Performance Desiderata

A. E. KING, Swift and Company, Chicago, Illinois

REFLECTION over a period of several weeks upon the subject "Performance Desiderata" in respect to soaps has resulted in the conclusion that more than performance in the hands of the consumer should be involved in this discussion. We are interested in performance in manufacturing and performance in marketing as well as performance in use.

A. E. King

When we say "performance in manufacturing," we refer to the facility with which a product is made, handled through labor-saving production and packaging machinery, and moved to market. Performance in manufacturing involves suitable formulation to make every step of the manufacturing process highly practical, which is an important consideration if a manufacturer expects to be competitive costwise.

Performance in marketing is equally essential. Our products must be acceptable to the wholesaler and retailer and have proper appearance, shelf life, attractive finish, and all of the other known desirable characteristics in their class.

The performance of soap products in their final use is, of course, most important. All three fields of performance however are so closely related that no discussion would be complete without taking all into consideration. To a considerable degree public preference has been molded by skillful advertising so that products uneconomical to manufacture have been displaced by others which can be made by efficient methods.

A study of these three fields of performance results in a rather formidable list of items desired, essential, or needed. To aid in our discussion of these items they have been listed in a table. This list may not be complete. Some students of the industry feel that important items have been overlooked. This may be true, but many controversial items, such as the items of economy, purity, rinsability, lubricating value, and optical bleach content, have been left out purposely because of lack of authentic information or due to absence of proved claims regarding these particular items.

For example, the subject of rinsability has been purposely left off the list of desirable items. Claims have been made by manufacturers regarding improved rinsing, and certain soaps have been stated to "rinse faster" or "rinse more completely." Investigation of such claims has invariably indicated that no dependable experimental basis exists for them. Rate of rinsing is still a matter of dilution, and the rate of rinsing in soaps is proportional to the rapidity with which water is added and drawn from the washwheel or other device being used. Consequently we can only assume that all soaps rinse at the same rate, assuming that we are comparing pure soaps under identical conditions. In the case of built soap there is a tendency for alkali builder to be adsorbed by the fabric, but this introduces a factor outside of soap.

In spite of the number of controversial performance items which have been left out of the listings, we have a large number to discuss and will take up various items in the order in which they appear on the list.

Good Detergency. This is the most desired performance item since most soaps are used primarily for cleaning or removing soil from a surface, fabric, or person. Good detergency happily is easily obtained in any soap formulation. Most soaps as they are made today from the plentiful supply of fatty raw materials possess excellent detergency. The detergency of soap is still the standard of excellence when detergency has to be measured.

You will note that the list shows three degrees of desirability for the various items; ranging from "A," which is an index of a property being desirable; and increasing through "B," where the property becomes important; and finally to "C," where the property is absolutely essential in the product being discussed. Our ratings as to the essentialities of the various desirable items in respect to the different products may be subject to question, and possibly we are incorrect in some instances where unusual soap applications are involved. However they do represent a rough appraisal of essentiality sufficient for the purposes of this discussion.

In the case of household soaps we feel that good detergency, although desirable, is only one of the many desirable features. Therefore, opposite the heading "Good Detergency," we have marked most of the household soaps "A" with the exception of granulated soap in packages and chips in packages. These items are used where soil is often difficult to remove, such as in washing white work in home washing machines. Since good detergency becomes more essential, we have marked these two particular types of product with a "B." In the industrial field detergency is a prime consideration for most products. For this reason we have marked all of the industrial products with a "C" with the exception of liquid soaps, paste soaps, and bulk washing powder. These products are not normally used for purposes where optimum detergency is essential, and we have marked them with an "A." A paper on detergency evaluation is scheduled later in this short course, and we will not devote any further time now to that subject.

Quick Solubility. It is an important performance factor since most soap is used in water. For economy in shipping most soaps are marketed in dry form and must be dissolved in water to be used. Therefore quick solubility is important. Bar soaps have mostly been marked with an "A" because while quick solubility is desired by some users, the aspect of economy is important to others, to the extent that they prefer bar soaps to dissolve more slowly. Some users of bar soap will dry bars on racks or on shelves for weeks on the theory that fresh soap is too soft and wears away too rapidly. This viewpoint is not too logical, but the opinion is held by many, and we have marked bar

soaps as a rule with an "A," indicating that quick solubility is desirable but not absolutely essential. Milled bars we have marked with a "B" because these bars are harder and should have good solubility to compensate for difficulty that might be encountered in rubbing off enough of the product in a short time to be effective.

