SODIUM SULFATE, $\text{Na}_2\text{SO}_4$

**Typical end products**
Table salt, flavoring agents, preservatives.

**Chemical curve:** Sodium sulfate R.I. per Conc% b.w. at Ref. Temp. of 20°C

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**Introduction**

Sodium chloride (NaCl), or common table salt, is a water soluble and colorless crystalline solid. The solution of dissolved salt in water is called brine.

Sodium chloride occurs as rock salt in nature, in natural brines, such as sea water. Rock salt deposits are mainly located in the USA.

The largest use of salt (in the form of brine) is in the electrolytic production of chlorine. In the food industry, salt is used as a food flavoring agent, preservative and color developer.

**Application**

Salt is obtained in three different ways: solar evaporation of seawater, mining of rock salt, and from brine wells (solution mining).

For special grades of brine to be used in foods or chemicals, pretreatment of the brine solution may be required to remove calciums. The main impurity left in the saturated brine feed is dissolved sodium sulfate ($\text{Na}_2\text{SO}_4$).

The saturated brine solution is recycled through a heat exchanger in a crystallizing evaporator. By adding heat, the saturated brine solution starts to crystallize and evaporate.

If the brine solution is over heated, a large quantity of sodium sulfate will also crystallize. This makes the salt impure. It is essential to know the amount of sulfate present in the brine to achieve both rapid production and high salt quality.

The salt-brine slurry is then washed, dried and filtered, before packaging.

**Instrumentation and installation**

The K-Patents Process Refractometer measures the sulfate levels of the brine in the crystallizing evaporator. By measuring the amount of impurities, the crystallization process can be controlled better, thus giving high purity salt with reduced production times.

Typical measurement ranges are 0-30 g/l (0-0.25 lb/gl) sulfate in brine. Common temperatures are 40-60 °C (104-140 °F).
**Instrumentation Description**

**Teflon Body Refractometer PR-23-M.** A compact refractometer for chemically aggressive solutions and ultra-pure fine chemical processes. Connected to the process by a G1/2” female or a 1/2” NPT process connection. It has a built-in flow cell designed to keep all metal and other easily corroding parts from coming into contact with the process liquid.

**Saunders Body Refractometer PR-23-W.** A heavy-duty refractometer for chemically aggressive liquids in large-scale production and in large pipe sizes (diameter 50, 80 or 100mm/2”, 3” or 4”). The Saunders body material is graphite cast iron, which provides a solid mechanical base. A PFA-lining ensures the chemical resistance.

**K-Patents Process Refractometer PR-43-GP** is a general industrial refractometer for pipes and vessel installations. The PR-43-GP can be installed with 2, 3 and 4 inch flange and 3 inch Sandvik L coupling process connections and a variety of flow cells for pipe sizes of 1 inch and larger.

**User Interface**

Selectable multichannel MI, compact CI or a web-based WI user interface options allow the user to select the most preferred way to access and use the refractometer measurement and diagnostics data.

**Measurement range**

Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 % by weight.