Rancidity Accelerated by Porous Packings

Some Observations on the Effects of Various Layer Boards on Rancidity in Baked-goods Shortenings*

By WILLIAM RABAK[1]

THE unusually long and hot summer of 1930 was the direct cause of numerous rancidity troubles in the baking trade. Numerous complaints emanated throughout the summer in regard to certain types of baked goods packed in cardboard cartons. Rancidity was found to be particularly prevalent in cartons containing cookies with a high shortening content. Investigation of the types of shortening used in the goods in question indicated that of the three types of shortening employed in the manufacture of biscuit and cracker products, considerably more trouble was experienced in cartons containing goods manufactured with the use of oleo oils and lards than those manufactured from all hydrogenated shortenings. With this information in hand, an investigation was conducted in an effort to determine the principal factors which appeared to be the cause of this premature rancidity development.

Critical examinations of the lards and oleo oils employed in the manufacture of the goods in question revealed the fact that, from the standpoint of keeping properties, these shortenings appeared to be normal in every respect. Attention was then directed to other features which might possibly be responsible for the trouble.

It was noted that in each case where distinct rancidity was observed in the carton, the layer boards between the cookies were heavily impregnated with fat apparently absorbed from the goods packed in the carton. This led to the supposition that the rancid odor in the carton might possibly be due to rancidity developed in the fat-impregnated layer board rather than in the goods themselves. Aeration of the goods removed from the carton proved in most cases that the odor could be dissipated from the goods. Examination of the layer boards in these cartons indicated that rancidity had developed *in the fat soaked card board.* This led to the theory that certain types of layer boards might possibly have a greater rancidity accelerating effect on the absorbed fats than others. For this reason it was decided to collect a number of different types of layer boards used regularly in packing biscuits of the sweet goods type. Accordingly arrangements were made for the collection of 30 samples of layer boards. These samples were found to represent 8 distinctly different types of cardboard, and the work done on this problem was confined to these representative types.

The following cardboards were included in the study:

1. Solid pulp board, plain (soft finish)
2. Solid pulp board, silicated (soft finish)
3. Filled pulp board (hard finish)
4. Solid news board (hard finish)
5. Patent white and news back board
6. Solid news board—Manila lined
7. Double Kraft board, asphalt filled
8. Solid news board — silica and waxed one side

The following method was employed to study the relative rancidity resistance of these different layer boards when stained with fat:

> Eight square inches of each board was impregnated with 2 c.c. of melted fat and the board was folded and placed in a clean Mason jar. It was then subjected to the accelerated keeping test which is ordinarily employed to determine the rancidity resistance of fats. This consists in exposing the fat under examination to a temperature of 145° F. in an electrically heated cabinet. Periodically these jars were removed and examined, by noting the odor, for evidences of rancidity.

The experiment was conducted with 3 different fats, a prime steam lard, an open kettle lard, and a No. 1 oleo oil. The relative resistance to rancidity development of the

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various types of board was the same with the 3 different fats. It might be mentioned that the keeping properties of the boards impregnated with oleo oil were somewhat superior to the boards treated with the two lards.

The reaction of the water extract prepared from each of these boards was also studied. This was done on the assumption that the residual chemicals in a layer board might in some way be associated with rancidity acceleration. The range of reaction of the water extracts on these papers was from pH 5.2 to 8.8. It appeared that the lower pH values were characteristic of solid pulp boards while the news boards were found almost invariably to have a higher pH value on the alkaline side. No relationship was found between the reaction of the board and the keeping properties of the fat absorbed by the board.

It was observed in each case where rancidity developed in a short period of time that the board was of a porous nature with a soft finish. For this reason the solid pulp boards were less resistant to rancidity than were the solid news boards or other boards having a harder and more impervious surface. The use of silicate on the solid pulp board did not appear to have much effect towards retarding rancidity development. In fact, in one case the silicated solid pulp board showed less rancidity resistance than did the ordinary solid pulp board. The reason for this is not at all clear unless it be possible that silicate acts as a catalyst or "hastener" of rancidity. Generally speaking, it was found that the boards which absorbed the melted fat the most slowly were the most resistant to the development of rancidity regardless of the type of stock from which they were manufactured. For example, the boards which were first silicated and then waxed were found to be quite resistant. Likewise the sample of board manufactured with the use of asphalt filler and double Kraft paper was found to be unusually resistant.

The result of this study on the rancidity resistance of the various boards may be summarized as follows:

1. The porosity of a layer board determines to a great extent its rancidity resistance. The porous boards, such as the plain solid pulp boards, were invariably found to hasten rancidity development. This can be explained by the fact that this type board when impregnated with fat exposes a greater area to the action of the air.

2. Layer boards having a *hard finish* appear to be more resistant to rancidity devolopment when treated with fat. The advantage of the hard finished boards is likely due to the fact that they are less porous and absorb less fat. The type of stock from which the hard finished boards are manufactured apparently does not affect the rancidity development of the fat.