The solubility of granulated packaged soaps and of packaged chips is more important because of the manner in which these products are used. In fine-fabric flakes and powder quick solubility is essential because these items are used largely in the so-called washbowl type of washing, where the articles are sudsed by hand in moderately warm water and the time factor is important. In industrial soaps quick solubility of bars, solids, paste, and bulk washing powder is not of major importance; however a reasonable rate of solubility is desirable. The rate of solubility in the case of chips and powder is more important, and we have marked the table accordingly.

Quick solubility in soaps is accomplished by proper selection of fats and oils and the inclusion of a percentage of coconut oil in the fat formula. Physical form is also important; thickness of chips has a bearing on solubility as does the shape and size of the particles in granulated soaps. The titer of the fats used is also important from a solubility standpoint. Generally speaking, the soaps of lower titer fats dissolve better at low temperatures than do the soaps of high titer. In the formulation of household soaps however low titer fats are not used to any extent, and solubility is achieved by using a percentage of coconut oil with a rather large percentage of tallow, grease, or other firm-bodied fat and by strict attention to physical form in the case of powdered soaps and flake soaps. To avoid confusion it might be well to note that coconut oil, strictly speaking, is a low titer oil, having a titer of about 23°C. However it has the soap-making properties of a much harder fat. Coconut oil yields soaps of good body and good builder-carrying properties. For these reasons coconut oil is not usually thought of as a low titer oil.

The crystalline phase in which the soap is present in the finished product also has an important bearing on the solubility of the product.

Some manufacturers include a percentage of potash soap in soaps, largely saponified with soda, in order to get additional quick solubility.

Plentiful Lather. This is desired by practically all household users. Many industrial users also insist that soaps lather profusely. It has been well established that the presence of lather on soap solutions has only one value, viz., to indicate that sufficient soap is present to satisfy the demand of the work to be done and to overcome all hardness present in the washing solution or introduced into the washing solution by the material being washed. The presence of suds is simply a guarantee that sufficient soap is present to do a satisfactory job. In spite of this fact manufacturers attempt to assure more profuse sudsing by using a percentage of coconut oil in practically all household products except yellow laundry soap and washing powder. Industrial soap products do not ordinarily contain coconut oil except where the finished products must have unusual liquidity in solution or where a liquid soap is to be manufactured. Some bulk products used by converters as a base for abrasive hand soaps may however contain a percentage of coconut oil.

A Light Color. In finished soap products this is universally desired. Most household soap products are white or nearly white. Whiteness in the public mind is associated with purity. Even where toilet soaps are colored by the use of dyes, good color in the original stock is necessary to avoid muddy colors. The desire for whiteness in household soap products is such that there is always a premium paid for the light-colored soap fats. At times large quantities of hydrogenated fish oil, hydrogenated whale oil, and edible fats, such as lard, find their way into household soaps because of the demand for light-colored finished products.

In the industrial field whiteness is not so important. A large percentage of all industrial soap products are not white but amber in color. Here performance is stressed more strongly than appearance. We have accordingly given light color an "A" rating for all industrial soaps whereas several items in the household list have "B" and "C" ratings because of the higher desirability of light color.

Agreeable Odor. This is a very important item in all soap products. Since most of the inedible fats and oils used in soap have characteristic odors, this means that perfumes and covering odors are rather universally used in soap manufacturing. This is particularly true in respect to household soaps. In the industrial field odor is not quite so important, but in some industrial applications it is very important and covering perfumes are used in many industrial soaps. The public is so accustomed to covering perfumes in soap that a citronella type of perfume is often described by persons smelling it as having a "soap" odor. A wide variety of odorous materials are used in soap manufacturing ranging all the way from expensive floral extracts down to synthetic chemicals, such as methyl salicylate.

