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Trends in Packaging

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INTRODUCTION

Certain trends tend to be universal, such as the desire to control capital expenses, reduce staff, improve productivity and reduce material usage and operating expenses. Such pressures provide an easy prediction of certain trends such as material reduction and reduction of packaging weight. Technology promotes additional trends by providing the means for more rapid development of graphic and packaging prototypes, more flexibility in design, and more control of manufacturing and distribution processes. Another important factor is a realization that we are moving to a truly global supply line. This bulletin presents both general and specific trends under a variety of headings of materials, manufacture, distribution and environment.

1. GLOBALISATION

Globalisation has made a major and continuing impact on many businesses, both internationally and locally. In general, there is now a global source of supply for materials and goods, and a rapid means (Internet and the World Wide Web) for accessing this supply. Products and packaging are now sourced with little restriction of country borders. This globalisation provides both opportunity and tremendous competitive pressure. It also has created concern over a loss of cultural identity

The real benefit of this globalisation trend is that costs are reduced and global trade is enhanced. Those who take advantage of this global market have the dual advantage of improved sourcing and an expanded potential market. For example, ethnic foods, which may be competing in a saturated market at home, may be embraced in other countries. Information to access this global market is available through the International Trade Centre, Geneva, Switzerland, through a series of publications. A valuable source is the PACkit series, which provides specific information on various products, packaging materials and specific information for both importing and exporting countries and regions. Additional information about this series is presented in the References section of this document.

Many governments recognize that increased exports and trade can be beneficial for their country's economy. Many agencies have been developed, therefore, to help companies enter the trade arena. In addition, the Internet has promoted expansion by providing easier access to information. Therefore, although these trends are not new, both the opportunities and speed of development have increased with Internet access.

2. PRODUCTS

Niche marketing and proliferation of specialized products is expected to remain a trend in product development. As companies consolidated (especially large companies and multinationals) production moved to higher and faster production for large volume items. Since competing in these product areas was difficult, companies started developing niche markets which could address market needs which are smaller than the big players choose to address. The result is a vast array of products. Niche marketing opportunities are particularly useful in view of the globalisation trend because new products can be brought into a market of mature products (with flat sales) in the domestic market.

An interesting counter trend is that an ability to change products or lines has increased in importance. In the manufacturing and machinery section of this document, trends towards smaller lines will be addressed.

3. GRAPHICS

3.1 Computer Support

The most noteworthy trend in presentation graphics results from the increase in computer power. Increased graphics potential, memory, storage space (for files) and processing speeds have all contributed to rapid development of graphics. Not only can the graphics themselves be developed faster, but presentation of the graphics is possible with three-dimensional representations which can present packages from different perspectives and within a retail setting. This has not only increased speed to production and market, but has also allowed for graphics changes or multiple graphics presentation for any given product. Large companies have found that multiple presentations appeal to a wider market. For example, a cereal manufacturer may have a variety of printings for the same product which appeal to people of different genders, ages and life styles. These changes in graphics have also promoted the trends for faster changeover in manufacturing. Even with large production runs, multiple graphics presentations require rapid changes for the packaging line.

Another aspect of computerization is rapid communication which allows remote development. Graphic development can be performed anywhere in the world and rapidly communicated to any other location. Therefore, graphic functions can be consolidated or dispersed, whichever works better for any given company.

A corollary to developing graphics remotely is the concept of packaging postponement, which has been practiced for decades but which has new advantages with globalisation. The concept suggests that the differentiation of a product be postponed to the last point in the distribution chain. For example, a product which is sold in many countries can be printed with graphics which includes multiple languages, or printed in the distributing country with only the local language.

3.2 Graphics consolidation

Although difficult to define as a trend, this principle has been sufficiently successful to those companies who employ the following principles that it is included in this bulletin. As more products compete for both shelf space and the attention of the consumer, products must declare their presence to the consumer more rapidly. Products may compete as individual products or gain visual support from a company's product line.

The idea of graphic consolidation suggests that some element or elements of the graphic design identify the company line and differentiate the entire line from the competition. This can be colour, a recognizable logo, border etc. Campbell soups, for example, are easily identified by the characteristic red and white motif. The individual soups can be distinguished as the consumer stands in front of the store shelf, but the entire product line stands as a unit as the consumer approaches the category from the store aisle.

It is prudent to observe your products on the supermarket shelf and see how they compete.

3.3 Labelless look

Graphics continue to be refined and improved. The thrust towards better graphics also includes the trend for paperless labels because of improved printing surfaces available with non-paper substrates.

