

Detergents in Latin America

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The importance of the Latin American detergent market is demonstrated by the strong business commitment of major worldwide and numerous local detergent manufacturers. Latin America consists of 33 independent countries with a total population of approximately 400 million, diverse cultural and ethnic backgrounds and widely different lifestyles and customs. The population is increasing about 2.5% per year, with about 40% of all Latin Americans being under the age of 15.

CONSUMPTION OF LAUNDRY PRODUCTS

In 1985 the total consumption of toilet soaps and household laundry detergents in Latin America is estimated to be 2.8 million tons, compared to 2.4 million tons for the United States and 4.5 million tons for Western Europe. Of the total consumption in Latin America, 12% was toilet soaps, 42.3% laundry bars and 45.7% laundry detergent powders. Hence, the market for laundry bars in Latin America is about equal to that for laundry detergent powders. The stability of the laundry detergent business is evidenced by the 2% annual growth in total volume consumption from 2.2 million tons in 1980 to 2.4 million tons in 1985 (Table 1). This reflects increased total consumption, but little change in habits and practices regarding the use of laundry products. The overall growth rate is, therefore, comparable to the population increase of the same period.

If we examine detergent usage by country (Table 2), we see that Mexico is by far the leader in tonnage, with over 1/3 of Latin America's total volume. This is followed by Brazil, Venezuela, Argentina and Colombia. In contrast, we see that Brazil leads in the usage of laundry bars, followed by Mexico, Colombia and Argentina. This points to the significant differences in consumer washing habits among the Latin American countries. In the most populated country, Brazil, 2/3 of laundry product consumption is in the form of laundry bars, with the remainder being powders. However, in Mexico, over 3/4 of the volume is in detergent powders, with a much lesser incidence of laundry bars.

TABLE 1
Consumption of Laundry Powders vs Laundry Bars, 1980-85

	Total consumption (000,000 tons)	
	Laundry powders	Laundry bars
1980	1.10	1.10
1981	1.17	1.10
1982	1.26	1.14
1983	1.26	1.13
1984	1.22	1.15
1985	1.26	1.17

TRENDS INFLUENCING LAUNDRY PRODUCTS

Four major factors influence the detergent business: local economies, consumer needs, available technologies and governmental safety and regulatory issues. The ways in which these factors impact Latin American detergent trends is contrasted to that for the U.S. and Western Europe.

ECONOMIC CONSIDERATIONS

In Latin America, the 1985 average per capita income in U.S. dollars ranged from approximately \$750 for countries such as the Dominican Republic to approximately \$4,000 for Venezuela (Table 3). As shown in the table, these figures compare to \$11,700 for France and \$15,480 for U.S.; however, the annual consumption of laundry products per capita in countries such as Mexico and Venezuela is as high as that in France and the U.S. In countries with lower family incomes, a much larger portion of the household budget is spent on laundering than in the developed nations.

In Latin America, powdered detergents are often packaged in plastic bags, offering economy compared with detergents in a cardboard carton. Since laundering is done primarily by hand, economical laundry bars are

TABLE 2
Detergent and Laundry Bar Tonnage for Selected Countries, 1985 (000 Tons)

Country	Detergents	Laundry bars	Total
Mexico	477	139	616
Brazil	209	420	629
Venezuela	153	20	173
Argentina	70	106	176
Colombia	44	139	183
Guatemala	12	35	47
Ecuador	12	52	64
Dominican Republic	5	30	35

TABLE 3
Income, Population and Laundry Product Consumption, 1985

	Per capita income (\$US)	Population (MM)	Annual consumption (kg/capita)
Venezuela	3,980	17	10.2
Mexico	2,580	76	8.1
Colombia	1,150	26	7.3
Argentina	900	30	5.9
Dominican Republic	750	6	5.6
Brazil	2,290	135	4.7
Panama	2,090	2	4.5
France	11,700	55	9.7
U.S.A.	19,480	239	8.8

DETERGENTS IN LATIN AMERICA

commonly used both alone and in conjunction with powdered detergent because topical application of detergent via a laundry bar facilitates removal of laundry stains with minimum wasted product. By contrast, the use of heavy duty liquid detergents in Latin America is very low, due to their low foaming and the perception of lower economy-of-use.

