1996 RIGID PLASTIC PACKAGING CONTAINER (RPPC) POLYETHYLENE TEREPHTHALATE (PETE) RECYCLING RATE

DEFINITION of RIGID PLASTIC PACKAGING CONTAINER

The definition of "RPPC" used to calculate the recycling rate is taken from the regulations adopted by the Board on June 23, 1994 and reflects Public Resources Code (PRC) section 42301:

> "Rigid plastic packaging containers" means any plastic package having a relatively inflexible finite shape or form, with a minimum capacity of eight fluid ounces or its equivalent volume and a maximum capacity of five fluid gallons or its equivalent volume, that is capable of maintaining its shape while holding other products, including, but not limited to, bottles, cartons, and other receptacles, for sale or distribution in the state."

DEFINITION of POLYETHYLENE TEREPHTHALATE (PETE) RECYCLING RATE

The definition of "recycling rate" is taken from the RPPC regulations:

> "The proportion, as measured by weight, volume, or number that all rigid plastic packaging containers, notwithstanding the size limitations set forth in §17943 (b)(30) or the exemption status as set forth in §17944.5 (a) of this Article, in the aggregate, sold, or offered for sale in the state are being recycled in a given calendar year."

The recycling rate calculation (method) is not limited by the size limitations or exemptions [§ 17944.5 (a)] that define a RPPC. The PETE recycling rate will include all PETE rigid plastic packaging containers, regardless of size and exempt only those RPPCs which are those produced in California and shipped out of the state (with product) and containers manufactured for use in the shipment of hazardous materials.

RECYCLING RATE EQUATION

The formula for calculating PETE RPPC recycling rate is as follows:

$$\text{PETE RPPC Recycling Rate} = \frac{\text{PETE RPPC Tonnage Recycled in CA}}{\text{PETE RPPC Tonnage Sold in CA}} * 100$$

The data for estimating the numerator and denominator are referenced below. A description of data sources used to determine the PETE recycling rate will be presented along with data representing the year 1996.

A. Units for Calculating Recycling Rates

The recycling rate calculation will be based on weight since existing statistics for generation, recycling, and landfilling of plastics are also documented by weight and consistent with measurement methods used by the recycling and packaging industries, AB 939, and AB 2494 reporting requirements. Department of Conservation data (AB 2020), while provided as container counts, is converted to weight.

B. Sources of PETE Recovery Data

Numerator: PETE RPPC Tonnage Recycled in California

The numerator (PETE RPPC tonnage recycled in California) was estimated using statistics from the following data set:

- Department of Conservation (DOC), Division of Recycling, California Redemption Value (CRV) plastic soda beverage containers, and New Postfilled containers.

The Department of Conservation's Division of Recycling monitors sales and returns of plastic beverage containers regulated by AB 2020, the Beverage Container Recycling and Litter Reduction Act. Statistics are maintained and published by container count in DOC's "Biannual Compendium of Beverage Container Sales, Returns and Redemption & Recycling Rates". Six month summaries of sales and recycled are published in March and September. Thus, the report documenting 1996 was published in March 1996 and provides the number of PETE plastic soft drink containers sold and recycled in California.

The biannual report also includes the number of PETE new postfilled containers (non-soft drink containers) recovered in California. The data for recovered non-CRV postfilled containers (known as "custom containers") will also be included in the numerator.

The DOC reports the number of plastic soda beverage containers and postfilled containers recovered in California. DOC also reports the number of recycled soda beverage and postfilled containers per pound. The number of recycled containers per pound are taken from samples at recycling centers. To estimate the <u>tons</u> of recycled soda beverage and postfilled containers, the number of containers recovered are divided by the number of containers per ton.

9-24

The following three equations indicate how DOC PETE recovery data is used to calculate CRV soda recovery for 1996.

Equation (1) estimates the tons of DOC CRV soda beverage containers recovered in California.

(1) CRV Soda = Soda Btl ÷ Soda Btl/lb ÷ lbs/ton

Where:

CRV Soda	=	tons of CRV soda beverage containers recovered in California in one calendar year,
Soda Btl	=	number of CRV soda beverage containers recovered in one calendar year as reported by DOC,
Soda Btl/lb	=	number of CRV soda beverage containers in one pound as reported by DOC,
lbs/ton	=	number of pounds per ton (2000).

Equation (1) is evaluated using DOC CRV recovered soda beverage container data for 1996.

$$\text{CRV soda} = \frac{607{,}521{,}858 \text{ containers}}{8.7 \text{ containers per pound}} \div \frac{2000 \text{ lbs}}{\text{ton}}$$

$$= 69{,}830{,}099 \div 2000$$

$$= 34{,}915 \text{ tons}$$

The results of equation (1) indicate that 34,915 tons of CRV PETE soda beverage containers were recovered in California in 1996.

Equation (2) estimates the tons of DOC new postfilled (custom) containers recovered in California.

