

# Strategic Factors for Business Success in the Flavor & Fragrance Industry

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**F**rom time to time, it is worthwhile to take stock of what we have learned in the flavor and fragrance industry during our 20 years of experience. We have learned that:

- This is a very complex and competitive industry consisting of a great number of manufacturers of essential oils, aroma chemicals, flavor and fragrance blends/compounds, which is not dominated by one or two companies;

- Aroma chemicals are mostly commodity fine chemicals (with, however, some notable exceptions), usually interchangeable for most important uses, sold to specifications for what they contain chemically, but with an added specification for odor;

- Flavor and fragrance compounds are mixtures of chemicals and natural products designed to solve specific customer problems, usually not interchangeable for most important uses;

- Demand for flavors and fragrances is essentially a derived demand depending directly on changes in the production of consumer and industrial/institutional end-products, new introductions in such end-products, as well as concentrations (dosages) of flavor and fragrance compounds in these end-products; and, in addition, depending indirectly on a host of other macroeconomic factors, such as population growth, real disposable income, habit, social values, government regulations, etc.; and

- The basic orientation of a flavor and fragrance company is a significant factor in its growth rate and profitability (functionally-oriented, market-oriented, and product-oriented).

## Accelerating Rate of Change

Where are we going in the flavor and fragrance

industry? We can see around us much evidence of an accelerating rate of change in technology, economy and politics, and last but not least, of social change. These changes will also affect the flavor and fragrance industry in the 1990s. Nevertheless, it can be said that the middle/long-term (1988-1995) growth outlook is relatively favorable (estimated worldwide average annual growth rate: 3.5% in quantity; 6.5% in value calculated in current US dollars) for the flavor and fragrance industry which depends on a very large number of relatively "recession-resistant," but not "recession-proof," consumer goods industries (foodstuffs; beverages; tobacco; perfumes; cosmetics and toiletries; washing, cleaning, disinfecting, polishing, etc. products). There will be a great number of contradictory negative and positive factors influencing the flavor and fragrance industry, but we think that the positive factors will probably offset the negative ones.

Competition will continue to be keener, and marketing will have to evolve more and more toward demand management, that is, management of relatively modest, but solid growth. In the future, companies have to plan for change, not stability, and for the adjustments to the new demand situation of the economy. Strategic marketing planning will become, therefore, much more important in the 1990s than simple annual sales plans or tactical sales promotion.

The winners in the future marketing "battles" and "wars" will be those companies that will have best learned and applied the techniques of strategic industrial marketing planning, and that will know thoroughly their own customers' and equally their own competitors' weak and strong points. Indeed, competitive marketing strategy, as well as competitive business/corporate strategy will be the key management areas in the 1990s for seeking com-

petitive advantages from such potential sources as industrial market segmentation, differentiation, cost leadership/reduction, technological change and substitute products.

Although the flavor and fragrance industry is only a small part of the chemical industry, it represents a relatively more profitable segment of it. The industry is highly fragmented, however, with a few large companies competing with themselves and with a very great number of small- and middle-sized firms. Large companies tend to be active in most market segments, while small- and middle-sized firms tend to specialize in specific ones. Changes in consumption patterns and market conditions have coincided with structural changes in the market itself leading toward greater industry concentration as companies integrate backward into raw materials, as well as horizontally, through mergers and acquisitions. These trends are expected to intensify in the future, leading to a more concentrated, highly competitive and changing industry.

What are the general management requirements for business success in this changing flavor and fragrance industry? As always, the most successful companies share a number of common characteristics, such as:

- strong technical capabilities in basic R & D in synthesizing new aroma chemicals;
- excellent creative staff of flavorists, perfumers, marketing and business specialists;
- good captive raw materials position; and
- stable, good management with the ability to respond quickly to an ever-changing business environment.

### Purchasing of Raw Materials

For manufacturing flavor and fragrance compounds, the flavor and fragrance industry purchases essential oils and other natural products, as well as aroma chemicals. For the manufacture of aroma chemicals, the industry buys essential oils for further processing and a wide variety of chemical feedstocks.

**Natural Essential Oils**—Essential oils are volatile materials of vegetable origin that are isolated from particular flowers and plants, mostly by steam distillation or solvent extraction. Essential oils have various end-uses, such as:

1. Ingredients/raw materials in flavor and fragrance compounds;
2. Ingredients/raw materials for the manufacture of natural aroma chemicals (derivatives/isolates); and
3. For resale as complete flavors (peppermint oil, etc.) or fragrances (in industrial products, etc.).

Essential oils suffer from uncertainties of supply,

seasonality and varying availability due to weather conditions, price fluctuations, adulterations, stability problems, politics, tariffs, quotas, as well as competition/substitution through synthetic products based on petrochemicals.

There is a basic tendency, consequently, to replace essential oils by synthetic substitutes. However, a few factors still work in their favor: some are very cheap; some are difficult or impossible to duplicate; and the underlying public preference and legislation for the so-called "natural products" (first of all, in flavors). More than 3,000 essential oils have been identified, but only about 150 to 200 are produced and consumed in commercially significant quantities. Essential oils still will remain a very important raw materials source for flavors and fragrances due to specific end-user preferences for their natural flavor/fragrance effects over their synthetic equivalents (in fine/alcoholic perfumes, natural flavors, etc.).

**Other Natural Products**—There is a wide variety of other natural products, such as:

1. Absolutes, concentrates, concretes and terpenic by-products derived from essential oils;
2. Animal secretions;
3. Expressions and/or distillates of berries, fruits, etc.;
4. Extracts from beans (cocoa, coffee, vanilla, etc.), herbs, mosses, nuts, roots (ginger), etc.; and
5. Exudates from balsams, gums, resins, etc.

Fruit and fruit juice concentrates, and spice oleoresins are generally sold directly from the producer to the food and beverage companies. However, some of these products are also bought by the flavor and fragrance industry as components in flavor and fragrance compounds.

