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**DEVELOPMENT OF A TRACKING METHOD TO RECORD THE GENERATION,
USE, AND REUSE OF PACKAGING MATERIALS FOR THE PURPOSE OF
REPORTING TO ENVIRONMENTAL RECOVERY ORGANIZATIONS**

A Thesis

Presented to

The Faculty of the Division of Technology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Masters of Arts Industrial Studies

by

Frida A. Droorian

August, 1995

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Abstract

DEVELOPMENT OF A TRACKING METHOD TO RECORD THE GENERATION, USE, AND REUSE OF PACKAGING MATERIALS FOR THE PURPOSE OF REPORTING TO ENVIRONMENTAL RECOVERY ORGANIZATIONS

by Frida A. Droorian

This study addresses data gathering needs in regards to packaging used to distribute products in the global market. It examines the possibility of combining the needs of different packaging industries into one workable solution. A detailed study has been carried out on different national and international organizations that have addressed any environmental regulations regarding packaging.

The research reveals that there are a number of national and international organizations which are actively enforcing regulations pertaining to packaging. Information obtained from these sources formed a Packaging Data Tracking Worksheet, which is presented in the study as a solution.

This research can be used as a reference guide by packaging professionals and companies that ship products to the global market.

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Contact me at (408) 243-3354 with requests for more information or inquiries.

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Chapter 1

Problem Definition

Introduction

Current environmental concerns of the global market have necessitated new laws and regulations set forth by federal and local governments throughout the world. The steady growth of solid waste over the past few decades has been paralleled by exponential growth of environmental legislation. As disposal options gradually diminish and regulations become more severe, the cost of compliance to sound packaging increases. Many manufacturers invest millions of dollars on environmentally-related activities. Fortune 500 companies alone are estimated to spend \$46 billion or more each year on environmental, health and safety issues. Environmental regulations now have a great impact on business location decisions.

During the past thirty years, waste generation in the U.S doubled from 88 million tons in 1960 to nearly 180 million tons in 1988 (EPA, June, 1990), or 4 pounds of waste per person per day. This number increased to 5.2 pounds per person in 1990. Americans produce 50 percent more waste per person than the Japanese and about 300 percent more than Germans.

In 1989 Franklin Associates reported that one third of the 160 million tons of waste generated by households and municipalities each year is packaging.

This was still true in 1990 (see Figure 1), according to Franklin Associates' study (cited in Gainer & Associates, 1994): Americans discarded 47.4 million tons of packaging, compared to 24.2 million tons in 1960.

(Gainer & Associates, 1994, p.3)

Figure 1. The percentages of packaging waste in 1989

Figure 2 illustrates a product process flow or life cycle process. Packaging development begins at the initial phase, which is the advanced product planning and specifications phase. The cycle of activities for package design and development has the same pattern as the product life cycle process. Environmental concerns and regulations are addressed in the phase out and disposal stage of the package.

Statement of the Problem

Some packaging professionals have taken the initiative to develop methods to record the amount of packaging they produce. However, these methods are not based on a standardized format; each company creates a method based on its involvement with specific markets.

The problem is that there are no clear guidelines for the type of packaging data that is necessary to track and record to be used by packaging professionals. Companies

Figure 2. The system life-cycle process

(Blanchard, & Fabrycky, 1991,p.22)

seeking compliance with world-wide regulations are unaware of the type of data they must track in order to report as required. The recent environmental concerns of the global market have given rise to this new problem.

This study has three purposes:

- (1) To establish the names of organizations that are currently enforcing any kind of environmental regulations for packaging;
- (2) To research the nature of these organizations and the types of data that currently, or in the future, would be necessary for compliance purposes;
- (3) To develop a standardized method of collection data for packaging materials that could be used by different industries.

In order to report the data to trading partners, the right type of data has to be tracked, documented, and retrieved as necessary.

Statement of the Sub Problems

Several questions related to the main problem are of interest:

- (a) Do companies currently have a method that they use to collect data on the packaging material which they generate?
- (b) Who are these companies and what is their method?
- (c) Who are the organizations within and outside the U.S that require any type of reporting and what are they asking for?
- (d) If companies are not being asked for any data collection, do they anticipate a need for it in the future?

Research Question

Can guidelines be developed for tracking packaging data and used by different industries seeking compliance with national and international regulation?

The Delimitation

The initial survey results will identify these organizations whose environmental recovery activities impact companies that use packaging for distribution of their products.

The Definition of Terms

Bituminous. A material containing bitumen. It is related to a mineral coal and when burned, produces a smoky, yellow flame.

Distributor. “Any person, firm or corporation who takes title to goods purchased for resale” (CONEG Source Reduction Council, 1989, p.2). This includes organizations that bring products into circulation and pass them on to a third party. There could be several distributors if products pass through several stages of distribution.

Leachate. “Liquid that has percolated through solid waste or another medium and has extracted, dissolved, or suspended materials from it, which may include potentially harmful materials. Leachate collection and treatment is of primary concern at municipal waste landfills” (Institute of Packaging Professionals, 1991, p. 14).

Manufacturer. as used in this paper, Any person, firm, company, or corporation that makes packages, packaging, or packaging components. Examples of manufacturers include a producer of glass bottles, steel for drink cans, board for cartons, or plastic granules used in packaging.

Municipal Solid Waste (MSW). Mainly waste that is generated by households, street refuse, commercial establishments, and institutions. Industrial process waste, demolition wastes, agricultural wastes, mining wastes, abandoned automobiles, ashes, and sewage sludge are excluded.

Package. “A container providing a means of marketing, protecting, or handling a product and including a unit package, an intermediate package, and a shipping container as defined in ASTM D996” (CONEG Source Reduction Council, 1989, p.2). Carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags, and tubs are considered parts of packages.

Packaging. Any part of a product package including, but not limited to, any interior or exterior cushioning, weatherproofing, coating, closure, ink, label, dye, pigment, adhesive, or other additives.

Packaging Component. “Any individual assembled part of a package such as, but not limited to, any interior or exterior blocking, bracing, cushioning, weatherproofing, exterior-strapping, coatings, closures, inks and labels. Tin-plated steel that meets the American Society for Testing and Materials (ASTM) specification A-623 shall be considered as a single package component. Electro-galvanized coated steel and hot dipped coated galvanized steel that meets the American Society for Testing and Materials (ASTM) specification A-525 and A-879 shall be treated in the same manner as tin-plated steel” (CONEG Source Reduction Council, 1989, p.2).

Petitioner. A manufacturer or producer petitioning for an exemption to a rule.

Postconsumer Recycled Materials. "materials produced from products generated by a business or consumer which have served their intended end uses, and which have been separated or diverted to form solid waste for the purpose of collection, recycling and disposition" (Institute of Packaging Professionals, 1991, p. 16).

Pyrolysis. "the chemical decomposition of an organic material by heat in an oxygen deficient controlled environment. The process results in destructive distillation and formation of combustion and formation of combustible (hydrocarbon) gases, oils, char, and mineral matter" (p. 17).

Recyclable. "waste material which is capable of being processed for subsequent use. Materials are only recyclable if there is a widely available economically viable collection, processing and marketing system for the material" (p. 17).

Recycled content. The portion of a package's weight that contains recycled materials.

Recycled. Material which has already been sorted from a waste product and processed in order to regain material.

Recycling. "any process by which waste, or materials which would otherwise become solid waste, are [sic] collected, separated, or processed and reused or returned to use in the form of raw materials or products" (p. 18).

Refillable. A container which is returned at least five times to the product manufacturer for refill with the product originally contained in the package.

Reuse. To use a product more than once in its same form and for the same purpose. An example is the soft drink bottle that is reused when it is returned to the bottling company for refilling.

Reusable. “when applied to packaging, reusable means a container, package, or component of the container or package (e.g. a foam cushion, plastic bag, etc.) is capable of being used more than one time, without being significantly changed (i.e., used in its same physical form, requiring only minor repair or cleaning.)” (Institute of Packaging Professionals, 1991, p.22).

Reuse Life. Refers to the number of times an item can be reused before the item is disposed of. The life can be expressed in months, years, or its number of reuses.

Rigid plastic packaging container. 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 (California Integrated Waste Management Board Legislative Office, 1993).

Slipsheet. A material handling device used for loading, stacking and unloading. It is usually made of solid fiber or plastic.

Sludge. A mixture of liquid and solid residue remaining from the treatment of municipal and industrial water and wastewater.

Solid waste management. The systematic control of the cycle of solid waste

generation, storage, collection, transport, separation, processing, recycling, recovery and disposal.

Solid waste. Useless or discarded solid materials with insufficient liquid content to be free flowing.

Source reduction. Collection activities and actions that, in combination or as one process, lead to a reduction in the amount of solid waste (Gillian, 1990). Also defined by the Institute of Packaging Professionals (1991), as “(1) the design and manufacture of products and packaging with minimum toxic content, minimum volume of material, and/or a longer useful life, and (2) The elimination of packaging or reduction of the weight, volume and/or the toxicity of packaging" (p. 23).

Suppliers. The organizations who provide packaging or packaging components to a manufacturer.

Abbreviations Used in This Study

ASTM	American Society for Testing and Materials
ARA	Altstoff Recycling Austria
Board	California Integrated Management Board
CAWF	California Against Waste Foundation
CFCs	Chlorofluorocarbons
CIPSI	Canadian Industry Packaging Stewardship Initiative
CIPSO	Canadian Industry Packaging Stewardship Organization
CONEG	Coalition of Northeastern Governors

DAVR	Deutsche Aluminium Verpackung Recycling GmbH
DEP	Department of Environmental Protection
DLS-PACK	Delivery Logistics Service Pack
DSD	Duales System Deutschland
EC	European Community
EE	Eco Emballage
EPA	Environmental Protection Agency
EU	European Union
HP	Hewlett-Packard
IBM	International Business Machines
ISO	International Organization for Standardization
IOPP	Institute of Packaging Professionals
ECO-Emballage	French Recycling Organization
EPM	Environmental Priority Material
EPS	Expanded polystyrene
MOEE	Ministry of Environment and Energy
MPCA	Minnesota Pollution Control Agency
MSW	Municipal Solid Waste
NERC	Northeast Recycling Council
NOPRP	National Office Paper Recycling Project
OCC	Old Corrugated Containers

OEA	Office of Environmental Assistance
OSPIRG	Oregon Public Interest Research Group
OWM	Office of Waste Management
PMDB	Packaging Material Data Base
PMDS	Packaging Material Data Sheet
PPM	parts per million
P2C2	Protective Packaging of Computer Components
R3P2	Reduction, Reuse, and Recycling of Protective Packaging
SCOPE	Select Committee on Packaging and the Environment
SMART	Saving Money and Reducing Trash
SPI	Society of Plastics Industry
SRTF	Source Reduction Task Force
TRTRAK	Packaging Materials Tracking
VdW	Verband der Wellpappen
VfW	Vereinigung für Wertstoffrecycling GmbH
VGK	Verwertungsgesellschaft gebrauchte Kunststoffverpackungen mbH

Assumptions

This study assumes that the challenges faced by the survey sample are the same that are faced by companies not included in the survey. It is assumed that the tool developed as the outcome of this study will be a workable model for the survey non-participants as well.

