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Trends in solid-waste management and the implications for the aluminum beverage can

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**TRENDS IN SOLID-WASTE MANAGEMENT AND THE IMPLICATIONS FOR
THE ALUMINUM BEVERAGE CAN**

An independent research project
submitted in partial fulfillment of
the requirements for the MBA degree

by

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INTRODUCTION

The aluminum beverage can market is extremely important for Reynolds Metals Company and other aluminum producers being the single largest end-use market for aluminum in the United States. Shipments of 77.9 billion cans in 1988 accounted for 96% of total beverage can shipments, equivalent to 3.6 billion pounds of input canstock or 21% of the estimated 16.9 billion pounds of U.S. aluminum industry shipments. It is also one of the few aluminum markets that has exhibited consistent growth this decade, with canstock shipments increasing 4.6%/yr. versus 1.8% for all other products. Its success can largely be linked to its recyclability and high scrap value. Despite this advantage, however, its recycling rate has stalled in the range of 50 - 55% during the 1980's, making it a continuing target for environmentalists (Can Manufacturers Institute, Aluminum Association, 1989).

State legislation targeted at used beverage containers (UBC's) as a means to control litter and encourage recycling has been proliferating since the 1970's. While the degree of control varies, there is hardly a state today without some sort of restrictive beverage container law. Provisions range from simple bans on detachable pull tabs to complex mandatory deposit and recycling legislation. Container manufacturers, bottlers, and brewers have long argued that mandatory deposit laws do not appreciably reduce litter and are far more costly than voluntary recycling, and result in increased beverage prices and consequent declines in demand, tax revenue, and employment.

In the late 1980's, however, a much broader issue has emerged. Many states with large urban populations will experience a solid waste disposal crisis within the next decade. Although voluntary efforts and mandatory legislation have removed a portion of aluminum, glass and plastic from the waste stream, a substantial volume still finds its way to landfills. Given the immediate need to reduce the volume of material sent to landfills, legislative

activity is intensifying to force waste reduction partially through packaging material recycling and reuse

Reynolds has continually sided with the industry in opposing mandatory deposit legislation. Recent industry trends, including higher aluminum prices and competitive threats from steel and plastics, coupled with promotion of curbside recycling laws by the glass and plastics industries, have suggested the company might wish to reevaluate its position due to the importance of the aluminum beverage can to both the industry and the company.

This study will examine current trends in solid waste legislation to determine the likely forms of such laws and their implications for the aluminum beverage container.

BACKGROUND

The controversy surrounding disposable beverage containers began in the 1960's as consumers began widespread adoption of convenience packaging (Sjolander and Chen, 1989). "Down with the throwaway society ... that was the rallying cry of environmental crusaders in the 1960's" (Nation's Business, 1980).

The two principle users of beverage containers in the U.S. are the soft drink industry and brewers. In 1960, 95% of soft drinks and 50% of beer consumed in the U.S. were packaged in refillable bottles. Manufacturers, distributors, retailers, and consumers were accustomed to this system, with the end result being bottles were used 10 to 30 times with an average life of five years. The introduction of non-returnable containers altered the supply/demand system and helped foster a revolution in the two industries (Moore and Scott, 1983).

The increase in consumption of beverage containers far outpaced that of beverages themselves. For example, in 1959, 15.4 billion beverage containers were consumed. By 1972, although per capita consumption of beverages increased 33%, beverage container consumption increased 221% to 55.2 billion (Congressional Digest, 1978). By 1975, Americans used about 65 billion throwaway beverage containers, of which 67% of soft drink and 79% of beer were non-returnable, up considerably from 5% and 50% in 1960. Of these 65 billion units, more than 4 billion containers and 3 billion detachable pull tabs ended up as roadside litter. It was projected that by 1980, volumes for containers and litter would reach 90 billion and 5 billion respectively. At the same time, the EPA estimated that beverage containers comprised 20-30% by piece count, or 40-60% by volume, of all litter (Moore and Scott, 1983).

Not surprisingly, initial legislative proposals were directed primarily at reducing roadside litter, with reduction of raw material and energy consumption cited as secondary benefits. Environmentalists' chief weapon consisted of "bottle bills" - laws that required deposits on beverage containers to encourage their return and ultimately, it was hoped, a demand shift back to refillable containers.

The bottle bill bandwagon started rolling during the early 1970's with Oregon enacting its pioneering five-cent deposit in 1971. But by 1979, only six States had mandatory deposit laws, nine had some form of litter control or recycling statute, and 32 had rejected container deposit legislation. Such limited adoption was due largely to successful container and beverage industry campaigns showing the costly side effects and through promotion of alternative approaches, such as voluntary recycling and the Keep America Beautiful campaign aimed at making litter socially unacceptable (Nation's Business, 1980).

By the early 1980's, over 2,200 pieces of container legislation had been introduced at various state and local levels. Additionally, there had been several unsuccessful attempts to introduce a nationwide bill (Moore and Scott, 1983).

By 1981, the aluminum industry had mounted successful voluntary recycling campaigns which achieved a recycling rate in excess of 50% representing 25 billion beverage containers. Aluminum's success helped deter the spread of deposit laws so that by 1983 only three additional states had adopted container laws. The nine states with laws -- Oregon, Vermont, Maine, Michigan, Connecticut, Delaware, Massachusetts, Iowa, and New York -- represented 19% of the nation's population (Moore and Scott, 1984). "Apparently, voluntary recycling efforts on the part of consumers and industry have quelled the cries of local and national lawmakers

for mandatory deposit legislation. Not since 1983 has a state taken the plunge, and more significantly, one state which had enacted forced deposits - Connecticut - last year initiated a mandatory recycling act...." (Davis, 1988).

"Recycling in the U.S. is at an all-time high, and the beverage and packaging industries appear to be leading the charge through aggressive and more focused programs..." (Davis, 1988). Primary packaging materials for beverages are being recycled with varying degrees of success. Estimated recycling rates for 1987 were 55% for aluminum, 10-15% for glass, 3-5% for steel, and 20% for PET (plastic), although the recycled PET came almost exclusively from deposit states (Davis, 1988).

Despite these successes and increased awareness, a new deposit bill was recently introduced at the federal level, in part prompted by the ever expanding beverage container business which by 1987 amounted to over 100 billion containers, of which only about 12% were refillable. However, facing the U.S. today is an environmental issue much more pressing than litter.

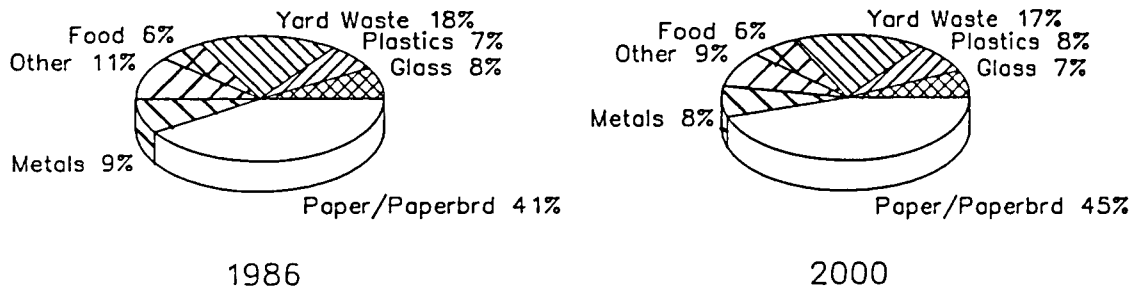
SOLID WASTE CRISIS

The major problem today is not litter, but "garbage, and the ecological buzzword of the late '80's is MSW -- municipal solid waste" (Mahar, 1987).

