Municipal water treatment essay

Municipal water treatment Executive summaryDrinking water is one of the easiest things in the world to take for granted. We turn the tap and the out comes is clean and fresh, life-sustaining water. Most people don't realize just how much planning, design and work goes into delivering water to their home. Providing an adequate water supply for a community includes three things: 1) finding and developing an adequate water source; 2) Treating the water to insure that it is clean enough to drink; and3) Delivering the water to every residential, commercial and industrial building within the service area. It is not possible to tell whether water is safe to drink just by looking at it. Simple procedures such as boiling or the use of a household activated carbon filter are not sufficient for treating all the possible contaminants that may be present in flowing water (stream water). Even natural spring water – considered safe for all practical purposes in the 1800s – must now be tested before determining what kind of treatment, if any, is needed.

Chemical analysis is the only way to obtain the information necessary for deciding on method of purification. Therefore this article considers municipal water supply (flowing water) that requires treatment before it can be used as a potable drinking water and supplied to domestic users. It also describes various water treatment strategies and also includes details on how to test free flowing well water.; IntroductionMunicipal Water Treatment is the process of removing contaminants from a raw water source. The goal is to produce water for a specific purpose with a treatment profile designed to limit the inclusion of specific materials; most water is purified for human consumption (drinking water). Water purification may also be designed for a variety of other purposes, including to meet the requirements of medical, pharmacology, chemical and industrial applications. Methods include, but are not limited to: ultra violet light, filtration, water softening, reverse osmosis, ultrafiltration, molecular stripping, deionization, and carbon treatment. Water purification may remove: particulate sand; suspended particles of organic materal; parasites, Giardia; Cryptosporidium; bacteria; algae; virus; fungi; etc.

Minerals calcium, silica, magnesium, etc. and toxic metals (lead, copper, chromium etc). Some purification may be elective in the purification process, including smell (hydrogen sulfide remediation), taste (mineral extraction), and appearance (iron encapsulation). Governments usually dictate the standards for drinking water quality. These standards will require minimum / maximum set points of contaminants and the inclusion of control elements that produce drinking water. Quality standards in many countries require specific amounts of disinfectant (such as chlorine or ozone) in the water after it leaves the water treatment plant (WTP), to reduce the risk of re-contamination while the water is in the distribution system. Sources of Flowing Water (Stream water)The water emerging from flowing water may have fallen as rain many decades, hundreds, thousands or in some cases millions of years ago. Soil and rock layers naturally filter the ground water to a high degree of clarity before it is pumped to the treatment plant.

Such water may emerge as springs, artesian springs, or may be extracted from boreholes or wells. Flowing water (stream water) is generally of very high bacteriological quality (i. e.

, pathogenic bacteria such as Campylobacter or the pathogenic protozoa Cryptosporidium and Giardia are typically absent), but the water typically is rich in dissolved solids, especially carbonates and sulfates of calcium and magnesium. Depending on the strata through which the water has flowed, other ions may also be present including chloride, and bicarbonate. There may be a requirement to reduce the iron or manganese content of this water to make it pleasant for drinking, cooking, and laundry use. Disinfection is also be required.

Effect of Toxins to HealthStream Waters have a significant bacterial and toxin that poisonous to the human system if consumed. Although higher natural concentration occurs in rivers which are associated with Industrial and domestic wastes which are deposited into rivers located in industrialized areas. The concentration of these heavy metals such as Mercury (Hg), Arsenic (As), Cadmium (Cd), Nickel (Ni), Tin (Sn), Zinc (Zn), lead (Pb), Selenium (se), Copper (Cu), Iron (Fe), etc in natural water is increased by deposition of Industrial and domestic wastes into Rivers, lagoons shakes and oceans; 1. Arsenic (As): If Swallowed can cause impaired pulmonary function, gastric troubles, sensory disorders in arms and legs, and anaemia.
2. Cadmium (Cd): If Swallowed can cause coughing, chest pains, difficulties in breathing, nausea, vomiting, dizziness, diarrhea, and cause pneumonia. 3. Mercury (Hg): are generally toxic by inhalation.

Alkyl a mercury Compound are very toxic if consumed, it’s poisoning cause speech impediments and fumbling ness. Sight and hearing are impaired4. Lead (Pb): read is harmful to human if swallowed or inhaled which particularly affect the nervous System some of its effects are gastric pain, kidney damage, nervousness etc.

5. Iron (Fe): Iron salt may cause poisoning if high dose are SwallowedTesting stream water Using effective Ratio TestingWater-effect ratio (WER) testing, examining the relative toxicity of copper in various dilutions of effluent and stream water as compared with laboratory dilution water, was conducted during January, April, and June, 1995, to assess the potential of seasonal and flow effects on site water quality and toxicity of copper to the fathead minnow. Total organic carbon (TOC) and dissolved solids were significantly related to effluent concentration in the site water (R2 = 0. 92, p ; 0. 01), resulting in higher copper median lethal concentrations (LC50s) and higher WERs as effluent contribution in site water increased. Total recoverable copper LC50s were similar to dissolved copper LC50s in laboratory and upstream water tests (p ; 0.

10), while effluent and stream water tests had significantly higher total recoverable than dissolved copper LC50s (p ; 0. 01), suggesting more solids or complexing agents when effluent was present. The LC50 and WER for upstream water were significantly higher in April than in January (p ; 0.