Soaps designed for heavy-duty cleaning are reinforced with alkaline builders. In soap products these builders accomplish a double purpose. They aid the product in detergency, and they also permit manufacture at a lower cost due to the fact that usually alkalies cost less than pure soap. This is not entirely true at the present time since a number of alkaline builders actually cost more than soap itself. Proper builder content is of particular importance in granulated packaged soaps, packaged chip soaps, and laundry bars. In the industrial field built soaps are offered particularly to the laundry industry, with the desire of furnishing a single product having the proper content of alkali to assure maximum detergency.

Soap Stability. Resistance to oxidation is a very important item. Upon aging, soaps not properly made or protected by antioxidants tend to deteriorate. White soaps darken and develop off odors. In extreme cases bulk chip soaps have been known to develop heat due to rapid oxidation to the point where they smolder down to a charred mass. These cases are very unusual, and it is much more common to find white soaps that have turned brown or developed spots and colored soaps that have developed uneven coloring due to oxidation. The presence of microscopic metal particles is a problem because such particles often cause the development of brown spots in white soap bars. Copper and bronze parts in conveyors and in soap press dies and throughout the entire factory have been

largely eliminated by most manufacturers to avoid soap discoloration on aging. The use of antioxidants is quite universal, and the addition of small amounts of alkaline builder has also been found effective in preventing oxidation. In bulk soaps the addition of small amounts of builder, the use of antioxidants, and the drying of the product down to a low moisture content all help to prevent deterioration due to oxidation.

Coconut Oil Content. In household soaps the proper amount is a very important item, and we have previously mentioned it in connection with our discussion of lathering properties of soap. Under the heading "Proper coconut oil content" we have marked nearly all of the household soaps with a "C," indicating that the addition of coconut oil is essential in these products. This is because a household user demands a quick and profuse lathering product. Coconut oil and its related oils, palm kernel and babassu, when used in soap in amounts ranging from 10 to 25% of the total fat content, impart increased solubility and increased lathering properties. Coconut oil soap is not a particularly good detergent. Coconut oil soaps are also irritating to the skin of many persons. Coconut oil is usually more costly than tallow, grease, and other inedible fats. For these reasons coconut oil content above 25% is seldom used except in the so-called coconut soap bars, in liquid soaps where coconut type oils are the only oils used, and in the manufacture of white laundry bars, where large amounts of alkaline builder are incorporated. Coconut oil is little used in industrial soaps except in liquid soaps, where sudsing is a prime consideration and concentration as high as 36% actual soap content may be desired. We have previously covered industrial products made for converters which may contain coconut oil.

Adequate Packaging. This is a "must" for practically all soap products. A few yellow laundry bars are still marketed unwrapped, but the majority of soaps are sold in tight wrappers, many of which are of the waterproof waxed paper type. Good packaging of household products serves several purposes. It protects the product in transit. It preserves the original moisture content and perfume content. It helps to prevent contamination of food products which might otherwise take up soap odors. It serves to identify the product on store shelves. It provides a means of offering instructions for use to the consumer.

Proper Packaging of High Moisture Products. Since this is very important, liquid soaps and potash paste soap are usually packed in metal or glass containers, and there is no problem in regard to loss of weight. Other high moisture products such as bar laundry soaps, floating toilet bars, coco bars, and washing powder require special attention. High moisture bar soaps, if not protected from evaporation, lose their shape due to drying on the exposed surfaces at a greater rate than on the covered surfaces. The corner bars in a case of unwrapped high moisture content soap will show extreme warping and distortion after long storage. Self-sealing wax wrappers appear to be the most adequate answer to this problem. In the case of floating bars the newer techniques of production result in lower moisture in final products; however manufacturers seem to be still using waxed wrappers to a large extent even on this type of production.

Coco bars display somewhat less tendency to lose moisture and to warp, probably because they contain a considerable quantity of glycerine which helps to maintain moisture content. Very few coco toilet bars are wax-wrapped although this might be a possible improvement.

Washing powder contains large quantities of water of crystallization which may be partly lost during storage unless packing is adequate. The two common methods of meeting this problem are to use an all-over waxed wrapper on the outside of the carton or to use a carton made from board containing an asphalt lamination. Both methods are effective. It is interesting to note that manufacturing trends are away from high moisture soap products which require special protection.

