

Do You Want Your Food Products To Sell?

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FOOD manufacturers have an important part to play in our present crusade for self-reliance and self-sufficiency. They have to use all resources within their means to produce foods of acceptable quality to replace or substitute for some of the imported food items that eat deeply into our scarce foreign exchange. Among the products that can be replaced by local production are tomato puree/paste, fruit juices, soft drinks, jams and marmalades, and various canned vegetable products. Recently refined and deodorized cooking oils by the Vegetable Oil Mills (GIHOC) can serve as useful substitutes for the various imported cooking oils.

In order to achieve this objective, our food processing organisations will have to make quality control one of the top priority areas in their operations. A cursory look at our food industries shows conspicuous absence of laboratories for quality control work. While some manufacturers have little understanding of quality control, others do not see the need for it, and still others are scared away by the extra expenses involved. Our food manufacturers should note that proper application of quality control to their operations will help them sell and keep on selling their products profitably and successfully while at the same time maintaining acceptable quality standards. The ultimate result will be increase in production output.

It is the purpose of this paper to explain the principles underlying food quality control and to suggest how these can be adopted locally to improve upon the quality of our products.

The principal aim in the food industry, as in any other manufacturing industry, is to produce economically standardized products that do not vary significantly. Standardization in the food industry is, however, more involved and difficult than in any other industry. The reason is that the raw materials for processing are from natural or biological sources so they have wide range and extreme variability in physical and chemical properties. This means that before these materials are selected for processing they must be critically examined.

It would be helpful at this point to acquaint ourselves with some basic definitions.

Quality

A food is required to possess properties such as nutritional value, purity, wholesomeness, and palatability. Together these properties make up the "quality" of the food. However, if any one of these properties is low, the general quality of the food is adversely affected. For example, no matter how nutritious a food may be when judged by its composition, if it is unpalatable it loses much of its value. That is an aspect which some nutritionists tend to overlook. The point is people do not eat food solely because it is good for them, they want to enjoy it as well.

The term "quality control" as used in this article is restricted to the control exercised by the chemist, in the food industry. Here it means a system which arrives at standardizing the raw materials used for processing, the manufacturing processes, and inspection of the finished products.

The purpose of quality control has been stated as two fold by (Bassett, 1956). First, there is the moral obligation on the part of the manufacturer to supply the consumer with standardised products within selected and appropriate commercial limits. Secondly, by controlling the quality of his products, the manufacturer himself is ensured that he does not send out overweight or very high quality products.

Quality control calls for constant vigilance, and must be exercised at all stages in processing so that any necessary adjustments are made at the appropriate time. The system calls for the application of chemical analysis for determining the purity and identity; physical methods of testing to check on physical properties and microbiological examination to ensure satisfactory hygienic conditions. The urgency attached to the results of such tests, calls for the development of suitable rapid tests that will not unduly hold up production.

For convenience, the main sequence of operations in a quality control organisation may be listed as follows:-

- Agricultural control
- Raw Materials control
- Process control
- Production Inspection, storage and packaging.

Agricultural Control

This is to ensure that the right type of raw materials are produced in large quantities to feed the processing factories.

In some advanced countries, it is common practice for quality control to start at the farms. By this, manufacturers exercise a great deal of influence in the growing of crops and the raising of stock. This practice has helped with the selection of suitable fruit for jam making, and vegetables for canning and freezing. A modest start has been made in the country along the lines indicated. The Crops and the Food Research Institutes of the Council for Scientific and Industrial Research have adequate information on joint projects they have carried out on horticultural and compositional characteristics of crops such as tomatoes (Eyeson et al, 1969), pineapples, cassava and guinea corn. There are plans to extend these projects to citrus and other important crops.

Experience at the Food Research Institute has shown that not all cassava or yam varieties are suitable for making instant fufu powder. One has to select the right variety of crop after having carried out preliminary laboratory work.

More recently, in some advanced industrial countries, there has been a great deal of research into breeding, selection and feeding of animals with a view to getting the ones with suitable processing characteristics. With pigs, animals that fall within certain weight limits, that is, have high lean to fat ratio, are acceptable.

Since the beginning of the present government's agricultural revolution, some local food industries have shown interest to set up their own farms. One industry has even gone to the extent to solicit the help of a horticulturist from the Crops Research Institute. This is a commendable step. The industries can further be advised to go into contract farming in order to maintain a constant supply of high quality raw materials. This will also help them maintain raw material costs within reasonable limits.

