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Developing the essential food ingredients for the future

Die Entwicklung wesentlicher Lebensmittelinhaltsstoffe für die Zukunft

The food ingredient industries in the 21st century continue to face new dynamics of operation. This article looks at some of the challenges that have been met over recent years and the ways in which companies have adapted their business models to succeed in these environments. Across a range of ingredient manufacturers from dairy, flavours and colours, starch and sugar the approaches have developed to refocus their offerings in terms of lateral product range development, service enhancement and reaching out to new and different markets. The demands for ever more sophisticated consumer products combined with a changing regulatory and raw material supply environment, have ensured that flexibility of response is the key tool to be used here. Going forward the industry will use the benefit of this diversity of experience to succeed.

Key words: change, flexibility, product development, constantly developing business model, ability to adapt

Die Industrie der Lebensmittelinhaltsstoffe sieht sich im 21. Jahrhundert auch weiterhin einer sich immer wieder neu entfaltenden Dynamik im operativen Geschäft ausgesetzt. Dieser Artikel beleuchtet einige der Herausforderungen, die in den vergangenen Jahren gemeistert wurden, und die Art und Weise, in der Firmen ihre Geschäftsmodelle angepasst haben, um in diesem Umfeld erfolgreich zu sein. Quer durch eine Auswahl verschiedener Hersteller von Lebensmittelinhaltsstoffen der Milchwirtschaft, der Aromen- und Farbstoff- sowie der Stärke- und Zuckerindustrie haben sich Vorgehensweisen entwickelt, die Angebotspalette neu zu fokussieren in Hinblick auf die Entwicklung ergänzender Produkte, die Verbesserung im Service und den Zugriff auf neue und unterschiedliche Märkte. Die Nachfrage nach immer anspruchsvolleren Endverbraucherprodukten in Verbindung mit Veränderungen im Umfeld des Lebensmittelrechts und der Verfügbarkeit von Rohmaterialien garantiert, dass hier der Schlüssel zum Erfolg bei einer flexiblen Reaktionsfähigkeit liegt. Diese Vielfalt der Erfahrungen wird die Industrie nutzen, um weiter erfolgreich voranzuschreiten.

Schlagwörter: Veränderung, Flexibilität, Produktentwicklung, fortwährende Weiterentwicklung des Geschäftsmodells, Anpassungsfähigkeit

1 Introduction – The challenge

The food ingredient industry of the 21st century continues to face new dynamics ranging from ever increasing sophisticated consumer demands, health concerns and a more detailed regulatory environment, through to greater market competitiveness, price sensitivity, industry consolidation, raw material availability and global demands.

The responses of the different elements of the industry to these issues demonstrate the diversity of approach needed to both survive and to grow in this environment and we can learn from better understanding some examples of these.

Against this background the various ingredient industries, in



their turn, have faced specific and ongoing challenges over recent years, which have shaped and continue to refocus their business models as well as encouraging them to reach out to different markets and a rich diversity of product developments.

1.1 Traditional businesses moving to value-added ingredient suppliers

The most significant change has been the increasing sophistication of products and service range offered by the industries. In most cases the concept of simple product supply and demand has long been surpassed by the development of a model designed to meet customer needs through far more

tailored, value added products and services. The economics of the wider food, beverage and related agri-products users' industries continue to drive ever greater efficiency and higher service levels.

This also encourages even closer working arrangements between them and their ingredient suppliers.

In many cases end user companies routinely expect their ingredient suppliers to develop new solutions for them in effectively an outsourced development role. The success of the ingredient businesses in these situations depends on their ability to respond effectively to these demands.

The range of ingredient companies employing references to 'innovation', 'solutions', 'partnership' etc. in their promotional material are testimony to these changes.



2 The food flavour and colours industries

Though the food flavours and colours industry dates back thousands of years it has undergone significant change since the 1980's. In Europe especially, the industry came under pressure from a range of sources to move to offer alternatives from chemically derived products. As a result the industry devoted great energy and resource towards the development of naturally derived solutions for its products [1]. The pressure for this was further increased with retailer demands for labelling reflecting the 'natural' elements and ultimately regulatory changes within food categories.