In addition to the points regarding desirable packaging already covered, it might be well to mention the importance of using packaging materials that are soap-resistant. Modern soap packaging requires careful testing of all paper, box boards, inks, and adhesives to assure resistance to soap alkalinity; resistance to discoloration and fading; and resistance to mold growth. By combining all of the factors mentioned, long shelf life is attained. It is true that soap turnover, particularly of advertised products, is rapid. However there is always the danger of failure to rotate stocks properly, and the smaller retailers in particular may have shelf stock on hand a year or more before it is finally sold. Much progress has been made within the last decade in packaging soaps to assure the desirable factor of long shelf life.

Outage. Vacant space at the top of packages of granulated and chip soaps is undesirable unless kept at a minimum. Large packages which turn out to be only half full when opened make no friends for the manufacturer. Failure to have packages that fit the contents gives consumers the impression of fraud even though the manufacturer may be innocent of fraudulent intent. Soap chip packages are particularly hard to keep full since there is a tendency for chips to break up in handling and in transit so that excessive outage results even if the package was full at time of packing. Control of outage depends on selecting proper size containers, maintaining uniform apparent specific gravity in the products packed, and protection against moisture loss in high moisture products. In addition to these points most manufacturers of packaged granulated soaps and packaged flake soaps pack their products overweight to some extent to guard against underweight packages reaching the consumer.

Kindness to the Human Skin. This is a desirable feature, particularly in household soaps used for bathing or used where it is difficult for the user to avoid long contact with the product. The desire for products that are kind to the skin conflicts to some extent with the desire for quick sudsing, which necessitates use of coconut oil; the desire for pleasant odors, which necessitates the use of perfumes; and the desire for good detergency, which may involve the use of builders. We have accordingly marked the desirability of kindness to the skin with a "B" on most of the household types of soap, realizing that other considerations result in a compromise on this important point. In industrial soaps kindness to skin is not of primary importance. In fact, many industrial soap products are heavily built with active alkalies such as caustic soda, sodium orthosilicate, sodium metasilicate, trisodium phosphate, and others to aid detergency. Most industrial soap products are handled mechanically or

with scoops and do not necessitate personal contact. Liquid soaps, being usually made of straight coconut oil, are not particularly kind to the skin, but here we have a compromise between the desire for high concentration, good clarity, moderate viscosity, and quick sudsing, which puts kindness to the skin in a minor position.

Manufacturing details important in connection with kindness to the skin are proper selection of fats and oils with a minimum of coconut type oil present, low free caustic or free fatty acid content, non-allergic perfumes in low concentration, oleic type oils in some formulations, and super-fatting in some formulations.

Convenient Bar Size. This and convenient bar shape are two important items in connection with bar soaps. Laundry bars are not as critical in regard to size as toilet bars. However a laundry bar should not be too big to be held easily in the hand and not be so small that its life is short and a high percentage of waste rsults. Most laundry bars are between the weights of 8 ounces and 16 ounces. The shape is almost universally rectangular although some bars have an octangular cross-section. The nature of the formula of laundry bars does not allow for too much change in form in the pressing operation. Deformation of laundry bars in pressing may lead to cracked bars or bars which crack in use. Floating bars are manufactured in a variety of sizes, the most popular being the 6-ounce and 10-ounce size. In recent years there has been some acceptance of a smaller floating bar about 3 ounces in weight. Floating bars are also cut in small 1- and 2-ounce sizes for hotel and bath house use. Floating bars are almost universally rectangular in shape since this results in minimum cutting scrap when made by the old-fashioned framing method and also results in lower rework scrap when made by the more modern extrusion process.

Milled toilet bars are made in a variety of shapes and sizes. The most popular weights are the 3- and 4-ounce toilet bar and the 4½- to 6-ounce bath bar. Milled soaps lend themselves well to manufacture into unusual shapes, such as ovals and round bars. Most popular brands however are made in a rectangular form only slightly rounded to facilitate use of high-speed wrapping and packaging machinery. Ovals are also popular, but they involve the use of a carton package in order to ship properly. Milled bars are also made into a large variety of small sizes, ranging from ½-ounce bars up to the toilet size and bath size previously mentioned. Large quantities of miniature size bars are used by the hotel trade.

