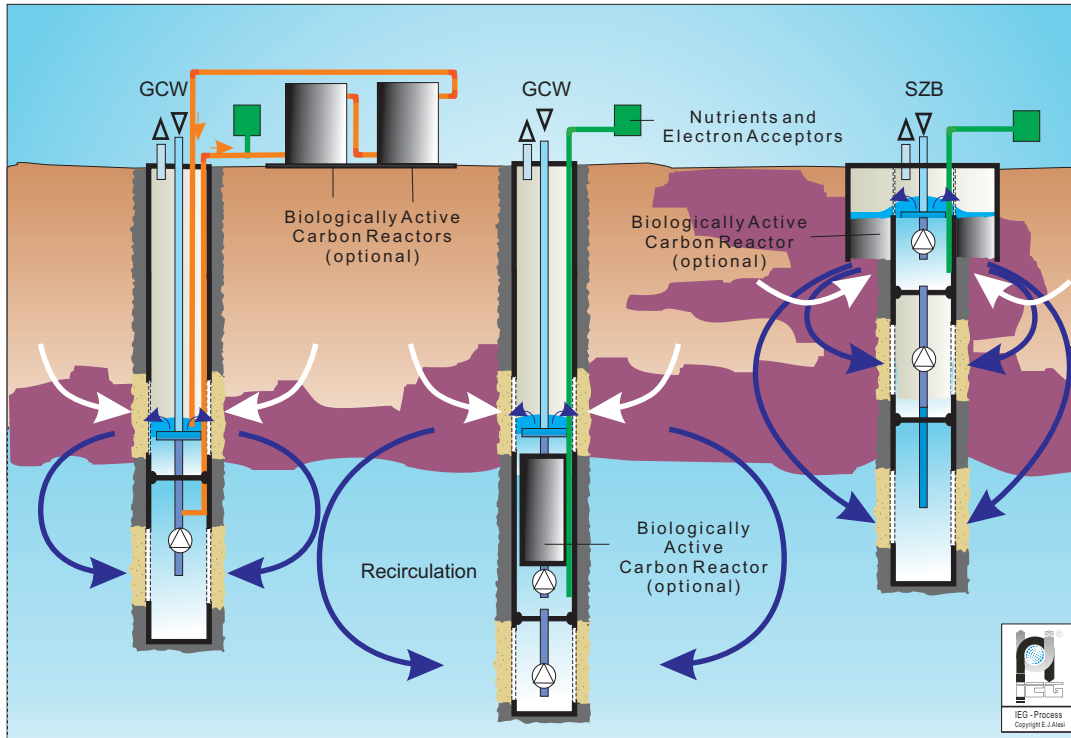


IEG Technical Briefing Note No. 14

Possible Bioreactor Reactor Configurations (mGCW - Process)



Enhanced in-situ Biodegradation by Augmentation of Indigenous Microbes Possible Bioreactor Reactor Configurations (mGCW-Process)

Due to the minimal environmental impact and low cost of implementation, biological remediation technologies have become increasingly popular during the last few years.

In an ideal case, depending on the type of contaminants on the site, naturally occurring microorganisms degrade organic compounds to carbon dioxide and water. The rate of biodegradation is determined by the existing chemical and physical conditions.

The goal of in-situ biological remediation technologies which IEG implements is to optimise the existing degradation potential. By improving the environmental conditions needed by the degrading bacteria, an effective reduction of contaminants is achieved.

GCW-Microbiological Remediation

Microbially-enhanced IEG Groundwater Circulation Wells accelerate the natural biodegradation of organic compounds under aerobic or anaerobic conditions. The systems are specifically designed and configured to provide accelerated aerobic, enhanced anaerobic or sequential anaerobic/aerobic reactions. The IEG GCW systems can also use small biologically active carbon (BAC) reactors for continuous growth, acclimation and augmentation. BAC reactors have been found to have much higher levels of biodegradation and higher specific growth rates than other attached growth systems.

Targeted contaminants are selectively retained in the reactor, and this facilitates the selection and enrichment of those microorganisms specifically capable of degrading these compounds. The reactors can be used as small carbon canisters in submerged recirculating systems, eliminating the requirement to abstract groundwater.

Biological/Physical In Situ Groundwater Remediation Using the GCW

The GCW system is especially suitable for removing biologically-degradable contaminants (e.g. hydrocarbons, phenols, pesticides, etc.) from the groundwater without having to pump the groundwater to the ground surface. The specially-designed GCW produces a groundwater convection cell in the aquifer around the remediation well. The circulating groundwater constantly transports both contaminants and existing degrading bacteria to the well. When flowing through the well, the contaminants are adsorbed onto the material inside the bioreactor. Simultaneously, the bacteria settle in the same area. If necessary, the accumulated microorganisms can be supplied with added nutrients.

Another advantage of the GCW is the oxygen enriched groundwater generated by the system, which enhances the population growth of the microorganisms in the aquifer, thus accelerating the degradation process. System variations include: discontinuous circulation flow reversing the circulation direction, installing different biofilter configurations and materials, and using a combination of physical, chemical and/or biological methods enabling the technology to be adapted to a variety of contamination scenarios.



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