The U.S. is running out of places to put its garbage. Americans generate more and more municipal solid waste each year, 16% more than 10 years ago, and 80% more than in 1960. This amounts to a per capita average of 3.5 pounds per day or a grand total of 160 million tons per year. Only about 10% is recycled, compared to 50% in Japan and several European nations (Donahue, 1988). Roughly 80% of the 160 million tons still goes to landfills, but there are a rapidly declining number of landfills to absorb it. In the past ten years, the U.S. has lost more than 70% of its landfill sites. Some 14,000 have closed, and only about 5,500 remain of which 2,275 are expected to close in the next five years. The nation's annual MSW could produce a seven inch layer over the 43,600 miles of interstate highway or fill the Superdome every other day (Kirkpatrick, 1988). While recycling fiddles, landfill dumping is growing. Many dumps operate under special dispensation, such as Fresh Kills, New York, which at 500 feet by the turn of the century is expected to be the highest point on the Eastern Seaboard south of Maine (Cook, 1988). Incineration, which now combusts 10-12% of MSW, has not been the answer, and efforts to establish new incinerators and landfills have run up against a tough opposition mind-set known as NIMBY - Not In My Back Yard (Rice, 1988). Unless a more concerted effort at recycling and incineration is undertaken, it is projected by the Year 2000 that landfills will still be taking 70% of the total U.S. waste of almost 200 million tons (Cook, 1988).

The bulk of the solid-waste problem does not arise from disposing of beverage containers, however, as shown in Figure I. Over 41% of MSW consists of paper and paperboard, followed by 18% for yard wastes. (McEntee, 1989).

Figure 1
MATERIALS IN MUNICIPAL SOLID WASTE
 Percent by Weight



Source: Franklin Associates 1988

An updated study by Franklin Associates in 1989, summarized in Table I, shows that by volume (which is what really counts in landfills) paper and paperboard remain the major contributors, while plastics and metals are more of a factor and glass less of a factor. The study also found packaging represents 34% of total MSW volume, with metal accounting for about 5% of the total or 15% of packaging.

Table I

Total MSW - 1986

<u>Material</u>	<u>By Weight</u>	<u>By Volume</u>
Plastics	7%	18%
Paper/Paperboard	36	38
Metal	9	14
Glass	8	2
Other	40	28

As seen in the Table II, the bulk of beverage containers (by weight) entering the waste stream are glass, which has the lowest recycling rate.

Table II

Beverage Containers to MSW - 1987

	<u># Mfgd. (Bil.)</u>	<u>Estm. # Recycled (Bil.)</u>	<u>Estm. Tons Recycled (000's)</u>	<u>Estm. Tons to Waste Stream (000's)</u>	<u>% of MSW By Weight</u>
Cans	76	38	791	791	0.5%
Glass	20	3	900	5,940	3.7
PET (Plastic)	<u>6</u>	<u>1</u>	<u>71</u>	<u>357</u>	<u>0.2</u>
Total	102	42	1,762	7,088	4.4%

(DeWoolfson, 1987)

However, translated to a volume basis using factors in the updated Franklin Study, the contributions of beverage containers to total MSW are about equal with aluminum at 0.8%, glass 0.7%, and PET 0.5%. This suggests that on a volume basis the total impact of beverage containers on the MSW stream is less than that measured on a weight basis.

Despite the progress made in recycling, beverage containers by weight still comprise about 4.5% of total MSW, only slightly lower than the 6% in the 1970's (when other containers such as wine, liquor, and milk are included, the figure is approximately 11% of MSW [OTA, 1989]). Now the pressure is on to fix the landfill problem quickly, and beverage containers are being singled out. "The problem is beverage containers are perceived as being the 'bad guys' when environmentalists and legislators point accusing fingers at roadsides and landfills. Those glaring cans and bottles seem to pop right out of the debris" (Mahar, 1987). Beverage containers will undoubtedly remain a favorite target of future solid waste management bills.

The U.S. garbage crisis is not unmanageable, but a combination approach including recycling, incineration, and landfills and cooperative efforts by packaging manufacturers, municipalities, private carters, and consumers, will be required (Cook, 1988). "The frontier days are over. When it comes to tossing things, at least, America has run up against limits" (Rice, 1988).

SYNOPSIS OF SOLID WASTE MANAGEMENT PROGRAMS

A. State and Local Programs

The following is a summary of the different types of legislation and programs at the state and local levels.

(i) Beverage Industry Recycling Programs (BIRP'S)

Beverage Industry Recycling Programs (BIRP's) are industry sponsored voluntary recycling programs designed to support state-wide voluntary recycling efforts. These programs were originally promoted as an alternative to forced deposits laws. In most states where active, BIRP's provide marketing and administrative support to independently-owned recycling centers (NSDA, 1989).

(ii) Statewide Keep America Beautiful and/or Litter Control Acts

Keep America Beautiful (KAB) is a national litter program which seeks to make litter socially unacceptable. These and similar programs also promote multi-material recycling, organized clean-up activities, and enforcement of anti-litter laws. Litter Control acts attempt to address the litter problems at its source by penalizing the litter and boosting voluntary recycling through funding public education and providing grants to recycling groups (NSDA, 1989).

(iii) Independent Recyclers/Buy-Back Centers

Each year the independent recycling industry in the U.S. recovers some 110 billion pounds of scrap metal,

glass, plastics, paper, and other materials, largely through voluntary recycling (NSDA, 1989). "From 1980 through last year (1987), a total of 232.5 billion aluminum cans passed through recycling centers, which currently number more than 10,000 in the U.S." (Davis, 1988). The major primary aluminum producers operate a network of can buy-back centers and purchase cans directly from smaller scrap collectors, activities which have led to the success of recycling of the aluminum can.

(iv) Pull Tab Ban

The most simplistic and widely used form of restrictive packaging law bans sale of beverage containers with detachable pull tabs. With the widespread use of the aluminum stay-on tab since the late 1970's, this has become a non-issue. Some laws exempt containers with pressure sensitive tape and/or exempt certain types of beverages.

(v) Connecting Device Restrictions

Such laws ban sale of multi-pack beverage container packaging, when the connecting material is a plastic or other non photo-, chemo-, or bio-degradable.

(vi) Forced Deposit Laws

Under deposit laws, consumers pay a deposit when they purchase a filled container and must return the container in order to redeem the deposit (Cassidy, 1988). The deposit laws in effect in nine states are similar.

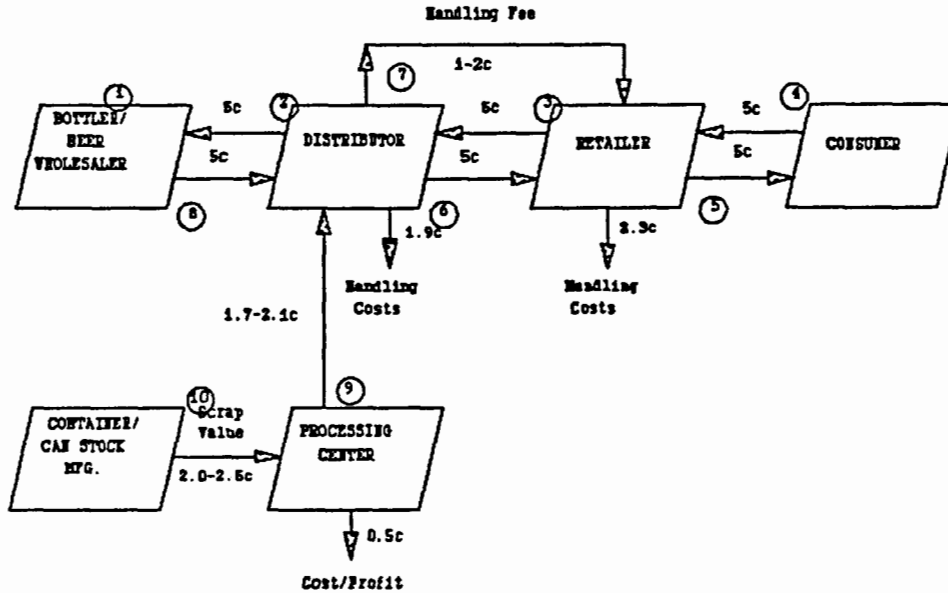
Most deposit laws:

- o Require a minimum 5-cent deposit on glass, metal and plastic beverage containers sold for off-premise consumption.
- o Require retailers and distributors to collect deposits and handle returns.
- o Provide a handling fee of 1-2 cents per container paid by distributors to retailers or redeemers.
- o Prohibit certain types of packaging, e.g. pull-tabs, non-degradable connectors.
- o Require marking of all containers with state abbreviation and deposit amount.

