23.Service Stations (SS)

I. Designated Chemical Substances and Products

[1] Chemical Substances and Products Subject to the Law for PRTR and Promotion of Chemical Management

[Designated Substances]

Chemical substances that have been recognized as being hazardous to human health and to ecosystems, are recognized to be widely present in the local environment (i.e.: tend to have high potential for causing exposure) and have been specified by Cabinet Order.

<Chemical Substances Specified by Cabinet Order>

(1) Class I Designated Chemical Substances:

354 substances, including benzene, toluene, xylene and ethylbenzene, which have been specified by Cabinet Order.

(2) Specified Class I Designated Chemical Substances:

A subgroup of the Class I Designated Chemical Substances that is composed of 12 carcinogenic substances, including benzene, that have been specified by Cabinet Order.

[Designated Products]

Products whose content exceeds a certain level of a designated chemical substance.

(1) Products that contain a Class I Designated Chemical Substance in a proportion of 1% by mass, or greater.

(2) Products that contain a Specified Class I Designated Chemical Substance in a proportion of 0.1% by mass, or greater.

[2] Products Handled by Gas Service Stations (SS) and Designated Chemical Substances and Products

The main products handled by SS are fuel oils, such as gasoline, kerosene and gas oils; lubricating oils; or vehicle-related products, such as waxes, water flushing agents, antifreeze and windshield washer fluid. The relationships between fuel oils and the products / substances subject to the Law for PRTR and Promotion of Chemical Management, are as follows:

[Content of Designated Chemical Substances in Fuel Oils Handled by SS]

(Industry Average Value) (wt %)

Designated Product / Designated Substance	Premium Gasoline	Regular Gasoline	Kerosene	Gas Oil
Benzene	0.51	0.64	0.01	0.00
Toluene	20.8	9.1	0.1	0.03
Xylene	8.5	6.1	1.1	0.22
Ethylbenzene	1.7	1.4	0.3	0.04
1,3,5-trimethylbenzene	1.1	0.9	0.7	0.13

Note: As the above values represent average values in industry, the particular figures given may differ from those stated within the MSDS.

As a result of the information above, within this manual, the products and substances subject to reporting of quantities released to the environment at the SS (as "fuel retailers") under the PRTR system, are defined as follows:

Designated Product	Designated Substance
Premium Gasoline	Benzene, Toluene, Xylene, Ethylbenzene, 1,3,5-trimethylbenzene
Regular Gasoline	Benzene, Toluene, Xylene, Ethylbenzene
Kerosene	Xylene

For the gas oils that fall under the category of fuel oils (products subject to reporting of quantities released) shall not be subject to the PRTR system, as the content of all the PRTR chemicals is below the designated level.

Furthermore, lubricating oils and other chemical products, such as waxes / water flushing agents / antifreeze / windshield washer fluid and products subject to reporting of quantities transferred, such as waste oils, may not usually be subject to the PRTR system since the content of designated chemical substances is below the specified levels, and the annual quantities handled may not exceed specified thresholds even if the designated substances content exceeds the specified levels. However, any SS that handles large quantities of such chemical products must confirm the annual quantities handled.

II. Reporting Businesses

[1] Reporting Businesses Subject to the PRTR System

The businesses that are required to report quantities of designated chemical substances released or transferred, are those that fall under any of the conditions (1) - (3), below. [Criteria for Reporting Businesses]

(1) Businesses that operate any business covered within the 23 business categories specified by Cabinet Order

<Petroleum Related Business Categories>

○ Fuel Retailers (Designated facilities are SS and kerosene specialty stores.)

○ Manufacturers (Designated facilities are petroleum refineries and oil storage bases.)

○ Petroleum wholesalers (Designated facilities are oil bulk terminals.)

(2) Businesses that employ 21 or more regular employees

(3) Businesses that own facilities (SS) that handle annual quantities of any Class I Designated Chemical Substance, of 1 t or greater (for the initial 2 years – but 5 t or greater for the years 2001 and 2002). However, for Specified Class I Designated Chemical Substances, which are carcinogenic, such businesses are those that own SS that handle annual quantities of 0.5 t or greater.

