

by Scott Chaplin

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Although the use of refillable bottles has declined over the last 30 years, environmental and economic concerns are leading to their growing use.

Refillable containers are an ancient tradition. Aztecs, Mayans and other native Americans were using refillable clay containers centuries before other settlers set foot on the continent. Abigail Adams, Benjamin Franklin, Harriet Tubman and Thomas Jefferson all lived in times when nearly all bottles were washed and reused.

Although there is a general perception that the use of refillable bottles has declined everywhere, this trend is not universal. Recent concern about the environment, coupled with favorable economics has led to an increase in the use of refillables in some areas.

Thirty years of change

To understand the environmental and economic effects of using refillable glass bottles, one must first assess how many times — or trips — a bottle goes from the bottler to the customer and back.

The number of times a bottle is refilled is known as "trippage." According to Douglas Dichting, manager of Coca-Cola's recycling planning and programs, in the 1950s refillable Coke bottles averaged 50 trippages; today the average for Coke bottles has fallen to 8.5 (1). Pepsi-Cola reports current trippage rates between 5 and 20 in various locations in Canada.

The decline in trippage rates parallels the decline in the refillable glass bottle's share of the container market. Dichting identified the cause of the decline to changing consumer lifestyles that demanded more "convenient" packaging, but small soft drink bottling companies claim the move to one-way containers was part of a concerted effort by larger bottling companies to dominate the market. While the advent of the "throwaway society" in the 1950s certainly hastened the demise of refillables, the effect of increasing market consolidation by large bottlers on the decline of refillables is less clear.

From 1950 to 1973, the number of soft drink bottling plants in the United States decreased by 60 percent while sales in the industry increased by 276 percent. During this period, many small bottlers were bought out, merged or folded as the 20 largest bottlers increased their market share from 20 to 32 percent (2). As a bottling company expanded its market share by increasing the geographic range of its distribution network, the convenience of one-way containers became more attractive. For large bottlers to compete in local markets where refillables had a cost advantage over throwaway bottles, small bottlers needed to be removed as a competitive force for the most costly economics of convenience to succeed.

Statistics on trippage rates are hard to come by; no government agency or trade association in the United States monitors them. In personal conversations, some soft drink bottlers reported that they refill their bottles five to six times per year; the average, however, is probably lower. While one Michigan Coca-Cola bottler reported that between 98 and 99 percent of his company's refillable bottles were returned for refilling, a Texas Coca-Cola bottler reported a return rate of only 66 percent.

The higher rate of return in Michigan is due to the well-developed bottle return infrastructure that exists in the state. A deposit, placed on all brands of beer and soft drinks that are sold in containers, is redeemable at any store where the brand is sold. The containers that are collected are sorted at the store by brand and type.

In Michigan, Pennsylvania and other states where refillable bottles constitute a significant portion of the bottles sold, it is not uncommon to find a bottle on a grocery store shelf that was manufactured in the early 1970s. One Pennsylvania soft drink bottler used bottles that were manufactured, on average, in the mid-1960s and some that were manufactured as far back as 1926.



1

Environmental effects

Refillable bottles affect the environment less than one-way containers, but only if

they are actually refilled. The major studies on the effects of containers indicate that refillable glass bottles for beer



2

and soft drinks have the lowest impact on the environment when trippage rates are above six to 10 (3).

It is generally agreed that the most energy efficient and environmentally friendly containers are refillable glass bottles for single-serving ($\frac{1}{2}$ -liter or less) beer and soft drink containers (3). While larger beverage containers, such as half-gallon



Pennsylvania bottler Peter Chokola sells soft drinks in bottles that are over 18 years old (1). Major brands of beer and soft drinks are still available in refillables in the U.S. (2 and 3).

they are refilled. According to E. Gifford Stack of the National Soft Drink Association, refillable glass bottles are absolutely safe and sanitary.

Economics

At the retail level, beverages are generally less expensive in a refillable container than in the same one-way container. Preliminary results from a price survey being conducted by the United States Public Interest Research Group indicates that most brands of beer and soft drinks are 20 to 40 percent cheaper when purchased in a refillable container than the same beverage in the same size one-way container (sale prices excluded).

