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## Water Softening by Base Exchange

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## WATER SOFTENING BY BASE EXCHANGE

EDWARD BARTOW

According to a map of the United States on which the hardness of water is shown, Iowa is one of nine states which are classed as having the hardest water. The states besides Iowa are Florida, Indiana, Illinois, South Dakota, Nebraska, Kansas, Oklahoma, and Arizona. These states for the most part are the best agricultural states. The hard water, however, makes them less desirable as places of residence.

By modern methods it is possible to make hard water soft so that it is not necessary to have the inconvenience and unpleasantness which accompany the use of a hard water.

Nearly twenty years ago I heard of a new system of water softening, called base exchange or zeolite system which interested me so much that I arranged to purchase a machine for the laboratory, tested it and found that it was excellent. I have recommended it to my friends for installation in their homes and to business acquaintances for installation in their factories or boiler plants, but not until last spring did I place one in my own home. During the many years from the time I learned of the method until I placed the apparatus in my own home, I had had cistern water and felt that a water softener was unnecessary. As I look back at it now, I think of the cistern water which was slightly hard and always more or less colored and feel that I made a great mistake in waiting so long to install the softener.

This zeolite softening material has been known for seventy years or more in the form of certain soils which would soften a hard water which passed through them. It was not until early in the present century that Dr. Ganz, a German, made the first practical use of the principle. Dr. Ganz made an artificial mineral which would remove hardness from water which was passed over it and called it permutit.

The hardness of a water is due to the presence of calcium and magnesium salts, commonly called lime and magnesia. The water softening mineral contains sodium which replaces the calcium and magnesium in the hard water and softens the water. The hardness

of a water is most noticeable when used with soap, as the insoluble lime and magnesium soaps will form and prevent the soap from exercising its cleansing power.

No chemicals are used in the softening process except common salt which is used to regenerate the mineral. After so much water has been softened that the mineral is exhausted, a solution of common salt is passed over the mineral; the calcium which has been removed from the water is transferred out of the mineral and sodium from the common salt, takes its place. The mineral is then ready for use again. This regenerating process can be carried out repeatedly, there being very little waste of the mineral. The hardness is entirely removed and no excess of chemicals are added. Therefore no care of the plant is needed except regeneration when necessary.

The softener consists of a tank filled with mineral called zeolite, glaucomte or green sand through which water passes. The mineral possesses the peculiar property of extracting all hardness from water. This softening process adds nothing to the water, uses no chemicals, and needs no pumps. The softener is installed in the cellar and connected to the water pipe. The water enters it at the top or bottom, and is softened as it flows through. The softened water passes directly to the faucets.

The only care the water softener needs is to be regenerated at periodic intervals. The mineral eventually absorbs its capacity of hardness from the water, and it has to be regenerated or revived. This is done by passing a solution of common salt through it. The water softeners are strongly and ruggedly built, and can be depended upon to give many years' service. The regeneration process is accomplished by simply turning the operating wheel to points plainly marked upon it. It is easy to understand and anyone can do it.

The water softener removes suspended impurities from the water supply that would otherwise be carried into the home. The impurities are caught on top of the mineral bed, and are flushed away during regeneration. Where large amounts of impurities are present or where the water is muddy, a filter should be used before the water is softened.

The household acquires many advantages by installing a water softening plant of the type mentioned.

If one has ever visited or spent a vacation where the water is naturally soft, and become acquainted with the many benefits of sparkling soft water, one has noticed that it produced a generous

lather, that it did not leave a line of dirty deposit around the bathtub or wash-basin. A zeolite water softener will give even softer water than this, in the home.

The advantages of clean softened water in a household are really tremendous, for many troubles and discomforts commonly attributed to other causes are due to hard water. Lime and magnesia — the hardness forming elements — coming in contact with soap, form an insoluble sticky curd that causes troubles only too well known to housekeepers and does damage in a multitude of ways not generally appreciated outside scientific circles.

It is difficult to produce lather with hard water and such lather as is produced causes irritation to the skin. Softened water readily produces such a generous volume of fluffy lather that bathing the children becomes a joy rather than a hardship. It is soap curds, not dirt, that leave a line of deposit around the bathtub or wash basin. When soap is used with hard water in the bath, the sticky soap curds that are formed work into the pores of the skin, clogging them and preventing the free discharge of body impurities that is essential to smooth, clear, healthy skin. Not only does this affect the complexion and the general condition of the skin, but it is detrimental to general good health. A man coated with varnish would live but a short time, and although hard water soap curds are naturally less obstructive than varnish, they clog up the skin pores to no small extent. At the same time they are responsible for real bodily discomfort, particularly in hot weather. It is a well known fact that evaporation has a cooling effect — that moisture exuded from the pores of the skin helps to keep us cool in hot weather. Hard water soap curds interfere with nature's cooling process, and produce sticky, clammy discomfort. All of these troubles can be eliminated by using softened water. Luxuriant lather, a clean, healthy skin, economy in the use of soap, absence of a "rim" in the tub or basin — these and other advantages are enjoyed.