One manifestation of the paperless label is the labelless look which is continuing to grow. Labels are printed on a clear substrate which gives an appearance similar to direct printing onto the container. The labels are often pressure-sensitive applications, but also include shrink labels which give the appearance of full decorating.

4. MATERIALS

4.1 Material Reduction

There is often pressure to introduce products to the marketplace as rapidly as possible. Since it is also relatively common that packaging considerations become critical after the product is developed, there is usually insufficient time to complete full shelf life studies. The liability for under packaged products is considerably higher than for overprotected products. Products, which fail to deliver in the marketplace due to insufficient packaging, will at best, suffer decreased initial and repeat sales, and at worst could trigger a health hazard. Therefore, it is typical to over-protect food products with some degree of over packaging. Once introduced, profit improvement may be realized by trimming packaging materials, such as specifying a thinner wall for a bottle, thinner cartons for a cereal, lighter weight liners on corrugated shippers etc. Such "cost reductions" are helpful in bringing down packaging costs and are common to the food industry. Since profit improvement is a consistent goal, material reductions will remain a trend.

4.2 Weight Reduction

Related to material reduction is weight reduction. However, this consideration has often driven choice to alternative materials. The conversion of many glass packages to plastics, for example has been driven by weight considerations. Glass is a relatively heavy packaging material and weight restrictions are often imposed for trucking and other transportation modes. If a product is heavy, limitations and pricing will be related to weight, and transportation vehicles will "weight out", or be limited by weight. Conversely, if a product is light, it may "cube-out" or be priced by volume.

Air transport is concerned with weight because fuel consumption is directly related to the weight which must be lifted. Heavy products and long distribution lines may encourage weight reduction programs to reduce transportation costs.

4.3 Glass

Glass containers, primarily bottles and jars are prone to breakage, especially if the surface has been scratched or impacted. Safety with glass packages was achieved historically by producing heavier glass packages which could strengthen the package against breakage. (Ampoules, utilized in pharmaceutical packaging are also subject to surface effects, and indeed, scoring is used to assure that the ampoules break at the intended position. These packages, however, can be made thin because they are shipped in boxes with dividers which prevent surface scratching during transit.) When plastics began to successfully compete with glass, technologies were developed to reduce the weight of the glass necessary to provide safety. This was done by improving glass distribution and/or protecting the surface through coatings and shields.

Uneven glass distribution in a container can focus forces and promote breakage upon impact. Technologies have allowed more uniform glass distribution during manufacture, and allowed for adequate strength with thinner walled bottles. This process has reduced weight and made glass more competitive.

Coatings on the surface of glass reduce abrasion and also allow thinner glass to be used for packaging. This concept was extended into foam shields which both protect the glass (allowing thinner walls) and provide consumer impact with graphics potential and insulating properties. Such technologies will therefore continue to make glass a viable packaging alternative.

4.4 Plastics

Weight reduction also remains a trend for plastics packaging. Packagers hope to find a least cost alternative for adequate protection. Therefore plastic packaging includes constant improvements in barrier, strength and other characteristics by laminations and co extrusions which combine properties of different plastic resins. In relation to the discussion with glass, only glass and metals provide essentially absolute barrier. All plastics are permeable to gases and moisture to different degrees. High barrier development is a consistent desire and continuing trend. Improved barrier properties are achieved with both polymer layers and coatings. Some industry experts expect the coatings to be emphasized because of recycling considerations, but both laminations and coatings will continue to be developed. These high barrier polymers will continue to be sought for applications formerly satisfied by glass, metal or foil packaging.

Plastics offer more design options than glass, metal and paperboard. As a result, plastics will continue to grow in those systems which exploit such properties. For example, many closures have switched from metal with pulp liners to plastics to take advantage of moulding flexibility, "living hinge" on polypropylene, and dispensing features. Bottles have moved to plastics to promote convenience such as measuring features and squeezability.

4.5 Other material trends

Other specific material trends include:

- improved consistency of materials. More consistency promotes more line controls and faster lines. This consistency includes uniform thickness as well as consistency of the components themselves.
- paper replacement. This includes containers for moisture sensitive products such as ice cream, labels and alternatives for paper/PE/foil/PE structures.
- foil replacement. This includes metallized films and high barrier laminates and co extrusions.

5. PRIMARY PACKAGING

5.1 Computer support

As with graphics, computers have and will continue to speed product development. Virtual design programs allow packaging development to precede manufacturing capabilities. Packages can be tested for such properties as compression strength, barrier performance, and visual impact through software. Computers therefore promote both increased options and faster development. This computer advantage also applies to transportation packaging.