(2) DOC Post = New Post ÷ New Post/lb ÷ lbs/ton

Where:

DOC Post	=	tons of new postfilled containers recovered in California in one calendar year,
New Post	=	number of new postfilled containers recovered in one calendar year as reported by DOC,

New Post/lb = number of postfilled containers in one pound as reported by DOC,

lbs/ton = number of pounds per ton (2000).

Equation (2) is evaluated using DOC recovered new postfilled container data for 1996.

$$\text{DOC Post} = \frac{127{,}904{,}829 \text{ containers}}{7.4 \text{ containers per pound}} \div \frac{2000 \text{ lbs}}{\text{ton}}$$

$$= 17{,}284{,}436 \div 2000$$

$$= 8{,}642 \text{ tons}$$

The results of equation (2) indicate that 8,642 tons of new postfilled containers were recovered in California in 1996.

Using the results of equations (1) and (2), equation (3) will provide the total tons of DOC PETE containers recovered in California.

(3) TL Rec = CRV Soda + DOC Post

Where:

TL Rec = total tons of DOC PETE containers recovered in California in one calendar year;

CRV Soda = tons of CRV soda beverage containers recovered in California in one calendar year (from equation 1);

DOC Post = tons of new postfilled containers recovered in California in one calendar year (from equation 2).

Using the values estimated in equations (1) and (2), equation (3) is evaluated. The results of equation (3) indicate that 43,557 tons of PETE containers were recovered in California in 1996.

TL Rec = 34,915 + 8,642

= 43,557 tons

C. SOURCES OF PETE RESIN SALES DATA

Denominator: PETE RPPC Tonnage Generated (sold) in California

The denominator, PETE RPPC tonnage generated in California, is determined by integrating statistics from the following two data

sets:

- DOC CRV plastic soda beverage container sales data, and
- National PETE custom bottle resin sales data published in the periodical *Modern Plastics*.

1. Department of Conservation Data

As referenced above, the DOC tracks the number of CRV plastic soda beverage containers sold in California. Statistics are maintained and published by container count in DOC's "Biannual Compendium of Beverage Container Sales, Returns and Redemption & Recycling Rates." Year-end summaries of sales are published in March of the following year. Information from DOC will provide the container count of plastic soda beverage containers sold in California in a calendar year. To estimate the tons of soft drink containers sold in California, the number of containers sold is divided by the number of soft drink containers per pound. DOC estimates the number of recycled soda beverage and postfilled containers per pound. These containers may contain contaminants (e.g., rings, labels, liquid, etc.) and may not accurately represent the number of new containers per pound. If new containers were used, the estimate of containers per pound would most likely be greater than recycled containers per pound. The resulting sales tonnage, using new container per pound estimates, would also likely be less than those presented. The DOC is attempting to investigate the weight of new containers. As DOC revises its container per pound estimate, it will be used in the calculation.

Equation (4) estimates the tons of DOC CRV soda beverage containers sold in California.

(4) CRV Soda Sales = Soda Btl Sales ÷ Soda Btl/lb ÷ lbs/ton

Where:

CRV Soda Sales	=	tons of CRV soda beverage containers sold in California in one calendar year,
Soda Btl Sales	=	number of CRV soda beverage containers sold in California in one calendar year as reported by DOC,
Soda Btl/lb	=	number of CRV soda beverage containers in one pound as reported by DOC,
lbs/ton	=	number of pounds per ton (2000).

Equation (4) is evaluated using DOC CRV soda beverage container sales data for 1996.

$$\text{CRV Soda Sales} = \frac{1{,}028{,}068{,}545 \text{ containers sold}}{8.7 \text{ containers per lb}} \div \frac{2000 \text{ lbs}}{\text{ton}}$$

$$= 118{,}168{,}798 \div 2000$$

$$= 59{,}084 \text{ tons}$$

The results of equation (4) indicate that 59,084 tons of soda beverage containers were sold in California in 1996.

2. *Modern Plastics* Data

National resin sales are published annually in the January edition of *Modern Plastics*, a magazine published by McGraw-Hill. The Society of Plastic Industries (SPI), through its Committee on Resin Statistics (CRS), establishes the data collection methodology and data review. The survey is developed and conducted by the firm Ernst & Young. The data presented in *Modern Plastics* are based on SPI data. In order for *Modern Plastics* to have year-end totals prepared for their January publication, fourth quarter sales are based on projections. These projections are adjusted in the following year's edition. Thus, the January 1997 issue presents sales for 1996 (incorporating a projected fourth quarter) and includes the adjusted resin sales for 1995.

Sellers of resin report monthly sales by weight in the following ways: by resin type; by amount sold for various applications within a resin type; and by the amount sold in major resin markets, including for packaging and containers. Monthly sales reported by each company are cross checked with the company's sales for the previous month and with sales for the same month, one year prior. Totals are not adjusted for non-reporting resin sellers.

