Soaps and Detergents: North American Trends

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Usually exciting, sometimes frustrating and always interesting is how I would describe the developments that have affected our industry and the challenges it has faced in the nine years since my previous report. Our industry is now deep in a period of rapid product development that began in the United States in 1970 when the first regulatory actions against detergent phosphates were taken. The last decade—especially the last five years—has brought a flood of new products and an acceleration of product modification. Even the time period between development and appearance of a product in the marketplace seems to have vanished. Forces outside our industry have helped quicken this pace. This paper will present an overview of major cleaning product trends and of the diverse underlying factors that have shaped them.

PRODUCT TRENDS

The market for cleaning products in North America is vast, intensely competitive, convenience-performance-oriented and dominated by products intended for consumption in households.

That part of North America comprising the U.S. and Canada produces and consumes 1/4 of the world supply of soaps, washing and cleaning compounds or about 8.0 million metric tons of products per year (1). The market approximates *in toto* that of the 17 nations of Western Europe plus Yugoslavia. These comparisons, based on data for 1982, are shown in Table 1 and are the most recent available. Of the North American contribution to world supply, the U.S. accounts for just above 95%. While the U.S. portion is about 9.5 times larger than that of Canada, the U.S. population, now at 241 million, is also about 9.5 times larger than the Canadian population, suggesting equivalent per capita consumption of cleaning products.

Figures for a more recent year indicating product volume in the U.S. are not available. The Canadian government publishes reports annually on the industry in Canada. Comparable official information for the U.S. is issued only at five-year intervals when the national *Census of Manufacturers* is taken. The next such census is scheduled to be taken in 1987, with preliminary results expected in 1989. Dollar sales volumes are another story. *Progressive Grocer*, a grocery industry trade journal, publishes dollar sales annually in its July issue.

About 90% of U.S. output of cleaning products is for consumption in households and reaches the consumer primarily through supermarkets. In 1985, Americans spent $4 billion for soaps and detergents, $1.7 billion for cleaners and $1.1 billion for laundry aids and additives (2). Table 2 presents sales data for some important categories within these major product groups. These product groups, taken as a whole, currently generate 3.5% of total supermarket sales.

These sales figures apply only to supermarkets. They are conservative with respect to the total sales picture and may become more so. The supermarket traditionally has been the primary retail outlet for getting cleaning products into the hands of consumers. While it still has the lion's share of the retail business, it faces increased competition from mass market discounters and other retail outlets that have added products that were formerly found mainly in supermarkets. Vigorous direct sales operations also bypass the supermarket. The courtship of the consumer dollar for cleaning products by diverse suitors is very keen.

Heavy duty laundry detergents remain the leading product class. Since the late 1970s, two new and now important concepts—concentration and multiple function—have had a major impact on these products. Other product areas have also been influenced.

Concentrated products are liquids or powders with a recommended use level of 1/4-1/2 cup (59 to 118 cc) (3) per washload. This is in sharp contrast to the 1-1 1/4 cup recommendation common a few years ago. The concept of concentrated liquid and powdered products has become well established and accepted. Consumers and retailers recognize the value of more active ingredients with less filler material.

Multifunctional products are those with performance characteristics besides detergency. Such products contain built-in systems to bleach, soften fabrics, reduce static-cling, remove stains and eliminate odors. The multifunction concept has excellent market appeal for liquid and powdered detergents because various laundry aids and additives once available only as separately packaged products are combined in one product. The convenience offered by these multifunctional detergents appeals to many consumers and outweighs perceived performance disadvantages, especially for high softening levels. Multifunctional detergents are here to stay, but it is unlikely that they will totally displace separately used laundry aids and additives because of the superior performance benefits offered by the latter.

A third significant development is the continuing rise in popularity of heavy duty liquids, also being emulated in other cleaning product categories. Liquids account for about 30% of heavy duty laundry detergent sales, having added 5% in 1985 following several years of gradual growth (4). The ban on detergent phosphates in some locales and the trend toward cooler wash temperatures have spurred the growth of liquids. Liquids also offer such advantages as more rapid and complete solubility in cool or cold water, easier pretreatment of stains prior to washing, easier dispensing from the package and no caking in storage when exposed to moisture.