The Significance of the Study

The outcome of the study will present a standard format that could be utilized by packaging professionals who have to deal with gathering and reporting of packaging data to environmental recovery organizations.

Another significance of this type of data collection is in the procurement area. Calculations based on the study's data could determine if savings would result from a material change or redesign. Marketing and public relations can also benefit by basing their advertising claims on the collected data. In addition, this study may alert organizations that are not currently aware of the upcoming environmental legislation to new responsibilities.

Chapter 2

Review of the Related Literature

The approach to Municipal Solid Waste (MSW) used in the U.S is different from that used in European countries. Figure 3 shows how the U.S and Europe differ in their approach towards environmental and MSW issues. The American approach focuses on the consumer side, and the European approach uses a third- party collaborator.

Figure 3. The American and European approach to Packaging waste recovery

The idea of "source separation," the segregation of waste materials for recycling, has existed in the United States for some time. In 1979, Denis Hayes, a senior researcher at Worldwatch Institute, recommended several ways in which the government might ease the shift to an economy based on secondary materials. Hayes recommended a change in regulations that would result in lower railroad rates for the transport of secondary material

than for virgin material. He also proposed taxes on the amount of virgin material used in a product and the possible toxic emission, pollutants, land loss, resource depletion, and disposal of material after use.

Data Collection

The importance of accurate data collection was studied at the state recycling level by Northeast Recycling Council (NERC). The study focused on the difficulties states encounter when trying to determine the sources and quantities of recyclable material, and how the collected data affect market development in the region (Rabasca, 1993). The study showed that there are inconsistencies in data collection from state to state. They reported that "inaccurate data on quantities recovered for recycling can lead to poor program planning, meaningless recycling rates, and ineffective market development strategies" (p. 1). The NERC study was a pilot conducted by the Council of State Governments in Lexington, Kentucky.

R3P2 Committee

In 1990, a task group inside P2C2 (Protective Packaging of Computer Components) of IOPP took on the task of applying the source reduction, mandated by government in 1989, to electronics packaging. The task group adopted the name R3P2 (Reduction, Reuse, and Recycling of Protective Packaging). This task group's purpose is to promote excellence in packaging by preserving the integrity of the product contained while minimizing negative impacts on the environment (Russell, et al, 1992).

Committee members meet regularly to discuss the proposed legislation and

enforced regulations pertaining to packaging. They have kept abreast of fast-changing, environmentally-related regulations. Based on enforced regulations for compliance on packaging issues, they have realized a need for gathering data for packaging materials produced. This realization has led to the creation of the Packaging Material Data Sheet (PMDS). Refer to Appendix A for a sample form. The PMDS is a spreadsheet that can be used to collect and record data on each product's packaging type, material, cost, weight, and volume. Companies like Hewlett-Packard (HP), Sun Microsystems, Apple Computer, and International Business Machines (IBM) have each modified the PMDS to fit their organizational needs. By keeping abreast of legislation, these companies are able to seek compliance in a timely manner, thereby increasing profitability. This research is based on the following concerns of the R3P2:

- A means to record the number of different packaging materials utilized in a single product's package design is lacking.
- Currently, no tracking method exists to enable a manufacturer to track the quantities of materials generated, reused, or reduced per geographic location.

Approaches to Data Gathering by the industry

Hewlett-Packard (HP) uses the original PMDS to conduct a one-time survey of all its manufacturing entities to determine the amount of packaging purchased and shipped to its customers. The PMDS is used to record each product's packaging cost, weight, and volume. Having this kind of data readily available helps make the annual summary report on packaging accurate and timely. The information obtained by this method proved to be

incredibly useful to HP's European operations, which needed this information to comply with local country regulations. The Delivery Logistics Services (DLS) group, an organization within HP's European headquarters, took the next step and developed software called PACK to collect PMDS information. The DLS-PACK software is network and is used by HP packaging engineers around the world to catalogue and track packaging material usage per product. Information obtained using DLS-PACK can be seen in Appendix B.

The key to the network approach is that HP's regulatory personnel in many countries can obtain packaging usage information from one source. This allows them to report packaging information more accurately and in a more timely manner, along with paying the appropriate take back fees.

Sun Microsystems utilizes a modified version of the PMDS. It is called the Environmental Tracking Tool (refer to Appendix C for a sample form). Sun's Packaging Engineers use the form to collect data on high-volume-product packaging and also as a checklist for compliance with the heavy metal and ozone-depleting substances. It tracks material type, recycled content, weight, and volume of each package material component for a single package design. The easy access to the packaging data allows a timely response when retrieval of such information is needed. Sun's packaging engineers use the information to communicate their environmental requirements with their suppliers.

Apple computer uses the Packaging Material Data Base (PMDB), which is another modified version of PMDS (refer to Appendix D for a sample form). Apple has decided

to take a simpler approach to developing a packaging material data gathering tool. PMDB is in the form of a spreadsheet data base, structured to report generic weights, paper, expanded polystyrene (EPS), and other plastics. It tracks the material weight by product. Upon request, a report on the total weight of paper and plastic used in Apple's packaging can easily be generated. Apple's requirements on heavy metals and ozone-depleting substances are already enforced upon suppliers, so there is no need to collect such data.

IBM divisions created their own tracking device called Packaging Materials Tracking (TRTRAK). Starting in January of 1995, TRTRAK will be used to track the amount and weight of packaging material used at each IBM location, single packaging components, and complete packaging units for any product. TRTRAK is in a computerized spreadsheet format with nine material classifications to record material type, material description, and content, such as heavy metals and ozone-depleting substances. The gathered data is used to report the potential waste from packaging that will be sent to landfills.

Eastman Kodak has worked proactively on issues associated with packaging waste reduction. As an active member of CONEG, Kodak has paid special attention to fulfilling its goals set in 1993 (The CONEG Challenge, 1993). Its goal was to create a packaging reduction database in order to quantify the existing packaging levels and to create a tool to assist in tracking and reporting of packaging efforts. The result of these efforts is the PQAD Data Input Sheet which collects data on packaging materials

generated (refer to Appendix E for a sample form). The PQAD Data Input Sheet consists of 23 columns to collect data on packaging components and 13 columns to collect product data.

California Against Waste Foundation

The California Against Waste Foundation (CAWF) also suggests ways to prevent waste. Among the tools for reducing the packaging waste, CAWF suggests "tracking savings and environmental impacts" (Gainer and Associates, 1994, p.23). Although the impact reduction on the environment is desirable, the ultimate justification lies in how the figures look on the bottom line. CAWF suggests that demonstration of a cost savings can help change perceptions about the cost of environmental projects. Costs are divided into two categories: fixed and variable. These are defined as follows:

Fixed costs	Capital costs which change very little compared to the number of units a company purchases or produces.
	Fixed costs are often spread out over several years.
Variable costs	Resource, energy, and labor costs directly related to the number of units a company purchases or produces.

(Gainer and Associates, 1994, p. 26)

When considering a material or design modification to a package, the existing and proposed packages should be compared by their fixed and variable costs, by volume and weight of packages, and quantity of packages used per year.

The cost savings evaluation should reflect the changed package or material.

Figure 4 provides the type of costs that could change when a package is modified.

Fixed Costs	Variable Costs
Equipment/tooling Pollution controls Start-up/training costs Insurance	Materials Parts/supplies Packaging Storage/inventory costs Transport/shipping /return Disposal/recycling Labor: Administration Production Maintenance Utilities: Energy Water

(Gainer and Associates, 1994, p.27)

Figure 4. Affected packaging costs due to a waste prevention program

The Figure 5, from Gainer and Associates (1994, p.4) shows a price comparison between virgin and recycled materials.

(Gainer and Associates, 1994, p.4)

Figure 5. Price comparison between virgin and recycled material

European Union

The European Economic Community (EEC) was formed when the representatives of six countries signed the Treaty of Rome in 1957. Since its formation, the EEC has been called different names, such as the Common Market, the European Community (EC), and most recently the European Union (EU). Four principal branches form the EU, which consists of: (1) the Commission, which is the Executive branch with members appointed by the governments of the member states; (2) the Council of Ministers, which has representatives from each member state; (3) the European

Parliament; (4) the Court of Justice. Their goal is to unite Europe in developing a common market. Until a proposal is approved by the Council, a directive cannot be adopted by the member states (Higginson, et al., 1994).

The European initiative on Packaging and Packaging Waste proposes legislation that aims at harmonizing national measures in order to reduce the impact of packaging waste on the environment and also to avoid trade barriers. The Council Directive on Packaging Waste recovery (Valorization) goals are stated in terms of "range." The Directive dictates a recovery rate of 50 to 70 percent, with recycling goals at 30 to 50 percent, with no material having less than a 20 percent recovery rate. This means that the countries which are slower in waste recovery have the lower target to comply with, while the Council enforces a maximum limit in countries like Germany. The intention of the directive is to allow the slower countries to raise the recycling limits to the level of others over time.

The EU currently has twelve member states, Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, and United Kingdom. New members are expected in the near future, increasing the EU's population to more than one-half billion by the year 2000.

Chapter 3

Methodology

Subjects

This study was conducted as an exploratory research. The need for reporting and data collection was satisfied by surveying a selected group of companies, which are members of IOPP. The companies were selected from the IOPP members listed in the Who's Who in packaging annual book. A R3P2 West and East coast group listing was also used to identify companies that have already become aware of environmental legislative requirements.

To ensure identification of the national and international organizations that require packaging data gathering, the survey questionnaire asked respondents to name these organizations.

The study considers only the national and international organizations which are revealed by the survey response. Each organization was contacted by a letter or a telephone call. Some information on specific issues was gathered by conducting personal interviews and attending seminars.

Instrumentation

The survey questionnaire was designed to establish a few points for the start of this research. The responses of Part I of the questionnaire (refer to Appendix F for a sample)

remain anonymous. The main purpose of Part I is to sort the sample groups.

Part II contains eight questions which were used to deduce results of this study.

The questions have the following purposes:

- (1) capturing as much of the industry's exposure to the environmental regulations as possible,
- (2) establishing the industry's need for gathering packaging data,
- (3) revealing the national and international organizations who make any kind of inquiry regarding packaging, or are the recipients of the gathered packaging data,
- (4) citing the type of packaging data which the industry has thus far recognized to be important to track and record.

Part III was designed to find the type of common materials which industries use.

The responses collected from this section were beneficial for designing the material section of the tracking tool.

Procedures

A survey questionnaire was sent to a number of selected IOPP and R3P2 committee group members. The selection was based on the nature of the products each company produces and their distribution market. Companies that do not manufacture a product, and therefore do not use packaging, were not included in this study. The survey results, along with the literature review, provided the necessary information for designing the data tracking form.

The names of the companies that participated in the study are listed in Chapter

4 under the survey participants section. However, the individual names of the employees who were the participants remain confidential. The responses on the national and international organizations that mandate any kind of packaging regulation are listed along with the type of data which must be tracked for compliance purposes.

The background information about the organizations revealed by the survey was investigated by calling and writing to the organizations directly. The international organizations were contacted through their embassies and the respective trade commissioners stationed in the United States.

CHAPTER 4

Results

Presentation of the Data (Treatment of the Data)

As indicated in Chapter 3, Part II of the questionnaire was designed to provide the type of information to be used as the basis of this research.

