1. Examples of calculation in typical processes

This section gives examples of calculation in the following 11 processes, which are assumed to be included in various business categories.

The table on the next page gives examples of correspondence between designated businesses (pIII-165, pIII-172) and the processes that may be performed by those businesses. Note that exceptions may exist.

Example of correspondence between designated businesses and processes

Industrial classification \ Process / Raw materials or materials handled	1 Storage process	2 Reaction and mixing process	3 Machining process	4 Washing process	5 Coating process	6 Printing process	7 Adhesion process	8 Plating process	9 Dyeing process	10 Sterilizing and disinfecting process	11 Process of using other solutions
	Raw materials or materials stored	Raw materials, semi-processed materials, additives, etc.	Cutting oil, etc.	Detergent, dry cleaning solution, etc.	Paint, anti-corrosive coating, etc.	Printing ink	Adhesives	Plating solution	Dye, bleaching agent, etc.	Sterilizing agent, antiseptic agent, disinfec-tant, etc.	Various solutions
1 Metal mining	○										
2 Crude petroleum and natural gas production	○										
3 Manufacturing											
a Manufacture of food										○	○
b Manufacture of beverages, tabacco and feed										○	○
c Manufacture of textile mill products						○	○		○	○	○
d Manufacture of apparel and other finished products made from fabrics and similar materials						○	○		○	○	○
e Manufacture of lumber and wood products, except furniture					○	○	○			○	○
f Manufacture of furniture and fixtures					○	○	○			○	○
g Manufacture of pulp, paper and paper products					○	○	○		○	○	○
h Publishing, printing and allied industries						○	○				○
i Manufacture of chemical and allied products	○	○									○
j Manufacture of petroleum and coal products	○	○									○
k Manufacture of plastic products, except otherwise classified	○	○	○	○	○	○	○				○
l Manufacture of rubber products	○	○	○	○	○	○	○				○
m Manufacture of leather tanning, leather products and						○	○		○		○
n Manufacture of ceramic, stone and clay products			○	○	○	○	○				○
o Manufacture of iron and steel			○	○	○	○	○				○
p Manufacture of non-ferrous metals and products			○	○	○	○	○	○			○
q Manufacture of fabricated metal products			○	○	○	○	○	○			○
r Manufacture of general machinery			○	○	○	○	○	○			○
s Manufacture of electrical machinery, equipment and suplies			○	○	○	○	○	○			○
t Manufacture of transportation equipment	○		○	○	○		○	○			○
u Manufacture of precision instruments and machinery			○	○	○	○	○	○			○
v Manufacture of ordnance and accessories			○	○	○	○	○	○			○
w Manufacture of ordnance and accessories			○	○	○	○	○	○			○
4 Electricity industry	○										
5 Gas industry	○										
6 Heat supply industry	○										
7 Sewage industry											
8 Railway industry			○	○	○		○	○			○
9 Warehouse industry*1)	○									○	
10 Petroleum wholesale industry	○										
11 Scrap iron wholesale industry*2)											
12 Automobile wholesale industry*2)											
13 Fuel retail industry	○										
14 Laundry industry				○							○
15 Photography industry		○									
16 Automobile maintenance industry	○		○	○	○		○	○			○
17 Machinery and equipment repair industry			○	○	○		○	○			○
18 Product testing industry		○									○
19 Measurement certification industry*3)		○									○
20 Household waste disposal industry*4)											
21 Industrial waste disposal industry*5)											
22 Higher educational institutions*6)		○								○	○
23 Research institutes for natural science		○								○	○

*1) Limited to the cases where agricultural products are stored or gaseous or liquid substance is stored in a storage ta

*2) Limited to the cases where the substances sealed in air conditioners for automobiles are handled.

*3) General measurement certification industry not included.

*4) Limited to waste disposal industry.

*5) Specific control industrial waste disposal industry included.

*6) Ancillary facilities included, and facilities related to cultural sciences not included.

1-1 Storage process (including acceptance and delivery facilities)

This is a process where raw materials, materials, products, etc. are stored in storage tanks such as follows.

- Fixed-roof tank
- Floating-roof tank
- Underground tank (such as gas stations)

The release to the environment includes the air emission resulting from the following losses.

- Fixed-roof tank: Breathing loss *1, Acceptance loss *2
- Floating-roof tank: Discharge loss *3
- Underground tank: Acceptance loss *2, Refueling loss *4

If exhaust gas is treated by activated carbon adsorption treatment in exhaust gas treatment facility, waste (such as spent carbon) may be generated.

The following methods can be used to calculate the released quantity.

(1) Engineering calculations
(2) Use of emission factors
(3) Use of mass balance

*1 Release of vapor containing a specified substance due to internal pressure change of the tank resulting from the temperature change between day and night
*2 Release of vapor containing a specified substance at the time of acceptance of the liquid containing the substance
*3 Release of a specified substance attached to the internal wall or the columns of the tank at the time of discharge of the stored materials
*4 Release at the time of refueling of automobiles, etc.

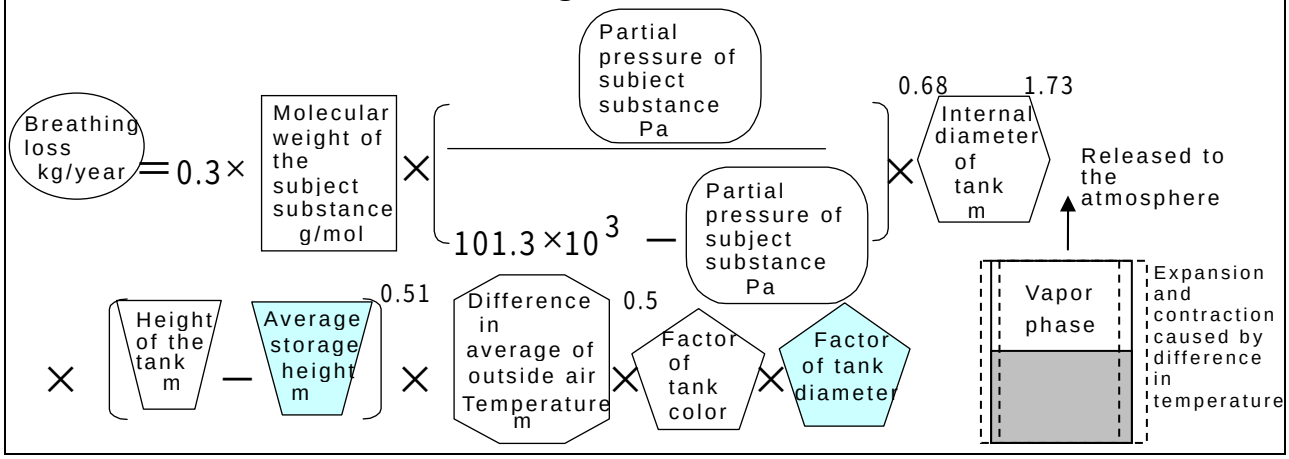
[Examples of subject substances]

Subject substance contained in raw materials, materials, and products stored

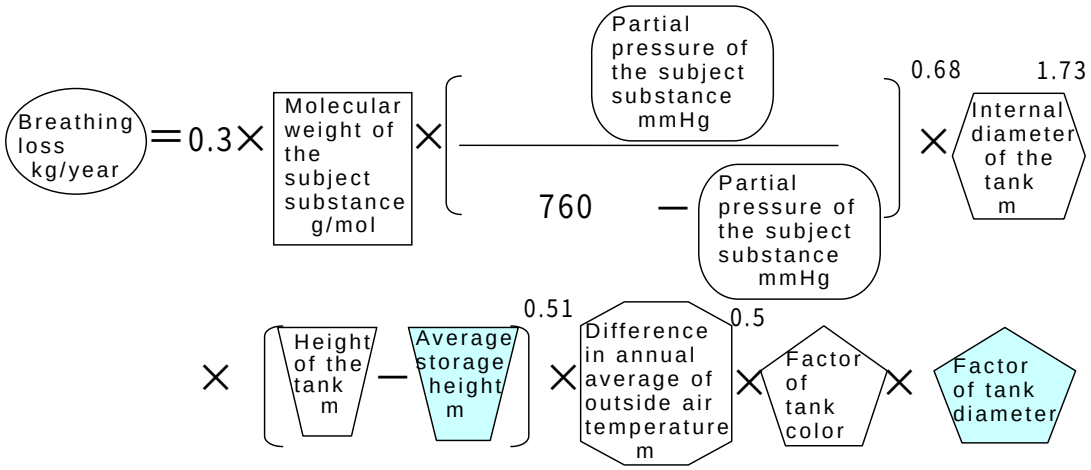
[Example of calculation (1)] Engineering calculations

This method can be used to calculate breathing loss and acceptance loss. The method presented by the United States Environmental Protection Agency (USEPA) is shown below.

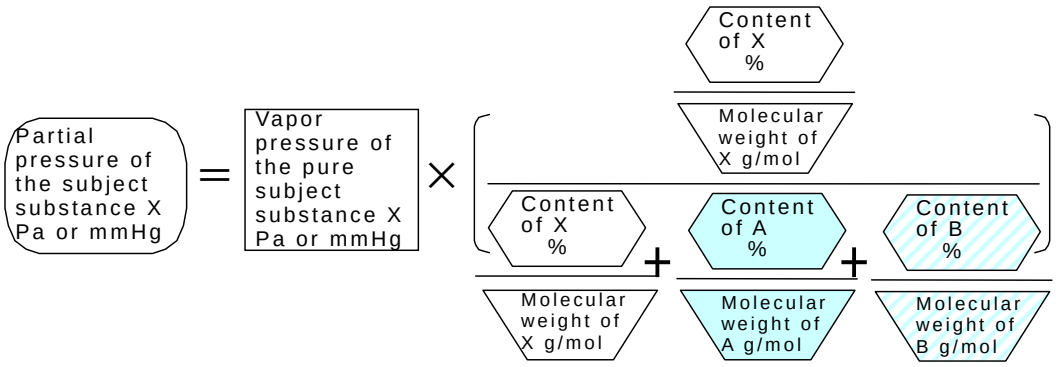
① Formula to calculate breathing loss



※1 If the average atmospheric pressure is not known, use 760mmHg(101.3×10^3Pa).
※2 Use the following formula to make calculations using mmHg as the unit of pressure.

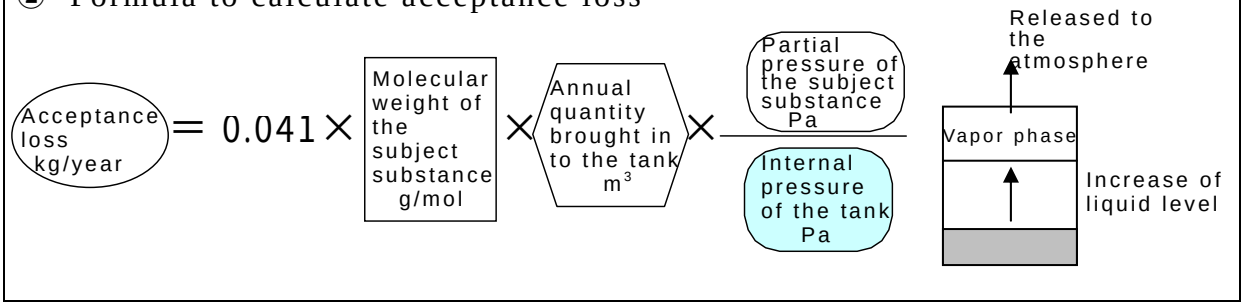


※3 When exhaust gas treatment is carried out, multiply the result of the above formula by [(100% − Removal efficiency %) / 100].
※4 When the substance stored in the tank is a mixture, calculate the partial pressure of the subject substance by using the formula shown below (Example: when the stored substance is composed of subject substance X, other substances A, and B).



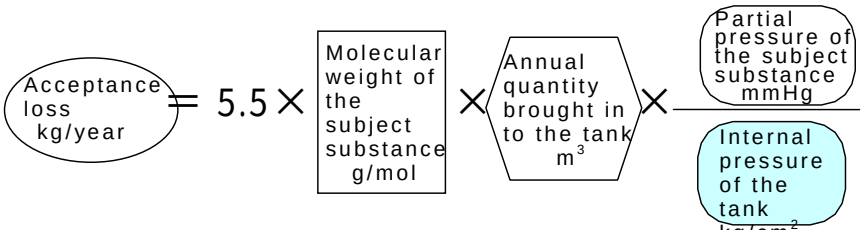
※5 If the average storage height is not known, use 1/2 of the total height of the tank. When the storage height is maintained for certain purposes (such as stockpiling), use the value of that height.
※6 The average outside air temperature difference of the year is the annual average value of the difference between the highest and the lowest temperature of a day.
※7 Factor of the tank color (−)
White: 1.0, Silver: 1.2, Light brown and cream: 1.33, Others: 1.46
※8 Correction factor of the tank of small diameter
When the tank diameter is 5 m or shorter: 0.3
When the tank diameter is 5 to 9 m: 0.8
When the tank diameter is 9 m or longer: 1.0

② Formula to calculate acceptance loss



※1 The annual average temperature inside the tank is assumed to be 20°C.

※2 Use the following formula to make calculations using mmHg or kg/cm^2 as the unit of pressure.



※3 When exhaust gas is treated, multiply the result of the above formula by [(100% – Removal efficiency %) / 100]

※4 In the case of a mixture, refer to ※4 of breathing loss.

The following is an example of calculating the release/transfer from the storage facility (fixed-roof tank) described by Table 1-1-1 and Fig. 1-1-1.

Table 1-1-1 Outline of the storage tank (fixed-roof tank)

Handling status of specified substance

① Outline of the work of handling specified substance

Storage method, etc.	Storage in fixed-roof tank (Refer to Fig. 1-1-1.) Generation of effluent/waste and leakage to land: None	
Description of the storage tank	Internal diameter: 10m	Capacity: 500m^3
	Height: 6.4m	Color: Silver
	Internal pressure 9.81 × 10^{4}Pa (Absolute pressure)	
	Average outdoor air temperature variation of the year: 5 °C	
	Average storage height: Not known	
Exhaust gas treatment facility	None	

② Raw material/material containing a specified substance handled

- Solvent A

Annual quantity brought in	2,000 m^3/year (Gravity: 0.87)
Stock at beginning of fiscal year	120 m^3
Stock at end of fiscal year	170 m^3
Content of specified substance listed in MSDS	

Substance No.	Name of substance	Content
63	Xylene	45%
227	Toluene	40%
299	Benzene	15%

③ Molecular mass and vapor pressure of specified substance contained in the raw material/material

Substance No.	Name of substance	Molecular mass	Vapor pressure
63	Xylene	92.1 g/mol	1.33 × 10^3 Pa
227	Toluene	106.2 g/mol	3.75 × 10^3 Pa
299	Benzene	78.1 g/mol	13.3 × 10^3 Pa

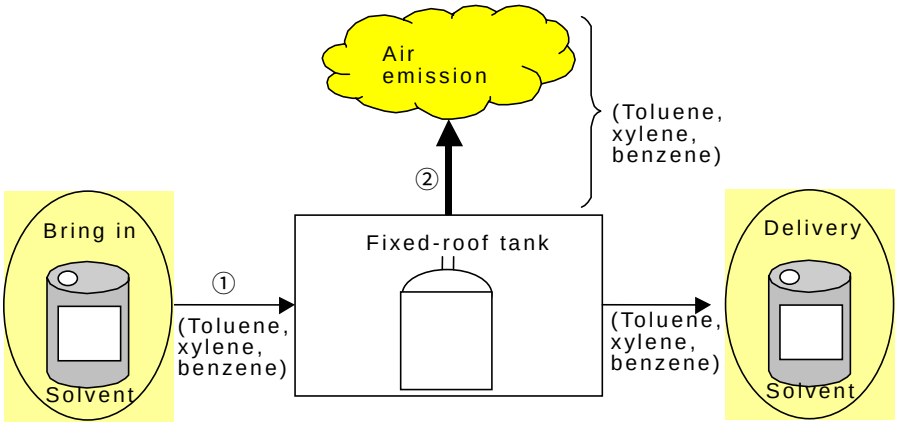


Fig. 1-1-1 Outline of storage tank (fixed-roof tank)

To make engineering calculations of the quantity released/transferred from the storage facility, follow the procedure shown below, which is distinct from the procedure using mass balance described in Part I and Part II. Examples given are of calculation of toluene. Follow the same procedure to calculate the quantity of xylene and benzene.

Step 1: Calculate the annual quantity of specified substance handled.
Step 2: Calculate the release/transfer to medium other than air.
Step 3: Calculate the air emission of the specified substance.
Step 4: Sum up the quantities of specified substance released or transferred.

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since specified substance is not manufactured in the storage facility, 0 is assumed as the annual quantity of specified substance manufactured.

