

SPECIFICATION OBJECTIVES OF THE CEREAL AND BAKED PRODUCTS DIVISION

by
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*Since the preparation and coordination of specifications have been described in other issues of the *Activities Report*,² a look at specifications from the point of view of the man in the laboratory—the man who does the spade-work on which the written document is founded—may furnish a fresh approach to the question occasionally heard—Who thinks up specifications?—as well as to the even more basic question—What conditions establish the need for a new or revised “spec”?*

The importance of specifications can be taken for granted. During fiscal year 1952, for example, the Armed Forces procured more than 300 million pounds of wheat flour, well over a billion pounds of other processed cereal grains, millions of pounds of macaroni and related products, not to mention products such as crackers, cookies, canned baked products, and the non-cereal ingredients contained therein. One hundred million dollars—the cost of these products for a single year—is a lot of money, and diverting a fraction of one per cent of the total sum to bettering these products through research and development in order to assure that they *will be consumed and not wasted* is a practical and in actuality a “cost-conscious” program.

two subsistence specification “success stories”

Now, to return to specifications objectives in the cereal field, the story of the ceaseless effort to improve products is the story of the attempt to make a hundred million dollars worth of cereal and baked products represent the best that that amount of money can buy. This story can be told most effectively, perhaps,

² See, for example, two articles by Major E. J. Sunderville, “Subsistence Specifications: Status and Coordination,” *Activities Report*, 3(1), 17 (1951), and “How to Use Subsistence Specifications,” *Activities Report*, 4(2), 135 (1952).

through the series of improvements effected in specific commodities—improvements which are quickly reflected in the buying instrument—the specification. Following are some typical examples.

Biscuits. Biscuits have been in U. S. Army rations for a long, long time. As “hardtack,” biscuits served as a “belly-filler” component of “dry rations” in the Civil War, again in the Spanish-American War, and yet again in World War I. Hardtack earned for itself a universally bad reputation—and is still a by-word for a hardship food. It became evident during the interim between wars that a better biscuit was needed, and during World War II it became evident that the need had turned into a demand. There were 16 changes in the formula—each of which was reflected in purchase descriptions or in the specification.

What were the technologists seeking by these changes? In the main, their objectives were (a) to modify the density, (b) to bring about, by ingredient changes, a softer texture, and (c) to improve flavor. By 1945, five types had been developed: biscuit bread, whole wheat crackers, sweet milk crackers, lunch crackers, and soda crackers. After the war, experimental work continued because it was shown, despite improvement, that only one of these types had stood up against critical taste evaluations—the salted soda cracker.

Although the salted soda cracker of commerce is well suited to civilian use where rapid turnover precludes any serious stability problems, for the Armed Forces it was necessary to specify a cracker better able to withstand long-term storage, such as one year at 100° F., the more or less standard endurance test for Armed Forces subsistence. Based on extensive work on the product, it was eventually learned—and added to the specification—that a shortening resisting rancidity development, a moisture content of five per cent or less

and a pH of 7.0 or below would provide the highly stable cracker called for. By keeping the pH below 7.0, it should be explained, it is possible to fortify crackers with vitamin B complex—a desirable attribute in packaged rations. For military use it was also found that alleviation of losses due to crumbling and breaking would be a definite economy, and work to effect this characteristic was undertaken, completed, and reflected in the specification. Since crackers are a bland-tasting product at best, any improvement in acceptability is worth exploring. Development of a thinner cracker than is normally found proved to increase the acceptability rating and thus still another addition was made in the specification. The current specification for crackers is reasonably satisfactory, but this is so only because of the constant effort to develop a cracker that would stand up in prolonged non-refrigerated storage and that would be eaten—and liked—after that ordeal. The story, step by step, can be followed in specification changes.

Canned bread. When it comes to a choice between crackers and bread, bread is almost invariably the winner. In the field, close to combat, it is virtually impossible to bake bread. The operation of baking is a sensitive one and ingredients, facilities, and skills are not aided by forward area “hurry, flurry, and worry.” Early in World War II, therefore, attention was turned to the possibility of canning bread. By 1945 a formula was developed, dough weights, ingredients, and can size determined, and a trial run made. The purchase description of that date (1945) is technological history despite the fact that experience later proved that the product had too high a pH for safety against *Cl. botulinum* and that the moisture level was likewise too high. The original purchase description furnished a starting point for improvement. When it was determined through extended studies that a pH below 4.8 and a moisture content of 33 per cent or less would eliminate danger of botulinum, the basis for a change in the purchase description was set up. Despite this finding, further work was indicated due to the necessity for obtaining a pH/moisture ratio that would yield a dough of optimum “workability.” A moisture level of 33 per cent is too low for the commercial type of dough preparation equipment. When this more satisfactory ratio was found, a modification of the specification was made and another step toward a perfected product taken.

