PRTR Estimation Manual

28. 18-Liter Can Manufacturing Industry

March 2004

Prepared by the Working Group for
the 18-Liter Metal Can Manufacturing Industry

Contents

Chapter 1 Outline of the PRTR Law

The English description here is omitted.

Chapter 2 Basic Concept for Releases and Transfers

2-1 Covered Businesses

A business having 21 or more full-time employees

Releases and transfers are identified and reported for each business facility (factory).

Industry type: Metal product manufacturing industry (Industry type code: 2800)

Business: A business handling PRTR chemical(s), etc.

2-2 Targeted Raw Materials

Typical basic materials for the can manufacturing industry and the PRTR chemicals contained in them are as follows:

① Liquid

Basic Material	PRTR Chemical Contained (Typical Examples)	Cabinet Order No.
Paint	Ethylbenzene	40
	Ethylene glycol monoethyl ether (ethyl cellosolve)	44
	Ethylene glycol monomethyl ether (methyl cellosolve)	45
	Xylene	63
	2-etoxymethyl acetate	101
	Styrene	177
	Toluene	227
Thinner	Ethylbenzene	40
	Ethylene glycol monoethyl ether (ethyl cellosolve)	44
	Ethylene glycol monomethyl ether (methyl cellosolve)	45
	Xylene	63
	2-etoxymethyl acetate	101
	Toluene	227

② Solids

Basic Material	PRTR chemical (Typical Examples)	Chemical No.
Solder	Lead and its compound	230

③ Solid products that dissolve, melt, or evaporate during handling (solder antioxidants, etc.)

Basic Material	PRTR chemical (Typical Examples)	Chemical No.
Solder antioxidant	Zinc chloride	1

