Softeners: Salt

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Salt, NaCl, is a simple molecule that gets more complex with more than a dozen water softening salt grades available, marketed under a score of brand labels, and differentiated by their particle size, shape, purity, and manufacturing method. Basically, there are three methods to produce salt: rock mining, vacuum, or solar. The type of salt that is most economical depends partly on where it is found. Rock, solar, and vacuum manufacturers aren’t uniformly distributed through the United States. The type of salt used also depends upon the purity of salt required. Table 1 lists typical purities of the three forms of salt.

<table>
<thead>
<tr>
<th>Type</th>
<th>NaCl (%)</th>
<th>Ca/Mg (ppm)</th>
<th>Insolubles (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse Southern Rock</td>
<td>98.5–9.0</td>
<td>3000-4500</td>
<td>100-500</td>
</tr>
<tr>
<td>Coarse Solar</td>
<td>99.3-99.8</td>
<td>600-1000</td>
<td>100-900</td>
</tr>
<tr>
<td>Vacuum Granulate</td>
<td>99.5+</td>
<td>400-900</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Common Purified</td>
<td>99.95</td>
<td>&lt;50</td>
<td>20</td>
</tr>
</tbody>
</table>

Southern Rock Salt

The underground mining of salt is the second oldest method of producing salt. A typical design includes two shafts in a mine - one for personnel and one to lower equipment and materials into the mine, as well as to hoist the mined salt to the surface. Large chunks of salt are crushed and the salt is then loaded into "Skips" (large holding bins) and then hoisted above ground.

Southern Rock salt is mined from Louisiana and Texas and barged up the mid-continent river system to the Midwest. The major impurity in rock salt is slowly soluble anhydrous calcium sulfate that accumulates as a sandy sludge in brine makers, making periodic cleaning necessary.
Solar Salt

The oldest method of salt production known to man is solar evaporation. Solar salt production is the capturing of seawater in shallow ponds where the sun evaporates most of the water. This method uses two types of ponds -- concentrating ponds and crystallizing ponds. In the concentrating ponds the water from the sea or ocean evaporates due to the effects of sun and wind. The highly concentrated salt brine is then drained into the crystallizing pond. In the crystallizing pond the salt crystals begin to grow. When the salt layer is thick enough, the salt is harvested with a mechanical harvesting machine.

Solar salt is prized by residential softener dealers for its economy, appearance, and perceived quality. It has a higher purity than rock salt, which means brine tanks have to be cleaned less frequently. Fine environmental insoluble contaminants natural to open-air solar salt operations can still be present and clog valves and resin. Also, sticky organic residues can color the brine, clump resin beads, and provide food for microorganisms in the resin bed. Imported solar salt can contain coral and silica that can clog screens and valves.

Vacuum Steam Crystal Salt

Salt from any of several sources is dissolved to create saturated brine. This brine is then pumped into vacuum pans. The steam vessels are normally in a series of three. The brine is pumped into the pans, and steam is then introduced. When the brine reaches the boiling point, the brine separates into steam and the salt begins to crystallize. The heavier salt crystals will fall to the bottom of the pan in a slurry. The salt slurry will then be drawn off and sent to the dryer wheel.

Vacuum salt is created in plants throughout the country. It can be more expensive per ton because of the energy required to produce it, but the transportation costs for rock or solar salts can compensate for this expense in areas near the vacuum plants.

Vacuum salt offers the highest purity and cleanliness, making it idea for rapid brining and reducing the need for cleaning brine tanks. One must make sure the bulk briner or brine system is designed to handle the granulated salt without plugging it up.

References

- *Are You Worth Your Salt*, David Strietelmeier, Water Technology, September 1993
- Salt Institute website at [www.saltinstitute.org](http://www.saltinstitute.org)
- Morton Salt website at [www.mortonsalt.com](http://www.mortonsalt.com)