Modelling techniques allow rapid prototype development, including techniques such as Stereo Lithography (SLA) which utilizes a laser to cross-link a three dimensional prototype design in a photopolymer bath and thereby prepare a model directly from the design program.

As with the above discussion with graphics, rapid communication allows shared specifications, including Internet access, which allows faster communication between supplier and user, headquarters and plant and even off-site vendors and workers. Computer specifications programs are available which allow multiple but varying levels of access such that different users may modify, approve, or just view the specifications.

5.2 Specific Packages and Types

Gusseted pouches continue to be a trend in packaging. Improved heat seals through the change from two to four thicknesses, faster line speeds and incorporation of dispensing and/or resealable features will promote continued use and expansion into larger gusseted pouches.

Convenience features such as handles, zippers, snap closures, hinges and measuring devices will continue to be employed to differentiate products and promote sales. Improvements in computer design, materials and manufacturing capabilities all contribute to enhance such capabilities.

An important trend in the United States of America is convenience and meals-on-the-go. As a result, single serve packages with convenience features are expanding rapidly. An example is a soup package which features a single serving of soup with a plastic lid which enables sipping. Resealable packages are an alternate means to add convenience for larger packages.

5.3 Product Protection - Shelf Life

Improvements in barrier polymers were mentioned under materials. Barrier improvement allows for extensions of shelf life or allows comparable shelf life to be obtained with less packaging material.
Another trend, which relates to improvements in distribution, is for companies to evaluate their actual shelf life requirements. Companies which can distribute products more rapidly have been able to both reduce packaging requirements (and costs) and deliver fresher products. Profitability is therefore improved.
Active packaging has been increasing in usage. This includes oxygen absorbers, moisture absorbers, ethylene absorbers, odour controllers, antimicrobials, controlled atmosphere packaging and vents (such as those used to allow gases to vent after coffee roasting). These active packaging systems promote shelf life of products and will continue to grow.

5.4 Product Protection - Pilferage

Counterfeiting and theft remain problems in many places. Authentication, security tapes, holographs etc. have been developed to provide positive identification of products and deter counterfeiting.

Identification systems to prevent theft can trigger alarms if a product is moved through a sensor without being deactivated. Many retail outlets employ such devices to prevent theft. For expensive products, such devices may be incorporated into the product. For example, a 1 gallon bottle of weed killer has incorporated an acousto-magnetic EAS tag that is installed in the bottle with tabs which prevent the device from coming out of the bottle during use.

Counterfeiting is a particular problem with expensive products, such as pharmaceuticals. Radio frequency identification (RFID), which employs a silicon chip and antenna embedded in tags or labels, can be used to track products throughout the distribution chain. Such technologies will continue to be developed to deter counterfeiting and ultimately be used for real-time inventory control.

6. TRANSPORTATION PACKAGING

6.1 Shippers

The trend for reducing material usage applies to both primary and transportation packaging. One manifestation of this is a tendency to replace full-corrugated shippers with trays with a shrink film over wrap. This revision works well with rigid primary containers which can contribute to the compression strength of the system. It does not work as well with flexible packages.

The dual concern for improved distribution and reduced weight of distribution packaging has resulted in many new developments, especially for shippers of flexible packages. Shipper designs have been developed which provide both increased strength and material reduction. For example, a shipping case with truncated and reinforced corners which improve stacking strength and utilize less corrugated has been developed. Other designs are also available. Z-flute board, which is essentially a paperboard container is reinforced with paperboard strategically located in the high stress areas, has also been developed. The Z stands for Zero flute and represents the thinnest possible corrugated (zero medium), but the dual liner adds strength. Both of these examples illustrate developments in which materials are strengthened in particular locations in order to reduce overall material usage. This is expected to be an ongoing trend.

Internal components are also changing. Many items have been used to reduce movement of products in shipping containers, including dividers, bubble wraps, peanuts, excelsior, paper, and foams. One interesting development involves foam-in-place and foam-in-bag, these are relatively complex systems which heat and combine component agents to make the foams. A company in the United States has introduced a product which consists of a compartmentalized bag which holds the two components for making the foam. A potential user presses and kneads the bag to break the inside seam and mix the components. Foam is released in the bag and expands around a product in the shipping container. This system offers a low investment option to small and medium sized companies to use foam packaging and may therefore make this a trend-setting alternative.