**Sulfate Turpentine Oil**—Sulfate turpentine oil is a by-product of the manufacture of cellulose/paper pulp from the pine wood by the sulfate process (Kraft sulfate wood-pulping process). It contains  $\alpha$ -pinene and  $\beta$ -pinene which are important starting materials for the manufacture of the very important group of monoterpeneoid aroma chemicals. In addition, a substantial amount of it is used to make the so-called "synthetic pine oil," a much-used and inexpensive direct fragrance ingredient/raw material for many household, industrial and institutional end-products (cleaning, disinfecting, etc. products) heavily competing with more sophisticated/expensive fragrance compounds.

**Petrochemicals**—There are numerous petrochemicals which are used as starting materials in the manufacture of synthetic aroma chemicals, such as:

1.  $C_2$ - $C_5$  petrochemicals (acetone, acetylene, iso-

- butylene, isoprene, etc.);
2. Benzene (chlorobenzene, cumene, styrene);
  3. Cresols (m-, o- and p-Cresol);
  4. Naphtalin (beta-Naphtol, phtalic acid);
  5. Phenol (anisol, butylphenol, hydroxybenzaldehyde, pyrocatechol, salicylaldehyde);
  6. Toluene (alkyltoluene, benzaldehyde, benzyl alcohol, benzoic acid); and
  7. Xylene (m-xylene).

With the very substantial decline in oil prices, as well as in the exchange rate of the US dollar during the years 1985-1988, it can reasonably be expected that purchasing costs of all the previously mentioned petrochemicals will continue to be relatively low during the next four years.

### Manufacturing Processes and Technologies

*Aroma Chemicals from Essential Oils*—The most common technology is fractional distillation of essential oils to provide nearly pure single chemicals or more often a "cut" of the oil that satisfies cost and odor requirements for specific flavor or fragrance use.

Solvent extraction is also a very important process

and becomes constantly more sophisticated. Traditional extraction processes produced oleoresins from spices and concretes and absolutes from flowers, roots, mosses, and other natural materials. Varying the temperatures and solvents gave different products.

Some years ago, the use of very low boiling point solvents like butane gave higher quality products as the solvent would boil off below room temperatures to minimize product degradation.

More recent has been the development of the carbon dioxide extraction at critical and supercritical conditions to avoid the use of solvents with toxicological problems.

*Aroma Chemicals Produced from Petrochemicals*—Aroma chemical production from petrochemicals has always been an important part of this industry. Many technologies are available, such as chlorination, esterification, nitration, oxidation (air and electrochemical), Darzen's synthesis, Diels-Alder condensation, various reactions (condensation, hydration, hydrogenation, Friedl-Craft, Grignard), etc.

An important group of products (linalool, geranial, etc.) can be made either from petrochemicals via isoprene or from alpha- or beta-pinene from tur-

pentine. At this time, feedstock costs favor turpentine. However, the existence of the petrochemical alternative is a very important moderating effect on the prices of these most important products.

**Biotechnological Processes and Technologies**—The use of plant cell cultures or bacteria to produce essential oils (for use as such or for isolating aroma chemicals) is being investigated by various companies in the USA, Western Europe, Japan and China. Apparently, this is a more promising approach than to try to produce single aroma chemicals by biotechnology. A number of companies are investigating, and several of them are already using the biotechnological production of aroma chemicals. However, the major problem with these processes is their economics. A biotechnological process is only of interest if it is more economical or is less of an ecological problem than existing synthetic or isolation processes. Biotechnology will succeed only if it is directed toward valuable, high-priced, otherwise difficult-to-access aroma chemicals. Another incentive may be the desire to make a natural aroma chemical (e.g., for flavors) by biotechnology, in order to replace a synthetic counterpart (e.g., vanillin, acetoin, acetaldehyde, diacetyl, etc.).

For the production of a range of aroma chemi-

cals—natural or synthetic—a chemical plant is required consisting primarily of multipurpose reactors and some specialized equipment for special reactions, crystallization devices and drying chambers for solid products. One of the most important processes is efficient distillation (solvent stripping and purification of raw products) and fractional distillation (separation of products from mixtures). These purification procedures determine the quality of the aroma chemical.

Manufacturing fine chemicals such as aroma chemicals requires batch processes for the relatively low volumes produced. Numerous products are made, but only in single grade or a few ones. Plant size is generally small to moderate. Equipment is designed to make the specialized product line but flexible enough to handle a number of different individual products. Production is scheduled ahead only for moderate terms, much shorter than for large tonnage commodity chemicals.

**Flavor and Fragrance Compounds**—Compared to aroma chemical production, compounding (blending/mixing) is a technically simple operation. In an open tank (usually stainless steel, capacity from 5,000 to 10,000 liters) equipped with a mixing device (ranging from hand-operated paddles to modern stirrers) and possibly a heating coil, the raw materials (essential oils, aroma chemicals, etc.) are added, one by one, thoroughly mixed and then packed into appropriate bottles, drums and containers. A sophisticated compounding plant contains a system of pipes to deliver solvents and large-volume liquid raw materials from a tank farm. They are metered into the tank by weight or volume, with small volume materials added by hand.

In view of this, and the large number of different compounds produced (over 1000 in large- and medium-sized companies), possibilities for automation exist and are increasingly exploited. For some applications of flavor compounds, a powdered form is required. For this purpose, liquid compounds are encapsulated, primarily by spray-drying an emulsion containing the liquid compounds and a carrier.

Manufacturing costs represent a lower percentage of sales in flavor and fragrance compounds compared to aroma chemicals (fine chemicals), because of the higher marketing and R&D expenses. Nevertheless, production of flavor and fragrance compounds poses a number of problems. There are at least hundreds and often thousands in a given line, many produced in numerous grades and most tailored to the needs of individual customers. As the physical volume of production is relatively low—often kilograms instead of tons—batch processes are used and plants are generally of small to medium size. Equipment is generally simple and usually serves multiple purposes.

In even the largest companies, most raw materials (aroma chemicals, essential oils, etc.) are purchased and not produced and, indeed, many flavor and fragrance companies avoid backward integration to aroma chemicals and essential oils because it reduces their flexibility in switching to new raw materials and, more importantly, because it diverts their attention from the marketplace where the relatively higher profits are made. However, because of the great variety of products and grades, and the large number of customers, production of compounds can be planned ahead only for short periods, and schedules, once established, are subject to frequent change.

