. Will it kill fastidious microorganism?</p>
	Answer	:	<p>A septic tank exhibits primarily anaerobic activity. However, since the tank is open to that atmosphere, there is some aerobic and microaerophilic activity near the surface. The oxygen transferred is not enough to meet the oxygen demand of the waste, so the majority of the tank stays anaerobic.</p> <p>In a septic tank or leach field where there is built up organics, it is hard to work off this build up anaerobically, since anaerobic metabolism is slower than aerobic metabolism. By adding MICROBE-LIFT® OX, we increase the percentage of aerobic activity to allow more rapid breakdown of organics by the bacteria and even effect some chemical oxidation of the organics. We do not add enough MICROBE-LIFT® OX to make the whole septic tank aerobic. As a result, the anaerobic population is not impacted that much.</p> <p>When MICROBE-LIFT® OX addition is stopped, the septic quickly returns to it primarily anaerobic function and operates normally, with little or no impact on the anaerobes.</p>
C24	Question	:	<p>At Nubika Palm Oil mill effluent pond treatment, 2 months into the treatment, client suddenly experience increase in pH and bad odor. The client is panicky and ask for an explanation.</p>
	Answer	:	<p>You are correct that nitrification can lower the pH, but deamination followed by ammonification, which will occur as organic solids break down, can increase the pH. They can test this by measuring the ammonia nitrogen.</p> <p>As for the bubbling, you are correct that this is an indication that the product is working, probably breaking down organic sludge on the bottom anaerobically. This sludge breakdown can also account for the color in the water as well as the odor. The odor should be eliminated once the system comes to equilibrium and the bacteria start to break down any putrefacting agents produced in the anaerobic decomposition of the organic solids.</p> <p>I just wish people would stop panicking when things we should expect, and see all the time, occur.</p>

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C25	Question	:	<p>We have done some trial on bunker composting with palm empty fruit bunch and palm oil mill effluent. After 30 days, the trial with MICROBE-LIFT® IND shows more white fungi, also known as Fire Fang. I am trying to find out what and how this happens. I have read that Fire Fang is actually actinomyces. I don't know if this is beneficial or not and why its visibility occurs in the MICROBE-LIFT® IND bunker.</p>
	Answer	:	<p>You are correct, the term Fire fang refers to actinomycetes. Typically, actinomycetes are critical in the breakdown of organic matter, especially in the soil, and, as such, typically improve the speed and efficiency of composting. Many people feel it also reduces the populations of bacteria and fungi that are detrimental in certain uses of compost, like growing mushrooms. They are also considered to be responsible for the “earthy” smell of soil.</p> <p>The MICROBE-LIFT® IND contains a number of actinomycetes, primarily from the genus Streptomyces. This is the reason I believe that we often see more of these white spots on compost piles inoculated with the MICROBE-LIFT® IND. I've also wondered if, on occasion, some of this is also due to “white rot” fungus, technical name Phanaerochaete chrysosporium.</p>
C26	Question	:	<p>There's some company using nano moisture for irrigation, and the diameter of the permeation pore of the moisture is 900 nanometer, is it possible for MICROBE-LIFT® IND bacteria to block this kind of nano pores or they can pass the pores and enter the soil with irrigation?</p>
	Answer	:	<p>Bacteria range from 1-10 um in length and 0.25-2 um in diameter and your pore size is 0.9 um. Some bacteria may be able to squeeze through depending on these dimensions and how they orient themselves with respect to the pore, but partial blockage could be a problem.</p>
C27	Question	:	<p>Do dry bacteria packets need to be used in conjunction with liquid MICROBE-LIFT® IND AND MICROBE-LIFT® SA in order to achieve maximum results? Or will MICROBE-LIFT® IND and MICROBE-LIFT® SA together achieve the same success?</p>

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	Answer	:	MICROBE-LIFT® PBD Dry packets - are suggested when the aquatic environment has a helving loading of leafy fibrous matter within the ecosystem at littoral (plant zone) and bathetic zone (bottom) that is contribution to organic pollution as these are difficult to degraded by indigenous microorganism within a reasonable period of time. MICROBE-LIFT® PBD contains select target enzymes that assist MICROBE-LIFT® IND & MICROBE-LIFT® SA in a more rapid bio enzymatic breakdown and following biological oxidation reduction removal process (speeds the process). At the same time the products selection is based on the amount of leafy matter present as low loading can easily be handled by MICROBE-LIFT® IND & MICROBE-LIFT® SA.
C28	Question	:	What are the overall benefits of using dry bacteria packets in ponds? What are the functions of dry bacteria packets in ponds?
	Answer	:	The use of ELI's dry bacteria products in a pond are two fold: <ul style="list-style-type: none"> a) they contain an extremely high concentration of microorganisms, b) they contain a series of select enzymes that assist in a more rapid reduction of leafy matter.