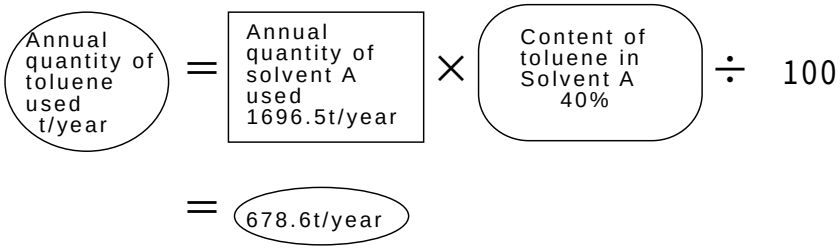
Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of Solvent A used.

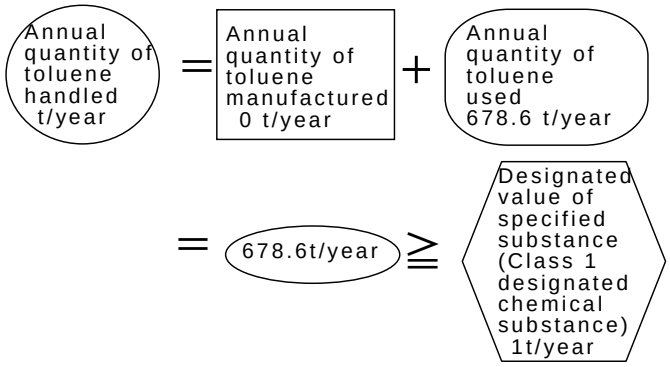
Annual quantity of solvent A used t/year = [Annual quantity of solvent A purchased 2000m^3/year − Quantity of solvent A stored at the end of the fiscal year 170m^3 + Quantity of solvent A stored at the beginning of the fiscal year 120m^3] × 0.87 t/m^3

= 1696.5 t/year

Step 1-3 Calculate the annual quantity of specified substance used.



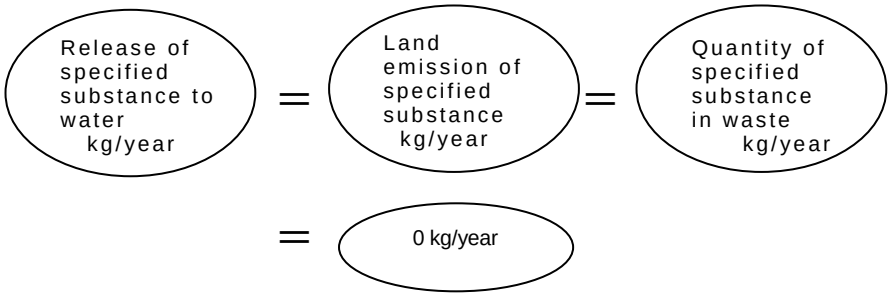
Step 1-4 Calculate the annual quantity of specified substance handled.



Since the annual quantity of toluene handled is larger than the specified quantity (1t/year), it is designated as requiring notification.

Step 2 Calculate the release/transfer to medium other than air.

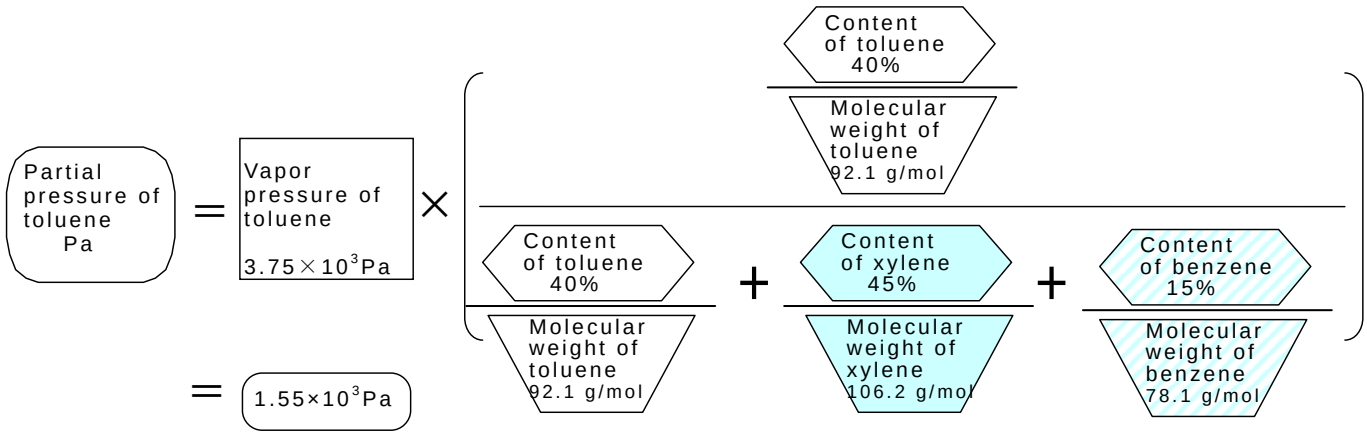
Since this tank does not have contact with water and there is no leakage to land and generation of waste, 0 is assumed as air or land emission of the specified substance.



Step 3 Calculate the air emission of the specified substance.

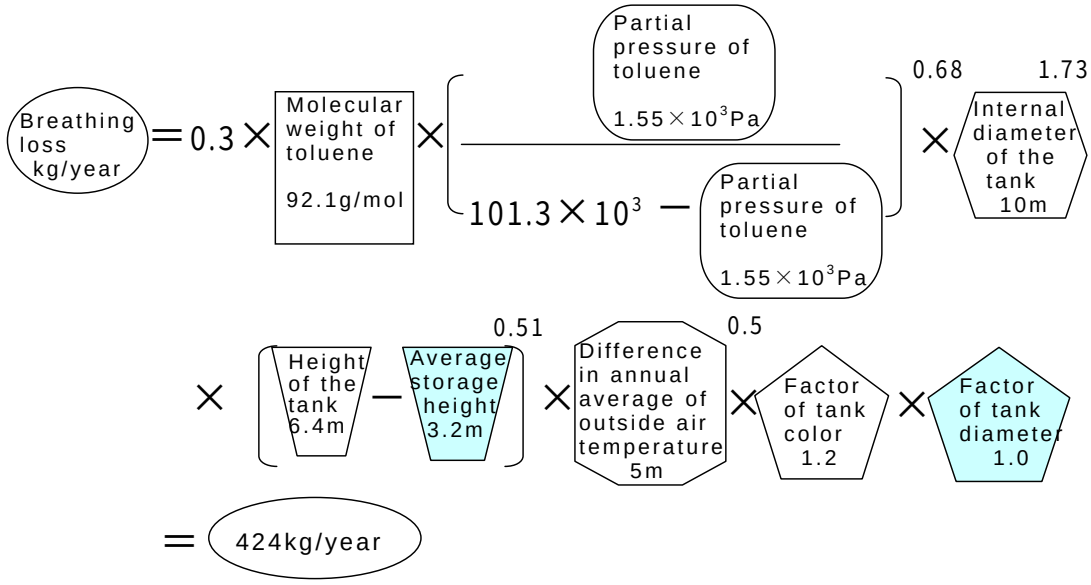
Step 3-1 Calculate the partial pressure of toluene in mixed vapor.

Since the stored solvent is mixed liquid of three substances, calculate the partial pressure of toluene using the formula shown in *4 in pIII-6.



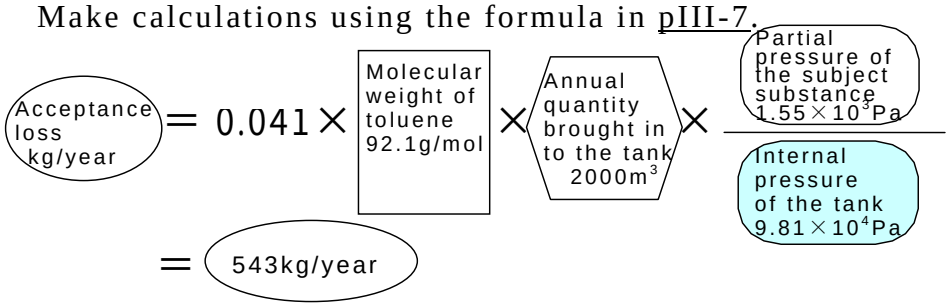
Step 3-2 Calculate the breathing loss of toluene.

Make calculations using the formula in pIII-5.



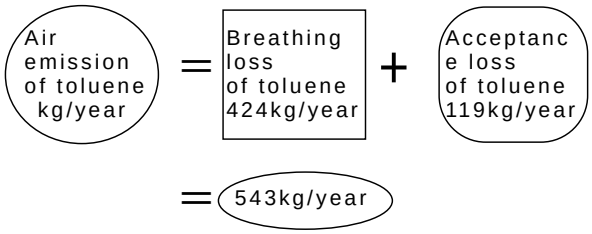
Step 3-3 Calculate the acceptance loss of toluene.

Make calculations using the formula in pIII-7.



Step 3-4 Calculate the air emission of toluene.

Sum up breathing loss and acceptance loss to obtain the air emission of toluene.



Step 4 Sum up the quantities of specified substance released or transferred.

Toluene (unit; kg/year)

Classification for Calculation	Classification for Notification
A Air emission; 543 →	(Releases) a. Air emission; 540
B Release to water; 0 →	b. Surface water discharge; 0.0
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 0 →	d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0 f. Off-site transfer in waste; 0.0

[Example of calculation (2)] Emission factors

The following is an example of calculating the release/transfer from the storage facility (gas station) described by Table 1-1-2 and Fig. 1-1-2.

Table 1-1-2 Outline of gas station

Handling status of specified substance

① Outline of the work of handling specified substance

Storage method	Storage and refueling of regular gasoline to gas station (underground tank) (Refer to Fig. 1-1-2.) Generation of effluent/waste and leakage to land: None
Exhaust gas treatment facility	None

② Raw material or material containing specified substance handled

- Regular gasoline

Annual quantity brought in	1,500 kL/year (Gravity: 0.73)
Annual quantity of refueling	1,420 kL/year
Stock at beginning of fiscal year	5 kL
Stock at end of fiscal year	8 kL
Content of specified substance (average value in the industry)	

Substance No.	Specified substance	Content
40	Ethylbenzene	1.4 %
63	Xylene	6.1 %
227	Toluene	9.1 %
299	Benzene	0.64%

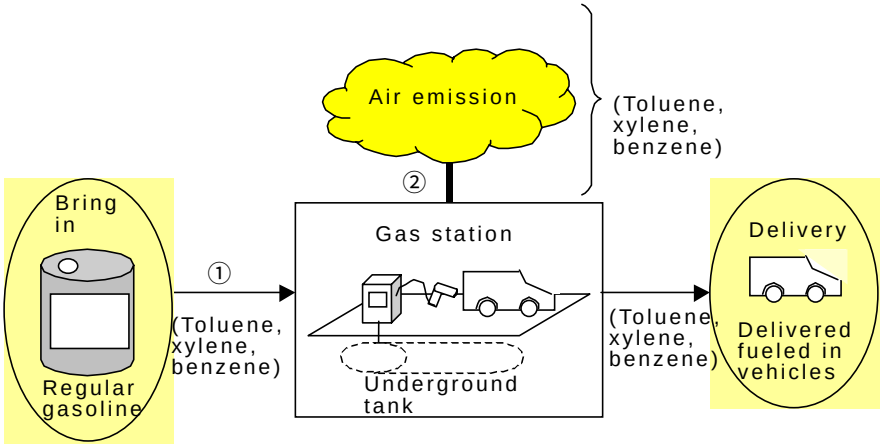


Fig. 1-1-2 Outline of gas station (underground tank)

To calculate the quantity released or transferred from the storage facility using emission factors, follow the procedure shown below, which is distinct from the procedure using mass balance described in Part I and Part II. Examples given are of calculation of benzene. Follow the same procedure to calculate the quantity of ethylbenzene, xylene and toluene. (Refer also to Q105 (→ pIII-152) in 2. Questions and Answers of Part III.)

Step 1: Calculate the annual quantity of specified substance handled.
Step 2: Calculate the release/transfer to medium other than air.
Step 3: Calculate the air emission of specified substance.
Step 4: Sum up the quantities of specified substance released or transferred.

Step 1 Calculate the annual quantity of specified substance handled

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since specified substance is not manufactured in the storage facility, 0 is assumed as the annual quantity of specified substance manufactured.

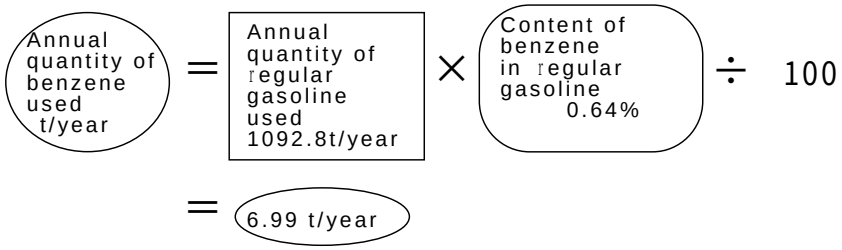
Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of regular gasoline used.

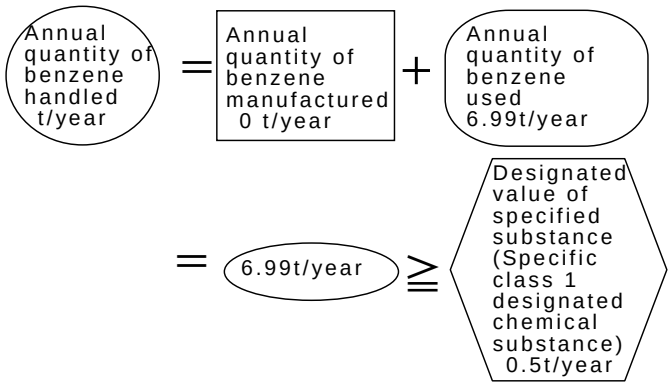
Annual quantity of regular gasoline used t/year = [Annual quantity of regular gasoline purchased 1500kl/year − Quantity of regular gasoline stored at the end of the fiscal year 8kl + Quantity of regular gasoline stored at the beginning of the fiscal year 5kl] × 0.73 t/kl

= 1092.8 t/year

Step 1-3 Calculate the annual quantity of specified substance used.



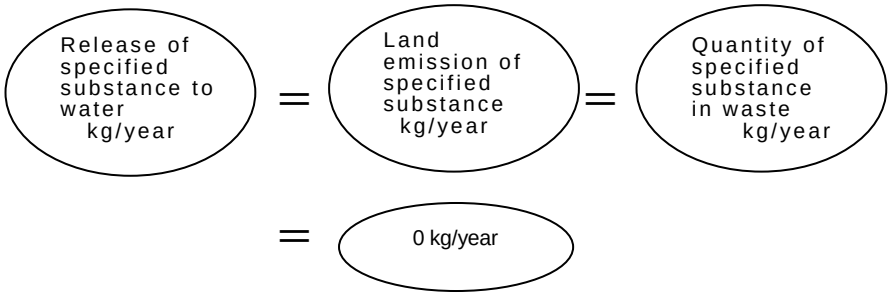
Step 1-4 Calculate the annual quantity of specified substance handled.



Since the annual quantity of benzene handled is larger than the specified quantity (1 t/year), it is designated as requiring notification.

Step 2 Calculate the release/transfer to medium other than air.

Since this tank does not have contact with water and there is no leakage to land and generation of waste, 0 is assumed as air or land emission of the specified substance.

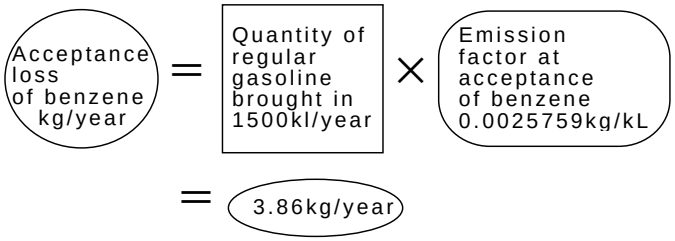


Step 3 Calculate air emission of specified substance.

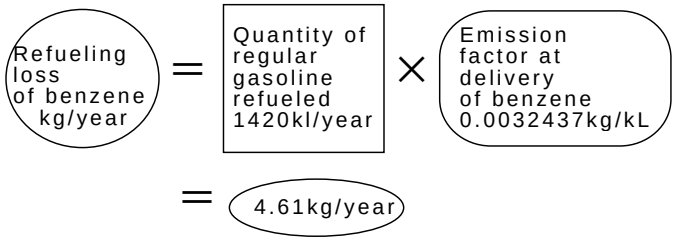
Calculate the air emission from the gas station by multiplying the following emission factors (→ pIII-250) at the time of acceptance to and delivery from the gas station by the annual quantity of regular gasoline accepted and fueled.

- Emission factor at acceptance of benzene: 0.0025759 kg/kL
- Emission factor at delivery of benzene : 0.0032437 kg/kL

Step 3-1 Calculate the acceptance loss of benzene.

