Industry News

Packaging for detergents

ABSTRACT

Current practices in soap and detergent packaging are reviewed, noting that the changes to more biodegradable materials in the 1960s and reduction of phosphate content in the 1970s led to the most recent major changes in detergent packaging. Detergent package sizes are being standardized in Europe, but still vary widely in the United States. Considerations in packaging liquid detergents are discussed.

Protection, presentation and cost are the main considerations in packaging soaps and detergents. The extensive research and testing which go into packaging formulation must result in a compromise between a material that will protect the contents for maximum washing efficiency, permit a good display to promote product identification and keep costs low enough to maintain manufacturing budgets for a utilitarian product.

The package must be designed for adaptation to fast and efficient filling machines and for optimum use of space during storage; it must cater to consumer convenience with easy carrying, opening, dispensing, closing and disposal; provide clear and accurate information on product contents, and satisfy regulatory stipulations regarding labeling. It must retain fragrance, withstand long periods of heat, cold and damp without color-bleeding or disintegration and, amidst a blur of brightly colored cartons and bottles on supermarket shelves, attract shoppers.

Responses from representatives at Procter & Gamble, Colgate-Palmolive, Armour and other major soaps and detergents companies have indicated that there have been few really new developments in soap and detergent packaging for several years.

Detergents

The conventional rectangular box is still the most prevalent laundry detergent package in the United States. These folding cartons use low-cost chipboard or boxboard and save tremendous storage space in flat form as compared, for instance, to bottles. The board is made from cellulose fibers, often recycled, and produced by the fourdrinier process (for bleached kraft) or cylinder process (for recycled pulp). A clay coating provides a good printing surface. Packages are usually printed by the gravure method which is suited to high speed, volume production on cheap material with good color reproduction.

During storage, transportation and home use, detergent powders are exposed to wide ranges in atmosphere, temperature and humidity. Therefore, detergent researchers employ a formidable series of tests to investigate the effects of moisture, the tendency of a product to cake under pressure, the loss of concentration that can occur at elevated temperatures or the possibility that other product components could migrate into and through the carton. Results influence package design, or, alternatively, can lead to a modification in the formulation.

Marvin Mausner, of Witco Chemical Administrative Center, whose paper "The Ins and Outs of Detergent Packaging" was presented at an SDA Detergents in Depth symposium in 1980, stressed that "very few facets of product and package are unrelated." Changes in package design were made to accommodate product changes in the 1960s, when the detergent industry switched to the use of surfactants which would biodegrade more easily, and in the 1970s, when manufacturers reduced phosphate levels in their laundry detergents, he said. The effect of both product changes was to make detergent powders more sensitive to moisture, thus requiring greater protection.

Barrier properties in packaging, to protect against moisture and water vapor, are sometimes necessary, particularly in products containing uncoated enzymes and perborate, as well as some nonperborate enzyme formulations, which tend to 'cake' as a result of moisture absorption, and in high nonionic formulas. In recent years, enzyme coating has provided more stable formulations and reduced the need for barrier coating.

Sometimes a package will carry a separate water-impermeable inner container. More frequently the board is treated to provide a moisture barrier.

The most common methods used in the early 1950s for packaging washing powders were an all-over waxed wrapper on the outside of the carton, or a carton made from board containing an asphalt lamination, Swift & Company's A. E. King said in a 1952 *JAOCS* article. The majority of package boards now are laminated with polythene.

In the late 1970s, Dr. O. Schraut carried out storage tests on protective boards and cartons at VP Verpackungen GmbH in West Germany, to study the respective moisture vapor transmission rates of foil-laminated, wax-laminated, polythene-laminated and polyvinylidene chloride, gravure varnished boards and packs. Although the polythene-laminated boards showed the worst barrier properties, and foil-laminated the best, polythene-laminated cartons absorbed moisture uniformly throughout the carton and close efficiently, so that they exhibited the best overall powder flow properties. Foil-laminated cartons, which are used only for dishwashing

detergents, reacted in an opposite manner. The study emphasized that moisture protection depends largely on how effectively the package is closed.