Compounds are usually prepared on customer request, and made for stock only if sales are regular and frequent. The reason is the relative instability of odor and taste characteristics of finished compounds, especially those containing natural raw materials. Thus, storage and inventories in the compounding industry are mainly raw materials (aroma chemicals, essential oils, etc. which may number 500 to 1000 for a compounds manufacturer). These inventories need to be controlled very carefully, both from a financial point of view and from a standpoint of stability. Turnover times of inven-

tries depend in the availability of the raw materials.

Finally, liquid effluents and solid wastes lead to environmental problems, just as in any chemical plant, and considerable investment is necessary for effluent purification plants and safe removal of solid wastes. A specific problem in the flavor and fragrance industry is the contamination of the air by the ingredients/raw materials which sometimes have an intense odor. While this type of contamination is not hazardous to human health, it can be very irritating to the employees and to the neighborhood of a plant. The principal measure to alleviate this nuisance is good ventilation of all technical facilities (activated carbon).

### **Captive Manufacturing of Compounds by Customers**

A problem for flavor and fragrance companies is captive manufacturing of flavor and fragrance compounds, usually by large customers/end-users. This is, of course, a classical case of backward integration. As to fragrance compounds, some very large perfumed end-products' manufacturers, such as, Procter & Gamble, Colgate-Palmolive, Lever Brothers, Henkel, KAO, Mira Lanza, as well as

many important fine/alcoholic fragrance manufacturers (Paris "couturiers", etc.), create and manufacture, partly or totally, their own fragrance compounds, and buy only aroma chemicals, essential oils and other natural products. They sometimes buy sub-compounds, and only occasionally finished compounds. As to flavor compounds, General Foods is known to create and use some flavor compounds made in-house, but the best known is Coca-Cola with its famous top secret cola formula.

In the fragrance compounds field, a very substantial market potential is not available in the form of compounds. According to our analysis and calculations concerning the US market, merchant sales of US fragrance compounds amounted to about \$510 million in 1985, instead of about \$700 million total usage. The big missing market potential of nearly \$200 million was compounded by large customers/end-users.

For most of these large customers/end-users, the reason for captive manufacturing was probably an economical one at times when profitability of flavor and fragrance companies was very high and perfume compounds could easily be manufactured cheaper although with less variety and creativity. This is, however, less and less the case and, indeed, some of these large customers/end-users show a tendency to buy more compounds on the merchant market often in the form of sub-compounds. Today, it probably would be more economical in most cases for these customers/end-users to have a specialized flavor and fragrance company do the creation, testing and manufacturing of compounds.

### Research and Development

The maintenance of a high-quality R&D organization is critical to the success of the largest flavor and fragrance companies in two areas: (1) Development and synthesis of new aroma chemicals by research chemists; (2) Interpretation of customers' brief/profiles for flavor and fragrance compounds by the creative talent and expertise of flavorists and perfumers. Consequently, leading flavor and fragrance companies spend considerable amounts on R&D. For example, four international flavor and fragrance companies' ratios of R&D expense to sales in 1988 were as follows (published figures):

IFF—5.9% (net sales ratio)

Quest (PPF & Naarden)—6.2% (net sales ratio)

Haarmann & Reimer—7.5% (net sales ratio)

Givaudan—8.3% (gross sales ratio)

*Aroma Chemicals*—R&D in aroma chemicals is essentially basic chemical research including:

1. Analyzing natural materials and identifying and synthesizing new aroma chemicals. Strong emphasis is on high impact chemicals that have such

low levels of use because of their powerful odors that even relatively high manufacturing costs result in low in-product costs;

2. Improving manufacturing processes and economies of existing aroma chemicals by focusing on efficient low-cost synthesis. Here, the key technical skill is that of the "manufacturing chemist," to be able to convert laboratory results into practical production at high yield and low cost. Critical factors here are the development of efficient processes, strict control of purity and batch-to-batch uniformity, as well as rapid response to customer inquiries;

3. Protecting innovations (new aroma chemicals and manufacturing processes) by patents and other means;

4. Problem-solving for their own application laboratories and for customers; and

5. Building the image of the company by presenting scientific papers at conferences/congresses, as well as publishing in scientific and trade journals, etc.

During the last fifteen years, many flavor and fragrance companies have concentrated their basic research efforts on improving the manufacturing processes and economies of important aroma chemicals. The increasing legalistic and toxicological requirements have made it difficult and risky to search for, develop, test and market new aroma chemicals. In the flavor field, for example, the cry of the public for "truly natural products" has seriously set back chemical research.

A wide variety of excellent commodity-type aroma chemicals are readily available today at relatively low prices. There are almost unlimited possibilities open to perfumers and flavorists to find new combinations and to create new and original flavor and fragrance compounds. Over the last 15 years, many high-impact aroma chemicals occurring in nature were analyzed, synthesized and made available to give a special "twist" to new compounds. These high-impact aroma chemicals often are low-volume/high-price products, and the desired special effect can be achieved with trace amounts only.

Large chemical manufacturers are not interested in this field and usually leave it to the original flavor and fragrance companies or to small specialized chemical producers. As to relatively large-volume (mostly commodity) aroma chemicals, it is evident that only a few are still protected by patents, and only a few require a special manufacturing know-how which is difficult to imitate. Consequently, competition in this field has become excessively keen resulting in eroding prices and profitability. Contributing factors are the relatively high capital investments which are necessary for an aroma chemical plant, rising operating and labor costs, un-

derutilization of existing capacities, restricting governmental regulations and environmental problems.

More and more, small and medium chemical manufacturers—otherwise not involved in the flavor and fragrance business—take up the production of one or more relatively high-volume aroma chemicals, in order to realize higher profit margins. Consequently, the original flavor and fragrance companies face a very strong competition and perhaps gradual elimination in this field. The internationalization of markets have brought Japanese and Chinese chemical suppliers into the market, and it is probable that Asian and East European companies will follow.

Related to basic R&D work are safety services, such as toxicology, problems relating to the physiology of odor and taste reception, and questions of environmental protection.