Question #4 of the survey solicited the names of the environmentally-oriented organizations, which have contacted the industry in regards to packaging. The responses collected from this question were the basis for the completion of this study. The results deduced from researching these organizations became the support data necessary to design the Packaging Data Tracking Worksheet (refer to Appendix J for the form and the descriptions). Tables 1 and 2 provide a summary of the survey findings and information gained from this research.

The research question was answered by designing the Packaging Data Tracking Worksheet, which is applicable to any industry. The exemptions to the rule are pointed out in the Table 2, as well as Chapter 4, which is divided into sections for each distribution market.

Survey Participants

The selected survey sample group participants are among the fortune 500 companies operating at national and international levels. Collectively, these

companies distribute products to America, Europe, and the Pacific Rim. These companies produce products for diversified markets such as electronics, biotech, diagnostic reagents, food, communication, pharmaceutical, and home care.

The participant companies are Alza, Amdahl, Apple Computers, Applied BioSystem, Bristol-Myers Squibb, Clorox, Compaq, Data General, Del Monte, Digital Equipment, Dole Food, Eastman Kodak, General Electric, Hewlett-Packard, IBM, Motorola Codex, National Semiconductor, Perkin Elmer, Raychem, Rolm Systems, Shaklee U.S., Sun Microsystems, Syva, Tektronix, Teradyne, Unisys, Ventritex, Xerox.

Survey Questionnaire

Refer to Appendix F for the sample questionnaire that was used to collect the information, which became the foundation and support of this study.

Data Analysis

Table 1 provides the survey responses to question #4 of the survey questionnaire: Who is the asking source for the packaging material data collection? The list includes all of the national and international organizations utilizing environmental recovery activities, which impact the companies who use packaging to distribute their products. The type of information that it is necessary to collect when a package is being developed varies based on the location of the distribution market. Table 2 provides a summary of the findings that became the foundation for establishment of the categories needed for designing the data tracking tool. Table 2 also provides the distribution markets as they relate to each category and the exemptions.

Table 1

List of national and international organizations revealed by the survey

United States	International
California Legislation Commonwealth of Massachusetts CONEG EPA Florida Legislation Minnesota state Legislation Hennepin county Waste Wise NOPRP Oregon Legislation	Austrian Packaging Ordinance Canada - Ontario French legislation ECO-Emballage German Government German Distributors DSD RESY VGK

Organizations in the United States

The organizations named in the United States were California Legislation, Commonwealth of Massachusetts, CONEG, EPA, Florida Legislation, Minnesota State Legislation, Hennepin County, Waste Wise, NOPRP, and Oregon Legislation. Internal company organizations were also named as sources of inquiry about packaging data.

The following is a description of the U.S. organizations, the regulations they enforce, and their effect on packaging data gathering needs.

California Legislation

In an effort to solve the solid waste crisis, Assembly Bill 939 was signed by the Governor of California on September 29, 1989, establishing the California Integrated Waste Management Act of 1989. Almost all of Title 7.3 of the Government Code,

Table 2.
Summary of the findings on the type of data needed in relation to the distribution markets and the exemptions

Organizations	Mat. type	Pre RC%	Post RC%	Reuse #times	weight	Volume	Heavy Metals	ODS	Recyclable	Exempts
US organizations										
California Rigid Plastic Pack. (Program starts on and after July 1st. 1996)	*		*	*	*				*	drug, medical food, medical device, and infant formula. pack. used for food, & cosmetics are exempt till Jan. 1, 1997.
CONEG	*	X	X	X			*		X	x-ray film, radioactive materials, and pack. manufactured prior to effective date of the law.
Florida	X						X			
Massachusetts	X	X	X	X			X	X		
Minnesota						X	X	X		food & medical pack.
Oregon	X	X	X	X						
International organizations										
Austria	*								*	
Canada	*				*					
France										
EE Rigid plastic	*					*				
Flex. plastic	*				*					
ADEL PHE					*	*				
Glass only					*	*				
Germany	*				*	*			*	

X = Voluntary program * = Mandatory program

which regulates Solid Waste management, and Chapters 1-3 of Part 2, Division 5 of the Health and Safety Code, which deal with garbage and refuse disposal, have been repealed and reenacted in revised form in the Public Resources Code (California Waste Management Board, 1989).

Integrated Waste Management, as an approach to solve the solid waste crisis, is urging the waste management industry to use a four-step hierarchy to compare the components of Integrated Waste Management against communities needs (Figure 6). The four steps are as follows:

- (1) Source reduction (including reuse of products)
- (2) Recycling of materials (including composting of food and yard waste)
- (3) Waste combustion (with energy recovery)
- (4) Landfilling.

(EPA, 1989, p.17)

Figure 6. Hierarchy of Integrated Waste Management

Rigid plastic packaging container program. On January 14, 1994, the California Integrated Management Board (Board) published a draft regulation pertaining to the rigid plastic packaging container program. As stated in Title 14, Division 7, Chapter 4, Article 3, Sections 17942-17952 of the California Code of Regulations, "The law requires that specific rigid plastic packaging containers must be either source reduced, be routinely reused or refilled, meet one of four specific rates, or contain 25 percent postconsumer material" (Welch, p. 1). The program will be in effect on July 1, 1996.

Purpose of regulations. The purpose of these regulations, per section 17943, is to provide guidance for those who must comply with the Rigid Plastic Packaging Program requirements. Product, container, and resin manufacturers, distributors, importers and retailers are provided with these guidelines to enable them to meet reporting, certification, and documentation requirements. These regulations apply only to rigid plastic packaging containers sold in California, regardless of where the products they contain are produced.

Container requirements. As stated in section 17942, regulatory Effect of Questions and Answers with effective dates on and after January 1, 1995, all rigid plastic packaging containers sold or offered for sale in the state must meet one of the following criteria:

- (1) Be made from 25 percent postconsumer material, or
- (2) Be recycled at one of the following rates:

- (a) All rigid plastic packaging containers must have a 25 percent recycling rate, or
- (b) All rigid plastic packaging containers whose primary material is polyethylene (PETE) must have a 55 percent recycling rate, or
- (c) All products -associated rigid plastic packaging containers must have a 45 percent recycling rate, or
- (d) All particular-type rigid plastic packaging containers must have a 45 percent recycling rate, or
- (3) Be reusable or refillable, or
- (4) Be a source reduced container.

(Rigid plastic packaging container program, 1994, January, p. 9-10).

How will waivers be granted? Waivers are allowed under the following conditions:

- (1) Compliance with postconsumer option can be waived if the requirements with postconsumer material can not be met. But the package still has to meet the applicable state and federal regulations, including those required by the Food and Drug Administration.
- (2) Compliance with the postconsumer option can be waived if it is technologically infusible to use 25 percent postconsumer content.
- (3) If by January 1, 1994, less than 60 percent of single family homes in California have curbside collection program that include beverage container recycling, all requirements of section 17944 can be waived for all product manufacturers.

- (4) If 50 percent, by number, of a product manufacturer's rigid plastic packaging containers sold or offered for sale, by January 1, 1995, in California, contain at least 25 percent postconsumer material. Also, if any of the options listed in the container requirements are met by the product manufacturer on or before January 1, 1996.
- (5) An introduced product, for twelve months immediately after the date on which it is first sold or offered for sale in California.
- (6) Until January 1, 1997, all containers that hold food or cosmetics are waived.

Exempt rigid plastic packaging containers. Under section 17946, packaging is considered exempt if it contains drugs, medical devices, medical food, or infant formula. Also, any container which contains federally regulated products such as insecticide, fungicide, and rodenticide are considered exempt. Hazardous materials cannot be shipped in manufactured rigid plastic containers.

Certification. Certification requests can be made in writing by the product or container manufacturer. When making the request for certification, the manufacturer has to provide information about the package such as company name, mailing address, telephone number, name of the person responsible for supplying required information, container type, product type held by the container, company size, or any other information which might be requested. If the manufacturer is seeking compliance through any of the options such as postconsumer material, the refill, reuse, or the source reduction options, the required information will change accordingly. The postconsumer material option requires the percentage of postconsumer material in the containers in question and the

total weight of resin used to manufacture the containers. The refill option requires information about the number of times the container was refilled. The reuse option requires the number of times the container was reused. The source reduction option requires information about the percentage of weight reduction for the containers and the average weight of the containers of the packaging line, before and after source reduction occurred. "The board will not initiate requests for certification until January 1st, 1996 and shall not require evidence of compliance until 90 days after the end of the calendar year or any measurement period set by section 17943 (b) (18)" (Rigid plastic container program, January 1994, p.15).

Certification penalties. Providing false or misleading certification of the regulations to the Board will result in being reported to the Attorney General for prosecution for fraud. Violations of Chapter 5.5 regulations (California Solid Waste Statutes, 1993, p. 46) will be considered a public offense and punishable by a fine of not more than \$100,000. In addition, the violator could also be subjected to a civil penalty assessed by the Board after a hearing procedure. The penalty shall not exceed \$50,000 for each violation and total fines will not exceed \$100,000 annually.

CONEG

The Coalition of Northeastern Governors (CONEG) consists of nine Northeastern governors who became partners in dealing with common regional problems. Reduction of solid waste became a priority concern of states and private sectors. CONEG member governors have asked industry's voluntary action on waste reduction. The CONEG's

governors, a source reduction task force, and its advisory group have agreed to cooperate in developing compatible, region-wide strategies to send a uniform message to the marketplace.

CONEG's involvement in environmental policy and services started in mid 1992. CONEG and its Policy Research Center Incorporation undertook research, informational services, policies, and activities in areas of energy, transportation, and the environment. Members continue cooperation on issues of packaging reduction, biomass, and high speed rail.

CONEG's Source Reduction Task Force (SRTF) encourages voluntary industry action for the purpose of developing coordinated state policies and legislation on source reduction. Key activities of SRTF in 1992-1993 included conducting workshops for industry on implementing the CONEG Preferred Packaging Guidelines. The guidelines encourage industry to eliminate, minimize, reuse and refill, and to use recycled content (Neblett & Totten, 1993).

Model Toxics in Packaging Legislation. The Model Toxic Legislation was developed in December 14, 1989, by the Source Reduction Council of CONEG. The legislation dictates the reduction of lead, mercury, cadmium, and hexavalent chromium in packaging or packaging materials sold in the U.S. The intention of this act is to achieve reduction in toxicity without discouraging the use of postconsumer materials in the production of packaging and its components (CONEG Source Reduction Task Force, 1991).

Who is responsible for compliance? Manufacturers, distributors, and suppliers have the responsibility to comply with the act. The limitations on heavy metals by the act are as follows: The sum of heavy metals used in packaging shall not exceed 600 PPM (0.06%) by April 1, 1992; 250 PPM (0.025%) by April 1, 1993; 100 PPM (0.01%) by April 1, 1994.

How to apply for compliance. The manufacturer or supplier of the packaging or packaging component is required to submit a certificate of compliance to the purchaser. This does not include individuals who make retail purchases. The manufacturer, supplier, and the purchaser have to keep the certificate on file for the duration of time that the package is in use. Refer to Appendix G for a sample of certificate of compliance form.

