Water purification

What is water purification? Water purification generally means freeing water from any kind of impurity it contains, such as contaminants or micro organisms. Water purification is not a very one-sided process; the purification process contains many steps. The steps that need to be progressed depend on the kind of impurities that are found in the water. This can differ very much for different types of water. In which ways is polluted water treated? Settling Before the purification process begins some contaminants, such as oil, can be settled in a settling tank.

They can then be removed easily, after they have reached the bottom of the tank. Removal of dangerous microorganisms Often polluted water has to be freed from microorganisms. The water is than disinfected, usually by means of chlorination. Removal of dissolved solids Microrganisms are not only a threat to water; they can also be an advantage when it comes to water purification processes. They can convert harmful contaminants to harmless substances. This biological purification process usually takes a long time and it is only used for water that is polluted with contaminants that the microrganisms, usually bacteria, can convert.

Physical/ chemical techniques When treatment by microrganisms is not an option we often use different treatment techniques, called physical/ chemical treatment techniques. Chemical treatment often deals with the addition of certain chemicals, in order to make sure that the contaminants change structure and can then be removed more easily. Fertilizers such as nitrates are removed this way. Removal of contaminants can also be done through more difficult specific chemical processes. It takes a lot of education to fully understand these purification steps.

Physical treatment usually deals with purification steps such as filtration. More information on water treatment chemicals [pic] Water pollution treatment process More detailed descriptions of water purification steps are available here How can bacteria be removed from water? Bacteria and other microorganisms are removed from water through disinfection. This means that certain substances are added to kill the bacteria, these are called biocides. Sometimes disinfection can also be done with UV-light. 10 STEPS IN THE PURIFICATION OF WATER Step 1: Ion Exchange

The complex process of purification begins with the removal of various metal ions through a process known as ion exchange. Sometimes referred to as water " softening", ion exchange utilizes large tanks which are filled with a special resin which carries a slight negative charge. The resin serves as a reservoir for a large number of positively charged potassium ions. As the water passes through the ion exchange system, metallic ions, which carry a relatively strong positive electric charge, displace the weaker charged potassium ions. The metallic ions are trapped via electromagnetic attraction to the resin beads.

The ion exchange beds are automatically regenerated at prescribed intervals (every 6000 gallons). Ion exchange provides effective removal of the metals responsible for " hard water" pipe scaling and deposits. Additionally, the process removes various heavy metals, such as lead, iron, mercury and cadmium, many of which have been associated with a number of well-publicized health concerns. Step 2: Granular Activated Carbon Once the water passes through the ion exchange system it moves into an oversized granular activated carbon bed. Carbon filtration, which utilizes process

known as adsorption, is a particularly effective technique for chlorine removal. Pesticides, herbicides and other organic contaminants (especially volatile organic) are also removed at this stage. Carbon also does an excellent job of removing trihalomethanes (THM's) from the water which are the result of chlorination of the public water supply. THM's are known carcinogens. Granular activated carbon filtration is the most common technology in use in home filter systems. Unfortunately, these home systems are often poorly maintained.

Over time, effectiveness declines, and in some cases the contaminants in the overloaded filter actually begin to discharge into the water. At the Home Environment Center, our carbon filters are " back washed" on an automatic cycle every 72 hours. Maintenance and filter replacements are carried out by trained personnel in accordance with a predetermined schedule. Step 3: Sediment Filter The next step in the purification process is a simple paper sediment filter. The sediment filter acts as a trap for relatively large particles which may be present in the water-- things like dirt, sand, or grit.

It's necessary to remove these large particles very early in the process to prevent fouling and clogging of the more sensitive equipment used at later stages. Our initial sediment filter is rated at 20 microns (a micron is one-millionth of a meter of 1/25000th of an inch). This rating means that this filter will stop 99. 97% of all particles with a diameter of 20 microns or more. Of interest is the fact that the human eye can only see particles that are 25 microns in diameter and larger. Step 4: Reverse Osmosis

Reverse osmosis is the centerpiece of the Home Environment Center water purification process. Many people have heard about the process of osmosis. Osmosis is a naturally occurring process whereby water passes across a membrane due to a pressure differential between one side of membrane and the other. As osmosis takes place, the concentration of dissolved material on each side of the membrane is equal moves closer to an equilibrium state. That is, the more concentrated solution will tend to become more diluted, and the more diluted solution will tend to become more concentrated.

Many people are familiar osmosis as the process by which living cells receive nutrients and excrete wastes. In reverse osmosis, high pressure is used to force water across a membrane while impurities are left behind. In other words, the high pressure causes the impurities to become more concentrated on one side of the membrane. Only the pure water is able to cross the membrane; even the dissolved impurities which cannot be removed by conventional filtration are captured and eliminated by the Home Environment Center's reverse osmosis purification system.