Variations do exist from state to state, however. For example, wine and liquor bottles are covered in Iowa; Delaware exempts aluminum cans until 1992 in favor of voluntary recycling efforts; Michigan and Oregon provide a two tier system, depending on whether the container is accepted by one or more than one bottler or brewer. Several states have recently expanded coverage to wine coolers (Library of Congress, 1989). Some states are attempting to lay claim to unclaimed deposit revenues in the form of escheat clauses. Other programs, such as that of the Canadian province of Saskatchewan, return to consumers only 5 of the 7 cent deposit levied, retaining 2 cents for government and environmental efforts (Resource Strategies, Inc., 1989).

A schematic of the money flow in a traditional "bottle bill" is depicted in Figure II. Costs shown have been gathered from various sources based on collecting aluminum cans. They are provided to give a feel for amounts involved.

Figure II
MONEY FLOW
TRADITIONAL BOTTLE BILL



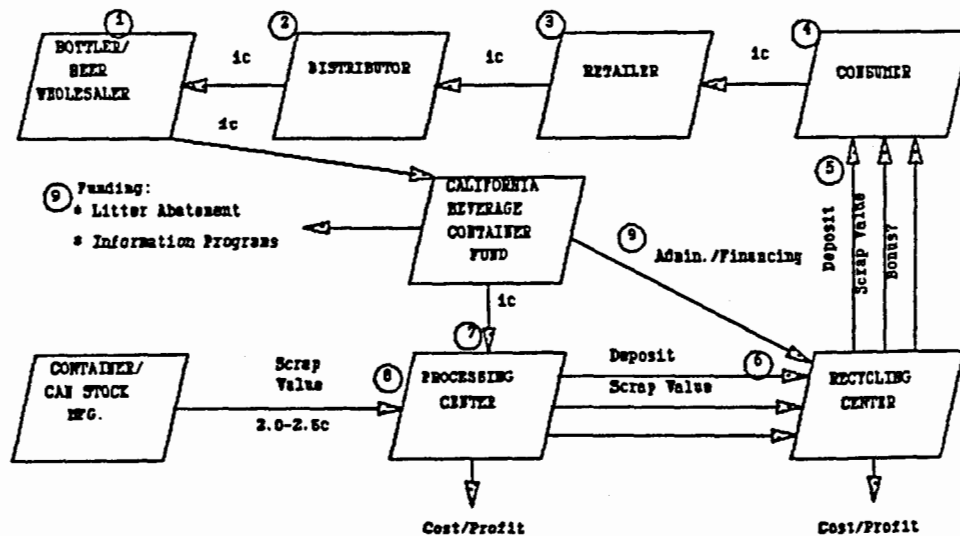
1. Bottler/beer wholesaler initiates deposit for each full container sold.
- 2-4. Distributor pays bottler/beer wholesaler deposit for each container. Deposit is ultimately paid by consumer (but not necessarily as an identifiable fee).
5. Consumer receives refund from retailer for each returned container.
6. Retailer receives refund from distributor for each returned container.
7. Distributor pays retailer handling fee for each returned container.
8. Distributor receives refund from bottler/beer wholesaler for each returned container.
9. Distributor receives scrap value for container sold to processors.
10. Processing center receives proceeds from sale of reclaimed materials for recycling or use for other purposes.

The California law, called "a free market approach to recycling," is a special case. The law requires consumers pay a "regulatory fee" of one cent per container. When the container is returned to a redemption center, the consumer receives the fee plus the container's scrap value and a bonus equaling a portion of unredeemed deposits. In effect, the law is designed to require manufacturers to buy back and recycle the containers they have made.

The law sets a recycling goal of 65% by 1990; the fee is doubled, rising to 3 cents if necessary by 1992. A key aspect of the bill is the establishment of convenience collection centers which must be set up within one-half mile of beverage retailers with annual sales of \$2MM or more. The number originally planned was 2,741, up from the 1,000 under the voluntary system (Cassidy, 1988).

A schematic of the money flow is depicted in Figure III.

Figure III
MONEY FLOW
CALIFORNIA BEVERAGE CONTAINER RECYCLING ACT



1. Bottler/beer wholesaler pays to the California Beverage Container Recycling Fund (CBCRF) an amount equal to the redemption value for each container distributed.
- 2-4. Deposit is passed along and is ultimately paid by the consumer (but not necessarily as an identifiable fee).
5. Upon return of the container to the recycling center, consumer receives redemption value, plus portion of scrap value and bonus if applicable.
6. Recycling center receives refunded amount for transfer of container to processing center, plus scrap value and administrative costs.
7. Processing center receives refunded amount from CBCRF.
8. Processing center receives proceeds from sale of reclaimed materials for recycling or use for other purposes.
9. Surplus funds are used to pay administrative costs and to finance recycling centers and other programs (DeWolfson, 1987).

(vii) Mandatory Segregation/ Recycling

Much of the emphasis in recycling today has focused on municipal solid waste as opposed to industrial waste, perhaps concentrating on the residential sector because of its high visibility (Glenn, 1988). Direct state legislative initiatives currently in existence generally mandate municipalities to recycle or require MSW generators to recycle. Some require municipalities only plan for recycling activities, or require recycling be a part of any new solid waste disposal proposal. Some laws include provision for state funding.

States with both mandatory and voluntary laws have generally established an overall recycling goal of 20-40%. Some with mandatory laws have adopted additional goal structures to include some combination of source reduction, reuse, composting, and incineration. Several states have banned designated recyclables from landfills and incinerators (Glen and Riggle, May, 1989).

While designs differ from state to state, the laws are generally intended to remove a substantial volume of recyclable material from the waste stream, reducing landfill costs and volume, and increasing incinerator efficiency. Each law is shaped by the particular needs and resources of the state, as well as by lobbies. A typical program requires each municipality of a certain size to submit a program for recycling several materials, such as aluminum, glass, newspaper and yard waste. Some plans permit municipalities to determine their own material mix; others dictate what must be collected (Goldberg, 1988).

A popular option for residential areas is curbside collection, which schedules pickup of presorted recyclable materials from residential curbsides in addition to regular garbage. Over 1,500 curbside recycling programs are in operation today, with new ones starting nearly everyday (Grove, 1989). Currently there are slightly more mandatory programs than voluntary ones. A less popular option is drop-off programs, whose success has been hampered by lack of promotion and convenience. In most instances, drop-off programs, which use a network of collection sites, provide less convenience, resulting in lower participation rates than curbside programs.

A survey by Bio-Cycle in 1988 of typical recycling programs in operation in the U.S. showed "mandatory recycling gets better recovery rates than voluntary recycling, and that the best voluntary programs are curbside rather than drop-off, especially when containers are provided. For the most part, the public sector is running the recycling programs" (Peters & Grogan, 1988).

(viii) Other

Various states have adopted other forms of restrictive packaging laws such as the following, some of which are part of mandatory recycling bills:

- o Disposal bans, particularly for yard wastes.
- o Product coding, particularly plastic containers.
- o Bans of plastic cans.
- o Restrictions on non-degradable forms of consumer product packaging, particularly plastics.
- o Packaging taxes on certain types of containers and packaging.
- o Packaging disposal fees.
- o Recycled material market development incentives -- tax credits, loans, government purchase preferences, and others.

B. Federal Programs

The main body of Federal legislation dealing with solid waste is the Resource Conservation and Recovery Act (RCRA). RCRA was passed in 1976 as an amendment to the Solid Waste Disposal Act, passed in 1965. The Solid Waste Disposal Act,

designed to improve solid-waste disposal methods, was amended by the Resource Recovery Act in 1970, then by RCRA in 1976.

RCRA was supposed to address the problem of disposal of the increasing tonnage of municipal and industrial solid waste. Three programs were created: Subtitle D, dealing with solid-waste; Subtitle C, dealing with hazardous waste; and Subtitle I, dealing with underground storage tanks.

RCRA was amended in 1980, and again in 1984, when the Hazardous and Solid Waste Amendments expanded the scope to deal with more hazardous waste. Much of the attention in recent years has focused on hazardous waste at the expense of the solid-waste portion of the law.

To assist in market development for recycled products, RCRA charged the Environmental Protection Agency with the task of developing guidelines for government purchases of the products. After more than 12 years and several lawsuits, the EPA finally began issuing the guidelines in 1988 (McEntee, 1989).

Also, in early 1989, the EPA issued a report entitled The Solid Waste Dilemma: An Agenda for Action, which established goals and made recommendations on dealing with the solid-waste problem.

