Ground Water, Surface Water, and Leachate

High Energy Destruction

Introduction:

High-energy destruction utilises high-voltage electricity to break down VOCs at room temperature.

Description:

The high-energy destruction technology is one of several approaches that enable the destruction of volatile contaminants before being released to the atmosphere. The aim of the technology is to offer a single, field-portable method of dealing with off-gases produced during other remedial processes.

High Energy Corona:

HEC exploits high-voltage electricity to eliminate VOC contaminants. The HEC reactor consists of a glass tube containing glass beads where the contaminated off-gas is passed through. A reactor is typically 2 inches in diameter and 4 ft long. A high voltage electrode is situated along the centreline of the reactor, and a grounded metal screen attached to the outer glass surface of the reactor. A power supply is connected across the electrodes to generate 0 to 50 mA of 60-Hz electricity at 30 kV. The current and power of the electrode is dependant on the type and concentration of contaminants.

The technology is placed in a self-contained mobile trailer that comprises of gas handling facilities and analytical capabilities. The HEC process can be operated with minimum maintenance. Neither failure nor decreases in efficiency have been observed over several months of use in the laboratory. The on-line gas chromatograph and process instruments necessitate periodic recalibration to guarantee the quality of data generated.

Tunable Hybrid Plasma Reactor:

This reactor utilises an energy electron beam that is injected into atmosphere impacted with the organic contaminants. Organics are broken down or oxidised to less-toxic chemicals through the interaction with the electrons and plasma generated from the electron beam. Due to the fact plasma is generated during the process, use of an alternating current or direct current generates an increase in the electron and gas temperatures, which in turn enhance the treatment process. The high tunability of the reactor is the reason for its name.

Applicability:

Most VOCs and SVOCs can be treated with this technology. Possibilities exist for treating inorganic compounds (oxides of nitrogen and sulphur) and can be a particularly effective method for treating organics, trichloroethylene (TCE), tetrachloroethylene (PCE), chloroform, diesel, and gasoline. It is best suited for treatment of gaseous streams with small concentrations of VOCs.

Data Needs:

Basic remediation data needed.

Performance Data:

HED technology can eliminate up to 99% TCE and can degrade PCE by 95%.

Cost:

Initial costs for a prototype field treatment system, is around £25,000. Large-scale production and customisation significantly reduces cost, perhaps to as low as £10,000. Energy needs are around £14 a day. Despite maintenance costs being low, total cost expect 8% downtime and a capital payback period of 6 months.