Laundry detergents have clearly become "high tech," and more innovations involving formulation and packaging/dispensing systems lie ahead. Two examples are a detergent/whitener/fabric softener product in the form of a single-use, quilt-like sheet for use in both the washing machine and dryer (5) and a gel-like detergent that is 99% active ingredients, pre-measured in two

dissolvable film packets attached by a perforated strip. These products are now in test markets or are being sold in limited areas of the U.S.

Innovation is also visible in other product areas, notably automatic dishwashing detergents. Liquid machine dishwashing detergents were introduced to the consumer market earlier this year. About 1/2 of households in the U.S. are equipped with automatic dishwashers. While the home inventory of these machines is said to be dependent on housing starts, the machine dishwashing detergent category is growing at about 5% annually (6), mainly due to consumers switching from hand dishwashing. Consequently, light duty liquid detergents have experienced some contraction since 1983. The slippage in product volume is now running about 2.5% per year (7), despite a formulation trend in the direction of higher performance products. There are some predictions that liquids will eventually command 15-20% of the automatic dishwashing detergent category, following a growth pattern similar to that of liquid laundry detergents (8). Should the growing consumer preference for liquid product forms spill over into this category, the forecasts may prove quite conservative. Like laundry liquids, automatic dishwashing liquids dissolve more readily than powders and remain unaffected by humid storage conditions, two features that have already demonstrated consumer appeal.

Another area of new product activity is household cleaners, even though this category is relatively mature with use in an estimated 90% of U.S. homes (9). The "all purpose" or "general purpose" cleaner segment is the largest portion of this category, $353 million in 1985. It, too, seems to be heading in the direction of the multifunctional product that cleans, disinfects and deodorizes in one convenient step without rinsing. Three new products incorporating these principles were introduced in 1984 and 1985 and are said to have captured about 15% of the all purpose cleaner market.

Bathroom cleaners, another portion of the household cleaners category, grew 61% on a dollar basis between 1983 and 1985. (10). These products contain disinfectants and are for cleaning fixtures and surfaces found in bathrooms. They are designed to provide easy, heavy duty cleaning. The sales volume of these products appears unaffected by the expanding multifunctional all purpose household cleaners with similar capabilities; whether this situation remains will be interesting to see.

Having presented this brief overview of major product developments, I want to turn to those influences coming from outside the industry that help set the scene for success or failure.

OUTSIDE INFLUENCES

The detergent industry does not operate in a vacuum. A franchise in the marketplace often depends upon reaction to external forces, over which an industry has little or no control. The flood of new products and innovative approaches to product designs and packaging are creative responses to two distinct trends—one demographic-social and the other environmental-regulatory—that emerged in the early 1970s and remain in full force today.

TABLE 1

Soaps, Detergents, Cleaners (1982 Production; 1,000 metric tons)[a]

Canada	300
United States	7,700
North America	8,000
Western Europe	8,000
World	30,000

[a]Based on data issued by Henkel KGaA, ZR-AS Volkswirtschaftliche Abteilung, February 1984.

TABLE 2

Sales in Supermarkets: Selected Categories[a,b]

	1984	1985
Soaps		
Toilet bars	$693	$718
Liquid soap	87	91
Laundry (bars, flakes, powders)	38	34
Detergents		
Laundry		
Powders	1,460	1,441
Liquids	559	705
Special purpose	43	43
Dishwashing		
Hand	601	606
Machine	332	342
Cleaners		
General purpose	328	353
Bathroom and bowl cleaners	259	252
Scouring powders	116	107
Laundry aids		
Presoaks	104	104
Bleaches	384	411
Fabric softeners	430	459

[a]Based on data supplied by *Progressive Grocer* (Stamford, Connecticut).
[b]In millions of current dollars.