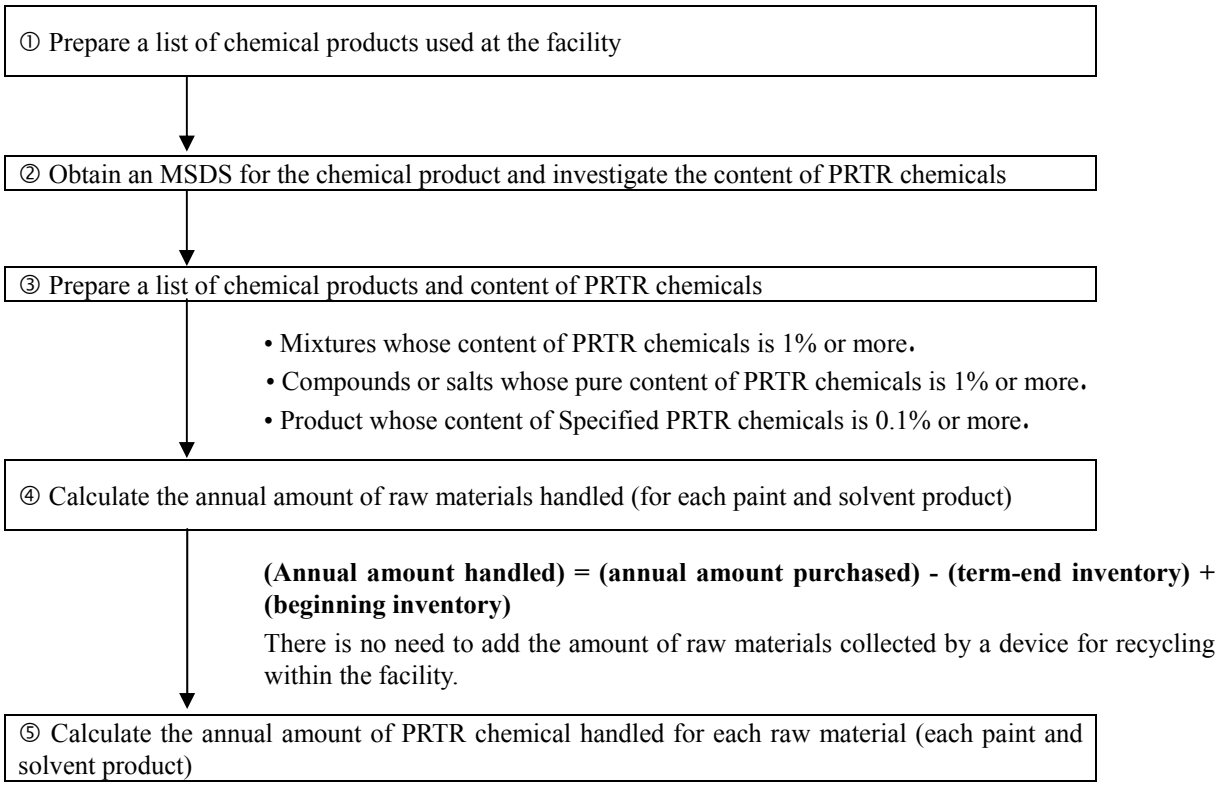
2-3 Targeted Manufacturing Processes

The process for manufacture of 18-liter metal cans from metal sheets is subject to reporting. Because paints and printing on the metal sheets for 18-liter metal cans are subcontracted in most cases, they are not included in the 18-liter metal cans manufacturing process in this manual. However, if the facility conducts coating and printing on-site, it is necessary to identify releases of metals as pigments. A business which has a facility that engages in the coating and printing metal sheets for 18-liter metal cans shall reference Part 3 in "PRTR Releases Calculation Manual - Edition 3, January 2004" (the Ministry of Economy, Trade and Industry and the Ministry of Environment) and the "Chemical Substances Releases/Transfers Calculation Manual (for industries other than Chemical Industry)" for the Can Manufacturing Industry on the website of the Japan Small and Medium Enterprise Corporation (www.jasmec.go.jp/kankyo/h12/book/2csb/sansyutu/02/pdf/12.pdf). In the manufacturing of 18-liter metal cans, nickel, chromium, and trivalent chromium compounds are not released or transferred because copper wire is used for wire seam welding or spot welding and a welding rod is not used.

Name of Manufacturing Process	Methods for Calculating Releases/Transfers
① Side seam repair and drying process	Coating process
② Top/bottom plate and roll tightening repair process	Coating process
③ Soldering process	Soldering process

* The calculation methods are classified into two types for paints and soldering.

2-4 Procedures for Determining Notification of PRTR Chemicals



(Annual amount of PRTR chemical handled for each raw material) = (annual amount handled) × (content [%] of PRTR chemical) ÷ 100

The annual amount handled is obtained from ④.

For Specified Class I Designated Chemical Substances, calculations are made likewise.

⑥ Calculate the annual amount of each PRTR chemical handled throughout the facility

(Annual amount of PRTR chemical handled) = Σ (annual amount of PRTR chemical handled for each raw material)

The annual amount of PRTR chemical handled for each raw material is obtained from ⑤.

For Specified Class I Designated Chemical Substances, calculations are made likewise.

⑦ Determine the necessity of PRTR chemical notification.

If the annual amount handled that was calculated in ⑥ is 1 ton or more, notification for the PRTR chemical is required. (For a Specified Class I Designated Chemical Substance, notification is required if the annual amount of the substance handled is 0.5 tons or more.)

Chapter 3 Methods for Calculating Releases/Transfers

3-1 Coating Process

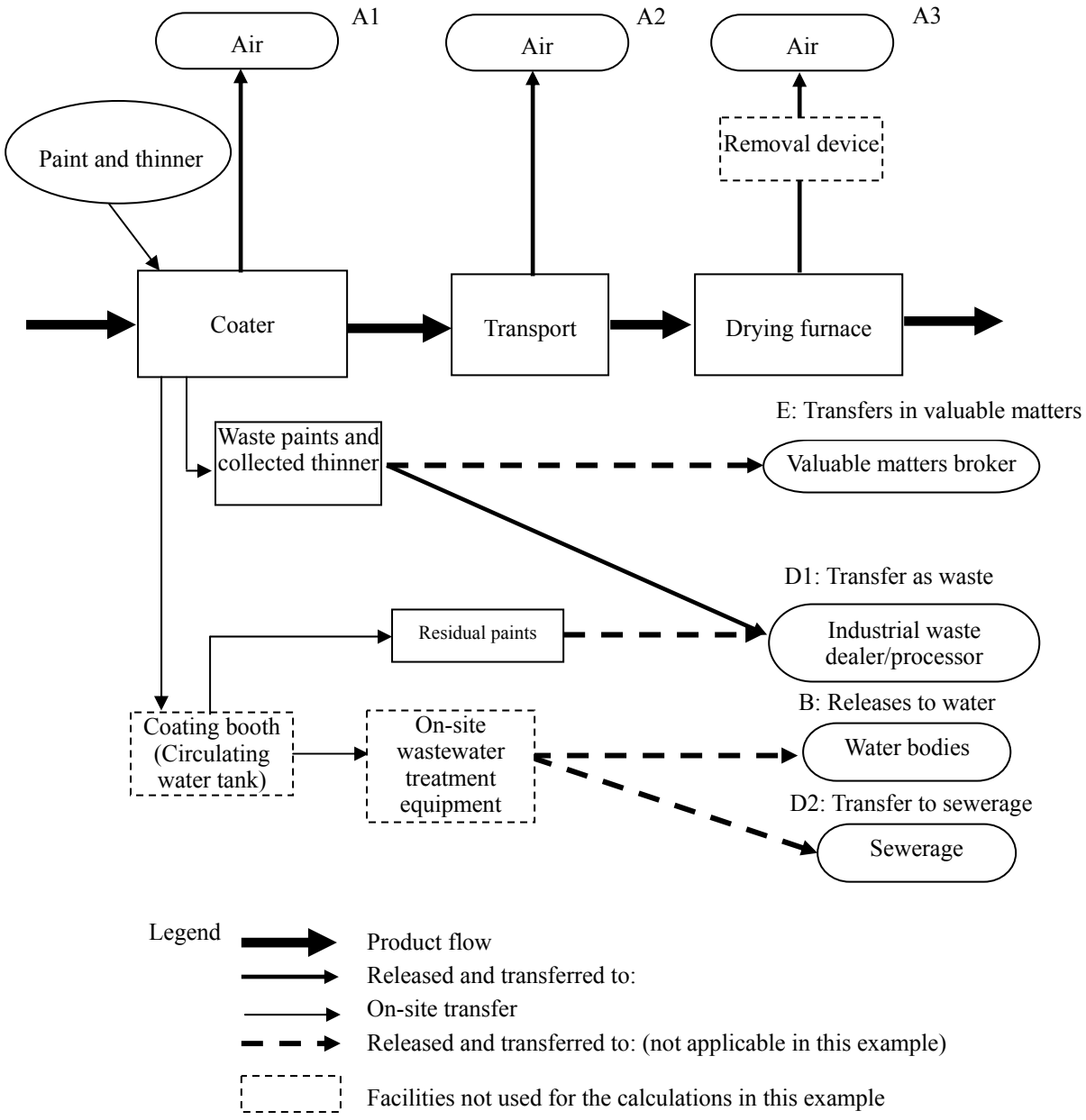
Can surfaces are coated using a roll coater or spray.

