Technical Problems of Frozen Meats and Frozen Foods: Retail Case Management

Presented by ART PEREZ

Discusses results of a series of tests usin a "simulator."

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The American consumer is about to ring the death knell on "caveat emptor". The old idea of, "let the buyer beware" has outlived its usefulness. It was, no doubt, a concept born of a society where supply was one of the biggest problems. In a society full of goods to sell, it seems to be a different question.

At a recent symposium on product safety held in Washington, D.C., N. W. Justin of the Food and Drug Administration seemed to put it in fine perspective. He said, "The consumer is not sure just what kind of assistance he wants, except that he wants more information on which to form a buying judgment. If this information is not provided voluntarily, the federal government will act. If it does, it is unlikely that control will ever return to private industry".

Justin went on to predict a congressional omnibus consumer protection bill.

While the emphasis in many protection activities is safety, in the food industry, more than safety is involved. It's easy to point out the fact that activities that have been in the past dedicated to safety have in recent years expanded their activities to include quality and performance. Witness the expanded U.L. concept.

What does all of this have to do with the food business? Obviously, I for one, think it means a great deal to every phase of the food industry that serves distribution. Otherwise, I wouldn't be talking on the subject.

Let's assume that you accept the idea of products and services having to produce the quality and performance that the consumer wants. We're not sure what the consumer wants, but we do know that he has found a voice. Various groups in recent years have been hard and performance. The AFDOUS code was one. It had at work in attempting to establish standards of quality good objectives, that of attempting to satisfy an end result. A quality product delivered to the consumer's table. Unfortunately, it did not level with the practical facts of life in all of the distribution steps.

I guess everything I have said so far only introduces the statement that: *in order for the food industry to deliver the proper quality and performance of food to the consumer's table, the whole system must be reviewed in order to upgrade.*

I suspect there might be many examples of system handling to demonstrate how the consumer might be best served. However, few examples are as dramatic as the one involving red meat. The reference here is to the processing of meat from the packer to the shopper's cart.

Recently, the company that I represent did a great deal of work in trying to identify all of the areas of problems that are associated with the process of selling red meat. Quite a few new and surprising things were found. Many of us had previously suspected them, but we needed some new tools in order to give quantitative data to try to move ahead several steps in knowledge.

With the help from some friends, we devised an experiment that went like this. We took some meat that was processed in a retail store and labeled it. At the same time, we had some primal cuts from a packer and had been careful to identify the age of the meat from slaughter and the temperature of the holding conditions. They were near ideal. We brought the meat into the retail operation, being very careful to preserve its temperature and sanitation. During handling, its temperatures were near ideal and the work area and cutting tools were handled with great care to preserve sanitation. Gloves, clean knives, paper over the tables and such made it possible for us to produce a number of cuts which were labeled "super sanitary". We then placed the two kinds of cuts in the display case side by side and put a basket over them so that they wouldn't be sold. This was repeated numerous times to prove what we suspected. Product that was processed in the regular retail operation had case life of two to four days. And it seemed to be quite variable. Product, which was handled in the sanitary way along with proper temperature had from seven to nine days case life.

While the whole series of tests were not conclusive, it certainly seemed to identify the fact that the quality of the products sold is affected to a great extent by what happens between the hoof and the display case.

Several other things were done in order to try to dig more deeply in producing a more satisfactory re-

sult in the whole process of getting the meat to the table. A great many hours were spent in developing a *simulator* that would accurately depict the temperature performance of the meat in display. A simulator was developed that does this accurately. The simulator brought new vision of surface temperatures of meat.

The surface temperature of meat is most important in the ever present battle of time, temperature and sanitation against bacteria mold and enzymes. The simulator recognized facts that Dr. Nauman of the University of Missouri long ago recognized and published. However, it resulted in establishment of specific quantities rather than in general directions alone. It confirmed the fact that surface temperature of meat runs significantly higher than that of the internal temperature, particularly in a display case. It identified the quantity and values suggested by Drs. Nauman and Stringer and it showed that surface temperatures run substantially higher than internal temperature.

Think of another thing. When a piece of meat is wrapped, you usually have little – sometimes big – air spaces between the meat and the wrapping material. Now what you have is a miniature hothouse for the growth of bacteria. You've got the moist red surface of the meat. The red absorbs heat and light a lot like black. So you bombard that little hothouse from the atmosphere, from the lights and then from the ceiling panels, from adjacent shelving. All of these are soaked up by the red surface of the meat. So the little hothouse is warm, moist and bright, ideal for bacteria to multiply.

Sometimes I think if we really understood what goes on, we'd have nightmares about it.

The simulator made it possible to show the barometer of performance of the opened refrigerator and its relationship to the surface temperature and, hence, quality of the meat held in it. It showed that relatively high velocity air across the product did the best job in maintaining surface temperature the closest to the air temperature. It also showed that the level of product display is very important to good surface temperature and, hence, shelf life. It showed that a conviction that many of us in the industry previously had is erroneous. We thought that the product displayed high in the case air flow would produce the best surface temperature. We found that product displayed two inches or lower below the load line gave the best overall temperature and, hence, the best shelf life. It was also found that products spottily displayed in a case produced spaces permitting cold air to nosedive. Because of this, product in front of voids were shown to be several degrees warmer than products in a fully loaded display case. The simulator has permitted a great deal of improvement in troubleshooting. More important, it has become possible to establish parameters of performance with respect to surface temperatures.