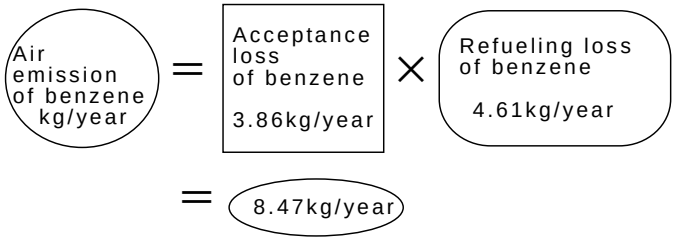


Step 3-2 Calculate the refueling loss of benzene.



Step 3-3 Calculate the air emission of benzene.

Sum up the acceptance loss and the refueling loss to obtain the air emission of benzene.



Step 4 Sum up the quantities of specified substance released or transferred.

Benzene (unit; kg/year)

Classification for Calculation	Classification for Notification
A Air emission; 8.47 →	(Releases) a. Air emission; 8.5
B Release to water; 0 →	b. Surface water discharge; 0.0
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 0 →	d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 0.0

[Example of calculation (3)] Mass balance

The following is an example of calculating the release/transfer from the storage tank described by Table 1-1-3 and Fig. 1-1-3.

Table 1-1-3 Outline of storage tank

Handling status of specified substance

① Outline of the work handling specified substance

Storage method	Storage of thinner A to storage tank (Refer to Fig. 1-1-3.) Generation of effluent/waste and leakage to land: None
Exhaust gas treatment facility	None

② Raw material or material containing specified substance handled

- Thinner A

Annual quantity brought in	3.0 t/year
Annual quantity delivered	2.8 t/year
Stock at beginning of fiscal year	0.7 t
Stock at end of fiscal year	0.4 t
Content of specified substance listed in MSDS	

Substance No.	Specified substance	Content
63	Xylene	45%

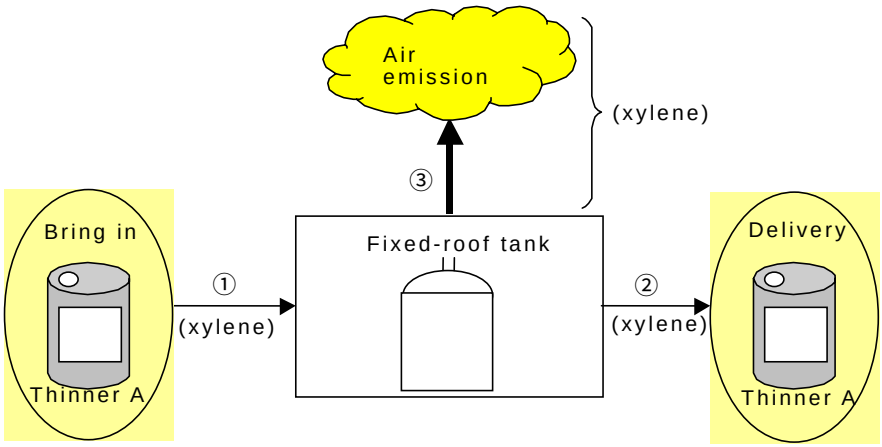


Fig. 1-1-3 Outline of storage tank

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the storage tank.

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since specified substance is not manufactured in the storage facility, 0 is assumed as the annual quantity of specified substance manufactured.

Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of thinner A used.

Annual quantity of thinner A used t/year = [Annual quantity of thinner A purchased 3.0t/year − Quantity of thinner A stored at the end of the fiscal year 0.4t + Quantity of thinner A stored at the beginning of the fiscal year 0.7t]

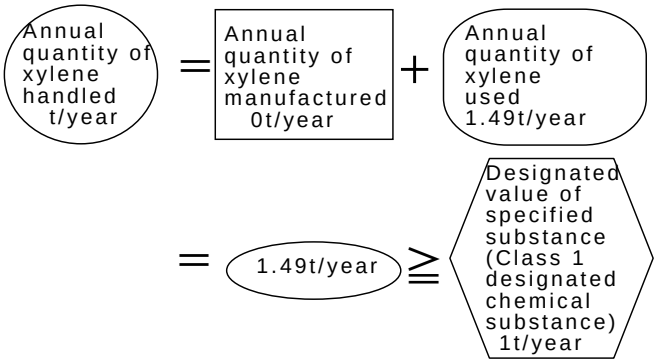
= 3.3t/year

Step 1-3 Calculate the annual quantity of specified substance used.

Annual quantity of xylene used t/year = Annual quantity of thinner A used 3.3t/year × Content of xylene in thinner A 45% ÷ 100

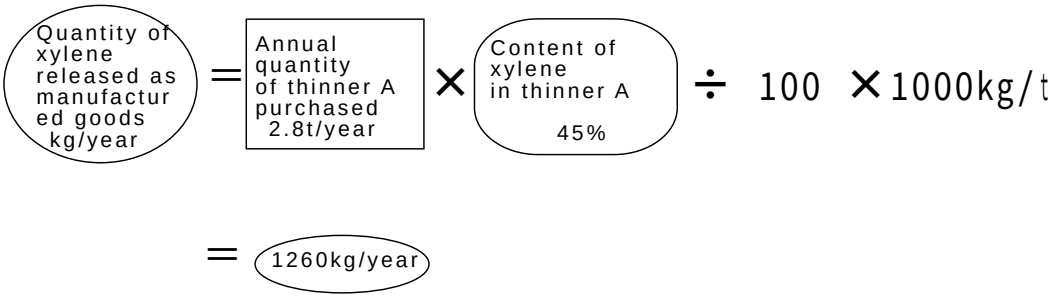
= 1.49t/year

Step 1-4 Calculate the annual quantity of specified substance handled.



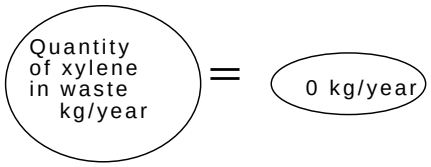
Since the annual quantity of xylene handled is larger than the specified quantity (1t/year), it is designated as requiring notification.

Step 2 Calculate the quantity of specified substance released as manufactured goods.

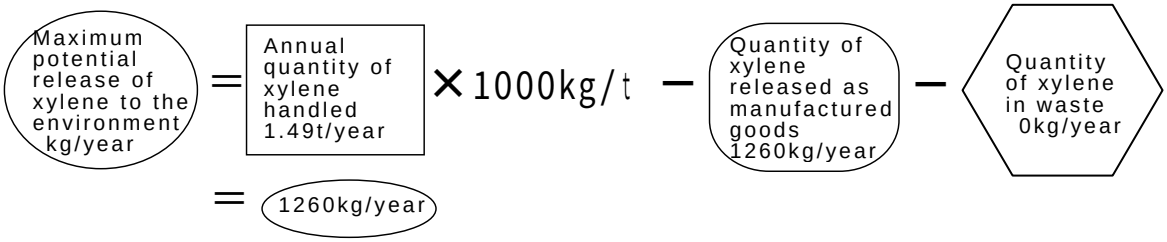


Step 3 Calculate the quantity of specified substance in waste.

Since no waste is generated, 0 is assumed as the quantity in waste.

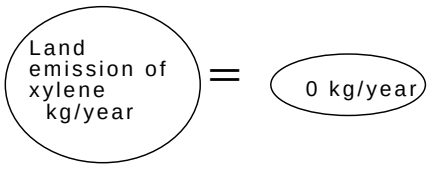


Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of the specified substance.

Since there is no leakage to land, 0 is assumed as land emission.

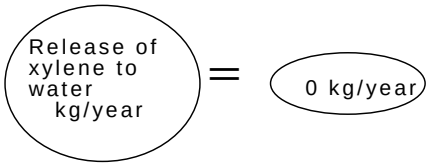


Step 6 Judge to which medium, land or water, larger or smaller quantity is released.

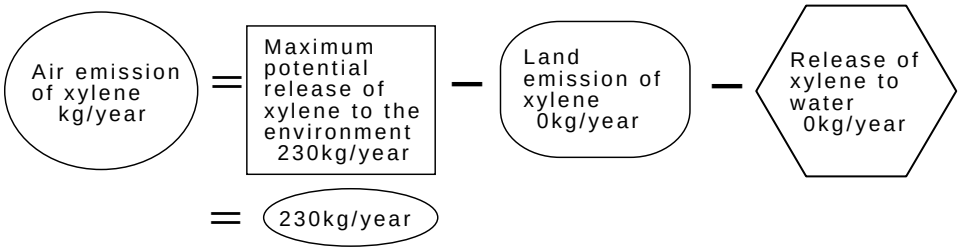
Since the storage tank does not have contact with water, it is assumed that larger quantity is released to air.

Step 7 Calculate the release of specified substance to water.

Since the storage tank does not have contact with water, 0 is assumed as the release to water.



Step 8 Calculate the air emission of the specified substance.



Step 9 Sum up the quantities of specified substance released or transferred.

Xylene (unit; kg/year)

Classification for Calculation	Classification for Notification
A Air emission; 230 →	(Releases) a. Air emission; 230
B Release to water; 0 →	b. Surface water discharge; 0.0
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 0 →	d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0 f. Off-site transfer in waste; 0.0

1-2 Reaction/mixing process

This is a process where raw materials are made to react to generate a new chemical substance, raw materials are mixed (without chemical reaction), distilled for purification or separated into solid and liquid to manufacture products.

The release to the environment and off-site transfer in waste include the following.

- Volatilization of specified substance contained in raw materials or manufactured goods into air or mixing into effluent
- Transfer as spent solvent

When exhaust gas or effluent generated from the process is treated by activated carbon adsorption treatment in an exhaust gas/effluent treatment facility, waste (spent carbon, etc.) may be generated.

[Examples of subject substances]

Subject substances contained in raw materials or products

[Example of calculation (1)] When new substance is manufactured with specified substance used as raw material

The following is an example of calculating the release/transfer from the reaction facility (1) described by Table 1-2-1 and Fig. 1-2-1.

Table 1-2-1 Outline of reaction facility (1)

Handling status of specified substance

① Outline of the work of handling specified substance

Description of reaction	Cyclohexane is manufactured with benzene used as raw material. (Refer to Fig. 1-2-1.) Reaction rate of benzene: 99% Washing effluent released from reaction facility: $2m^3$/time, 10 times/year
Exhaust gas treatment facility	None
Effluent treatment facility	Activated sludge treatment (Removal rate: 60%, Decomposition rate: 0%)
Effluent released to:	***** river

② Raw materials or materials containing specified substance handled

- Raw material A

Annual quantity purchased	4.7 t/year
Stock at beginning of fiscal year	0.6 t
Stock at end of fiscal year	0.3 t
Content of specified substance listed in MSDS	

Substance No.	Specified substance	Content
299	Benzene	100%

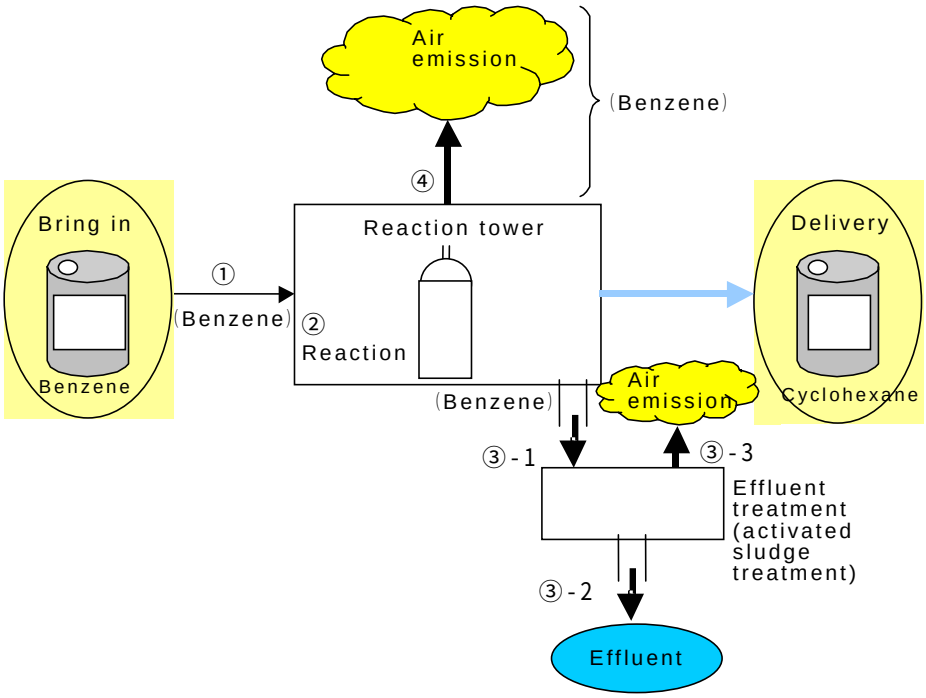


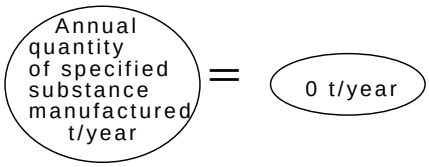
Fig. 1-2-1 Outline of reaction facility (1)

Calculate the release/transfer from this reaction facility using mass balance that has been described in Part I and Part II.

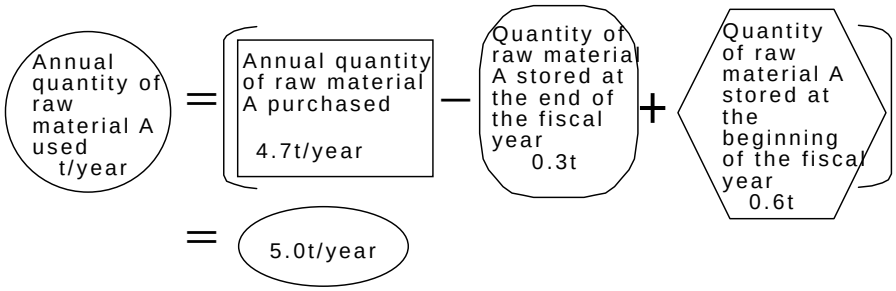
Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

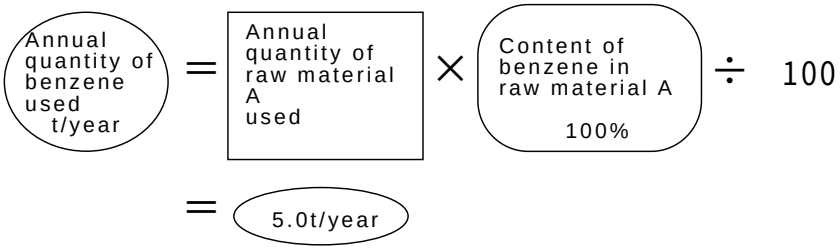
Since no specified substance is manufactured in this reaction facility, 0 is assumed as annual quantity of specified substance manufactured.



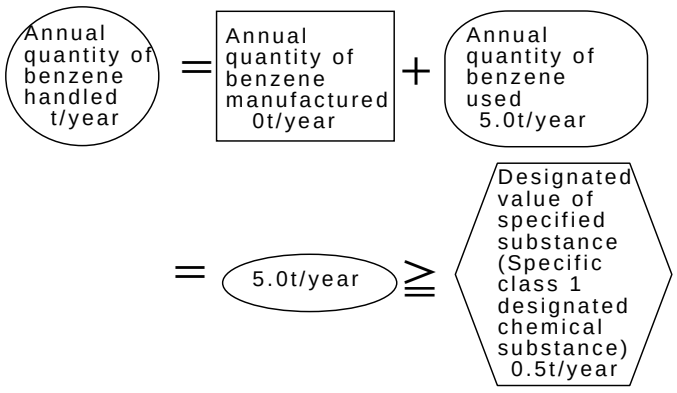
Step 1-2 Calculate the annual quantity of raw material A used.



Step 1-3 Calculate the annual quantity of specified substance used.



Step 1-4 Calculate the annual quantity of specified substance handled.



Since the annual quantity of specified substance handled is larger than the specified quantity (0.5 t/year), benzene is assumed as requiring notification.

Step 2 Calculate the quantity of specified substance released as manufactured goods.

Since the quantity of benzene released as manufactured goods from this reaction facility equals to the value consumed by the reaction, make calculations using the following formula.

Quantity of benzene released as manufactured goods kg/year = Quantity of benzene consumed by the reaction kg/year = Annual quantity of benzene purchased 5.0t/year × Reaction rate of benzene 99% ÷ 100 × 1000kg/t

= 4950kg/year

Step 3 Calculate the quantity of specified substance in waste.

Since waste such as waste liquid containing benzene is not generated from this reaction facility, 0 is assumed as the quantity in waste.

Quantity of benzene in waste kg/year = 0 kg/year

Step 4 Calculate the maximum potential release to the environment.

