

Notes on Symposium on Carbonation

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In the Morehead, Minnesota, factory of the American Crystal Sugar Company, the lime addition system is divided so that lime is added at both the top and bottom of the carbonation tank. The lime addition at the bottom of the carbonating tank is controlled to give an alkalinity of approximately .005 below that in the secondary tank.

Operating results for the four years were presented. The 1951 results were with the divided lime addition:

| Year | Lime Cake Loss | Alkal- inity | Soda Ash Addition | Lime Salts | Wash Water % Coke |
|------|-------------------|-----------------|----------------------|---------------|----------------------|
| 1948 | .10 | .089 | .72 | .084 | 121 |
| 1949 | | .104 | .98 | .066 | |
| 1950 | | .102 | .67 | .046 | |
| 1951 | .04 | .077 | .22 | .036 | 83 |

It has been reported that this method of lime addition at another factory showed little or no improvement over single addition.

The Great Western Sugar Company described a pilot plant experimental first carbonation station at Loveland. Following is Mr. Dahlberg's description of the pilot plant and remarks on factory installation:

"The station consists of a primary and a secondary tank, each 10 inches in diameter and about 5 feet high. Above the tanks is a Howard feeder for the addition of lime and raw juice. The milk of lime enters the side of the primary tank about 28 inches above the bottom. The gas distributor in the secondary tank is a copper, perforated ring designed to give good gas distribution.

"The raw juice and the recirculated juice are mixed before any milk of lime comes into contact with the mixture. The recirculation is done by means of an axial flow pump. The speed of the pump can be varied to give anywhere from 2 to 12 turnovers. The volume of flow is approximately 1/2 gallon of juice per minute. Both primary and secondary tanks are equipped with paddles for slow stirring.

"The first experimental work planned is to make a very careful comparison of Micromax and Speedomax controls.

"Notes on Factory Carbonation: Quite a number of our factories are equipped with Dorr continuous carbonation, and others are still equipped with batch carbonation. I think it can be said without much fear of contradiction that up to the present time the batch carbonation gives the best quality of juice. This is indicated both by lower lime salts and lower color values percent on non-sugars. However, continuous carbonation has so many advantages in the saving of labor and material on the filter press station that we are compelled to accept somewhat poorer quality juice in return for the reduction in costs.

"During the past campaign, we made a survey of all of our first carbonation stations and found greater differences in equipment

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than we had realized. It is hard to explain how some of these differences in design came about, but it's demonstrated that we have them from time to time. Several things were demonstrated in this survey: (1) The variability of lime addition percent on beets from hour to hour was even greater than we thought it was; (2) there is evidence in several factories of poor mixing and stratification, causing the final juice to be a mixture of under- and over-carbonated juice; (3) the control of pH by the Micromax equipment left much to be desired; (4) no one knew the number of turnovers that was actually being used at any one factory.

"As a result of this survey, it was decided to install a small continuous carbonation station at our Development Laboratory at Loveland. The first study that will be made at this station will be to compare the efficiency of Micromax and Speedomax controls. After we have established the best method of control, various other items of information will be gathered such as the most desirable number of turnovers, the best method of mixing raw juice and carbonated juice, and the effect of various changes in procedure on the settling rate. It is, of course, highly important that high settling rates be secured so that the time of retention in a Dorr thickener can be reduced."

Spreckels has had a laboratory-size complete plant where as small a quantity as 100 pounds of beets can be sliced, diffused, carbonated, the juice concentrated and the standard liquor boiled to granulated sugar. This plant has been of inestimable value, not only for experimental purposes, but at times of difficulty in settling juices the pilot plant has been able to point the way to overcoming the difficulties.

Many phases of the carbonation process have been studied and reported on at meetings of the association and in the sugar journals. Comparison can be made between the standard Dorr system and the various European systems so recently reported in the literature.

Some of the important determinations made on the plan are:
The advantage of alkalinity over pH for control.
Effect of retention time in process on lime salts and color.
Value of additional lime addition.
Effect of temperature on beets of high invert content.

Mr. Campbell of Dorr Company described the work in Europe on the Wicklund process, the Dedek preliming and the French work. Most of these have been described in recent literature.

The use of centrifugal pumps for handling the muds was generally condemned as causing lower filtration rates. The gravity handling of muds was advocated as the best means for obtaining high filtration rate.