

Simplex Water Softeners

The Problem — Hard Water

The original source of all the water we use is rain, which is itself soft. However, once the rain falls to earth it runs through the rock strata and dissolves from it metal salts such as those of Calcium and Magnesium. In many areas of Britain the water coming from the mains or a borehole is a solution of these salts. This is called HARD WATER because of the hard deposits caused in water systems when the salts come back out of solution like a rock turning back to rock. These hard deposits are generally called “scale”, However it is actually more like concrete forming a thick coating on heating elements in boilers and hot water tanks. Soaps and detergents do not work as well so larger measures are required for the same amount of cleaning. This in turn creates scum deposits which are difficult to remove. Boilers, dishwashers and washing machines fed with hard water need significantly more maintenance and cleaning. Scale build up on heating elements reduces their efficiency because of the time taken for the heat to get through to the water. Thicker scale means higher energy costs. Scale also insulates the elements.

The Solution

A cost effective way to solve these problems is to remove the dissolved hard mineral salts from the water and exchanging them with “soft salts” which are more soluble and therefore do not form hard scale. This is achieved by using one of our wide range of fully automatic water softeners. They work by a process known as ion exchange. The hard water passes through a high quality exchange resin column inside a pressure vessel. The resin removes the Calcium and Magnesium ions from solution and exchanges them for Sodium ions. When the resin is about to become exhausted the softener commences the regeneration phase which is initiated by timer or volume control. The actual regeneration is achieved then the softener draws a solution of common salt water (brine) through the column of resin which displaces the captured Calcium and Magnesium ions and replaces them with the Sodium ions in the brine. Throughout the regeneration period, the unwanted ions and the subsequent rinse water is flushed to drain and does not enter the service line. The regeneration period takes between 60 and 120 minutes depending upon the size of the softener and can be repeated as necessary over many years without significant loss of performance.



Simplex softeners can be specified with a number of different valve options depending on size and manufacturer preference. Some examples are shown in the photographs on the right.

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Simplex or single column water softeners are best suited to steady demand applications up to moderate capacities for the domestic and commercial markets. Industrial and other large demand systems often use duplex softening which is described on a separate leaflet. Regeneration is programmed to occur during low water usage periods, typically 2am. However instantaneous regen systems are available. During the regeneration cycle, simplex systems will normally pass hard water to service to maintain supply unless otherwise specified. Generally, simplex softeners will need to be sized to give at least one day's supply of softened water output before regeneration. This can be worked out using the flow rate information and capacity table on the reverse page. These types of softeners are very reliable and give many years of good service with minimal maintenance. They are therefore extremely cost effective.

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Specifying & Sizing

Fundamentally, the size of a water softener is governed by the amount of exchange capacity that is required by the application. The capacity of ion exchange resin is a function of the volume of the water that passes through it, the hardness of the incoming water, and the regeneration brine setting. On the chart below we show the capacity of each size of softener assuming the feed water has a hardness of 300mg/litre. The volume can be adjusted for different levels of hardness. Another important criteria to consider is the continuous flow rate required. This affects the size of valve that can be used and sometimes the size of the resin column, since the water needs to have a minimum contact time with the resin to achieve full softening. Short time higher peak flows can be tolerated, but this sometimes results in a low level of hardness passing through into service and can increase the pressure drop across the softener. At design flow rates you can expect a pressure drop of between 3/4—1 bar. The minimum pressure required is 2 bar and the maximum is 8 bar. All softeners require an electrical supply of 240v. Transformers are supplied (12V for Clack and 24V for Fleck).

Valve Specifications

Softener control valves are sized and specified according to the flow rate of the application. The inlet and outlet connection ports generally range between 3/4" and 3" for standard control valves with flow rates up to 50m³ per hour. Steady demand applications are suitable for either timer control or metered.

Consumables & Maintenance

Automatic water softeners need a supply of appropriate salt to make the required brine for regeneration purposes. Salt is most commonly supplied in 25kg bags of either granular or tablet type. This type of salt is manufactured specifically for water softening purposes and has a very high purity level. Other types of salt should not be used due to the levels of impurity or additives. The only attention required from the user is to check on a regular basis that the level of salt in the brine tank is kept topped up to ensure a saturated brine solution is available for regeneration. Although softeners are very reliable, as with any other piece of essential plant, routine servicing is strongly recommended. This will ensure many years of reliable service from the plant.

Simplex Sizing Table

Simplex Model	SX25	SX50	SX75	SX100	SX150	SX250	SX350	SX500	SX750	SX1000	SX1250
Flow Rate m ³ /hr 1"	1.0	2.0	3.0	4.0	6.0						
1.5"						10.0	11.6				
2"							14.0	20	24.0		
3"										40.0	50
Vessel Size (")	9x35	10x54	13x54	14x65	16x65	21x62	24x72	30x72	36x72	42x72	48x72
Brine Tank Volume (Litres)	120	160	300	300	500	750	1000	1000	1000	1500	1750
Salt Used per Regen (Kg)	3.5	7.0	10.50	14.0	21.0	35.0	49.0	70.0	105	140	175