*Flavor and Fragrance Compounds*—R&D in flavor and fragrance compounds is essentially application research (through specialized perfumers, flavorists, cosmetic chemists, detergent chemists, food technologists, etc.) including:

1. Creation and development of new compounds

according to their own ideas or as a response to market demand;

2. Adaptation of existing compounds to special cases such as new applications and local tastes;
3. Replacement of expensive or unavailable ingredients/raw materials (aroma chemicals; essential oils, etc.) with appropriate substitutes; and
4. Direct work with customers to match their expectations.

Generally speaking, R&D effort in compounds focuses on the application of chemical technology to the solution of customers' problems. Key skills required are detailed knowledge of the end-uses for which the compounds are intended, formulation (blending/mixing) rather than synthesis, and testing for performance, first in suppliers' own laboratories, and then under actual conditions in customers' plants. Critical factors are intimate contact with customers and good feedback of technical performance data from customers' plants. Salesmen naturally are the principal channel for this contact and feedback. The high requirement for technical service provides a second important channel. A third channel, also important, is direct contact between technical personnel on the suppliers' R&D staff and plant/technical people in customers' organizations.

### Patents

The value of patents in the flavor and fragrance industry is relatively limited. Flavor and fragrance compounds as such are not patentable, only the discovery/invention, manufacturing and use of aroma chemicals. The costs for a reasonable coverage in the important industrial countries are relatively high (\$20,000 to 30,000 per patent). Proof of violation is often difficult to establish, and the enforcement is also difficult. In general, the large competitors respect each other's patents, whereas the small ones ignore them or use them as sources of information. Substance claims (e.g., for new aroma chemicals) are quite clear and valid. Process claims are a good means of protecting new manufacturing processes, but only worth applying for in the case of high-volume products. Use patents have a certain value, but are almost impossible to enforce.

As a result, only a few companies bother to patent their innovations. For example, a survey on flavor aroma chemicals patents revealed that, between 1980 and mid 1983, 150 patent cases were published, of which 75 percent belonged to IFF and Firmenich, 16 percent to other large flavor and fragrance companies, and 9 percent to others including some food companies. Only 30 percent of these 150 patents were concerned with new product applications. The situation might be similar in fragrance

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aroma chemical patents, although process patents for new manufacturing methods of certain important product groups (monoterpenes ex-pinene, etc.) may be useful.

For the protection of innovations, patents in the flavor and fragrance industry are, therefore, of limited value. Many flavor and fragrance companies think that the patent approach of safeguarding new products and their applications is less acceptable than published secrecy. The difficulties of proving patent infringements in highly complex compounds are formidable. For protecting new findings, secrecy seems to be more important, although it also might be questionable in view of modern analytical methods and the frequent movement of personnel. It is, therefore, indispensable to be better, more efficient and faster than competitors. Also, the increasingly more complicated process in going from an innovation to a marketable product, will be a partial protection for new original developments.

### Legislation and Regulations

Legislation and regulations in the flavor and fragrance industry are increasingly becoming difficult to comprehend on a worldwide basis. Three very

helpful international organizations are important in this field:

- *International Fragrance Association (IFRA)*—Members are national associations of flavor and fragrance companies.
- *International Organization of the Flavor Industry (IOFI)*—Members are national associations of flavor and fragrance companies.
- *Research Institute for Fragrance Materials (RIFM)*—Members are individual flavor and fragrance companies.

*Aroma Chemicals and Essential Oils*—For the regulation of these ingredients/raw materials, there are two basic possibilities: Negative lists (substances not to be used; all others are free) or positive lists (all substances permitted; substances not listed are not allowed for use).

In the area of fragrance aroma chemicals and essential oils, there is no binding legislation banning such fragrance ingredients/raw materials, but certain governments may recommend or issue limits to use, or ban certain ingredients/raw materials such as skin irritants and allergenes. The fragrance industry exercises a considerable amount of voluntary self-



control via a self-regulating system in cooperation with IFRA and RIFM, which is followed by the industry and respected by the legislators. This voluntary system is laid down in a "code of practice" by IFRA.

RIFM is involved in the identification of ingredients/raw materials with possible unwanted side effects. To date, monographs for over 1,000 aroma chemicals have been published by RIFM (evaluated by an expert panel). These monographs are scientific documents, but they are legally binding. The code of practice of IFRA recommends toxicological tests for: acute oral toxicity, acute percutaneous toxicity; skin irritation potential, eye irritation potential, phototoxicity and skin photosensitivity potential. The costs of these tests are at least \$20,000 per substance.

The efforts of the fragrance industry in respect of voluntary self-control, self-policing, testing the safety of ingredients/raw materials, and eliminating products with unwanted side effects, are remarkable. As a result, governmental regulations in the fragrance field are at a minimum level and usually restricted to recommendations. This self-control and self-policing is accepted as sufficient by most governments, and no general legislation in this field is expected.

The use of aroma chemicals and essential oils as flavor ingredients/raw materials is the subject of much legislation differing from country to country. The main objectives of flavor legislation are to protect consumers' health and to prevent frauds, as well as to introduce equal conditions of competition for all manufacturers. Legislation usually refers to permitted ingredients/raw materials (positive lists) or forbidden ones (negative lists) and to the declaration of flavors on the labels of consumer products. Although IOFI has issued a "code of practice" (a voluntary self-controlling instrument for the flavor industry), there are many different national laws, and they are rapidly increasing. Toxicological tests recommended by IOFI are: test for acute oral toxicity, the Ames test, and a subchronic toxicity test in two animal species. Costs of these tests are at least \$5,000 per substance.

The most important document in this field is the so-called FEMA GRAS list of the United States, comprising over 1,000 substances. This is a positive list (permitted ingredients/raw materials) containing all substances generally recognized as safe (GRAS) flavor aroma chemicals and essential oils, however, excluding other food additives. This list was recommended by the US Flavor & Extract Manufacturers Association (FEMA) and accepted by the US Food & Drug Administration (FDA). Tacitly, this list is considered as a valid guideline by many other countries. For example, the US sys-

tem is applied in many countries of Latin America and the Far East, more so, it is true, because of standards set by multi-national food companies than because of government regulations.