On the demographic-social side, the home is no longer the center of "life," as it was as recently as 20 years ago (11). Nor is it as clean. According to 68% of the women who rated their cleaning habits in a recent *Good Housekeeping* survey, their cleaning standards have "fallen a good deal" (12). Feminism, inflation and certain demographic developments are responsible for the decline. Heightened career expectations of women and the widespread need for a second family income have thrust more and more women with children into the labor force. According to *American Demographics*, fewer than 11% of American women could be classified as stereotypical housewives, that is, married women, not in the labor force, with children under 18 years of age. Additionally, only 21 million American women were full-time homemakers in 1984, down from 27 million in 1970 (13). Currently about 72% of employed women with children work on a full-time basis. Time is at a premium for these working women; consequently, they assign a lower priority to household cleaning and laundering. If

these tasks are to be done at all, the products needed to do them must work quickly, perform well and be easy to use, to allow consumers to allocate their limited free time for more pleasurable activities. In the U.S., women have cashed in the dishrag for the paycheck, and our industry has responded by creating products that are convenient to use and multifunctional in nature, products that compensate for limitations of time, energy and motivation.

The burst of women into the market place has been accompanied by other demographic developments that contribute to a reduced priority for cleaning and laundering, notably the rise in the senior citizen population and the increase in single-parent and single-occupant households where the motivation to clean is likewise diminished by personal free time limitations and bodily energy constraints. The elderly now constitute the largest segment of homemakers, and by 1995 60% of fulltime homemakers will be aged 55 or older (13).

The cost increases since 1973 for energy to heat water and power appliances have had a heavy impact on consumers and, by extension, on product development. The rising costs set into motion a trend toward cooler water temperatures for home laundering, which has been assisted by the widespread popularity of synthetic fibers requiring lower washwater temperatures. Figure 1 illustrates the dramatic shift away from hot water cycles that has occurred in the selection of laundering wash/rinse temperatures by consumers. The tendency among consumers today is to wash in cooler water and to use cold water rinses.

Consumers are also using their automatic dishwashers less frequently. Weekly cycles, on the average, dropped to 5.6 in 1983–84 from 8.0 in 1971. The decline is unrelated to dishwasher capacity. Consumers use this appliance less often because they wash full rather than partial loads of dishes. Smaller families and a trend toward eating more meals away from home have also contributed to the reduction. Figure 2 depicts this development.

Clothes washers and dishwashers have also become more energy-efficient. On a per-cycle basis, new clothes washers and dishwashers require an average of 34% and 36% less energy, respectively, than in 1972. This information is based on 1984 energy data and on weighted averages of appliance shipments, reflecting a consumer preference for energy-saving models (14). One other applicance note—home laundry equipment is finally beginning to move out of the basement into more convenient household locations. Much new equipment is being located in first-floor laundry rooms, with kitchens, hall closets and bathroom areas as popular alternatives, according to a manufacturer survey of new owners of stacked, full-capacity washers and dryers (15). More convenient locations for this equipment not only provide a savings of personal time and energy, but also help support the home laundering habit in the new demographic climate.

The environmental-regulatory influences affecting the detergent industry today fall into two categories: (i) major environmental legislation of a general nature—clean air, clean water, toxic substances control acts, etc.—in the U.S. on the federal and some state levels, and (ii) environmental legislation/regulation directed specifically to cleaning products and their ingredients in some state and local jurisdictions. While the major environmental statutes have had a pervasive influence on all U.S. industry, including ours, the legislation specific to cleaning products and their ingredients has generated even more serious concern because of the direct impact on the products themselves and, by extension, their franchises in the marketplace.