Colleen Newell, a representative of the

and gallon sizes, are available in both refillable glass and refillable plastic, only glass is used for single-serving refillable containers in the United States.

A 1989 study by Franklin Associates compared 16-ounce (almost 1/2-liter) refillable glass bottles with 16-ounce polyethylene terephthalate (PET) plastic bottles, 12-ounce aluminum cans and several other sizes of one-way glass and PET containers, including three-liter PET bottles. The Franklin study showed that at current recycling rates, a 16-ounce refillable glass bottle refilled eight times has the lowest atmospheric emissions and water wastes impact of any of the alternatives, including three-liter PET bottles. In addition, the study showed that even if nonrefillable containers were made from 100 percent recycled materials, and if refillables were used 20 times, refillables would still have the lowest impact for these types of emissions.

In terms of solid waste, refillables are one of the lowest waste generators. At today's recycling rates, according to the Franklin study, a 16-ounce glass bottle refilled eight times generates far less solid waste than other single-serving containers, with the exception of 12-ounce aluminum cans. Most of the solid waste calculated for the refillable bottles was due to unrecycled broken or discarded bottles, although caps, carriers, pallets and minor wastes were also taken into account (4).

Refillable bottles pose no health threats to consumers. Bottle washing plants in the United States use high technology optical and aromatic contamination detectors to ensure that bottles are free of substances. Bottles are washed and rinsed several times at high temperatures before

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Ontario Soft Drink Association and an employee of Pepsi-Cola in Canada, recently stated that one of the main selling points of soft drinks sold in refillables was the 30 percent cost savings to consumers. In 1989, both Coca-Cola and Pepsi-Cola conducted studies in Canada that compared the consumer price for their product sold in refillables compared to non-refillables. In both studies, 16 ounces of beverage averaged approximately 45 cents in nonrefillables and 30 cents in refillables (in Canadian funds).

A comparison of milk sold in refillable and nonrefillable plastic containers showed a cost advantage of 10 cents per gallon for refillables. This savings was reported by the Stuart's chain of convenience stores in New York with a Lexan (an engineered plastic) jug, and also by the Schroeder Dairy in Minnesota with a high density polyethylene container. Furthermore, orange juice is available for \$1.29 per quart and soft drinks for \$0.50 per quart delivered in refillable glass bottles in Pennsylvania.

A general rule of thumb in the beer and soft drink industry is that the contents of a single-serving one-way container cost

approximately half as much as the container itself. The cost of containers varies widely, depending on the quantity ordered, delivery distances and other factors. A brief survey of several suppliers showed that 12-ounce aluminum cans cost approximately 8.0 to 8.5 cents each, 12-ounce bi-metal cans cost 7.5 to 8.0 cents per can, 16-ounce PET bottles cost 7.5 to 8.0 cents each, one-way 16-ounce glass bottles cost 9.0 to 13.8 cents, and refillable 16-ounce glass bottles cost approximately 20 to 30 cents each.

Many bottlers prefer customized refillables. Small bottlers that market their own brand of beverages often find the cost of customized bottles prohibitive due to poor economies of scale. Bottle manufacturers are reluctant to change bottle molds and composition formulas for small orders. Refillable glass bottles, whether customized or standard bottle type, are more expensive than one-way bottles because they are thicker and heavier to prevent breakage.

The cost of a single serving of a beverage has little to do with the popularity of its container type; convenience plays a far greater role in most consumers' minds

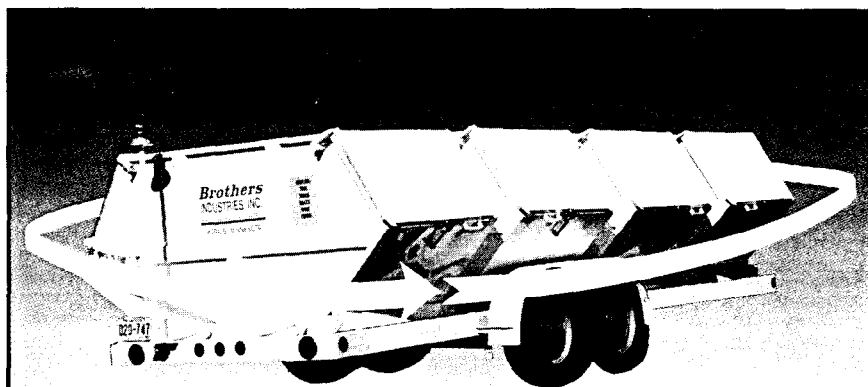
when they shop. Aluminum cans, which are often the most expensive beer and soft drink containers, are also the most popular in the United States. For example, aluminum cans captured about half of the beer market in 1989 (see Table 1).