Exemptions. The model legislation allows exemptions from compliance with certain limitations. The limitations on packaging and packaging components are applied to packaging manufactured prior to the effective date of the law, packaging containing heavy metals due to compliance with federal health and safety regulations, packaging containing heavy metals for which there is no feasible substitute (such as photographic x-ray films and radioactive materials), and packaging all or partly made of postconsumer materials. Refer to Appendix H for a sample of certificate of compliance exemption status form.

Enforcement and penalties. Enforcement to the model toxic legislation is left to the discretion of each individual state. However, violators will be pursued by state agencies in a consistent manner, and information regarding their violations will be shared throughout

the Northeastern states. Refer to Appendix P to obtain further information and inquiries on related publications.

Environmental Protection Agency (EPA)

United States regulations require the packaging industry to practice source reduction, reuse, and recycling when and where possible (Environmental Protection Agency, 1990). The EPA makes recommendations on reducing packaging waste :

Order merchandise in bulk, purchase products with minimal packaging and/or in concentrated form, work with suppliers to minimize the packaging used to protect ... products, establish a system for returning cardboard boxes and foam peanuts to suppliers for reuse, request that deliveries be shipped in returnable and/or recyclable containers, minimize the packaging used for ... products, use reusable and/or recyclable containers for shipping ... products, repair and reuse pallets or return them to ... supplier, reuse newspaper and shredded paper for packaging, reuse foam packing peanuts, "bubblewrap", and cardboard boxes, or donate to another organization. (EPA, 1993, p. 23)

Florida Legislation

The Florida Department of Environmental Protection has introduced laws pertaining to toxins in packaging. The rules and the intentions are similar to the CONEG model legislation.

Rule 17-723 (Florida Department of Environmental Protection, 1994) is written with the intention to prevent and minimize hazards to the public and the environment by reducing the use of heavy metals in packaging. The effective date of this rule was July 1, 1994.

The schedule for removal of incidental amounts of heavy metals with applies to lead, cadmium, mercury, and hexavalent chromium used in a package or any packaging component. The rule prohibits the manufacturer and distributors from offering, for sale or promotional purposes, products and packaging with a total combined concentration of lead, cadmium, mercury, and hexavalent chromium that exceeds:

- (a) 600 PPM by weight (.06 percent), with implementation date after July 1, 1994.
- (b) 250 PPM by weight (.025 percent), with implementation date after July 1, 1995.
- (c) 100 PPM by weight (.01 percent), with implementation date after July 1, 1996.

How to apply for compliance. Effective July 1, 1994, a manufacturer or distributor has been able to seek compliance with the rule in the following ways:

- (a) The manufacturer or distributor provides information about the raw materials content.
- (b) Material content is verified by laboratory testing of the package or the packaging component.
- (c) A certificate provided by the supplier stating the materials used in manufacturing of the package or packaging component.
- (d) Any other method that the manufacturer or the supplier can use to demonstrate reliability equal to the already mentioned methods.

Exemptions. Effective July 1, 1994, the following items have been exempt from compliance to the heavy metals rule:

- (a) Packaging or package components with a code indicating date of manufacture prior to the May 12, 1993;
- (b) Any alcoholic beverage bottled prior to July 1, 1993;
- (c) Heavy metals used to comply with federal or state law;
- (d) Heavy metals used where no other material could be substituted.

Heavy metals in the recycled material content are exempt until July 1, 1998.

Petition for exemption. Effective July 1, 1994, petitions requesting exemption can be filed with the Florida Department of Environmental Protection. The requests must be made in writing and contain the following information:

- (a) The name, address, and telephone number of the petitioner;
- (b) Name, address, and telephone number of a second person prepared to answer questions on behalf of the petitioner;
- (c) Type of packaging or packaging component for which the petition is sought;
- (d) The type and concentration level of heavy metals present in the packaging or packaging component, and the method used to determine the level;
- (e) A statement expressing the steps that are being taken to reduce heavy metals concentration and reduction of the packaging solid waste.

If the requirements for the exemption are met, a two-year exemption will be granted to the petitioner. The petitioner may renew the exemption by filing a written renewal request on form 17-723.900. This request must be made 90 days prior to the exemption's expiration date. The renewal request shall describe differences, if any, between the original exemption petition and the renewal one.

Certificate of compliance requirements. Since July 1, 1994, a certificate of compliance has been required to be provided by the manufacturer or distributor to the purchaser of the package or packaging component. The certificate of compliance shall state that the package or packaging component is in compliance with Florida's heavy metals requirements. An authorized official of the manufacturing or distributing company signs the certificate of compliance. The manufacturer and distributor should keep the certificate on file for as long as the package is in use and, thereafter, a copy should remain on file for three years after the last sale or distribution. If the package or packaging component is reformulated, or a new one is created, an amended or new certificate of compliance must be provided by the manufacturer or the distributor.

A certificate of compliance must provide the following information :

- (a) The type of package;
- (b) Name and address of the manufacturer or the distributor;
- (c) Name, title, and signature of an authorized official of the manufacturer or the distributor.

Requests for a certificate of compliance can be made by any person, in writing, to the manufacturer or the distributor. The manufacturer or the distributor has to respond within 90 days of receiving the request.

Enforcement and penalties. Violators are considered those who provide a falsified certificate of compliance or offer the certificate for sale.

Since July 1, 1994, violators can be punished by civil penalty code provided in section 403.141, F.S. Refer to Appendix P for a certificate of compliance or exemption.

Commonwealth of Massachusetts

The Integrated Solid Waste Management System of Massachusetts is a combination of the old recycling and composting facilities with present solid waste landfills and combustion facilities. The Massachusetts Solid Waste hierarchy includes reduction, recycling, combustion with energy recovery, and landfilling. The Commonwealth of Massachusetts' short-term plan for municipal solid waste (MSW) is reusing and recycling, and the long term goal is reducing toxins in products. Efforts to reduce toxins in household products and safe disposal concerns have lead to legislation mandating the sale and disposal of mercury and cadmium batteries in Massachusetts. The implementation of the Bottle Bill in 1989 created a source for funding the recycling plan in Massachusetts.

The Department of Environmental Protection (DEP) provided the Integrated Solid Waste Master Plan in 1990, and updated it in 1994. The goals set forth for the reduction of the MSW in Massachusetts are set at 23 percent by 1992, 34 percent by 1996, and 46

percent by 2000. The Massachusetts' packaging challenge was developed with state's assistance to continue the recycling effort and to create a market for postconsumer recycled materials for packaging. To develop a market for recycled material, an incentive for manufacturers to secondary material to make recycled products became necessary. (An end product is considered recycled only when it is made of secondary material, which is material separated for recycling from trash.)

Recycling related manufacturing is estimated to bring more than \$600 million dollars per year to the Commonwealth of Massachusetts (Ballantyne, et. al., August 1994).

National Office Paper Recycling

The National Office Paper Recycling Project (NOPRP) is a non-profit partnership of public and private sector organizations. The organization's goal is to increase office paper recycling and reduce office waste.

NOPRP is supported by the U.S. Conference of Mayors and the EPA. The National Strategy on Office Paper Recycling was developed to increase office waste paper recycling. One of the goals is to increase the office paper recycling from 15 percent in 1991 to triple that amount by 1995 in order to be able to supply the market demand (NOPRP, July, 1991). The project challenges governments and businesses from coast to coast to participate in office recycling efforts. A three-step commitment is required: (1) collection of office waste paper, (2) support for the recycled product market by

purchasing recycled fiber products, and (3) provision of educational programs for employees.

Minnesota

The Packaging Program of Minnesota was created in 1973 when the legislature passed Chapter 116F, pertaining to the Recycling of Solid Waste Act. Section 6 of the Act instructed the Minnesota Pollution Control Agency (MPCA) to study the new and revised packages sold at the retail level in Minnesota. The purpose was to determine the packages' consistency with the environmental policies of the state. The source of these policies was primarily the Minnesota State Environmental Policy Act 116D.02, Subd. 2, enacted in 1974. The review process was limited to packaging used for cosmetics, food, and cleaners (Willson, 1982). The agency declared that the packaging regulations were advisory, should only be used as guidance, and would not be enforced. The Minnesota Legislature passed Statute 115A.5501 in 1992, which set a 25 percent voluntary packaging reduction goal from 1992 to 1995. This statute encompassed packaging that was delivered to solid waste composting, incineration, refuse derived fuel and disposal facilities. The 25 percent reduction goal was set to be achieved by any, or all, of the methods of recycling, and reduction of refuse (Chiles, 1993). In an attempt to promote the goal of packaging reduction to businesses and the public, the Office of Waste Management (OWM) has labeled this initiative the "25 by 95" goal (p. 3).

In 1989, Governor Rudy Peipich appointed 29 Minnesotans to serve on the Select Committee on Packaging and the Environment (SCOPE). The committee members were

selected from all sectors of industry, including city and county governments (SCOPE, 1990).

SCOPE set out to achieve three goals:

- (1) Source reduction - reduce packaging at the manufacturing end;
- (2) Maximize material recovery rate;
- (3) Ensure that the packaging that goes through the waste stream does not burden the environment for source reduction activities, the committee set a goal of reducing discarded packaging by one-quarter and suggested 1985 as the baseline year for the comparison. SCOPE decided rigid plastics should be reduced 25% by 1994.

The Office of the Environmental Assistant (OEA), formerly called OWM, will be conducting annual studies of solid waste at disposal and packaging facilities to determine the packaging percentages in metropolitan and non-metropolitan areas. The method for conducting such a study will be decided by the OEA. The study will produce a report that shows the packaging percentages, the margin of error, and an annual total of reported waste received at disposal and processing facilities. OEA will study the provided figures, calculate the packaging discards per capita, and report to the Legislative Commission on July 1 of each year, through 1996.

The voluntary packaging hierarchy set by the Minnesota State legislature in 1994 suggests the following goals: a reduction in toxicity in packaging material, reusing packaging for its original purpose at least five times, recyclability of the package and availability of the recycling collection program to at least 75% of the residents of the state.

Other ways the OEA promotes “25 by 95” are the Reusable Transport Packaging Directory, Saving Money and Reducing Trash (SMART), Minnesota Waste Wise, and Minnesota Materials Exchange Alliance (Packaging discards, 1994, p. 12). Each of these programs provides information to the consumer with the ultimate goal of source reduction. The Reusable Transport Packaging Directory provides a list of suppliers for reusable transport packaging like plastic boxes and pallets. The SMART shopping campaign provides information on consumer packaging with reduced packaging.

The Minnesota Waste Wise program was created in participation with Minnesota’s Chamber of Commerce. The purpose of this program is to increase waste prevention and recycling among all businesses operating in Minnesota. Their enrollment as of July 1994, reached 126 companies and is increasing (Osdoba, et al., 1994). The Minnesota Material Exchange Alliance provides a statewide service that introduces to companies with waste material to companies that want to use these materials.

According to the MPCA, municipal solid waste contained 35 percent packaging waste during 1990-1992. However, Franklin Associates’ estimate for EPA is 29.2 percent. Chiles explains the 5.8 percent difference by stating:

The MPCA’s underlying figures are based on actual waste composition sorts. Franklin does not rely on sorts, but rather on a combination of manufacturers’ production reports, import and export figures, and estimates of the interval of time that passes between manufacture and disposal for many different

products and packages. There are fewer opportunities for error with the former approach. For example, much paper packaging absorbs moisture readily, and its weight as measured in waste will be higher than its weight at the time of production.