In general, detergent cartons are sealed by glued flaps and sometimes have additional protection in the Van Buren ear closure (Fig. 1) and the cupo style closure (Fig. 2). Reclosure devices can help maintain that protection after the package is opened and prevent spillage.

A survey taken in 1978 and 1979 reports that consumers rated detergent packages harder to open than any other product category on store shelves, Mausner said. This was a result of the infamous "press here and tear back" instruction on the scored opening, which is often insufficiently deep to break very easily, he said. To ensure the carton against weakness at this point, manufacturers tend toward a shallow score, although a "double-cut" scoring technique, involving cutting from both surfaces of the board, may provide an answer.

In testing procedures, cartons containing detergent powder are kept in conditions of constant temperature and relative humidity. The product is examined for flowability, as well as weight gain or loss. Release of printing inks on the carton is checked by a series of rub tests and the board itself is further tested for stiffness, creasing and folding, ply adhesion, bursting strength, tensile strength, tearing strength and scuff resistance.

FIG. 1. Van Buren ear closure.

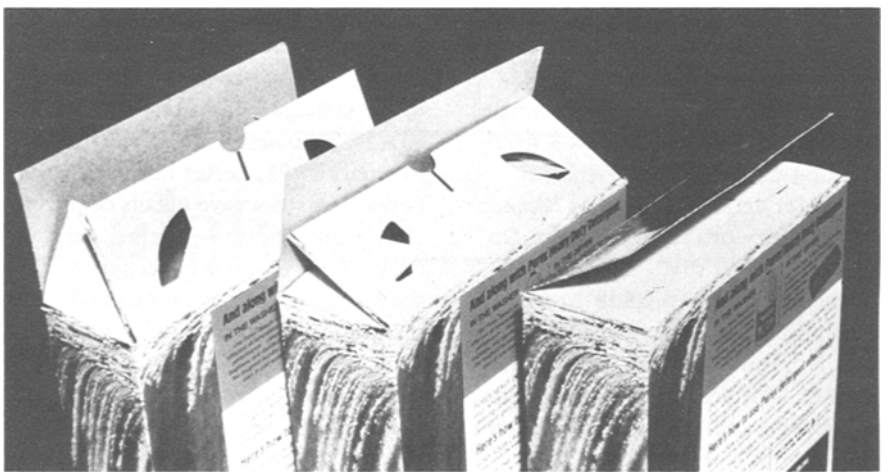

FIG. 2. Cupo style closure.

Liquid Detergents

Researchers testing materials for packaging liquid detergents which now have a 22% share of the detergent market, consistently faced the problems of stress cracking in the plastic, which could cause leakage. Detergent bottles were manufactured from polythene or polyvinyl chloride, even though aggressive formulations tended to attack the polymer chains in these materials and weaken the strength of the bottle. Polypropylene, however, like polyethylene, which is now widely used for packaging liquid detergents, has a much greater stiffness, lower weight and better gloss. It is much more expensive and increases production costs for bottle manufacture since the machine speeds must be lower to accommodate the high heat content of the polypropylene during conversion.

Further considerations in the design of a liquid detergent bottle include the resistance of the polymer material to temperature extremes, its compatibility to the product, its impact strength (or, alternatively, its "squeezability"), the wall thickness of the bottle to allow for the density of the liquid product and size of the bottle, the sensitivity of the detergent to light —usually necessitating an opaque polyethylene—and the liquid detergent viscosity, which will dictate the size of of the bottle opening for ease of pouring and closing. Computers frequently are used to design such bottles.

Package designers must take into account the adaptability of their box or bottle to factory processing—for instance, whether the aperture will allow efficient filling at high speeds. An average speed of over 180 bottles per minute is normal for liquid detergents, which will tend to foam excessively if the bottle neck is too narrow. Bottles may also be unstable on production lines if they are not of a very uniform height and wall thickness. (Cartons for powdered detergents must allow for particle size and flow characteristics in order to take filling speeds of over 150 cartons a minute.)