The demand and the response from the industry was considerable, reformulating products, proving new compounds and evaluating dose rates for a myriad of applications which was an impressive feat.

At the same time the profit margins of the ingredient manufacturers themselves were under pressure driven by the demands of food processors and the growth of private label lines. This has created a dynamic in which the industry has had to balance the demand for economy products with the equal demand for premium offerings, which deliver the uniqueness of food brands and differentiate them in the highly competitive consumer food marketplace.

In this environment one has seen the diversification of the industry to meet this challenge. The highly competitive consumer food market drives companies within this to seek ever stronger product positioning and in turn puts pressure on ingredient suppliers. These demands have been responsible for the requirement to offer uniquely tailored product and service to customers resulting in highly sophisticated applications centres where the flavour or colours are developed, evaluated and proven in dedicated end use products [2].

The effect of these changes on the industry and the way in which it responded is in itself a study in adaptation and growth. Clearly any industry has to react to its customers' demands, but doing so against a background, in Europe at least, of almost completely reinventing the core product ranges provides a lesson in business flexibility.

The major challenge confronting flavourists and food colours specialists is to provide taste and character within new and tighter cost constraints. Equally consumers desire for certain low sugar, low fat and low salt products combined with trying to offset the often blandness of some healthier foods applies additional developmental pressure. The demand for natural products will continue to rise but so will the demand for ever more cost effective ingredients.

3 The dairy ingredients industry

The dairy ingredients industry responded to a changing business environment with diversity of approach, in Europe driven partly by changes introduced by the CAP [3] in the 1980's, but also in other territories as well. Equally the

move from direct liquid milk sales to supermarket sales with its commensurate effects provided a need to extend the business offering and improve profitable opportunities. The development of more specialised industrial ingredients was apparent, broadening and improving wider business potential.

Sophisticated milk and blended cream powders were developed using new spray drying methods, to meet convenience product demand. Tailored dairy powders were developed meeting specific characteristics, such as dissolving more easily in water, and also extended to blending with non-dairy products providing bespoke products for customer.

Advanced ultrafiltration techniques were applied to a range of dairy products such as whey enabling the development of more specialist products to be offered for areas such as health and wellness sectors [4]. Whey protein, for example, with its egg-like nutritional properties was separated from whey using ultrafiltration providing milk sugar or lactose. The whey protein was dried and marketed on its own or mixed with non-dairy nutritional ingredients for use in health foods. The lactose was then purified by direct crystallisation, milled and provided excellent material for use in tableting. Lactose was also split into its component sugars using captive enzyme processes to give a sweeter more tractable sugar for use in sugar confectionery.

Working closely with end product manufacturers meant increasing use of dairy technology in combined use applications. The industry adapted and managed volume issues and successfully sought value added product and enhanced service developments, which continue to this day.



4 The starch industry

Starch extraction from agricultural raw materials like potato, wheat and corn was at the beginning of an expanding starch industry supplying no longer only flour but separated pure ingredients like starch, vegetable protein and valuable germ oil. What was originally a milling business turned the commodity of plain starch into a wide range of speciality and value-added products that transformed the industry successfully into a global agro-industrial ingredient supplier.

From early on the starch industry had to adapt to changes in national agricultural policies introduced in order to maintain the vitality of local farming communities. Thus corn growers in the US benefited from national grants that helped to develop corn syrup obtained from starch liquefaction into the key sweetener for soft drinks, which in the form of isoglucose successfully competed with sugar. The elimination of isoglucose production quotas in Europe by 2017 is expected to challenge the traditional use of sugar also in Europe [5].

The Common Agricultural Policy of the EU had closed the door to corn imports from the US. Corn starch then had to be produced from European corn, which required more sophisticated processing but allowed for GMO-free labelling. Wheat became an alternative to corn favoured by the high value of its protein, the vital gluten that today is indispensable in quality bread baking. Wheat starch and extruded speciality wheat starches today are used in speciality dietary products like baby food or geriatric food in the form of custom-made blends and pre-mixes.

