

## MOTIVATING BEVERAGE CONTAINER RECYCLING ON A COLLEGE CAMPUS

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### ABSTRACT

Maintaining our materials base for production in the face of declining energy and materials resources requires effective procedures to encourage recycling of scarce resources. The present research assessed the effects of a prompt, raffle and contest procedure on aluminum can recycling in college residence halls. A reversal design was used. The results showed that the prompt, raffle and contest procedure was much more effective than the baseline condition in which prompts to recycle and a convenient recycling container were provided. The implication of these findings for our general energy problem are discussed.

Imports provide more than half the aluminum, iron ore, tin, chromium, asbestos, and nearly two dozen other mineral resources used in manufacturing in the United States [1]. Since most of these materials are found in nature in an oxidized state, energy is required to reduce them to a usable form; e.g., to produce aluminum from alumina. In fact, energy use is a pervasive aspect of the entire materials use cycle, from mining and transportation and processing to distribution and disposal or reprocessing. Nearly 16 per cent of United States energy consumption is now associated with materials production [1].

Significantly, as the supplies of these resources dwindle, the proportion of energy required by the materials cycle is expected to increase, due to higher costs of extraction, transportation and processing [2]. Price increases are expected to follow increased costs.

Further, while it was once thought that abundant resources (e.g., aluminum) could be substituted readily for scarce resources (e.g., copper), it is now clear

that high energy costs are a major obstacle to most such substitutions [3]. As a result, it is likely that processes to recycle materials will be developed and/or be streamlined and that recycling will occupy an important place in the effort to maintain an expanding materials base while simultaneously reducing energy use. The advantage of recycling over virgin materials production is that energy frequently is saved by reprocessing. An extreme example is that the remelt energy for aluminum requires only 3-4 per cent of the energy required to produce aluminum from bauxite [2].

A major obstacle to recycling, however, results from problems associated with the physical recovery of usable materials from the waste disposal system. In general, two approaches have been proposed: centralized waste recovery systems in which recyclable materials are selected and sorted from other wastes upon delivery to the recovery plant, and decentralized approaches in which recyclable materials are separated from other wastes at the point of use. Hannon indicated that the latter approach is generally to be preferred because of the inefficiency and high costs of centralized systems [4]. However, point-of-use disposal is only viable if consumers can be motivated to separate recyclable from non-recyclable materials before they enter the waste disposal system.

The purpose of this research was to develop and evaluate a system designed to motivate consumers to recycle aluminum, one of our important material resources.

A major source of aluminum waste is the beverage container. In 1972 it was estimated that approximately 60 billion throw-away beer and soft drink containers were used and discarded. Many of these were aluminum or glass, both of which are recyclable materials [5]. On the local college campus, approximately 200,000 soft drink containers are sold annually in residence halls, and another 200,000 beer containers are sold in the college union. Virtually all of the soda containers and most of the beer containers are aluminum. The specific purpose of this research was to evaluate a procedure designed to motivate residents of the local college dormitories to recycle these containers.

Two general strategies to promote recycling have been reported in the literature. In one approach, prompts have been used to encourage recycling, while in the other approach, incentives (sometimes in combination with prompts) have been provided for recycling.

The effectiveness of prompts to encourage consumers to purchase soft drinks in returnable bottles was investigated in an "early" study by Geller, Farris, and Post [6]. The results showed that the use of prompts increased the percentage of returnable bottle customers by about 28 per cent.

Newspaper recycling was increased in an apartment complex when residents were prompted to recycle and when recycling containers were made more convenient [7]. Across three apartment complexes, increases in the percentage of paper recycled (compared to baseline) ranged from 50 to 100 per cent.

A two part study by Luyben and Bailey was reported in which flyers and

convenient access to recycling containers were used in two mobile home parks while an incentive procedure was added to the above procedure in two other parks [8]. The results showed that the use of flyers and increased convenience of the recycling container produced increases of 44 to 59 per cent above baseline rates when the prompts were introduced in the multiple baseline condition. The results of the second part of that study are cited below.

Another study used children to prompt apartment residents to recycle newspapers [9]. In that study children asked residents to recycle and collect newspapers. The results showed substantial increases in recycling, with a mean percentage gain relative to baseline of 397 per cent.

A recent study by Luyben, Warren, and Tallman [10] is directly relevant to the present research in that it was directed at beverage container recycling in college residence halls. A single recycling container was placed on each floor in baseline, after which seven recycling containers were distributed throughout the residence hall during the intervention phase. In addition, posters which urged recycling were strategically placed on walls and bulletin boards and weekly flyers were placed in mailboxes. The results were complicated by the fact that both steel and aluminum containers were collected, and by the multiple baseline design that was used. In general, however, clear increases in recycling were obtained when the information was introduced, although the increases varied in size from dorm to dorm and with the type of container. Also, only about 30 per cent of the cans sold were actually recovered.