Rinse cycle fabric softeners, although well accepted in some Latin American countries, also have a low consumption level (Table 4). To provide the Latin American consumer with a convenient and economical method of obtaining the fabric softening benefit, heavy duty laundry detergents with a fabric softening system have recently been introduced. "Softergents" have already gained acceptance in the U.S., Western Europe and Australia and are now becoming established in Latin American markets such as Venezuela.

The use of chlorine bleach is very common due to its effectiveness and low cost. It is used on white garments and as a disinfectant in general household cleaning.

Economic considerations apply not only to the types of products in the market, but also to the way they are sold and how they are manufactured. Typical distribution channels of detergent products are wholesalers, outdoor markets, small grocery stores and discount stores, in addition to the standard supermarkets.

For the detergent manufacturer, the use of local raw materials is often required to conserve foreign exchange, to support the local industry and to provide the consumer with quality products at the lowest possible cost. The availability of raw materials for the detergent

industry in Latin America varies from country to country. For instance, in Argentina, Brazil, Mexico and Venezuela, most raw materials for detergents are available locally, while in Central America and the Caribbean countries, most of the raw materials, from detergent alkylate to brighteners, are imported.

CONSUMER NEEDS

Laundering habits and washing conditions in Latin America are compared in Table 5 with those of consumers in the U.S. and Europe. Laundering in Latin American countries takes a lot of the homemaker's time and effort due to the high incidence of presoaking and handwashing. Cleaning standards for laundered garments are very high, and detergent foam is valued as an indication of effectiveness.

The hand wash laundering procedure is fairly standard. The detergent, usually a powder, is added to the ambient water in one or more buckets or tubs. It is agitated by hand to dissolve the detergent and to generate foam. The laundry is sorted, and white and lightly soiled garments are washed first. While garments are mostly made of cotton, there is a moderate increase in the use of polyester-cotton blends. The proportion of white to colored garments is about 65% colored and 35% white. Usually there is a presoaking step, which averages about one hour. Subsequently, the garments are scrubbed one at a time. A spot or stain is scrubbed with a laundry bar or extra detergent and occasionally a small brush. As more and more garments are washed, the detergent concentration builds up in the basin. Then the consumer tackles the most heavily soiled items. The buildup of detergent concentration and the scrubbing process leads to lots of suds. The load is then thoroughly rinsed and the garments are line-dried.

Laundering locations differ from one country to another because clothes washing is done wherever water is available. In Mexico, for example, the wash is done at a laundering sink called a "lavadero." Many lavaderos may be found in a community laundering area. Laundering may also be done at the riverside, as in Jamaica, or at a canal, as in the Dominican Republic. The sources of water are varied: well, river, or accumulated rain water. The water hardness is gener-

TABLE 4
Per Capita Consumption of Fabric Softeners, 1985

	Annual consumption (kg/capita)
Venezuela	0.34
Mexico	0.25
Brazil	0.16
Argentina	0.12
Colombia	0.02
Dominican Republic	0.02
Switzerland	4.0
U.S.A.	6.1

TABLE 5
Relative Habits, Practices and Laundering Conditions

	Latin America	United States	Western Europe
Incidence of presoaking	High	Low	Moderate
Incidence of handwashing	High	Low	Low
Incidence of cotton in wash load	High	Low	Moderate
Incidence of line drying	High	Low	High
Foam preference	High	Low	Very low
Washing time, hrs	2-8	1/2-3/4	1 1/2-2
Temperature, °C	Ambient (15-30)	Moderate (15-60)	High (50-92)
Hardness, ppm	20-200	0-150	200-400
Concentration, %	0.3-0.6	0.15	0.3-0.5
Powder, %	50	65	93
Laundry bar, %	50	—	—
Liquid, %	—	35	7

ally lower than in the U.S., although it varies significantly in different locations.

Laundering by machine is not as prevalent as in North America or Europe. In Venezuela, 50% of households have washing machines, in Mexico 36% and in Brazil 30%, while in some countries, such as Ecuador, machine ownership is less than 1% of households. In contrast, 95% of households in the U.S. and 99% in Japan have washing machines. The majority of the washing machines are U.S.-type top-loading automatic machines; however, they are predominantly used as a laundry aid in addition to handwashing practices. Even households with machines do a fair amount of washing by hand to ensure that special items or heavily soiled garments receive the proper attention.

Before a laundry detergent product is formulated and manufactured, the habits and practices of the consumer in a particular region must be closely examined. The products sold in each area must be designed by their manufacturers to deliver maximum performance, convenience and value to the consumer. Further, they must be safe under anticipated conditions of use for both the consumer and the environment.