Often driven by farmers' cooperatives in the EU, traditional potato starch soon was complemented by roasted potato starch dextrins, till

today a standard for glue preparations. Pregelatinized and chemically modified potato starches are competing as food ingredient specialities against modified waxy corn starches and tapioca starches derived from raw materials imported into Europe.

In the last decades the starch industry extended its range of products into new fields of applications. As the starch product line was complemented by more sophisticated physically and chemically modified starches to fulfil highest processing demands in the production of convenience food, the sweetener line was also extended by speciality syrups [6] meeting highest quality standards of up-market confectionery and ice cream. Polyols, the sugarless low caloric sweeteners obtained by hydrogenation of starch-based carbohydrates gave access to vast dietary and health food markets. High purity speciality ingredients like crystalline dextrose, sorbitol powder, crystalline mannitol or erythritol provided a link into health food, dietary supplements and use as pharmaceutical ingredients.

The ever more demanding applications in terms of product quality require new standards of processing, e.g. in spray drying for baby food or crystallisation of dextrose for injection. Today's customers demand certified quality and regulatory compliance not only of the product but also of raw materials, product handling, packaging, warehousing and last not least the related documentation.

Product lines have even been complemented with non-starch functional food ingredients like fructooligosaccharides [7] or non-caloric high intensity sweeteners like stevia. Food ingredient suppliers have also looked into synergies with other businesses. Mergers and acquisitions took place between starch and sugar producers as well as fruit processors. Geographical diversification turned national starch producers into truly global acting multi-nationals present not only in the key markets of Europe, SE Asia and the US but reaching out also to emerging economies like Brazil, Turkey, Russia, India etc.



5 The sugar industry

The EU is the world's largest sugar consumer (after India) as well as the world's third largest sugar producer (after Brazil and India). The EU is host to many of the world's largest sugar companies, which have followed expansion and consolidation approaches over the past few years and developed to reach 80% of the bloc's production.

The EU is a mature sugar market, with a high level of per capita consumption (33kg compared to a world average of 21kg). Consumption has been rising only slowly. Total sweeteners (sugar and isoglucose) consumption in the EU is set to continue to rise, while sugar and isoglucose are not perfect substitutes, they only compete in about 30% of the total sweeteners market in the EU.



Beyond sweetness, sugar today provides key functionalities as a major food ingredient:

- texture to give bulk and structure, e.g. in ice cream and meringue,
- colour and flavour by Maillard-browning processes, e.g. in bakery products,
- acting as a preservative, e.g. in jams, syrups, comfits or pickles,
- and as a fermentation substrate for yeast, e.g. in bread or sparkling wines.

The industry has very successfully turned sugar into a wide range of products not only of different granulometry like icing sugar, decorating sugar and rock sugar but also added specialities. Besides the standard types of white sugar and brown sugar there are now cane sugar, organic sugar, flavoured sugars and calorie-reduced “stevia sugar” on offer. Special blends are helping the consumer to perfect creation of jam, ice cream and mousse. Further more the industry extended the product line into calorie-reduced bulk sweeteners like isomalt and stevia and developed specialities like sugar cores and spheres reaching out to new pharmaceutical markets. Besides food ingredients, the range of products originating from sugar beet have been extended into the non-food sector including animal feed, green chemistry products and biofuels.

Beet and sugar production in the EU is known as the common market organisation of the sugar sector or Sugar CMO. In 2006 the CMO underwent major reform [8], which eliminated domestic sugar price intervention and export refunds and had the main objective of incentivizing sugar production to migrate to more cost effective regions by offering higher cost producers a chance to surrender production quotas and leave the industry upon compensation. The sugar industry responded with a major restructuring closing 83 factories between 2006 and 2008 and a cut in production by some 3 mn t.

Isoglucose quotas fell only slightly. A major consequence from the Reform is a leaner industry with significantly higher sugar/sugarbeet yields from a much reduced number of players (factories). The 2006 Sugar Reform also has encouraged EU processors of domestic sugar beet to diversify their business by

investing in cane refining and participating in the sugar trade business. Since the 2006 reform of the Sugar CMO, the EU has become a net importer of sugar, mainly in the form of cane sugar for refining.