The targeted chemicals are PRTR chemicals of solvent components contained in paints and thinner (if PRTR chemicals are contained as resin components and pigments, they need to be calculated separately). The solvent components are evaporated and released to the air almost completely. If a wet-type booth is installed, however, the PRTR chemicals are mixed into wastewater and transferred as waste paints. It is assumed that there will be no transfers through adhesion to product. (Releases = 0)

{Example of PRTR chemicals}

Solvent components: Toluene, xylene, etc.*

[Process]



Flow for Calculation Procedures		Calculation Procedures
1	Calculating the annual amount handled (X)	This is calculated from the consumption of paints and thinner by the said device and the content of PRTR chemicals in them. **Annual amount handled (X) = Σ ([consumption of paint and thinner] × [content])**
2	Calculating transfers in wastes (D1)	This is calculated from the amount of waste paints and thinner and the content of PRTR chemicals in them. **Transfers in waste (D1) = Σ ([amount of waste paint/thinner sent out] × [content])** * The content in the wastes shall be the same as that in the original liquid. If this is not sufficiently practical, the actual content shall be measured. * Various paints and thinner are used. If the amount of wastes cannot be determined for each paint or thinner, the total amount is apportioned using annual consumption.
3	Calculating transfers in valuable matter (E)	This is calculated from the amount of wastes and the content of PRTR chemicals in them. **Transfers in valuable matter = Σ ([amount of valuable matter] × [content])** * E is basically 0 in the PRTR for the 18-liter can manufacturing industry.
4	Calculating transfers to sewerage (D2)	If waste liquid (water circulated in the coating booth) or wastewater is released to sewerage: **Transfers to sewerage (D2) = (annual amount of wastewater) × (concentration of PRTR chemical in wastewater)** * The annual amount of wastewater and the concentration of PRTR chemical shall be at the same measuring point. * This shall be based on dissolution data or measured values of the PRTR chemical. * If wastewater is released after treatment and the same PRTR chemical flows in from other devices, the amount of PRTR chemical in the released (waste) water shall be apportioned using each load at the entrance of the wastewater treatment equipment. * If wastewater is treated after aeration (activated sludge), it is assumed that the concentration of PRTR chemical in the released (waste) water is “below the lower limit of detection”; it shall not be regarded as having been removed by the wastewater treatment equipment but as released to the air by A1.