The EPA concludes that the solid-waste problem demands "a fundamental change in the nation's approach to producing, packaging and disposing of consumer goods." The report recommends a "national strategy" and outlines a hierarchy of "integrated waste management" which favors source reduction/reuse, recycling (including composting), and then landfilling and incineration. It sets a "national goal of 25

percent source reduction and recycling (up from the current 10 percent) by 1992." It establishes research and educational goals regarding recycling and raises the issue of procurement to build markets for recycled materials. It falls short of making legislative proposals (EPA, 1989).

PROGRAM STATUS AND LEGISLATIVE TRENDS

A. State and Local Trends

Table III presents a summary by state of the status of solid-waste/recycling legislation. Legislative activity at the state and local levels has been extensive. In 1988 alone, over 2,000 solid-waste bills were introduced into state legislatures (Biocycle, Feb. 1989). Provisions were many and varied.

TABLE III
SOLID WASTE/RECYCLING LEGISLATION BY STATE - MID 1989

	Mandatory Recycling	Forced Deposit	KAB/ Litter Cntrl.	BIRP	Connect. Device Restrict	Pull-Tab Ban	Plastic Can Ban	Product Coding	Mkt.Dev Incntv.	Recycling Goals
Alabama										
Alaska					X	X				
Arizona			X *	X		X				
Arkansas										
California		X **	X		X	X		X		20%
Colorado						X				
Connecticut	X	X			X	X	X	X		35%
Delaware		X ***			X	X				45%
Dist. of Columbia									X	30%
Florida	X			X	X	X		X		25%
Georgia			X *							
Hawaii						X				
Idaho										
Illinois	X		X			X		X	X	25%
Indiana										
Iowa		X			X	X				
Kansas				X		X				
Kentucky			X *	X						
Louisiana			X *			X				25%
Maine		X			X	X				25%
Maryland	X			X		X				15-20
Massachusetts	X	X			X	X				35%
Michigan		X			X	X		X	X	28-32
Minnesota					X	X	X			
Mississippi										
Missouri										
Montana						X				
Nebraska			X *			X				
Nevada										
New Hampshire			X							
New Jersey	X				X	X			X	25%
New Mexico			X	X		X				
New York	X	X			X	X				40-42
North Carolina			X *						X	
North Dakota						X				
Ohio			X	X		X				
Oklahoma				X		X				
Oregon		X			X	X			X	
Pennsylvania	X		X		X					25%
Rhode Island	X				X	X				15%
South Carolina						X				
South Dakota										
Tennessee			X			X				
Texas			X							
Utah										
Vermont		X			X	X			X	40%
Virginia			X *			X				25%
Washington						X				
West Virginia			X *	X						
Wisconsin					X	X			X	20%
Wyoming						X				
TOTALS	9	10	16	9	17	34	2	5	8	

* KAB's
** Modified Deposit Law
*** Exempts aluminum can until 1/15/92

Source: Can Manufacturers Institute; Beverage Industry Annual Manual; Recycling Today; Biocycle

The problems associated with solid-waste management vary considerably throughout the U.S., although in many parts of the country landfills are the chief problem. Of 35 states that have developed estimates of remaining landfill life, 14 have five years or less of capacity and only five estimate their capacity is more than 20 years. Related to this is the cost of land disposal, which also varies considerably. Tipping fees (the amount charged to dump at landfills) range from \$5 to \$10/ton in Southern and Western states, to \$60-\$100/ton in the Northeast. Current recycling rates by state are typically low, with only nine states estimated to have rates in excess of 10%.

Thus it comes as no surprise that removing materials from the waste stream is fast becoming the preferred method of management. "Curbside recycling is rapidly becoming a way of life in the U.S." Over 1,000 programs have been identified in 35 states. In 13 of these where estimates have been made of the population covered, about 8.5 million people are served, not counting New Jersey which has over 40% of all curbside programs. With either current or pending legislation in numerous states requiring that municipalities plan for or mandate recycling, "it's a certainty that the number of curbside programs will increase substantially over the next several years" (Glenn & Riggle, April, 1989). The Council on Plastics and Packaging in the Environment has estimated by the end of 1991, 16 million homes representing 20% of the population will be involved in curbside collection programs, up from 9 million currently.

Research by International Plastic Consultants Group suggests there will be rapid movement by non-deposit states to adopt legislation similar to New Jersey, and for deposit states to pass recycling laws like New York and Connecticut,

a state which will have mandatory recycling by 1991. The number of states adopting recycling laws is expected to be about 24 by 1992, with all states covered by 2002 (Schlegel, 1988).

It appears unlikely that states will adopt the modified deposit legislation or redemption bills of California which mandates establishment of "convenience buy-back centers" for recycling. The financial stability of the convenience centers, administrative burdens associated with implementing the program, and other difficulties are creating concern over the viability of this approach " (Office of Technology Assessment, 1989).

Although Rhode Island passed a mandatory recycling law in 1986, New Jersey (in 1987) is generally recognized as the first state to pass comprehensive legislation aimed at reducing MSW, requiring an initial recycling rate of 25% for each county and curbside separation and collection of at least three recyclable materials by July 1988. This law has often been criticized for causing a used newspaper glut due to lack of a market, one of the common problems for curbside programs.

As of mid-1989, other states with recycling laws included Connecticut, Pennsylvania, New York, Massachusetts, Maryland, Florida, and Illinois. Washington, Oregon, Minnesota, and Tennessee had serious legislation under study, while Georgia, Alabama and Texas had related bills pending (McEntee, 1989).

The recent Florida and Pennsylvania recycling laws have been receiving a lot of attention, and elements of these will likely form the foundation for other state laws. The Florida law requires counties to initiate recycling programs with the help of vast amounts of state financial aid. It also employs

a long-term incentive for industry to recycle by imposing an "advanced disposal fee" on glass, metal, or plastic containers which do not reach a 50% recycling level by late 1989. The Pennsylvania law seeks to improve on neighboring curbside state laws by adding financial assistance, marketing development provisions, and public education as key elements. While mandating curbside collection, the law also permits substitution of mechanical sorting systems so long as recycling targets are achieved (Powell, 1988).

B. Federal Trends

"With the June 1 (1989) introduction to the Senate of the Waste Minimization and Control Act, more gears began to roll in the machine that is expected to manufacture a national solid-waste-management and recycling law" (McEntee, 1989). The provisions of the bill are similar to the recommendations of the EPA.

Commonly referred to as the "Baucus Bill" after its sponsor Senator Max Baucus, D-Montana, S.1113 is part of legislation to reauthorize RCRA. In the main the bill:

- o Calls for greater solid-waste reduction and increased recycling;
- o Sets specific solid-waste management standards;
- o Mandates State planning for solid-waste management.

The Baucus Bill's key provisions are as follows:

- o Requires a national recycling rate of 25% within four years of passage, with the rate to be increased to 50% within ten years.
- o Requires states to submit solid-waste management plans.

- o Assists in market development for recycled materials by requiring the federal government to purchase more recycled paper, plastics, and metal.
- o Establishes an office within the EPA to provide funds and technical assistance on waste reduction and recycling opportunities.
- o Establishes standards for incinerator ash and infectious waste and other industrial wastes than can't be recycled.
- o Proposes a \$7 per ton tax (0.35¢/lb.) on virgin materials used for packaging (1988 provision) while establishing a National Packaging Institute to oversee packaging regulations.
- o Authorizes \$140 million to establish a federal Office of Waste Reduction and Recycling, including a clearinghouse for information on waste reduction and recycling (McEntee, 1989).

In addition to the above, it seems every member of Congress wants to get on the recycling band wagon, as recycling bills abound. Some of the major measures as of July, 1989 include:

- o S.244 would require the General Services Administration to encourage the development and use of degradable plastics.
- o S.269 would prohibit the disposal of solid-waste in a state other than the one in which the waste was generated.
- o S.932/HR.586 would provide for a national beverage container deposit system. This bill is getting a lot of support. As of December, 1989, there were 94 co-sponsors in the House.
- o S.201/H.R.500 call for a five-year phase-out of nonrecyclable packaging, establishment of a clearinghouse for information on recycling programs, and provisions for national education and research programs on waste minimization and recycling.
- o S.1112 would set a goal of reducing waste 50 percent by 1990 and require resin labeling on all plastic packaging.

