# Manufacturing Flavors—How the Industry Produces Uniform Flavors

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Many of you call yourselves flavorists—and many of you are qualified at this art, but I'll take the liberty of saying that flavorists would be better equipped to perform their functions if they spent some time in their plants observing and actually working on flavor production. I'll also take the liberty of saying that those who *do not* do this will never be fully disciplined in flavor creation if they do not routinely see what happens to their creations at the production level.

Our purpose in this paper is to outline how to best carry out completely and economically the total operation of producing and shipping of our flavors. These flavors must meet the total requirements of our customers, our management and certainly pass all the analytical requirements of both our customers and our in-house quality assurance programs. Our primary intent should be that the scaled-up product very closely resembles that flavor we originally created and submitted to our customer who made the long, tedious, and expensive purchasing decision, after many hours of testing, to buy this flavor.

To accomplish all this is no easy task, and you must depend on many individuals within your entire corporation to produce an approved product. I advise you that even the pot and pan or tank washer must be a part of this exercise. If you don't believe this, try sending out a garlic note in an ice cream flavor or a strawberry fruit product with a toothpaste overtone in it. No one act or no one person plays less of a role of importance than the total group.

### Ingredient Specification and Control

Do you know what you are buying? Was your creator at the start of a project, aware of the limitations of all the raw materials to be used? Did you have available a spec sheet from your supplier covering the product or products being used to create this flavor? Did your purchasing agent advise your creation group of the limits of supply and seasonal restrictions on materials? Were you aware or knowledgeable of the substitute possibilities of those items which potentially presented supply problems to you? Constant dialogue with your purchasing department is an absolute first step in producing an acceptable project.



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Established specifications for all ingredients, both purchased and produced internally as intermediates, cannot be overemphasized. Specs should be practical and sensible enough so that limitations on production are not so stringent that you will never get an order out of the door. In those cases where your purchasing department did not supply your quality assurance department with suppliers' specs, then it is the responsibility of your quality control (QC) department to establish them.

Do we put undue pressure on our QC department to allow production to use a raw material before total analyses for spec compliance have been completed? Do we have many plant managers who are overconfident in predicting that everything they produced will be passed and need not wait for QC work to be completed? If this is the case, they had better be very lucky people or have a guardian angel protection when using this tactic.

Every item purchased should have the corporate product identification number on it. No two items should have the same number, nor should duplicate numbers be assigned to the same item. We cannot stress too severely the necessity for complete control of identification numbers for all products which should, in turn, have a spec sheet for that numbered raw material. Your internal administration control must respect the product code systems, and failure of suppliers to comply with these specs should result in a review of purchase and possible rejection of the shipment. If you are on a computer system for manufacturing, compliance with product identification is an absolute must—unless you want to spend days readjusting inventory balances.

If you are faced with a recall, you certainly will help yourself through this disastrous circumstance if you closely abide by the product raw material code system. Through all this, however, don't become a "supply rejection house." We all have our share of those among our own customers, and we know how it hurts to have to take back materials. Talk to your suppliers before final rejections are made. Most times there is a reasonable explanation and differences can be worked out.

Do not resign yourselves to the pre-shipment sample routine for final manufacturing purposes. This system has many pitfalls and few advantages. Any raw material going into your batch must be checked just prior to production! If your raw material shipment represents more than one batch, then your supplier must so indicate this on the receiving report. All individual lots must be checked and your batch sheets must show split batches of items.

After all this is done and you are satisfied that your raw materials are approved, pull off the "not approved" labels, date the receiving shipment, put the items into your warehouse and pay the bill for the items!

### Interdependence of Production

Our plants generally are well equipped. In some instances, however, particular operations cannot be successfully or economically handled. The flavorist must have a sensitivity to these conditions. It certainly doesn't mean that new creations should be scuttled or that new thoughts or the changing of existing processes should be disallowed because the available existing equipment does not permit the application of these new products, but there must be an appreciation for what can be produced.

Some pitfalls must be avoided in order to ensure that you and your production people will enjoy an appreciation for each other's function and purpose.