DETERGENT TECHNOLOGIES

Several detergent technologies are generally used to address the specific needs of the Latin American consumer in developing heavy duty laundry products. The task of the detergent manufacturer is to formulate, process, distribute and sell products that meet or exceed the customer's expectation of performance and value. The products must be suited to types and colors of fabrics, washing practices and budgets.

Conventional Latin American detergents contain five basic components: high foaming surfactants for ambient water functionality; builder systems to enhance surfactant effectiveness; antiredeposition agents to help washed-out soils from redepositing on garments; optical brighteners to heighten the whiteness impression; fragrance to compliment the cleaning function. Additionally, some detergents contain enzymes to enhance removal of food and body soils and fabric softening components that do not detract from cleaning or foaming.

Latin America is primarily a hand-wash region where foam is a strong benchmark of good performance. The workhorse of surfactants in Latin America is alkylbenzene sulfonate. One can contrast this with trends in the U.S., where the steady growth of heavy duty liquids and the continued acceptance of nonionic powders have created a significant usage of alcohol ethoxylate surfactants. Foam generation and stability of an alkylbenzene sulfonate with that of an alcohol ethoxylate typically used in the U.S. are illustrated in Figure 1. The initial level of foam is significantly greater for the anionic surfactant, and this difference increases with time. In a hand-wash regimen, both foam generation and stability are critical. Additionally, when one factors in the need for a cost-effective material, we can see why alkylbenzene sulfonate is indeed the predominant surfactant in use in Latin America.

The builder system is used to chelate the free calcium and magnesium ions in the water. Otherwise, these

would hamper the foaming and cleaning attributes of the surfactant. The builder of choice in Latin American is still tripolyphosphate, often in combination with sodium carbonate, because it best enhances the overall cleaning ability of the detergent at a reasonable cost.

Although tripolyphosphate itself suspends and disperses clay-type soils, the high prevalence of cotton fabrics in Latin American washloads lends itself to the incorporation of antiredeposition technologies to aid in preventing suspended soils in the washwater from redepositing on clothes. The most widely used agent is carboxymethyl cellulose (CMC) because of its affinity for cotton fibers, although other polymeric agents may also be employed.

To restore garments to a "like-new" appearance, most detergents contain brighteners. These compounds are substantive to cotton in the wash liquor and function by absorbing "invisible" ultraviolet (UV) light and fluorescing "white light." However, long exposure to UV light, especially in the presence of water, degrades the complex brightener molecules. Where line drying is predominant, as in Latin America, sun-stable brighteners are very important. Two types of brighteners, a conventional one and one that is sunlight-stable, are compared in Figure 2. Three regimens are compared: (A) 15 wash/dry cycles, no UV exposure; (B) 15 wash/dry cycles, 200 Langley exposure; and (C) 15 wash/dry cycles, 450 Langley exposure.

The concentrations of the two brighteners were normalized such that they whitened cotton fabric equally after 15 wash/dry cycles with no UV exposure. It is evident that as the exposure to light increases, the sunlight-stable brightener maintains more of its efficacy than the conventional material. The use of "sunlight-stable" brighteners helps insure that the Latin American consumer receives the end benefit at the point of wear.

A final component in virtually all heavy duty laundry

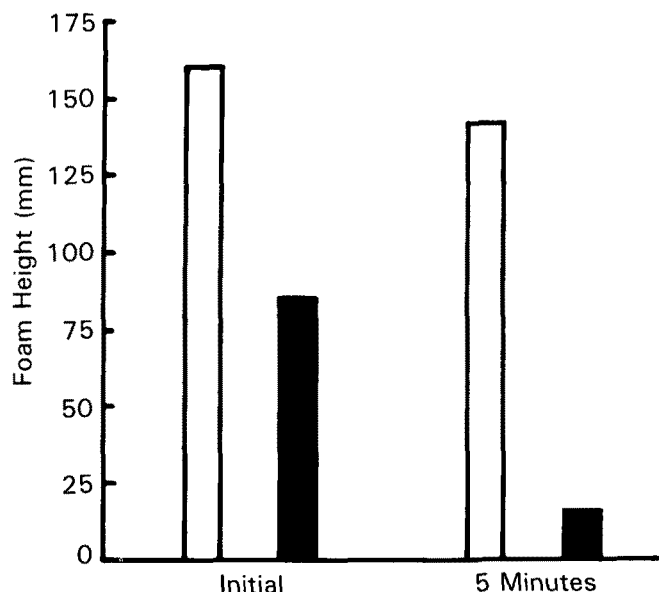


FIG. 1. Ross-Miles foam heights (1.0 g/l surfactant; 25 °C; deionized water). □, Alkyl benzene sulfonate; ■, alcohol ethoxylate.

detergents is fragrance, which provides a pleasant smell upon opening the package, covers the soil odor in the wash water and imports a clean, fresh scent to laundered garments.

