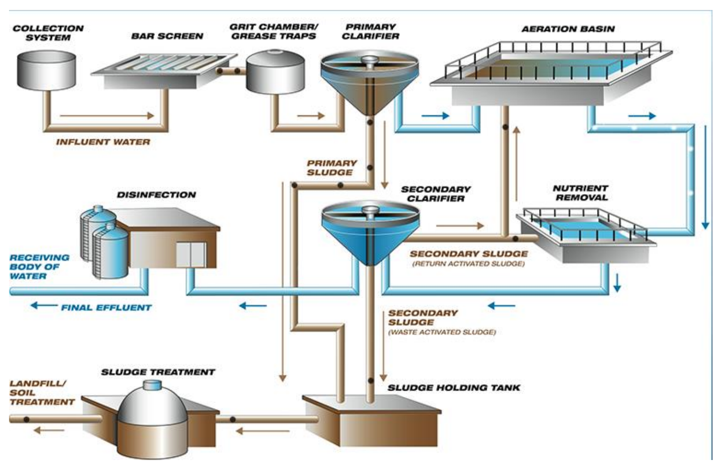
Gas Detection in Wastewater Treatment plant

Application Field: Municipal and industry wastewater treatment plants

Wastewater Treatment Plants (WWTP) are designed to prevent pollution and disease by treating wastewater before released to the environment. Water used to flush and transport liquid wastes of residences, businesses and industries is defined as wastewater. The sewage system also transports the run-off surface water and storm water. Any wastewater that is potentially dangerous to humans or the environment because of its toxicity, flammability, corrosively, chemical reactivity, etc. requires treatment before it is released back to the water system.

Typical gases to be monitored at a wastewater plant are: combustible gases (primarily Methane, CH4), Hydrogen sulfide (H2S), Chlorine (Cl2) and Oxygen (O2). In addition, some plants also require Sulfur Dioxide (SO2), Ammonia (NH3), Ozone (O3) and Chlorine Dioxide (ClO2) gas detection.

In-plant pump stations are facilities that consist of pumps and service equipment designed to pump flows from lower to higher elevations to allow continuous and cost-effective treatment through unit processes within the plant. If those pumping stations, lift stations, dry wells or wet wells are in an enclosed building or structure, additional to Methane (CH4) monitoring, Hydrogen Sulfide (H2S) and Oxygen (O2) detectors also will be needed.



In Primary Treatment, where 40 - 50% of the solids are removed, sanitary (or separate) sewers carry wastewater from homes and businesses to the treatment plant. Bar screens let water pass through but filter out trash. A grit chamber slows down the flow of water, allowing sand, grit, and other heavy solids to settle out. A primary sedimentation tank collects the smaller particles. Lighter-than-water liquids, primarily oil, float on top. These “floaters” and “sinkers” are removed. Gas detection for combustible gases and vapors may be required where surface and storm water might carry fuel oil, gasoline, or flammable solvent spills.

In Secondary Treatment, which removes 85 - 90% of the pollutants, an aeration tank supplies large amounts of air to a mixture of wastewater, bacteria, and microorganisms. Oxygen (aerobic process) speeds the growth of these helpful organisms which consume harmful organic matter. A secondary sedimentation tank (anaerobic breakdown) allows the microorganisms and solid waste to settle out. In the process of aerobic breakdown, when happening in enclosed buildings or structures, gas detection may be required for Carbon Dioxide (CO2) and Oxygen (O2; depletion). In the process of anaerobic breakdown gas detection for Methane (CH4) and Hydrogen Sulfide (H2S) may be required.

The sludge collected at the bottom of the clarifier is then recycled to the aeration tank to consume more organic material. The term "activated" sludge is used, because by the time the sludge is returned to the aeration tank, the microorganisms have been in an environment depleted of "food" for some time, and are in a "hungry", or activated condition, eager to get busy biodegrading some more wastes. Since the amount of microorganisms, or biomass, increases as a result of this process, some must be removed on a regular basis for further treatment and disposal, adding to the solids produced in primary treatment.

One commonly used method of sludge treatment is digestion. Since the material is loaded with bacteria and organic matter; why not let the bacteria eat the biodegradable material? Digestion can be either aerobic or anaerobic. Aerobic digestion requires supplying oxygen to the sludge; it is similar to the activated sludge process, except no external "food" is provided. In anaerobic digestion, the sludgers feed into an air-free vessel and digestion produces a mixture of methane and carbon dioxide. The gas has a fuel value, and can be burned to provide heat to the digester tank and even to run electric generators. Digestion can reduce the amount of organic matter by about 30 to 70 percent, greatly decrease the number of pathogens, and produce a liquid with an inoffensive, "earthy" odor. This makes the sludge safer to dispose of on land. In the process of aerobic breakdown, when happening in enclosed buildings or structures, gas detection may be required for Carbon Dioxide (CO2) and Oxygen (O2; depletion). In the process of anaerobic breakdown gas detection for Methane (CH4) and Hydrogen Sulfide (H2S) may be required.

Chlorine is the most widely used disinfectant for municipal wastewater because it destroys target organisms by oxidizing cellular material. After disinfection, the water's Chlorine residual must be reduced to nontoxic levels and Sulfur Dioxide (SO2) is often used in this de-chlorination process. Alternative disinfectants include ozonation (O3), Chlorine Dioxide (ClO2) and ultraviolet (UV) disinfection. The disinfection process makes the wastewater a safe effluent to flow into rivers, lakes or seas. These various disinfection processes often require Gas Detectors to monitor for Chlorine (Cl2), Sulfur Dioxide (SO2) or other disinfectant gases which may be dangerous to life and property.

Another WWTP often requiring gas detection is Ammonia (NH3) stripping. This is a simple desorption process used to lower the Ammonia content of a wastewater stream. In Ammonia stripping, lime or caustic is added to the wastewater which converts Ammonium Hydroxide ions to Ammonia gas; often requiring the need for Ammonia gas detectors.

RC Systems' Recommendation:

Wired Gas Detection System		
Gases	Detectors	Controller
CH4	SenSmart 3300 IR	ST-90 (Up to 4 points)
Cl2, O2, SO2, NH3, O3, ClO2	SenSmart 3100 EC	ST-71 (Up to 16 Points)
CO2	SenSmart 3400 IR	ST-72(Up to 64 Points)

Wireless Gas Detection System		
Gases	Detectors	Controller
CH4	SenSmart 7300 IR	WNR WaveNet Receiver
Cl2, O2, SO2, NH3, O3, ClO2	SenSmart 7100 EC	(Up to 32 Points)
CO2	SenSmart 7400 IR	

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