The packaging and container statistics assembled by Modern Plastics identify the amount of each resin type sold for producing containers, closures, coatings, and films. Tonnage estimates representing the amount of PETE custom bottle resign sales will be obtained from the category PETE custom bottles. Equation (5) incorporates national custom bottle resin sales data for 1996 into the methodology.

(5) US CBottle = Tons of PETE custom bottle resin sales in U.S.

= 541,000 tons

The national custom bottle resin sales tonnage will be extrapolated to California based on California's share of US population and retail sales. This procedure is presented in the following section.

Extrapolation of U.S. Custom Bottle Resin Sales Data to California

The next step to estimate California generation of PETE custom bottle resin sales is to prorate nationwide custom bottle resin sales to California. The scaling factor for this proration is based on equal weights of California population and economic activity compared to the U.S. This is calculated in equation (6).

$$\text{CA Share} = 0.5\,\frac{\text{CA Pop}}{\text{US Pop}} + 0.5\,\frac{\text{CA RS}}{\text{US RS}} \qquad (6)$$

Where:

CA Share = scaling factor to apportion US custom bottle resin sales to California,

CA Pop = California population in a calendar year,

US Pop = US population in a calendar year,

CA RS = dollar value (millions) of non-durable good retail sales in California in a calendar year,

US RS = dollar value (millions) of non-durable good retail sales in the US in a calendar year.

Population totals for California are taken from estimates prepared by the State of California, Department of Finance, Demographic Research Unit. Estimates of U.S. population are prepared by the U.S. Department of Census and available from the Department of Finance. Estimates of nondurable good retail sales are taken from the U.S. Department of Commerce, Current Business Reports.

Equation (6) is evaluated using population data and U.S. Department of Commerce non-durable goods retail sales data for 1996.

$$\text{CA Share} = 0.5\ \frac{32{,}609{,}000^{1}}{266{,}130{,}000^{3}} + 0.5\ \frac{\$158{,}010^{2}}{\$1{,}457{,}818^{4}}$$

$$= 0.5(0.123) + 0.5(0.108)$$

$$\text{CA Share} = 0.116$$

California custom bottle resin sales are estimated by multiplying the tonnage of national custom bottle resin sales by CA Share; the resulting tonnage is then multiplied by 0.99 to account for a 1 percent resin loss that occurs during the container manufacturing process (Franklin Associates, 1992). This calculation is presented in the equation (7).

(7) CA CBottle = US CBottle * CA Share * 0.99

Where:

CA CBottle	=	tons of PETE custom bottle resin sales in California in one calendar year,
US CBottle	=	tons of PETE custom bottle resin sales in U.S. in one calendar year,
CA Share	=	scaling factor to apportion US custom bottle resin sales to California,
0.99	=	1 percent resin loss factor.

Equation (7) is evaluated using the scaling factor estimated from equation (6) and resin sale statistics taken from Modern Plastics for 1996.

CA CBottle = 541,000 * 0.116 * 0.99

= 62,128 tons

---

1 Conversation with analyst at the Department of Finance, Demographic Research Unit, May 1997.

2 Conversation with analyst at the U.S. Department of Commerce, May 1997. ($million).

3 Conversation with analyst at the Department of Finance, Demographic Research Unit, May 1996.

4 Conversation with analyst at the U.S. Department of Commerce, May 1997. ($million).

The results indicate that 62,128 tons of custom resin were sold in California in 1996.

The last step is to add the tons of DOC CRV soda beverage containers sales to the tons of custom bottles sold in California. Equation (8) presents this calculation.

(8) TL Sold = CA CBottle + CRV Soda Sales

Where:

TL Sold	=	total tons of PETE containers sold in California in one calendar year,
CA CBottle	=	tons of PETE custom bottle resin sales in California in one calendar year,
CRV Soda Sales	=	tons of CRV soda beverage containers sold in California in one calendar year.

Equation (8) is evaluated as:

TL Sold = 62,128 tons + 59,084 tons

= 121,212 tons

Equation (8) indicates that 121,212 tons of PETE were sold as containers in California in 1996.

PETE RATE CALCULATION 1996

The PETE recycling rate (percent) is calculated in equation (9) using information taken from equations (3) and (8) above.

(9) PETE Rate(%) = TL REC ÷ TL Sold * 100

Where:

PETE Rate(%)	=	recycling rate percentage for PETE RPPC containers representing one calendar year.
TL REC	=	total tons of DOC PETE containers recovered in California in one calendar year (from equation 3).
TL Sold	=	total tons of PETE containers sold in California in one calendar year (from equation 8).

Equation (9) is evaluated using total PETE recovery and sales data for California for 1996.

$$\text{PETE Rate } \% = 43{,}557 / 121{,}212 * 100$$

$$= 35.9 \%$$

The results of equation (9) indicate that the RPPC recycling rate for PETE containers is **35.9%** in **1996**.

9-32