6.2 Unitising

Distribution control is enhanced with improved unitisation. Therefore, trends continue to improve the ability of a unit load to maintain its integrity. Stretch wraps on pallets, for example can be tightened by machine, rather than hand, because machines can increase the stretch upon application. Further, machines can apply a more controlled amount of stretch films. Therefore, machine applications can increase the tightness of the unitising film and decrease the film usage by both increasing stretch (film goes further) and decreasing number of layers.

Further control is obtained by heat sealing the tab end of the stretch film which can help stabilize the load, prevent unwrapping during shipping, and increasing resistance to vibration. The heat sealed tabs have specific benefits to improve unitising integrity in freezer environments, where stretch tack can decrease. Therefore, heat sealed tab applications are finding use with ice creams and frozen foods.
Other unitising methods also find increasing usage. Adhesives, which hold cases on pallets which will not tear shippers upon unloading, have experienced increased sales. Such unitising methods will continue to increase because they facilitate the unit load and decrease damage.

Another trend which will influence distribution is increasing demand for mixed pallet loads. Retailers are influencing orders to contain what they believe they can sell, with a result that manufacturers are pressured to deliver pallets which contain a mixture of products rather than a single product. Such demands require more control of the manufacturing line, including artificial intelligence for the case packing and palletising stations.

Pallets are being considered more in terms of protection than a cost item. Many pallets, especially one-way pallets, are bought on the basis of cost. Poor construction or nails sticking up can damage products. Better quality pallets are often employed to reduce this damage, and may be bought or rented.

An ongoing distribution trend is the increase in containerisation. Although not a new development, containerisation has allowed inter-model distribution which has improved speed and transportation options. The benefits of these systems will continue to expand as handling systems improve and expand into the developing world.

7. MANUFACTURE & MACHINERY

An obvious trend which can be seen at any packaging and processing machinery exposition is increased computer control of manufacture. The trend encompasses two components - the desire for improved process control and the tools for implementing that control (computers, sensors, software).

Allied systems further promote better control of the manufacturing systems. For example new imaging systems can identify closures that have incorrect tamper-evident rings, are cocked during application or even loose (height dimension can be measured online at line speed and compared with specification). Such systems can identify, track, and expel defective or out-of-specification product.

Systems exist for closures, labels, boxes, tamper features and other components. A new system exhibited at the 2002 PMMI show, for example, can track labels before they are applied to a pharmaceutical product, and divert a non-compliant label to a carrier web before it is applied to the bottle. This allows the unlabeled bottle to be more readily identified later online, and reduces the chance of an incorrect label getting through production. It also allows an audit trail for the recovered defective label. Such control will remain a trend in manufacturing control.

Improved efficiency in manufacturing lines remains an ongoing trend. Additional trends include manufacturing designs which increase line efficiency by adding versatility to lines to allow adjustments and repairs. Accumulators, for example, have allowed for such line adjustments. A new development exemplifies the concept of a conveyor system which incorporates an accumulation station. When a line is in full operation, product is conveyed normally. However, if downstream operations stop for adjustment or repair, product accumulates do not cause a slow down in the balance of the line. If the upstream machines stop, accumulation shrinks to maintain feeds for downstream. First introduced four years ago at the Packaging Machinery Manufacturers Institute (PMMI) exposition in Chicago, USA (1998), this concept has been adopted by numerous manufacturers because of the improved efficiency, which justifies its inclusion in a discussion of trends.

Another trend is to define lines with more versatility and shorter and easier changeovers. Such capabilities can be developed with existing lines by studying changeover systems and developing tools and procedures to facilitate the change, or by installing new lines.

Related to the trend for more versatility is a trend to replace high speed mass production lines with medium and low speed lines which offer more flexibility. A major converter in Malaysia, for example, has an overall capacity equivalent to a US converter who supplies millions of impressions for a major food manufacturer. The Malaysian system has five small lines to the US single high speed line. Although output volume is similar, the five smaller lines afford more rapid turnover and considerably less web to feed the line on start-up. The single high speed line is suited for high volume, but even high volume manufacturers are tending towards varied graphics for the same product such that multiple presentations can attract multiple markets. (See Graphics section above). Two continuing trends in manufacturing are to reduce environmental impact and improve employee conditions. The environmental concerns are manifested in programs to reduce waste, improve efficiency (which reduces waste) and switch from solvent to aqueous systems. Improved employee conditions result from increased shields, sensors, line controls and fail-safe systems. Overall conditions are also considered such as noise in plants, atmospheric conditions, etc.

It deserves mention that consideration of employee conditions may influence packaging lines. Noise levels, for example, has been a consideration in packaging shifts from glass to plastics.