Raw Materials Control

Raw materials control follows closely agriculture control. At times the two operations are treated as one.

The term "raw material" in the food industry nowadays means anything purchased by the manufacturer for direct or indirect use in food production. Thus, in addition to food ingredients and water, bottles, cans, flexible packaging materials, detergents and so forth, all fall within this definition (Pearson, 1968).

It is a good practice for every factory to have specifications for all its raw materials. Before purchasing raw materials in bulk, it is advisable to examine a buying sample to see if it conforms to the above mentioned specifications. This is very important if the factory will have to order samples from other sources. It will then be imperative to examine representative samples from any subsequent delivery to ensure the bulk is up to approved factory specifications.

Examination of raw food materials should include tests to check for genuineness and composition, freedom from contaminants and conformity with any official or factory standards. These standards once established may require regular checks in order to standardise properties

such as colour, clarity, particle size, together with the factors which affect organoleptic acceptability.

Examination carried out will vary according to the nature and type of ingredient. For instance, examination of tomato puree will include total solids, acidity as citric acid, reducing sugar content and salt. These determinations give indication of the composition and organoleptic characteristics of the product. Further to this, the general appearance of the product may provide clues as to how smooth the product appears and to what extent separation of liquid has taken place. Colour is another important attribute of tomato puree. The puree should be of good, bright red colour, free from black specks, insects or other foreign matter. It should also be free from foreign and abnormal flavours, or any traces of caramelization (Dickinson & Goose, 1955; Blanchfield, 1967). Microbiological characteristics of the product can be observed in a standardized microscopical examination. The object of this examination is to find to what extent the product has been contaminated with mould filaments. This is done to discourage the use of mouldy fruits in the preparation of the puree.

Oils and fats should be examined for identity, purity, freshness and keeping properties. Examination for the keeping properties is very important if the fat or oil has to be stored before use or if the products for which it is to be used will be required to have a long shelf life.

Fats and oils undergo chemical changes during storage which result in the production of unpleasant taste and odour. This is the phenomenon known as rancidity. Rancidity brought about by the action of air is called oxidative rancidity and that by micro-organisms as ketonic rancidity. Oxidative rancidity is very common and is accelerated by exposure to heat and light, by moisture and by the presence of metals such as copper, nickel and iron. Ketonic rancidity does occur in coconut and palm kernel oils, and is caused by moulds and encouraged by moisture.

It has been known for years that fats and oils slowly take up oxygen for a period of time before rancidity is detected. This period of initial oxygen uptake is known as induction period. It is important for a manufacturer to obtain a measure of this induction period in

order to be sure of the stability of the oil or fat he is going to use for processing. In short, a manufacturer using fats and oils as raw materials should be conversant with the behaviour of these food items under all conditions they might be exposed. If the necessary control measures are exercised, customers would be spared the unpleasantness of buying partially spoiled mayonnaise and poorly flavoured biscuits which are common experiences in our shops. Such undesirable organoleptic characteristics can be traced to the fat or oil used in the manufacture of these products. In the same manner, bread bakers should try not to use rancid fats or oils in greasing baked tins since any bad smell or flavour will be imparted to the finished bread.

If manufacturers want to produce foods of acceptable quality then they have to use the right raw materials.

Examination of the raw materials must be followed by a "trial run" processing of the product to check whether the formulated recipe need be modified. An example is the processing of orange marmalade. A trial batch of the particular orange fruit will show if the finished orange marmalade is of good quality and has ability to withstand storage. Checks on the pH, soluble solids, invert sugar content and the pectin should be made and adjustments carried out where necessary.

Some foods containing acid or alcohol are liable to corrode metals from which processing vessels and equipment are made. It is of utmost importance that special attention is given to the examination of the inside of the cooking or mixing vessels during the trial batch processing.

Process Control

It is essential to give sufficient attention to control of processing techniques in food production. The processes employed should ensure homogeneity of the product and standardization of the treatments it undergoes. It is important to see to it that the correct amounts of the ingredients are used, that correct methods of preparation and mixing are observed and that containers have been properly closed and adequately sterilized. Special note should be taken of the processing times and temperatures necessary to bring about the desired effects.

In the course of processing it may be necessary to examine samples of the product, (the "intermediates"), to ensure that desired com-

position, consistency and concentration, etc., are being achieved. Rapid on-the-spot tests are preferred to elaborate methods of analysis. The appropriate feedback information is transmitted to the factory floor for a modification where necessary, to be made on the original formulation. This sequence of operations is all important in process control. In the preparation of jams and jellies, the concentration of soluble solids in each batch can be conveniently measured using suitable refractometer to ensure that the sugar content is within desired range. Hydrometers have been devised to measure the sugar content of syrups rapidly and enable quick adjustments to be made. The viscosity and consistency of products such as sauces, salad cream, mayonnaise and preserves can be controlled by the use of special instruments which can be obtained on order from the manufacturing companies.

