

Nitrate Reduction Systems

The Problems

The presence of Nitrates in water causes many problems, ranging from blue baby syndrome (if fed to babies under 6 months old) to contamination of poultry if used as feed water for farmed birds. The source of Nitrates in ground water is usually from farming fertilisers. The EEC permitted maximum is 50mg/l with an advisory maximum of 25mg/l.

Nitrate dissolved in water is not able to be removed by simple filtration. It can only be reduced by either regenerable or disposable cartridge type ion exchange systems or eliminated by reverse osmosis. RO systems can be used to treat all of the water for a specific application, or just to remove the Nitrates from a drinking water supply in the kitchen.

For single dwellings with one drinking water tap and low water consumption, a point of use system provides efficient reduction at low cost. For large of multiple properties, commercial and industrial applications, regenerable ion exchange systems will be preferred. It is these systems that are illustrated here.



How Do Nitrate Removal Systems Work?

Ion exchange Nitrate removal is a similar process to water softening, using slightly different polymer resin. The resin removes the Nitrate (and some of the Sulphate due to its chemical similarity) from the water and replaces it with Chloride ions. Once the resin bed is nearly exhausted of Chloride ions, the control valve carries out a regeneration of the bed.

This is achieved by passing a Chloride rich brine solution (made up from common salt dissolved in water) through the resin bed, which flushes out the Nitrates and Sulphates to drain, replacing them with Chlorides again. After a final rinse to remove excess brine, the unit is automatically put back into service again. The only input required by the user is to ensure that the brine tank is kept topped up with salt.

For fixed or constant flow rates a simple timer controlled valve will suffice. This will effect the regeneration of the resin bed at a pre-set time interval. For varying demands, a water meter controlled unit is more suitable, regenerating only after a set volume of water has passed through the resin bed. With applications that require continuous high flows, a duty / standby "duplex" system will be required.

Regeneration

Regeneration is controlled by a valve mounted ontop of the pressure vessel containing resin. A solution of brine is drawn through the column and the chloride from the salt displaces the Nitrate and Sulphate ions, flushing them down the drain.



Clack WS1 valve



Fleck 2910 valve

Specifying And Sizing

The capacity of a Nitrate removal unit is a function of the amount of resin in the column, the amount of Nitrate and Sulphate, and the amount of salt used at each regeneration. The output will therefore increase or decrease according to local circumstances and the salt dosing rate. The raw water can also change dramatically in composition depending on the season and weather conditions. Commercial and industrial systems are built with separate brine tanks and can be simplex or duplex. They will be assembled with the most suitable valve for the peak flow rate.

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Domestic Technical Data

Cabinet Model	Trojan			Caribbean	
Resin Volume Litres	7	10	14	20	30
Service Flow M3/hr	0.28	0.40	0.56	0.78	1.20
Salt Used Per Regen KG	1.75	2.5	3.5	5.0	7.5
Height mm	660	660	805	1120	1120
Width mm	230	230	230	350	350
Depth mm	450	450	450	520	520
Inlet/outlet	3/4"	3/4"	3/4"	3/4"	3/4"

Commercial / Industrial Technical Data

Resin Volume	25	50	75	100	150	250
Service Flow M3/hr	1.0	2.0	3.0	4.0	5.6	10.0
Salt Used Per Regen KG	6.25	12.50	18.75	25.0	35.0	62.5
Vessel Type	935	1054	1354	1465	1665	2162
Inlet/outlet	1"	1"	1"	1"	1"	1.5"
Brine Tank Dimensions mm	285 x 285 x 960	370 x 430 x 960	480 x 1040	700 x 950	840 x 900	960 x 1250

Capacity Table

Resin Litres	Service Flow M3/hr	150ppm NH4 + SO4	200ppm NH4 + SO4	250ppm NH4 + SO4	300ppm NH4 + SO4	350ppm NH4 + SO4	400ppm NH4 + SO4	450ppm NH4 + SO4
10	0.4	3.33	2.50	2.00	1.67	1.43	1.25	1.11
20	0.8	6.67	5.00	4.00	3.33	2.86	2.50	2.22
50	33.33	16.67	12.50	10.00	8.33	7.14	6.25	5.56
100	66.67	3.33	25.00	20.00	16.67	14.29	12.50	11.11
200	133.33	66.67	50.00	40.00	33.33	28.57	25.00	22.22
300	200.00	100.00	75.00	60.00	50.00	42.86	37.50	33.33