Therefore, in the event that any SS, owned by a business, do not fall under the conditions described in 3) above, then such SS are not required to report the quantities of designated chemical substances released. [Criteria for Reporting Business Premises] (Refer to the "Flow Chart to Determine Reporting Criteria for Quantities Released by SS ("Fuel Retailers")".)

[2] Criteria for Fuel Retailers (SS) Subject to the PRTR System

(1) Number of Employees

Among all the businesses operating SS, any business that employs 21 or more employees on a regular basis

Note: The number of employees is equivalent to the number of regular employees within the entire business enterprise (corporation, affiliated company or other organization, including administrative departments) and not merely the number of employees working at any one SS (single location). In addition, the term "employees" shall include part-time employees, other than full-time employees.

(2) Quantities of Designated Chemical Substances Handled

A business that operates SS, which handle annual quantities of designated chemical substances exceeding the specified levels (refer to (3) of [1], above).

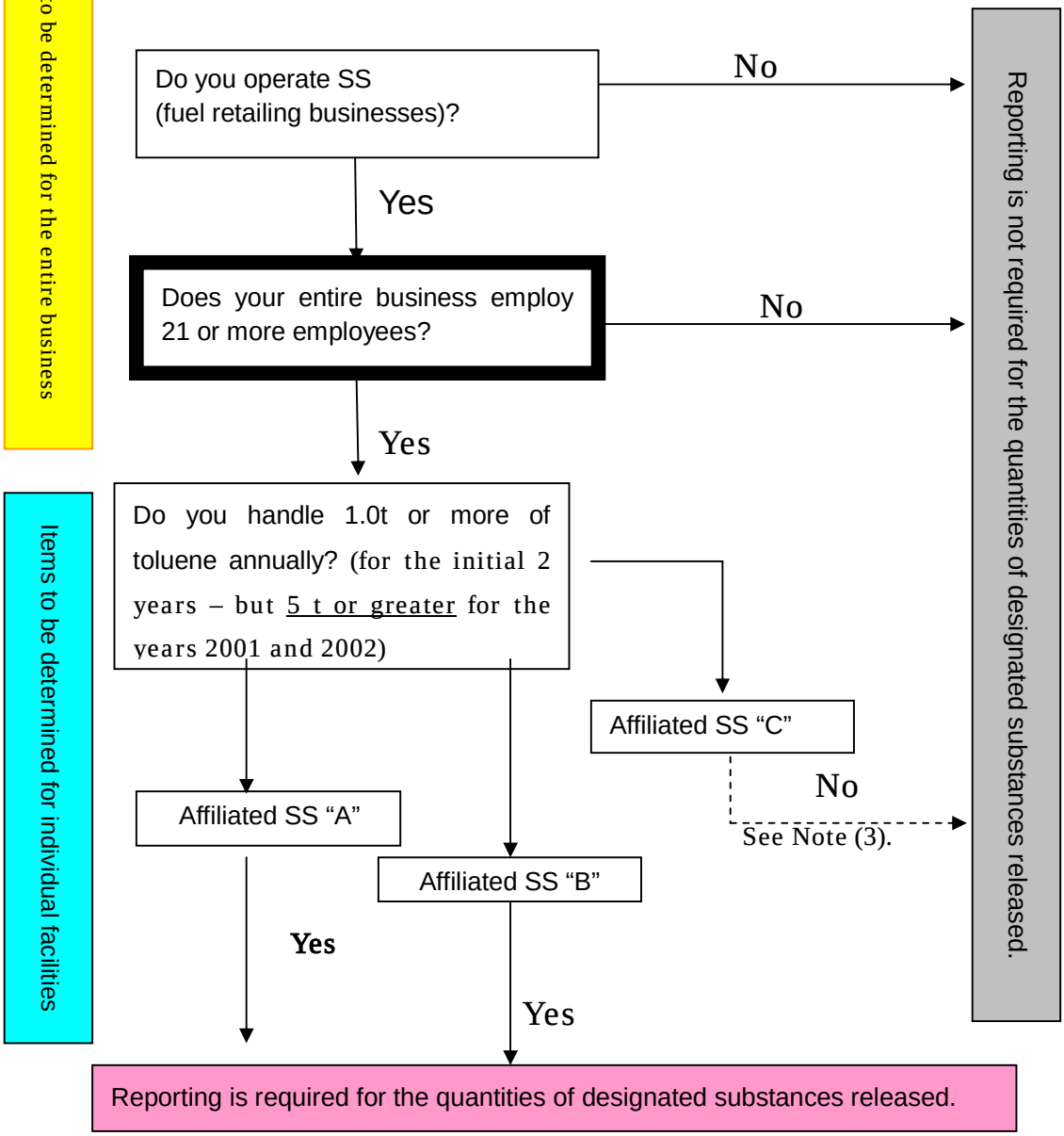
→ A business shall be subject to reporting requirements under any of the following conditions: if the annual quantity of premium gasoline handled at the SS is 7 kl or greater (toluene content); if the annual quantity of regular gasoline handled is 16 kl or greater (toluene content); or if the annual quantity of kerosene handled is 115 kl or greater (xylene content).