Package Size

The United States still lacks a clear-cut

standardization for package size, which is now becoming mandatory in most of Europe and Canada. EEC Directive 80-232/CEE relates to "the ranges of nominal quantities and nominal capacities permitted for certain pre-packaged products" and defines the permissible categories of detergent packs by weight and volume —the so-called 'E' size packaging. The objective is to prevent irregular sizes that could confuse the customer or prolong unnecessary production costs. Graeme Burge, director general of the Soap and Detergent Industry Association in Britain, says that the integration of packaging in line with the standardized sizes in Europe was done on a voluntary basis by UK industry. In France, this will be in effect by 1983 and elsewhere by 1985.

In the USA, liquid detergent bottles are usually restricted to about 3 sizes—32 oz, 64 oz, and 128 oz—whereas cartons for detergent powders come in a wide variety of shapes and sizes. On one supermarket shelf, the most common sizes were the 3 lb 1 oz "Giant Size," used by Cheer, Tide, Ajax, All, Bold, Fab and Oxydol; the 5 lb 4 oz "King Size," for Cheer, Tide, Bold and Oxydol; and the regular size 1 lb 4 oz for Tide and Cheer. Purex was packaged in cartons of 2 lb 10 oz, 4 lb 8 oz, and 20 lb; Dash in cartons of 6 lb 4 oz and 3 lb 3 oz; Rinso in a 2 lb 12 oz package; Breeze in one of 4 lb 1 oz; Arm and Hammer at 6 lb 15 oz; and All at 9 lb 13 oz.

Larger volume packages are becoming increasingly popular in most developed countries where consumer convenience is an important consideration. In Europe, cartons are available in multikilo sizes, with a carrying handle, and, for larger volumes, the drum container (at twice the cost per unit product) is also popular. These come with an inner polythene bag and a handle and are frequently made "in house," such as at the Henkel plant in Germany and at the Lever Company factories in Switzerland, Denmark and France. In the United States, "family size" packs are sold with handles, but the drum is seldom used in the U.K. or U.S. for washing products. According to Burge, the so-called "bag-in-box" packaging may enter the British market.

In developing countries, the widespread use of sachets for detergent powders reflects the greater importance of economy. These packs are usually small (40 g-2 kilos) and made from polythene-coated paper or unsupported polythene. In Asia, the annual consumption of soap and detergent per capita is a little over 1 kg, as compared to 10-20 kg in North America and Western Europe, and most of the rural population still use soap, flakes or paste.

Labeling

Labeling of detergent packages in the U.S. is regulated by government. In a paper "Labeling Laws as They Pertain to the Detergent Industry," given at an AOCS Southwest Section meeting in February 1983, Lester Leenerts of Purex Industries gave details of the "Fair Packaging and Labeling Act," which, he says, "was conceived with the intent of making packaging (labeling) uniform so that the consumer would be able to glance at a package and quickly determine what it was for and the quantity that was being purchased." The 1966 act specifies the location, terms to be used and the size of type needed for the declaration of contents. The product name must include a statement of the function of the product, i.e., "brand X heavy duty laundry detergent," and the manufacturer's name and address must be featured on the label. The Federal Hazardous Substances Act of 1960 gives detailed requirements for the location, type size and wording of information concerning hazardous ingredients and precautionary measures, and the Poison Prevention Packaging Act is concerned with the use of child-resistant closures for certain hazardous products.

In the 1970s, the FTC proposed a regulation requiring full ingredient labeling of laundry detergents to help consumers with their selection. The proposal was abandoned after it was decided that such labeling would have no practical economic benefits to consumers.

Bar Soap

Bar soaps packaging has changed little since the article "Bar Soap Packaging," by Luis Spitz, specialist for the soap industry and U.S. agent for ACMA and Mazzoni, appeared in the January 1978 issue of *JAOCS*.