The situation is different in Western Europe where different criteria and principles are used. For example, flavor legislation in West Germany is based on a mixed system: natural and nature-identical aroma chemicals (chemicals occurring in nature) are permitted for use unless they are on a negative list, whereas artificial aroma chemicals (chemicals not occurring in nature) are only permitted if they are on a positive list. So, there is a negative list of natural and nature-identical aroma chemicals and a positive list of artificial ones. The German system is considered by experts to be the preferred one, and it is followed more or less by many other West European countries.

In Japan, the "Standards of Food Additives" list is a positive list of groups of aroma chemicals. No valid general flavor legislation exists in Eastern Europe and China. The USSR, and more or less other East European countries, have a positive list system that contains a few dozen of defined aroma chemicals and essential oils. Otherwise, most industrial countries more or less follow the US system. Much effort is made by many countries to create detailed flavor regulations. The attempt, however, to harmonize flavor legislations, at least regionally (ECC), is prevented by the desire of national governments to create individual flavor legislations for their countries.

*Flavor and Fragrance Compounds*—For flavor and fragrance compounds, only the use and safety of their ingredients/raw materials (aroma chemicals and essential oils) are regulated. There is no special legislation for flavor and fragrance compounds per se.

### Diversifications

*Horizontal Diversification*—Horizontal diversification is a way to take advantage of existing technology, manufacturing capacity and particularly marketing capability. Opportunities are obviously in products to be marketed to the cosmetic, toiletry, soap and detergent industries in relation to the marketing of fragrances, and the marketing of food and beverage ingredients in conjunction with the sale of flavor compounds.

While there is an obvious attraction to this diversification, the trend in the industry is away from this position. There are few significant successful diversifications. One has been with sunscreen chemicals (Haarmann & Reimer which recently bought the Felton sunscreen business including the specialized sales organization separate from the Fragrance Division, Givaudan, and others). This is

**Table I. Sales Per Employee in 1988.**

Companies	in US dollars
International Flavors & Fragrances	200,992 (net sales ratio)
Firmenich	181,500 (estimated net sales ratio for financial year 1988-1989)
Fritzsche, Dodge & Olcott-BASF (together)	176,939 (net sales ratio)
Flavor & Fragrance Industry in Grasse, France (14 companies)	169,104 (net sales ratio)
Givaudan	161,058 (gross sales ratio)
Haarmann & Reimer	151,786 (net sales ratio)
Quest (PPF and Naarden)	147,460 (net sales ratio)

based on the similar manufacturing technology and products, as well as the same customer group as fragrances. The other is botanical extracts, for the same reason; similar technical and manufacturing abilities, and a familiar customer base among cosmetic and toiletry companies.

**Vertical Diversification**—Backward diversification for a flavor and fragrance compounding company means integration into aroma chemical, essential oil, fruit juice and pulp production. A further step may be made into plantations for essential oil, etc. production, although this, in practice, is not very common. Plantations were, and still are, common with many original French flavor and fragrance companies in Grasse, but now mostly joint ventures in such places as Morocco, Algeria, Turkey, Egypt, India, and only rarely wholly owned. Takasago, Ogawa, and a few other companies do similar farming on a larger scale. IFF has a joint venture in Yugoslavia (with Etol) to grow berries and fruits, and also produces fruit juices in Oregon and cedar oil in Texas.

The temptation is great for essential oil users to go into such a diversification, but present experience indicates that most present arrangements are more to provide a steady supply of flavor and fragrance quality raw materials rather than for any great profit possibilities.

**Forward Diversification**—Forward diversification for a flavor and fragrance company would mean to go into manufacturing and selling cosmetics and toiletries, soaps and detergents, foods, beverages and tobacco. However, no significant diversification has been made in this direction due to the secretive nature of the flavor and fragrance business, and the close collaboration between the flavor and fragrance supplier and the customer.

**Table II. Published 1988 Profit/Net Sales Indicators/Ratio.**

	%
International Flavors and Fragrances	
Operating profit	25.7
Pretax profit	24.9
After-tax profit	15.3
Takasago (Financial Year 1988-1989, ending March)	
Operating profit	4.8
Pretax profit	3.7
After-tax/net profit	1.8
Quest (PPF and Naarden)	
Operating profit	11.4
Haarmann & Reimer	
After-tax/net profit	6.7

## Productivity

No data are available on manufacturing productivity (essential oils, aroma chemicals, flavor and fragrance compounds) of individual companies. The only, but very general, productivity indicator that we can calculate is sales per employee (worldwide consolidated sales/number of employees) of a few flavor and fragrance companies. This indicator oscillated in 1988 roughly between US \$150,000 and \$200,000 with regard to the companies listed in Table I.

Table I is, of course, incomplete. It nevertheless gives some meaningful insights into the economics of the flavor and fragrance industry.

## Profitability

It is still believed, first of all, in financial circles, that flavor and fragrance companies are very profitable. This was no doubt true up to about ten years ago. Today, however, only a few flavor and fragrance companies show a very high profitability. Many of them manage a good average performance, and quite a few are in difficulties due to their marginal performance.

It is difficult to demonstrate this as only limited comparable financial data as to general profitability ratios (operating profit, pretax profit, after-tax profit), are available because very few flavor and fragrance companies publish their financial results. Table II shows some published indicators/ratios for 1988 (profit/net sales).

Our guess is that the average after-tax/net profit ratio of the worldwide flavor and fragrance industry might be, at present (1988-1989), around seven to eight percent. If some companies show much higher net profit ratios than the average, it proves the case for them, but not for the whole flavor and fragrance industry. We think that the average profitability of the flavor and fragrance industry will still

**Table III. Guess-Estimated Worldwide  
Average Net Profit Ratios**

<u>Flavor &amp; Fragrance Product Categories</u>	<u>%</u>
Fragrance compounds	7-13
Essential oils	7-11
Flavor compounds (natural, nature- identical, artificial)	6-10
Specialty aroma chemicals	7-9
Commodity aroma chemicals	4-6

be good in the future, not because of the nature of this business, but as a result of expert, top-performing and well-managed companies.