- All formulas should be compounded in the metric system only—preferably by weight—and each one should have a specific yield indicated on the formula for either the sub-compounds or the final process. Thus we avoid a "goes-in-ter." You all know what that is, of course. That's one of the many sub-formulas that flavorists use when they are creating new products. One sub "goes-in-ter" the other, and immediately when production managers see a formula of this type they "goes-in-ter" a hairy spell!
- Don't create formulas which to a large extent are mixtures of a number of other so-called finished products or stock items. I don't mean to imply the impracticable—that everything you create must be 100% original. We all know that the raw materials' age plays an important part in the taste of final products. It is impossible to come up with the same product time after time when unreasonable amounts of finished goods form the basis of new products. The age of each finished good used has a significant effect on the end product.

  In addition, have you ever had the experience of trying to cost out a product of a mixture of stock items: If your accounting system is like ours, then realize that it costs many cents more to produce this type of product than the more exploded formula. Higher costs mean higher selling prices. The product is less competitive in the field, and the flavorist is less successful because this product didn't sell! We

recognize it is the easy way out to make such products, but it definitely is not the production manager's dream to come across these formulas.

- Stay away from using solutions of active ingredients whenever possible. We recognize that, when you are making small quantities in your lab, a solution is probably the most exact way you can apply highly active ingredients into your formula. But let this procedure stay in the lab! The formula which goes into production should, whenever possible, show only neat materials.

  Solutions at the plant level are generally made by the compounders that need them. The tendency is for these people to keep their own solutions available for their own use. What was originally made as a 1.0% or 0.1% solution, after a period of time and on frequent opening and closing of the bottle, is no longer a 1.0% or 0.1% solution, but something other than the original strength at which it was made. With a number of compounders in a plant, the chances are good that the same compounder *will not* be compounding the same flavors all the time. Different compounders or different benches give different age solutions and consequently different results in end products from batch to batch.

  Further, if you are making large batches of finished goods you will be using large quantities of alcohol at its full tax paid cost, or else you are bound to submit a formula for the Bureau of Alcohol, Tobacco and Firearms approval to receive alcohol tax drawback. You will also find that there will be marked differences in your end results when supersensitive chemicals are added in the neat form versus the diluted form.

- Too many present-day flavorists have dismissed the practice of using ingredients extracted from natural herbs, botanicals, or fruits. I'm inclined to think this is because they have not exposed themselves to products which are made in this way. Ginger oil and ginger oleoresin are good products, but I still believe that an alcoholic extraction from ginger root is a beautiful item. Vanillin is an extremely important ingredient, but there is certainly nothing that compares to a single-fold vanilla extract. Almond oil or benzaldehyde is a necessary ingredient in many of our flavors, but a well extracted, filtered and clarified wild cherry extract can also be a part of new creations. A few days in the plant will give you the insight to all the products which are the results of good manufacturing practices

involving extractions, distillations and concentrations.

- Equipment and many raw materials have limitations in what end results they can be expected to perform. How often do we get a formula for spray drying a product which is high in natural fruit content, resins, or hydrolysates, without any thought given to adjusting the quantity of carrier that is used to do the drying? How often do we get a formula that is very high in low boiling esters, and absolutely no thought is given to changing the spray drying parameters?

  It is not unusual to get formulas for spray drying that contain a high percentage of water soluble flavor ingredients. Nor is it unusual to be told by a flavorist that a product is varying from the results that were obtained in the lab dryer as compared to the production dryer. Too often we get a request to spray a flavor which is high in solvents such as ethyl alcohol or propylene glycol. These formulas have made really religious believers out of our spray dryer operators. A very serious situation occurs when a flavorist wants to increase the active ingredient content of a new creation to 30 or 40 percent and is totally surprised when tastes of the new suggestion at parallel levels shows the two products to be different. Equipment and raw materials have limitations. You can't expect duplicate results if you don't apply some know-how to formulas before they are sent in for lab runs or production size batches.