Industrial bars are made in a wide variety of sizes, most of which are designed to be cut up before use. Many industrial bars are made in 3½- and 4-pound sizes, usually with a cross-section about 2½ by 3 and a length of about 12 to 12½ inches. Soap bars are as old as the soap industry, and bar shape and size have received so much attention that every requirement of size and shape can be met.

Attractive Finish. On household bar soaps appearance is of considerable importance, particularly in respect to floating bars and milled bars. Attractive finish free from dents and blemishes is accomplished by attention throughout the entire manufacturing process. The fats selected must be of such a nature that soap of a firm body results. Equipment through which the bars are handled must be designed to accomplish the operations of cutting, pressing, and wrapping without undue strain on the bar. Conveying equipment must be designed to avoid excessive strain on the bar during handling. In some production lines a drying and cooling period is used between pressing and wrapping to achieve hardness sufficient to stand the mechanical handling of the wrapping machine. Attractive finish is the result of close attention to a multitude of details.

Adequate Body. We have already covered the importance of body in a partial fashion. Adequate body is of considerable importance in the making of laundry bars. Yellow laundry bars containing rosin must be carefully formulated to have adequate body. Usually not more than 40% of rosin is used in the formulation; the balance is a firm fat, such as tallow or firm-bodied grease. White laundry bars are heavily built and require a high percentage of coconut oil in the formula to prevent separation of builder during the framing operation.

Freedom from Cracking. This is an important item in connection with bar soaps of all kinds. Cracks result from a variety of reasons. In framed soaps cracks may develop from the inclusion of niger in the framed soap, the presence of excessive quantities of salt, and excessive deformation of bars during the pressing operation. Milled bars may develop cracks in use due to excessive salt content, too low a temperature in the plodding operation, improperly designed plodding equipment, and others. Elimination of cracks in bar soap is often a very complex problem, and we can only touch on a few of the major reasons in this discussion.

Antiseptic Properties. All soaps have these to the extent that they remove bacteria from surfaces cleaned and, while not rendering the surface sterile, soaps do reduce to a marked extent the number of surface microorganisms. Various additives have been used with soap in an effort to develop true antiseptic properties. In most cases however true antiseptic properties are not attained. Claims of antiseptic properties place the product under the Pure Food and Drug Act, and it is obvious that any such claims must be factual. There is apparently a great deal of public acceptance for soap items having antiseptic and deodorant properties. Within the last few years a large number of products containing hexachlorophene have appeared on the market. This chemical is stated to inhibit bacterial growth and odors due to bacterial growth. It appears likely that soaps of this kind are still in their infancy as far as public acceptance is concerned.

Washstand Life. Some soapers have featured their oval bar shape in advertising, claiming longer life due to the fact that only a small point of contact is made by the bar in a wet soap dish.

Apparent Specific Gravity. It is important in a number of products, including floating bars, granulated packaged soaps, packaged chips, fine fabric flakes and powder, and packaged washing powder. To a lesser extent it is important in industrial granulated and chip soaps and in bulk washing powders. Apparent specific gravity of floating soaps must, of course, be less than 1.0 in order that the product may float. The only commonly used method of achieving the floating property is to whip air into the soap while it is in a molten condition. Inert gases, such as nitrogen, may also be used but, as far as we know, are not used to any extent at this time. The size of the air bubbles is important, and, in general, very minute air bubbles are preferred. The use of chilling machines, such as