In addition to the lower cost to the consumer over the life of the container, the use of refillable glass bottles yields other economic benefits. Refillable bottle sys-

Table 1 — Estimated draught and container share by state, 1989 (in percent)

State	Metal cans	One-way bottles	Refillable bottles	Draught
Alabama	85	11	1	3
Alaska	61	32	1	6
Arizona	60	27	4	9
Arkansas	79	15	2	4
California	53	35	4	8
Colorado	53	25	6	16
Connecticut	56	15	15	14
Delaware	76	6	6	12
D.C.	55	34	1	10
Florida	68	22	1	9
Georgia	72	22	1	5
Hawaii	63	31	1	5
Idaho	62	16	6	16
Illinois	57	26	2	15
Indiana	72	12	7	9
Iowa	54	11	11	24
Kansas	69	14	3	14
Kentucky	73	17	4	6
Louisiana	72	21	1	6
Maine	56	18	19	7
Maryland	58	29	2	11
Massachusetts	49	17	23	11
Michigan	50	24	14	12
Minnesota	54	19	10	17
Mississippi	75	22	1	2
Missouri	67	19	3	11
Montana	68	15	4	13
Nebraska	64	17	4	15
Nevada	48	40	2	10
New Hampshire	63	29	2	6
New Jersey	45	37	6	12
New Mexico	72	20	1	7
New York	40	35	12	13
North Carolina	67	28	1	4
North Dakota	74	15	2	9
Ohio	57	28	5	10
Oklahoma	72	15	4	9
Oregon	52	22	7	19
Pennsylvania	40	26	12	22
Rhode Island	48	36	4	12
South Carolina	72	22	2	4
South Dakota	72	14	3	11
Tennessee	62	33	1	4
Texas	70	22	2	11
Utah	65	22	2	11
Vermont	50	16	25	19
Virginia	65	25	2	11
Washington	50	27	4	11
West Virginia	72	18	1	11
Wisconsin	53	14	7	11
Wyoming	61	27	1	11

Source: Beer Institute, 1990.



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tems strengthen local economies. Generally speaking, most refillable bottlers are located near their distribution areas, thus adding to the number of local jobs. Also, more labor is required at a plant that washes and refills containers than at a plant that uses only one-way containers.

Experience elsewhere

In most other countries, refillable containers for beer and soft drinks are still the norm.

The United States is surrounded by refillables. Disposable glass beer bottles are not available in Canada, where refillables accounted for 73.5 percent of the beer container market in 1989 (5). According to the Brewers Association of Canada, 97.3 percent of the beer bottles used in Canada are returned for refilling. On Prince Edward Island, all packaged beer has been sold in refillable bottles since the mid-1970s, all packaged soft drinks since 1984, and all wine coolers since 1989.

In Ontario, legislation has been in effect

since 1985 that mandates the use of refillable bottles for at least 30 percent of the beer and soft drink container mix. The recently elected provincial government for Ontario, the New Democratic Party, rode to victory on a platform that incorporated several green initiatives, including a call for a return to the use of refillable bottles for all soft drinks, beer, ales, wine coolers and Ontario-produced wine and liquor sold in the province.

In Mexico, refillables account for over 80 percent of the beer container market and over 70 percent of the soft drink container market (6).

Other countries use refillables extensively. In 1978, 94 percent of the packaged beer and 88 percent of the soft drinks in West Germany were sold in refillable containers. While these percentages fell during the '80s, new efforts are being made to reverse the decline. The West German government has set a 1991 goal of 90 percent refillable containers for beer and mineral waters, 80 percent for carbonated beverages, 35 percent for fruit drinks, and 50 percent for wine (7).