Frequently we are asked to produce flavors which involve the reaction of amino acids. Initially these creations are made by the flavorist in a "kitchen" type operation with a pot and a pan. All intentions are good, but good intentions do not give the end results these delicate products require. Scale-up operations from pot and pan to pilot size are imperative. Further, pilot batches are but another step toward achieving the desired end result. Too often we find in such products that an overabundance of active ingredients are used in the lab batch; that is, when sophisticated equipment and controls are used in the plant we can save on the amount of active ingredients and their costs, which may be extremely expensive.

- Don't be a brown or green bottle flavor creator! All liquid flavors must be put together in such a fashion that they have an acceptable degree of solubility and clarity. It is not unusual to see instructions on formulas such as "pack in a brown bottle." You cannot hide your errors by suggesting this type of packing. The same thing holds true for the product which is not mixed or emulsified correctly. "Shake well before use" labels belong on pharmaceutical preparations filled into bottles of four ounces or less. They don't belong on containers into which flavors have been filled. You can just see the look on your customer's face when he receives a drum of flavor with a "shake well before using" label on it!
- Avoid any extra processing steps that can possibly be avoided. In dry or powder types of products it is often wise to mill a few of the ingredients before mixing the entire mass. It may not be necessary to mill the total product, thereby saving some in-plant costs. When working with fruit products, it pays to depectinize some of the ingredients individually rather than treating the entire batch. The same thing holds true at times with centrifugation and filtration. If you have one or two ingredients that need this extra care, do so at the initial point to decrease production costs and increase the yields of the final products.
- If you are making the soluble or terpeneless types of flavor or oils, give extra care and time to proper chilling of the early steps before proceeding with the separation and filtration steps. Remember, that step of putting a 500 cc separatory funnel into a freezer to hasten the separating operation will most assuredly cause your plant manager to call you all kinds of names unless you have a freezer big enough to handle a 500 or 1,000 gallon tank!
- Indicate all the laboratory steps and precautions and pass them on when the formulas are submitted for production purposes.
- After you are convinced that the work is complete and that you have the product which you really want to create, then once again review your formula for total, correct nomenclature of all ingredients used. Clearly indicate whether you want Lemon oil California, Italian, Argentina or Arizona. If you use a coarse grind particle size of a dry product in the lab, show this on your formula—don't make your people play guessing games. When using synthetic aroma chemicals, clearly indicate the purity of the esters, aldehydes, or others used in your creation. In many cases it is absolutely essential to indicate either the source of the raw material or its supplier. There are vast differences from supplier to supplier in the quality of aroma chemicals which we buy. There are also vast differences in the costs of many of these items from supplier to supplier.
- We are all faced with supplying products which are bacteriologically clean or at least acceptable. Give serious selection consid-

erations when choosing ingredients for any new submission. Here again the intent is not to limit the raw materials for your creation, but an attempt to use those products which, because of some prior processing, are either low in bacteria or bacteria-free. Avoid the pitfall of having to clean up a finished product because no prior thought was given to selecting raw materials which are "bug free." When making sample quantities in the lab, the flavorist may not be concerned about the high plate count in a creation, but at the production level and in production quantities this is a different and expensive step.

- Finally, don't use an unnecessarily high number of raw materials or ingredients in a new issue. There is absolutely nothing wrong with a new formula which contains only six to eight items. In my opinion there is nothing impressive in a new formula which contains literally a hundred or more ingredients. Each item used adds a significant cost to the product. Be constantly reminded of all the expenses involved in inventory, purchasing, and quality control of all these raw materials.

When you have reached this point, it is time to carefully review your formula with the thoughts of possibly eliminating some items which are used in small quantities and which, if omitted, will have little or no effect on the final product. The same procedure should be considered when unusually large amounts of liquid and solid diluents are used. Container costs and shipping charges, both on the incoming and outgoing steps of bulky materials, are eating into your profits.