While it is clear that prompting procedures have reliably increased recycling, most of the actual gains have been modest and not nearly large enough to produce significant reductions in materials use. Procedures which have used reinforcers generally have been more efficient than procedures which relied on prompts.

In the study mentioned above to increase newspaper recycling in mobile home parks [8], substantial increases in recycling were obtained when toy prizes were offered to children for newspapers recycled. The percentage increases over baseline were 60 per cent and 154 per cent in the two parks, respectively. These increases were much greater than the increases obtained in the other two parks in which only prompts were used.

A recent study by Geller compared the effects of baseline, contest and raffle conditions on recycling in a college dormitory [11]. In the contest strategy the dorm which recycled the most paper received a cash prize, while in the raffle condition participants received a ticket for each instance of recycling, exchangeable for goods or services provided by local merchants. The results showed that the incentive conditions produced a 56 per cent increase in the number of pounds recycled compared to baseline. Raffles and lotteries have been effectively used in other studies, particularly in efforts to reduce littering [12, 13].

The present study used a package program to increase recycling. The

package consisted of prompts, a lottery and a contest to motivate beverage container recycling in college residence halls.

## METHOD

### Subjects and Setting

Three "low rise" undergraduate residence halls were selected as target dorms. The criteria for selection were that the three residence halls were virtually identical in design (rooms were arranged on both sides of a central corridor on three floors). Also, they were roughly equivalent in population, housing approximately 190 male and female students, most of whom were underclassmen.

Five other residence halls, four academic buildings and the college library were used as well.

Of particular interest here was the fact that each dorm contained a single soft drink vending machine which was located either in the lounge on the main floor, or in the hallway just outside the lounge.

### Experimental Conditions

*Baseline*—During baseline phases a single recycling container was placed adjacent to the soft drink vending machine in each residence hall. A second recycling container was placed in the resident assistant's (R.A.) office in each dorm, also located on the main floor. The residence assistants were available in this office to receive recycled containers from students from 8 p.m. until 12 p.m. Sunday-Thursday, and from 9 p.m. to 1 a.m. Friday and Saturday.

A yellow, 20 inch × 13 inch poster which displayed the message "Please Recycle Cans" was attached to the front of the soft drink vending machine at about eye level. Also a single recycling container was placed adjacent to the soft drink vending machine in each of the other non-target buildings in the study, with a corresponding poster.

The recycling containers were square, white Rubbermaid receptacles (Model #3569) with swing top lids. The message "Please Recycle Cans Here" was stenciled in green letters (about 1 inch high) on all four sides of each lid. The recycling containers were distinctly different from the round, grey, lidless trash containers used by housekeeping personnel.

### Intervention

A combination of prompts, a lottery, and a contest procedure was used in the intervention phase. At the beginning of this phase a flyer was placed in each mailbox in the three target dorms. The flyer informed the residents that recycling saves energy and also contained the announcement that a recycling

lottery and contest between the three target dorms was beginning. The rules for participation also were described. In the contest a lottery was to be held each week in each of the three dorms. The winner of the lottery in the dorm which recycled the largest number of cans would receive a minimum of \$8.00, plus 60 per cent of additional revenues from the sale of beverage containers collected during that week. The winners of the lotteries in the second and third ranking dorms received \$3.00 and \$2.00, plus 25 per cent and 15 per cent of additional revenues, respectively. (The cash prizes were obtained from the sale of beverage containers received from all twenty-two recycling containers distributed on campus.)

To participate in the lottery, residents were required to bring two beverage containers to the R.A. office during office hours. Upon receipt of two containers, each resident received one lottery ticket. The participant was asked to write his or her name and room number on the ticket and to deposit the ticket in a specially marked lottery container.

Posters which said "Recycle Cans! Save energy and win money!" also were placed on every floor.

In addition, a feedback poster was placed in the window of the resident assistant's office on which was displayed a bar graph which showed the number of cans recycled in each dorm, the names of the winners, and the dollar values won each week.

### **Data Collection Procedures**

Between 8 p.m. and 9 p.m. each evening, observers collected and counted the cans received in the three target dorms. (Collections in the other buildings were made between 5 p.m. and 7 p.m.) Separate counts were made of steel and aluminum containers. The containers which were collected were stored and then, once each week, transported to a local recycling plant where they were sold.

Exact records also were kept of the amount of time required to collect the cans, deliver flyers, construct and maintain posters, clean recycling receptacles and transport beverage containers to the recycling plant.

### **Experimental Design**

A reversal design was used in which baseline was followed by the implementation of the intervention phase. A subsequent reversal was followed in turn by a reimplementation of the intervention.