Danish officials estimate that 99 percent of their country's beer and soft drink bottles are collected and refilled (8). In the Netherlands, refillable bottles represent 90 percent of the beer market, 45 percent of the soft drink market and 30 percent of the milk market (9).

In Japan, 1.8-liter refillable bottles are still the most popular containers for soy sauce and sake. A deposit makes these bottles a valuable commodity for recycling processors, although the use of plastic bottles is beginning to dampen demand. A new "Ecomark" rating system that is being placed on environmentally friendly products is expected to increase the use of refillables (10).

The reliance on refillables worldwide isn't limited to just beer and soft drink containers. In India, ballpoint pens and cigarette lighters are refilled as well as beverage bottles. In Central America, motor oil is often sold in refillable glass bottles; automobile battery cases are refilled with fresh lead and acid; and cooking oil and home care products are available in refilled glass bottles. In Argentina, wine

and other beverages are delivered to the door in refillable bottles.

Prospects for the U.S.

While there has been a general trend away from refillable containers in many states, refillable bottles still share a significant portion of the market in others. In 1989, it was estimated that refillable containers comprised over 10 percent of the volume of beer sold in non-draught containers in Iowa, Minnesota and New York; over 15 percent in Michigan and Pennsylvania; and over 25 percent in Massachusetts and Vermont (see Table 1). Sales of new refillable glass milk bottles increased 25 percent in 1990 over the 1989 level (11).

Refillables' share of the beer market actually increased in 11 states between 1982 and 1989. In Massachusetts and Vermont, refillables' share of the beer market increased by over 100 percent from 1982 to 1989. In states where there was a significant drop in the use of refillables in this time period, there was a dramatic increase in the use of cans, as well as a decrease in the volume of draught beer sold, suggesting that refillables are losing their market share to

cans rather than to changes in consumption of draught beer.

Overall in the United States, refillables' share of the beer container market has fallen from nearly 100 percent during World War II to approximately 5 percent today (12). Likewise, refillables' share of the soft drink market has fallen to 8.7 percent (13).

The actual number of bottles refilled has not decreased nearly as rapidly as the market share of refillables has dropped. While refillables' share in the soft drink market dropped over 85 percent, the actual number of bottles refilled annually has fallen less than 70 percent since 1947 (14). This is due in part to increased population and increased per capita consumption of packaged beverages. Per capita consumption of soft drinks has more than quadrupled since 1945 (15).

All major brands of beer and soft drinks are still available in refillables in the United States, including Coca-Cola, Pepsi-Cola, Budweiser, Coors and many others. Anheuser-Busch, which holds over 40 percent of the U.S. beer market, still refills bottles at 11 of its 12 U.S. breweries. Representatives of Coca-Cola, Pepsi-Cola and Anheuser-Busch maintain they will

continue to sell beverages in refillable bottles as long as there is consumer demand.

Many firms are using refillables:

- The Stuart's chain of 172 convenience stores in New York sells approximately 10,000 cases per week of soft drinks in refillable bottles, as well as a large volume of milk in one- and two-quart refillable bottles. Company president Bill Dake estimates that each of its soda bottles is refilled three times, each of their one-quart milk bottles is refilled 20 times, and each of their two-quart milk bottles is refilled 50 times.
- General Electric, which manufactures the Lexan resin used in the milk jugs sold by Stuart's, is planning to set up pilot projects in the Northeast over the next six to 12 months. Lexan bottles, which were first used in 1971, are now being used by 30 dairies in North America. According to a company spokesperson, the bottles are washed at high temperatures, using the same equipment that is used to wash glass bottles, and can be refilled 50 to 100 times.
- The St. Julian Winery in Michigan began washing refillable wine bottles in 1987 for its own wine production as

well as for other wineries. Company representative Chaz Catherman acknowledges that with the difficulty it now has in getting a high return rate for these bottles, the firm's refilling operations save only 10 to 20 cents per box of wine. One reason for the low return rate is the lack of infrastructure for bottle return, since there is no deposit on wine bottles in Michigan. Although St. Julian pays consumers five to 10 cents per wine bottle at nine retail outlets in Michigan, for many consumers the system is too inconvenient.

