Flavors for Snack-Food Applications

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Flavors and seasonings are an important consideration for snack foods around the world. They enhance the products and provide appeal for different consumer segments. Topical seasonings rely heavily on the contribution of flavors to reduce the usage of more expensive commodity items or enhance their flavor. The overall snack-food product development process is described here, from concept selection through seasoning development, consumer testing and commercialization. Many of the comments are broadly applicable to the development of processed food products and should give some level of insight to flavorists with regard to customer processes.

Concept Selection

Projects are often initiated by identifying an unfocused concept or small group of complementary concepts for development. The genesis of concepts can come from a variety of inputs. Focus groups are often held with users, non-users or target consumers to get narrative input on flavor possibilities for a product line. Often these are initiated with some draft-concept boards and sometimes employ rough product prototypes.

The positive aspect of focus groups is input from consumers, while the possible negative impact could be that reports are often heavily skewed by the opinion of the moderator or ranking marketing person associated with the project. Competitive products with proven consumer acceptance often provide a target. No one likes "me too" projects, but they are a fact of life in a competitive environment. Complementary products also come with positive affirmation of consumer acceptance of a flavor idea. Concepts also come from studying cookbooks, restaurant trends and regional or ethnic cuisines. A lot of projects come from what I term "divine inspiration"; directed objectives which flow from that wellspring of consumer wisdom, the senior staff. Most treasured should be concepts that are supported by quantitative consumer feedback. The likelihood of success is better if a few hundred consumers say the objective is a good idea than if they say it is not.

Seasoning Development: The User Perspective

Many product developers tend to do seasoning or flavor selection by screening an array of products from a group of vendors and picking one that seems to work. If the product meets expectations, it is rushed to market. Failing that, additional submissions are requested on a short timeline, and the cycle repeats. This is more a process of *shopping* than *development*. Flavor delivery depends heavily on the product itself; factors such as level and type of oil, other matrix materials, process parameters, bulk density and product geometry all play a role in how the flavor is perceived. True development is best accomplished by structuring a project to include a timeline that allows the vendor company to do its homework to provide an optimized commercial product.

This approach expands the options the developer has to evaluate raw materials and flavor executions. The product should include an induction period to allow the vendor to get fresh samples of raw materials, do some prototype development, and evaluate their product under conditions which emulate those faced in production. The project pathway should be defined for the vendor, including a model system to test flavors, process parameters, date and nature of consumer tests and timing for scale-up. The response should be that the vendor dedicates resources on a continuing basis until the project is complete.

A high-powered product-development path will have multiple sensory tests as the project proceeds. The product developer should expect that seasonings provided for consumer tests be freshly prepared from raw materials that represent the commercial stream of those materials. This should ensure the seasoning will scale-up appropriately and maintain continuity with the earlier testing. Home-use tests, if employed, should be done with scaled-up seasonings made from commercially prepared raw materials. If the new product is put into the test market, both parties need to track the flavor and appearance of their raw materials and finished products.

Seasoning Development: The Vendor Perspective

A few keys can lead to success in snack seasonings. First, utilize some capable creative and technical talent. Constructing the flavor profile for a snack seasoning is comparable to compounding a flavor. In essence, a continuum exists between pure flavor systems and classical seasoning systems made with commodities. Seasoning progress will come from improvements in flavor systems, but not at the expense of consumer perception of the products. Seasoning development has the additional challenge of controlling powder properties, appearance and shelf life. Applications work needs to be done. Establish that your product tastes

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the way you think it should in the customer's application and after it has been through some proxy for plant conditions. An objective mode should be developed to evaluate your work. Finished-product consumer acceptability is the key to capturing business and having the product succeed in the market. One person or even small groups of technical people are not very predictive of consumer tests. Find a way to get consumer feedback using objective sensory measures. You must control your raw materials. Raw materials determine the flavor, appearance and physical properties of the seasoning in production. The time to worry about the integrity of the materials is at the beginning of the project, not at the commercialization stage.

When constructing a topical seasoning for salty snacks, it must be optimized for taste, appearance and physical form. Taste sensations interact and must be optimized against the concept and with the specific base product. The appearance of the product also deserves prime consideration. A seasoning that looks like barbeque will taste like barbeque to a suprising number of folks. Conversely, changing the color or adding piece identity will create a different expectation for many consumers. Creating visual appeal in salty snacks is an opportunity. The physical form of the product determines whether it will remain homogenous in handling and perform in seasoning-applications equipment.

Constructing the aromatic profile requires the thought patterns of a flavorist. Top-note character, body and aftertaste must be balanced to create a coherent profile that is complex, recognizable within the context of the concept and pleasing enough to provide high consumer acceptance. A lot of work goes into ensuring the individual flavors and ingredients work together to create the desired profile. Flavors need to be balanced for topical-seasoning applications. Excellent spray-dried flavors for some applications do not work on snacks because the flavor peaks quickly and dissipates. Few liquid flavors work well in snacks for a couple of reasons. First, the environment does not favor retention of volatiles, and the product can fail shelf life through flavor scalping. Also, liquid flavors tend to have a very high bag aroma for the amount of flavor delivered. This can adversely affect consumer perception and impact acceptability. Spray-dried flavors and spice replacements have proven to be more consistent for flavor integrity, consistency and stability. Ground spices can vary in particle size, lose volatile oil and, in some cases, have calamitous enzyme activity. Balancing spray-dried flavors for snacks requires that the developer manipulate the flavor concentrate and spray dry matrix such that the aromatics release appropriately for the application. This again requires critical tasting of flavors in snack applications and iterative work between the flavorist and seasoning developer.

