

H-6516

Ion Exchange Demonstrator

Purpose

The Hampden **Model H-6516** Ion Exchange Demonstrator is a bench mounted unit designed to demonstrate the use of ion exchange resins for either continuous water softening or demineralization. The equipment is designed to emulate the industrial operation of such units, including monitoring breakthrough and regeneration cycles.

Description

Two vertical transparent tubes mounted on a steel panel contain the cation and anion resins. A manifold arrangement at the inlet and outlet to the tubes allows the flow configuration to be changed to simulate the cycles involved in the operation of a deionizer. Union couplings permit the tubes to be removed from the manifolds and interchanged for softening/demineralization experiments.

Regenerant and test or wash solutions contained in separate sumps are selected by a traversing tube and delivered to the apparatus by pump through a control valve and flowmeter. Effluent may be fed to a sump tank and treated water collected in bottles for test on hardness, conductivity, or dissolved solids. A conductivity meter connected to the outlet of the second ion exchange bed gives a continuous indication of the progress of demineralization. The apparatus is supplied with typical commercial cation and anion resins. Other ion exchange materials may be used so that their characteristics, exchange capacity, etc., may be measured and compared.

Water softening theory

The usual ion exchange material employed in water softening is a sulphonated styrene based resin, supplied in the sodium form. This has a strong affinity for calcium and magnesium ions and will also remove ferrous ions after the

almost complete removal of calcium and magnesium. Softening may be carried out as a batch process by stirring a suspension of resin in the water, until equilibrium or an acceptable level of hardness is reached. It is more convenient to operate as a continuous flow process, passing the water slowly downward, through a column of resin beads. The exchange reaction takes place rapidly enough for the upper layers of the bed to approach exhaustion before the lower layers are able to exchange ions. Thus, there is a zone of active exchange which moves down the column, until the resin at all depths becomes exhausted. When the zone of active exchange reaches the bottom of the column, the emerging water begins to show an increasing hardness. This is the breakthrough point when it becomes necessary to regenerate the resin with a strong sodium chloride solution.

Specifications

Pump

Self priming diaphragm type

Flowmeter range

0.34–2.75 oz/min

Sump tank capacity

5.5 gal.

Anion exchange resin

0.2 gal.

Cation exchange resin

0.26 gal.

Chemicals required (not supplied)

- Sodium chloride
- Hydrochloric acid
- Sodium hydroxide

Experiments

- The exchange capacities of different resin materials
- Water softening using a cationic resin
- Regeneration efficiency of a softening system
- Demineralization using two-bed exchange
- Regeneration efficiency of a cationic and anionic resin

Services Required

Electrical supply

120V-1ph-60Hz

Water supply

Initial fill and drain



All Hampden units are available for operation at any voltage or frequency

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