It is of utmost necessity that the product is protected from contamination during processing by maintaining satisfactory hygienic conditions at the factory floor. The processing plant should be such that it can be cleaned regularly and the cleaning procedures should be specified. Good house keeping practice must be strictly observed in a factory, and periodic checks need be carried out at regular intervals.

In view of the difficulties as planning rapid microbiological methods as such, chemical methods have been designed which reflect the bacteriological condition of the factory.

Such chemical methods are employed in liquid milk processing plants. Bacteriological counts have to be carried out regularly in industry and the results tabulated or recorded on charts so that changes can be readily studied on a week to week basis. Careful scrutiny of such trends can give a general indication of whether strict hygienic standards are being adequately maintained. In addition to this, periodic inspection by one who is a trained observer can help with adequate maintenance of hygienic standards at the premises and the plant. Personal cleanliness at the factory floor should be strictly observed. For our purposes, standards of hygiene for food handlers as suggested by Goldenberg (1968) will be appropriate.

The rules are set out in Table I.

Table 1. "Hygiene rules for food handlers"

"Wear clean overalls and head coverings.
Top pockets are not permitted.

Long-sleeved jumpers must not be worn under overalls with short sleeves.

Wash hands before starting work, after every break, and always after visiting the lavatory. Keep finger nails clean and short; do not use nail varnish.

All cuts or burns on the hands must be covered with a waterproof dressing and then with a glove. Finder stalls or loose dressings which may fall off must not be used.

Do not smoke or chew gum in the production rooms.

Do not eat meals in the production rooms.

Do not lick fingers when handling food or wrapping materials.

Do not sneeze over food. Always use a clean handkerchief.

Keep shoes, outdoor clothing, handbags and other personal belongings in the cloakrooms and lockers, not in the production sections.

Do not wear hair clips, loose jewellery, earrings, brooches or wrist watches.

Never bring pins or needles into production rooms.

Food handlers must keep themselves and their working area clean, neat and tidy. "Clean-as-you-go" is essential".

These rules are worth the attention of the top personnel in our food factories.

Product Examination

Finished product examination or inspection is carried out to ascertain to what extent the desired results, decided upon when the recipe was formulated, have been achieved. Though the purity of the ingredients would have been checked earlier on, there might have been contamination during processing. Furthermore, ability to withstand storage can only be confirmed in the product. In a cannery, representative samples are often opened and contents judged against a known standard for such properties as colour, texture and flavour. Scoring systems are sometimes designed to evaluate the organoleptic characteristics of the product. The seaming of the cans need a careful checking. For contamination can occur if there is any leakage in the cans.

Weight or volume of products is another factor the manufacturer has to consider. At the end of the production line, packets have to be weighed individually. The recorded weights should at all costs fall within the limits allowed on

appropriate quality control charts. At all times manufacturers should endeavour to supply consumers with foods with correct weight. Weights and measures are governed by law in many advanced countries, so if we ever want to export, this is an area our manufactures will have to exercise great care.

The labelling of a product can reflect on its quality. The label should be clear and informative. The name and address of the manufacturer, the code number indicating the date of manufacture, the list of important ingredients and additives, and net weight or volume of the product should all be declared. In fact, a good and attractive label will aid the successful marketing of a product.

In the laboratory, the chemical analysis required will be mainly to check (a) the general composition of the essential ingredients to ascertain what variation there is from the limits set, and (b) conformity with any legal requirements as to composition. Some foods may need special tests to check on physical properties which are related to organoleptic acceptability. For instance, the particle size of sugar and cocoa in chocolate affecting its smoothness to the palate, the colour of sauce, the setting power of jelly, and the balance of spices in cured meat products. On a long term basis, the appearance, shape and texture of sections of bakery products can be photographed and comparisons made on batches as time goes on.

During the development of a recipe it would have been decided whether additions such as colour, emulsifiers, preservatives, antioxidants, and solvents are necessary and at what concentrations. It is important to check the product for unwarranted traces of these additives and possible contaminants. In many advanced countries with well established food legislation, there are statutory limits for contaminants such as lead and arsenic.