Flow for Calculation Procedures		Calculation Procedures
5	Calculating the maximum potential releases (Y)	This is calculated as the difference between the annual amount of PRTR chemical handled and the transfers in wastes, valuable matter, and to sewerage. **Maximum potential releases (Y) = (X) - (D1) - (E) - (D2)** * If no removal (treatment) device is installed, Y above becomes the releases. * If a removal (treatment) device is installed, the removal rate and releases concentration are calculated from the guaranteed values in the device specifications or measured values according to steps 7 and 8 below.
6	Calculating releases to soil (C)	**Releases to soil (C) = 0** (The workshop floor is covered with concrete and does not allow leakage into the ground.)
7	Calculating releases to water (B)	If waste liquid after wastewater treatment is released to bodies of water: **Releases to bodies of water (B) = (annual amount of wastewater) × (concentration of PRTR chemical in wastewater)** * The annual amount of wastewater and the concentration of PRTR chemical shall be measured at the same point. * This shall be based on dissolution data or measured values of the PRTR chemical. If wastewater is treated after aeration (activated sludge), it is assumed that the concentration of PRTR chemicals in the released (waste) water is “below the lower of detection”; it shall not be regarded as having been removed by the wastewater treatment equipment but as released into the air by A1. * If wastewater is released after treatment and the same PRTR chemical flows in from other devices, the amount of PRTR chemical in the released (waste) water shall be apportioned using each load at the entrance of the wastewater treatment equipment.

Flow for Calculation Procedures		Calculation Procedures
8	Calculating releases to the air (A)	**(A)=(A1) + (A2) + (A3)** ① Releases from coater (coating booth) (A1) (A1) = ([Y] – [C] – [B]) × (coater evaporation rate) * The coater evaporation rate is measured or calculated using Equation (i) below. If treatment equipment is used, the rate is multiplied by (1 - removal rate). ②Releases from transport system (A2) (A2) = ([Y] – [C] – [B]) × (transport system evaporation rate) * The transport system evaporation rate is measured or calculated using Equation (i) below. If treatment equipment is used, the rate is multiplied by (1 - removal rate). ③Releases from the drying furnace (A3) (A3) = ([Y] – [C] – [B]) × (Drying furnace drag-in rate) × (1 - removal rate) The drying furnace drag-in rate is measured or calculated using Equation (i) below. Notes: • The relationship between the coater evaporation rate, transport system evaporation rate, and drying furnace drag-in rate is as follows: Coater evaporation rate + transport system evaporation rate + drying furnace drag-in rate = 1·····(i) • If it is preferable in terms of removal device configuration, etc., or calculation of releases, (A2) may be regarded as part of (A1) or (A3).

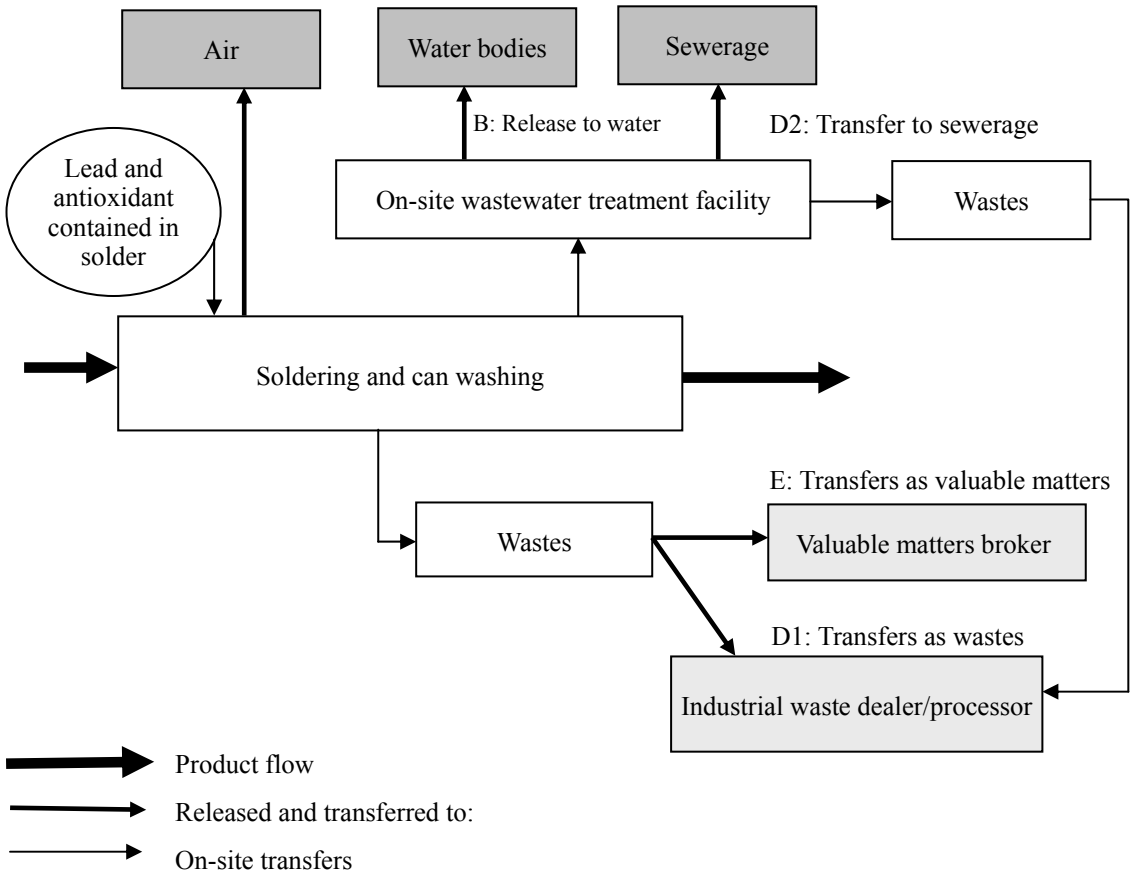
Flow for Calculation Procedures		Calculation Procedures
		• The evaporation rate and drag-in rate are calculated as follows: Weight measurement of can body or test piece Measurement and calculation of concentrations and amounts of exhaust gas using exhaust ducts, etc. • For the removal rate, the guaranteed value in the removal (treatment) device specifications or the measured value is used. • If the removal (treatment) device is used in common with other processes or facilities, releases at the exit shall be apportioned using each load at the entrance of the removal device. • If the removal device is of the activated charcoal type, there will be transfers as wastes. • If the generated residual paints and waster thinner are incinerated in an on-site facility, the amount of removal shall be calculated and subtracted from the transfers because the solvent components are thermally decomposed.