However, the profitability situation will differ according to the flavor and fragrance product category mix (essential oils, aroma chemicals, flavor compounds, fragrance compounds), as well as the customer mix (fine/alcoholic perfumes, cosmetics and toiletries, soaps, washing, dishwashing, cleaning, polishing, disinfecting, etc. products, foodstuffs, beverages, tobacco, etc.). We estimate that the fragrance compounds business is probably the most profitable part of the industry followed by essential oils, flavor compounds and aroma chemicals Table III.

It would then seem that compounds are clearly more interesting, from the point of view of profits, than commodity aroma chemicals. Aroma chemicals are only highly profitable if they are true, exclusive specialties (most of them today are commodities). Essential oils are generally very profitable, although vast differences probably exist between companies, and there is undoubtedly great year-to-year variation.

### Marketing Requirements

Flavors and fragrances are intermediate industrial goods sold for industrial use. Their basic marketing is, therefore, typically industrial marketing (and not consumer marketing) requiring a very close relationship between suppliers and customers/end-users. This is due to the derived-demand nature of flavors and fragrances, as well as to their basic technical/technological nature and interrelationships. The quality of these products is difficult to measure objectively and remains largely a matter of subjective judgment.

The sales force of a flavor and fragrance company must have a solid knowledge of the technical/technological aspects of their products: their nature, stability, mode of application, compatibility with other parts of the end-product, and also legislative and regulatory aspects. In the case of major customers, commercial and technical people must often

make joint sales visits. Trade marks/names are, of course, of value but not overly important. Of greater value is a worldwide distinct company name (advertising, etc.) and perhaps a few trade names for special product groups.

The flavor and fragrance business has many characteristics ascribed to a service industry. Because flavor and fragrance companies can do little to stimulate the final demand originating from flavored and fragranced end-products (consumer/households and industrial/institutional), very frequent supplier-customer contacts must be maintained. The sales/marketing personnel of the flavor and fragrance company (account managers, area managers, market managers, product managers) work closely with the customer company and its consumer end-product lines. This, however, means that suppliers of flavors and fragrances are obliged to use two basic and differing marketing techniques:

- Industrial marketing which is related to marketing strategy with regard to the flavor and fragrance product categories of the supplier (marketing plan, flavor and fragrance potentials/market size, market shares, competition, market penetra-

tion, acquisitions and mergers, diversifications, etc.); and

- Consumer marketing which is related to marketing tactics with regard to flavored and fragranced end-products of customers (consumer panels/market research according to individual end-products, sales presentations, advertising by market segments, flavor and fragrance trends analyses, etc.).

More and more, large customers look to suppliers of flavors and fragrances for a complete consumer marketing package including not only the appropriate flavors and fragrances, but also new end-product ideas, suggestions for colors, brand names, packaging, advertising, etc. along with consumer market research data (panel testing of flavor and fragrance compounds, etc.). This means that suppliers of flavors and fragrances must accept considerably higher marketing expenditures in absolute and relative terms (as a percentage of sales) than in the past.

*Flavor and Fragrance Aroma Chemicals*—Marketing of aroma chemicals is characterized by relatively low sales of any one product. In general, there are relatively few customers for each item. The one unique characteristic of marketing aroma

chemicals is the odor requirement. In spite of all instrumental quality checks, if the smell is not acceptable, the sale will not be made. The final smell test is by the nose, not an instrument. This peculiarity puts aroma chemical manufacturing and marketing in a special category of the chemical business, and must be an important consideration for anyone entering the business.

Many aroma chemicals formerly produced by companies, such as IFF, Givaudan, Norda and Fritzsche are now supplied by large- and medium-sized chemical companies, such as BASF, DSM, Glidco; and by small specialized chemical companies, such as Grau, Oxford, Bedoukian, etc.

Marketing of commodity aroma chemicals (high-volume/low-price) is similar to that of other commodity fine chemicals. Since qualities from different producers tend to be increasingly similar for the same chemical, business success becomes a matter of odor quality, price and ability to deliver.

Marketing of specialty aroma chemicals (low-volume/high-price) requires highly skilled personnel in such areas as industrial market research, market development/sales promotion and technical service. The dream of every aroma chemical manufacturer, whether captive or outside the industry, is to develop a unique aroma chemical with wide application and protected by patents and/or technical expertise in manufacture. This only happens rarely, but the result can be extremely profitable to the company, as Hedione has been for Firmenich, Glaxolide for IFF, Lilial for Givaudan, Tonalide for PFW, and a few others.

*Flavor and Fragrance Compounds*—Flavor and fragrance compounds are performance products offered for what they do in the end-products. They are typically additives or service items representing a relatively small fraction of customers' total costs in flavored and fragranced end-products. Accordingly, pricing is not so highly competitive as in the case of aroma chemicals, and remains relatively stable throughout the business cycle. For all but the most mature specialties, prices are based primarily on the value in use to the customer. Markets are usually small to moderate in size but with many customers, each purchasing in relatively small quantities. Marketing expenditures run a high percentage of sales due to various services.

Flavor and fragrance compounds usually are sold direct to customers rather than through agents or distributors. Salesmen are generally application-oriented problem-solvers; they must sell in depth. Key sales contacts are not so much the customers' purchasing personnel as their product managers, market managers, brand managers, perfumers, flavorists, application-laboratory specialists, chemists, production staff, etc. Salesmen have rela-

tively few accounts, but they spend a great deal of time with each account. The volume of sales (quantity and value) per salesman, thus, is relatively low.

Marketing of flavor and fragrance compounds requires extensive knowledge of customers' needs, excellent technical service, sales promotion (advertising, presentations, etc.) and market development. Marketing success depends on selling in a personalized way and offering excellent products and services (marketing and technical). However, a successful new original compound cannot be kept exclusive for long. There is no patent protection of compounds, although patent protection of certain aroma chemicals is possible. In spite of the fact that formulas are complex and kept secret, it is possible that they are discovered by the competition, possibly through personnel change, but more often through instrumental analysis.

Thus, it is a reality that successful new compounds (odors and tastes) are rather quickly and widely imitated by both large and small flavor and fragrance companies. However, a consolation is that the original creator of a new odor/taste has a good head start, and objective good customers respect creative companies. Since the lifetime of a

new good compound is relatively short, the need for constant innovations is very high.