In shampooing with hard water, insoluble soap curds are deposited on the scalp, causing irritation, and in the hair, making it sticky and utterly destroying its lustre. Hundreds of hair-dressing establishments have installed water softeners for that reason, because softened water will bring out the beautiful natural sheen and softness of the hair, and will keep the scalp clean and healthy. For shaving, the creamy, long-lasting lather produced by softened water quickly softens the beard and imparts a genuine comfort unknown to hard water users.

In the laundry, soft water imparts a snowy, dry fluffiness, and a

sweet-smelling cleanliness to the wash. The absence of sticky curds gives a long life to silks and linens and produces a quality in woollens and dainty laces that cannot be surpassed. Colored goods take on a brighter hue and delicate fabrics may be laundered without fear of harm. Textile mills and laundries the country over have found softened water to be absolutely invaluable in producing work of the highest quality, and for the same reason zeolite softened water in the home adds new crispness and coolness to clothes and linens, especially appreciated in the summer time. Large quantities of soap are saved by the use of soft water and the laundry work is done in less time and with less discomfort than those suffering from the handicap of hard water would believe possible. Those who do not do their laundry work at home will be pleased by the service rendered by zeolite softener equipped laundries.

In addition to its destructive property of forming soap curds, the hardness in water has another unfortunate characteristic; that of precipitating a hard, insoluble scale. Doubtless you have often seen the layer of stone-like scale that accumulates in hot water kettles — that is hard water scale. Likewise when water is heated in your boiler, or when hot water flows through pipes and faucets, this scale is deposited. Beside the danger of complete clogging when boilers or pipes become scaled up, it requires more fuel to obtain the necessary amount of heat, for scale is a very powerful insulator. Leaks and burned out pipes often result. And sometimes even whole piping systems have to be replaced. Soft water from a softener will positively prevent scale in any kind of water heater, which is evidenced by the fact that hundreds of softeners are in use in large commercial boiler plants for that very purpose. The increase in efficiency of heating systems, the reduced trouble, and expense from leaks, breaks and burned out pipes, and the immediate saving in fuel are sources of considerable satisfaction.

In the kitchen, glassware, silver and china will take on a brighter lustre and pots and pans will need less scouring when softened water is used. Dishwashing is done in half the time, and will not coarsen or roughen the hands, as strong cleansers are not needed. And in the cooking, too, its use becomes of really great importance, because if hard water is used, instead of scale merely being deposited on the container in which foods are being cooked, scale is actually deposited on the food itself. Vegetables such as peas, beans, corn, beets, or things having a skin or fibre structure are particularly susceptible to these hard water deposits, and are made harder, tougher, and more difficult to digest, to a marked degree. Leading

canning factories and preservers of fruits and jams have installed large softeners in their plants, as they have found that soft water adds tenderness, flavor and color to cooked vegetables and fruits. Housewives owning softeners report very noticeable improvements in their cooking, and better bread and pie crust to such an extent that they would never again attempt to run a house without it. Tea and other beverages are delicious when made with soft water.

When hard water is used in the kitchen, the teakettle becomes first coated with a deposit and if left long enough, partially filled with this deposit. I have taken a quart of such deposit from a single tea kettle. This of course makes it more difficult to heat water and there is of course a possibility of the scale getting into the food. With soft water, this trouble is entirely eliminated; there is no deposit on the tea kettle and no danger of scale in food.

The cost of a water softening apparatus for an average home would be from \$100 up. There are several companies furnishing water softening machines which work on the principle of zeolite or base-exchange softening. The size of the machine varies with the hardness of the water and the number of occupants of the house. The companies will make an estimate of the size. Where a city or general supply is used, records are available so that the company can make its estimates without difficulty. In many cases the hardness of the water can be estimated and the size of the machine calculated without an analysis. Sometimes it is necessary to make an analysis in order that the proper size may be obtained.

Financial returns are sometimes hardly noticeable though some laundries have shown sufficient saving in soap to pay for the plant. One laundry estimated a saving of 825 lbs. of soap and 534 lbs. of soda per week, which represented an investment return of 160% per year. The entire plant was paid for in seven months.

The saving in soap after the installation of a softening plant in the home is not as evident, but still it will pay interest on the investment. Other advantages which are not measured in money are the pleasantness and convenience of using soft water in washing and **bathing**, the better appearance of white clothes, the softer texture of all clothes and the longer wear of textiles generally.

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