05), consistent with the higher TOC, alkalinity, and lower stream flow observed during April. The WER tests, using different proportions of upstream water and effluent (tests of additivity) in both January and April, indicated that total recoverable copper WER was predictable under a variety of stream flow conditions. Dissolved copper WERs were less predictable, in part because effluent and upstream water WERs were similar, particularly in

April. Low-flow stream conditions (when effluent concentration was greatest) appeared to be the limiting condition in terms of greatest copper toxicity at this site. Furthermore, winter low-flow conditions appeared to be more limiting (less water effect on copper toxicity) than similar or even lower flows in spring (April) or summer (June). This was probably due to the higher TOC and dissolved solids present in upstream water in the warmer seasons. All analyses indicated that copper was at least five times less toxic in the effluent-influenced stream water than in typical laboratory test dilution water.

Our data indicate that seasonal effects on water quality, as well as stream flow, can be important in determining limiting conditions on copper toxicity in effluent-dominated stream systems.; Various methods of Treating stream waterThere are various techniques used to remove the fine solids, micro-organisms and some dissolved inorganic and organic materials from flowing water(stream water). The choice of method will depend on the quality of the water being treated, the cost of the treatment process and the quality standards expected of the processed water. Particularly the most important once are distillation and reverse osmosis. Boiling: Water is heated hot enough and long enough to inactivate or kill micro-organisms that normally live in water at room temperature. Near sea level, a vigorous rolling boil for at least one minute is sufficient. At high altitudes (greater than two kilometers or 5000 feet) three minutes is recommended.

In areas where the water is “ hard” (that is, containing significant dissolved calcium salts), boiling decomposes the bicarbonate ions, resulting in partial precipitation as calcium carbonate. This is the “ fur” that builds up on kettle elements, etc., in hard water areas.

With the exception of calcium, boiling does not remove solutes of higher boiling point than water and in fact increases their concentration (due to some water being lost as vapor). Boiling does not leave a residual disinfectant in the water. Therefore, water that has been boiled and then stored for any length of time may have acquired new pathogens. Carbon filtering: Charcoal, a form of carbon with a high surface area, absorbs many compounds including some toxic compounds. Water passing through activated charcoal is common in household water filters and fish tanks. Household filters for drinking water sometimes contain silver to release silver ions which have an anti-bacterial effect.

Distillation: Involves boiling the water to produce water vapor. The vapor contacts a cool surface where it condenses as a liquid. Because the solutes are not normally vaporized, they remain in the boiling solution.

Even distillation does not completely purify water, because of contaminants with similar boiling points and droplets of unvaporized liquid carried with the steam. However, 99. 9% pure water can be obtained by distillation. Distillation does not confer any residual disinfectant and the distillation apparatus may be the ideal place to harbor Legionnaires’ disease. Reverse osmosis: Mechanical pressure is applied to an impure solution to force pure water through a semi-permeable membrane. Reverse osmosis is theoretically the most thorough method of large scale water purification available, although perfect semi-permeable membranes are difficult to create.

Unless membranes are well-maintained, algae and other life forms can colonise the membranes. Ion exchange: Most common ion exchange systems use a zeolite resin bed to replace unwanted Ca2+ and Mg2+ions with benign (soap friendly) Na+ or K+ ions. This is the common water softener. Electrode ionization: Water is passed between a positive electrode and a negative electrode. Ion selective membranes allow the positive ions to separate from the water toward the negative electrode and the negative ions toward the positive electrode.

High purity deionized water results. The water is usually passed through a reverse osmosis unit first to remove non-ionic organic contaminants. pH adjustment of WaterThe average pH for distilled water is 7 (neither alkaline nor acidic) and sea water has an average pH of 8. 3 (slightly alkaline). If the pH is lower than 7, then the water is acidic, lime or soda ash is added to raise the pH.

Lime is the more common of the two additives because it is cheap, but it also adds to the resulting water hardness. Making the water slightly alkaline ensures that coagulation and flocculation processes work effectively and also helps to minimize the risk of lead being dissolved from lead pipes and lead solder in pipe fittings. Extra treatment optionsFluoridation – fluoride is added to water for preventing tooth decay.

This process is known as water fluoridation. Fluoride is usually added after the disinfection process. Water conditioning: Is a way of reducing the effects of hard water. Water with high concentrations of hardness salts can be treated with soda ash (sodium carbonate) which precipitates out the excess salts, through the Common-ion effect, producing calcium carbonate of very high purity.

Plumbosolvency reduction: In areas with naturally acidic waters of low conductivity (i. e surface rainfall in upland mountains of igneous rocks), the water may be capable of dissolving lead from any lead pipes that it is carried in. Adding small quantities of phosphate ion and increasing the pH slightly both assist in greatly in minimizingg plumbo-solvency by creating insoluble lead salts on the inner surfaces of the pipes. Radium Removal: Some flowing water (stream water) contain radium which is a radioactive chemical element. Radium can be removed by ion exchange, or by water conditioning. Fluoride Removal: Though fluoride is added to water in many areas, some areas of the world have excessive levels of natural fluoride in the source water.

High levels can be toxic or cause undesirable cosmetic effects such as staining of teeth. One process of minimizing fluoride levels is by treatment with activated alumina. Table 1.

0 below Show how the treatment of Water takes place. Table 1.

0 ConclusionFrom Our analysis we have seen that flowing water (stream water) contains toxin which are very harmful to human bodies and therefore should be treat properly by using the appropriate method stated above before consumption. References: 1 .

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