Seasoning Issues

The factors the must be considered during seasoning design include adhesion in production, powder properties, shelf life of both seasoning and finished product, appearance of the snack product, flavor consistency, price and sensitivity to the environment. Adhesion and appearance consistency are both correlated to particle size of the individual ingredients as well as blending procedures. Powder properties are related to a large number of factors, including particle size, surface properties, water activity and hygroscopicity of ingredients, order of addition, level and distribution of oil, temperature, temperature history, and blending procedures. Powder properties in systems as complex as topical seasonings are difficult to measure and control. Avoiding lumping and dusting requires knowledgeable selection of ingredients and product/process design. Still, some level of empirical investigation is necessary for each new formula. A well-designed seasoning will have some inter-particle attraction, often achieved with vegetable oil. Flow agents like silion dioxide, tricalcium phosphate and others are used. Powder properties will change for a period of time after blending, increasing or decreasing in flow. Study is required to get the properties correct in the blender to achieve acceptable performance at the customer.

Shelf life of seasonings and of the resultant snack products also depends on ingredient selection and control. Problems come most often from oxidation but can also come from come from flavor loss and interaction between constituents. Dairy products with milk fat are succeptible to oxidation, and shelf-life risks increase with age. Vegetable oils oxidize easily if they are not stabilized. This risk is also present in cereal products with low levels of oil. Plated liquid flavors will lose impact, depending on their volatility. Ground spices can lose volatile oil and become less characteristic. In some instances, volatile constituents can react with other ingredients to generate off-flavors. This can be avoided if the volatiles are bound in an appropriate matrix. This type of problem will normally manifest itself if the seasoning is stored at 40° C in a sealed container for a week. These issues tend to be time-temperature related, and good production systems will avoid aged raw materials and excess heat and humidity exposure for raw materials and finished goods. Heat exposure will drive off volatiles, cause redistribution of moisture in the ingredients and destroy the particle integrity of high-fat materials such as cheese powder.

Internal Flavors for Snack Foods

A number of flavor companies have products intended for use in snacks prior to processing. Snack processing conditions create a very hostile environment for internal flavors. Products are fried or baked to very low moisture levels to maintain crispness through shelf life. A lot of energy is input to drive off the last of the moisture, so only a fraction of highly volatile materials are retained. Heavier flavors like meat/savory, sweet brown or some spices are retained. Capsaicin and piperine will survive. The issues created in the manufacturing environment are flavor leaching into frying oil, making it useful for only one product and airborne cross-contamination of other lines. Some flavor constituents also hurt the stability of the fryer oil. In general, post-application of flavor or seasoning will be more cost-effective, provide better flavor fidelity and reproducibility and give more flexibility on production lines.

Flavor Needs in the Snack Industry

Flavors will play an increasingly important role in snacks, US and worldwide. The most popular US snacks are shown in Table 1, and various global snacks are shown in Table 2.

Table 1. Major US snack flavors

Potato Chips	Extruded Snacks
BBQ	Cheese
Sour Cream & Onion	Spicy Hot Cheese
Cheese & Sour Cream	
Tortilla Chips	
Cheese	
Spicy Cheese	
Ranch	

Table 2. Flavors of the world

Cheese	Salt & Vinegar	Cheese & Onion
Ketchup	Adobo	Barbacoa
Chili	Paprika	Teriyaki
Chat Masala	Pudina	Curry
Chicken	Consummé	Five Spice Pork
Prawn	Cuttlefish	Seaweed
Steak	Roasted Corn	Cheese & Bacon

Many of the seasonings for these products are made with flavors in addition to the commodity and semi-commodity ingredients that are used. In the US, cheese, sour cream, tomato, onion, garlic, buttermilk, black pepper and chili peppers dominate the characterizing, non-flavor ingredients used in snack seasonings. The same items are used globally, plus a variety of other products, including spices, soy sauce, meat and seafood. Most of the US seasonings are not Kosher or Halal, though that is a requirement for some significant global markets. Normally, artificial flavors are not an issue if the flavor is non-characterizing. In fact, characterizing artificial flavors are satisfactory where natural does not achieve the necessary product acceptability. Opportunities exist for improving the fidelity and stability of flavors everywhere. To the extent that flavors can displace, supplement or enhance the commodity items, improvements in price/value, quality and transportability can be attained. This can only be accomplished when the flavor systems deliver finished products with high consumer acceptability to allow the products to survive in the marketplace.

Several genuine needs for snack applications can be identified:

- Great-tasting core-brand seasoning executions of new concepts.
- Superior executions of proven concepts.
- Flavors that can be incorporated in snack products, internally or topically.
- Flavors to make low-fat and no-fat products with better consumer acceptance.

Making low-fat snacks taste good has proven to be a difficult task. Classical topical seasonings do not perform. Without much oil to act as an adhesive, only limited amounts of powder can adhere. The flavor acceptability of standard seasonings in this application is low with the flavor profiles distorted. Flavor systems will be the answer, but most current flavor products are also unbalanced for this application. Many flavor houses have provided flavors for snack applications which do not score well with consumers. They need to develop an understanding of what flavor qualities drive consumer acceptance in addition to understanding what controls shelf stability in this unique application. If the flavor does not provide consumer benefit, e.g, superior taste or a cost advantage, it does not provide value. As I said of the customer role, they don't care about or consider the following aspects/concepts:

Reaction flavor
Fermentation
High-tech extracted
Extruded
Precursor flavor
Heat stable: enzyme-treated, high-tech encapsulated
Nature-replicating or nuked, mystical and multimedia

However, they do require a measurable consumer benefit.

References

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