BASE EXCHANGE WATER SOFTENERS

DUPLEX
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 water supply 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 systems.

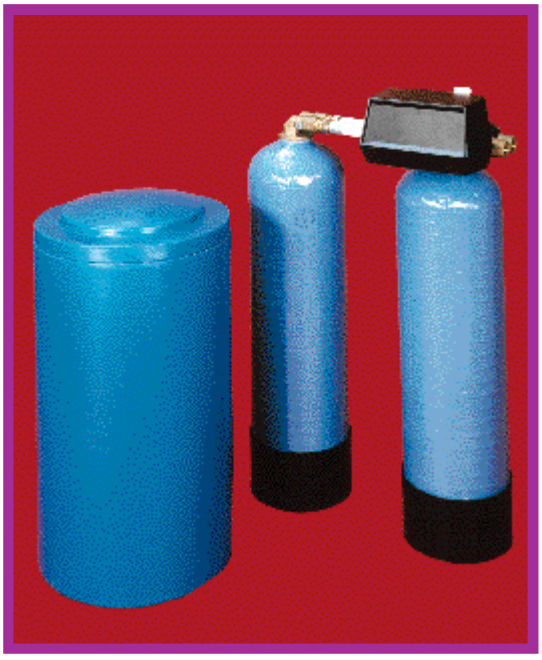
The deposits are often called scale. However, it is actually more like concrete, forming a thick coating on heat exchanging elements and the inside of boilers, tanks and pipes. In addition, the hard minerals left in solution significantly detract from the performance of soaps and detergents which then 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.

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.



Fleck 9000 Valve illustrated.

Duplex Softeners

Duplex softeners function similarly to simplex units, except that they consist of two resin columns where one is in service and the second is on standby. The flow of water to service is metered and when the first column reaches exhaustion the control valve automatically switches the service flow to the second column and then regenerates the exhausted first column. It is then put on standby until required again for service. In this way a duplex softener is capable of giving a continuous 24 hour supply of softened water. Duplex softeners are therefore ideal for sites with large variations in water demand or for applications where a continuous and uninterrupted supply of soft water is essential. It is normal practice to size a duplex unit on the basis that each column regenerates once each day. Due to the ability to change columns only as required, it is possible to minimize salt usage.

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

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Valve Specification

Duplex control valves are sized and specified according to the required flow rate for the application. The inlet and outlet connection ports typically range between 1-3 inches and in standard configurations can achieve flow rates of up to 50m^3 per hour.

Specifying and Sizing

The size of any water softener is governed by the amount of exchange capacity 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. It is possible periodically to allow for higher capacities than shown (up to two regenerations per column per day) to accommodate exceptional demand periods. The plant should not be sized in this way for routine use as there would be a danger of a loss of quality of the softened water. The figures shown assume the feed water has a hardness of 300 mg/litre (21^o Clarke). These volumes 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 the 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 will sometimes result in a low level of hardness passing through to service and can increase the pressure drop across the softener. At the design flow rates shown there would be a pressure drop of between 10-15 psi across the plant. All automatic water softeners need a minimum supply water pressure of 25 psi. In the case of duplex units, this pressure must be available at the design flow rate so that there is sufficient pressure to allow a regeneration to occur whilst the demand flow is passing through the service column. They are designed to operate up to at least 100 psi.

All these softeners require an electrical supply of 240 Volts and come with 24 Volt transformers.

Technical Details and Sizes

RESIN VOLUME (Litres)		4	6	10	12	14	20	30	40	50	60	80	100	120	140	150	190	200	250	300	350	500	750	1000	1250
Maximum Continuous Flow (m^3/hour) for Port Size:	1"	0.16	0.24	0.40	0.48	0.56	0.80	1.2	1.6	2.0	2.4	3.2	4.0	4.8	4.8	4.8	4.8	4.8	4.8						
	1½"												4.0	4.8	5.6	6.0	7.6	8.0	8.4	8.4	8.4				
	2"													4.8	5.6	6.0	7.6	8.0	10	12	14	20	24		
	3"																					20	30	40	50
Capacity in m^3 at 300 mg/lit $CaCO^3$		0.668	1.0	1.67	2.0	2.3	3.3	5	6.6	8.3	10	13.3	16.7	20	23.3	25	31.7	33.4	41.7	50.1	58.4	83.5	125	167	208
		(These capacities are for one regeneration per column per day.)																							
Maximum Height mm		960	960	960	1060	730	1060	1060	1290	1540	1390	1540	1944	1974	1978	2098	2142	2148	2148	2335	2335	2682	2693	2370	2470
Vessel Type (x2)		613	618	817	635	822	835	1035	1044	1054	1248	1354	1465	1465	1665	1665	1865	2162	2162	2472	2472	3072	3672	4278	4882
Brine Tank (Diam. x Height)		285 x 285 x 960					370 x 430 x 960		1040 x 480			950 x 700	900 x 840	1100 x 880			1250 x 960			1330 x 1050			1050 x 1430	Two Tanks 1050 x 1430	
Salt Storage (Kg)		80	80	80	80	80	120	120	160	160	160	300	400	500	500	500	750	750	750	1000	1000	2x 1000	2x 1800	2x 1800	2x 1800
Salt Used/Regen (Kg)		.56	.84	1.40	1.68	2.0	2.8	4.2	5.6	7.0	8.4	11.2	14	17	20	21	26.6	28	35	42	49	70	105	140	175
Shipping Weight (Kg)		25	30	35	39	42	50	75	103	125	140	198	260	315	360	390	480	490	625	780	820	1150	1780	2525	3025

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^{o}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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