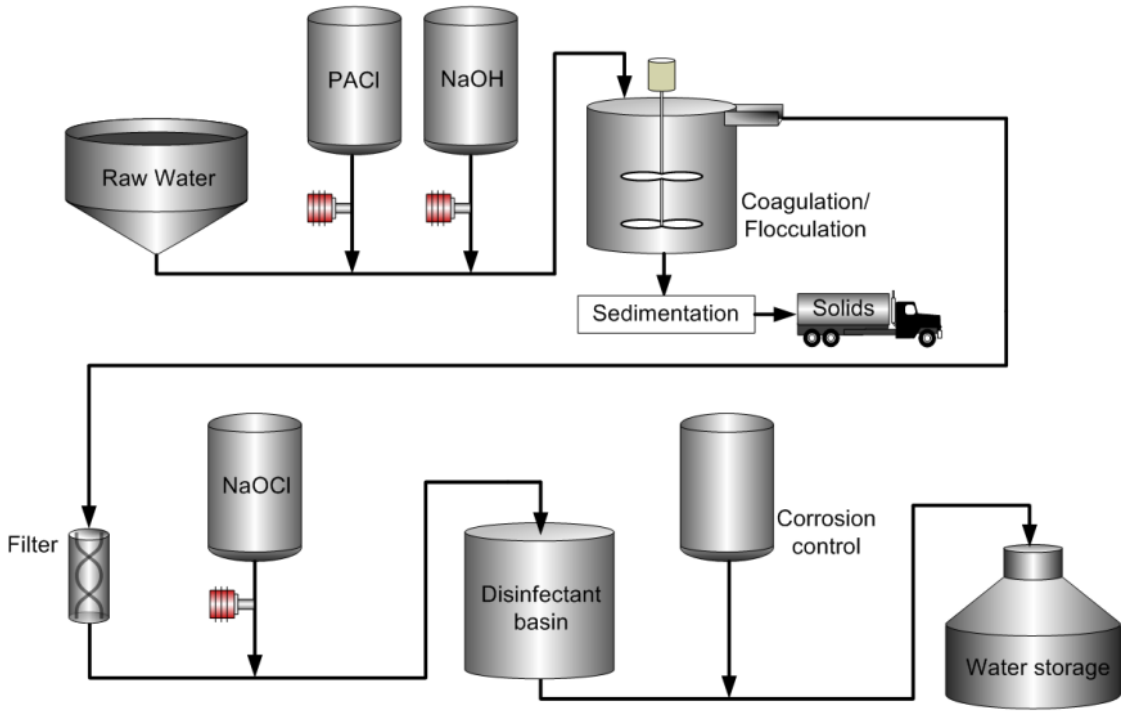

POLYALUMINIUM CHLORIDE PACl, SODIUM HYDROXIDE NaOH, SODIUM HYPOCHLORITE NaOCl

Typical end products

Drinking water, medical, pharmacological, chemical and industrial applications water

Introduction

Pure water treatment is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from raw water. Water purification is aimed at producing water for a specific purpose: human consumption, medical, pharmacological, chemical or industrial needs.

Polyaluminium coagulants are finding increasing use in potable water treatment plants, particularly, for soft, coloured surface waters. Polyaluminium chloride (PACl) is replacing the Alum (aluminium sulphate) which is also a commonly used coagulant in water treatment plants. Alum has limited coagulation pH range: 5.5 to 6.5, and supplemental addition of alkalinity to the raw water is often required to achieve the optimum coagulation pH. Furthermore, the alum floc produced is particularly fragile. This is especially important if a coagulant is required to maximise colour removal in a microfiltration-based water treatment process.

Application

Water treatment by chemical precipitation is a complex process. It starts with adding flocculants, specifically, Polyaluminium Chloride (PACl) and Sodium Hydroxide (NaOH) into raw water. PACl is a synthetic polymer dissolved in water. It precipitates in big volumetric flocs which absorb suspended pollutants in the raw water. The amount of Polyaluminium Chloride to be added to the process is defined with regard to the turbidity of the raw water. In order to keep the flocculation process smooth, PACl concentration must be higher than 10 %. When in the storage tank, Polyaluminium Chloride is stable, however, tends to crystallize after a period of time. K-Patents' refractometer allows for monitoring of PACl, informs about the necessity for the tank or pipe cleaning, and thus prevents them from blocking with the PACl crystals.

NaOH regulates pH level, increases alkalinity and neutralizes acids in the water. In alkaline water coagulation and flocculation processes work more effectively. Moreover, sufficient alkalinity prevents lead dissolving from lead pipes and pipe fittings, as well as reduces the corrosiveness of water to iron pipes.

Further, particles suspended in water start precipitating and combining into larger particles, i.e. flocs. The flocs are then settled at the bottom in the form of sludge. The sediment is removed from the process. After separating most floc the water proceeds for filtering where remaining suspended particles and unsettled floc are removed.

In the filtration phase the water goes through the layers of anthracite, sand and gravel. Organic compounds contributing to taste and odor are removed. Other remaining particles are trapped by adhering to the sand and gravel particles.

After harmful micro-organisms have been filtered, it is necessary to add disinfecting chemicals to the water in order to inactivate pathogens and potentially harmful micro-organisms. When dissolved in water, Sodium Hypochlorite (NaOCl) releases chlorine. It is an efficient and safe disinfectant if added in a sufficient amount. Fluoride may also be added to the water with the goal of reducing tooth decay and preventing chronic diseases. However, Fluoride in the water must not exceed recommended levels. Excessive levels of fluoride can be toxic or cause undesirable cosmetic effects such as staining of teeth. Apart from sodium hypochlorite, liquid chlorine and chlorine dioxide may also be used as disinfection reagents.

Sodium Hypochlorite is unstable and easily decomposes. The stability of NaOCl solution is dependent on the following factors: hypochlorite concentration, temperature of the solution, pH value of the solution, concentration of the impurities catalysing decomposition, and exposure to light. With K-Patents refractometer it is possible to monitor NaOCl concentration and control the disinfection conditions.

The water purification disinfection stage is accomplished in the disinfectant basin. In order to assure high quality of the purified water corrosion control is performed. Finally, the pure water is stored for further consumption.

Installation

K-Patents Teflon Body Refractometer PR-23-M provides in-line measurements of Polyaluminium Chloride and Sodium Hydroxide at the initial stage of the purification process, insuring efficient flocculation of undesired particles. By measuring Sodium Hypochlorite and Fluoride at the water disinfection stage high quality of the purified water at the outlet is assured.

The mounting point of the K-Patents' three refractometers is in a by-pass loop between the storage tank pump outlet and the treatment point. The refractometer sensor allows monitoring of the chemicals concentration at the exit from the storage tank to the pipe treatment point.

Typical measurement range of PACl is ca. 10-11%.

Typical measurement range of NaOH is ca. 40-45%.

Typical measurement range of NaOCl is ca. 8-12%.

Instrumentation	Description
	Teflon Body Refractometer PR-23-M. A compact refractometer for chemically aggressive solutions and ultra-pure fine chemical processes. Connected to the process by a G1/2" female or a 1/2" NPT process connection. It has a built-in flow cell designed to keep all metal and other easily corroding parts from coming into contact with the process liquid.
Measurement range:	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 % by weight.