3-2 Soldering Process

The PRTR chemicals (lead and antioxidant contained in the solder) are released from the solder cans and washed cans.

Possible releases are releases to water bodies from the wastewater treatment equipment. And wastes generated from the soldering process and washing cans process and sludge from the wastewater treatment equipment should be assumed as transfers.

[Process]



Flow of Calculation Procedures		Calculation Procedures
1	Calculating the annual amount handled (X)	This is calculated from the consumption of antioxidants, etc., in the said device and the content of PRTR chemicals in them. **Annual amount handled (X) = Σ ([consumption of agent] × [content])** * For a compound or salt, the pure content of the substance prescribed by the Ordinance shall be adopted as the content.
2	Calculating transfers in wastes (D1)	This is calculated from the amount of wastes and the content of PRTR chemicals in them. Sludge from wastewater treatment facilities is also included and calculated by ① or ②. ① Calculation from the amount of wastes and the content of PRTR chemicals in them **Transfers in waste (D1) = Σ ([amount of waste delivered] × [content])** * The content in wastes is measured. ② Backward calculation using releases to sewerage (D2), transfers in valuable matter (E: basically 0), and releases to water bodies (B). **Transfers in waste (D1) = (X) - (E) - (D2) - (B)** * ② may be used if no data is available on the content in wastes or if the concentration in wastes fluctuates greatly and releases to sewerage (D2) and releases to water bodies (B) are more reliable.
3	Calculating transfers in valuable matter (E)	This is calculated from the amount of valuable matter and the content of PRTR chemicals in them. **Transfers in valuable matter =Σ ([amount of valuable matter delivered]×[content])** * The content in valuable matter is measured.
4	Calculating transfers to sewerage (D2)	This is calculated from the content of PRTR chemicals released from on-site waste treatment facilities to sewerage. **Releases to sewerage (D2) = (annual amount of wastewater) × (concentrations of PRTR chemical in wastewater)** * The annual amount of wastewater and the concentration of PRTR chemical shall be at the same measuring point. * This shall be based on dissolution data or measured values of the PRTR chemical. * If wastewater is released after treatment and the same PRTR chemical flows in from other devices, the amount of PRTR chemical in the released (waste) water shall be apportioned using each load at the entrance of the wastewater treatment equipment.