Until quite recently, soaps had been wrapped by manual or semiautomatic machines. In his 1952 *JAOCS* article, A. E. King said the majority of bar soaps were sold in tight wrappers, mostly of waterproof waxed paper, with an inner wrapper for protection from light and retention of perfume, and a stiffener. According to Spitz, this same rectangular "double-point end fold" wrap is still the most widely used soap package style worldwide, although the printed carton is the fastest growing category. The only real changes have been the quality of paper, the graphic treatment and the wrapping speeds.

Spitz says that modern high-speed bar soap wrapping and cartoning lines now achieve speeds of up to 325-350 bars/min, although 200 bars/min is still the norm. Some new packaging lines use programmable controllers—a significant advancement in recent years.

Marketing Considerations

It was the advent of supermarkets in the 1950s that brought packaging in the United States to prominence as an advertising strategy. Consumers no longer asked a grocer for specific products; they looked and chose for themselves. Today, the package is the "silent salesman," a marketing tool that operates continuously in the store and in the home, besides providing the first impression the customer will have of the product. McHugh, of Colgate-Palmolive, who gave a paper on the selection of optimized packages at the 1980 AOCS Detergents Eight-O Short Course, explains that packaging strategy must be "short, concise and translatable into visual graphics because of the compressed time and environment within which the package has to convey the message."

The designer aims for a distinctive, eye-catching package, which will carry a maximum "shelf impact" and assure product appeal. However, as Dr. Mausner pointed out, packages must reflect a quality level that the consumer will actually experience in using the product, since research has shown that people often feel let down if the package is too attractive to match a mundane product.

Lifestyles and shopping practices—influenced by the increase in working women who have less time to shop—have accentuated the trend toward building a strong brand identity that is easily recognizable on a fast shopping trip.

Packaging decisions in the near future will be affected by cost escalations of packaging materials and methods of production. Package designers will probably be using smaller print and fewer colors. Mausner sees the industry working toward energy savings in all areas—in manufacture, transportation, disposal and recycling. Environmental protection will, of necessity, become a greater priority, as well as considerations for the aged in easier to handle and easier to open packages. Inevitably, computerized systems will increasingly handle the complex input from product developer, package engineer and the market to obtain optimum designs.

Changes in detergent production tend to be of a gradual, evolutionary nature. Consequently, significant new product and packages are rare. The introduction of Colgate-Palmolive's 'Fresh Start'—a powdered detergent in a plastic bottle—has become a case-study of the evolution of a package to fit the product. Fresh Start is a concentrated laundry detergent, needing only ¼ cup powder as opposed to as much as 1¼ cup per load. The decision to package the new detergent in a transparent plastic bottle effectively conveyed the message that the product was different. A high-density polyethylene gives the powder good moisture protection and is affordable since the powder is concentrated. A screw cap reinforces the protection, prevents spillage and acts as a measuring cup. The complete package stands out on a supermarket shelf as the only bottle in a row of chipboard packages.

Calendar

AOCS NATIONAL MEETINGS

Annual Meeting, April 29-May 3, 1984, Fairmont Hotel, Dallas, TX.
Annual Meeting, April 21-25, 1985, Franklin Plaza Hotel, Philadelphia, PA.
Annual Meeting, May 11-15, 1986, Hilton Hawaiian Village, Honolulu, Hawaii.

AOCS SHORT COURSES

AOCS Short Course on Fatty Acids, Sept. 23-26, 1984, Kings Island, OH. Contact: Meetings Coordinator, AOCS, 508 S. Sixth St., Champaign, IL 61820.

1984

XVth Meeting of the Spanish Committee on Surface Active Agents, March 21-23, 1984, Botanic Hotel, Puerto de la Cruz, Tenerife. Contact: Secretaría de la Asociación de Investigación de Detergentes (A.I.D.), Jorge Girona Salgado, s/n, Edificio Juan de la Cierva, Barcelona-34, Spain.

"Surfactants in Our World – Today and Tomorrow," CESIO Surfactant World Conference, May 6-10, 1984, Munich, Germany, Contact: CESIO, Avenue Louise 250, Boite 102, 1050 Brussels, Belgium.