Equally as meaningful as the other factors already mentioned, is the fact that the simulators were able to identify other influences of malperformance with respect to quality of red meats and shelf life. For example, with the simulator it was easy to run a series of tests in a store and in the lab with lights *on* over the display case. Similar tests with the lights off. Repeating this numerous times, convincingly demonstrated the influence of the infrared on the surface temperature of the red meat. It was easy to show that incandescent lamps of the conventional variety (or hundred footcandles of light) add a minimum of 6° to surface temperature. The heat rejecting lamps like General Electric cool beam and some other makes too, reduce this to a minimum of 3° and in the case of fluorescent lamps, the infrared effect is less than 1°.

This is not all that is involved. For indeed, the examination of display hardware could not possibly be complete without an examination of the effects of defrosting on the products.

A series of experiments were run to try to specifically demonstrate the results of defrosting on meat products.

A test similar to the first one with live meat was run. A series of cuts were made. The cuts were divided into two halves. One half would go through every defrost experienced by the refrigerator. The other half would be removed every time the display case went on defrost. It would be placed in a walk-in cooler until the case defrost was completed, then the platter of meat would go back into the case.

The result of this test? Initially there was some reduction in shelf life due to the effects of defrosting. In other words, the cuts that were removed during each defrost showed slightly longer shelf life, something in the order of a day. Subsequently, the refrigerator was examined to make sure that it was adjusted according to manufacturer's specification. It was found that the settings were improper. The refrigerator was readjusted according to published data. The test was run again. This time it was impossible to detect a difference in shelf life between the cuts that went through defrost and the ones that did not.

Totaling the series of tests that were run on meat cases, one could now find it easy to sum up following points: All of the fresh meat should be delivered to the supermarket in good temperature and sanitation conditions. It should be cut, utilizing sanitary practices. It should be stored to assure good temperatures. It should be displayed giving full respect to load lines. There should be a full stock of merchandise avoiding empty spots. By design, the lighting system should provide for the lowest surface temperature warmup. The ceiling temperatures should be by design maintained at a moderate temperature, preferably room temperature or slightly below. Display cases should use a temperature regulating EPR valve to produce uniform temperatures throughout. It has the added advantage of producing the same performance throughout the year. The defrost should be adjusted precisely according to the manufacturer's recommendations. Display case should be designed by the manufacturer to a proven level of performance with respect to product surface temperature. The resultant of a whole collection of considerations is both economically attractive and attractive to the consumer.

The suggestion here is that a similar analysis may be made for all types of perishable foods. Doing so, it should not be at all difficult to identify all the parameters that enter into the whole problem of bringing these foods to the table of the consumer.

As an example, similar tests may easily be made regarding the much less critical dairy and frozen food items. Nevertheless, we have already suggested that quality and not safety will ultimately become a requirement. It follows that a great deal more must be known about the temperature and the performance characteristics involving other food items through its handling and display life.

Techniques described by the fresh meat test at least suggest methods that can and should be employed to establish quantative values for things that are suspected or already known.

Even after these are attacked and completed, various

steps of communication regarding the display refrigerator itself remain. For years, technical representatives of display equipment manufacturers have been comparing notes in such areas as testing techniques. Witness ASHRAE Standard No. 72-68. In spite of the testing standard, a great deal of work remains to be done in closing the loop of communication between the laboratory people and the users. However, some directions are clearly in focus, and I'd like to spend the remaining few minutes in discussing them.

ASHRAE 72-68 suggests a presentation for uniform communication to those who can understand the data. The technique is presented here from the actual ASHRAE manual. In practice, a refrigerator's performance would be presented in this fashion and it would as a result of a standard testing method produce three simulators' average temperatures, the *warmest*, the *average*, and the *coldest*. It would have one ordinate in temperature and the other one against BTU. The manufacturer would draw a vertical line to show the location of the standard rating of the particular refrigerator.

Although 72-68 does not include entering supply air temperature for the case, it is suggested that supply air temperature should be added so that an easy thermometer check can determine whether or not the case is actually performing as the designer intended.

The only thing that remains is for the manufacturer to identify the amount of safety factor that is built into the *published* figure in order to allow for variables. This is done in order to gain greater precision in the information. Improved precision is bound to improve the result.

Nevertheless, it's important for application people to be intimately aware of the way changing store ambients affect open case load requirements. A psychrometric chart gives a good cue.

It certainly gives proof of the great need for controlling store temp and humidity in all seasons in order to make use of the new precise information.

The entire result of this is that the loop of communication is closed, with the manufacturer publishing data and telling precisely what it means in terms of safety factor.

An important conclusion: Manufacturers may certify that the data will be correct. They will certify that the product temperature performance will be as charted.

The communication is not only complete but it is likely to produce a correct technical result consistent with the practical needs.

A final comment seems to be in order. Commercial refrigerator manufacturers have publicly announced their intentions to progress towards an N.S.F. standard dealing with sanitation and performance of their refrigerators. The very young technology of open display case refrigerators has apparently matured sufficiently as already suggested.

It is not the desire of the individual or collective manufacturers to sweep anything under the rug. It has, therefore, been of the independent choice to work with an already established body in order to gain *concensus* in the establishment of such a standard. The concensus becomes mandatory in going ahead to an ANSI standard and possibly an ISO standard.

The only purpose of mentioning this is that it's necessary for users, that is, operators of supermarket and operator groups and others, possibly including this one, to have their voices heard so that their expertise may be added to a useful and reasonable standard.

Editor's Note:

Discussion following presentation of the papers brought out these issues:

1. Economic feasibility of the computerized checkout system.

2. Experiences by other companies with off-line order entry equipment.

3. The factor of shrinkage in frozen meat.