(Chiles, 1993, p.9)

Recycling costs for commercial and industrial packaging, when considered by weight, are mostly due to old corrugated containers (OCC). Minnesota's OWM reported to the Minnesota State Legislature, "OCC is about 80 percent of all business packaging" (Chiles, 1993, p. 15). Businesses either pay a hauler to carry their OCC to the recycling center or use business-owned transportation. The market prices for buying OCC or hauling it away are rated by the weight. When purchasing OCC, the buyer should consider the quality of the material before determining a price.

A forecast for the future of the packaging waste and the cost reported by OWM appears in Figure 7. The cost increase predicted by Regional Economic Modeling Inc. (REMI), is 55 percent inflation factor over a 10-year time period.

The MPCA is in charge of public education and enforcement of the laws that affect packaging waste. A recent law, in effect since January 1993, is the recycled-content labeling law. According to this law, every time a recycled content claim is made, a supporting statement outlining the minimum verifiable percentage of postconsumer waste should accompany the claim.

Forecast of packaging waste costs in 2002

	Estimated Tonnage in 2002	Cost in 2002 (REMI inflation factor)	Cost in 2002 (10% Annual inflation)
Discarded packaging	774,000	\$228 million	\$385 million
Recycled packaging	659,000	\$83 million	\$140 million
State agency packaging waste abatement activities other than grants to recycling programs		\$3 million	\$3 million
Totals	1,433,000	\$314 million	\$530 million

(Osdoba et al., 1993, p.26)

Figure 7. The forecast for packaging waste costs in 2002

The fee system. A packaging material fee system was suggested by SCOPE in 1990. It recommended that the Legislature authorize the system in 1991 and set the initial fee scales at zero. The fee system is suggested to be studied every two years, and if no major effect on raising recovery rates or reducing environmental burdens are indicated, the fees may go up substantially. The suggested fee system was to be applied to the packaging materials that would not meet the recovery rate or would be considered an “environmental burden” (Chiles, 1990, p. 6). The purpose of the fee was to encourage environmental responsibility and source reduction and to increase recycling instead of disposal. This system makes the packagers or the material suppliers responsible for

payment of fees.

According to Minnesota Statute 115A-93 and 115A 9301, starting January 1, 1994, licensed haulers are required to charge fees to residents or businesses as their waste volume or weight increases. Fees collected for the hauling services include fees for garbage collection and recycling services.

To complete the packaging policy, SCOPE studied the toxic and hazardous material contents in products and suggested the CONEG model for toxic metals and compounds used in packaging material. It also recommends a shelf-based labeling system for problem material. The manufactured products directed to the Minnesota market, which contain Environmental Priority Materials (EPM), are considered hazardous substances and should be registered by paying a fee. The fee applied to EPM used in the product will be based on the amount and the volume of products sold.

Exemptions. The products which have a dedicated industrial disposal system will be exempt. Producers who reduce EPM in their product can receive an exemption from paying the fee. Food and products used for medications are exempt from fees.

Hennepin County is one of Minnesota's most active counties involved in waste sort. In 1993, Hennepin county used \$8.5 million from facility income to pay for the SCOPE program (Osdoba et al., 1994, p.21). Hennepin County's two facilities are Hennepin Waste-to-Energy and NSP-ELK River with processing capacities of 1,000 and 1,500 tons per day (Osdoba et al., 1993, p.73).

Oregon Legislation

The Oregon Public Interest Research Group (OSPIRG) initiated Environmentally Acceptable Packaging. A package has to be:

- (1) reusable five times for the same or substantially similar use
- (2) made of 50% recycled material
- (3) recycled at rates of:
 - (a) 15 percent by January 1, 1993;
 - (b) 30 percent by 1996;
 - (c) 45 percent by 1999; and
 - (d) 60 percent by 2002.

Although the OSPIRG initiative was voted down in a public election, the idea remained and became a model for other such initiatives.

SB66 passed the Senate and was referred to the Joint Ways and Means Committee. It required rigid plastic containers to be reusable and contain 25 percent recycled content or be recycled at a 25 percent rate by January 1, 1995.

International organizations

The organizations and the legislative forces that affect the packaging distribution to various countries are Austrian Packaging Ordinance, German Packaging Ordinance, German distributors, DSD, RESY, VGK, French Packaging Ordinance, ECO-Emballage, and Canadian legislation. In addition, individual branch offices of each company request packaging data. This could be a result of legal requirements in the country of the branch

office or the country of the next distribution location. Following is a description of the legislation of the different countries cited and their enforcement criteria.

Austrian Packaging Ordinance

An initiative was adopted in October 1992 that obliges manufacturers and distributors to take back used packaging without charging a fee. Local collection and recycling systems are available and can be used by the industry. However, those industries who do not participate in the system have a recovery target of 40 percent enforced as of October 1, 1993, increasing to 80 percent by the year 2000.

An initiative for the reuse and recycling of electronics waste was proposed on August 12, 1993. This initiative would impose a take-back obligation on manufacturers, retailers, and distributors. July 1995 is the suggested start date. The Austrian scheme is similar to the German approach in that it proposes a take-back policy involving an authorized third-party collection organization (Federal Office Newspaper of Austria, 1992). Altstoff Recycling Austria is considered the authorized third-party organization.

Altstoff Recycling Austria. Altstoff Recycling Austria (ARA) is a third-party packaging collection organization set up by the packaging chain. Its responsibility is to take back packaging waste for recycling and charge a fee for the service. Fees are collected from the producers and importers of goods based on material type and convenience of collecting and recycling of their goods.

Canadian Legislation

Canada currently has one of the most developed recycling programs in the world

(Ontario Ministry of Environment and Energy, June 1994). Ontario's municipally run recycling program is called the Blue Box. A total of 540 municipally funded programs across the province organize and run this program. An estimated 39 percent of packaging waste by weight was diverted from municipal solid waste by the Blue Box program (Canadian Industry Packaging Stewardship Initiative, June 1994).

Ontario Bill 143, or the Blue Box program, became law in March 1994 (Ontario Ministry of Environment and Energy, June 1994). The section of the law that applies to packaging obligates the large waste generators to follow the 3Rs: Reduce, Reuse, and Recycle. The funding for the municipal Blue Box programs was extended from March of 1994, for another two years, until long-term arrangements are made to secure more private-sector funding for the Canadian recycling programs.

Canadian Industry Packaging Stewardship Initiative. The Ontario Ministry of Environment and Energy released the Canadian Industry Packaging Stewardship Initiative (CIPSI) proposal for public comment on June 21, 1994, in Ottawa (Canadian Industry Packaging Stewardship Initiative, June 1994). The CIPSI initiative is sponsored by seven packaging industry associations. The CIPSI initiative promotes the 3Rs and also aims to provide private-sector funding for the municipal curbside programs by proposing third-party involvement in waste collection. CIPSI proposes a two-phase implementation strategy as follows:

Phase I**(First Two Years)**

- Brand owners pay C\$24 per ton levy based on weight of packaging.
- True cost of managing individual types of packaging evaluated.
- CIPSO pays C\$64 per ton to municipalities.
- Brand-owners are eligible for rebates up to 50% of their levy based on the average rate of collection and recycling of packaging.

Phase 2**(Beginning Year Three)**

- Levies are assessed on material-specific basis (see formula below).
- Rebate incentive no longer applies.

CIPSI Funding Formula:

$$\begin{array}{r} \text{Operating Cost Standard} \\ \text{minus} \\ \text{Revenue Factor} \\ \text{minus} \\ \text{Municipal Share} \\ \text{equals} \\ \text{Industry Payment to Municipalities} \end{array}$$

(Goff, August 1994, p.7)

The final consumer packaging is considered to include everything from food and drugs to cosmetics, clothing, and household and electronics goods.

CIPSI is a weight-based system and requires all brand owners to join the Canadian Industry Packaging Stewardship Organization (CIPSO), also called “the corporation.” The brand owners who do not become members of the CIPSO have to submit their plan of diversion strategy to the Ministry of Environment and Energy within 3 months after the regulation has gone into force, and must also prepare a status report of their plan every 6 months. The proposed implementation schedule is described as follows:

	CIPSO Members	Non-CIPSO Members
1. Regulation Promulgated	...	...
2. Within three months after regulation promulgated	Brand owners indicate intent to join CIPSO	Submit plans to MOEE (Ontario's Ministry of Environment and Energy)
3. At the end of six months after promulgation	1st quarter levies due	Implement plans
4. At the end of nine months	Municipalities start eligibility for Phase 1 funding	Report to director (and every 6 months after)

(Canadian Industry Packaging Stewardship Initiative, June 1994, p. 14)

CIPSO members responsibilities. The packaging stewards must fulfill certain requirements in order to comply with CIPSO. In addition to a letter of intention to become a member, paying an initial fee and thereafter paying the dues as prescribed by CIPSO, the packaging stewards must also provide information about the type of products marketed in Ontario and the weight of the packaging material to be sold for final consumption.

Non-CIPSO members' responsibilities. The non-CIPSO members who are retailing their products in Canada are required to prepare a report detailing their waste management plans every 6 months and submit it the Ministry of Environment and Energy.

The report must include the name of the retailer and the business names used, the name of the corporation, the brand names and the Universal Product Codes (UPC's) for each of the packaging product sold in Ontario, description of the package classification as

needed, the total weight of each type of the packaging to be distributed each year in Ontario, the type of system and the equipment used to meet the waste management objectives based on the regulations, the name and location of the receiver of the diverted waste, and the system of record keeping which the company intends to use to monitor the planned waste management objectives. Brand owners who do not comply with this act face prosecution by the Canadian Institute for Environmental Law and Policy, which could prohibit the brand owners from marketing their products in Ontario.

French Packaging Ordinance

The French Packaging ordinance is based on decree 92-377 of April 1, 1992, and was adopted on January 1, 1993. The decree applies to all packaging and establishes that the manufacturers and producers are responsible for taking back and reusing household packaging waste that they put into the market. The regulation will go into force after the EU directive has been adopted. The proposed recycling rate is 75 percent. Incineration with energy recovery is permitted and municipalities rather than industry are responsible for the collection of waste. Manufacturers' and importers' obligations can be met by becoming a member of an approved waste management system. The approved service organizations are ECO-Emballages and ADELPHE.

ECO-Emballage. Eco Emballage SA (EE) a private company owned largely by packager/fillers and a number of converters and distributors. Companies that choose to become members of ECO-Emballages sign a three-year contract, which entitles them to delegate the care of their packaging to the organization. The products then have to carry a

green dot. EE offers a take back guarantee for glass, plastic, steel, aluminum, and paper/paperboard. Figure 8 provides the EE's system of recovery. The EE system is set up to achieve recycling goals by working with the local municipalities. EE pays the municipalities for the delivery of materials for recycling. EE charges a fee or tariff to the manufacturers and importers for the packaging material which carries its green dot. The fees are collected based on volume for rigid containers and on weight for flexible packaging. The payments to EE are made each quarter according to the number of packages sold during that quarter. EE has set a recovery goal of 75 percent by 1996.