8. ENVIRONMENT

Environmental concerns will continue to influence packaging choices as well as local and international trade. Regulations concerning use of packaging materials have both attempted to consider the environment and been used as veiled trade barriers. It is therefore important to recognize trends in this area.

Environmental concerns for packaging materials have concentrated on recycling and reuse. It is anticipated that these concerns will continue as both trends and legislation. Below is a brief description of recycling of key packaging materials.

8.1 Corrugated

Corrugated and paperboard packaging is made from cellulosic fibres. These fibres can be reused, and environmental pressures exist to increase the amount of recycling. Major retail establishments have found it worthwhile to collect, crush (to reduce bulk) and bundle used corrugated for recycling. The pressures are multiple - 1) reducing discard costs, 2) being environmentally friendly, 3) helping the source of supply for packaging materials, and 4) meeting environmental regulations, where applicable, either domestically or in export markets.

Cellulosic fibres shorten with processing, so each recycling cycle weakens these fibres. Therefore, recycled fibres have limitations in use.

8.2 Glass

Glass manufacturers and institutes have promoted the recyclability of glass as a major environmental attribute. Glass is made from sand, and the energy required to convert sand to glass versus recycling glass indeed favours recycling. Cullet (recycled glass) is even required in the glassmaking process. Therefore, this material is easy to recycle. Furthermore, the heat required to melt glass will destroy any microorganism or organic contamination, so recycled glass is safe for direct food contact. However, glass is a heavy material and the energy required to ship glass to the plant must be considered for true environmental impact. Glass which must be transported long distances to be recycled will use more energy in shipping than the energy saved with recycling. Glass recycling, therefore, is important and worthwhile within reasonable distances but not beneficial for long distances. The limits of these distances can be determined.

8.3 Metal

Metals are easily recycled. The heat required to process them will destroy any organic contamination, so recycled metals can be safely used for food packaging.

Aluminium is the most successfully recycled material because of its value and ease of reprocessing. Reusing aluminium is more energy efficient than initial production, however foils must be made from virgin stock.

Steel is less valuable than aluminium but easily separated because of magnetic properties.

8.4 Plastics

All thermoplastics are theoretically recyclable. Thermoplastic means that the polymer can be processed by heat, so can be melted and re-formed. However, multi-layered and composite structures may not be compatible with a processing line. Materials may be able to be separated, but usually such a process is not economically feasible.

It is important to differentiate between processing waste and post-consumer waste. All plastics (at least in their homopolymer - i.e. single component form) are recycled at the plant level. This property of plastics has helped to make plastics competitive with other packaging materials. Clean scrap obtained at the plant level is ground and returned to the extruders. Post-consumer packaging materials vary in their ability to be recycled, reused, or converted into energy.

Plastics developed into an important packaging material because of their versatility, cost-effectiveness, and ability to be recycled at the plant level. As a post-consumer material, recycling becomes more difficult. First is the issue of contamination which can limit both usage and ability to be reprocessed. Second is identification and separation of the various plastics. The product codes which identify the plastics helps this separation, but separation must be sufficient to prevent difficulties in reprocessing. Third, multilayered materials pose problems for recycling efforts. Fourth, temperatures used in reprocessing may not eliminate microbial or organic contamination, so recycling for direct food contact in food applications is not recommended.

The easiest recycling occurs with a large identifiable market. For example, in US, HDPE milk bottles and PET beverage bottles are easily identified, separated and available in sufficient quantity to justify major recycling. However, the recycling is not directed for food use. PET can be de-polymerised and re-polymerised as a safe food contact material, and this has been done. However, it is not economical to do so. The trend, therefore is to utilize the recycled materials into other consumer products.

It deserves mention that recycling efforts can sometimes be used as a marketing advantage. Large beverage manufacturers have reused materials that were not economically advantageous as materials (such as the de-polymerise-re-polymerise system) because the companies saw a marketing advantage to being environmentally friendly, and had a process which was not available to smaller competitors. Therefore, recycling efforts may be evaluated on multiple levels. In general, long term recycling will be viable only if economically justified.

8.5 Closed Loop

For any recycling to be successful, materials must both be collected (including separation and cleaning) and used in new products. Collecting itself, which may be mandated, does not offer a workable system unless use of the supply is developed. Some recycling efforts have failed because of this principle, but the trend is for more sophistication and continued efforts to close the loop.

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PACkit Series, An integrated Export Packaging Information Kit available through the International Trade Centre. The Kit consists of modular profiles which present packaging information in four categories:

1) products and their packaging needs
2) different packaging materials
3) packaging profiles of exporting countries
4) packaging profiles of major target markets/importing countries.

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