For finished products that are prone to bacterial spoilage, it is necessary for bacteriological examination to be made. This will ensure that the necessary hygienic precautions have been taken care of at all stages of processing, that the heat treatments have been adequate to effect pasteurization or sterilization, and that in subsequent stages no bacterial re-contamination has occurred. Examples of products that fall within this category are canned meat and fish products.

Storage and Packaging

The keeping properties of foods which depend upon sugar, salt or acid for preservation have to be checked to see that they will have the "shelf life" required under the conditions to which they are most likely to be exposed. Often examination has to be carried out on packages and cans after they have been stored at elevated temperatures and humidities.

Containers and contents have to be examined for faults, rancidity, growth of organisms and insects and loss of colour and so on. Prediction can, for instance, be made on the storage characteristics of jams and marmalades from the proportion of reducing sugars. For example, in a product like full cream condensed milk whose keeping qualities depended on high concentration of sugar, one has to check whether the sugar content in the aqueous phase can be increased sufficiently to inhibit the growth of moulds and yeasts. For similar reasons pickles, sauces and salad dressings should contain sufficient salt and volatile acidity in the aqueous phase to inhibit the growth of undesirable organisms.

Selecting a suitable form of packaging material for the finished product is essential. The packaging is required primarily to protect the product from light, insect or pest contamination and to keep it under hygienic conditions until it gets to the consumer. The material for packaging must also be such that it does not contaminate the product, and also is effective in preventing the product from deterioration. Whether the package should be air-tight, moisture-vapour-proof, semi-permeable to moisture vapour, or opaque to light, will depend upon the nature of the product for which it is to be used. For dry foods a material which is impermeable to moisture vapour is suitable. On the other hand, if "wetter" foods are packed in the same material, contamination and mould growth would occur in the package. For such products the packaging material must permit some limited loss of moisture. Fresh products must therefore be packed in a permeable material.

The manufacturer must take special interest in the way the product is stored after it leaves the factory. Here leaflets of instructions can be given to retailers, wholesalers and customers. The shopkeeper has to be guided by the important principles of stock rotation on the "first in,

first out" service. It is common sight in many of our departmental stores to see blown up canned or deteriorated bottled products unknowingly displayed. This can be controlled by periodic inspection of stores and stored products by the manufacturers and retailers working in co-operation. Stores at the factory should often be sprayed to get rid of pests such as rats and insects.

This paper has attempted to give a brief account of the general principles of quality control that can be adopted by the local food industries to raise up production and maintain high quality standards. It is recognised implementation of these principles may involve extra expenses, but if one takes into account the long term benefits that will accrue to the manufacturer, then the venture is worth pursuing.

It is often remarked Ghanaians do not complain much about the quality of the locally manufactured products. Probably this is the reason why little support has been given to the National Consumers Association. It is worth noting that the Association was established to educate consumers to appreciate good quality products, and by constructive criticisms help manufacturers to improve upon the quality of their products. By supporting the activities of the Association we shall be helping with the quality control of our locally manufactured products.

The National Standards Board is another organisation that is closely associated with improvement of our local products. Up to date the Board has published about 35 food standards. Among these are standards for Edible Oils and Fats; Canned Leafy Greens (Nkontomire); Processed Tomato Concentrate; Canned Pepper Puree; Fruit Juices and Drinks; Canned Pineapples; Biscuits and Mayonnaise. Proper application of these standards can help our manufacturers a great deal. Often exporters of raw materials such as ginger, dried powdered pepper and cassava chips are asked to conform to specifications laid down by the importing countries. Any deviation from these specifications will mean a substantial loss of money. The study of food standards is therefore worth our serious attention.

The promulgation of the Ghana Food Act and Regulations can influence our manufacturers to improve upon their products. No manufacturer will afford to be reprimanded in

court for producing a sub-standard product or food unfit for human consumption. This is an area the Ministry of Health will have to come to the aid of the country.

Talking about import-substitution is not a minor proposition. It means our manufacturers will have to produce good quality foods in quantities that can replace the imported ones. In addition to this, they must be prepared to go into the production of new food products.

Quality control calls for constant vigilance and sustained effort. It has to ensure that in the carrying out of the production programme the maximum possible proportion of production reaches the required standard of quality. A manufacturer must be conversant with any new scientific and technological knowledge in his field of specialization, so that he can revise his methods of control accordingly. It is a moral obligation on the part of the manufacturer to supply to the public food that is clean, wholesome, nutritious and palatable. A manufacturer's reputation will run high if his products are noted for maintaining high quality standards.

References

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