ADELPHE. ADELPHE is another approved organization which services the glass industry. The fees are charged based on volume and are similar to EE's. The transport packaging fees and the secondary packaging fees are based on weight or the volume of packaging.

The ECO-Emballages System

(Porter, 1994, p. 4-4)

Figure 8. The EE's system of recovery

German Packaging Ordinance

The German Verpackungsverordnung (VerpackV) is a packaging ordinance designed to avoid packaging waste; it was established June 21, 1991 (Schwartz, 1992). The legislation came into force on January 1993. The German packaging ordinance (Rummler & Schutt, 1990/1992) states the provision for transit packaging as follows: "from 1 December 1991 transit packaging must be taken back by manufacturers

and distributors and be directed to reuse or material recycling" (p. 122). It also states the management objectives: "Packaging shall be manufactured from materials which are environmentally responsible and do not prejudice the material recycling of the material" (p. 56).

All parties in the distribution chain are obliged to take back and reuse or recycle used packaging. The target for July 1995 is that 80 to 90 percent, by weight, of each packaging material will be collected and sorted. The take-back policy suggested by the legislature includes transport, secondary, and sales packaging.

Transport packaging. There are two responsibilities related to transport packaging, the take back and reuse/recycling. The responsibility to take back transport packaging falls on each link in the production and distribution chain. Reuse or recycling becomes the raw material suppliers' responsibility. Transport packaging includes, crates, corrugated boxes, shrink and stretch wraps.

Secondary packaging. The obligation to take back is the responsibility of the distributors, but the distributors who sell to the end-users have to take back from the end-users. No one else in the production and distribution chain is affected. Secondary packaging includes certain blister-packs, cartons, hangers, hooks, and wraps.

Sales packaging. All distributors and retailers are obligated to take back the sales packaging from the end-user either in, or in close proximity to, their stores. Sales packaging includes packaging that contains products such as soaps and sodas, including the wraps and the containers used to store them.

The only exemption applied to the take-back policy relieving the packaging manufacturers and distributors from taking back the sales packaging occurs when the activity of taking back is handled by a qualified private packaging waste company willing to guarantee the recycling of the waste collected (Porter, 1994).

Duales System Deutschland. Der Grüne Punkt - Duales System Deutschland Gesellschaft für Abfallvermeidung und Sekundärrohstoffgewinnung mbH. A third-party organization, which acts as an intermediary in collection of packaging sold in Germany after use. The industry has established the Duales System Deutschland (DSD) system for the collection and sorting of household packaging waste. Participating industries finance the organization by payment of fees. DSD has faced many financial difficulties since its inception on September 28, 1990, in Bonn, where its headquarters is located. DSD has 600 companies as shareholders, which consist of retail trade, the consumer goods industry, the packaging industry, and material suppliers. DSD started its activities in July 12, 1991, in Bonn. DSD holds yearly promotional activities such as its Prize for Innovative Packaging (DSD press information), to promote ideas for development of environmentally friendly packaging. Like the ECO-Emballage system, DSD's member companies are required to place a green dot, the DSD Trade Mark, on their packaging before shipment to distributors. After the consumer buys the product and discards the packaging, DSD collectors take the packaging to one of their 300 sorting plants, where the packaging is prepared for recycling. Figure 9 displays a diagram of DSD's recycling system, the separate collection channels, and the forwarding of materials to recycling

industries. DSD had up to 15,000 Trade Mark applicants by October of 1993. DSD has invested seven billion Deutsch Marks and is planning to create 18,000 jobs by 1995. Refer to Appendix I for a sample of DSD's packaging data declaration form.

DSD RECYCLING SYSTEM

(Porter, 1994, p. 3-6)

Figure 9. DSD Recycling System

RESY. Several organizations joined to establish the firm RESY GmbH on July 2, 1991, to comply with VerpackV on shipping containers and packaging made of paper or cardboard. The organizations that form RESY GmbH are the Verband der Wellpappen Industrie (VDW), the association of the corrugated board industry, the Veren Zur Forderung der Interessen der Hersteller von Wellpappenrohapapier aus Altpapier e.v., and the Vereinigung für Wertstoffrecycling GmbH (Vfw), and the Association for Materials Recycling. According to section 11 of VerpackV, manufacturers can be exempt from the responsibility of recovering and recycling their packaging if a third party takes full responsibility in their place. Thus, Vfw member companies that form the RESY system offer third-party services. Figure 10 shows RESY System involvement in the movement of waste material to raw material manufacturers.

RESY System started its operating facilities December 1, 1991. Foreign and domestic material manufacturers and importers of goods are free to join the RESY GmbH. The annual fee for the usage of RESY Symbol is calculated based upon the weight of shipping/packaging material made of paper or corrugated board that each member is planning to distribute inside Germany. The fee does not cover the disposal or recycling costs. Upon becoming a member, a firm is granted the right to display the RESY symbol. Figure 11 displays symbols that are available. There is no specific color scheme prescribed when displaying the symbol, but a minimum size of 60 millimeters is required. In addition to the symbol, a manufacturer's identification code is also required to be displayed for control purposes.

RESY GmbH assumes responsibility for the packaging that bears the RESY symbol. The German paper industry and the Vfw have agreed to accept all packaging made of paper or corrugated board which is marked with the RESY symbol. However, packaging made of wax coated corrugated boards or bituminous compound do not qualify to display the RESY symbol.

The RESY system offers a combination of waste collection points from small to large. Refer to Appendix P to acquire a list of waste disposal agents participating in RESY system.

VGK. The converters and the secondary raw material industry have joined to form the Verwertungsgesellschaft gebrauchte Kunststoffverpackungen mbH (VGK). The VGK recycles used plastic packaging, which includes the whole spectrum of plastic packaging (Rummler & Schutt, 1992).

DAVR. Deutsche Aluminium Verpackung Recycling GmbH (DAVR) is a company that recycles aluminum. It provides guarantees for recycling packaging made of aluminum and packaging containing aluminum foils (Rummler & Schutt, 1992).

The Cycle Which Material Goes Through From Waste Material to Raw Material

(Schwarting, 1992, p. 4)

Figure 10. The RESY recovery system

RESY symbols

Reusable packaging

Recoverable packaging

Packaging made partly or entirely of recycled materials

x%: percentage of recycled material used in the manufacturing of the product.

(Commission of the European Communities, 1992, p.44)

Figure 11. The RESY marking symbols

CHAPTER 5

Summary, Conclusions, and Recommendations

Summary

Packaging is used for transport and distribution of products. Current environmental research and studies have identified packaging waste as a major contributor of solid waste. Among ongoing solutions to the solid waste crisis, recycling, reusing, and reducing have become a motto for everyone concerned.

Two questions should be asked when one considers implementation of a packaging change: (1) How can a package be changed to a more environmentally sound one? (2) What are the legal requirements? Regulations enforced by some European nations have placed restrictions on products being sold in their countries. To be able to export products to those countries, companies have to become accountable for every single package they ship by seeking compliance with that country's regulations. American companies never needed to worry about such regulations in the past but do now because of changes in American environmental awareness. Figure 12 illustrates this point. Currently in the U.S. there is no standard way of collecting and reporting information about packaging materials which are generated by various industries. The American approach to packaging waste data collection focuses on the amount of the waste that goes to municipalities. Therefore, the contact points in the companies are facility departments.

Selected national and international organizations which responded to a survey were studied. Survey participants were selected among the large corporations nationwide who distribute their product globally.

Information regarding the recovery organizations was gathered by contacting the embassies and trade commissioners of each country (for the international organizations), environmental recovery organizations, environmental consultants, publications, personal interview with the industry professionals, attending seminars, and attending the R3P2 task group meetings.

Europeans obligate the companies to take responsibility for the packaging that they produce by taking the used packaging back. Usually a third-party organization is involved in facilitating the collection and recovery of the used packaging. The third-party organizations or the collaborators charge a fee to the manufacturers and producers based on the material type, weight, quantity sold, and volume.

The U.S. approach to waste management relies upon local governments to set programs and facilities for recovery and recycling. No fees are charged to the manufacturers and producers of the packaging. There are a number of laws passed on the subject of packaging with respect to environmental concerns; however, none are enforced except the California Rigid Plastic Packaging Program and CONEG's Heavy Metals Program. Businesses and municipalities are asked to participate voluntarily in their respective county and municipality programs.

Figure 12. The American and European approach to packaging waste recovery

Conclusions

The research question of this study led to the design of the Packaging Data Tracking Worksheet. To facilitate the information gathering aspect of product packaging, this study concludes in a guideline that emphasizes the type of information necessary for record keeping. Once it is recorded, this information can be used by manufacturers when seeking compliance with certain countries. It can also be a valuable marketing tool for organizations by showing the company's voluntary cooperation with respective state regulations. The guideline is called Packaging Data Tracking Worksheet (see Table 3). The description of the designated categories and the usage provided in the pages 2 to 5 of the Appendix J. Packaging Data Tracking Worksheet is in a spreadsheet format designed to be used by all packaging industries. Depending on the nature of the company and the product, the form can be modified for the company's needs. The categories of plastic,

metal, glass, and paper could contain different materials according to the nature of the business. The Packaging Data Tracking Worksheet should be utilized when the design and development of the package is finalized. The completed record of the packaging data will be a useful tool when the package is shipped.

In a system life cycle process (see figure 2), packaging development begins at the initial phase, which is the advance product planning and specifications. The cycle of activities for package design and development has the same pattern as the product life cycle process. The phase-out and disposal stage of the package development is where the environmental concerns become noticeable. As applied to packaging, the “phase-out and disposal” stage could be interpreted as a package redesign or disposal after use.

Marketing can also use the gathered information as a valuable marketing tool for the organizations by showing the company’s voluntary cooperation with respective state regulations.

Table 3
Packaging Material Data Tracking Worksheet

Packaging Data Tracking Worksheet

Packaging Part Number _____ Heavy Metals Certificate _____

Product Package Description _____ ODS Certificate _____

Component Part #	Matl. Type	#of units	Pre RC%	Post RC%	Reuse # times	Comp. Wt./unit		Total Weight		Comp. Vol./unit		Total Volume		Comments
						lbs.	gm.	lbs.	gm.	cu. cm.	cu. cm.	cu. cm.	cu. cm.	
Paper														
Plastic														
Metal														
Composites														
Glass														
Total														

Description of the Packaging Data Tracking Worksheet

The packaging data sheet is a means for collecting data on a package as an aggregate used for shipment. A package can consist of a few different inserts and trays and cushioning, each made of different material with different weights and volumes. In the case where nothing except a corrugated box is used, the weight, volume and the percentages of the pre and post consumer recycled content of the corrugated board can be documented.

Packaging part number. In this section the part number assigned to the whole package, which includes the individual components, can be documented.

Product/package description. A description of the package or the product associated with the package can be documented at this section.

Heavy metals certification. Heavy metals in sections 22-66261.24 of Title 26 of the California Code of Regulations are mentioned as: antimony, arsenic, barium, Beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

CONEG has certain rules and regulations which pertain to compliance to the CONEG Toxics Model Legislation. But the particular heavy metals of concern are lead, mercury, cadmium, and hexavalent chromium, on the basis of available scientific and medical evidence. For further detail, refer to the CONEG section. Refer to Appendix K for a list of compounds which are considered Hazardous Substances.