Desirability Key

A—Desirable
B—Important
C—Absolutely Essential

PERFORMANCE DESIDERATA

Household Soaps

	Ldry. Bars	Floating Bars	Milled Bars	Coco. Bars	Gran. Pkgs.	Chips Pkgs.	Fine Fab. Fla. and Pwdr.	Liq.	Paste	Pkg. Wash. Pwdr.
Good Detergency	A	A	A	A	B	B	A	A	A	A
Quick Solubility	A	A	B	A	B	B	C		A	A
Plentiful Lather	B	C	C	C	B	B	C	C	A	
Light Color	A	C	C	C	B	B	C	A	A	A
Agreeable Odor	B	C	C	C	B	B	C	B	B	A
Proper Builder Content	A				B	B				B
Good Stability	B	C	C	C	B	B	C	A	A	A
Proper Coco Oil Content		C	C	C	C	C	C	C		
Adequate Packaging	A	C	C	C	C	C	C	B	B	C
Negligible Loss of Weight	B	B	B	B	B	B	B			C
Long Shelf Life	A	C	C	C	C	C	C	C	A	C
Minimum Outage					C	C	C			C
Kindness to Skin	A	C	C	A	B	B	C	A	A	A
Convenient Bar Size	B	B	C	B						
Convenient Bar Shape	B	B	C	B						
Attractive Finish	A	C	C	B						
Adequate Body	B	B	C	B						
Freedom from Cracking	C	C	C	C						
Antiseptic Property [a]			C					C		
Deodorant Property [a]			C					C		
Washstand Life	A	C	C	B						
Desirable App. Sp. Gr.		C			C	C	C			B
Desirable Particle Size					C		C			B
Freedom from Dust					C	C	C			A
Minimum Chip Thickness						B	C			
Satisfactory Chip Shape						B	C			
Good Clarity								C	A	
Satisfactory Viscosity								C		

Industrial Soaps

	Bars	Solid	Neut. Granulated	Neut. Chips	Liq.	Paste	Built Gran. or Chips	Bulk Washing Pwdr.
Good Detergency	C	C	C	C	A	A	C	A
Quick Solubility	A	A	B	B		A	B	A
Plentiful Lather	A	A	B	B	C	A	B	
Light Color	A	A	A	A	A	A	A	A
Agreeable Odor	B	B	B	B	B	B	B	A
Proper Builder Content	A	A					C	B
Good Stability	B	B	C	C	A	A	C	A
Proper Coco Oil Content					C			
Adequate Packaging	B	B	B	B	B	B	B	C
Negligible Loss of Weight	B	B	A	A			A	C
Long Shelf Life								
Minimum Outage								
Kindness to Skin	A	A	A	A	A	A	A	A
Convenient Bar Size	A							
Convenient Bar Shape	A							
Attractive Finish	A							
Adequate Body	B							
Freedom from Cracking	C	A						
Antiseptic Property [a]					C			
Deodorant Property [a]					C			
Washstand Life								
Desirable App. Sp. Gr.			A	A			A	B
Desirable Particle Size			C				C	B
Freedom from Dust			B	B			B	A
Minimum Chip Thickness				B			A	
Satisfactory Chip Shape				A			A	
Good Clarity					C	A		
Satisfactory Viscosity					C			

[a] When claimed by the manufacturer.

the Votator, enables finer dispersion of air than does the old-fashioned crutcher method of aeration. When air bubbles are smaller, the apparent whiteness of the bar is improved. Extension of the floating property to laundry soaps and also to milled bar soaps has been attempted by some of the smaller manufacturers, apparently with little consumer acceptance.

Apparent specific gravity in granulated soaps is controllable in the spray-drying process. The type of spraying device and the temperature of the air into which the soap is sprayed are important. Spray drying enables the production of soaps with a wide range of density. Extremely light products however are not desirable since the appearance of fraud results when a relatively large package of product has very little weight. In the early days of spray drying one or two products were produced with a very low apparent specific gravity, and after a few months it was found necessary to discontinue the manufacture of these products and to bring out more dense products under different brands because of adverse public reaction.

Control of apparent specific gravity permits the filling of soap packages to capacity without excessive outage and, for this reason, is of great importance in connection with granulated packaged soap and packaged washing powder. Packaged chips usually have to be pressed into a carton except when the chips are milled and cut into regular shapes. Milled soap flakes in diamond shape have been controlled as to density to some extent by putting a slight curl on each individual flake.

Industrial soap is less critical in regard to control of specific gravity. In general, bulk granulated soaps are more dense than packaged granulated soaps.

Over a period of years there has been a tendency for the various manufacturers to bring the apparent spe-

cific gravity of granulated packaged soaps, packaged chips, and packaged fine fabric chips and granules to approximately uniform density in each class. The usual range in weight per cubic foot of the various products is about as follows:

Packaged Granulated Soaps	18-22 pounds
Packaged Soap Chips	13-15 pounds
Packaged Fine Fabric Flakes and Granules	12-14 pounds
Industrial Powdered Soap	28-35 pounds
Industrial Soap Chips	24-31 pounds

Particle Size. The largest single type of soap marketed in the United States is the packaged, granulated soap. Manufacturers in this field have put much effort on getting proper particle size, not only with the objective of controlling density and solubility, but from the standpoint of making a dust-free product or the so-called "no-sneeze" product.

