

Technical Service Bulletin 907

Loading of Resin

Ion Exchange Column is regenerated when design output between regeneration (OBR) is achieved or designed run hours are completed or outlet water quality deteriorates. It is not correct practice to exhaust bed completely as the regenerant quantity is never sufficient to fully regenerate resin. The typical regeneration process of an ion exchange resin column is as follows:

Backwash	<p>Backwashing discharges accumulated particulates from the ion exchange resin and serves to loosen the compaction and entanglement of the ion exchange resin layer that has been compressed from the top. Since backwash bed expansion varies with temperature and flow rate, it is necessary to adjust the optimal conditions according to the equipment and season.</p> <p>In counter-current regeneration (CCR) units, backwash shall be done only after 7-8 service cycles, followed by double regeneration, as a minimum.</p>
Settling	<p>After backwashing, wait until the expanded ion exchange resin layer naturally settles.</p>
Injection	<p>The process involves passing the regenerant uniformly through the ion exchange resin layer to restore its exchange capacity. The amount of regenerant, concentration, and flow rate vary depending on the type of equipment and its purpose.</p>
Slow rinse	<p>After the injection process, unreacted regenerant remains within the resin layer. To make full use of it, water is used to push it through at the same flow rate & same direction as the injection. This is also referred to as a slow rinse.</p>
Rinse	<p>Following the slow rinse process, the procedure to wash out the remaining regenerant waste liquid in the resin layer involves increasing the water flow rate to the same as the service flow rate and same direction. Rinsing is carried out until the regenerant is completely washed out, and the target water quality is achieved. This is also referred to as a fast rinse</p>
Service	<p>Once the target water quality is secured, the service is initiated to produce the desired treated water and supply to the process. If the water quality deteriorates during service, or after a set amount of target water has been produced, the regeneration process is repeated starting from the backwash step.</p>

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1. Example of Co-current Regeneration

The table below is for reference only and may vary depending on site conditions.

1.1 Cation Exchange Column

Process	Backwash	Settling	Water filling	HCl Injection	Slow Rinse	Rinse	Service
Time (min)	15	5	5	30	30	10	-

1.2 Anion Exchange Column

Process	Backwash	Settling	Water filling	NaOH Injection	Slow Rinse	Rinse	Service
Time (min)	15	5	5	30	30	10	-

Note

As the Anion Resin ages it requires more time to rinse. At the same time the rinse time can be cut short if expected conductivity is achieved.

1.3 Weak Acid Cation Column

Process	Backwash	Settling	Water filling	HCl Injection	Slow Rinse	Rinse	Service
Time (min)	15	5	5	30	30	10	-

1.4 Weak Base Anion Column

Process	Backwash	Settling	Water filling	NaOH Injection	Slow Rinse	Rinse	Service
Time (min)	15	5	5	30	30	10	-

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2. Example of Counter-current Regeneration

2.1 Cation Exchange Column

Process	Backwash (Optional)	Middle Collector Wash	Settling	Water Filling	HCl Injection	Slow Rinse	Rinse	Service
Time (min)	15	5	3	2	30	30	10	-

Note

In Counter-current type regeneration, backwash should be carried out only after 7- 8 service cycles. After Backwash the Resin needs to be regenerated at least twice.

2.2 Anion exchange column

Process	Backwash (Optional)	Middle Collector Wash	Settling	Water Filling	NaOH Injection	Slow Rinse	Rinse	Service
Time (min)	15	5	3	2	30	30	10	-

Note 1

In Counter-current type regeneration, Backwash should be carried out only after 7- 8 service cycles. After Backwash the Resin needs to be regenerated at least twice.

Note 2

Thoroughfare & Layered Bed Regeneration has not been discussed here as it involves lot of steps which are difficult to tabulate in a simple table.

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3. Example of Mixed Bed Regeneration Time Schedule

The timers in the table below are for reference only and may vary depending on site conditions.

Both Beds			Cation Bed			Both Beds				
Process	Backwash	Settling	Process	HCl Injection	Slow rinse	Drain	Mixing	Water Filling	Rinse	Service
Time (min)	15	3	Time (min)	30	30	5	15	5	10	-
			Anion Bed							
			Process	NaOH Injection	Slow rinse					
			Time (min)	30	30					

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