Sugar production is now concentrated in fewer groups, activities of M&A and FDI are as high as ever and investments in higher yields continues in addition to the gains bestowed on the sector by global warming. Since 2005, average beet yields in the EU have risen by 20%, whilst maize and wheat yields have not shown any significant upward trend. The average length of the beet campaign is likely to increase by almost 20% to 130 days in 2017. The EU has thus become a leaner and more efficient sugar producer.

Crucially, the Reform of the EU Sugar Regime in 2017 [9] will abolish sugar and isoglucose production quotas, as well as minimum beet prices

altogether, leading to further market deregulation in the EU. Sugar prices in the EU are forecast to go down significantly. The larger EU beet sugar operations will thrive in a quota-free environment, with the smaller beet sugar producers as well as the cane sugar refiners suffering the bigger losses.

Isoglucose production is expected to rise from 0.7 mn t during the 2013-2016 period to 2.2 mn t in 2023, following the expiry of isoglucose production quotas in 2017. Sugar consumption may fall from the current level of 18 mn t due to the likely increased penetration of isoglucose in the EU soft drink industry [5]. It is estimated that most of the large European producers are able to produce sugar at a cost allowing them to price out some future isoglucose production growth.

Exports are expected to increase and imports to be halved, but would not disappear due to the seasonality and concentration of production in the EU. A faster than expected development of a beet bioplastic industry and a significant offtake of beet ethanol production could boost potential sugar import demand.

Major players are expected to step up investment to remain competitive. New investment is likely to involve assets outside the EU. In this challenging environment we are sure to see the industry react through a continuing diversity of approach in order to meet the changing demands placed upon it.

6 The future and food ingredients

The food ingredients manufacturers of the future will continue to face the challenges that have shaped the industry over time whether from political, regulatory, economic or market and consumer demands. The key to a constantly changing environment, as we have seen, is the ability to adapt and to successfully develop opportunities from these situations offering new products, services and business models.

The industry also will, it is clear, embrace further extensive technological change, 3D printing for example, which may seem embryonic, already has the capacity to produce a range of foods. 3D additive manufacturing technology can be used together with other processes to copy existing products or to develop completely new ones. Printing food, rather than being science fiction, can become a more widespread reality. In the US and Europe we have seen products from sugar confectionery, chewing gum, chocolates, pasta and pizzas made with this technology. Manufacturers may use the flexibility of these approaches to tailor products to meet customer needs and enhance diversity of offering and delivery methods [10].

The food ingredient industry is in every sense an essential part of the food industry and has increasingly developed its ability to deliver more to its customers in order to meet in turn the wider consumer demands. The sophistication of product development diversity, product tailoring, use of specialist application and evaluation facilities across the industry has proven the point and will continue to shape its future.

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De Smet Engineers & Contractors and EMINEO join forces

De Smet Engineers & Contractors (DSEC) has taken an equity participation in EMINEO Ltd, a Mauritian industrial integrator and general contractor active in engineering, construction management and technical assistance to its clients from the Sugar and Agro industry sectors. The acquisition of this participation is contributing to DSEC's development strategy across the African continent and the Middle East, the company said in a statement.

"Our joint capabilities will provide us with the best range of services to answer the needs of our clients in growing markets and of crucial importance for the development of these regions" declared Guy Davister, CEO from DSEC. "Together we are today capable to offer all the services required by our clients from partial plants upgrades to the realization of a complete production unit" declared Arnaud de Speville, Executive Director of EMINEO Ltd.

DSEC is one of the world leaders in engineering and construction dedicated to Agro Industry, Renewable Energies and Biochemistry.



Back: Mr. *Koenraad Adam*, Ambassador of Belgium in Mauritius; Mrs. *Pascale Delcomminette*, General Director of AWEX (Wallonia Foreign Trade and Investment Agency); in front: Mr. *Guy Davister* (right), C.E.O. of De Smet Engineers & Contractors (DSEC); Mr. *Arnaud de Speville* (left), Executive Director of EMINEO Ltd