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FOOD & NUTRITION**

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Future Together



INGREDIENT SELECTION

Technical Bulletin

Choosing the right ingredient

CHOOSING THE RIGHT INGREDIENT IS AN EVERYDAY CHALLENGE FOR MANY FOOD DEVELOPERS.

The vast number of ingredients and additives is growing, the diversity of food applications becomes wider and selection of ingredients has become a complex process. There is no simple model, like a decision tree, which takes all influencing factors of the selection process into account. The optimal choice of ingredients is critical, in order to achieve the right texture and the desired organoleptic properties. This is true also for the required shelf life and the appropriate marketing claims of the final food product.

Brenntag has introduced a product development approach in which a project is addressed in five separate aspects. These concentrate on food technology, food design, health & nutrition, food safety & shelf life and processing aids. This systematic approach facilitates ingredient choice and makes the selection process more transparent. A product development briefing may include product improvement, focusing on a limited number of properties, or a new product innovation where all subjects are not only important but are heavily interdependent.



FOOD TECHNOLOGY

PROVIDE THE RIGHT SYSTEMS FOR TEXTURE AND STABILITY.

Food technology focuses on achieving the right structure of the finished food product under given processing conditions. Many food systems are multi-phase systems: emulsions, dispersions, foams or combinations of before mentioned. Creating a multi-phase system as well as stabilising it, is also a serious challenge for food technologists.

The common ingredients of choice are starches, emulsifiers, thickeners and gelling agents. Phosphates and proteins are also used. In carefully choosing these ingredients a pourable, pumpable, spreadable or cut-able food product can be made. Key functionalities like fat and water binding, crystallisation control, rheology characteristics, freeze-thaw or bake stability and mouthfeel are the result of precise selection of these ingredients.

Processing conditions have a major influence on the performance of the ingredients. The intensity of mechanical shear and heat treatments should be taken into consideration. Ingredients capable of withstanding the processing conditions, in combination with the pH of the product, should be selected.

Most ingredients do not act alone, in fact ingredient interactions can be beneficial. In order to achieve such interactions, the ingredients need to be in the right state, they must be soluble. Process conditions should be chosen to guarantee that ingredients dissolve at the correct rate and in the right amount of time.

In short: a clear vision of the required finished food properties (e.g. pourable emulsion), together with the desired ingredient functionalities (e.g. waterbinding, emulsification) and the given process conditions, make a successful evaluation of ingredients possible. This first evaluation step is mainly to eliminate ingredients which will not perform under the circumstances or which do not display the required functionality. A second evaluation step concentrates on functionality in more depth and other attributes such as cost/performance, efficiency and labelling also play a role.



FOOD DESIGN

CREATE ATTRACTIVE PRODUCTS IN COLOUR AND TASTE.

Consumers only choose attractive products: The right colour and colour intensity should generate an appealing appearance and is a first indicator of the taste to be expected. If the colour and the flavour do not match, consumers tend to identify the food more by its colour than its flavour, so colour selection is extremely important. Besides the basic colouring of food, colours are also used to enhance the natural and variable colour of a food product or compensate the colour which is lost during processing.

Taste is a main driver in the food industry, taste is complex, it is about flavour, flavour release, flavour intensity, texture and mouthfeel. Flavour trends evolve continuously, emerging from regions, blending between cultures, deriving from specific preparation methods and shifting from applications, e.g. savoury flavours in traditional sweet applications. New flavours are developed but also traditional flavours are used in new and innovative applications.

Some natural colours like anthocyanins and carotenoids have been linked to health effects such as anti-oxidant and vitamin activity. In Asia this led to the introduction of health-by-colour concepts. Preserving the natural colours and pigments, gives the physical appearance as well as preservation of the natural goodness. This aligns very well with the trend towards natural. We observe this in fruit and vegetable beverages and also in convenience products like soups. The so-called super fruits are another good example where natural colour and goodness are combined, and these have their influence on flavour trends too. So, in addition to their primary function flavour and colour can be identifiers for healthy products.

Colour and flavour should be a perfect fit with the deep instincts we have and which are awakened by the senses of sight and taste. Food design is the challenging combination of food science and culinary art, with the goal to introduce innovations that attract and satisfy consumers.





HEALTH & NUTRITION

ACHIEVE THE OPTIMUM BALANCE IN NUTRITIONAL COMPOSITION.

Health is a major driver for food development in addition to convenience and taste. More scientific information with regard to the relationship between diet and health becomes available every day and this creates possibilities for innovation. Ingredients like vitamins, minerals, amino acids, fibres, herbal extracts and other nutraceutical ingredients such as omega-3-fatty acids and sterol esters can be used to develop food with a health or nutritional benefit.

