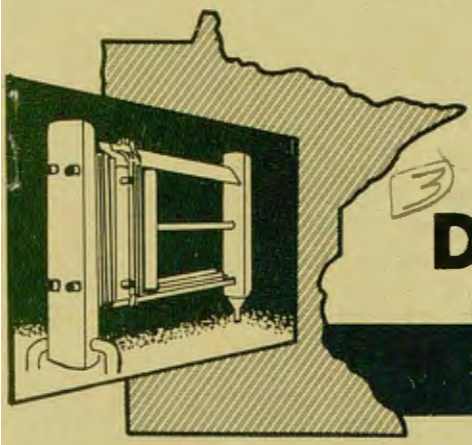


Minnesota Dairy Products Processor

AGRICULTURAL EXTENSION SERVICE • INSTITUTE OF AGRICULTURE
UNIVERSITY OF MINNESOTA • ST. PAUL, MINNESOTA 55101

Editor - V. S. Packard January 1966 No. 21

CONTINUOUS BUTTERMAKING

The art of continuous buttermaking is not new. Yet its acceptance and application in industry only recently has appeared to become assured. With increasing numbers of continuous machines being installed, it seems desirable to devote some attention to this technology.

PROCESSES TO BE DESCRIBED

Equipment currently being used is designed after the Fritz process originating in Europe. Three units are being sold in this country: German, Westfalia; Danish, Silkeborg; and French, Contimab. Because they are designed after the same process they have certain basic similarities.

SIMILARITIES

1. Cream is churned in a cylinder similar to an ice cream freezer. Beaters churn out the fat in a matter of seconds.

2. Some method--and here's where they differ--is used to separate butter granules from buttermilk.

3. Working is begun in two sets of augers turning inward toward each other.

4. Final working and texturizing is accomplished by forcing the butter through a series of perforated plates of dimishing hole size, kneading by means of impellers.

Certain changes in design are constantly being made, but separation of granules from buttermilk is now handled in these ways:

1. Contimab--Augers sweep the granules from the surface of the buttermilk.

2. Silkeborg--Two strainers placed one above the other shake rapidly in opposite directions. Granules agitate forward on the upper strainer, backward on the lower one, and into the auger section.

3. Westfalia--In a "secondary churning" cylinder granules are picked up by paddles and worked across a screened cylinder from which they drop into the augers. Buttermilk passes through the screen.

COMPOSITION CONTROL

Most important to the success of a continuous buttermaking operation is precise composition control. As in conventional buttermaking, primary control of composition is exerted through moisture manipulations. But in the Fritz-type continuous processes many factors influence moisture content of the final product. All must be balanced and regulated to maintain good composition control.

RULE OF THUMB

With possibly one exception, changes which take place in a positive direction cause an increase in moisture content (unless compensated by adjustment(s) in a negative direction. Note below.

FACTORS THAT INFLUENCE MOISTURE CONTENT

1. Cream temperature--an increase in temperature will cause an increase in moisture (everything else being held constant).

Cream temperature must be maintained within rather narrow limits. Cold-wall storage tanks are necessary. Sweet water on the churns may be used to vary temperature to some extent.

2. Butterfat test of cream--an increase in fat test causes an increase in moisture.

3. Beater speed on the churning cylinder--higher speeds result in higher moisture test.

Beater speed is the primary adjustment made to control moisture in the Silkeborg and Contimab machines.

4. Auger speed--faster speeds yield higher moisture test. This is the primary adjustment made to control moisture content in the Westfalia machine.

5. Wash water temperature (if butter is washed)--an increase in wash water temperature will increase moisture test.

6. Water content of the salt solution--salt is injected as a brine. As the ratio of water to salt goes up, moisture content goes up.

7. Level of buttermilk--buttermilk level in the sump can be raised or lowered by adjusting the height of the buttermilk siphon. Toward the vertical, level of buttermilk is higher and moisture increases.

8. Sliding template--the Westfalia is equipped with two templates that may be adjusted back or forth to close or open the holes in the perforated plates. Opening the holes increases moisture.

9. Rate of cream infeed is an exception to the rule. As cream rate is decreased moisture content rises.

In all the above factors the reverse move causes a decrease in moisture.

In normal operation an attempt is made to maintain constant cream temperature, butterfat test, rate of infeed, and all other control settings. Moisture is regulated via beater speed and/or auger speed.

To maintain uniform moisture tests it is necessary to adjust negatively to compensate for changes in a positive direction and vice versa.

KOHMAN ANALYSIS

Regular and accurate testing throughout the day's operation is essential --is essential--to the success of continuous buttermaking.

Initially a box of butter is manufactured, the machine shut down, and a moisture test made. If necessary, adjustments are made in beater or auger speed and equipment restarted. From this point, sampling and testing must continue at regular intervals.

While the Kohman test is reasonably accurate, it is none too precise for present-day needs. Care should be taken in running the tests. Also, the Kohman balance should be located away from heavy traffic or doorways where windcurrents may make readings difficult.

Current practice is to determine moisture and salt, assume 1.4 percent curd, and subtract the sum of these ingredients from 100 to get butterfat. As yet it is uncertain that curd is, in fact, a constant or fairly constant value. Therefore, when testing, it might be desirable to determine moisture, salt, and fat to be sure that legal standards are met and overages minimized.

QUICK SALT TEST

A quick salt test has been devised by Land O' Lakes Laboratory. It is helpful in speeding up this analysis:

1. Carefully weigh 1 gram of butter, using Kohman balance, into cup.

2. Melt butter by mixing in 40 to 50 milliliters of warm distilled water. (Precise measurement of water is not necessary)

3. Add 4 to 5 drops of potassium chromate indicator.

4. From burette, add standard silver nitrate used in Kohman analysis, until a brick red color appears in butter-water solution. Read results directly from burette. Each milliliter of silver nitrate used is equivalent to 1 percent of salt.

NOTE: Keep fresh stock of silver nitrate on hand. Keep in a brown glass bottle and avoid exposure to light.

INGREDIENTS FOR SUCCESS IN CONTINUOUS BUTTERMAKING

Some of the factors that appear to be important to a continuous buttermaking operation are:

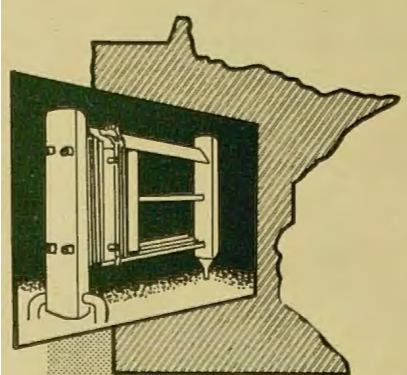
1. Willingness to work out the bugs following installation. Each plant is unique. Problems should be expected and will have to be resolved on an individual plant basis.

2. Use of good techniques in composition analysis and frequent testing throughout the processing run.

3. Conscientious churnmen. The machines will only do as good a job as the men operating them. To prevent excessive butterfat losses, skilled employees are essential. They must be willing to ply their skills effectively each day of the year.

Note: We have said nothing about the economics of continuous churning. To our knowledge little or no data has been published concerning this aspect. There is no reason to believe, however, that the criteria known to influence the business status of conventional operations will be any different in continuous operations. Volume is still a must.

Names of products and tests are used in this publication for convenience and clarity. Inclusion does not constitute endorsement and omission does not constitute discrimination by the University of Minnesota Agricultural Extension Service.



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Agricultural Extension Service
Institute of Agriculture
University of Minnesota
St. Paul, Minnesota 55101
Luther J. Pickrel, Director
Cooperative Extension Work
Acts of May 8 and June 30, 1914

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