Maximum potential release of benzene to the environment kg/year = Annual quantity of benzene handled 5.0t/year × 1000kg/t − Quantity of benzene released as manufactured goods 4950kg/year − Quantity of benzene in waste 0kg/year

= 50kg/year

Step 5 Calculate the land emission of the specified substance.

Since there is no leakage from this reaction facility to land, 0 is assumed as land emission.

Land emission of benzene kg/year = 0 kg/year

Step 6 Judge to which medium, land or water, larger or smaller quantity is released.

Since benzene has high volatility, it is assumed that larger quantity is released to air.

Step 7 Calculate the release of the specified substance to water.

Calculate the potential release of benzene to water using the solubility of benzene to water, 1.8 g/L (=1.8 kg/m^3).

Potential release of benzene to water kg/year = Annual effluent quantity 2m^3/washing × 10times/year × Solubility of benzene to water 1.8kg/m^3 ÷ 100

= 36kg/year

Calculate the quantity of benzene released to water after effluent treatment and that released to air during the treatment process using the removal/decomposition rate of activated sludge treatment.

Release of benzene to water kg/year = Potential release of benzene to water 36kg/year × (100 − Removal rate of activated sludge treatment 60%) ÷ 100

= 14kg/year

Quantity of benzene released to air during the treatment process kg/year = Potential release of benzene to water 36kg/year × (Removal rate of activated sludge treatment 60% − Decomposition rate of activated sludge treatment 0%) ÷ 100

= 22kg/year

Step 8 Calculate the air emission of specified substance.

Calculate the air emission from reaction facility to air using mass balance.

Air emission of benzene from reaction facility kg/year = Maximum potential release of benzene to the environment 50kg/year − Land emission of benzene 0kg/year − Potential release of benzene to water 36kg/year

= 14kg/year

Step 9 Sum up the quantities of specified substance released or transferred.

Benzene (unit; kg/year)

Classification for Calculation	Classification for Notification
A Air emission; Reaction facility 14 Effluent treatment 22 B Release to water; 14 C Land emission; 0 D Quantity in waste; 0	(Releases) a. Air emission; 36 b. Surface water discharge; 14 c. Land emission in the business establishment; 0.0 d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0 f. Off-site transfer in waste; 0.0

[Example of calculation (2)] When specified substance is manufactured

The following is an example of calculating the release/transfer from the reaction facility (2) described by Table 1-2-2 and Fig. 1-2-2.

Table 1-2-2 Outline of reaction facility (2)

Handling status of specified substance

① Outline of the work of handling specified substance

Description of reaction	Trichloroethylene is manufactured with ethylene used as raw material. (Refer to Fig. 1-2-2.) Washing effluent released from reaction facility: 10 m^3/washing, 12 times/year Generation of waste and leakage to land: None
Exhaust gas treatment facility	Combustion treatment (Removal/decomposition rate: 99.5%)
Effluent treatment facility	Activated carbon adsorption treatment (Removal rate: 80%, Decomposition rate: 0%)
Effluent released to:	***** river

② Raw materials and materials containing specified substance handled

- Trichloroethylene manufactured

Annual quantity manufactured	3.0 t/year
Annual quantity delivered (except for those kept within business establishment as stock)	2.8 t/year

③ Waste generated

Type of waste	Quantity generated	Content of specified substance	Treatment of waste
Spent carbon	Not known	Not known	Delivered to an industrial waste management contractor

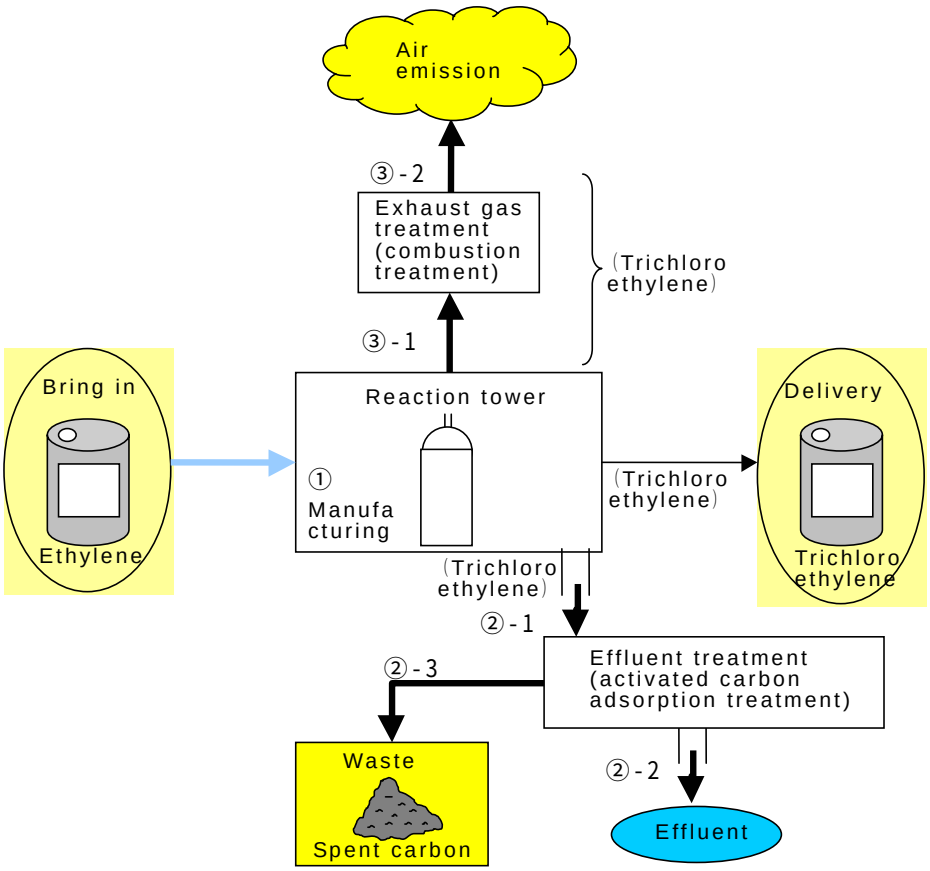
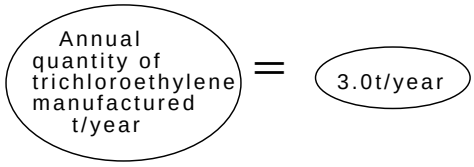


Fig. 1-2-2 Outline of reaction facility (2)

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the reaction facility.

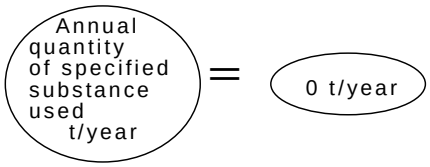
Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.



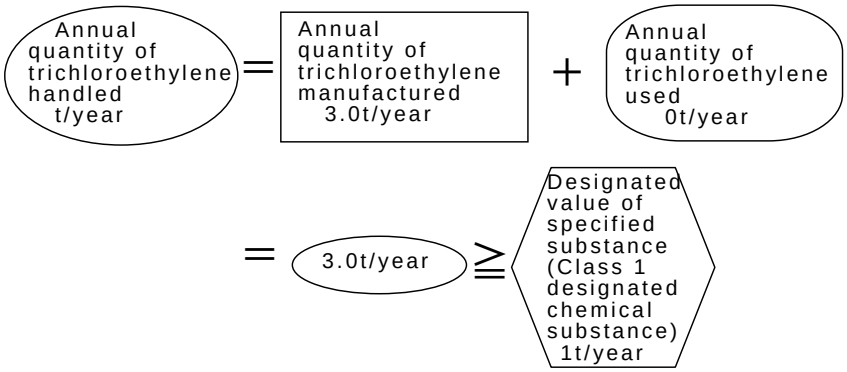
Step 1-2 Calculate the annual quantity of specified substance used.

Since raw material or material containing specified substance are not used in this reaction facility, 0 is assumed as the annual quantity of specified substance used.



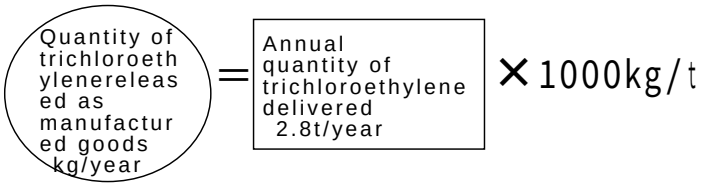
Step 1-3 Calculate the annual quantity of specified substance handled.

Since the annual quantity of trichloroethylene handled is larger than the specified quantity (1t/year), it is designated as requiring notification.



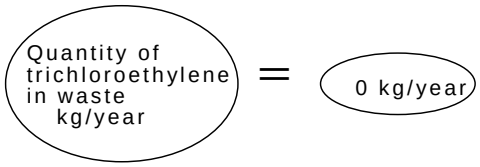
Step 2 Calculate the quantity of specified substance released as manufactured goods.

Since the quantity of trichloroethylene released as manufactured goods from this reaction facility equals to the quantity of trichloroethylene delivered, make calculations using the following formula.

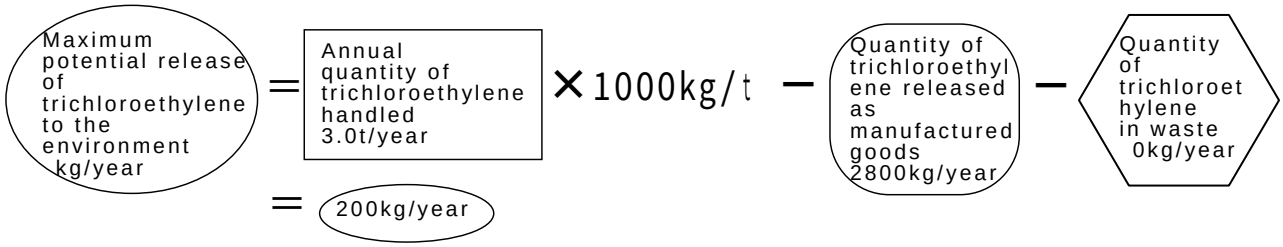


Step 3 Calculate the quantity of specified substance in waste.

In this reaction facility, spent carbon containing trichloroethylene is generated by effluent treatment. Calculate the quantity in waste when calculating the release to water using the removal rate of effluent treatment.
Since this is the only waste that contains trichloroethylene, 0 is assumed as the quantity in waste.

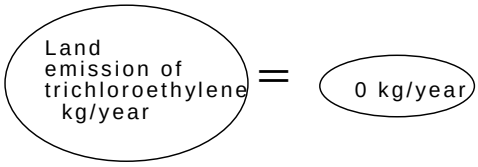


Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of the specified substance.

Since there is no leakage from this reaction facility to land, 0 is assumed as land emission.



Step 6 Judge to which medium, land or water, larger or smaller quantity is released.

Since trichloroethylene has high volatility, it is assumed that larger quantity is released to air.

Step 7 Calculate the release of specified substance to water.

Calculate the release of trichloroethylene to water after effluent treatment using the actually measured concentration of trichloroethylene, 1.0mg/L ($=1.0\times10^{-3}$kg/m^3).

Release of trichloroethylene to water after effluent treatment kg/year = Annual effluent quantity 10m^3/washing × 12times/year × Actually measured concentration of trichloroethylene 1.0×10^{-3}kg/m^3

= 0.12kg/year

Calculate the potential release of trichloroethylene to water and the quantity in waste (spent carbon) generated by the treatment using the removal/decomposition rate of activated carbon adsorption treatment.

Potential release of trichloroethylene to water kg/year = Release of trichloroethylene to water after effluent treatment 0.12kg/year ÷(100− Removal rate of activated carbon adsorption treatment 80%)× 100

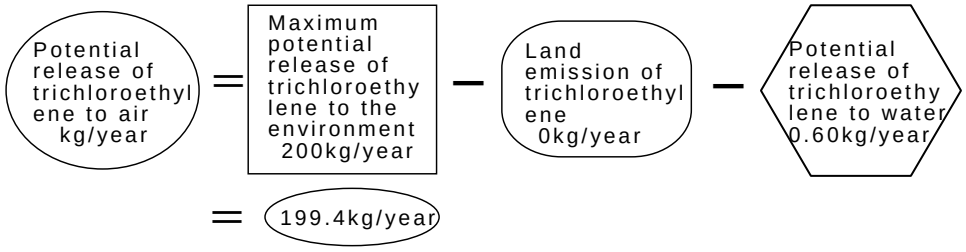
= 0.60kg/year

Quantity of trichloroethylene in waste (spent carbon) generated by the treatment kg/year = Release of trichloroethylene to water after effluent treatment 0.12kg/year ×(Removal rate of activated carbon adsorption treatment 80% − Decomposition rate of activated carbon adsorption treatment 0%) ÷ (100− Removal rate of activated carbon adsorption treatment 80%)

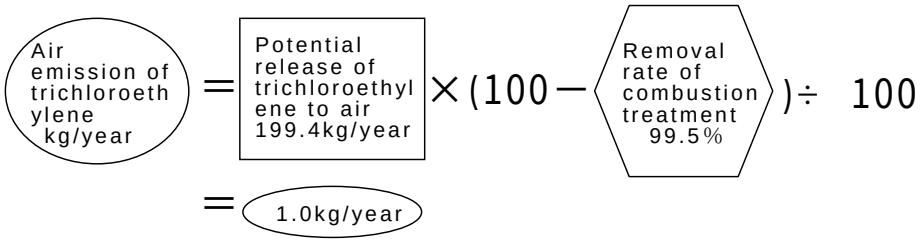
= 0.48kg/year

Step 8 Calculate the air emission of the specified substance.

Calculate the air emission of trichloroethylene using the following formula.



Calculate the air emission of trichloroethylene after exhaust gas treatment using the removal rate of combustion treatment. Since the removal rate and the decomposition rate of combustion treatment are the same, 0 is assumed as the quantity in waste generated by the treatment.



Step 9 Sum up the quantities of the specified substance released or transferred.

Trichloroethylene (unit; kg/year)

Classification for Calculation	Classification for Notification
	(Releases)
A Air emission; 1.0 →	a. Air emission; 1.0
B Release to water; 0.12 →	b. Surface water discharge; 0.1
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 0.48 →	d. Landfills in the business establishment; 0.0
	(Transfers)
	e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 0.5

[Example of calculation (3)] In the case of mixing process

The following is an example of calculating the release/transfer from the mixing facility (1) described by Table 1-2-3 and Fig. 1-2-3.

Table 1-2-3 Outline of mixing facility (1)

Handling status of specified substance

① Outline of the work of handling specified substance

Description of mixing	Toluene and pigment are mixed to manufacture paint. (Refer to Fig. 1-2-3.) Quantity of paint manufactured: 45 t/year, Toluene content: 20% Washing effluent released from mixing facility: 2 m^3/washing, 50 times/year Generation of waste and leakage to land: None
Exhaust gas treatment facility	None
Effluent treatment facility	Activated sludge treatment (Removal rate: 60%, Decomposition rate 0%)
Effluent released to:	***** river

② Raw material or material containing specified substance

- Raw material A

Annual quantity purchased	10.8 t/year
Stock at beginning of fiscal year	0.6 t
Stock at end of fiscal year	1.4 t
Content of specified substance listed in MSDS	

Substance No.	Specified substance	Content
227	Toluene	100%

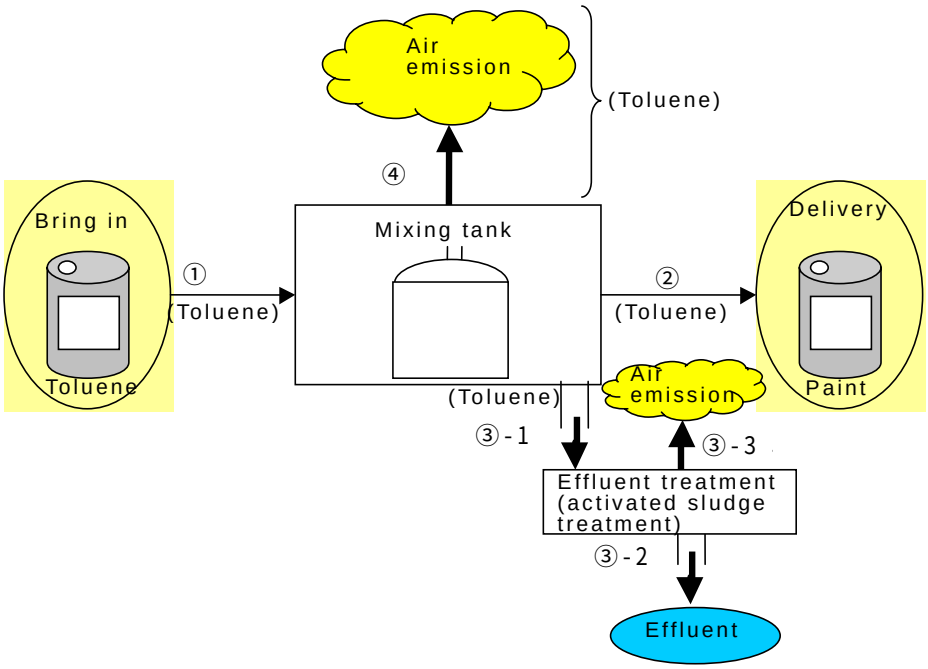


Fig. 1-2-3 Outline of mixing facility (1)

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the mixing tank.