### The Regulatory Agencies

Today's manufacturing plants must be concerned not only with producing an acceptable product, but they must do so and comply with all the rules, regulations, governmental requirements, labor restrictions and, yes, even specific dietary and religious conditions. There are a mass of policemen out there watching you! OSHA—EPA—MID—FDA—and local inspectors—rabbis—ABC—RIFM—FEMA—GRAS—and many more abbreviations which I can't even remember. The day is gone when you would pull out the little formula book; not be concerned with code numbers, batch sheets, alcohol tax reports, red label declarations; and just make the product, get it out the door, invoice same and try to get paid as fast as you can, because "you needed the money!"

Yet when we look back and are really honest with ourselves, we must discern which era is the most stable and comforting. Do we want to return to a non-scientific, loosely controlled, pot-and-pan era? Do we really want to be called "the kitchen art of flavors"? By nature I guess we object to the acts of semi-bureaucratic departments directing or advising us of what we are doing wrong, and we have an immediate impulse to rebel against these "isms." Is it wise to fight OSHA on every safety suggestion they make, or even fight a fine when we know have been at fault and severely neglectful? Are we being a patsy when OSHA advises us of repeated safety hazards our employees choose to work under, and yet we don't take a managerial position to correct the employees.

I must honestly say that in most cases the advice from vigilant inspectors is sound and generally doesn't present a disaster in operations. I also fully know that some of the promulgated requirements are totally asinine and can never be economically carried out, but by and large, my advice is "don't fight the agencies!" Unfortunately this is such a broad subject, with so many unknowns assigned to it, that our inspectors are often groping for help on how to correct a bad situation. Often times you know much more about certain specifics of their job than they do. Don't hit them over the head with this, but gently and diplomatically show them how they can accomplish their goals by doing it your way!

OSHA—EPA—FDA are here to stay!! We all have EPA inspectors watching us closely Try to see their role as a small cog in a gigantic conservation program, which can be the difference between good health and life and death. If you don't believe this is so, just ask someone who has walked through the streets of Nigeria or Ghana and then talk further about protecting the environment.

OSHA—Occupational Safety and Health Administration
EPA—Environmental Protection Agency
MID—U.S. Meat Inspection Department
FDA—Food and Drug Administration
ABC—Alcohol Beverage Control
RIFM—Research Institute for Flavor Materials
FEMA—Flavor & Extract Manufacturers Association
GRAS—Generally Recognized As Safe

We can talk for hours about our future role and ability to comply with all these issues. I'm sure no one wants to have a process shutdown for twenty-four to forty-eight hours so that we can mark our products "K" for Kosher. Who wants to run a spray dryer on only those days when the wind will blow the odors away from the limits of our property and the nearby community? Can any of us afford to shut down our entire plant for a weekend because a local health inspector found roach signs in the production area. "Fog the entire plant!" he says. We will—and we do! We have found it wise not to fight these decisions. You can offer no excuse to a customer who received a product in which insects were found.

Perhaps our company may be somewhat more compassionate to these agents of the courts than others have. But over the years our experience has been that we have gained more than we have lost by working with them and not fighting the obvious issues.

In all this time we have talked about specs, QC alertness, purchasing, equipment, the various agencies, and manufacturing in general. However, the single most important factor which is going to produce an acceptable product for you consistently in an economically satisfactory manner is your plant staff. Today even with all our scientific improvements in technology and instrumentation, our greatest assets are the people who are responsible for putting it all together. I had the privilege of being a plant manager for a number of years and was dubbed "The Godfather." Somehow there was always time to talk to our employees, have lots of free lunches and picnics, but also discuss the monthly performance sheet with all of them. We always talked—they knew what was going on—present and future. They cared and we got capacity performance from them because they knew we cared. How many operational managers fully realize that acceptable production is the direct reflection of people who care! Take time out to listen and show sincere concern over the well being of your people. You owe it to them. It will pay off multifold!

At home we enjoy the "M * A *S *H" program reruns. Just prior to this program a short ad is run—"Did you hug your child today?"

Plant Managers, if you want acceptable products, let me ask you: "Did you hug your compounder today?"

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