- o H.R.1691 imposes a tax on the sale of domestic and imported paper and paper products that do not contain the minimum amount of recovered materials specified in EPA guidelines (Resource Recycling, 1989).

Despite this flurry of activity, the general belief is is the federal government will confine itself to establishing recycling goals, material use policies, and market stimulation programs, and will seek to permit states to devise programs to fit their particular circumstances. Regarding national deposit legislation, the OTA (1989) states "In this light (local flexibility) and in the interest of maintaining flexibility at the Federal level with respect to recycling strategies, it is not clear whether it is desirable at this time for Congress to adopt national deposit legislation or any other single approach to encourage materials recovery and recycling." Supporters in Congress are attempting to keep the bill alive and an attempt will likely be made in 1990 to attach it to RCRA when it reaches the House floor. The EPA is also proposing to require incinerator operators to recycle as part of an air emissions proposal. This proposal has met with considerable opposition.

C. International Trends

Recycling programs can be comprehensive and extremely successful. The solid waste management program in land-poor Japan might well serve as a model for the rest of the world. The following is a summary of findings by Hershkowitz and Salerni (1987).

Japan has a well developed solid-waste management program driven by social commitment and cohesion and active participation and coordination among national, regional and local governments. The national government plays an active

role in establishing policies and regulations, providing subsidies, collection of precise management data, and promoting development of waste management technologies. However, the Japanese believe in allowing municipalities the greatest amount of authority in determining locally appropriate mixes of waste management options. The Japanese also take elaborate steps to eradicate sanitary illiteracy by emphasizing public education, community participation, and the role of housewives and female professionals.

The Japanese separate MSW into four main categories:

- o Recyclable and reusable materials, including glass, metals, and paper.
- o Hazardous materials.
- o Landfill wastes, often including plastics.
- o Incinerated wastes, including kitchen wastes, soiled paper, and mixed-resin filmy plastics.

In the home, waste can be sorted into additional subcategories, typically seven, but at the extreme 21 categories. The most common categories are metals and metal cans, paper, bottles, glass, textiles, plastics, and wastes difficult to dispose of. Households are often required to identify items to facilitate collection. Approximately 90% of Japanese cities require separation at the source. Materials are collected through house-to-house collection, station collection (groups of 15-40 houses), or fixed container collection (apartment complexes). Most collection of recyclables is carried out by volunteer civic groups or private companies.

The Japanese have been extremely successful with their system, recycling about 50% of their wastes, while landfilling

only about 20%. The remainder is handled by incineration and composting. The country recycles 50% of its paper, 40% of its glass bottles, but only 40% of all steel and aluminum cans. The Japanese are currently studying ways to improve their can recycling rate.

Increased awareness of recycling is occurring in other parts of the world. Aluminum beverage can recycling is taking a higher profile in the UK. Sweden has been successfully recycling 85-90% of aluminum cans via a mandatory deposit law (American Metal Market, August, 1988). Athens, Greece is experimenting with curbside collection and mechanical material separation and recovery (Frantzis, 1988). Sao Paulo, Brazil is establishing pilot curbside operations (Turner, 1989). West Germany recently instituted a 28¢ deposit on one-way plastic beverage containers (Cote, 1989). Denmark restricts one-way containers and has banned metal cans. Even industry recognized it had to act, as a number of packaged goods companies banded together in late 1989 to form the European Recycling Association to promote curbside collection of recyclable materials (Short, 1989). The push for recycling worldwide is likely to intensify.

IMPLICATIONS OF ALTERNATIVE APPROACHES

Summarizing the numerous activities in the area of solid-waste management and recycling, there appears to be three basic approaches, or combinations thereof, being promoted. In effect, these can be viewed as alternative reverse distribution channels, each with different implications for society and for the aluminum beverage can. The approaches are:

- o Voluntary
- o Forced Deposit Laws
- o Mandatory Segregation/Recycling

A discussion of each follows. The concept of a packaging tax, such as recently proposed by the Bush Administration, might be considered as a fourth option, but will not be discussed as such proposals are at the conceptual stage and the implications are so broad as to be beyond the scope of this paper.

A. Voluntary Systems

Through the various state and industry sponsored initiatives discussed previously, voluntary systems pioneered by Reynolds in 1968 and which have been of substantial size for over 10 years, consist of community-oriented collection mechanisms, including many civic organizations, from which cans have been purchased primarily by a network of commercial scrap dealers and returned to the aluminum rolling mills for reprocessing into can sheet. Price, promotion, and convenience have been the key to the system's success.

There are a number of variations to the collection process, such as reverse vending machines which accept containers and return money. Voluntary curbside collection

and waste drop-off centers have recently become part of the system. The aluminum companies have also played a important role through strong promotional efforts and establishment of their own collection networks. Resource Strategies (1989) notes:

"Reynolds has been most active in this regard and, in fact, has an extensive grass roots collection system of its own including reverse vending machines. In terms of its ability to collect cans directly from the consumers, Reynolds is by far the most 'integrated' of the aluminum companies. Alcoa, by contrast, has been significantly less involved at the grass roots level but has placed considerable emphasis on raising public consciousness of the value of recycling aluminum cans by funding major advertising campaigns and going in for other promotional activities. In terms of actual collections, however, Alcoa has emphasized working through the traditional dealer network and through some of the beer and beverage companies."

Alcoa is now beginning to support their own buy-back centers, targeting high population, low recycling rate and steel product areas such as Philadelphia. Other aluminum companies, including Alcan, Comalco and Kaiser, are stepping up their efforts. In fact, 1990 capacity to remelt aluminum UBC's is expected to be 73% greater than 1987 (Apotheker, 1989).

The success of recycling for the aluminum can is due mainly to its high intrinsic value for reuse in producing new cans. By mid-1989, the aluminum can had all but driven out the bi-metal can (steel body/aluminum end), holding a 96.4% market share of all canned beer and soft drinks (Apotheker, 1989). As mentioned previously, its 50+% recycling rate, contrasts with 10-15% for glass, 3-5% for steel, and 20% for PET, with the PET volume coming almost exclusively from deposit states.

In terms of economics, as compared to steel, Resource Strategies (1989) concludes:

"The voluntary recycling system clearly favors aluminum over steel. The reason for this is quite simple. If we assume that 35¢/lb is the minimum price that will permit the voluntary system to 'work', then the cost of collecting cans is in the range of 1-1.2 cents each. If we apply this rule of thumb to steel cans it is equivalent to a production cost of about 20¢/lb or \$450/tonne. This is approximately five times the market value of ferrous scrap in normal conditions. In other words, it is plainly not feasible for the steel industry to compete with aluminum in actually paying cash for cans. Thus, the voluntary effort only purchases steel cans, incidentally, as a matter of goodwill. These cans are then rejected fairly early on at the magnetic separation stage of processing."

Aluminum also has a substantial advantage over glass and plastics. Aluminum-scrap at 40-50 cents per pound or about 70% of virgin metal value is the clear leader. Plastic bottles (PET) valued at 6 cents and glass bottles at one cent (Marcellino, 1989), represent less than 20% of their virgin material values. Also, plastic is further disadvantaged in that it can not be reused in beverage containers due to possible contamination.

Against this back-drop of success, however, efforts of voluntary recycling seemed to have stalled in the 50 - 55% range, although 1989 topped 60%. In fact, the recycling rate actually declined in the mid-1980's, as seen in Table IV, most likely due to low scrap prices. However, the industry experienced a significant up-turn in 1988 as scrap prices rose rapidly and were sustained well into 1989.

Table IV

UBC Price Versus Recycling Rate

	<u>Aluminum Can Recycling Rate (%)</u>	<u>Processor's UBC Price ¢/#</u>
1980	37.3%	48.8
1981	53.2	46.8
1982	55.5	46.2
1983	52.9	45.0
1984	52.8	45.3
1985	51.0	35.2
1986	49.0	38.6
1987	50.5	50.4
1988	54.6	69.8
1989	60.8	64.2

Source: Aluminum Association, Resource Recycling

Clearly, there is less enthusiasm for recycling at a processor price of around 35-38 cents per pound, which translates into a consumer price of 18-23 cents per pound, and aluminum companies must be sensitive to protecting these levels. In fact, Alcoa believes the price must be maintained at 42 cents per pound, or a street price of 17 cents per pound to prevent lost interest (Apotheker, 1989). Those who study recycling have also found there is a large segment of the population who will not recycle for cash (Mahar, 1987).