For the last quarter century—and possibly well beyond the foreseeable future—cleaning products have served as environmental targets due to their intimate association with water and their widespread use thoughout the population. Environmental-regulatory trends began to affect detergent products directly in the early 1960s, when surfactant biodegradability surfaced as a popular issue. The transition to more biodegradable surfactants was accomplished by mid-1965 with essentially no legislative intervention. By the late 1960s, however, phosphates in detergents had

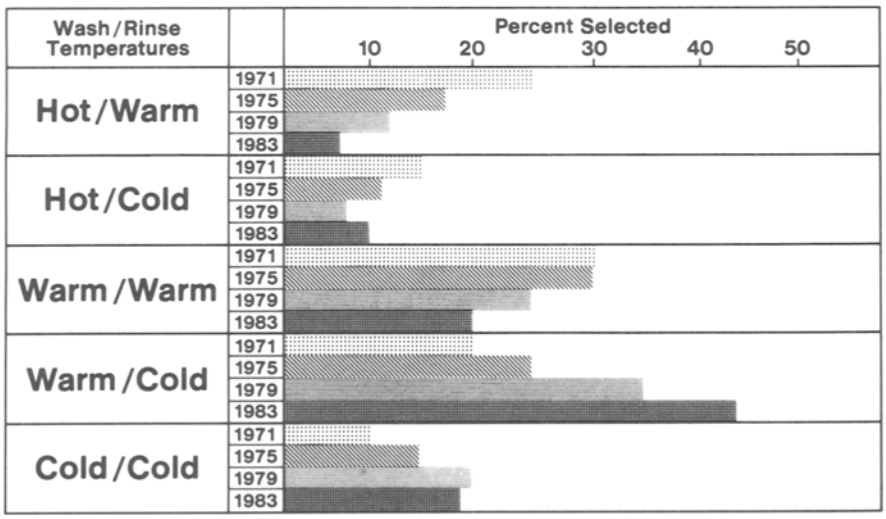

FIG. 1. Automatic clothes washer cycles used, by water temperature (14).

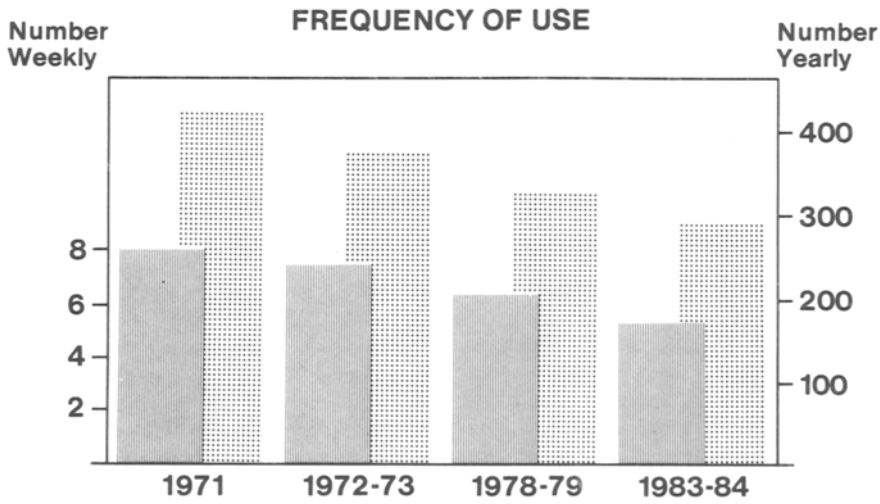

FIG. 2. Automatic dishwasher cycles (14).

become the new focus of environmental and then legislative attention. Between October 1970 and June 1971, a majority of antidetergent phosphate legislation was introduced and largely defeated or not acted upon. The next few years were relatively quiet as public interest shifted to other problems. In fact, during this period one state and some local communities revoked or amended their detergent phosphate restrictions. However, by 1975, interest in banning detergent phosphates rekindled and has resulted in a "second wave" of detergent phosphate bans. Maryland, Wisconsin and Washington, D.C., are recent additions to the areas under detergent phosphate interdictions.

The bans were introduced to help solve environmental problems associated with deteriorating water quality. They have effected no measurable improvements, even in areas such as Indiana and New York that have had total bans in place since 1973. In fact, the bans are counterproductive to the very things they are supposed to protect, for they can obscure the need to identify the causes and cures of local eutrophication problems and the need to implement appropriate nutrient control strategies.