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since no specified substance is manufactured in the mixing facility, 0 is assumed as the annual quantity of specified substance manufactured.

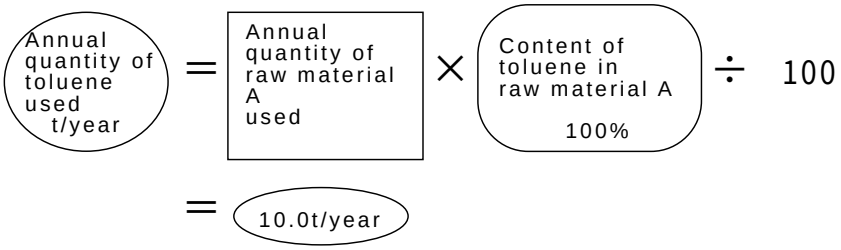
Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of raw material A used.

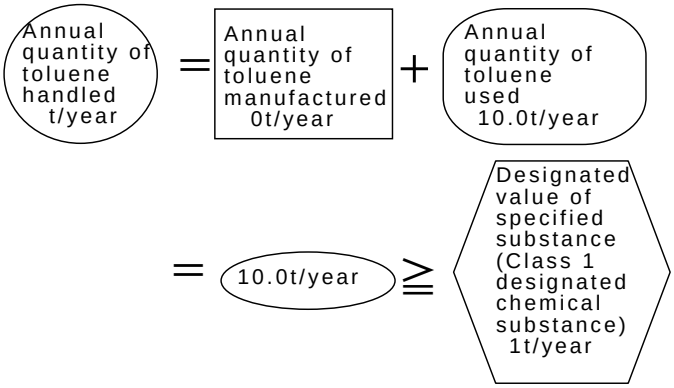
Annual quantity of raw material A used t/year = [Annual quantity of raw material A purchased 10.8t/year − Quantity of raw material A stored at the end of the fiscal year 1.4t + Quantity of raw material A stored at the beginning of the fiscal year 0.6t]

= 10.0t/year

Step 1-3 Calculate the annual quantity of specified substance used.



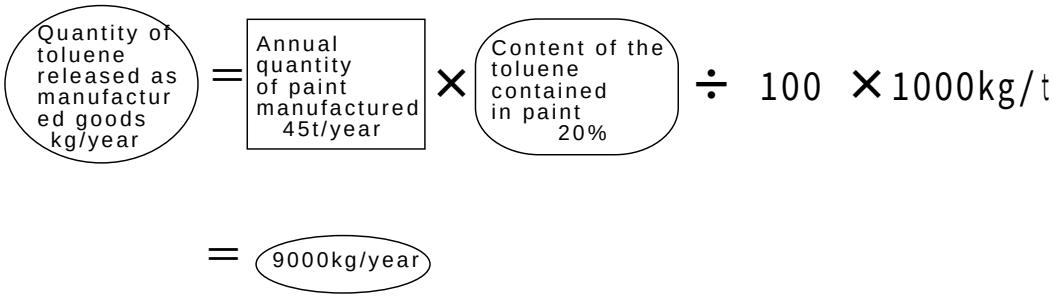
Step 1-4 Calculate the annual quantity of specified substance handled.



Since the annual quantity of toluene handled is larger than the specified quantity (1t/year), it is designated as requiring notification.

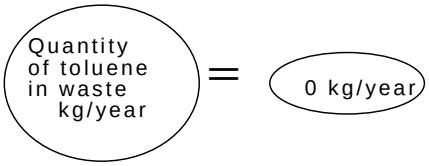
Step 2 Calculate the quantity of specified substance released as manufactured goods.

Since the quantity of toluene released as manufactured goods from this mixing facility equals to the quantity contained in the paint manufactured, make calculations using the following formula.

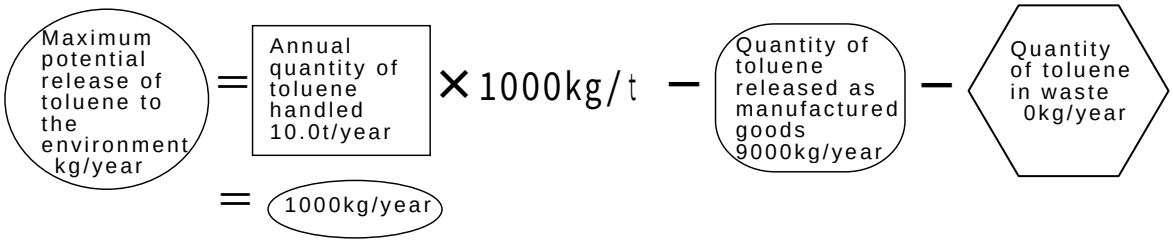


Step 3 Calculate the quantity of specified substance in waste.

Since waste such as waste liquid containing toluene is not generated from this mixing facility, 0 is assumed as the quantity in waste.

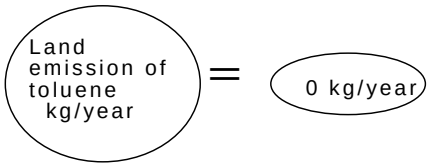


Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of the specified substance.

Since there is no leakage from this mixing facility to land, 0 is assumed as land emission.

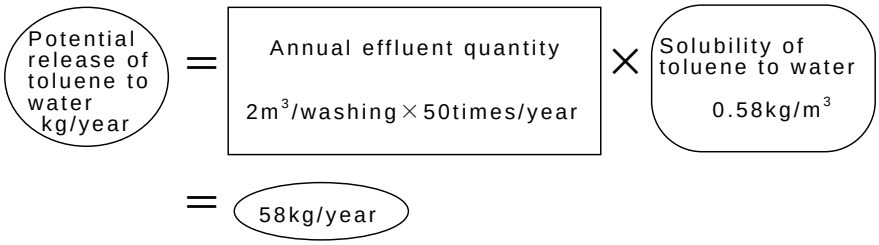


Step 6 Judge to which medium, land or water, larger or smaller quantity is released.

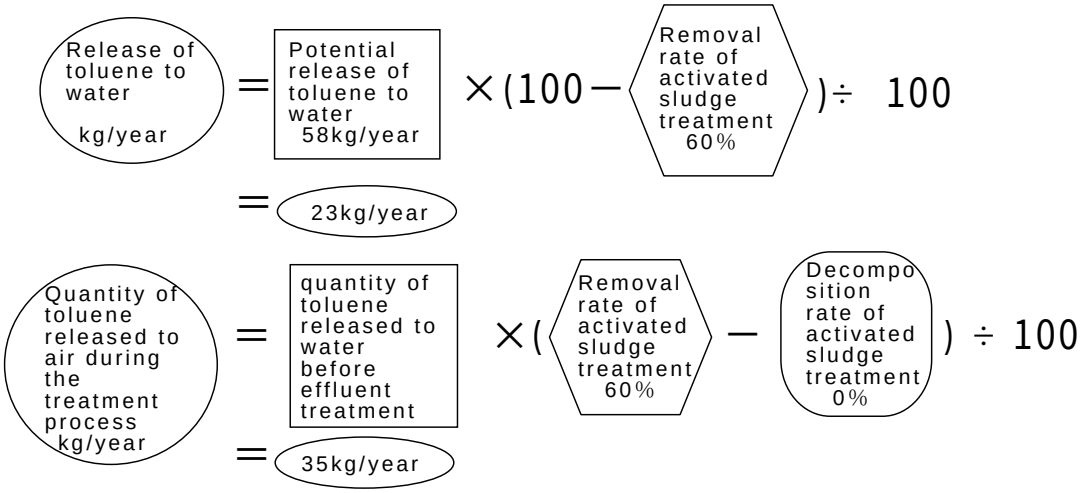
Since toluene has high volatility, it is assumed that larger quantity is released to air.

Step 7 Calculate the release of specified substance to water.

Calculate the quantity of toluene released to water before effluent treatment using the solubility of toluene to water, 0.58g/L (=0.58kg/m^3).

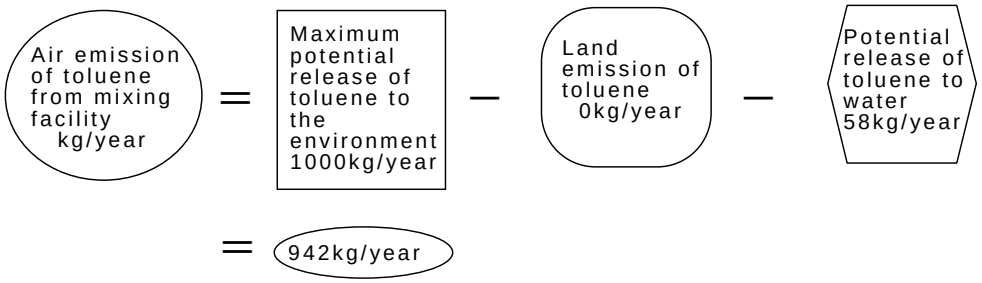


Calculate the release of toluene to water after effluent treatment and the air emission by the treatment using the removal rate and decomposition rate of activated sludge treatment.



Step 8 Calculate the air emission of specified substance.

Calculate the air emission from the mixing facility using mass balance.



Step 9 Sum up the quantities of specified substance released or transferred.

Toluene (unit; kg/year)

Classification for Calculation	**Classification for Notification**
A Air emission; Reaction facility 942 Effluent treatment 35 B Release to water; 23 C Land emission; 0 D Quantity in waste; 0	(Releases) a. Air emission; 980 b. Surface water discharge; 23 c. Land emission in the business establishment; 0.0 d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0 f. Off-site transfer in waste; 0.0

[Example of calculation (4)] When many types of products containing specified substances are manufactured in small quantity

The following is an example of calculating the release/transfer from the mixing facility (2) described by Table 1-2-4 and Fig. 1-2-4.

Table 1-2-4 Outline of mixing facility (2)

Handling status of specified substance

① Outline of the work of handling specified substance

Description of mixing	Toluene and pigment are mixed to manufacture printing ink. (Refer to Fig. 1-2-4.) Yield of toluene in manufacture of printing ink: 99% Washing effluent released from mixing facility: 2 m^3/washing, 50 times/year Generation of waste and leakage to land: None
Exhaust gas treatment facility	None
Effluent treatment facility	Activated sludge treatment (Removal rate: 60%, Decomposition rate: 0%)
Effluent released to:	***** river

② Raw materials containing specified substance handled

- Raw material A

Annual quantity purchased	10.8 t/year
Stock at beginning of fiscal year	0.6 t
Stock at end of fiscal year	1.4 t
Content of specified substance listed in MSDS	

Substance No.	Name of substance	Content
227	Toluene	100%

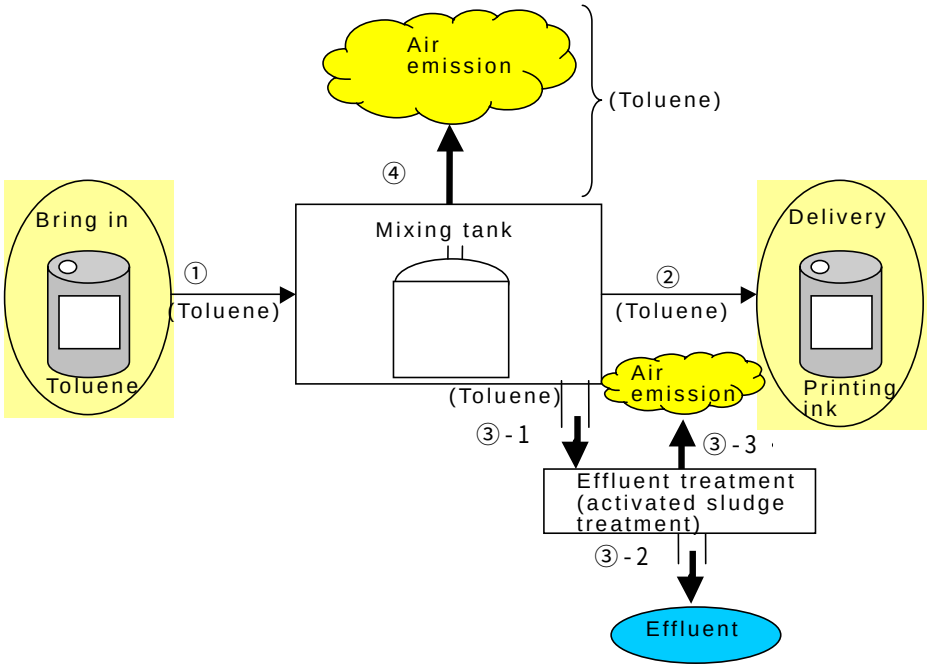


Fig. 1-2-4 Outline of mixing facility (2)

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the mixing tank.

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since specified substance is not manufactured in this mixing facility, 0 is assumed as the annual quantity of specified substance manufactured.

Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of raw material A used.

Annual quantity of raw material A used t/year = [Annual quantity of raw material A purchased 10.8t/year − Quantity of raw material A stored at the end of the fiscal year 1.4t + Quantity of raw material A stored at the beginning of the fiscal year 0.6t]

= 10.0t/year

Step 1-3 Calculate the annual quantity of specified substance used.

Annual quantity of toluene used t/year = Annual quantity of raw material A used × Content of toluene in raw material A 100% ÷ 100

= 10.0t/year

Step 1-4 Calculate the annual quantity of specified substance handled.

Annual quantity of toluene handled t/year = Annual quantity of toluene manufactured 0t/year + Annual quantity of toluene used 10.0t/year

= 10.0t/year ≧ Designated value of specified substance (Class 1 designated chemical substance) 1t/year

Since the annual quantity of toluene handled is larger than the specified quantity (1t/year), it is designated as requiring notification.

Step 2 Calculate the quantity of specified substance released as manufactured goods.

Since the quantity of specified substance released as manufactured goods equals to the quantity of toluene contained in manufactured printing ink, calculate the quantity using the yield of toluene as shown by the following formula.

Quantity of toluene released as manufactured goods kg/year = Annual quantity of toluene handled 10t/year × Quantity of toluene contained in manufactured printing ink 99% ÷ 100 ×1000kg/t

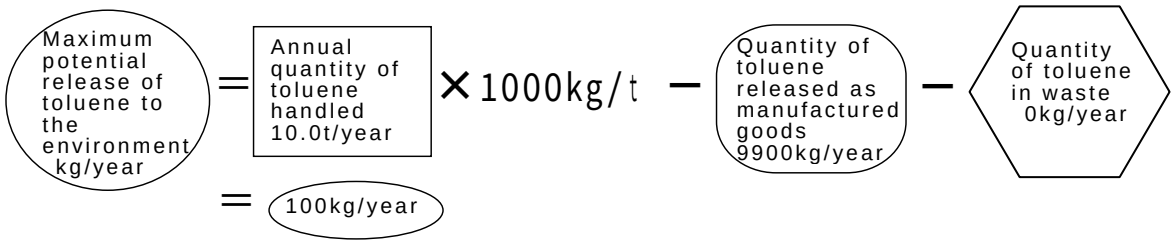
= 9900kg/year

Step 3 Calculate the quantity of specified substance in waste.

Since no waste such as waste liquid containing toluene is generated in this mixing facility, 0 is assumed as the quantity of specified substance in waste.

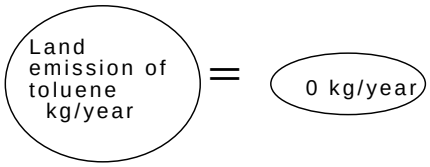
Quantity of toluene in waste kg/year = 0 kg/year

Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of specified substance.

Since there is no leakage from this mixing facility to land, 0 is assumed as land emission.

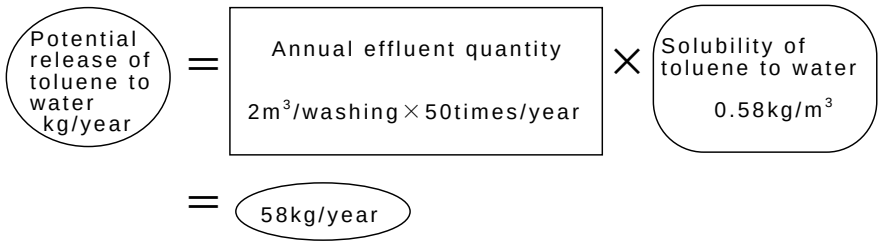


Step 6 Judge to which medium, land or water, larger or smaller quantity is released.