Even increased convenience and the introduction of a 1 cent redemption value to augment the intrinsic scrap value have been able to achieve only a 65% recycling rate in California. The state has recently raised the fee to 2.5 cents (Apotheker, 1989).

The success of voluntary recycling is even less spectacular when one considers the following:

"A national UBC recycling rate of approximately 55% is attained by an 83 percent recycling rate from the 30 percent of the U.S. population who live in deposit and redemption states and a 43 percent rate from the remaining 70% of the population. For the aluminum industry to reach its stated goal of 75 percent recycling rate by 1995, the recycling rate in states without deposit or redemption will have to reach 71%." (Apotheker, 1989)

The industry's goal of 75% recycling under the voluntary system appears extremely ambitious and questionable as to its attainability. Therefore, despite aluminum's advantages over other materials due to its intrinsic value, the voluntary system is unlikely to live up to society's expectations of a high recycling rate and a further reduction in waste.

B. Forced Deposit

Historically, adoption of beverage container deposit laws has been an emotional issue, involving the environment, jobs, personal freedoms, and lifestyles. Differences in opinion exist as to the economic and environmental impact of these laws. This stems from conflicting evidence presented in various studies, depending on research methods chosen and which "side" was conducting the research.

Moore and Scott in 1983 drew some tentative judgments of deposit laws based on an extensive review of studies up to that point in time, although they admit much of the research "lacked scientific rigor." These are summarized as follows:

- o There is a great reduction in container litter with minor decreases in total solid waste. Worthwhile reductions in primary aluminum and steel usage also occur.
- o Changeover costs are high, but usually can be recovered during the first few years. Sales decrease initially but then continue previous growth patterns. There is a

decline in can sales, and a dramatic switch from nonrefillable to refillable bottles.

- o Usually there are price increases above normal inflation for beverages in nonrefillable containers.
- o Energy savings are very small percentage-wise, but significant in an overall sense.
- o Small net employment increases occur, with gains at lower levels and losses at upper levels.
- o Despite some inconvenience, reaction has been positive both in terms of what consumers say (opinion polls) and what they do (return rates). The two major reasons cited for consumer approval are litter reduction and energy conservation, in that order.

With the exception of energy conservation, for which estimates widely conflict, many of these observations have been supported in subsequent studies by others.

Data reported by several deposit states indicates total roadside litter declined between 15 and 50%, and beverage container litter by as much as 80% (OTA, 1989). Based on a review of studies in the late 1970's, Moore and Scott found return rates ranged from 70-90%. More recent surveys of Massachusetts and New York indicate return rates for soft drink containers have averaged around 70% for the last several years (Temple, Barker, & Sloane, 1988), although Michigan has maintained a rate above 93% for the past ten years (T B & S, 1989). This is probably due to Michigan's 10 cent deposit as opposed to the typical 5 cents. Indeed it is generally accepted that there is a positive correlation between the return rates and the size of the deposit and other administrative aspects of the system. This has been shown to be the case in Sweden, where return rates are now 85-90% (RSI, 1989). As noted previously, a return rate of 70%+ in deposit states far exceeds that of the mid 40's experienced in non-deposit states.

Regarding the impact of deposit laws on beverage demand, a common problem which researchers have encountered is that data is often unavailable, incomplete, or unreliable. Much of the research has tended to rely on consumer "opinion" studies based on surveys, rather than on purchase behavior. Early empirical work was conducted by the General Accounting Office in 1980 which used data from states and concluded that a transitory effect on sales growth may result during the first year of a deposit law, after which sales resume predicted growth rates (Sjolander & Chen, 1989). Some of the most extensive empirical work related to demand patterns has been conducted by Richard Sjolander using sales data for beer sales, which is more reliable and more readily available than that for soft drinks due to alcoholic beverage tax reporting requirements. Sjolander and Kahela in 1988 studied the effect of the Michigan Deposit Law and concluded the legislation had a negative effect on sales of beer. In 1989, Sjolander and Chen published the results of a more extensive study on beer sales in nine deposit states. To correct for extraneous factors such as changes in the drinking age, consumer preference, etc., the researchers used non-deposit control states for comparison. The study confirmed the GAO work and concluded that deposit laws had a negative effect on beer sales, an effect that does not appear to be transitory. In three states, increasing consumption changed to decreasing consumption in the year following implementation. In five of the remaining states, consumption declined at an increasing rate. Only in Delaware did increasing sales change to constant sales. Furthermore, the patterns in eight of these nine states deviated noticeably from that in the control states, suggesting consumption deviations were probably not caused by exogenous variables. The authors also note that to some a reduction in alcoholic beverage consumption might be

viewed as positive, while in contrast the beer industry views reduced sales negatively. Their research also identified other areas where further empirical testing is required, particularly in regards to the law's effects on litter, solid-waste and energy consumption.

The anomaly in Delaware might be explained by the fact that aluminum cans and large containers (one liter+) are exempt from deposits. The effect of this was to all but eliminate glass containers in retail sales of beverages. Active participation by the aluminum industry in supporting "buy-back centers", coupled with a government operated multi-material recovery plant serving two-thirds of the population, resulted in recycling rates of 61% and 80% respectively (Vasuki, 1986).

Studies by Temple, Barker, & Sloane, Inc. (1989) also support the first year decline in beverage sales. Citing reductions in New York of 6% and Oregon and Massachusetts at 8%, they conclude actual sales lag one to two years behind where they would be without legislation.

Lesser & Madhavan (1989) also have studied demand shifts and have drawn these conclusions:

"Although highly state-specific, some generalizations can be made about container mix. Cans, after a period of decline, are regaining share, probably due to the economic recyclability of aluminum. Major reductions in one-way glass bottles are universal, although total disappearance is unlikely. Clearly benefiting is the PET bottle. Returnable bottles have increased share, but not at the rate predicted. As a result, the beverage sector has invested millions in filling equipment but actual amounts have not been estimated. Nor have there been estimates of loss of profits associated with consumption declines. Reductions in consumption have been estimated to range from 0 to 8%."

Other reported spot shifts in container mix include:

- o One-way soft drink bottles in Michigan decreased from 45% to 2%, while beer sold in cans decreased from 69% to 38% of the market;
- o In Vermont, soft drinks in cans fell from 39% to 13% of the market;
- o In Maine, beer and soft drinks in cans fell from 33% and 40% to 5% and 9% of the market (Scott and Moore, 1984).

Lesser and Madhavan have attempted to quantify the direct cost of "reverse distribution" based on data obtained from The Rockefeller Institute's 1985 study of New York's deposit law. They estimate the direct cost on a container returned basis at 90% return rate to be as follows:

Retailer Handling	2.25¢
Distribution	1.87
Recycling Revenues	<u>(.50)</u>
Total	3.62¢

Extrapolating this on a national basis, the authors arrive at a cost of \$3 billion per year, and conclude that at such a high cost, mandatory deposit legislation should be adopted only as a last alternative, and then only following a detailed assessment of public opinion. (These costs did not include losses due to reduced sales.) The Office of Technology Assessment (1989) disagrees and concludes "it appears overall, however, that both the benefits and costs of deposit systems are considerable and not out of proportion to each other."

Another study of the Michigan law by Temple, Barker, & Sloane, Inc. (1989) confirms the high costs to bottlers, finding that even with revenue from sale of scrap materials,

bottlers incurred net costs of \$14.2 million from the deposit law in 1988.

P. Nagy cites several studies of the Michigan law and concludes these increased channel costs are ultimately passed on to the consumer. "There is adequate documentation that those in Michigan bottling, distribution, and retailing have long ago adjusted their pricing to cover their costs" (Nagy, 1987).

The opposition by grocers appear to be further evidence that bottle bills are costly. Grocers object to additional storage costs, sorting expenses, sanitation problems, and problems with differentiating containers from those of adjacent states. Costs in Oregon and Vermont from the first year were estimated at \$1,872 per store, plus lost sales of 10% (Geurts, 1985). Suits are now being brought against retailers for refusing to take back containers (AMM, June, 1989). On the other hand, many grocers feel such bills work well in controlling litter. Some retailers have found bottle bills advantageous through use of beverage returns as a marketing tool to get customers into their stores and to further entice consumers by using beverages as loss leaders (Nagy, 1987). Some store managers have even learned to like deposits when there is a competent third party firm collecting the containers (Raymond, August, 1989).