So, despite the problem of imitation, a well-managed company will always derive a fair profit from its flavor and fragrance compounds business through its creativity (creation of new original compounds), reformulating such compounds when they are imitated, and substituting some high-priced raw materials (essential oils/aroma chemicals) with less expensive ones. A leader in the compounds business needs a creative/innovative R&D and flavorists/perfumers group, as well as a competent and professional sales/marketing staff for constantly developing really new/original compounds, improving old ones and defending existing ones.

### Financial Requirements

*Aroma Chemicals (Fine Chemicals)*—Capital investment is, of course, much higher than in compounds, because fixed assets (land, buildings and equipment at first cost) run 40% to 80% of annual sales. Marketing costs are low because selling, general and administrative expenses average 5% to 15% of sales. Selling prices are 5 to 20 times raw material costs. Profit margins before taxes range from 2% to 20% of sales, and operating returns, also before taxes, 3% to 25% of total assets employed. However, because of the highly competitive pricing, profits move up and down with the business cycle (moderate to high cyclicity of profits).

*Flavor and Fragrance Compounds*—Compounds require relatively little capital investment in bricks and steel, but high expenditures for people in marketing and R&D. As these expenditures cannot be capitalized but must be written off each year, any expansion of activity in compounds reduces short-term profits.

Despite their higher costs of marketing and R&D, or perhaps because of them, the compounds business is more profitable than aroma chemicals in good or bad times. Because prices of compounds are less cyclical, profits neither rise sharply in boom years nor drop precipitously in depression years. Also, because of the lower capital requirements of compounds, their profitability is less affected by inflation than that of aroma chemicals or large-tonnage commodity chemicals.

As a result, capital investment in compounds is relatively low (20% to 50% of sales); cost of goods sold is between 30% to 65%; selling, general and administrative expenses run between 15% and 50%. Selling prices are 5 to 20 (or even more) times raw material costs. Profit margins before taxes range from 8% to 30% of sales, and operating returns, also before taxes, 10% to 40% of total assets employed. The cyclicity of profits is low, and reduction of apparent profits by inflation is low to moderate.

### Management Requirements

*Flavor and Fragrance Aroma Chemicals (Fine Chemicals)*—Management of aroma chemicals companies (fine chemical companies) focuses on raw material sources, production and sales. In contrast to commodity chemical businesses, the organization in aroma chemical businesses is flexible, relatively informal, and fast moving. The chief executive typically has a background in either R&D or manufacturing. His key functions are: (1) identifying sources of future business, and (2) assuring flexibility in the organization, the highest purity and uniformity of products, production at lowest cost, and prompt service to customers.

*Flavor and Fragrance Compounds (Specialty Chemicals)*—Management of a flavor and fragrance compounds company focuses on customers, their technology, economics and needs. Key functions of executives (market managers, product managers, area managers, etc.) are: (1) early identification of market needs and trends; (2) critical selection of segments/niches for long-term development; (3) fast response to short-term changes in the market, especially in modifying and improving products (compounds) in existing lines; (4) assurance of unusually

close teamwork for realizing the above fast response; and (5) managing and controlling many relatively small businesses according to individual compounds.

Flavor and fragrance companies have informal, flexible, flat and fast-moving organizations capable of quick response to customer needs. Operations are decentralized to autonomous profit centers (flavored and fragranced end-product segments). Organizational levels are kept to a minimum to avoid cumbersome hierarchical pyramids. For success, the companies need top executives (market managers, product managers, area managers, etc.) with an entrepreneurial spirit, an orientation to profit rather than volume of production or sales, and the patience to back the development of new compounds' businesses for the several years it may sometimes take to build them. Such executives generally have a background in marketing or sometimes in R&D.

### Strategic Factors/Steps for Business Success

*Flavor and Fragrance Aroma Chemicals (Fine Chemicals)*—In aroma chemicals (fine chemicals), as in other businesses, the highest profits go to those producers that have achieved a market posi-

tion distinctive enough to limit competition. The best route to such a position is to exploit a company's strengths and to avoid products where its weaknesses would be damaging. In aroma chemicals, the traditional strategy is low cost of production/sales achieved by concentration either in a given field of chemistry or class of customers.

Today, aroma chemicals are manufactured by three different types of companies/competitors:

- Classical/original flavor and fragrance companies (IFF, Givaudan, Quest, Haarmann & Reimer, Firmenich, Takasago, Bush Boake Allen, Dragoco, Fritzsche, etc.) producing, first of all, specialty aroma chemicals for their own use in compounding, and also selling them to competitors, as well as to large manufacturers of flavored and fragranced end-products (Procter & Gamble, Colgate, Lever, etc.) with compounding facilities;

- Large diversified chemical companies (BASF, Boehringer, DSM, Hoffmann-La Roche, Hoechst, Huls, Rhône-Poulenc, SCM, Union Camp, etc.) producing, first of all, large-volume commodity aroma chemicals as a complement of their fine chemicals or specialty chemicals businesses; and

- Small/medium-sized chemical companies (Grau, Bedoukian, Oxford, PCAS, Fontarome) specializing in aroma chemicals with a market too small to be of interest to the first two groups.

Historically, the classical/original flavor and fragrance companies were the most important manufacturers of all types of aroma chemicals. However, production of large-volume commodity aroma chemicals has been shifting more and more to the large diversified chemical companies. In addition, aroma chemical production in Japan, China and other Far East countries is strongly increasing.

There are, of course, opportunities in aroma chemicals for all the three types of companies/competitors, each of them having advantages and disadvantages in this business field.

Classical/original flavor and fragrance companies, being large manufacturers of flavor and fragrance compounds which are end-products for aroma chemicals, have the advantages of early knowledge of needs for new aroma chemicals within their own organizations, and often the opportunity to exploit their own research in synthesizing the molecule. They have a captive market and the opportunity to increase the value added in their compounds. Where secrecy is important, they can ensure it.

The classical/original flavor and fragrance companies have some disadvantages. Integrating backward from flavor and fragrance compounds into aroma chemicals frequently diverts general managements' attention from their main businesses, which, being further downstream in the vertical industry structure, are generally more profitable

(compounds). Producing aroma chemicals internally may lead to the lack of competitiveness often found in captive operations. Finally, internal production locks up additional capital in operations subject to the risks of uncertain or changing demand/needs.