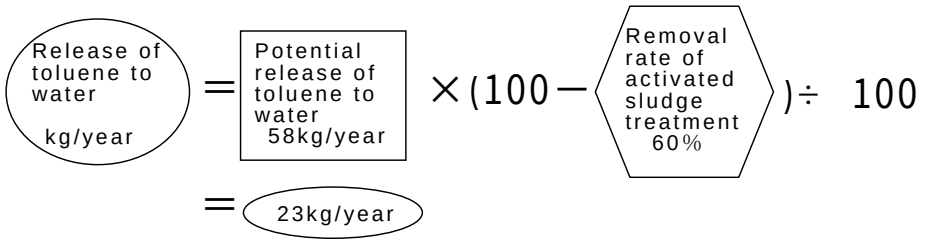
Since toluene has high volatility, it is assumed that larger quantity is released to air.

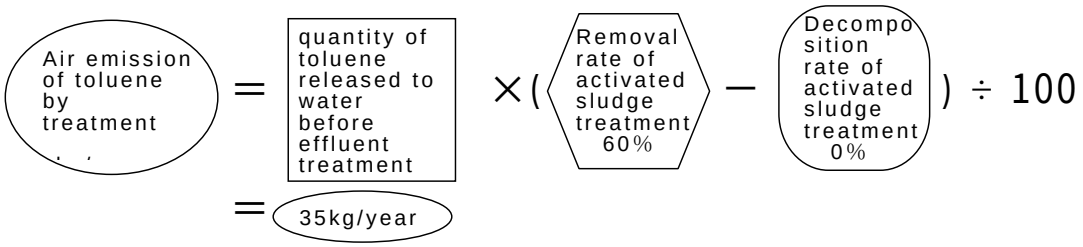
Step 7 Calculate the release of specified substance to water.

Calculate the release of toluene to water before effluent treatment by using solubility of toluene to water, 0.58 g/L (= 0.58 kg/m^3).



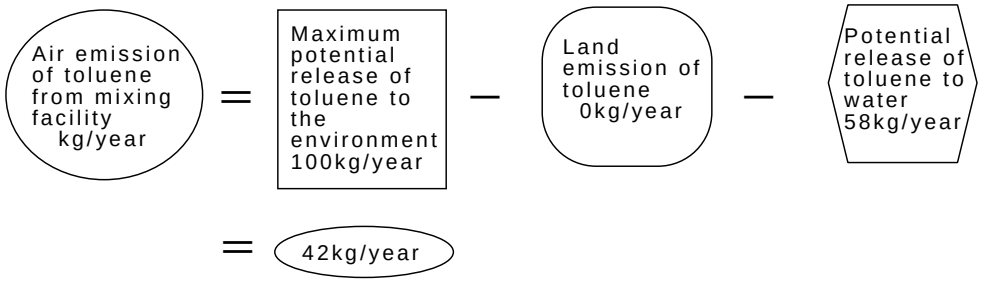
Calculate the release of toluene to water after effluent treatment by using the removal rate and decomposition rate of activated sludge treatment.





Step 8 Calculate the air emission of specified substance.

Calculate the air emission from the mixing facility using mass balance.



Step 9 Sum up the quantities of specified substance released or transferred.

Toluene (unit; kg/year)

Classification for Calculation	Classification for Notification
A Air emission; Reaction facility 42 Effluent treatment 35 B Release to water; 23 C Land emission; 0 D Quantity in waste; 0	(Releases) a. Air emission; 77 b. Surface water discharge; 23 c. Land emission in the business establishment; 0.0 d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0 f. Off-site transfer in waste; 0.0

1-3 Machining process

This is a process where metallic materials, etc. are cut or polished to obtain desired form.

The release to the environment and off-site transfer in waste include the following.

- Mixing of specified substance contained in cutting oil (nonvolatile), which is fed as an additive to prevent nick at the time of cutting or polishing, into effluent
- Transfer as spent cutting oil

[Examples of subject substances]

Boron and its compounds (Sodium tetraborate) , 2-aminoethanol, etc.

[Example of calculation]

The following is an example of calculating the release/transfer from the machining facility described by Table 1-3 and Fig. 1-3.

Table 1-3 Outline of machining facility

Handling status of specified substance

① Outline of the work of handling specified substance

Outline of machining process	Metallic parts are washed with water after boring. (Refer to Fig.1-3.)
Exhaust gas treatment facility	None
Effluent treatment facility	None
Effluent released to:	***** river

② Raw material or material containing specified substance

- Cutting oil A

Annual quantity purchased	23.8 t/year
Stock at beginning of fiscal year	0.9 t
Stock at end of fiscal year	0.2 t
Content of specified substance listed in MSDS	

Substance No.	Name of specified substance	Content
304	Boron and its compound (Sodium tetraborate)	4.3%

③ Waste generated

Type of waste	Quantity generated	Content of specified substance	Waste treatment
Spent cutting oil	20 t/year	Not known	Delivered to industrial waste management contractor

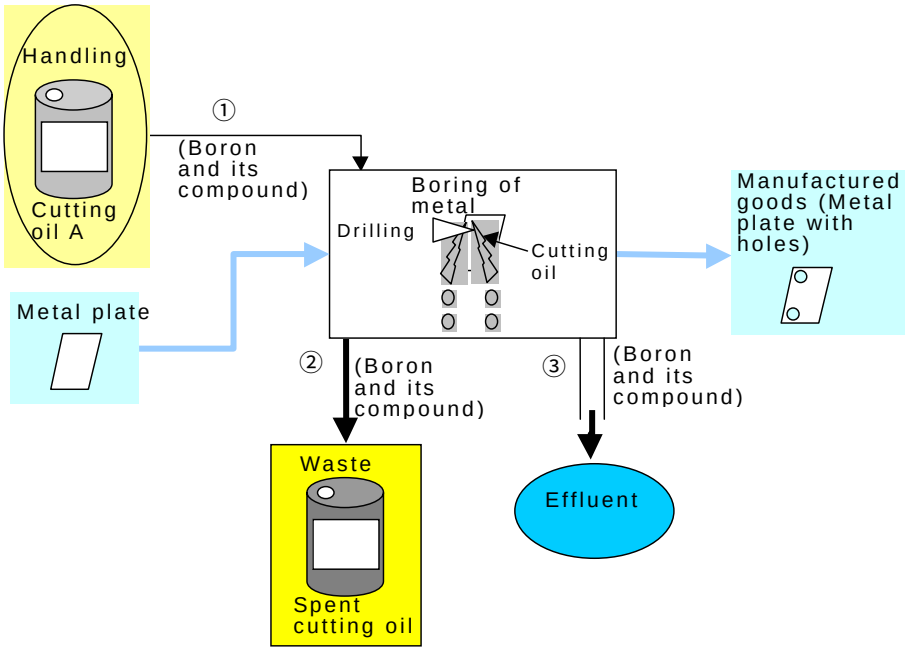


Fig. 1-3 Outline of machining facility

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the machining facility.

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since specified substance is not manufactured in the facility, 0 is assumed as the annual quantity of specified substance manufactured.

Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of cutting oil A used.

Annual quantity of cutting oil A used t/year = [Annual quantity of cutting oil A purchased 23.8t/year − Quantity of cutting oil A stored at the end of the fiscal year 0.2t + Quantity of cutting oil A stored at the beginning of the fiscal year 0.9t]

= 24.5t/year

Step 1-3 Calculate the annual quantity of specified substance used.

Annual quantity of boron and its compound used t/year = Annual quantity of cutting oil A used 24.5t/year × Content of boron and its compound in cutting oil A 4.3% ÷ 100

= 1.054t/year

Step 1-4 Calculate the annual quantity of specified substance handled.

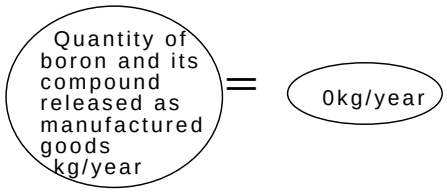
Annual quantity of boron and its compound handled t/year = Annual quantity of boron and its compound manufactured 0t/year + Annual quantity of boron and its compound used 1.054t/year

= 1.054t/year ≧ Designated value of specified substance (Class 1 designated chemical substance) 1t/year

Since the annual quantity of boron and its compound handled is larger than the specified quantity (1 t/year), they are designated as the substances requiring notification.

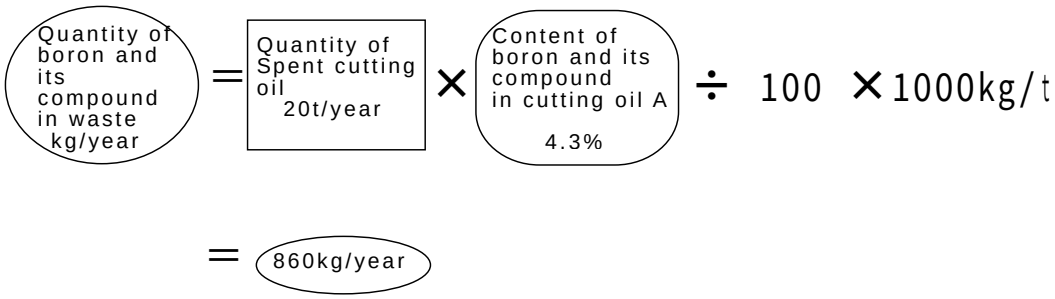
Step 2 Calculate the quantity of specified substance released as manufactured goods.

Since no goods are manufactured in the facility, 0 is assumed as the quantity released as manufactured goods.

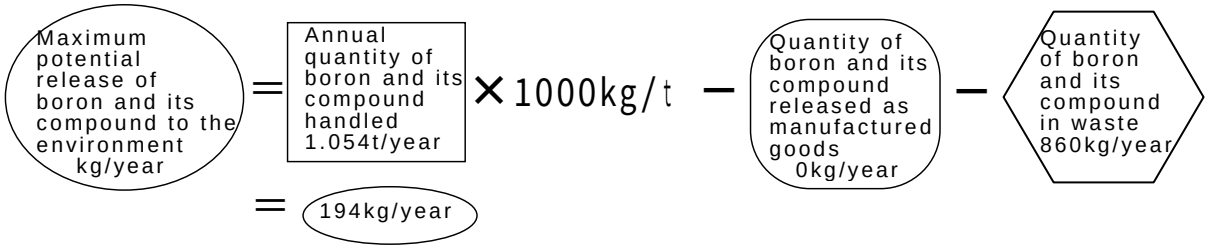


Step 3 Calculate the quantity of specified substance in waste.

Spent cutting oil containing boron and its compound is generated in the facility. However, as the content is not known, calculate the quantity using the content in the cutting oil used.

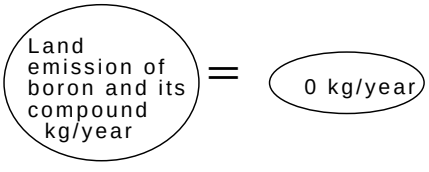


Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of specified substance.

Since there is no leakage from this facility to land, 0 is assumed as land emission.

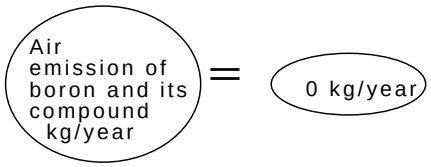


Step 6 Judge to which medium, air or water, larger or smaller quantity is released.

Since sodium tetraborate has high melting point (741 °C), air emission is assumed to be almost none. Therefore, larger quantity is released to water.

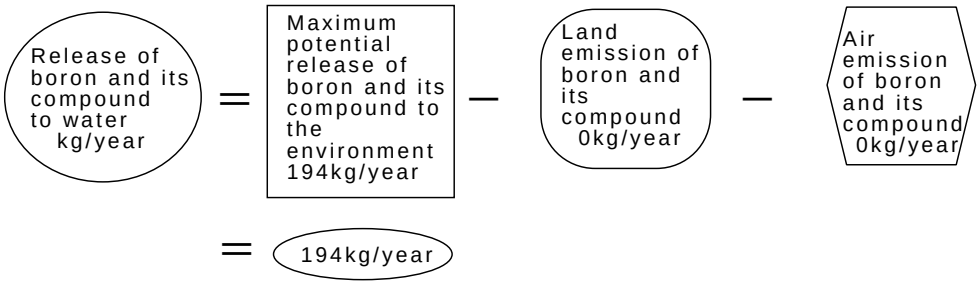
Step 7 Calculate the air emission of specified substance.

Since sodium tetraborate has high melting point (741 °C), air emission is assumed to be almost none. Therefore, 0 is assumed as air emission.



Step 8 Calculate the release of specified substance to water.

Calculate the release from this facility to water using mass balance.



Step 9 Sum up the quantities of specified substance released or transferred.

Boron and its compounds (unit; kg/year)

Classification for Calculation	Classification for Notification
A Air emission; 0 →	(Releases) a. Air emission; 0.0
B Release to water; 194 →	b. Surface water discharge; 190
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 860 →	d. Landfills in the business establishment; 0.0
	(Transfers) e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 860

1-4 Washing process

This is a process where dirt attached to products and parts are washed away using water-based detergent (such as surface active agent) or non water-based detergent (such as chlorinated solvent).
Dry cleaning process of clothes, etc. is included in this process.

The release to the environment and off-site transfer in waste include the following.

- Air emission of specified substance in washing detergent by volatilization or release in effluent from washing equipment
- Transfer as spent solvent

If exhaust gas or effluent generated in the process is treated in exhaust gas or effluent treatment facility by activated carbon adsorption method, etc., waste (such as spent carbon) may be generated.

[Example of specified substances]
Dichloromethane, trichloroethylene, tetrachloroethylene, poly (oxy-ethylene) = nonyl phenyl ether, etc.

[Example of calculation (1)] When volatile washing detergent is used and waste is generated

The following is an example of calculating the release/transfer from the washing facility described by Table 1-4-1 and Fig. 1-4-1.

Table 1-4-1 Outline of washing facility

Handling status of specified substance

① Outline of the work of handling specified substance

Description of washing	Degreasing and washing of metallic parts (Refer to Fig. 1-4-1.) Generation of effluent and leakage to land: None
Exhaust gas treatment facility	None

② Raw material or material containing specified substance handled

- Detergent A

Annual quantity purchased	3.6 t/year
Stock at beginning if fiscal year	0.5 t
Stock at end of fiscal year	1.3 t
Content of specified substance listed in MSDS	

Substance No.	Name of specified substance	Content
211	Trichloroethylene	100%

③ Waste generated

Type of waste	Quantity generated	Content of specified substance	Waste treatment
Spent detergent	1.7 t/year	Not known	Delivered to industrial waste management contractor
Waste	1.0 t/year	Weight of waste before adsorbing solvent: 2 kg Weight of waste after adsorbing solvent: 2.5 kg	

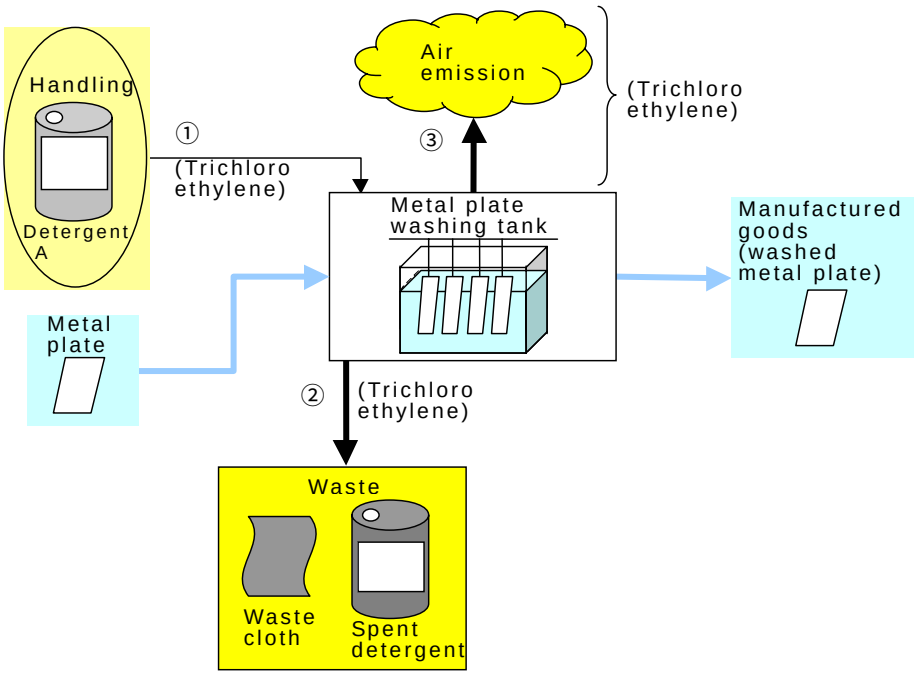


Fig. 1-4-1 Outline of washing facility

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the washing facility.

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since specified substance is not manufactured in the facility, 0 is assumed as the annual quantity of specified substance manufactured.

Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of detergent A used.

Annual quantity of detergent A used t/year = [Annual quantity of detergent A purchased 3.6t/year − Quantity of detergent A stored at the end of the fiscal year 1.3t + Quantity of detergent A stored at the beginning of the fiscal year 0.5t]

= 2.8t/year

Step 1-3 Calculate the annual quantity of specified substance used.

Annual quantity of trichloro ethylene used t/year = Annual quantity of detergent A used 2.8t/year × Content of Trichloro ethylene in detergent A 100% ÷ 100

= 2.8t/year

Step 1-4 Calculate the annual quantity of specified substance handled.

Annual quantity of trichloro ethylene handled t/year = Annual quantity of trichloro ethylene manufactured 0t/year + Annual quantity of trichloro ethylene used 2.8t/year

= 2.8t/year ≧ Designated value of specified substance (Class 1 designated chemical substance) 1t/year

Since the annual quantity of trichloroethylene handled is larger than the specified quantity (1 t/year), it is designated as requiring notification.

Step 2 Calculate the quantity of specified substance released as manufactured goods.

Since products containing specified substance are not manufactured in the facility, 0 is assumed as the quantity released as manufactured goods.

Quantity of trichloro ethylene released as manufactured goods kg/year = 0kg/year

Step 3 Calculate the quantity of specified substance in waste.

Spent detergent containing trichloroethylene and waste are generated in the facility. Since the content of specified substance in spent detergent is not known, calculate the quantity using the content in detergent A.

Quantity of trichloroethylene in spent detergent kg/year = Quantity of spent detergent 1.7t/year × Content of Trichloro ethylene in detergent A 100% ÷ 100 × 1000kg/t

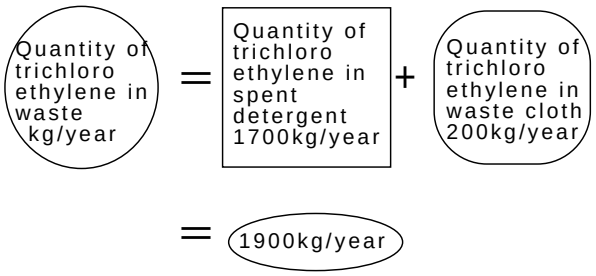
= 1700kg/year

Calculate the quantity of specified substance in waste per 1kg from the weight of waste cloth before and after adsorbing the detergent.

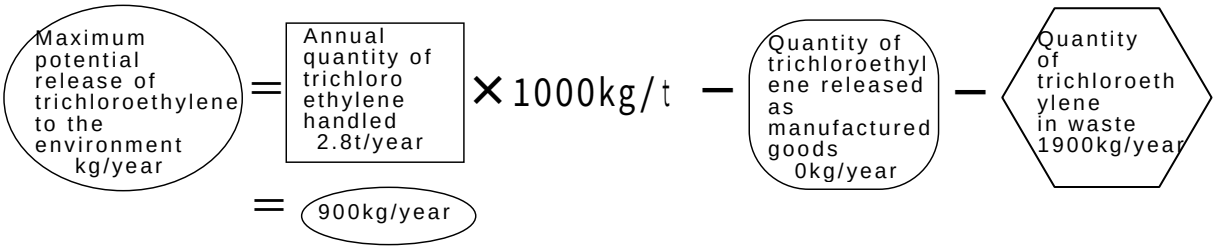
Quantity of trichloro ethylene in waste cloth kg/year = Quantity of waste cloth 1.0t/year × (Weight of waste cloth after adsorbing the detergent 2.5kg − Weight of waste cloth before adsorbing the detergent 2.5kg) ÷ Weight of waste cloth after adsorbing the detergent 2.5kg × Content of Trichloroethylene in detergent A 100% ÷ 100 / 1000kg/t ×

= 200kg/year

The quantity of trichloroethylene released is the sum of the quantity in spent detergent and in waste cloth.

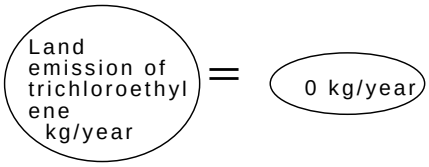


Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of specified substance.

Since there is no leakage to land in the facility, 0 is assumed as land emission.

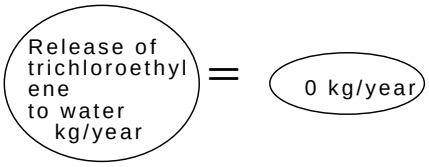


Step 6 Judge to which medium, air or water, the larger or smaller quantity is released.

Since the facility does not have contact with water, it is assumed that larger quantity is released to air.

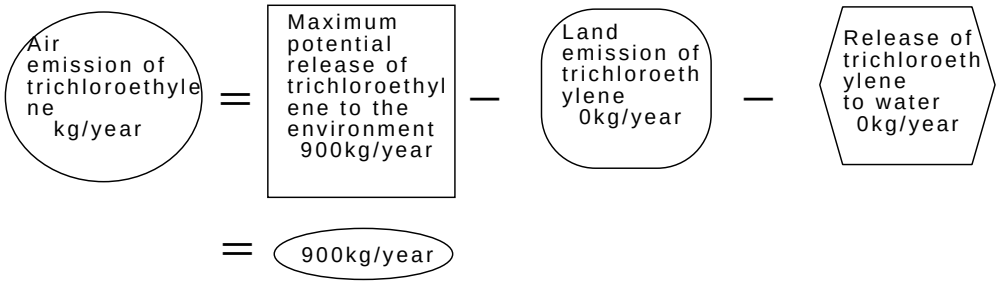
Step 7 Calculate the release of specified substance to water.

Since the facility does not have contact with water, 0 is assumed as release to water.



Step 8 Calculate the air emission of specified substance.

Calculate the air emission from the facility using mass balance.



Step 9 Sum up the quantities of specified substance released or transferred.

Trichloroethylene (unit; kg/year)

Classification for Calculation	Classification for Notification
	(Releases)
A Air emission; 900 →	a. Air emission; 900
B Release to water; 0 →	b. Surface water discharge; 0.0
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 1900 →	d. Landfills in the business establishment; 0.0
	(Transfers)
	e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 1900

[Example of calculation (2)] When dry cleaning is performed

The following is an example of calculating the release/transfer from the dry cleaning facility described by Table 1-4-2 and Fig. 1-4-2. (Refer also to "Cleaning business" in the manual by business.)

Table 1-4-2 Outline of dry cleaning facility

Handling status of specified substance

① Outline of the work of handling specified substance

Description of dry cleaning	Dry cleaning of clothes (Refer to Fig. 1-4-2.) Quantity of effluent: 1,200 m^3/year Leakage to land: None Weight of laundry per cleaning: 30 kg Number of times of cleaning per year: 600
Exhaust gas treatment facility	Cartridge filter (Replacement per year: Twice) Activated carbon adsorbing equipment (Replacement per year: Once, Weight of replaced activated carbon: 50 kg)
Effluent treatment facility	None
Effluent released to:	***** river

② Raw material and material containing specified substance handled

- Dry cleaning solvent A

Annual quantity purchased	1.3 t/year
Stock at beginning of fiscal year	0.44 t
Stock at end of fiscal year	0.24 t
Content of specified substance listed in MSDS	

Substance No.	Name of specified substance	Content
200	Tetrachloroethylene	100%

③ Waste generated

Type of waste	Quantity generated	Content of specified substance	Waste treatment
Filter	Not known	Not known	Delivered to industrial waste management contractor
Distillation sludge	Not known	Not known	
Spent carbon	Not known	Not known	

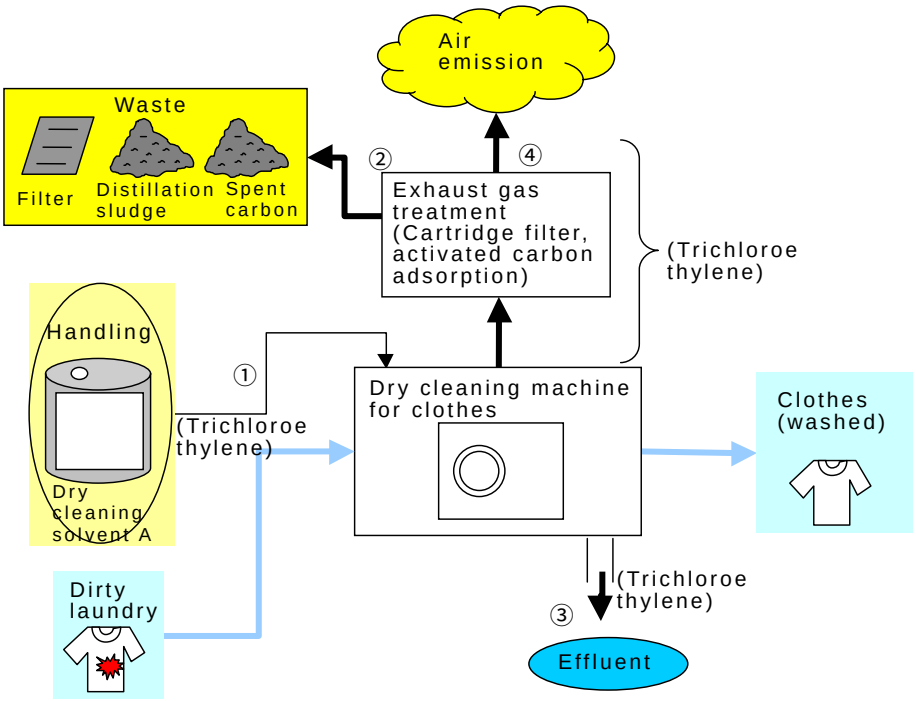


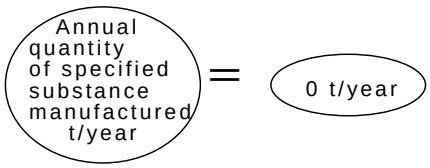
Fig. 1-4-2 Outline of dry cleaning facility

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the dry cleaning facility.

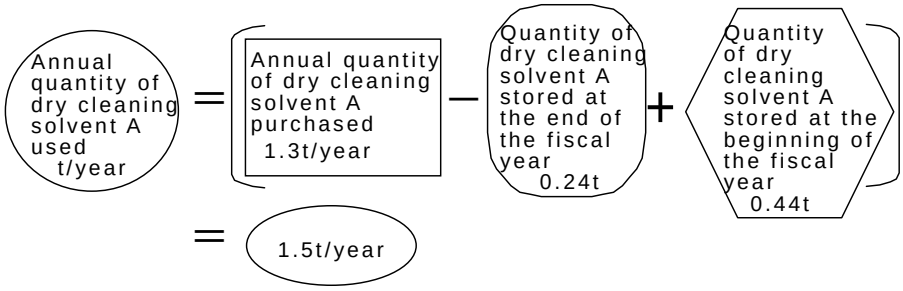
Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

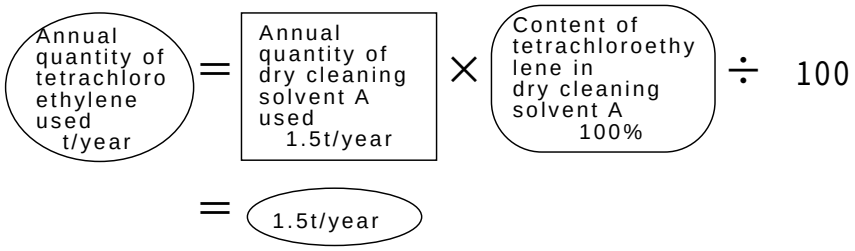
Since specified substance is not manufactured in the facility, 0 is assumed as annual quantity of specified substance manufactured.



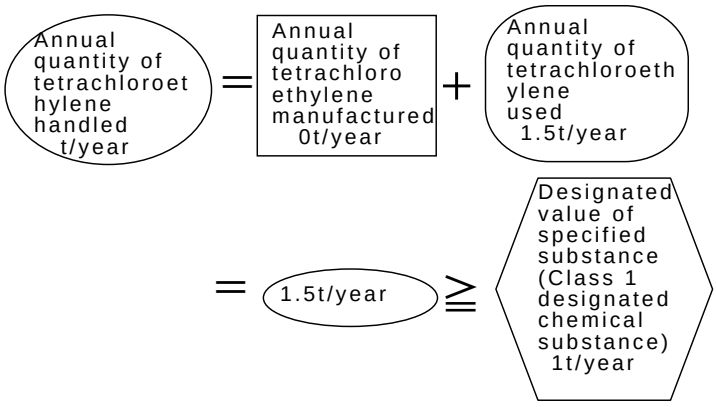
Step 1-2 Calculate the annual quantity of dry cleaning solvent A used.



Step 1-3 Calculate the annual quantity of specified substance used.



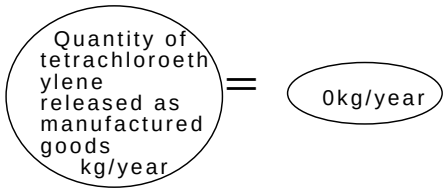
Step 1-4 Calculate the annual quantity of specified substance handled.



Since the annual quantity of tetrachloroethylene handled is larger than the specified quantity (1t/year), it is designated as requiring notification.

Step 2 Calculate the quantity of specified substance released as manufactured goods.

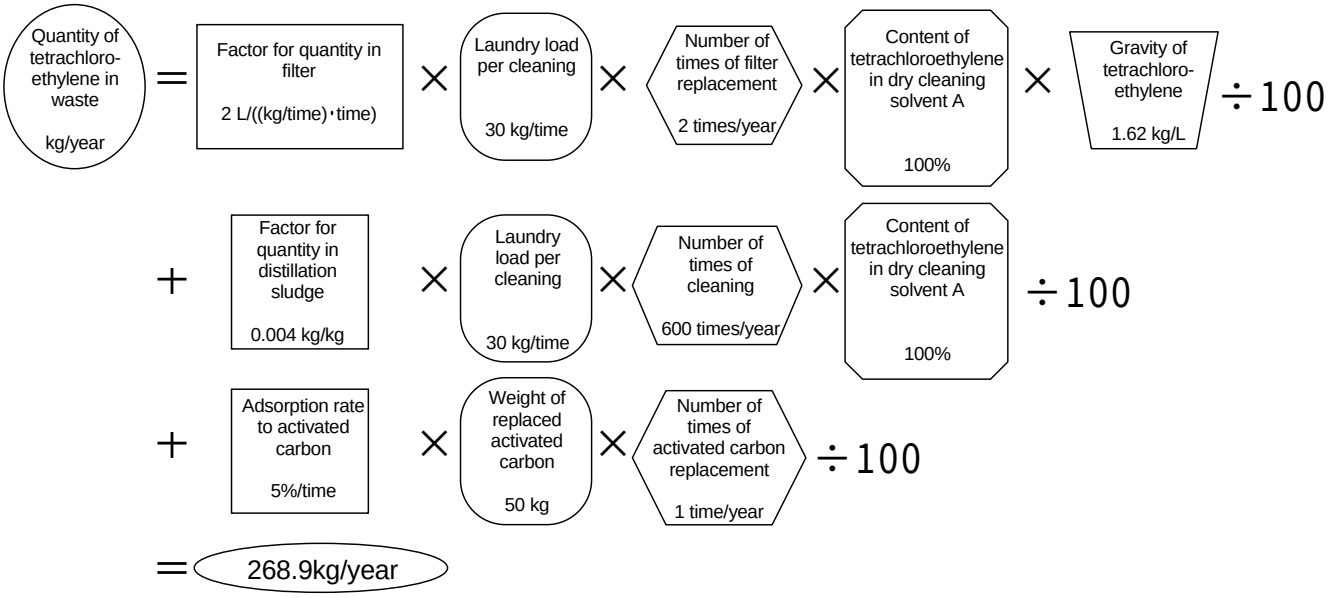
Since products containing specified substance are not manufactured in the facility, 0 is assumed as the quantity released as manufactured goods.



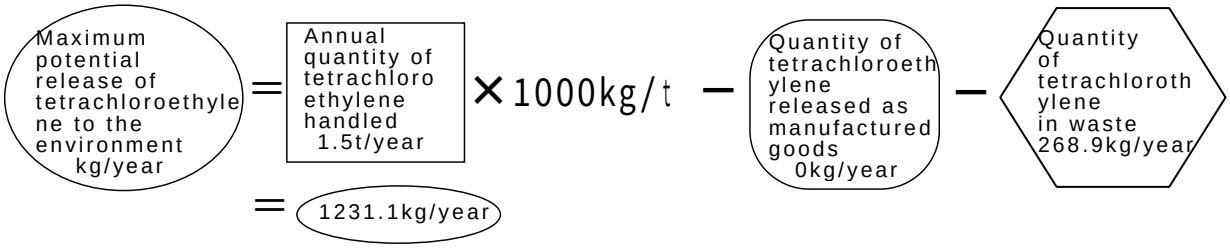
Step 3 Calculate the quantity of specified substance in waste.