Flow of Calculation Procedures		Calculation Procedures
5	Calculating the maximum potential releases (Y)	This is calculated as the difference between the annual amount of PRTR chemicals handled and the transfers in wastes, in valuable matter, and to sewerage. **Maximum potential releases (Y) = (X) - (D1) - (E) - (D2)** * If no removal (treatment) device is installed, Y above becomes the releases. * If a removal (treatment) device is installed, the removal rate and concentration in waste are calculated from the guaranteed values in the device specifications or measured values according to the steps 7 and 8 below.
6	Calculating releases to soil (C)	**Releases to soils (C) = 0** (The workshop floor is covered with concrete and does not allow leakage into the ground.)
7	Calculating releases to water bodies (B)	If waste liquid after wastewater treatment is released to water bodies: **Releases to water bodies (B) = (annual amount of wastewater) × (concentration of PRTR chemical in wastewater)** * The annual amount of wastewater and the concentration of PRTR chemical shall be at the same measuring point. * This shall be based on dissolution data or measured values of the PRTR chemical. If wastewater is released after aeration (activated sludge), it is assumed that the concentration of PRTR chemical in the released (waste) water is "below the lower limit of the detection"; it shall not be regarded as having been removed by the wastewater treatment equipment but as released to the air by A1. * If the same PRTR chemicals flow from other devices into the wastewater treatment equipment, the amount of PRTR chemicals in the released (waste) water shall be apportioned using each load at the entrance of the wastewater treatment equipment.
8	Calculating releases to the air (A)	**Releases to the air (A) = (annual amount of exhaust gas) × (concentration of PRTR chemical in exhaust gas)** * The lead concentration in exhaust gas is measured. * It may be determined that zinc chloride used in the soldering process is not released to the air because of the evaporation temperature.

Chapter 4 Determining the Need for Notification of PRTR Chemicals and Calculating Releases/Transfers

Currently, 18-liter metal cans are manufactured through welding and bonding. Only a small percentage of cans for special uses are manufactured with soldering. However, because this method is not standard, the releases and transfers of PRTR chemicals in can manufacturing with soldering are not explained here. This section describes releases and transfers in the coating process for can manufacture with welding.

Here, the number of cans manufactured (and its breakdown) is as follows:

Number of outside side-seam repaired cans: 5,000,000/year

Number of top/bottom plate and roll tightening repaired cans: 1,300,000/year

Number of inside side-seam repaired cans: 960,000/year

4-1 Example of Determining Notification of PRTR Chemicals

① Preparing a list of chemical products for factory use

Paints	For inside repair coating
	For outside repair coating
Thinner	For inside repair coating paint
	For outside repair coating paint

② Obtaining MSDSs for the chemical products and checking the content of PRTR chemicals

Name of Chemical Product	PRTR chemical	Content (%)	Notification
Paint for inside repair coating	2-etoxymethyl acetate	21	Required
Paint for outside repair coating	Ethylbenzene	42	Required
	Xylene	42	Required
	Styrene	2.9	Required
Thinner for inside repair coating paint	2-etoxymethyl acetate	21	Required
Thinner for outside repair coating paint	Ethylbenzene	48	Required
	Xylene	48	Required

* For a chemical product containing 1% PRTR chemical or more (0.1% or more Specified I Designated Chemical Substance), the user must always be provided with an MSDS.
* If the MSDS gives a range of content of PRTR chemical, the maximum value shall be used or the manufacturer shall be asked for the accurate content.
* MSDS based on the PRTR Law states the content (%) of designated chemical substances to two significant figures

③ Calculating the annual amount of raw materials, etc., handled

From the table in ② above, targeted chemical products are identified and the annual amounts handled are calculated for each brand of paint or solvent using the following equation:

Annual amount handled = (annual amount purchased) - (term-end inventory) + (beginning inventory)

(Unit: kg/year)

Name of Chemical Product	Calculating the Annual Amount Handled			
	Annual Amount Purchased	Term-end Inventory	Beginning Inventory	Annual Amount Handled
Paint for outside repair coating	2,400	225	90	2,265
Thinner for outside repair coating paint	315	75	45	285
Paint for inside repair coating	870	30	75	915
Thinner for inside repair coating paint	15	15	15	15

If wastes are collected by equipment and recycled for on-site use, there is no need to add the amount recycled on-site.

④ Calculating the annual amount of PRTR chemical handled for each chemical product

(Annual amount of PRTR chemical handled for each chemical product)

= (annual amount handled) × (content of PRTR chemical) ÷ 100

Basic Material		PRTR Chemical		
Chemical Product	Annual Amount Handled (kg/year)	PRTR Chemical	Content (%)	Annual Amount Handled (kg/year)
Paint for inside repair coating	915	2-etoxymethyl acetate	21	192
Paint for outside repair coating	2,265	Ethylbenzene	42	951
		Xylene	42	951
		Styrene	2.9	66
Thinner for inside repair coating paint	15	2-etoxymethyl acetate	21	3
Thinner for outside repair coating paint	285	Ethylbenzene	48	137
		Xylene	48	137

⑤ Calculating the annual amount of PRTR chemical handled for each raw material in the entire facility

(Annual amount of PRTR chemical handled)

= Σ (annual amount of PRTR chemical handled for each raw material)

Name of PRTR Chemical	Name of Material	Annual Amount Handled (kg/year)	Total Annual Amount Handled (kg/year)
Ethylbenzene	Paint for outside repair coating	951	1,088
	Thinner for outside repair coating paint	137	
Xylene	Paint for outside repair coating	951	1,088
	Thinner for outside repair coating paint	137	
2-etoxymethyl acetate	Paint for inside repair coating	192	195
	Thinner for inside repair coating paint	3	
Styrene	Outside repair coating	66	66

⑥ Judging the notification of PRTR chemicals

A PRTR chemical must be reported if its annual amount handled is one ton (1,000 kg) or more. Notification for a Specified I Designated Chemical Substance is required if its annual amount handled is 0.5 tons (500 kg) or more.