Schedule for Removal of Incidental Amounts. CONEG's Model Toxic Legislation

indicates the sum of the concentration levels of cadmium, mercury, and hexavalent chromium in any package or packaging component is not to exceed, 600 PPM by weight (0.06%) effective date is determined by each state; 250 PPM by weight (0.025%) effective date is determined by each state; 100 PPM by weight (0.01%) effective date is determined by each state.

ODS Certification. Recently chloroflourocarbons (CFCs), and other chemical agents sometimes connected with packaging production, have been observed to create several kinds of hazards. CFCs have been associated with ozone depletion, toxic gas emissions, and multiple human health hazards, including cancer. Based on the Clean Air Act of 1970 and Amendments of 1977 and 1990, the EPA phases out CFCs and encourages reduction in the use of solvents and volatile organic compounds (Environmentally conscious electronic systems manufacturing, 1993). Appendix K provides a list of Class I Ozone-Depleting Substances compounds.

Component part number. To keep track of each individual part or component, start with each piece on a separate line.

Material type. Tracking material type has many benefits. The International Organization for Standardization (ISO), section 1043-1 for product marking stated in section 11469 marking standards that the packaging material made of plastic are required to be identified by their acronym. Also refer to California regulations including the rigid plastic packaging program. In addition, any type of certification or registration with the European recycling program requires the identification of the material type. Refer to

Appendix L for the common plastic materials with their standard acronyms and their usage.

Number of units. To eliminate an extra line of input for the identical components in a package, this section is provided. Entering similar data once can save time while inputting data.

Preconsumer recycle content. Post recycle content includes industrial scrap produced while manufacturing a material. Track this data by percentage of the content of scrap collected and reused while manufacturing the material to be used in packaging. This data can be provided by the supplier of the packaging material.

Postconsumer recycle content. Packaging material made up partly or completely of recycled material. This type of data can also be obtained from the packaging material supplier. Refer to Appendix M for calculation of the postconsumer recycled content of a corrugated container.

Reuse number of times. The number of times a component can be used while still protecting the integrity of the product it contains. Refer to Appendix N, for a formula to determine the number of refills.

Component weight per unit. The weight in pounds and grams can be tracked to be used when needed. The weight of each piece of component should be measured.

Total weight. To reach total weight of the components in pounds or gram of the similar kind can be calculated by:

$$\text{Weight of 1 unit of component} \times \text{number of units} = \text{Total weight.}$$

Appendix O provides some standard unit of measurements.

Component volume per unit. The volume of each component in cubic measurement can be specified in this section.

Implications

This research was conducted to benefit the packaging industry and American manufacturers. The Packaging Data Tracking Worksheet and the support data derived from national and international environmentally active organizations will be shared, first with the survey respondents and thereafter with the industry via publication.

Recommendations for Further Research

New environmental laws and regulation pertaining to packaging are continually being proposed; some are enacted and others are rejected. This study analyzed the regulations that have currently passed in the county or the country of the national and international recovery organizations. Some of the organizations included in this research have proposed regulations which are still pending.

Continuation of this initial research and updating of the information is advisable. Revisiting this study each year and modifying the Packaging Data Tracking Worksheet according to legislation would provide the U.S. packaging industry with valuable information.

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Appendix A

Packaging Material Data Sheet (PMDS) for R3P2

UTILITY 0000
 PRODUCT # HPS7705
 TOTAL PACKAGING MATERIAL COST (US\$): 3.48

Packaging Materials	Pack. Comp. description (Optional)	Part number (Optional)	New Metal or below 100 PPM (cer/letter)	ODS Free (cer/letter)	Post-Cons. Recycle Content (%)	Material L.D. symbol	Weight (Kg)	Volume (cm3)
Cellulose			yes no	yes no	yes no	yes no		
Paper			yes no	yes no	yes no	yes no		
Corrugated	BOX	9211-0000-1	X		40		3.5	23026.31
Coated Corrugated (I)								
Chip board								
Molded fibre								
Crimpled/Packing								
Slip sheet								
Coated (I)								
Reinforced (II)								
Other								
Wood								
Virgin (Natural)								
Plywood								
Press board								
Other								
Plastic								
Form								
Polystyrene	Cushion	9211-0000-1	X	X	35	X	1.9	78947.37
Polyethylene								
Polypropylene								
Copolymers								
Polyurethane								
Other								
Rigid Plastics								
ABS								
Polystyrene								
Polyethylene								
Polycarbonate								
Polyamide (Nylon)								
HPPS(II)								
PVC								
Other								
Film								
PVC								
Polystyrene								
Polyethylene	Bags	9211-0000-1	X	X		X	0.11	124.85
Polypropylene								
PETG								
Composites, PET (IV)								
Reinforced								
Coated	Tape	N/A	X	X		X	0.01	UA
Other								
Bandings/Strapping materials								
Polyester								
Polyethylene								
Polypropylene								
Polyamide (Nylon)								
Others								
Metals								
Aluminum								
Steel								
Tin								
Others								
Glass								
Others								

(*) Packaging Materials Data Sheet

UA: UNAVAILABLE

(I) ex. (water resist/ESD-Aluminum/carbon)

(II) ex. (bags/mail envelopes/tapes)

(III) High Impact Styrene

(IV) Polyethyleneterephthalate

[illegible]

Appendix C

Sun Microsystem' Environmental Tracking Tool
Used with permission

Environmental Tracking Tool

Packaging Assembly Part Number:

Product Package Description:

Packaging Component Part Number	Matl Type	HM Cert	ODS Cert	Pre- RC%	Post- RC%	Matl ID Symbol	Comp Wt. (gms.)	Comp Vol. (cu.cm.)	Comments
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									
xxx-xxxx-xx-revX									

Packaging Assembly Part Number	Total Pre- RC%	Total Post- RC%	Total Pkg Wt. (gms.)	Total Setup Pkg Vol. (cu.cm.)	Comments

Environmental Tracking Tool

Current Date

Appendix D

Apple Computer's Packaging Material Data Base (PMDB)
Used with permission

Declaration						
Class:						
Paper	EPS	Other	Plastic	Metal		
Number of items > 31 or > 1.6 sq.cm.		Number of items < 31 or < 1.6 sq.cm.		Total Number of items		

Appendix E

Kodak's POAD Data Input Sheet

Used with permission

Phone Number: _____
Date Prepared: _____

(use 1 sheet for each Representative Product Catalog Number)

Product / Catalog # Data:

Product Catalog Number (Buy Cat. #)	Product Description	Active Date mm/dd/yy	Inactive Date mm/dd/yy	Sales Unit of Measure	Group	Product Representative Prod Cat. Number	Previous Mfg. Site
80							

Product Weight Data:

Product Weight	Weight Unit of Measure ¹	Total Product Weight

Packaging Component Data:

Line No.	Packaging Material Component Number ²	Net Weight (mm/dd/yy)	Qty per Unit of Measure ³	Component Effective Date (mm/dd/yy)	Component Weight (mm/dd/yy)	Percent Recycled ⁴	Percent Reused ⁵	No. of Times Recycled	Pkg. Comp. Cat. Ctl.	Pkg. Class	Pkg. Weight Unit of Measure	Net Unit Ctl.	Material Component Ctl.	Package Component Weight	Site ³	Previous Component Number ⁴	Previous MRP System	Previous Net/Cls Component (mm/dd/yy)
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
9.																		
10.																		
11.																		
12.																		

- 1 Weight of film, paper, chemical, equipment.
2 Claim either % Reused, or % Recycled Content per component if it can be verified that is being done by EK or EK Suppliers.
3 Record the unit of measure and size for all rigid plastic and glass containers (e.g.; to record an 8-oz. bottle, enter UOM = oz and Size = 8).
4 Include all package components on Bill of Materials (e.g.; spools, cores, magazines, cartridges, primary, secondary, and tertiary packaging and non BOM components; e.g., Distribution added components). To take credit for prior package component source reduction efforts (Reduced, Reused, Recycled, Recycled Content) which has occurred from 1988 (base case) to current, record the obsolete / modified Packaging Component Number and the component attribute data.
5 % Reduced will be calculated using both previous and current component weights. The percent Source Reduced can be claimed in addition to % Reused, or % Recycled, or % Recycled Content.

Appendix F (Page 1)

Survey Questionnaire**Part I.**

Name Phone Type Industry (Elect., food, pharmec., etc.).....

Company

Address

Part II.

1. Do you ship your packaging outside of U.S.? Yes No

2. Are you being asked to report on the packaging material which you generate to any source? Yes No

3. Do you anticipate a need for gathering data in future? Yes No

4. Who is the asking source for the packaging material data collection? Internal Company.....

U.S organization (source names)

Outside of U.S (source names)

5. What kind of data are you being asked to report on? Type material Weight(gr. or lb.)..... Volume

Recycle content Material Reused content Others

6. Do you currently have a tracking method to collect the generation of the packaging material? Yes No

7. Is it in a form of? manual Computer Type Soft Ware O/S

8. If the answer to Q. 6 is Yes, Please fax or send a copy of your form to me.

Is the form Confidential Not Confidential (State as such on the copy also)

Part III.

Type of material you use in designing packaging for you product, please mark where applicable:

Cellulos**Paper:**

Corrugated

Coated Corrugated

Chip Board

Molded Fiber

Crinkled/Packaging

Slip sheet

Coated

Reinforced

Others

Plastics**Foam**

Polystyrene

Polyethylene

Polyethylene

Polypropylene

Copolymers

Others

Rigid Plastics

ABS

Polystyrene

Film

PVC

Polystyrene

Polyethylene

Polyethylene

Polypropylene

Composites

PET

Reinforced

Coated

Others

Appendix F (Page 2)
Survey Questionnaire (continued)

Page 2

Company or name.....

Wood

Virgin (Natural)

Plywood

Press board

Others

Banding/Strapping**Materials**

Polyester

Polyethylene

Polypropylene

Polyamide (Nylon)

Others

Metals

Aluminum

Steel

Tin

Others

Comments:

Rigid Plastics

Polyethylene

Polycarbonate

HIPS

PVC

Others

Glass

Tinted

Frosted

Clear

Printed

Others

Please send your responses by to Frida Droorian, FAX (408) 924-3198 or mail to:

San Jose State University

Division of Technology

One Washington square

San Jose California, 95192-3198

Thank you for your cooperation.

Appendix G

Sample**REDUCTION OF TOXICS IN PACKAGING LAW
CERTIFICATE OF COMPLIANCE**

We certify that all packaging and packaging components sold to (Company Name) or its subsidiaries in the State of (state name) comply with the requirements of this law; namely that the sum or incidental concentration levels of **lead, mercury, cadmium & hexavalent chromium** present in any package or package component shall not exceed the following:

- **600 Parts Per Million by weight**
(Effective two years after the legislation was signed into law)
- **250 Parts Per Million by weight**
(Effective three years after the legislation was signed into law)
- **100 Parts Per Million by weight**
(Effective four years after the legislation was signed into law)

We further certify that in cases where the regulated metals are present at levels below the schedule stated above, the regulated metals were not intentionally added during the manufacturing process.