*Reliability*—At various times during the first seven weeks of the experiment a second observer independently counted the containers collected from each building during that day. Both because perfect agreement was obtained on all of the checks, and because a change in the storage system made reliability checks

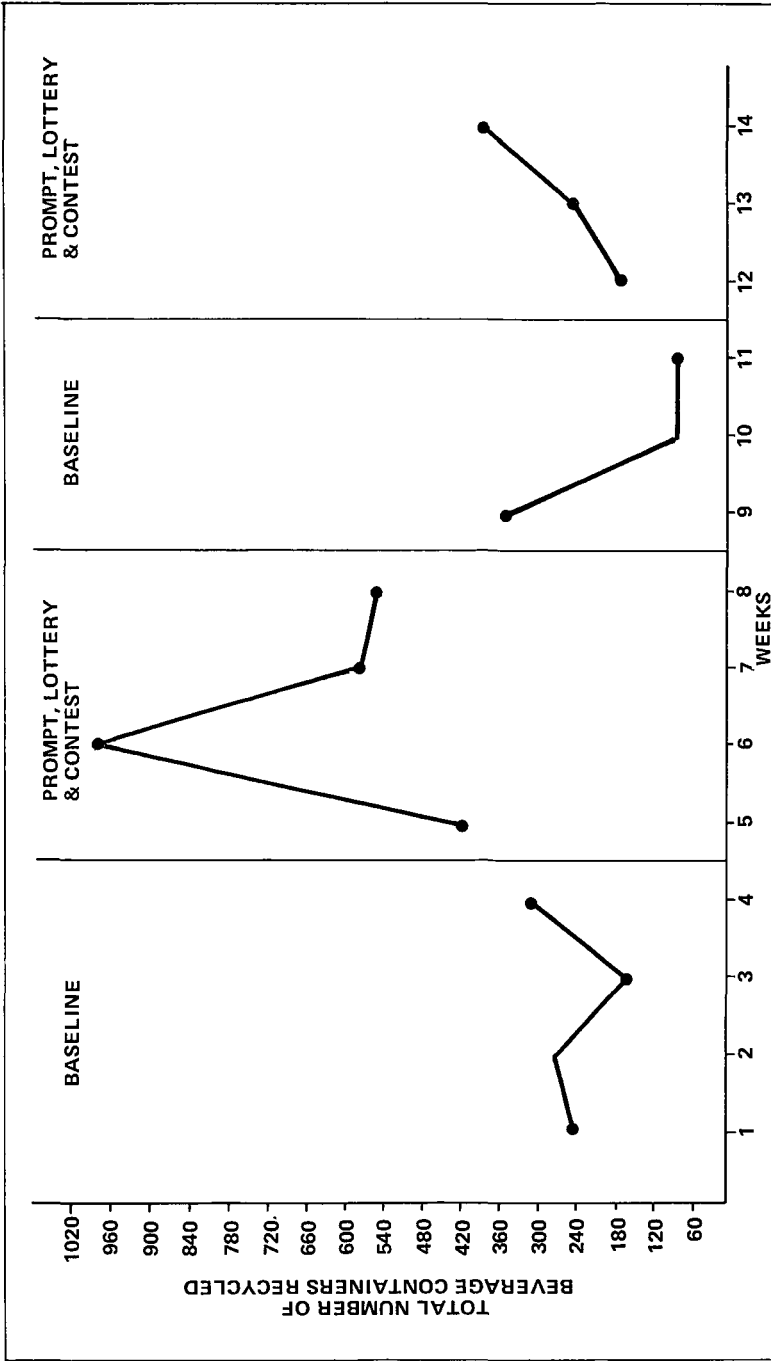


Figure 1. The total number of beverage containers recycled in all three target residence halls across the four phases of the study.

difficult, reliability assessments were not obtained during subsequent weeks of the study.

## RESULTS

Figure 1 presents the total number of beverage containers recycled each week across the four phases of the study. During the four weeks of baseline, these totals ranged from 166 to 319 containers per week. However, when the intervention phase was introduced there was a modest increase to 426 containers during the first week, followed by a much greater increase (to 986 containers) the following week. These data then "settled" at about 575 containers per week for the last two weeks during this phase, or about 325 containers more than were obtained during the average week during baseline. The reversal to baseline initially produced a modest decline to 350 containers during the first week of this phase, followed by two weeks in which the recycling rates continued to decline to ninety-three and eighty-seven containers per week, or less than half the initial baseline rate. The reimplementation of the intervention phase reversed this trend, with successive increases in the number of containers recycled during the next three weeks. These data show an upward trend with 179, 248 and 394 containers recycled each week. It is interesting to note that the last data point in this phase is higher than the terminal data points in either of the preceding baseline phases, although these data are much lower than were the rates achieved during the initial intervention phase.

