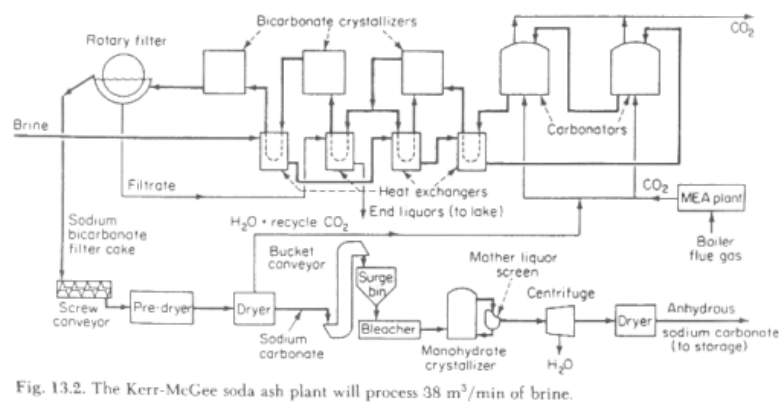# Shreve Chemical Process Industries Download Pdf

MANUFACTURE OF SODIUM BICARBONATE

Sodium bicarbonate, or baking soda, is made by treating a saturated solution of soda ash with CO_2 in a contacting tower at about 40°C. The suspension of bicarbonate formed is removed from the bottom of the tower, filtered, and washed on a rotary drum filter. The cake is then centrifuged and dried on a continuous belt conveyor at 70°C. Bicarbonate made in this fashion is about 99.9% pure. Sodium bicarbonate is widely used in the food industry, in making rubber, in pharmaceuticals as an antacid, in fire extinguishers, soap and detergents, rug cleaners, animal feeds, and textiles, in leather and paper manufacturing, for flue-gas scrubbing, and for many other diversified small-scale uses. The manufacturing capacity in the United States was 250,000 t/year in 1980.

The Piceance Basin of Colorado has nahcolite (natural sodium bicarbonate) beds among

*Parkinson, Soda Ash Plant Exploits Mineral-Laden Brine, *Chem. Eng.* 84 (24) 62 (1977)

Fig. 13.2. The Kerr McGee soda ash plant will process 38 m^3/min of brine.

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2\. Shang X, Hu Q. The state of chaos and complexity in nonlinear science, as exemplified by the study of coupled nonlinear oscillators. 2003;9(7):1103-1122. 3\. Pronk H, Schomerus H. Orthogonal distance-based estimation of weighted phase lag index for EEG analysis. 2012;12(22):2735-2743. 4\. Pronk H, Schomerus H. Parametric mapping of phase synchronization measures: Comparisons of weighted phase lag index, phase sync, and circular variance. 2011;11(2):529-542. **Introduction** We use the phase plane to illustrate some special cases, the graph of the phase function z of the system $(\[1-3\])$-$(\[1-7\])$ is plotted as Figure \[fig:1\].\ The phase plane diagram for system $(\[1-3\])$-$(\[1-7\])$ is plotted in Figure \[fig:2\]. **The Model** \[tab:1\] In chemical engineering the system of nonlinear ordinary differential equations:$$\label{1-1} \frac{dy_{1}}{dt}=\frac{\varepsilon_{1}-\alpha y_{1}^{\beta}-\beta y_{2}}{\alpha_{1}+y_{1}},$$ $$\label{1-2} \frac{dy_{2}}{dt}=\frac{\varepsilon_{2}-\gamma y_{1}^{\alpha}-\delta y_{2}^{\delta}}{\alpha_{2}+y_{2}},$$ where y_1, y_2 are dimensionless concentrations of urea and acetate, respectively, and ε_1, ε_2 are dimensionless concentrations of ammonia and phosphoric acid, respectively, α_{1}, α_{2} and α are positive parameters, β, γ and δ are non-negative parameters. The coefficient of the nonlinear term is positive. In the system $(\[1-1\])$-(82157476af

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