3. The use of silicate alone applied to a porous type of board does not improve its rancidity resisting properties. However, the use of a combination of silica and wax was noted to have a decided effect towards improving rancidity resistance.

4. The amount of residual chemicals in the various types of board as indicated by the pH of the water extract apparently has no connection with the rancidity hastening effect of laver boards.

This investigation of the rancidity resisting properties of layer boards demonstrates that the selection of the proper layer board is important especially during the summer months. It appears that the safest procedure to follow in selecting layer boards for packaging goods high in fat content is to eliminate the soft finish, porous type boards.

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Mayonnaise Containers

The Division of Simplified Practice of the Bureau of Standards, Department of Commerce, has mailed to all manufacturers of mayonnaise and allied products, a summary report of the recent general conference of the division on simplification of glass containers for mayonnaise and kindred products. The recommendation of the conference is that *sizes* of such glass containers be limited to five in number: the 3 fluid ounce, half-pint or eight fluid ounce, pint, quart and gallon sizes.

The Bureau of Standards has requested the adherence of all manufacturers of mayonnaise and kindred products to the recommendation of the conference as to sizes of glass containers, and any manufacturer who has failed to receive a copy of the conference report is urged to write the Bureau for such copy and a blank form for the registry of his assent with the Division of Simplified Practice.

Especial attention is directed to the fact that reduction in the number of *sizes* of glass containers used by the mayonnaise industry is not intended in any way to affect the variety or individuality of *design* of containers which may be used by various producers.

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Cacao butter consists entirely of the glycerides of palmitic, stearic and oleic acids. Any addition of fat containing lower fatty acids can be detected by isolation of these lower acids. *Z. Untersuch. Lebensm.* 60,327-31, *Chem. Abstr.* 25,3857 (1931).

A. O. C. S. Bowling Tournament

The twelve fastest and smoothest alleys in the city of Chicago, at 235 South Wabash Avenue, just around the corner from the Congress Hotel, have been secured for the Second Annual Bowling Tourney of The American Oil Chemists' Society, October 29th.

Play will be resumed for the Nuchar Challenge Trophy Cup, won last year by the Amaizo team of The American Maize Products Co., and this year the eligibility rules have been so tightened up that a good stiff competition, in doubt to the last minute, is assured.

All contestants must be actually employed in the chemical laboratory or in some department of the plant where actual processing of fats, oils or soaps is done, and at least one member of each team must be a member of The American Oil Chemists' Society, in good standing. Exhibitors at the convention are also eligible for competition.

In addition to the Nuchar Challenge Trophy, herewith shown, there will be several other prizes, including individual high single game, and high three games, also illustrated.

One of the most dangerous teams last year was the Procter and Gamble team of Cincinnati, and we understand that, in spite of extreme heat, this team has started preliminary practice on the Wyoming alleys, headed by President Richardson of the Society. They will be a hard team to beat this year. They are all eligible.

The Armour team will bear watching this year, as they turned in the highest single game of the year last year and we hear that John Vollertsen has had them out practicing regularly. The Swift Premiums form one of the best teams we have ever seen in competition.

Such exceptional interest has been shown in this tournament that nine entries have been received for five-man teams already, including the Swift Premiums, the Armour Stars, the Wilson Certified, the Industrial Chemical Nuchars, the Swift Vreams, the Armour Soap Works Luxors, the A. Daiggers, the Swift Silverleafs, and the Procter & Gamble Criscos. Entries are expected from the American Maize Products Company Amaizos, and the Lever Brothers Lux, so that the 12 alleys originally reserved appear to be insufficient and reservation has been made up to 18 alleys, or two solid floors, at 235 South Wabash Avenue, and entertainment features will be provided so that everyone will have a good time. There will be alleys available for singles and two-men

A. O. C. S. Bowling Challenge Trophy

teams and for the ladies and there will be prizes for all and a surprise handicap, which will provide a lot of laughs.

It will assist the bowling committee greatly if the members will send in reservations for the alleys promptly, so that no one will be disappointed, because if the 18 alleys provided for do not prove sufficient, the committee wants to know in plenty of time to provide more. Please send reservations in at once to:

John P. Harris,
205 W. Wacker Drive—Room 1306
Chicago, Illinois.

The Committee sincerely hopes that every chemist in attendance at the meeting will bowl with us as this will be a strictly informal bowling affair, so that it will not require those bowling to bring their own bowling ball or even their own bowling shoes, so if they happen to slide over the foul line a little bit, they are not going to be penalized, because the purpose of the occasion is just to get together in an informal way and there is no place where good fellowship can be promoted as it can on the bowling alleys. There will be plenty of prizes for all and the biggest prize of the evening will go to the winner of the surprise handicap, so that it is quite possible that one of the bowlers making a poor score will take home the prize, which is sure to please the winner.