Reverse Osmosis Process

The Reverse Osmosis water purification process is applied in several different industries to improve water quality. Water purified via reverse osmosis, is higher in quality, which allows the user to increase efficiency in their manufacturing process. Reverse osmosis is a highly effective and relatively simple process, using a membrane and pressure, to store for later or immediate use.

Pre-Treatment

The Reverse Osmosis process begins with pre-filtration of the source water. Pre-filtration allows large particulates and contaminants in the water to be easily removed before reaching the membrane used in the RO process. By filtering the water, the shelf life of the semi-permeable membrane employed by the RO unit is increased through the prevention of clogging. If molecules are allowed to accumulate too much on the membrane, the effectiveness of the process is reduced and there will be a noticeable drop in pressure between stages. If a unit is losing pressure through each stage of the RO process, it is highly possible that the water has not been filtered well enough before entering the unit and contamination is causing the pressure loss. The source water employed in the RO process determines the filters used in the pre-treatment process. Depending on the condition of the source water, either a carbon filter, a green sand filter, and/or a 5-micron filter can be employed. Chlorine is particularly damaging to the membranes in the RO machine, so it is important to ensure water is properly de-chlorinated before entering the process. Finally, the water should be heated before entering the RO unit. When the water is pre-heated, the output of the RO unit is significantly increased. Heating the source water 20 degrees has been shown to double the output of the RO Unit.

Reverse Osmosis Filtering Stage

Osmosis is the passage of water from a region of high water concentration through a semi-permeable membrane to a region of low water concentration. For example, osmosis is most commonly observed in plants. Water flows into plant cells, since the inside of plant cells contain salts and the cell is semi permeable. Water is drawn into the cell from the outside because pure water will move across a semi permeable membrane to dilute the higher concentration of salt on the inside. Reverse osmosis is the opposite of this process. By increasing the pressure on the salt side, water is passed through the membrane in the opposite direction and the salt is filtered out. Reverse osmosis forces water through the semi-permeable membrane and filters out contaminants, producing purified water.

Once the pre-treatment process has been completed, the source water is passed through a semi-permeable filter, commonly constructed of polyimide. Polyimide is highly permeable to water, but relatively impermeable to various dissolved impurities, including salt ions and other un-filterable molecules. These properties make it ideal for use in the RO process. The pressure needed to force the water through the membrane varies, depending on the type of contamination being purified. A home RO system used to purify

water for drinking or cooking can run at 50-70 PSI, while a massive RO unit in a desalination plant filtering ocean water will need 800 PSI or more. Industrial applications fall in between depending upon the concentration of the water they intend to purify.

Water Collection

Once the source water passes through the membrane in the purification stage, it is collected for future use. A spacer between the membranes collects the purified water, and the pressure forces the pure water to exit the unit. After passing through the unit, it can be collected and stored or used immediately for its intended purpose. Alternatively, the water can be run through the RO unit once again, if further purification is desired or necessary. However, after each trip through the process, the water will be more pure and therefore require more pressure and time to be purified. There will be diminishing returns from the inefficiency of multiple trips through the unit, therefore it is advisable to evaluate whether or not multiple purification trips are necessary to reap the benefits of the purified water.

The wastewater from the RO Unit is disposed of directly to the drainage system. There are no dangerous contaminants created during the process and the water is safe to return to the ground. Alternatively, wastewater can be recycled or evaporated if the user of the unit deems necessary or ideal.

Summary

Reverse osmosis is a relatively simple procedure that greatly enhances water quality. By employing this process, an individual or company will have purified water for use in their application, increasing efficiency and quality.

For more information on reverse osmosis go to www.midbrook.com