BASE EXCHANGE WATER SOFTENERS

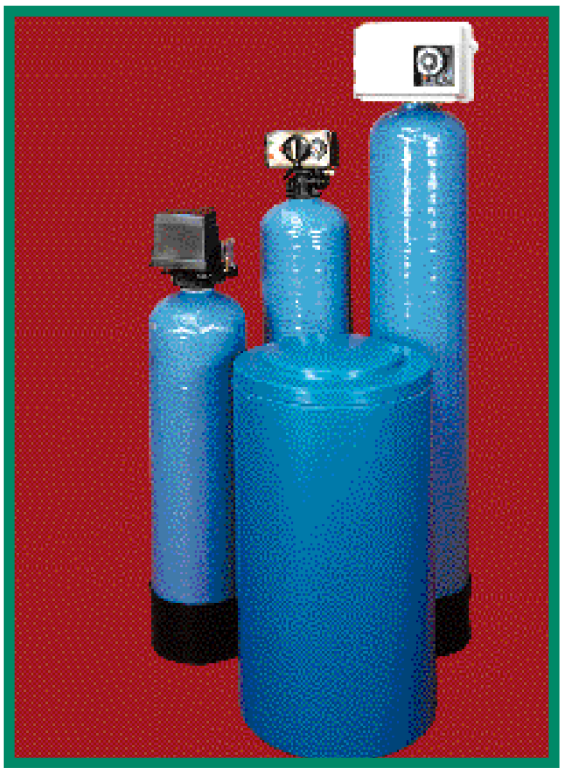
SIMPLEX
WATER SOFTENERS

The Problems

The need to reduce the hardness of water is the most common form of water treatment. Hard water is created when naturally soft rain water percolates through subterranean rock strata and dissolves many solids including, in particular, calcium and magnesium. There are many areas therefore, where the supply water contains a significant level of these salts. It is called "hard water" because of the hard deposits created when this type of water is used in many applications.

The deposits are often called scale. However, it is actually more like concrete, forming a thick coating on heat exchanging elements and the inside of boilers, tanks and pipes. In addition, the hard minerals left in solution significantly detract from the performance of soaps and detergents which then have to be used in greater quantities to achieve the necessary cleaning performance. This not only adds to the level of deposits occurring inside systems and equipment, it also adds significantly to the chemical waste discharged into our sewer systems.

The other main problem created by scale build up is the reduction in efficiency of all heat exchange systems due to the insulating effect of the deposit. This will increase the energy costs and, in addition, can create overheating on the surfaces of the heat source, thereby causing premature failure.



Autorol 255, Fleck 5600 and 2750 Valves illustrated.

The Solutions

A cost effective way to solve these problems is to remove the dissolved hard mineral salts from the water, replacing or 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 the 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 when the softener draws a solution of common salt - called 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 all the subsequent rinsing 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 it can be repeated as often as necessary over many years without significant loss of performance.

Simplex Softeners

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 larger demand systems often use duplex softening which is described on a separate leaflet). Regeneration is programmed to occur during low water usage periods - typically 2 am. However, instantaneous regen systems are available.

During the regeneration cycle, simplex systems will normally bypass 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.

These types of softeners are very reliable and give many years of good service with minimal maintenance. They are therefore extremely cost effective.

The Right Product
...At the Right Price
...At the Right Time

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Valve Specification

Softener control valves are sized and specified according to the flow rate required by the application. The inlet and outlet connection ports generally range between $^{3}/_{4}$ - 3 inches for standard control valves with flow rates up to 50m^3 per hour.

Steady demand applications are suitable for either timer control or volume control. Variable demand systems are better served by using volume control via in-built metering.

Specifying and Sizing

Fundamentally, the size of a water softener is governed by the amount of exchange capacity that is required for the application. The capacity of ion exchange resin is a function of the volume of water that passed 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 (21 degrees Clarke) and a brining rate of 140g NaCl per litre of resin. The volume can be adjusted on a pro-rata basis 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 term 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 10-15 psi. Usually, all automatic water softeners need a minimum supply water pressure of 25 psi and can operate up to at least 100 psi.

All these softeners require an electrical supply of 240 Volts and come with 24 Volt transformers (except for 5600 Mechanical Valves).

Technical Details and Sizes

RESIN VOLUME (Litres)		10	14	20	25	30	40	50	60	75	80	100	120	140	150	200	250	300	350	500	750	1000	1250
Maximum Continuous Flow (m^3/hour) for Port Size:	$^{3}/_{4}$"	.40	.56	.80	1.0	1.2	1.6	2.0	2.4	3.0													
	1"	.40	.56	.80		1.2	1.6	2.0		2.8	3.2	4.0	4.8	5.6			5.9		5.9				
	1$^{1}/_{2}$"											4.0	4.8	5.6			10		11.6	11.6			
	2"														6.0	8.0	10	12	14	20	24		
500 litre	3"																				30	40	50
Capacity in m^3 at 300 mg/lit $CaCO^3$		1.6	2.3	3.3	4.1	5.0	6.6	8.3	10	12.5	13	16.7	20	23	25	33	42	50	58	84	125	167	208
Maximum Height mm		960	960	1100	1100	1100	1330	1580	1430	1580	1590	1984	1984	1988	2098	2098	2098	2335	2335	2560	2693	2370	2470
Vessel Type		817	822	835	9x35	1035	1044	1054	1248	1354	1354	1465	1465	1665	1665	2162	2162	2472	2472	3072	3672	4278	4882
Brine Tank (Diam. x Height) mm				285 x 285 x 960			370 x 430 x 960		480 x 1040	109 x 480	480 x 1040	950 x 700		900 x 840		1100 x 880		1250 x 960		1330 x 1050	1050 x 1430		
Salt Storage (Kg)		80	80	80	80	80	120	120	160	160	160	300	300	400	400	500	500	750	750	1000	1500	1500	1500
Salt Used/Regen (Kg)		1.4	2.0	2.8	3.5	4.2	5.6	7.0	8.4	10.5	11.2	14	17	20	21	28	35	42	49	70	105	140	175
Shipping Weight (Kg)		16	20	30	40	45	65	75	75	95	100	125	140	165	185	235	270	335	370	500	950	1240	1530

NB To prevent damage to the vessels this equipment must be protected from negative pressure from the drain or the supply. A vacuum relief valve is recommended on the inlet supply and is supplied by us on all equipment using vessels of 370 mm diameter upwards.

The maximum water temperature permissible is 45°C.

Consumables and maintenance

Automatic water softeners need a supply of appropriate salt to make the required brine for regeneration purposes. Salt is most commonly supplied in 25 kg bags of either granular or pellet type. This type of salt is manufactured specifically for water softening purposes and has a very high purity level. Sometimes on very large systems P.V.D. salt can be supplied in bulk. 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 is generally straight forward and will ensure many years of reliable service from the plant.

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