



DOWEX Ion Exchange Resins

Backwash Flow Rate Calculations

Ion exchange resin beds are backwashed periodically in order to reclassify the resin beads and to remove particulates and resin fines. It is important that the backwash step be performed correctly in order to maintain good hydraulic properties in the resin bed during the regeneration and service cycle. A backwash is accomplished by applying a uniform flow of water from the bottom of the bed in order to fluidize the resin and disengage any resin fines and suspended material from around the resin beads. Typically, the volume of backwash water required is approximately 2 displacements of the freeboard volume (see Figure 1).

In order for resin fines and particulate to be removed from a bed of resin it is suggested that the resin bed be expanded to within 12 inches (30 cm) of the backwash collector at the top of the vessel (see Figure 2).

The percent expansion for an ion exchange vessel can be calculated using the formula below.

$$\% \text{ Expansion} = \frac{\text{Fluidized Height}}{\text{Settled Bed Depth}} \times 100$$

Figure 1. IX Vessel at Start of Backwash

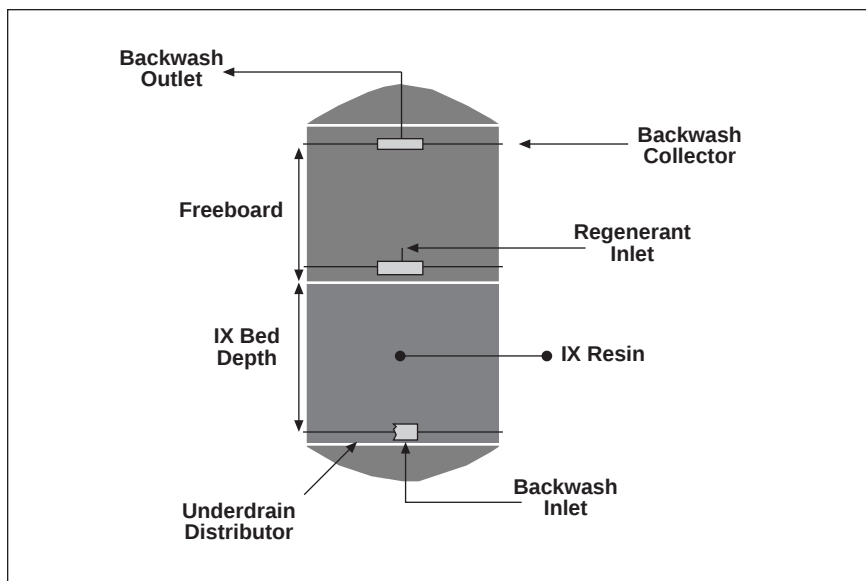
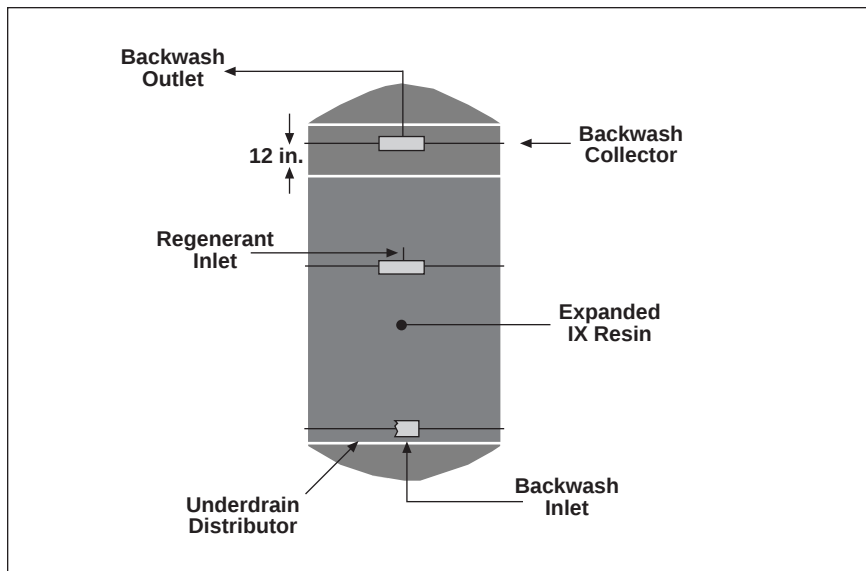


Figure 2. IX Vessel During Backwash



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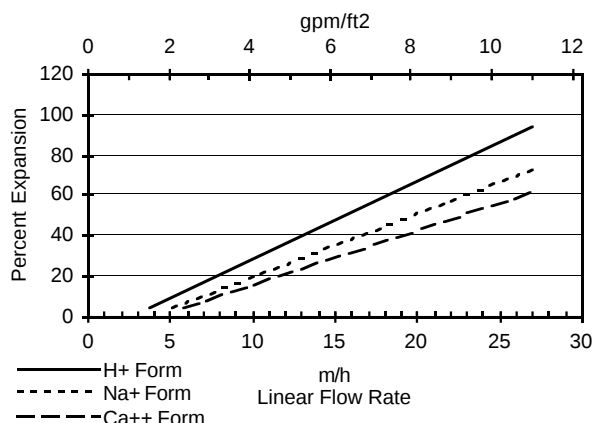
The expansion characteristics of an ion exchange resin are a function of water temperature, resin bead size and resin density which are unique for each particular resin. In order to determine the backwash flow rate for a resin it is necessary to consult the

technical product literature which is specific to that particular resin. In the literature there will be a graph of backwash expansion vs. flow rate at a standard water temperature, typically 77°F (25°C). This graph is used to determine the backwash flow

rate which will yield the necessary resin percent expansion (see Figure 3). The backwash flow rate can be adjusted for water temperature with either of the following equations.

Figure 3. Typical Backwash Expansion Graph

Temperature = 25° C (77° F)



For other temperatures use:

$$F_T = F_{77°F} [1 + 0.008 (T_F - 77)], \text{ where } F \equiv \text{gpm/ft}^2$$

$$F_T = F_{25°C} [1 + 0.008 (1.8T_C - 45)], \text{ where } F \equiv \text{m/h}$$

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Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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