Calculate the quantity of tetrachloroethylene contained in filter, distillation sludge and spent carbon using the following factors (→ pIII-252).

- Factor for the quantity contained in the filter per laundry load (weight) (per replacement of filter): 2L/((kg/cleaning)･Cleaning)
- Factor for the quantity contained in distillation sludge per annual laundry load (weight): 0.004 kg/kg
- Adsorption rate to activated carbon per weight of replaced activated carbon (per replacement of activated carbon): 5%/replacement

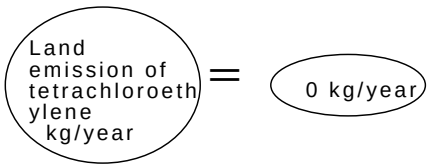


Step 4 Calculate the maximum potential release of specified substance to the environment.



Step 5 Calculate the land emission of specified substance.

Since there is no leakage to land, 0 is assumed as land emission.

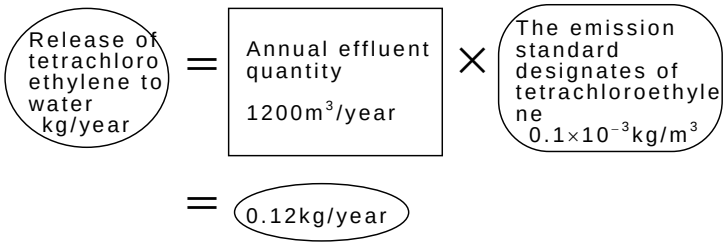


Step 6 Judge to which medium, air or water, larger or smaller quantity is released.

Since tetrachloroethylene has high volatility, it is assumed that larger quantity is released to air.

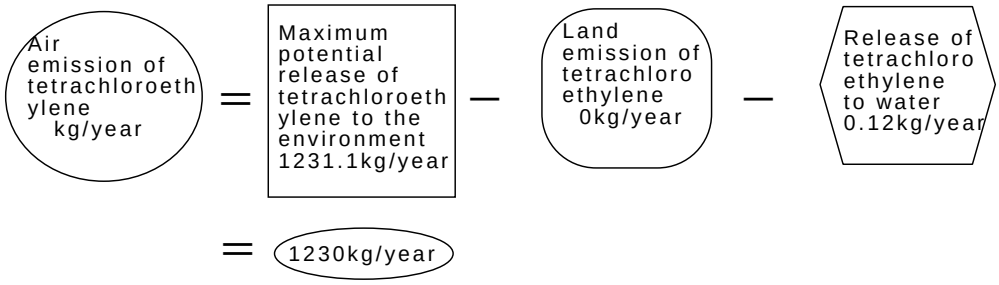
Step 7 Calculate the quantity of specified substance released to water.

The concentration of tetrachloroethylene in effluent is not measured. However, since the emission standard designates that the concentration must be 0.1mg/L ($=0.1\times10^{-3}$kg/m^3) or lower, calculate the release to water on the assumption that the concentration is that value.



Step 8 Calculate the air emission of the specified substance.

Calculate the air emission using mass balance.



Step 9 Sum up the quantities of specified substance released or transferred.

Tetrachloroethylene (unit; kg/year)

Classification for Calculation	**Classification for Notification**
	(Releases)
A Air emission; 1230 →	a. Air emission; 1200
B Release to water; 0.12 →	b. Surface water discharge; 0.1
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 268.9	d. Landfills in the business establishment; 0.0
	(Transfers)
	e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 270

1-5 Painting process

This is a process where parts, surface of products, etc. are coated by spraying or electro-coating.

The release to the environment and off-site transfer in waste include the following.

- Volatilization of specified substance (solvent component) in paint to air
- Mixing of solvent component or pigment component from wet booth to effluent
- Transfer of solvent component or pigment component as spent paint, etc.

If exhaust gas or effluent generated from the process is treated in exhaust gas or effluent treatment facility by activated carbon adsorption method, waste (such as spent carbon) may be generated.

[Examples of subject substances]

Solvent component: Toluene, xylene, etc.
Component of pigment: Hexavalent chromium compounds, lead and its compounds, etc.

[Example of calculation]
The following is an example of calculating the release/transfer from the coating facility described by Table 1-5 and Fig. 1-5.

Table 1-5 Outline of coating facility

Handling status of specified substance

① Outline of the work of handling specified substance

Description of coating	Airless spray coating of metal plate (Refer to Fig. 1-5.) Generation of effluent and leakage to land: None
Exhaust gas treatment facility	None

② Raw materials and materials containing specified substance handled

- Paint A

Annual quantity purchased	14.7 t/year
Stock at beginning of fiscal year	1.22 t
Stock at end of fiscal year	0.78 t
Content of specified substance listed in MSDS	

Substance No.	Name of specified substance	Content
227	Toluene	50%
311	Manganese and its compounds	20%

③ Waste generated

Type of waste	Quantity generated	Content of specified substance	Waste treatment
Spent paint	200 kg/year	Not known	Delivered to industrial waste management contractor

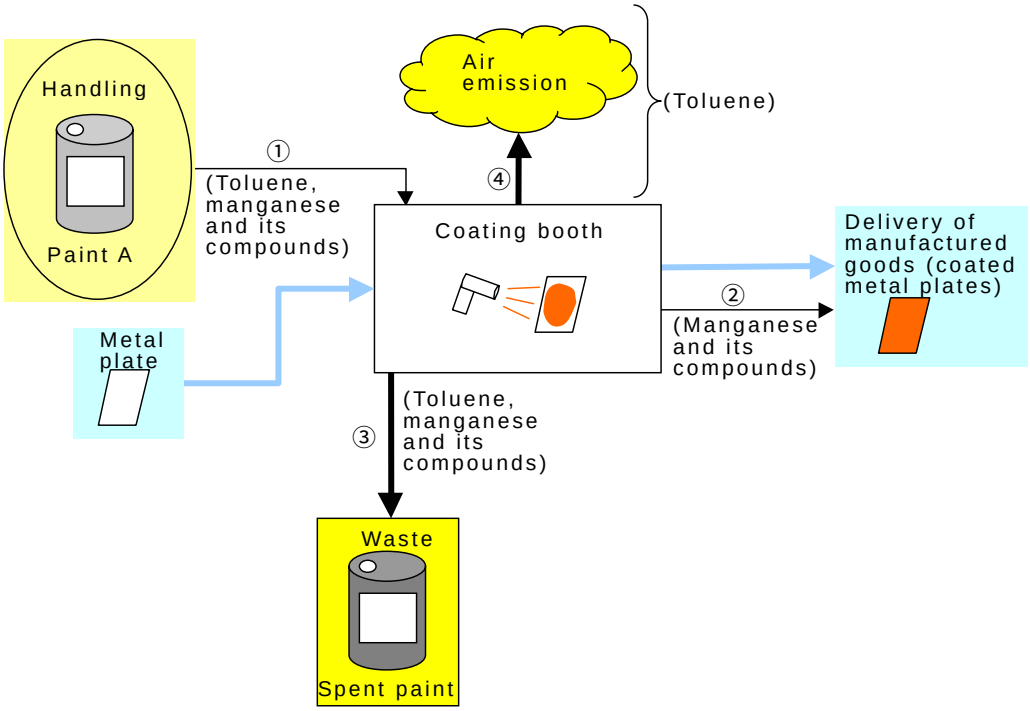


Fig. 1-5 Outline of coating facility

Follow the procedure based on mass balance described in Part I and Part II to calculate the release/transfer from the coating facility. (Refer also to the example of calculating the release from the wet booth in coating facility in Part I.)

Step 1 Calculate the annual quantity of specified substance handled.

Step 1-1 Calculate the annual quantity of specified substance manufactured.

Since no specified substance is manufactured in the facility, 0 is assumed as the annual quantity of specified substance manufactured.

Annual quantity of specified substance manufactured t/year = 0 t/year

Step 1-2 Calculate the annual quantity of paint A used.

Annual quantity of paint A used t/year = Annual quantity of paint A purchased 14.7t/year − Quantity of paint A stored at the end of the fiscal year 0.78t + Quantity of paint A stored at the beginning of the fiscal year 1.22t

= 15.14t/year

Step 1-3 Calculate the annual quantity of specified substance used.

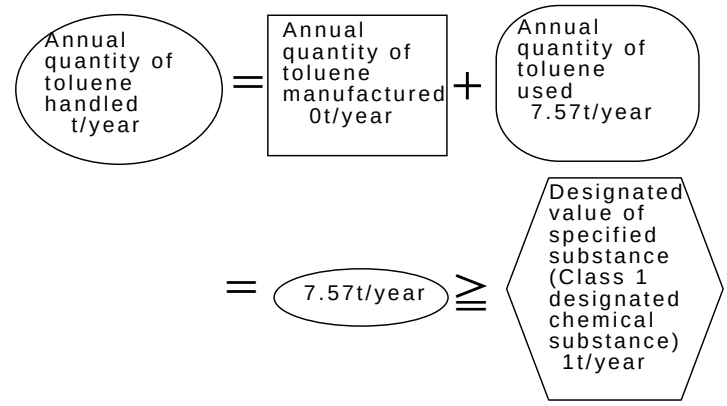
Annual quantity of toluene used t/year = Annual quantity of paint A used 15.14t/year × Content of toluene in paint A 50% ÷ 100

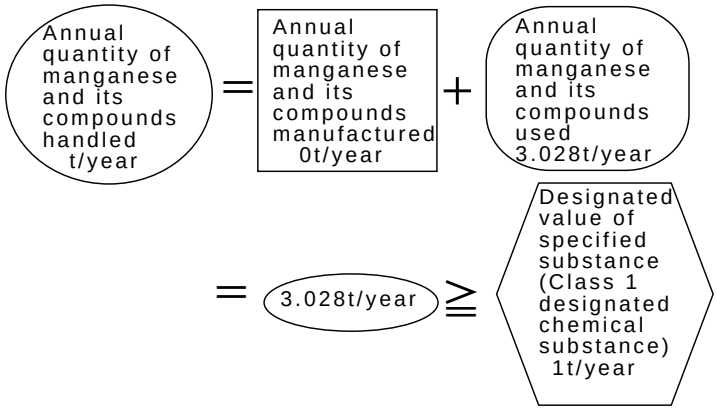
= 7.57t/year

Annual quantity of manganese and its compounds used t/year = Annual quantity of paint A used 15.14t/year × Content of manganese and its compounds in paint A 20% ÷ 100

= 3.028t/year

Step 1-4 Calculate the annual quantity of specified substance handled.





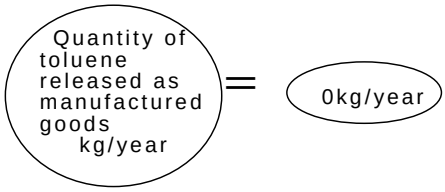
Since the annual quantity of toluene and manganese and its compounds handled is larger than the specified quantity (1t/year), they are designated as requiring notification.

Procedure of calculating solvent component (toluene) and pigment component (manganese and its compounds) is described separately in the following sections.

Step 2 Calculate the quantity of specified substance released as manufactured goods.

○ Solvent component

Since specified substance is not contained in manufactured goods (coated metal plates), 0 is assumed as the quantity released as manufactured goods.



○ Pigment component
Calculate the quantity using the following adherence efficiency.

- Adherence efficiency of airless spray to metal plate: 60 to 70% (Use 60% to be on the safe side.)

Quantity of manganese and its compounds released as manufactured goods (kg/year) = Annual quantity of manganese and its compounds handled (3,028 t/year) × 1,000kg/t × Adherence efficiency of airless spray to metal plate (60%) ÷ 100

= 1,817kg/year

Step 3 Calculate the quantity of specified substance in waste.

○ Solvent component
Since the content of specified substance in spent paint is not known, calculate the quantity using the content in paint A.

Quantity of toluene in waste (kg/year) = Quantity of spent paint (200kg/year) × Content of toluene in paint A (50%) ÷ 100

= 100kg/year

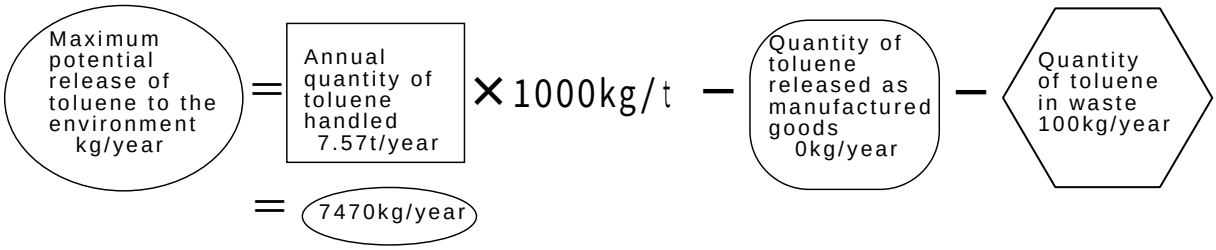
○ Pigment component
Since the release to the environment is assumed to be almost none, calculate the quantity using mass balance.
(The quantity in waste includes the quantity that attached to the floor during coating process and not delivered as manufactured goods as well as the quantity in spent paint.

Quantity of manganese and its compounds in waste (kg/year) = Annual quantity of manganese and its compounds handled (3.028t/year) × 1000kg/t − Quantity of manganese and its compounds released as manufactured goods (1817kg/year)

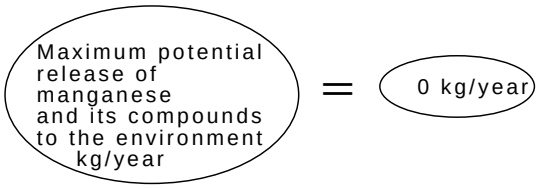
= 1211kg/year

Step 4 Calculate the maximum potential release of specified substance to the environment.

○ Solvent component



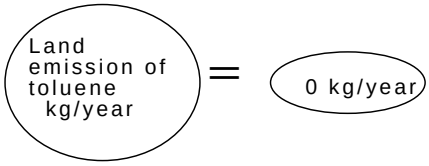
○ Pigment component
Since the release to the environment is almost none, 0 is assumed as the maximum potential release to the environment. (The subsequent procedure will be omitted.)



Step 5 Calculate the land emission of specified substance.

Since there is no leakage to land in the facility, 0 is assumed as land emission.

○ Solvent component

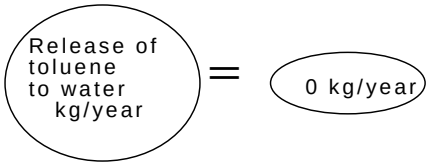


Step 6 Judge to which medium, air or water, larger or smaller quantity is released.

○ Solvent component
Since the facility does not have contact with water, 0 is assumed as release to water.

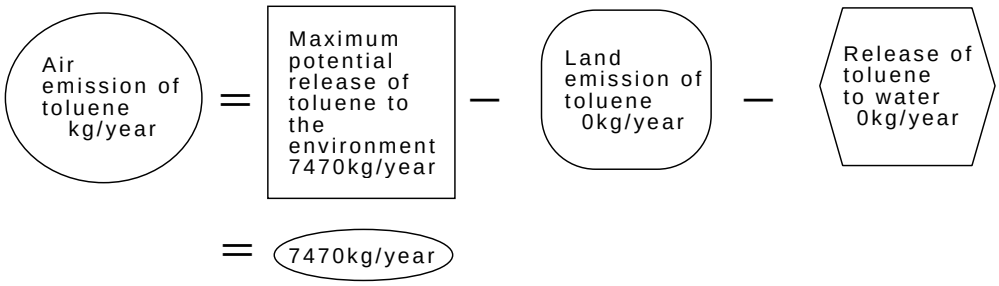
Step7 Calculate the release of specified substance to water.

○ Solvent component
Since the facility does not have contact with water, 0 is assumed as the quantity released to water.



Step 8 Calculate the air emission of specified substance.

○ Solvent component
Calculate the air emission using mass balance.



Step 9 Sum up the quantities of specified substance released or transferred.

Toluene (unit; kg/year)

Classification for Calculation	Classification for Notification
	(Releases)
A Air emission; 7470 →	a. Air emission; 7500
B Release to water; 0 →	b. Surface water discharge; 0.0
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 100 →	d. Landfills in the business establishment; 0.0
	(Transfers)
	e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 100

Manganese and its compounds (unit; kg/year)

Classification for Calculation	Classification for Notification
	(Releases)
A Air emission; 0 →	a. Air emission; 0.0
B Release to water; 0 →	b. Surface water discharge; 0.0
C Land emission; 0 →	c. Land emission in the business establishment; 0.0
D Quantity in waste; 1211 →	d. Landfills in the business establishment; 0.0
	(Transfers)
	e. Transfer to sewage; 0.0
	f. Off-site transfer in waste; 1200