There have been many further advances. Shortenings used in the original formulas

were found to be the source of rancid flavors which affected the acceptability of the product. Exclusion of soybean and lard shortenings solved this problem. Rust spots—appearing at points such as the seams or score lines—packaged another problem. How this problem was solved is written up in detail in a previous issue,^b but in general the solution obtained can be attributed to the use of high vacuum (25" + Hg.).

The present specification for canned bread records the steps that advanced this product from a technologist's^c good idea to the usable product. It should be pointed out that what the specification doesn't show are steps that were not “progress” but only “educational.” These steps are inevitable in scientific work and often mislead people who look at a “spec” and say, “How simple!” The forward step is not infrequently made possible by the steps to the side—or even back.

the pioneering aspects of “spec” writing

Specification activities of the Cereal and Baked Products Division are most difficult when little or no commercial experience is available as to the manufacturing details for products. The initial specification must define, as in the case of canned bread, in complete detail the ingredients, formulation, processing, packaging, and end-product requirements. These definitions must be sufficiently explicit so that the manufacturer producing the end-product will have no difficulty meeting any of these essential requirements. In the interest of economy, scarce or premium quality ingredients, elaborate processing, and difficult end-product requirements must be avoided unless such requirements are absolutely essential to the quality or performance of the desired end-product. Further, the specification must be written so that existing commercial food processors can manufacture the item using existing plant machinery with, at most, only slight modification. Moreover, it is essential that the specification requirements be designed so that the food processor can manufacture the end-product in large volume at a high production rate and at economical cost. And, finally, the specification must be written so that a substantial number of responsible food processors can be induced to enter competitive procurement bids, insuring thereby the most economical unit price.

^b “Canned Bread Can Be Corrosion-Free,” Donald Coppy, *Activities Report*, 5(2), 137 (1953).

^c Mr. Joseph Cryns, QMFCI.

decisions concerning revisions

Periodic procurement exceptions, amendments, and revisions of cereal and baked product specifications are made to facilitate procurement, utilize less expensive and more readily available ingredients, correct product deficiencies, and utilize technological advances as developed by industrial processors and by the QMFCI. Commodities for which the specifications recently have been amended will illuminate this problem further.

Butterscotch sandwich cookies. This product has for many years employed roasted nonfat milk solids to contribute the butterscotch flavor to the item. Sources of supply for roasted nonfat milk solids were very limited and when fluid milk was seasonally in short supply, procurement of butterscotch sandwich cookies was severely handicapped. To facilitate procurement of sandwich cookies in adequate volume, a vanilla sandwich cookie filling utilizing pure vanilla extracts was developed to replace the butterscotch filling. Acceptability and stability studies comparing the new and old fillings as a part of this development problem showed the newly developed vanilla sandwich cookie and filling to be equally acceptable initially and to display superior acceptability after six months' storage at 100° F. The recent specification revision utilizes this newly developed cookie filling.

Alimentary pastes (spaghetti, macaroni, and noodle products). These products utilize durum semolina or durum semolina ground into flour containing a minimum of 12.2 per cent protein (calculated on a moisture-free basis). This minimum protein content is specified because alimentary pastes of higher protein content will withstand abuses in cooking (overcooking and protracted holding periods on steam tables) better than lower protein content alimentary pastes. During the past several years, however, the harvested durum wheat crops have contained less protein than normal because of unusually abundant rainfall late in the growing season. To insure procurement of alimentary pastes in adequate volume, a procurement exception has been authorized to lower the minimum protein requirements to 11.7 per cent (moisture-free basis).^d Since this exception is designed to

^d This import of seasonal variations will be appreciated in connection with the 1953 durum-wheat crop: 60% of this crop was rust-damaged, necessitating the use of a mixture of hard wheat and durum wheat in the manufacture of alimentary pastes.

accommodate unusual crop conditions, it will be rescinded as soon as durum wheats of higher protein content again become available.

coordinate, contemplate, integrate

The unusual subsistence problems which face the Armed Forces in global feeding operations create the stringent military requirements for food products used by the Military. Intelligent coordination of objectives and the technical knowledge of the food processing industries and the QMFCI can usually effect a satisfactory solution to these problems. Such solutions are incorporated into the specifications used in the procurement of these items.

Whenever a new specification, specification revision, or specification amendment is proposed, a draft of that specification or amendment is subjected to wide coordination among interested manufacturers, military agencies, and other Government agencies for comment and suggestion. Every comment received as a result of this coordination is carefully weighed, and, if found to meet Armed Forces objectives and to possess technical merit, is then written into the final official specification. The time and effort expended by the food processing industries in reviewing and commenting on proposed specifications, revisions, and amendments has been a key factor in the success of cereal and baked product specifications. The extreme value of this cooperation is gratefully acknowledged. Continuation of this cooperation is hoped for in the future. It is through cooperation that the most basic objective of all—better rations for the Armed Forces—will be realized.

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