



3 Tier Technologies Technical FAQ

What is 3 Tier's Polyelectrolyte Enhanced Biopolymer (PEB)?

The foundation of all 3 Tier Environmental Products is an advanced Polyelectrolyte Enhanced Biopolymer (PEB) that is derived from very stable, organic compounds found in brown and oxidized black coal. Our proprietary processing technology purifies and unleashes the vast potential of this massive molecule.

What is the nature of PEB?

PEB is a highly reactive long chain molecule providing a purified carbon source available with various concentrations of fulvic acids, highly reaction functional groups, high CEC potential, and low ash and ballast. PEB is an all natural, highly soluble, liquid concentrate that is safe and easy to use for both soil and aqueous application.

How does the PEB work?

PEB possesses several beneficial characteristics that buffers the treatment environment, creates a foundation for maximum biological, geological and chemical reactions, is both hydrophobic and hydrophilic, and is designed to work effectively in both soil and aqueous environments. Two versions of this molecule are used independently and combined, one that is negatively charged and one that is non-ionic (no charge).

Why is the PEB important to the remediation process?

PEB has both hydrophobic and hydrophilic sites, and thus can connect/react with a variety of contaminants like oil and microbes at the same time. Additionally, PEB protects microbe's cells from the toxic effects of various contaminants while increasing their performance whether they are indigenous or augmented. This combined action provides a platform from which the microbes can reach the organic contaminants like oil, decompose the carbon-hydrogen bonds, and use the carbon for food and the electrons for energy. Hydrogen protons are released and bind with atmospheric oxygen to form water.

What is the impact of PEB on salt contaminated soils?

PEB based products for salt management are composed of both non-ionic and negatively charged molecules which attract and bind positively charged sodium molecules. Through this binding process, salts lose their ability to bind to soil particles which allows excessive amounts of salt to become more mobile resulting in a natural ability to safely leach through the soil. This binding process also increases sodium's specific gravity which increases its ability to precipitate out of water. Any remaining sodium residue creates a benign new mineral formation that is physically and geologically bound, thus eliminating salt impact resulting in desalination and salt toxicity reduction/elimination.



Why is the PEB effective on heavy metals?

For metals, our products will naturally stimulate toxic organic and mineral pollutants decomposition into neutral compounds such as converting Chromium VI to Chromium III which is accomplished by an abundance of hydroxyl and phenol groups. These functional groups are key to the metal complexation resulting in the detoxification and binding of various metals which protects the environment. PEB detoxifies and helps immobilize metals in soils while detoxifying them and precipitating them out of aqueous solutions.

How does PEB improve the soil condition?

PEB, as a byproduct of most of its reactions in soil, creates fresh soil organic matter that results in increased CEC, better water holding capacity, and soil porosity/structure that results in healthy, active soil for re-use. The new soil structure is actively regenerated to enable proper support of new vegetation.

What is PEB's effect on H₂S Gas and Frac Wastewater?

PEB is an alkali product that has a tremendous ability to bind protons in a variety of water conditions. Knowing that in acidic aqueous media the release of H₂S is increased due to increased content of protons (acidic cations); PEB counters that process by binding the protons and stopping the formation or conversion to H₂S. PEB also has "oxidative" catalytic properties. This enables the oxidation of H₂S into elemental sulfur and sulfates.

PEB and other components of our products also impact the water quality and alter it to a more beneficial environment while increasing the ORP. ORP at -150 and greater makes H₂S development very fast and easy. Treatment with our product has a benefit in increasing the ORP to above -150 then to Positive numbers in a very reasonable timeframe making H₂S generation impossible and improving the water quality standard significantly for re-use down hole for some companies. Other results are that beneficial biological processes for organic consumption can work and further improve the water quality while reducing TDS, TSS, and electrical conductivity.

Why are enzymes and select microbes added to the PEB in some of 3 Tier's products?

Bacteria are nature's garbage disposal. The challenge with biological remediation is that contaminants often are too large and can act as a preservative by overwhelming microbial activity. Effective bioremediation must first balance and buffer the area so that effective microbial activity, whether indigenous or augmented works. PEB acts as that buffer and catalyst for maximum microbial activity

Enzymes are a critical environment conditioning component. The principal process enzymes perform is that they catalyze complex molecular structures into simpler, more biodegradable forms. They turn apples into applesauce which makes them easier to remediate. They are broad spectrum and work on a wide array of organic constituents. Enzymes go to work immediately since they don't require time to grow while stimulating increased indigenous and augmented bioactivity. Enzymes also are effective in both high and low pH environments.