In terms of container mix, deposits favor aluminum cans, discouraging the beverage industry from using cheaper steel cans, which are a cost item for distributors who must dispose of them (Raymond, August, 1989). Resource Strategies (1989) makes a persuasive economic argument favoring aluminum cans, and concludes a "deposit system provides much greater value-added to aluminum than a voluntary system and creates a much

greater incentive to use aluminum rather than steel (and we suspect other materials such as glass and plastics)."

Deposit laws do aid in collecting plastic containers, where the steadily growing recycling of PET containers has come mainly from deposit states as seen in Table IV (Schlegel, 1988). Despite this, the plastics industry has not been an advocate of bottle bills. However, because these containers compete mainly in the one and two liter container markets, the impact on the demand for the 12-ounce aluminum can would likely not be great if a national deposit system were introduced.

TABLE IV
CONSUMPTION AND RECYCLING OF PET BEVERAGE BOTTLE RESIN

	<u>Consumption</u>		<u>Recycling</u>			
	<u>Million Bottles</u>	<u>Million Pounds</u>				
	<u>Deposit States</u>	<u>Total U.S.</u>	<u>Deposit States</u>	<u>Total U.S.</u>	<u>Million Pounds</u>	<u>%</u>
1980	208	3,000	21	310	14	4.5
1981	281	3,400	29	355	28	7.9
1982	407	4,700	42	392	44	11.2
1983	503	5,500	51	468	67	14.0
1984	1,001	6,200	97	535	100	18.7
1985	1,128	6,700	108	595	100	16.8
1986	1,219	6,700	116	640	105	16.4
1987E	1,365	7,500	127	704	110	15.6

The major opposition to bottle bills has come from beer and soft drink interests who are convinced the reported shock effect of a fall in demand is real and damaging. Fearing alienation of their customers, beverage container manufacturers have sided with them in opposing such bills. Political battles have also raged between industry and government over unclaimed deposits.

From society's standpoint, bottle bills appear to be the

best option for reducing litter and for achieving high recycling rates which in turn reduce MSW. The inclusion of wine, liquor, and milk containers would more than double the impact. However, such bills are expensive for consumers and the beverage industry, although the cost of disposal of beverage containers is internalized on the industry and direct consumers, rather than on the taxpayers (OTA, 1989).

From the aluminum industry's viewpoint, the increase in recycling rates as a result of deposit laws would likely translate into lower prices for UBC, although given the amount of excess industry melt capacity, it is difficult to predict at what recycling rate this would occur. A national bottle bill would promote consistency in the recycling treatment of beverage containers. It might also reduce the first year "shock" decline in demand, since consumers would not have lower-cost non-deposit contiguous states from which to purchase their beverages. The ideal law for the aluminum can would be one that:

- o Initially exempts the aluminum can, at least until glass and plastic rates catch up to it. It is quite likely that aluminum will have to ultimately be included in order to get the recycling rate much above 60% which was the rate seen in Delaware in buy-back regions. The temporary exemption should promote a switch by bottlers as occurred under the Delaware bill exemptions.
- o Establishes a third party system to handle container redemption in order to alleviate retailers' objections.
- o Permits coexisting curbside programs, minimizes battles over unclaimed deposits, and portrays the beverage industry in a favorable light to consumers, which perhaps might overcome some of the industry's opposition. One alternative might be to adopt a form of the Saskatchewan law where, say out of a 5-cent deposit, only 4 cents is paid to consumers, the remainder going to fund curbside and other waste management programs.

Despite the advantages for aluminum under such a law, the aluminum industry is hard pressed to promote deposit laws because of the strong opposition from the beverage interests, who are unlikely to modify their stance, unless perhaps, they can be assured lower UBC prices would be translated into cost savings for cans. One approach might be to share in cost savings based on some historical index for the processor's UBC price tied to merchant aluminum ingot prices (the two prices move in unison). Consideration should be given to initiating low-key discussions with beverage interests on formulating a proposal advantageous to both groups.

C. Mandatory Segregation/Recycling

Mandatory segregation attempts to develop a much "cleaner" waste stream by forcing consumers to separate recyclables at the source, making it easier to process materials back into marketable commodities.

"The general consensus is that the collection process -- as opposed to reclamation and end-use -- is the hot topic right now" and mandatory segregation using curbside pick-up programs has drawn plenty of attention. The glass and PET groups have been major promoters of the curbside move, while most beverage and packaging industry groups have refused to embrace any single recycling alternative as a national cure-all (Davis, 1988). The aluminum industry has been basically neutral toward curbside, preferring the voluntary system instead. In so doing, the industry may be running the risk of creating the perception it is against curbside.

Another form of collection, drop-off programs, has been less popular, but such programs have been particularly

successful where waste disposal is still cheap, in low population density rural areas, or in high population density areas such as apartment complexes. Some have been used as adjuncts to curbside programs. The key to drop-off programs success is locating a site convenient to the public while they are running other errands (Glenn, February, 1989).

The main elements of a curbside recycling program are:

- * Separation and Collection
- * Processing
- * Marketing and Sale of Materials

In curbside systems, recyclables can be separated in the home prior to collection, at the curb when collecting, or during processing, but most segregation programs have relied on households to perform the bulk of separation which tends to restrict participation in voluntary systems. Curbside separation during collection is expensive and slow and comingled collection has been hampered by lack of sophisticated processing facilities, although this may be changing.

Critical to the success of curbside programs are the number and types of materials collected and the participation rate. Participation rates are affected by the number of separations, collection frequency, and whether or not containers are provided. The most common materials collected are newspapers, and glass and metal food and beverage containers. Home collection programs can divert up to 20-25% of waste from those provided with the service. The addition of such materials as corrugated cardboard and plastic containers can increase the collection rate to 30-50%. Participation rates for each of the materials also varies. For example, although newsprint is usually less than half of

the material that could be recycled, it typically accounts for 70-75% of actual collections, with glass at 15-25%, and metal 5-10% (Glenn, May/June, 1988). Segregation of plastics has not been widely adopted in curbside programs because of their light weight and high volume, requiring expenditures for trucks with balers (Raymond, August, 1989).

Clearly mandatory segregation overcomes one of the chief recycling bottlenecks for glass and plastic containers - collection of materials from consumers. As noted, very little plastic is being reclaimed and recycled from curbside systems. For example, despite the fact BFI has 66 curbside programs, 98% of the plastic it recycled came from deposit states (McEntee, 1989).

A key link in the growth of curbside and its advantages to glass and plastic is the development of sophisticated material recovery facilities (MRF). These facilities process comingled waste, typically requiring separation into only two streams -- mixed containers and mixed paper. In 1988, 10 MRF's were in operation. An additional 35 are currently under construction. Technology is advancing rapidly. For example, it is now possible to identify glass by color and plastic companies are working on ways to incorporate plastic identification by resin type into their design (Marcellino, 1989). MRF's may pose problems for the aluminum can. While there is an increase in contaminants from aluminum cans segregated by households and collected at the curb, it has not been a major problem (McEntee, 1989). However, indications are contamination due to the comingled stream through MRF's may be unacceptably high.

"Creating stable markets for recycled material has been a stumbling block for recycling in general...new materials

often are less expensive to use than recycled goods" (Treadaway, 1989). Markets are extremely volatile for some materials. Aluminum has an advantage over glass, which is considered marginal (Dillingham, 1988). Recycling of post-consumer plastics is in its infancy, with most effort focusing on PET and HDPE. However, considerable market potential exists for increased recycling of these and other resins (OTA, 1989).