A more detailed presentation of the data is given in Table 1. In this table the mean and total numbers of containers recycled per week are presented and are broken down by type of container (soft drink or beer), and by location in the residence halls (lobby or R.A. office) across phases of the experiment. Inspection of these data show that there were substantial increases in mean numbers of containers recycled in the R.A. offices when the intervention was begun. For the two baseline and intervention phases, the mean numbers of soft drink containers recycled increased from 25 and 46 to 222 and 105, respectively. Similarly, the mean numbers of beer containers recycled in the R.A. offices increased from 13 to 18 during the two baselines to 304 and 118 after the interventions, respectively.

Inspection of the data from the lobbies shows inverse changes to those obtained in the R.A. offices. Reductions in the mean numbers of containers recycled in the lobbies were observed in each instance when the intervention phase was implemented.

To examine the hypothesis that the increases in recycling found in the R.A. offices were due merely to a shift in the location of recycling, but not in the total amount of recycling, a comparison of the total numbers of containers recycled across both baseline phases was made with comparable data for the intervention phases. The results of this analysis show that the total number of

Table 1. The Mean and Total Numbers of Soft Drink and Beer Containers Recycled Each Week in the Lobbies and Residence Assistant (R.A.) Offices Across Phases of the Study<sup>a</sup>

		<i>Baseline</i>	<i>Prompt, Lottery and Contest</i>	<i>Baseline</i>	<i>Prompt, Lottery and Contest</i>
Soft Drink Containers	Lobby	106 (423)	99 (296)	74 (223)	36 (107)
	R.A.	25 (100)	222 (888)	46 (139)	105 (315)
Beer Containers	Lobby	108 (432)	41 (162)	38 (114)	15 (44)
	R.A.	13 (53)	304 (1214)	18 (54)	118 (355)
Subtotals	Lobby	214 (855)	115 (458)	84 (337)	31 (122)
	R.A.	38 (153)	526 (2102)	48 (193)	168 (670)
Grand Total		252 (1008)	640 (2560)	177 (530)	264 (792)

<sup>a</sup> The total numbers of cans recycled in each phase are presented in parentheses.

soft drink containers nearly doubled when the intervention phase was in effect (885 containers were collected in baseline and 1606 during the intervention phase) while the number of beer containers recycled more than doubled (653 and 1775 containers, respectively).

A curiosity in the data is that the numbers of cans collected in the second baseline and intervention phases were less in both cases than were recycled in the first intervention phase. To account for changes in drinking habits over the semester, the numbers of soft drink containers sold in each dorm during each phase was obtained from the vending distributor. A percentage of the number of containers recycled of those sold was then computed. These data are presented in Table 2.

The data in Table 2 show that higher percentages of the number of containers sold were recycled in the intervention conditions than in baseline phases. The total percentage of containers recycled of the number sold increased from



Table 2. Percentages of Soft Drink Containers Recycled of Those Sold in the Target Residence Halls, by Location and Across Phases of the Study

	<i>Baseline</i>	<i>Prompt, Lottery and Contest</i>	<i>Baseline</i>	<i>Prompt, Lottery and Contest</i>
R.A. Office	9	73	12	55
Lobby	29	30	45	28
Total Percentage	38	103	57	83

38 per cent during baseline to 103 per cent during the first intervention phase. Reversal produced a decrease to 58 per cent, while reinstatement of the intervention produced an increase to 83 per cent. (Because containers sold in other dorms could be exchanged for a lottery ticket, it was possible to recycle more than 100 per cent of the number of containers sold in a given dorm.)

## DISCUSSION

The purpose of this study was to assess the effects of an incentive program on recycling of beverage containers. These data provide clear evidence that recycling of aluminum beverage containers was substantially increased when the program was in effect. Representing the findings both as the total number of containers recycled and as the percentage of containers recycled of the total number sold each provide support for this conclusion. Because the number of beverage containers sold in dorms declines from September to December, the percentages are necessary to show the proportion of containers recycled of the number available.

Recognition of the changing rate of sale of containers over the semester (and therefore of the "supply") helps to account for the fact that the high levels of total containers recycled in the first intervention phase were not replicated entirely when the prompt, lottery and contest was introduced the second time. However, the trends observed clearly were in that direction and it is predicted that high levels would have been achieved had it been possible to continue the experiment longer.

A second reason a complete replication was not achieved was that some resident assistants were not aware that the program had been reimplemented and consequently did not give lottery tickets to persons who brought containers for recycling. If a reversal of conditions had not been necessary it would have been possible to establish the long term effects of the program more clearly.

On a larger scale, it is important to develop procedures which produce

high rates of resource recovery. These data provide clear evidence that a procedure which uses incentives is much more effective than appeals based on long term energy needs or upon "good will." What are needed now are legislation and programs which arrange reward contingencies such that recycling is rewarded substantially. These data provide encouragement that we can "get people involved" if we carefully arrange the contingencies.

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