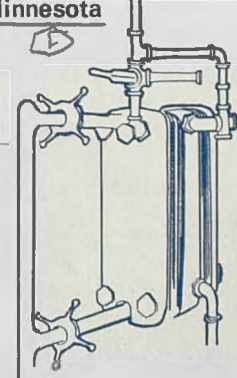


MINNESOTA DAIRY PRODUCTS PROCESSOR



By V. S. Packard
Extension Specialist Dairy Products

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Butter plants continue to increase volume in order to lower costs. The continuous churn, with its potential for round the clock operation, has added new impetus to this long-term trend. Since local milk supplies rarely are sufficient to maintain 24 hour-a-day operation, cream is now being purchased and shipped interplant. This practice has caused a renewed demand for accurate sampling and testing. Let's take a look at some of the testing questions.

INACCURATE FAT TESTING COSTS MONEY

Assume the following: A plant receives 50,000 pounds of cream each day by tank truck; the cream tests 40 percent fat; the Babcock test accuracy is limited to 0.5 percent.

Using these values and assuming further that the fat is all churned into butter worth \$.67 a pound, the potential loss (or gain) to a plant amounts to approximately \$75,000 per year. No wonder plants have difficulty reaching agreement on test results.

BABCOCK TEST

On wholemilk the Babcock test is usually considered accurate to within ± 0.1 percent (one point). On cream, using standard test bottles, accuracy on any one test is limited to approximately ± 0.5 percent.

BABCOCK VS. MOJONNIER

From the data available in the literature it is apparent that the Babcock test gives higher readings than the Mojonnier test. And, as the fat test of the product increases the difference becomes greater. Data of Hileman et al (1) which appear below, illustrate this point.

Range of Babcock Tests	Number of Samples	Average Babcock Test (%)	Average Mojonnier Test (%)	Difference (Babcock-Mojonnier)
3.00-3.49	143	3.341	3.282	0.059
3.50-3.99	254	3.705	3.624	0.081
4.00-4.49	79	4.218	4.120	0.098
4.50-4.99	32	4.666	4.534	0.132
5.00 and up	5	5.126	4.933	0.193

These same workers standardized cream at 20, 40, and 50 percent fat, then ran Babcock and Mojonnier methods. The results were as follows:

Cream Standardized to (%)	Number of Samples	Difference (Babcock-Mojonnier)
20	45	0.158
40	88	0.527
50	53	0.717

More recently Randolph et al (2) studied differences between the two methods on samples of cream. Their findings are shown in the following table:

Fat Range (%)	Number of Samples	Average Mojonnier	Average Babcock	Range	Average Difference
Below 20	6	16.80	16.80	-.26 to +.23	+0.00
20-30	6	25.73	26.00	+0.18 to +.20	+.27
30-35	7	32.88	33.21	+0.13 to +.77	+.33
35-40	8	37.27	37.82	+0.19 to +1.10	+.55
Above 40	10	45.28	45.93	+0.17 to +1.20	+.65

So the evidence indicates that the Babcock test yields higher readings than the Mojonnier, on both milk and cream, with the difference becoming greater as fat content increases. But while the Babcock test is accurate to within +0.1 percent on milk and 0.5 percent on cream, duplicate Mojonnier analyses should agree to within +0.03 percent on milk and +0.25 percent on cream.

INFLUENCE OF RANCIDITY

One other factor must be considered. Mojonnier results will be influenced by hydrolytic rancidity (lipase action). Readings tend to be lower. The more rancid a sample, the lower the results will be. In other words, differences between the Babcock and Mojonnier results will be greater on rancid samples, the absolute difference depending upon the extent of rancidity. Therefore, if you plan to use a Mojonnier test, you should consider making an Acid Degree Value determination at the same time.

RUN MORE THAN ONE ANALYSIS

You have a better guarantee that you have maintained a narrower range of variability if you make more than one determination and average the results. Duplicates are a must. Discard results that fall outside the range of expected results. Or run four tests on the same sample and average the results. Agreement should be closer, within samples and between laboratories. You will soon find out whether or not you can live with the results. At worst, they will be excessive. At best, you will have minimized testing errors to a livable range.

ENCLOSURE

The enclosed brochure is intended for high school and junior college students as they contemplate a choice of careers. We wanted you to have a look at it. It was prepared by students of the Department of Food Science and Industries and represents their views of educational and career opportunities in the food processing industry and allied fields. We think they did a fine job.

Additional copies are available upon request to the Department. Please feel free to ask for copies to share with interested persons in your area. Our industry sorely needs the talents our young people represent.

REFERENCES

- (1) Hileman, J. L., K. K. Rush, and C. Moss. "The Relationship of Errors in the Babcock Test to Losses in Cream Plants." *Jour. Dairy Sci.* 25(5): 373. 1942.
- (2) Randolph, H. E., T. V. Armstrong, I. A. Gould. "Variations in Fat Tests Results as Related to the Fat Content of Fluid Milk Products." *Milk Dealer*, 49(12):30. 1960.

Agricultural Extension Service
Institute of Agriculture
University of Minnesota
St. Paul, Minnesota 55101

Roland H. Abraham, Director
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