PRTR Chemical	Annual Amount Handled (kg/year)	Notification
Ethylbenzene	1,088	Required
Xylene	1,088	Required

4-2 Calculating Releases/Transfers

Releases and transfers require the following classification:

Releases	Transfers
Releases to the air Releases to water bodies Releases to on-site soil On-site landfills	Transfers to sewerage Transfers off-site

4-2-1 Classifying the annual amount of paints and thinner handled in each process

If different types of equipment are used in each process, it is necessary to identify the annual amount of basic materials handled in each process.

Process	Basic Material	Annual Amount Handled (kg)
Outside side-seam repair	Paint for outside repair coating	975
	Thinner for outside repair coating paint	125
Roll tightening repair	Paint for outside repair coating	1,290
	Thinner for outside repair coating paint	160
Inside side-seam repair	Inside repair coating	915
	Thinner for inside repair coating paint	15

4-2-2 Example of calculations for the outside side-seam coating process

The outside side-seams of welded cans are coated using an airless spray equipment. The PRTR chemicals in solvent components contained in the paints and thinner are subject to reporting.

(a) Outline of the facility

• Process: Repair coating for welds on the outside surface of can

• Equipment used: Airless spray (local exhaust)

• Exhaust gas treatment systems: Waste gas section of the coater ··· None
Waste gas section of the transport system ··· None
Waste gas section of the drying furnace ··· None

• Coater evaporation rate + transport system evaporation rate + drying furnace drag-in rate = 100%

• Paints used:

Basic Material		PRTR Chemical	
Basic Material	Annual Amount Handled (kg/year)	PRTR Chemical	Content (%)
Paint for outside repair coating	975	Ethylenebenzene	42
		Xylene	42
Thinner for outside repair coating paint	125	Ethylenebenzene	48
		Xylene	48

* Paints for outside repair coating shall be diluted with thinner for use.

• Amount of wastes

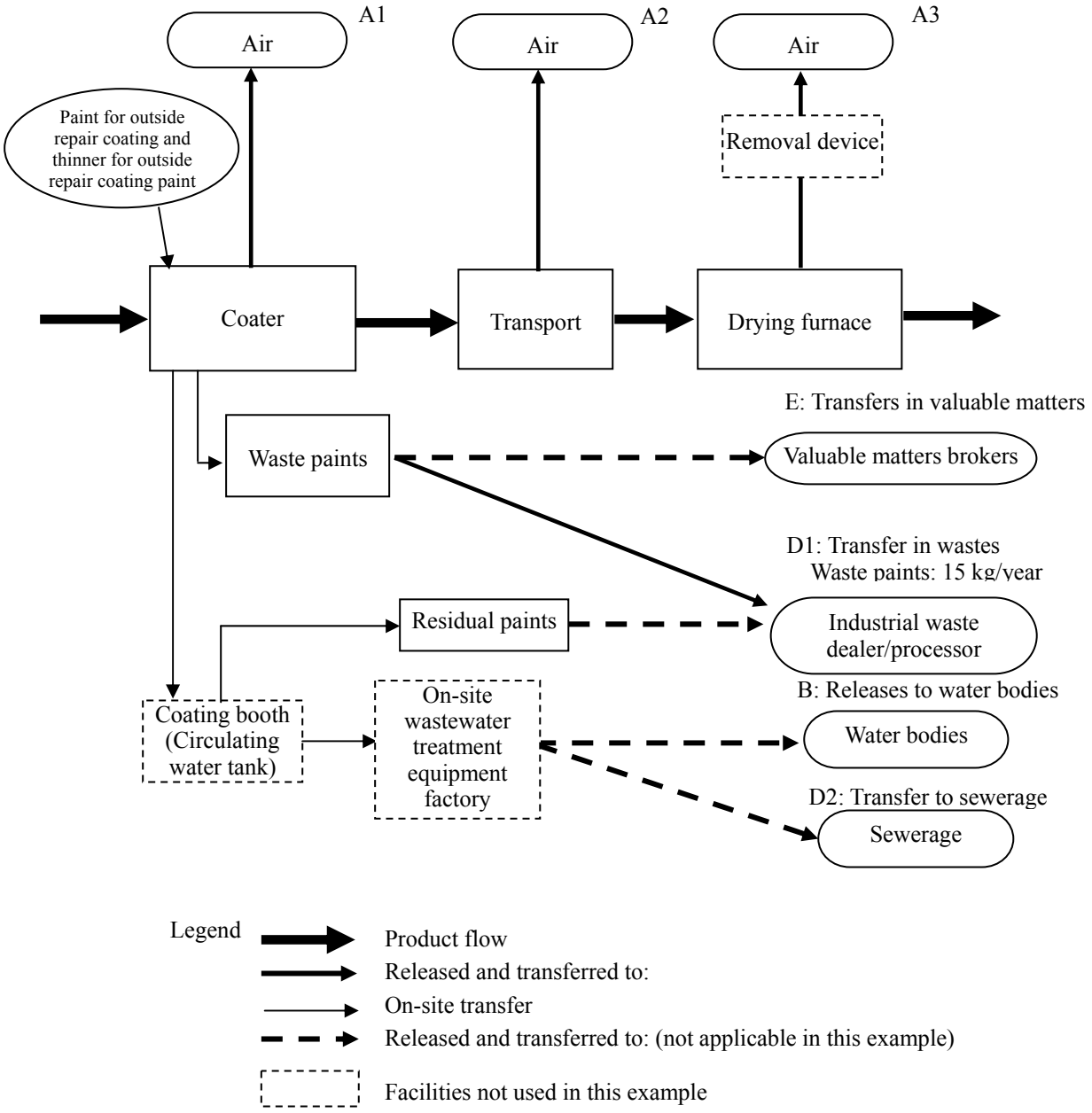
Paint for outside repair coating: 0 kg/year