■ Encore of Richmond, California has washed and reused wine bottles for 15 years. The business, which grossed over \$3 million dollars in 1989, delivers approximately 9.3 million refillable wine bottles to over 300 wineries in California (16).

■ Beginning in April 1990, the Rainier Brewing Company of Seattle, Washington switched its entire line of bottles to refillables. Company president Bruce Vaughan estimates that if all its bottles are returned, two million cubic feet of trash will be kept out of landfills and off highways. Rainier was joined in the switch to refillables by its sister brewery, Blitz-Weinhard, in Portland, Oregon (17). Both breweries are owned by the G. Heileman Brewing Company of La Crosse, Wisconsin and sell beer in 12 Western states. To date, company officials estimate the breweries are receiving 78 percent of their bottles back from deposit law states and 24 percent back from non-deposit states.

■ Anheuser-Busch updated bottle washing equipment during a multi-million dollar renovation of its bottling plant in Newark, New Jersey, where over 100 million bottles are refilled annually.

■ Schroeder's Dairy of St. Paul, Minnesota reports that sales of milk in refillable containers have increased by over 400 percent in the last two years and now account for over 30 percent of its milk sales.

■ Other dairies across the U.S. are reporting increased sales of milk in refillables, including Welsh Farms, Inc., of Long Valley, New Jersey; Quality Creamery of Grand Rapids, Michigan; and Oberwies Dairy of Aurora, Illinois.

■ Other products are becoming available in refillable containers. The use of refillable five-gallon containers for spring water has dramatically increased across the nation. In California, tofu is available in refilled buckets; in Michigan, jams and jellies are available in

refilled glass jars. Across the nation, many cooperative markets sell shampoo and other health care and food products in bulk and provide refillable containers for customers. These markets also encourage customers to bring their own containers to be refilled.

A return to a refillable system is one of the first steps that our country can take in its transformation from a "disposable society" to a society with an environmentally sound economy. Container manufac-

turers need to realize that their business is delivering beverages, not producing containers. While a transformation to fillables would entail significant increases initially in glass bottle production, in the long run, production of glass bottles would probably drop to 50 to 75 percent of today's levels. In 10 to 15 years, we may see the conversion of bottle manufacturing plants to bottle washing plants.

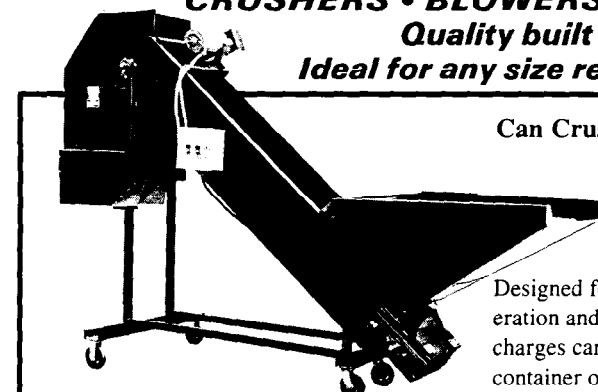
Ultimately, the use of refillables in the United States will not depend on the co-

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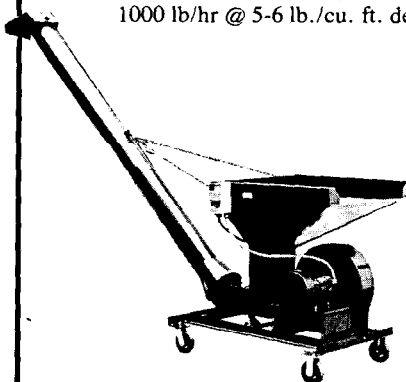


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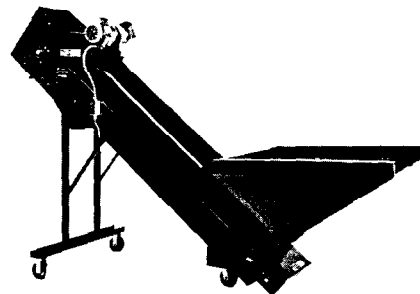
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per container, but on consumer preference. Consumer awareness of the ecological soundness of refillable containers will determine the future of refillable bottles in this country. **RR**

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