The reverse osmosis system featured at the Home Environment Center utilizes state-of-the-art technology for both purified water production and quality control. Every drop of our purified water must pass through layers of reverse osmosis membranes. The result is a purity level that's second to none. In fact, we encourage our customers to compare our water with any other water-spring water, mineral water, home-filtered water. We bet you'll find our purity to be far superior to the other brands--with a better taste, too!

Step 5: Five Micron Carbon Block Filter

The five micron carbon block filter is designed to capture extremely small particles present in the water. The five micron size designation indicates that particles larger than five millionths of a meter will be captured by the filter. The filter itself is composed of an extruded block of carbon, providing an additional measure of adsorptive capacity for the removal of chlorine and organic contaminants. The extruded carbon block filter is manufactured to very tight tolerances thereby providing optimal permeability and porosity characteristics for adsorbing and removing contaminants.

Step 6: Ultra Violet Disinfection Since the Home Environment Center process removes all chlorine from the water, two forms of chemical-free disinfection technology are employed to ensure that the purified water remains absolutely and completely free from micro biological contamination. Ultra violet disinfection is the first of these technologies. At this step of the process, the water passes through a special chamber which houses a large ultra violet light source. This ultra violet light acts as a powerful sterilizing agent.

If any bacteria, viruses, or other micro biological contaminants are present in the water, the ultra violet light at this particular wave length destroys the genetic material within these organisms, eliminating the possibility of bacterial or viral reproduction and proliferation. The organisms quickly die and are captured and removed during the reverse osmosis purification process. Step 7: One Micron Sediment Filter The one micron sediment filter is a protective device designed to maintain the system integrity during servicing so that the final product holding tank is not compromised.

Step 8: Ozonation The second phase of chemical-free disinfection is known as ozonation. Ozonation relies on oxygen to ensure that our purified water remains entirely free of any possibility of micro biological contamination. The ozonation process involves taking basic molecular oxygen (O/2) and passing this oxygen through a special chamber in which it is exposed to a high voltage electrical charge. (This type of ozone generation is called cold-plasma discharge). The electricity causes the oxygen molecule to split and recombine in a higher energy form known as ozone (O/3).

This ozone is then continuously circulated through the purified water. Ozone is a very powerful disinfectant and is capable of oxidizing a very broad range of contaminants. In fact, ozone is highly effective against many types of impurities and organisms, such as cryptosporidium. Tests have shown that a normal concentration levels (1 part per million or PPM), ozone will destroy 99. 99% of cryptosporidium oocysts given five minutes of contact time. Chlorine however, doesn't affect cryptosporidium oocysts viability at a concentration of 30, 000 parts per million for a period of eighteen hours.

The standard concentration of chlorine in tap water is approximately 3 part per million-imagine what 30, 000 parts per million would taste like! Ozone is not a stable state for oxygen, and over the course of a few minutes it returns to it's natural O/2 state. This state-of-the-art disinfection system is simple, yet extremely effective. And best of all, it relies on nothing more than all natural oxygen--absolutely no strange chemicals or additives. Step 9: Storage and Recirculation After the water has passed through the preceding eight steps it moves into the storage and recirculation phase.

This storage and recirculation system has been designed so that the product water will retain it's exceptionally high purity and will come into contact with any material or substances that could in any way compromise the quality of the water. The Home Environment Center features a storage tank made entirely of FDA-approved food grade material. Many people are unaware that brass, a key component of many plumbing systems, is a primary source of lead contamination. By using food-grade material, this problem, and the problem of potential interactions of other substances, is completely avoided.

The Home Environment Water does not simply sit in the storage tank. Instead, the water continuously travels through a recirculation loop. During recirculation, additional ozone is periodically added to maintain the completely sterile and bacteria-free condition of the system. Step 10: Purified Water Dispensing When a bottle is filled or refilled at the Home Environment Center, the water is drawn directly from the continuous recirculation loop. For added protection, the water dispensers utilize stainless steel on all water contact surfaces.

As the water passes through the dispenser into the bottle, enough ozone is present in the water to effectively resterilize the container. Ozone Rinse Bottle Washing Station Unique to the Home Environment Center, this 3 compartment station allows you to clean and sanitize any size bottle before filling with purified water. This process is as follows: 1. Rinse the outside of the bottle with pure, ozone-injected water. 2. Clean the inside of the bottle with ozone and antibacterial soap. 3. Rinse the inside of the bottle with pure, ozone-injected water. WWW. HOMEENVIRONMENTCENTRE. COM