At present, 100% of the Canadian population and about 26% of the U.S. population lives in detergent phosphate-restricted areas. Because of the "halo" effect resulting from distribution patterns, the actual population of the U.S. that is affected is probably higher. Figure 3 shows those parts of the U.S. where total or partial restrictions on detergent phosphate are now in effect. The state of Montana does not have a state-wide ban per se; however, it does have legislation allowing a few counties the option to ban the sale of phosphorus compounds used for cleaning. Legislated phosphate levels shown in Figure 3 apply mainly to laundry detergents. Automatic dishwashing detergents and industrial and institutional products have been granted exemptions from total bans in most jurisdictions. In these places, automatic dishwashing detergents are permitted to contain 8.7% phosphate or more, as illustrated by Figure 4.

NTA (nitrilotriacetic acid, sodium salt), the only other known builder material with a level of efficacy comparable to that supplied by phosphates, has been broadly used in Canada for the last 15 years. Its use has been under the scrutiny of a continuing monitoring program and has yielded no evidence of adverse health effects. Over the same period in the U.S., however, NTA has been subjected to lingering questions about its effects on public health, and it now faces an even more cloudy future politically.

New York's Department of Environmental Conservation promulgated a total ban on NTA use in detergents which took effect in November 1985. Fifteen years earlier, detergent manufacturers had voluntarily discontinued NTA use on the basis of preliminary toxicologic studies, pending further research into potential environmental and public health effects. Ten years later, in 1980, the U.S. Environmental Protection Agency injected some optimism into the NTA situation when it announced its decision not to take regulatory action against "the resumed production and use of NTA" in laundry detergents. The NTA ban in New York makes it unlikely that NTA use will prove acceptable to industry or to the regulatory authorities in any other state despite the EPA posture.

Recently a new form of environmental legislation has sprung up in the U.S. directed at controlling disposal of "hazardous household wastes." The legislation for the most part does not define such wastes, and thus through broad interpretation could be construed to include substances as innocuous as most cleaning products. Various environmentally active citizens groups are proponents of this legislation.

On another front, that of product safety, pressures exerted by animal rights groups are causing reassessment of current test procedures involving animals and development of new alternative in vitro methods. The North American Soap and Detergent industry has reduced its use of animals in safety testing where possible. It has also been sponsoring major research for several years into alternatives to the Draize eye irritation test and additional work aimed at identifying promising in vitro eye irritation tests.

INGREDIENT TRENDS

Product innovations and modification resulting from environmental restrictions and changed lifestyles have made a significant impact on detergent ingredients in practically all aspects of formulation. The demand picture today differs markedly from a decade ago. New categories have been added to the ingredient list, and older categories have undergone alteration. I will discuss only surfactants, builders and enzymes.

The product changes have had a stimulative effect on surfactants. They have benefited from the popularity of heavy duty laundry liquids, the incorporation of cationic fabric softeners in formulations and the environmental restrictions on phosphate builders. There has been an expansion in overall surfactant volume in detergents and an increase in surfactant levels per unit of product. The traditional heavy duty, high phosphate-built laundry detergent contained about 15% actives on average. Now the content (upper limit) may range from 20%-50%, depending upon whether the product is a powder or a built or unbuilt liquid. Some ranges for surfactants and builders are shown in Figure 5.

The factors that increased overall surfactant consumption have caused shifts in usage patterns over the same period. Linear alkylbenzene sulfonate (LAS), the traditional surfactant of choice, was rising in volume until 1978, due to increased levels of use in low- and no-phosphate formulations. A gradual reduction in LAS consumption in detergents, attributable to new formulations, took place between 1979 and 1982. LAS use is once more increasing, about 4% annually, due to the popularity of heavy duty laundry liquids that incorporate LAS in combination with other surfactants (16). Currently, about 292,000 metric tons of LAS go into various household detergent products. One supplier has announced new research focusing on linear alkylbenzene (LAB) technology to produce highly soluble LAB, specifically for the growing liquid heavy duty detergent market (17). Since it is unlikely that this supplier is alone in such an effort in today's competitive environment, we may expect LAS to remain a major detergent surfactant.