COMPANY NAME: _____

ADDRESS: _____

CERTIFIED BY:

(Name) (Signature)

(Title)

Date: _____

We will maintain adequate documentation of this certification for inspection upon request.

Appendix H

SAMPLE
REDUCTION OF TOXICS IN PACKAGING LAW
CERTIFICATE OF COMPLIANCE:
EXEMPTION STATUS

We certify that all packaging and packaging components sold to (company name) or its subsidiaries in the state of (state name) are in compliance with this law. However, certain packages or packaging components produced by (company name) are exempt from this law for one or more of the following reasons:

- **Package and/or packaging components were made or delivered before the effective date of the statute prohibition:**

(list package or
packaging components)

- **Package and/or packaging component contains heavy metals in order to comply with federal health and safety requirements and there is no feasible alternative;**

(List package or
packaging components)

- **Package and/or packaging component is made from post consumer material.**

(List package or
packaging components)

COMPANY NAME: _____

ADDRESS: _____

CERTIFIED BY:

_____ (Name) _____ (Signature)

Title: _____ Date: _____

We will maintain adequate documentation of this certification for inspection upon request.

Appendix I

DSD Packaging Data Declaration Form

Anlage 2.1

Best.-Nr.: PB.1D

Produktblatt für die Anmeldung von Verpackungen				
Antragsteller/Zeichennehmer		Kunden-Nr. Datum der Meldung - - 		
Ild. Nummer (1)				
Produktbezeichnung (2)				
EAN-Code (3)	 	 	 	
Füllgutschlüssel (4)	 	 	 	
Zusatzinformati- onschlüssel (5)	 	 	 	
Material- schlüssel (6)	 	 	 	
Gewicht der Verpackungseinheiten in g (gemäß Belegabmessung der jeweils gültigen Preschle nach Zulassungsbedingungen)	Glas (7)	 , 	 , 	 ,
	Papier/Pappe/ Karton (8)	 , 	 , 	 ,
	Weißblech (9)	 , 	 , 	 ,
	Aluminium (10)	 , 	 , 	 ,
	Kunststoff (11)	 , 	 , 	 ,
	Verbund (12)	 , 	 , 	 ,
	Naturmaterial (13)	 , 	 , 	 ,
Markteinführungs- datum (14)	 . . 	 . . 	 . . 	
Seite von insgesamt Seiten				

Bitte Formblätter mit Schreibmaschine bzw. schwarzer Handschrift ausfüllen.

Bitte ausschließlich arabische Ziffern verwenden und beim handschriftlichen Ausfüllen die angegebenen Linien nicht überschreiben.

Bitte ausschließlich Original-Formblätter verwenden.

Appendix J

Partial List of Hazardous Substances

Compound	allowed conc. PPM (mg/kg)
Antimony and compounds	10
Arsenic and- compounds	5
Beryllium and-compounds	10
Cadmium and-compounds	5
Chromium (hexavalent) compounds	10
Cobalt and -compounds	25
Lead and-compounds	100
Mercury and-compounds	2
Metal Carbonyls	10
Organic Tin compounds	10
Selenium and-compounds	10
Tellurium and-compounds	10
Thallium and-compounds	10
Asbestos	10
Cyanides	10
Benzene	1
Phenol (monomer)	10
Toluene	0
Xylones	5
Polycyclic aromatic/hydrocarbons	5
CFC's and halogens	0
Acrylonitrile (monomer)	25
Dioxins	0
PVC and PVC blends	1000

Appendix K (page 1)

List of Class I compounds considered Ozone-Depleting Substances

ODC Name	Formula	Chemical Name
Class I Compounds		
Group I		
CFC 11	CCl ₃ F	Trichlorofluoromethane
CFC 12	CCl ₂ F ₂	Dichlorodifluoromethane
CFC 113	C ₂ Cl ₃ F ₃	1,1,2 Trichloro 1,2,2 trifluoroethane
CFC 114	C ₂ Cl ₂ F ₄	1,1 Dichloro 1,2,2,2 tetrafluoroethane
CFC 115	C ₂ ClF ₅	1 Chloro 1,1,2,2,2 Pentafluoroethane
Group II		
Halon 1211	CBrClF ₂	Bromochlorodifluoromethane
Halon 1301	CBrF ₃	Bromotrifluoromethane
Halon 2402	C ₂ Br ₂ F ₄	1,1 Dibromo tetrafluoroethane 1,2 Dibromo tetrafluoroethane
Group III		
CFC 13	CClF ₃	Chlorotrifluoromethane
CFC 111	C ₂ Cl ₅ F	Pentachlorofluoroethane
CFC 112	C ₂ Cl ₄ F ₂	1,1,1,2 Tetrachloro 2,2 difluoroethane 1,1,2,2 Tetrachloro 1,2 difluoroethane
CFC 211	C ₃ Cl ₇ F	1 Fluoro heptachloropropane 2 Fluoro heptachloropropane
CFC 212	C ₃ Cl ₆ F ₂	1,1 Difluoro hexachloropropane 1,2 Difluoro hexachloropropane 1,3 Difluoro hexachloropropane 2,2 Difluoro hexachloropropane
CFC 213	C ₃ Cl ₅ F ₃	1,1,1 Trifluoro pentachloropropane 1,1,2 Trifluoro pentachloropropane 1,1,3 Trifluoro pentachloropropane 1,2,2 Trifluoro pentachloropropane 1,2,3 Trifluoro pentachloropropane
CFC 214	C ₃ Cl ₄ F ₄	1,1,1,2 Tetrachloro 2,3,3,3 tetrafluoropropane 1,1,1,3 Tetrachloro 2,2,3,3 tetrafluoropropane 1,1,2,2 Tetrachloro 1,3,3,3 tetrafluoropropane 1,2,3,3 Tetrachloro 1,1,2,3 tetrafluoropropane

Appendix K (page 2)

List of Class I compounds considered Ozone-Depleting Substances (continued)

ODC Name	Formula	Chemical Name
CFC 215	C3C13F5	1,1,3,3 Tetrachloro 1,2,2,3 tetrafluoropropane
		1,2,2,3 Tetrachloro 1,1,3,3 tetrafluoropropane
		1,1,1 Trichloro pentafluoropropane
		1,1,2 Trichloro pentafluoropropane
CFC 216	C3C12F6	1,1,3 Trichloro pentafluoropropane
		1,2,3 Trichloro pentafluoropropane
		1,1 Dichloro hexafluoropropane
		1,2 Dichloro hexafluoropropane
		1,3 Dichloro hexafluoropropane
CFC 217	C3CIF7	2,2 Dichloro hexafluoropropane
		1 Chloro heptafluoropropane
		2 Chloro heptafluoropropane
Group IV		
	CCl4	Carbon tetrachloride
Group V		
	C2H3Cl3	1,1,1 Trichloroethane (also known as methyl chloroform) Not 1,1,2 Trichloroethane

Appendix L

Common plastic materials used in packaging and the identification systems

The plastic materials used in packaging and their acronyms are:

<u>Material</u>	<u>ISO 1043-1 Acronym</u>	<u>SPI Number</u>
Polyethylene Terephthalate	PET	1
Polyethylene-High Density (HDPE)	PE-HD	2
Polyvinyl Chloride (Vinyl)	PVC	3
Polyethylene- Low Density (LDPE)	PE-LD	4
Polypropylene	PP	5
Polystyrene	PS	6
Polyurethane	PUR	
Poly (ether urethane)	PEUR	
Polycarbonate	PC	
Acrylonitrile/butadiene/styrene	ABS	

Identification systems

The SPI identification system. The current standard resin identification system in U.S. is the identification system suggested by the SPI. The symbol is a 3 sided triangular arrow with a number in the center and letters underneath. Numbers and letters represent resin content. For further information contact SPI, refer to Appendix P for the address.

The R3P2 identification System. R3P2 task group suggests a more descriptive marking system based on ISO 1043-1 (Russell, et. al, 1992), which is as follows:

Appendix M

Formula to calculate postconsumer material content

The Rigid Plastic Packaging Container Program of California in its regulatory adoption under Title 14, Division 7, CHAPTER 4, Article 3, Sections 17942-17952 of the California Code of Regulations suggests the following formula for calculation of postconsumer material for single and multiple containers:

$$\text{Percent of Postconsumer Material} = \frac{(\text{weight of Postconsumer resin})}{(\text{weight of postconsumer resin}) + (\text{weight of all other resin})}$$

To calculate the postconsumer material content for multiple packaging lines:

$$\text{Percent of Postconsumer Material} = \frac{(C) (P_0)}{(C) (P_0 + V_0)} \times 100$$

where:

C = each container packaging line complying with the postconsumer material option

P₀ = tons postconsumer resin in the container packaging line

V₀ = tons virgin resin in the container packaging line

Appendix N

Formula for calculation of number of reuses

The Rigid Plastic Packaging Container Program of California in its regulatory adoption under Title 14, Division 7, CHAPTER 4, Article 3, Sections 17942-17952 of the California Code of Regulations suggests the following formula for calculation of the number of reuses for the containers in a packaging line:

$$\begin{array}{l} \text{Average Reuse Per} \\ \text{Packaging line} \\ \text{Container} \end{array} = \frac{(\text{number of replacement product packages sold})}{(\text{number of original containers sold}) (n)}$$

where:

n = the number of replacement product packages required to fill the original container to accomplish the same number of units or uses of product held by the original container.

Container manufacturers can also provide their own formula.

Appendix O

Conversion Information and standard units of measurements

To determine cubic measurements:

Length x width x height (in inches) = cargo cube (cu. in.)

Cargo cube (cu. in.) divided by 1728 = cubic feet

Cubic feet x # of cartons (if all same size) = total cu. ft.

Total cubic feet x .028317 = total cubic meters

One cubic meter = 35.31 cubic feet

Total weight (lbs) x .45359 = kilos (to get kilo tons, move the decimal point
3 places to the left)

One kilogram = 2.204 lbs

One metric ton = 2204.6 lbs

Standard Units of Measurement

Mass	$1 \text{ Kg} = \frac{1}{0.45359237} \text{ lb} = 2.205 \text{ lb}$
------	---

Length	$1 \text{ m} = \frac{1}{0.3048} \text{ ft} = 3.281 \text{ ft}$
--------	--

Volume	$1 \text{ m}^3 = 35.31 \text{ ft}^3$
--------	--------------------------------------

Appendix P

Information sources

CONEG Policy Research Center

To obtain further information and related publication write to:

CONEG Policy Research Center, Inc.,
400 North Capitol Street, N.W., Suite 382
Washington, D.C. 2000
Tel: 202-624-8450

Florida department of Environmental Protection

To obtain a certificate of compliance, exemption, and any other related information, contact Department headquarters in Tallahassee, or write to:

Administrator of the Waste Reduction Section
Bureau of Solid and Hazardous Waste
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Duales System Deutschland (DSD)

To acquire a list of waste disposal agents participating in RESY system, write to :

RESY GmbH,
Hilperstrasse 22,
W-6100 Darmstadt,
Germany

Society of Plastics Industry

To obtain information on plastics identification symbols, write or call:

Society of Plastics Institute
1275 K. Street, NW
Suite 400
Washington, DC 20005
(202) 371-5200