The choice of appropriate ingredient depends on the positioning, or benefit proposition, of the healthy product. Positioning can range from, better-for-you products, with a reformulated composition, i.e. taking fat, sugar, calories and/or salt out, to benefits based on true health platforms, like heart, eye, bone or digestive health.

Product positioning can centre on themes like “Feel Good”, “Look Good” and “Body Shape”. Feel Good can relate to being concentrated when studying, feel energetic while performing or relax after working. Look Good has been dominated by personal care products, but today we know that diet has a clear influence on skin health. Body Shape relates to maintaining or achieving a healthy body weight as well as a healthy body composition, with or without sports or heavy exercise.

Product positioning is often focused on a specific target population group, such as children, athletes, elderly people or working mothers. A health & nutrition concept can be applied to “traditional” food such as beverages, dairy or bakery products but also innovative ideas can evolve. As an example of the latter, let’s look at “foods-on-the-go”. This trend offers opportunities for convenience products combined with healthy eating; hand-held foods in portion packaging, with added health benefits.

To choose the right ingredient following basic questions need to be answered. What is the food application and desired product positioning? What needs to be communicated to the consumer? Which ingredient fulfils the requirements and can technically be formulated, in sufficient dosage, in the application and under the given process conditions? Important to emphasise in this context is that an “ingredient” is not only the ingredient itself but also the accompanying scientific evidence of effectiveness.



FOOD SAFETY & SHELF LIFE

PROTECT PRODUCT QUALITY THROUGHOUT THE SHELF LIFE.

From food manufacturer, throughout the distribution channel, up to the consumer, the initial properties of the food need to be maintained, to be sure that the food products are safe and as delicious and nutritious as freshly made.

Thus protection against oxidation and microbial degradation is required. Food composition drives the choice of ingredients such as preservatives, anti-oxidants and acidulants, and as a result of that the resistance to oxidative and microbial degradation. The right ingredient, in combination with the applied processing, packaging and storage conditions should guarantee product quality.

Oxidation can result in rancidity, browning, development of black spots or loss of nutritional value. This is due to the damage done to vitamins or amino acids. An insight in the mechanism of action of the anti-oxidants can be helpful. Antioxidant properties can result from chelating functionality, oxygen scavenging or interfering in the oxidation chain reaction. Preservatives prevent or slow down the growth of moulds, yeasts and bacteria that cause food spoilage and food poisoning.

For testing the effectiveness of a shelf life solution, accelerated methods, incubation at certain temperatures for microbial analysis and forced oxidation to measure rancidity, can be used. Besides the accelerated methods, close follow up during shelf life is important; this includes sensory analysis of colour and taste. The combination of tests gives the basis to determine achievable shelf life extension.

There are both synthetic and natural preservatives and anti-oxidants available. The consumer trend towards natural products may generate improvement projects.

To conclude: looking at the composition and storage conditions the sensitivity towards microbial and oxidative degradation should be taken into account. Protection achieved by processing and packaging can be determined. Any gap needs to be filled with the choice of the right ingredient. All options need to be checked with the regulations, maximum dosages and permitted applications.

PROCESSING AIDS

FACILITATE THE PRODUCTION PROCESS.

The processing aids are a specific group within the food industry. In first instance a food manufacturer will look at optimization of processing conditions, but the use of antifoams and free-flowing agents is sometimes necessary, to either control the production process or maintain properties during storage. Enzymes are also in most cases processing aids; being active during the production process and being inactivated in the final food product. Enzymes influence the yield, capacity or efficiency of food manufacturing processes, but also influence end product properties; enzymes used in baking are a clear example. Processing conditions, food composition (substrate) and required action are the selection criteria for choosing the correct enzyme. Application of enzymes in baking, beer brewing, alcohol production and fruit processing are well known but novel applications of enzymes are under development.

INGREDIENT INTERACTIONS.

Of course the five development aspects do not stand alone. Some examples; when working on a health & nutrition objective like salt reduction, also the shelf life and the taste are affected. The pH of a product affects the shelf life; it affects the taste, and also affects solubility and therefore effectiveness of preservatives, thickening and gelling agents. Texture and mouthfeel, generated by applying the right food technology, have certainly an influence on taste and in that sense are part of food design.

Complexity in food development will not disappear, but to start ingredient selection by narrowing down to separate aspects makes the process more transparent and give a better insight and understanding about ingredient performance.



CONTACT US

Brenntag Europe is delighted to offer its customers a wide portfolio of preservatives and acidulants. If you would like to discuss with one of our food dedicated specialists, which particular products would best meet your requirements, then please write a short email to food-emea@brenntag.de and your local Brenntag office will provide you with the requested information and samples.

Please visit www.brenntag-food.eu

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