Nonionic surfactant use in detergents began increasing in the 1960s with the expanding proportion of synthetic fibers in the wash load. Such fibers now comprise about 75% of the fabric in the average load (3). Nonionic demand in detergents climbed steeply during the same period when LAS reductions in formulations were being made. The boost came from such plus factors for the nonionics as better tolerance for water hardness ions and comparatively easy incorporation into liquids. Surfactant demand profiles for heavy duty liquids for the years 1979 and 1984 are shown in Figure 6. The "other" category is comprised mainly of cationic fabric softeners. Formulations combining LAS and nonionic surfactants are obviously already common in heavy duty liquids, and they are expected to become even more common in liquids and in powders as well.

Total surfactant use in 1985 is estimated at 590,000 metric tons for household laundry and 180,000 metric tons for other household applications (19). Demand in the household laundry segment is estimated to grow at

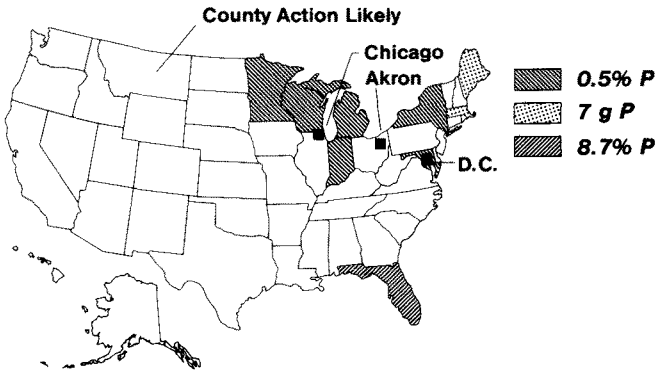

FIG. 3. Detergent phosphate restrictions in place in the U.S. as of July 1, 1986.

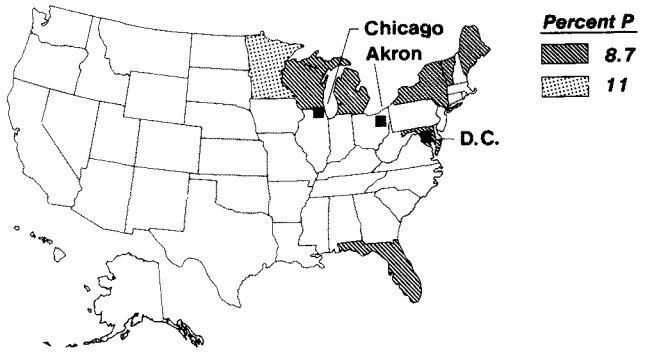

FIG. 4. Phosphate legislated areas for automatic dishwashing detergents in the U.S. as of July 1, 1986.

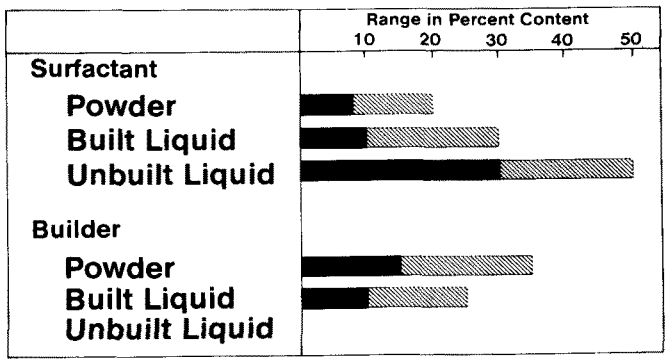

FIG. 5. Laundry detergent (19).

