Soil, Sediment, Bedrock and Sludge

Incineration

Introduction/Description:

Excessive temperatures, 800-1,100 °C, are utilised to aerobically combust organic contaminants in hazardous waste. Typically the process is powered by auxiliary fuels that initiate and maintain the combustion. The destruction and removal rate for correctly operated incinerators is above the 99.9% required for hazardous waste and can be operated to meet the 99.99% requirement for PCBs and dioxins. Off gases and combustion residuals often need treatment.

Circulating Bed Combustor (CBC):

Circulating bed combustor employs high velocity air to generate a turbulent combustion zone that breaks down hydrocarbons and operates at lower temperatures than standard incinerators. The turbulence creates a uniform temperature in the combustion chamber and hot cyclone and efficiently mixes the waste during the process of combustion. Thorough mixing in combination with a low combustion temperature can lower operating costs.

Fluidised Bed:

Fluidised beds employ high-velocity air that circulates and suspends particles in a combustion loop and operates up to a temperature of 850 °C.

Infrared Combustion:

Infrared combustion is a mobile thermal system where electrically powered silicon carbide rods heat organic wastes to combustion temperatures. Waste is placed into a primary chamber and heated by silicon carbide rods situated above a conveyor belt. A blower delivers air along the belt to contain the oxidation rate of the waste feed. Remaining combustibles are incinerated using an afterburner.

Rotary Kilns:

Commercial incinerators are called rotary kilns and are equipped with an afterburner, a quench, and an air pollution control system. The kiln is a revolving cylinder that operates at temperatures up to 950 °C.

Incinerator off-gas needs treatment by means of the air pollution-control system in order to remove particulates and neutralise acidic gases such as HCl, NOx, and SOx.

Incineration has been selected or used as the remedial choice at numerous sites, with short- to long-term cleanup times.

Applicability:

Incineration is capable of remediating soils contaminated with hazardous contaminants specifically chlorinated hydrocarbons, PCBs, and dioxins. Explosives can also be treated.

Limitations:

- Only one off-site incinerator is permitted to burn PCBs and dioxins.
- Specific feed size and material handling requirements that can affect applicability or cost.
- Heavy metals have the potential to generate a bottom ash that needs stabilisation.
- Volatile heavy metals namely lead, cadmium, mercury, and arsenic, leave the combustion unit along with flue gases and require the gas cleaning systems for removal.

- Metals may react with other elements in the stream, such as chlorine or sulphur, producing more volatile and toxic by products.
- Sodium and potassium form low melting point ashes that are capable of attacking the brick lining and generating a particulate that fouls the gas ducts.

Data Needs:

After identifying the soil contaminants and concentrations, the soils moisture content and classification are also desirable. Sieve analysis is needed to estimate the dust loading in the system in order to ensure the correct design of the air pollution control equipment.

Performance Data:

Approximately 20 commercial hazardous waste incinerators and 10 mobile high temperature units are in operation in the United States. Commercial units have large rotary kilns with afterburners and refined air pollution control systems.

Cost:

There is a £ 200- £ 350 gap in cost for quantities ranging from 5,000 – 100,000 tonnes.