Because of market issues, many question whether deposit and curbside can coexist. Critics say deposits pull "valuable" recyclables, particularly aluminum, from the curbside programs, rendering them less economic. Per ton prices in a typical market are \$55 for newsprint, \$40 for glass, and \$1,000 for aluminum (Stevens, 1989). An April, 1989 study by Franklin Associates appears to support the skeptics' position. The Franklin study showed it would cost \$87 per ton to cover recycled materials in New York under a coexisting scheme versus \$59/ton if the deposit law were phased out. Some have questioned a number of sweeping assumptions in the study (Raymond, August, 1989). The recent controversy over Chicago's proposed 10 cent surcharge is further evidence of a potentially troublesome coexistence (AMM, Feb., 1990). Darrell Morrow, project director at the Center for Plastics Recycling at Rutgers, predicts once curbside collection systems are fully developed, states with bottle bills will repeal them because a dual system is too expensive (Raymond, October, 1989). A study commissioned by the state of Oregon recently concluded curbside collection is more efficient than mandatory deposit legislation (AMM, September, 1989).

Some curbside systems in Connecticut and New York report container volumes consisting of 20-25% deposit bottles and

cans, suggesting consumers prefer convenience and comprehensive recycling, which many claim are lacking under bottle bills. There are conflicting studies, such as the one conducted by Anheuser-Busch in 1989 which revealed a combined curbside/deposit program recovers more material than a stand alone curbside program in the state of Vermont (Henry, 1989). There is also concern whether curbside alone will be effective enough in recovering beverage containers. Newark's curbside program was expected, at best, to recover only 30% of available bottles and cans; because of this, the city in 1988 and was in favor of deposit legislation (Sudol and Zach, 1988). Japan's inability to get its can recycling rate much above 40%, despite a comprehensive collection system, may be further evidence of this.

The viability of the voluntary system under both deposit and curbside is also questionable. Reynolds closed all of its public recycling centers in New York in 1983 because of deposit laws (NSDA, 1989). Furthermore, while some voluntary curbside systems, such as San Jose, CA, and Seattle, WA, have successfully coexisted with buy-back centers for aluminum, there is evidence to suggest this may not be the case under a mandatory system. For instance, Alcoa in 1988 under the New Jersey curbside system closed its aluminum can buy-back center in Newark because of lack of business (Sudol & Zach, 1988). Thus, although the aluminum industry, because of its past success, might prefer to see buy-back centers coexist with curbside, economics might not permit this as noted by Resource Strategies (1989):

"... aluminum constitutes one of the few really valuable fractions of the municipal waste stream. To the extent that a municipal recycling center produces a lot of aluminum and sells it, the fees that need to be charged to the municipality for operating the center by its manager will be reduced. If, however, volunteer efforts have first picked out most of the aluminum from the waste

stream, the cost to the town of operating the center will be increased since aluminum will not be available to offset some of the other costs of the recycling center."

At a minimum, aluminum-only buy-back centers will probably be required to become multi-material to survive.

There is also a move to develop strategic alliances in the area of recycling. Many of the large waste handling companies, such as BFI, feel the best way to maximize profits is to establish an alliance with a complementary company, looking for the best way to handle source separation and to create more MRF's (McEntee, 1989). Another prominent waste handler, Waste Management, has formed recycling ventures with DuPont in plastics and Jefferson Smurfit in paper (Miller, 1990). Such alliances appear to be aimed at ensuring markets for lower-value recyclables and are thus more likely to represent a threat than an opportunity for aluminum which already has a high scrap value and a developed market.

Mandatory segregation/recycling will become an increasingly important approach in solving the U.S. landfill problem. While the aluminum industry remains neutral towards curbside, it may be inadvertently creating the perception it is against curbside. The growth in curbside programs will likely occur in urban areas, driven by escalating landfill costs. While these programs should benefit glass and plastics by establishing a collection network, it is doubtful whether they will be as effective as deposit laws in recovering used beverage containers.

There are conflicting arguments as to whether curbside and deposit can coexist, and there is strong reason to believe the voluntary aluminum buy-back centers may not survive along with curbside due to the need to keep valuable recyclables

within the collection system. Depending on the degree of separation by the household, contamination may also be a problem for aluminum.

SUMMARY OF FINDINGS

1. While beverage containers remain a target of environmentalists, the emphasis has switched from one of reducing litter to the broader problem of reducing the country's solid-waste volume. Because beverage containers represent 5-10% of MSW, they will be a favorite target of evolving solid-waste legislation.
2. Legislative activity at the state and local levels has been accelerating rapidly. While provisions are many and varied, states appear to be moving toward mandating some form of recycling. As of mid-1989, nine states had mandatory recycling and a total of eighteen had adopted recycling goals ranging from 20 - 45%. At the state level, the push for deposit laws seems to have diminished. There have been no new deposit states since New York became the ninth state in 1983, although California has tried a modified deposit or redemption approach which has encountered difficulties. All states are expected to have recycling laws by the end of this decade, including those which currently have deposit laws. Forms of packaging bans and taxes are also being considered by some states.
3. At the federal level, activities are centered on passage of the Waste Minimization and Control Act as an amendment to the Resource Conservation and Recovery Act (RCRA). This bill calls for greater solid-waste reduction and increased recycling (25% goal); sets specific solid-waste management standards; and mandates state planning for solid-waste management. Other recycling bills abound, including a national deposit bill, whose sponsors are expected to attempt to attach it to the RCRA amendments. Despite all the

activity, the general belief is the federal government will permit states to devise their own programs and will confine itself to establishing recycling goals, material use policies, and market stimulation programs.

4. While voluntary recycling of aluminum has been far more successful than glass, plastics or steel, its recycling rate, with the exception of 1989, has stalled in the 50 - 55% range over the past nine years. In fact, in the non-deposit states, it is in the mid 40's. Therefore, without additional mandatory deposit legislation, attainability of the industry's goal of 75% recycling appears questionable. Therefore, despite aluminum's advantage over other materials due to its high intrinsic value, the voluntary system is unlikely to live up to society and industry expectations of a high recycling rate and a further reduction in waste.
5. From society's viewpoint, deposit legislation appears to be the best solution for reducing litter and achieving high recycling rates, which in turn reduces MSW. Such bills, despite their expense, would internalize the cost of disposal on the industry and direct consumers, rather than on the taxpayers.

For the aluminum industry, the increased recycling rate would probably translate into lower UBC prices. However, given the amount of excess melt capacity, the precise recycling rate at which this would occur is difficult to predict. A national bottle bill would promote consistency in the recycling treatment of beverage containers and might even soften the first year "shock" effect of a potential decline in demand for soft drinks and beer.

6. The ideal deposit law for aluminum would be one that:
- o Initially exempts the aluminum can, at least until glass and plastic recycling rates catch up to it. The temporary exemption should promote a switch by bottlers to the aluminum can, as occurred under Delaware's law.
 - o Establishes a third party system to handle container redemption in order to alleviate retailers' objections.
 - o Permits coexisting curbside programs, minimizes battles over unclaimed deposits, and portrays the beverage industry favorably to consumers, which perhaps might overcome some of the industry's opposition. One alternative might be to adopt a form of the Saskatchewan law and pay out to consumers only 4 cents of a 5 cent deposit, the remaining penny going to fund curbside and other waste management programs.
7. Mandatory segregation/recycling will become an increasingly important approach in solving this country's landfill problem. The aluminum industry has been basically neutral toward curbside, preferring the voluntary system. In so doing, the industry may be inadvertently creating the perception it is against curbside.

The growth in curbside programs is expected to occur mainly in urban areas, driven by escalating landfill costs. These programs should benefit glass and plastics by establishing a viable collection network, which has been uneconomic under free market conditions. It is doubtful, however, whether curbside programs will be as effective as deposit laws in recovering used beverage containers.

On the issue of coexistence of curbside and deposit systems, there are conflicting arguments and studies. There is strong reason to believe that voluntary aluminum buy-back centers may not survive along with curbside due to the need to keep valuable recyclables within the collection system. Additionally, depending on the degree of separation by

households, contamination from comingled streams may pose a problem for aluminum.

8. A national deposit law, properly structured, appears to be the most advantageous approach for society and the aluminum industry for recycling beverage containers. However, the aluminum industry is hard pressed to promote a deposit bill because of strong opposition from beverage interests. The beverage industry is unlikely to modify its stance, unless perhaps it can be assured lower UBC prices would translate into cost savings for them. One approach might be to share in cost savings based on some historical index for the processor's UBC price tied to merchant ingot prices. Consideration should be given to initiating low-key discussions with beverage interests on formulating a proposal advantageous to both groups. Timing may be critical since a national deposit bill is currently getting attention in Congress.

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