Waste thinner for outside repair coating paint: 0 kg/year

Waste paints: 15 kg/year (ethylbenzene content: 1%)

• Amount of valuable matter E: 0 kg/year

(b) Process Flow Diagram



Note: Since no removal device has been installed at points of release (A1, A2, and A3), the releases to air should be A1 + A2 + A3 = 100%.

Example of Calculating the Releases/Transfers of Ethylbenzene

Calculation Procedure		Equation
1	Calculating the annual amount handled (X)	Annual amount handled (X) = Σ ([consumption of paints and thinner] × [content]) = 975 kg × 42% + 125kg × 48% = 470 kg
2	Calculating transfers in wastes (D1)	Transfers in waste (D1) = Σ ([amount of waste paints and thinner delivered] × [content]) = 15 kg × 1% = 0.15 kg
3	Calculating transfers in valuable matter (E)	Transfers in valuable matter (E) = Σ ([amount of valuable matter delivered] × [content]) = 0
4	Calculating transfers to sewerage (D2)	Releases to sewerage (D2) = (annual amount of wastewater) × (concentration of PRTR chemical in waste liquid) = 0
5	Calculating the maximum potential releases (Y)	Maximum potential releases = (X) - (D1) - (E) - (D2) = 470 kg - 0.15 kg – 0 kg = 469.85 kg
6	Calculating releases to soil (C)	Releases to soil (C) = 0
7	Calculating releases to water bodies (B)	Releases to water bodies (B) = 0
8	Calculating releases to the air (A)	Calculating releases to the air (A) = (A1) + (A2) + (A3) (A) = ([Y] – [B] – [C]) = (469.5 [kg/year] – 0 [kg/year] – 0 [kg/year]) = 469.5 kg/year

Preparing a sheet for aggregate totals

PRTR Chemical: Ethylbenzene (kg/year)

Item \ Process		Outside-Side Seam Repair	Top/Bottom Roll Tightening Repair		Total
1	Calculating the annual amount handled (X)	470	618		1,088
2	Transfers in waste (D1)	0.15	0.40		0.55
3	Transfers in valuable matter (E)	0	0		0
4	Releases to sewerage (D2)	0	0		0
5	Maximum potential releases (Y)	469.85	617.6		1,087.45
6	Releases to soil (C)	0	0		0
7	Releases to water bodies (B)	0	0		0
8	Calculating releases to the air (A)	469.85	617.6		1,087.45

The following points shall be noted when preparing a PRTR notification form:

* Enter the amount of releases/transfers to two significant figures. (Ex. 1,088 → 1,100)

* If the releases/transfers of PRTR chemicals other than dioxins amount to below 1 kg, the second decimal place shall be rounded off. (Ex. 0.55 → 0.6)

* If the value becomes zero as a result of entering two significant figures, enter 0.0.