The most favorable opportunities in aroma chemicals are the products that are consumed cap- tively in high and stable volume and consistent quality, are not available commercially or likely to become so, and have ingredients/intermediates where secrecy is desirable.

Large diversified chemical companies have the advantages of broad capability in research and process development, internal streams of raw materials, wide contacts with many consuming industries, global marketing strength and immense financial resources. However, they often lack flexibility and speed in decisions and actions. They tend to be conservative and against taking risks. Finally, they find it difficult to manage many small projects.

The most favorable opportunities for large diversified chemical companies lie in aroma chemicals produced in high and stable volume (commodities), particularly if they can be marketed globally; complex aroma chemicals developed through own research, particularly if patented; and high purity aroma chemicals refined from internal raw material streams.

Small/medium-sized chemical companies (mostly independent) have the advantages of specialization in particular fields of chemistry or processes. Furthermore, they have the flexibility, promptness to decide and act, and willingness to take risks that the large chemical companies often lack. However, they lack the financial strength and broad research capability of bigger firms. Furthermore, they have a narrow base of customers and a more localized marketing effort.

For these smaller companies, the best opportunities lie in aroma chemicals in high value but low volume (specialties) for which they have unique production capabilities; or aroma chemicals of uncertain/unstable demand. Custom synthesis or toll manufacture also can be attractive for them when they have substantial advantages over competitors that give them favorable costs.

*Flavor and Fragrance Compounds (Specialty Chemicals)*—As in aroma chemicals (fine chemicals), a low cost of production in flavor and fragrance compounds (specialty chemicals) is also desirable, but generally not the most critical requirement. The key strategy in compounds is to build and exploit knowledge of end-uses through intensive sales contacts, industrial and consumer market research, high technical service to customers, application research and some direct contact between



suppliers' R&D staff and technical personnel in customers' plants and laboratories.

Armed with this knowledge, the successful specialty firm finds end-product segments/niches in which it can offer unique products of high value in use. Anything that diverts the attention of management from this focus on knowledge of customers' economics and technology reduces the effectiveness of the knowledge strategy. Accordingly, many, or maybe most, flavor and fragrance compounds' companies probably buy most of their raw materials (essential oils, aroma chemicals, etc.) rather than produce them captively.

Flavor and fragrance compounds have many characteristics of "young" products in the early stages of their life cycles. Like most such products, they require relatively high R&D, selling in-depth and considerable technical service. As many categories of flavor and fragrance compounds, however, mature with time, they lose their specialty characteristics because of: (1) increasing volume, (2) greater knowledge and sophistication of customers, (3) maturing of technology, (4) decreased need for technical service, (5) greater competition, and (6) reduced prices which force cutbacks in expenditures for R&D, technical service and marketing.

As a consequence, many specialty chemicals slowly drift to a pseudo-commodity status. As volume rises, the growth entices new competitors to enter the market. Competition forces prices, profits and costs down. Eventually, a shakeout eliminates the weaker suppliers and the market stabilizes to allow the survivors at least moderate profits. In such a situation, suppliers of flavors and fragrance compounds can retain the specialty nature of their products only by segmenting the market further and offering specialty grades for particular industries/segments/niches, applications, customer types, or geographic regions. Companies can retain their specialty nature by concentrating on the types of compounds that are most resistant to drift to a pseudo-commodity status. These generally have the following characteristics: low volume, low to moderate growth, incorporated in a system, prices that are low in relation to customers' total costs, customers of low technology, high service component, wide distribution network, and well-maintained trade secrets.

A supplier of flavor and fragrance compounds rarely offers the whole range of products in a category, but rather items in selected end-product segments/niches. The best opportunities often lie in segments where technology is changing, competition is not yet entrenched or growth is high.

Selection of the right end-product segments/niches to exploit is a key function of management. Since development of a successful end-product segment/niche may take some years of expensive R&D and market effort, the decision of a specialty company to select a particular end-product segment/niche is comparable in importance to the decision in a fine or commodity chemicals company to build a major new plant. End-product segments/niches chosen for development should match as nearly as possible the company's overall culture. In particular, they should require technologies generally similar to those of existing product lines. The end-product segments/niches and the tier of operations should also match the supplier's strength in marketing. Finally, end-product segments/niches need not be very large for a successful business.

As emphasized previously, business success in flavor and fragrance compounds requires a quite different company culture from that of aroma chemicals. The key strategic factors/steps for business success in compounds can be summarized as follows:

- Focus on profit rather than volume of production/sales.
- Seek end-product segments/niches where compounds have low to moderate volume but high value in use, that is, compounds that represent only a small fraction of customers' total costs.

- Find such end-product segments/niches by discovering customers' needs, as well as competitive threats and opportunities early, before the crowd, through inside efforts (end-use knowhow in customer's economics and technologies; anticipation of probable changes in technology, costs, trends, etc.) and outside efforts (in-depth selling; intense sales effort; good feedback from the field, etc.).
- Alternatively, develop such end-product segments/niches by acquiring existing businesses or organizing a joint venture with a suitable partner.
- Careful selection of new end-product segments/niches for development. Make sure that the market and competitive situation justify the critical mass of technical and sales support required for success.
- When possible, select end-product segments/niches that involve selling down to customers of low technology.
- Dominate the selected end-product segments/niches through continual improvement of compounds and services, as well as expanded sales efforts.
- Price on value in use to the customer.
- Give the compounds businesses the time they need to grow.
- Prevent the drift of specialty compounds to a pseudo-commodity status.
- Organize to provide: a flat organization with the fewest possible hierarchical layers, independent profit centers for each strategic business unit (segments, sub-segments, etc.) even if they appear too many and too small, compensation schemes that are suited to each strategic business unit (segments, sub-segments, etc.), particularly in sales/marketing, but not the corporation as a whole.
- Manage to build and maintain: a specialty culture; an open, flexible and informal style; unusually close teamwork; and an entrepreneurial spirit.
- Be different from, better, or unique among competitors (avoiding a "me-too" company image).

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