Sodium gluconate is widely used in the concrete industry in several applications. One of the reasons gluconate finds favor over other materials is its uniform quality and consistent performance.

The advantages of gluconate include:

- Reducing water without sacrificing workability and strength.
- Retarding setting time and improving workability without increasing water addition. This will aid in difficult conditions, such as, long hauling times, hot summer days or tropical weather operations and placement of concrete in large areas.
- Improved resistance to freeze-thawing.
- Decreased bleeding, segregation, dry shrinkage and cracking.

**Water Reducing**

As a water reducer, sodium gluconate allows better workability of the concrete mix and provides increased slump. By careful modification of the water-cement ration and the addition of sodium gluconate, adjustments can be made to increase strength of the structure or actually reduce the cement content while maintaining the original strength.

**Set Retarding**

Besides its wetting agent function, sodium gluconate is a good retarder. Retarding admixtures are used in hot-weather concreting operations when delays in transport and handling between mixing and placing may result in early setting and loss of workability. In concreting deep bore holes where the temperature is usually higher than 90° C, retarders have to be used. In the construction of large structural units and dams the manufacture of exposed aggregate panels, retarders are incorporated into concrete. Recently, retarders have also been used to maintain concrete returned from the ready-mix concrete trucks.

The action of retarders is related mainly to their influence of the tricalcium silicate and tricalcium aluminate components of cement. Sodium gluconate’s retarding action is possibly related to the poisoning effect on the hydration and physical characteristics of these components. The induction period can be controlled between 4.5 and 55 hours with 0.05 and 0.15% of gluconate. The exact retarding effect is dependent on temperature, water: cement ration, cement type, etc.

The table below shows a specific example of how the retardation of the set depends on the added amount of sodium gluconate:

<table>
<thead>
<tr>
<th>% of Sodium Gluconate Added Based on Weight of Cement</th>
<th>Time (hours) to Beginning or End of Setting, Compared with a Control series Portland Cement 275</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning</td>
</tr>
<tr>
<td>0.05</td>
<td>.4</td>
</tr>
<tr>
<td>0.10</td>
<td>1.1</td>
</tr>
<tr>
<td>0.15</td>
<td>3.4</td>
</tr>
<tr>
<td>0.20</td>
<td>6.9</td>
</tr>
<tr>
<td>0.30</td>
<td>16.5</td>
</tr>
</tbody>
</table>
Corrosion Inhibition
Sodium gluconate is an excellent chelator and as such, provides a degree of protection against corrosion of the re-bar used in concrete.

In addition to concrete, the inclusion of gluconates can modify the physical characteristics of mortar, grout and various masonry products.

Specifications
Sodium gluconate is available in solid or liquid form. Sodium Gluconate FCC comes in both granular and powder form. Liquid Gluconate 60 (LT) is available in drums, totes or bulk. Gluconic Acid 50% is also available in drums or bulk. In addition, S-45 (~30% gluconate) is widely used in the concrete industry.

References