One of the optional components in Latin American detergents is enzymes. These ingredients are present in detergents to catalyze the hydrolysis of large organic molecules, such as proteinaceous food stains. Once these large molecules are hydrolyzed to smaller fragments, the surfactant can wash them away. Enzymes in detergents represent a significant technology in the U.S. and, perhaps due to the high incidence of presoaking, have even greater importance in Latin America.

The typical regimen in the U.S. includes a 10-min, warm water machine wash followed by a cold rinse. The incidence of presoaking is low. In Latin America, ambient temperature presoaking is the norm, with times ranging from 30 min to overnight. Profiles of stain removal of a protease containing anionic/phosphate built detergent at 25 C are shown in Figure 3. The times recorded are those of the soaking regimen, which was always followed by a 10-min wash. Two concentrations were used, the higher one representing a typical hand wash dosing, the lower one representing machine washing conditions. The longer the contact time in the wash liquor, the greater the performance benefit from the enzymatic detergent. The use of enzymes in both Latin America and the U.S. has been facilitated by strides made by manufacturers in encapsulation technology. By encapsulating enzymes, dusting during shipping and handling has been nearly eliminated. This technology has helped make the use of enzymes in powdered detergents safe as well as effective.

Detergents containing a fabric softening system have recently been developed in Venezuela, providing the benefits of fabric softeners without separate softener additives. The hand wash/line-dry regimen used in Latin America affords a unique challenge for providing the secondary benefit of softening in the wash cycle. For example, the quaternary, cationic-type

organic compounds used in "softergents" in the U.S. to help reduce static from the dryer and provide softening on fabrics are not applicable in Latin America due to their foam-reducing tendencies and the high incidence of line drying. Instead, it has been found that activated sodium bentonite clays provide fabric softness and increased comfort-to-wear on cotton fabrics under hand wash conditions. These inorganic compounds, when properly enhanced, exhibit special properties when added in the wash water. The clay material disperses in the wash liquor and then coats the cotton fibers. The dried fabric has an improved feel due to the increased slip of the fibers imparted by the layered clay on their surface.

Clearly, the types of detergent technologies employed are dictated by specific needs of the target consumer. Table 6 summarizes typical ranges of laundry detergent ingredients for the U.S., Western Europe and Latin America. The varied washing habits and practices of these three regions result in these differences. An additional difference arises because many Latin American homemakers use detergent products originally designed for laundry to wash other surfaces, ranging from floors and walls to dishes.

Let me present an example of tailoring detergent technologies to a specific task of the consumer. Dishes traditionally have been washed with laundry powders, laundry bars and left-over slivers of toilet soaps. In recent years, however, there has been an increase in the use of specialty dishwashing products in Latin America, in the form of powders, pastes or liquids. These products provide the consumer with convenience and mildness at the point of use. Under proper use conditions, specialized dishwashing products also provide better economy.

In 1985, the total consumption of specialty dishwashing products was 360,000 tons in 14 Latin American countries (81% of the total population) vs 750,000 tons in the U.S. Of total consumption, 58% was liquids, 24% paste and 18% powders. These specialty products have so far only penetrated segments of the

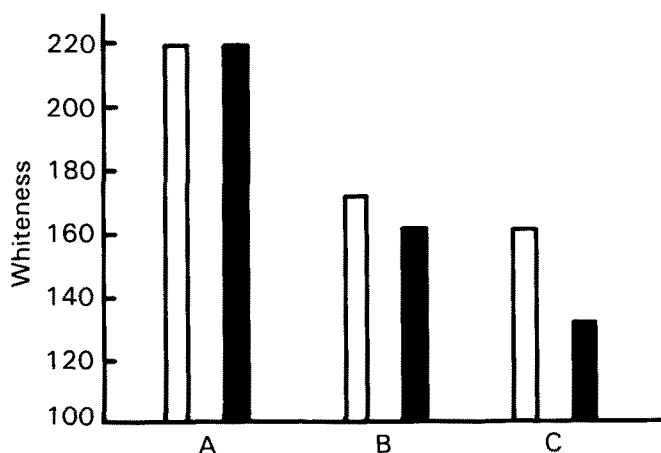


FIG. 2. Brightener stability vs UV light exposure. □, Sunlight stable brightener (CBS); ■, conventional brightener (DMS). A, 15 cycles; B, 15 cycles/200 Langley; C, 15 cycles/450 Langley. (Data courtesy of Ciba-Geigy Corp.).