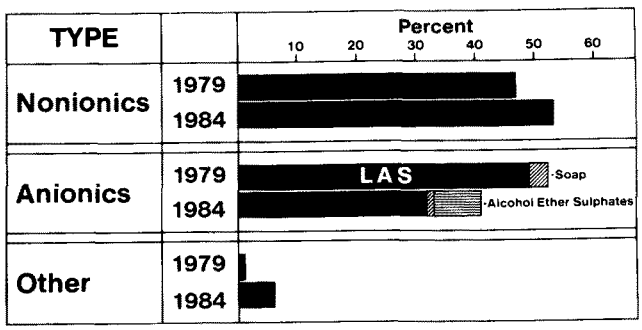

FIG. 6. Heavy duty liquid surfactant demand.

4-5% annually from 1986-1990 (18). Other household applications, except hand dishwashing liquids, are also expected to have positive growth rates (18). Figure 7 provides estimated rates by household application segment. Growth expectations to 1990 are also positive by overall surfactant class, with cationics in the lead at 4 1/2%-5% per year, followed by nonionics at 3%-3 1/2% a year and anionics (including soap) at 1 1/2%-2% (20).

Sodium tripolyphosphate (STPP) production totaled 330,000 metric tons in 1985, (21), up about 3% from the previous year. Most was utilized as builder in detergents. The outlook for STPP remains bright in industrial and institutional detergents, as they have been exempted from ban provisions in many areas. At present STPP does not face an expansionary future in household detergents because of the phosphate bans and the popularity of heavy duty liquids. One bright note, however, is that some jurisdictions in the U.S., in addressing their nutrient problems, seem to be taking a more scientific approach than an outright ban on phosphates. They are attempting to study the total nutrient-loading picture and to evaluate eutrophication control measures on that basis.

The available alternatives to phosphates include sodium citrate, NTA, sodium aluminosilicates or zeolites and sodium carbonates. Only citrates currently appear on the increase, a benefit attributable to their use in heavy duty liquids. Consumption of citrates in detergents was 13,600 metric tons in 1983. Later figures are not available. However, the growth spurt in heavy duty liquids that added 5% to their share of the heavy duty detergent market in 1985 alone had to have added considerably to citrate volume. Zeolites are used mainly in heavy duty powders for phosphate ban areas. Heavy duty powdered detergent sales decreased 0.06% in 1985 according to Selling Areas Marketing, Inc. (SAMI), suggesting a fairly static market for zeolites, but statistics are not available. Sodium carbonate (soda ash) is also used as a builder for detergents in areas with phosphate bans. About 590,000-635,000 metric tons (650,000-700,000 tons) currently are produced annually for detergents (21). The popularity of heavy duty liquids has led to expectations of a somewhat static outlook for this material as well. As mentioned earlier, NTA is used extensively in Canada, but its future in the U.S. is not promising.

Enzymes offer special action against protein- and starch-based stains that can be tough to remove. Easy, effective stain removal by a laundry detergent is a highly visible attribute to consumers, who perceive such activity as a benefit in terms of total product performance and convenience. Enzyme use in laundry detergents is becoming common and will continue to become more so because enzymes do enhance product effectiveness. As late as 1980, enzyme-containing detergents are estimated to have accounted for only 6% of detergent volume, but it is expected that they will reach 30% this year. (Data translating the 30% into actual volume are not available.)

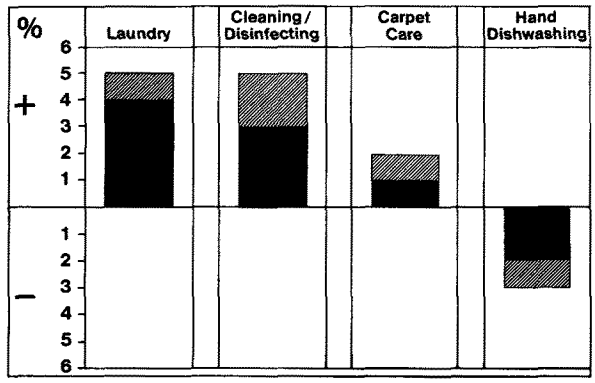

FIG. 7. Surfactants for household products—average annual growth rates estimated 1986-1990 (19).

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