Elimination of Dust. This is at least partly attained by air separation and elimination of extremely fine particles, controlling all spraying and drying conditions, use of small amounts of soluble oils to agglomerate fine particles or to give elasticity to larger particles, selective screening, and special formulation in regard to types and amounts of fats, oils, and builders. In spite of all the work that has been done on this problem there will be some dust in most packaged granulated soaps due to the wearing down of particles in packaging, shipping, and marketing of these products. However much progress has been made.

Packaged soap chips are no longer as popular as they were several years ago. The trend away from soap chips and to powdered or granulated products has been fostered and promoted by the soap industry. Soap chips do not lend themselves well to handling through hoppers and filling machines at any rate of speed. Therefore promotion has been along the lines of pushing granulated products at the expense of soap chips or soap flakes.

Chip Thickness. Surviving brands of household soap chips are of two types, ordinary dryer chips, which are packaged in the same condition in which they come from a dryer, and milled soap chips, which are polished by milling through roller mills. In both cases much attention is paid to the thickness of the chip, and milled chips are often cut into regular shapes, such as diamonds. In both cases the chips are thin to aid solubility.

Liquid soaps are not a large tonnage item for the soap industry, but there is a fairly constant demand for this type of soap. Liquid soaps are usually made from coconut and coconut type of oils although a small percentage of the production may be made from vegetable oil fatty acids, other than the coconut type, or from red oil. Coconut oil potash formulations have the advantage of high solubility in water, which allows the production of finished liquid products containing as high as 40% total solids. Vegetable oils such as soya bean oil, corn oil, and peanut oil make potash soaps which are less soluble than the soaps of coconut oil. Therefore such potash liquid soaps are limited in concentration to approximately 20% solids.

Clarity. Users of liquid soaps favor products of good clarity, and clarity is achieved by chilling and filtering these products. Some manufacturers also use what are called chelating materials as an aid in maintaining clarity.

Liquid soaps for shampoo purposes are often packaged in glass containers, and the type of glass in such containers is of great importance due to the fact that liquid soaps will attack soft glass, resulting in an accumulation of insoluble silicate in the product after long standing. Hard glass containers are therefore indicated.

Viscosity. Most liquid products sold for shampooing or dispenser use are required in rather low viscosities. However a few products, such as liquid scrub soaps, find better acceptance in the form of clear, but rather thick solutions. Additional viscosity is achieved in some products by the use of a percentage of rosin or refined tall oil potash soap in the product or by the addition of alkaline builders, such as trisodium phosphate in limited amounts.

Resistance to Hard Water. An item in performance of interest to a segment of the soap consuming public is resistance to water hardness. Resistance to hard water is required by soap users who have to use sea water or extremely hard water in limestone areas. The original salt water soap was a straight coconut oil bar soap, and this type of product still finds favor in salt water and hard water areas. Resistance to hardness is also important in various soaps which are not particularly designated as hard water soaps. Complex phosphates, such as tetrasodium pyrophosphate and the various polyphosphates, are used to some extent in granulated packaged soap, also industrial soaps. Users however are showing a definite trend toward the use of synthetic detergents instead of soap where there is a severe hard water condition.

Convenience. We have not mentioned the desirable chraacteristic of convenience in our discussion up till now. In the final analysis convenience in use is a major requirement of all soap users. People will use a product which they consider the most effective, providing that the product is also convenient. Lack of convenience can lead to the discarding of a product just as lack of efficiency does. The subject of convenience is such a broad one that we will not attempt to elaborate on it in this short discussion. It is enough to say that a soap product to receive acceptance must be convenient to manufacture, distribute, store, and use.

Cost. Last, but by no means least, we have the desirable item of low cost. This requirement is well met by the soap industry. Young men in the soap business can be proud to be associated with an industry which turns out products so essential to the health, comfort, and high living standard of the American people, and turns them out at ever lower costs and ever improved quality. The people of the United States are the largest per capita users of soap in the world, and their cost is the lowest in the world. The trend line representing soap and detergent consumption per capita is still upward and will continue upward as long as we keep quality desirable and price low.