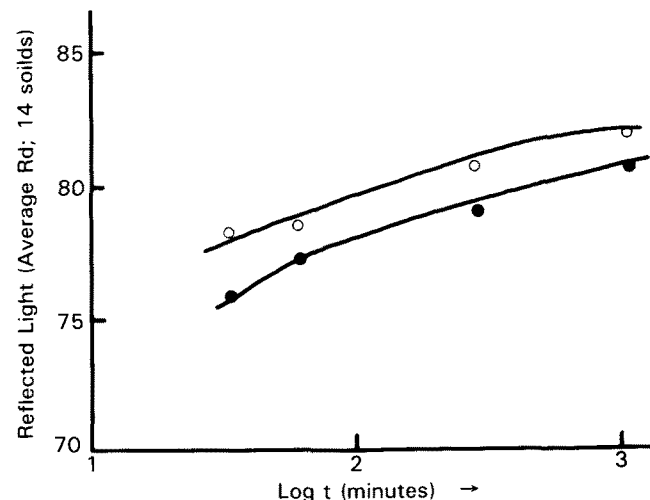


FIG. 3. Enzymatic performance vs time (25 C; 150 ppm). ▲, 3.5 g/l; ●, 1.5 g/l.

TABLE 6
Powder Laundry Detergent Formulations (Weight Percentages)

	Latin America	United States	Western Europe
Actives ^a	15-30	8-20	8-18
Builders ^b			
TPP	20-30	25-60	20-35
Mixed or non-phosphate	20-40	15-30	20-45
Soda ash	0-60	0-50	—
Antiredeposition agents ^c	0.2-1.0	0-0.9	0.4-1.5
Anticorrosion agents	5-12	5-10	5-9
Optical brighteners	0.08-0.5	0.1-1.0	0.1-0.7
Bleach ^d	—	—	15-30
Enzymes	0-0.5	0.1-1.5	0-0.75
Moisture	6-13	6-20	4-20
Process aids	10-35	20-45	5-45

^aMostly alkyl sulfonates (linear and branched), alcohol ethoxylates, alcohol ethoxysulfates and alcohol sulfates.

^bMany builder systems are mixtures of TPP with other phosphates or nonphosphates (i.e., sodium carbonate). Nonphosphate builder systems include zeolites, NTA, sodium carbonate and combinations thereof.

^cCMC, other cellulose-based polymers and synthetic polymers.

^dDetergents containing activated oxygen bleaches are being test-marketed in the U.S.

TABLE 7
Dishwashing Detergent Consumption for Selected Countries, 1985 (000 Tons)

	Liquid	Paste	Powder	Total
Brazil	115	—	—	115
Argentina	63	—	—	63
Venezuela	10	—	—	10
Puerto Rico	9	—	—	9
Ecuador	8	74	—	82
Colombia	0.2	12	—	12
Mexico	—	—	64	64

population; many consumers still use products designed for laundering clothes.

Brazil is the leading consumer of dishwashing liquids, followed by Argentina, Venezuela and Puerto Rico (Table 7). By contrast, in Mexico the main dishwashing product is powder, whereas in both Ecuador and Colombia, a paste is the main product for dishes. In Latin America, dishwashing detergent products (liquid, paste and powder), like laundry detergents, are predominately based on alkylbenzene sulfonate. The liquid form may also contain some alkanolamides and ethoxysulfates.

ENVIRONMENTAL AND CONSUMER ISSUES

Regulations concerning safety of laundry and dishwashing detergents and environmental problems have been put in place in only a few countries. For example, Venezuela has switched to linear alkylbenzene sulfonate from branched alkylate, and limits to 10.5% P₂O₅ maximum have been established for phosphate content in laundry detergents. There are no phosphate limits in other Latin American countries, and branched alkylbenzene sulfonate is still the predominant surfactant used by the detergent industry.