The number of employees (21 or more) of a business that operates SS shall be used to determine whether or not the particular business is subject to PRTR requirements, in accordance with the above conditions.

Flow Chart to Determine Reporting Criteria for Quantities Released by SS

("Fuel Retailers")

(For Toluene content in Regular Gasoline)



Note:

① This flow chart assumes that 3 SS are being operated.

② The quantity "1 t or more of toluene annually" is approximately equivalent to the toluene content present within 16 kl (or more) of regular gasoline, handled annually.

③ This example exhibits a situation in which SS "C" is not subject to reporting. However, with consideration for the quantitative conditions indicated in②, it is considered that few SS of this type are present.

III. Method for Estimating Quantities Released

[1] Determining the Quantities Handled

In order to estimate the quantities released at the level of the SS, first determine separately the “annual quantities loaded” (for the specified fiscal year) (note 1) and the “annual quantities refueled” (for the specific fiscal year) (note 2) for the gasoline and kerosene at respective SS. (A simple method is presented later in this manual. This method allows for the automatic calculation of the quantities of PRTR chemicals released by using the “annual quantities loaded” and the “annual quantities refueled”.)

Note 1: The term "annual (in the specific fiscal year)" refers to the one-year period beginning in the "previous fiscal year", and extending until the date that the quantity released is reported in the current year (between April and June of every fiscal year).

Note 2: With respect to the "quantities refueled ", such quantities shall include only those amounts refueled on the premises of the SS. Any substances refueled from outside of the premises of the SS, such as from small tank trucks, shall not be considered to form part of the “quantities refueled”.

[2] Types of Release

Currently, there are two types in which designated chemical substances are released at SS, as described below.

(1) Releases to the atmosphere during the underground tanks filling operations at SS

When gasoline or kerosene is loaded from a tank truck into underground storage tanks, vapor present in the space just above the liquid level is vented to the atmosphere through the vent line.

(2) Releases to the atmosphere during the vehicle refueling operations

When a fuel is supplied to a vehicle (when selling fuel to customers), as the liquid surface inside the vehicle fuel tank rises, the vapor present inside the fuel tank is vented to the atmosphere.

<Special Case: Vapor Return Equipment Being Installed >

The quantities of designated chemical substances released can be reduced if SS have a system that allows for the return of vapors back to the tank truck via the venting line and a system that allows for the return of vapors released from vehicle fuel tanks, while fuels are being supplied to vehicles. Please make sure if vapor return equipment is being installed.

The vapor return rate of SS that have installed vapor return equipment was determined to be as 85%, for both during the filling operation of storage tank and vehicle refueling at SS where the vapor return equipment is installed.

The aforementioned vapor return rate was obtained from the "*Manual for Estimating Quantities of Released and Transferred Chemical Substances*" (drafted by the Ministry of Economy, Trade and Industry and the Ministry of the Environment).

[3] Estimating the Quantities of Designated Chemical Substances Released

(1) The quantities of designated chemical substances released from the petroleum products handled at SS, such as gasoline, are calculated using an "emission factor". The emission factor is calculated by multiplying the "concentration in gas" of the particular designated chemical substance, by the "emission constant" (the rate at which hydrocarbon vapors are emitted from the liquid) for each petroleum product, in accordance with the aforementioned "*Manual for Estimating Quantities of Released and Transferred Chemical Substances*".

(2) The quantities of designated chemical substances released from the petroleum products handled at SS are calculated by multiplying the "emission factor for each designated chemical substance in each petroleum product" by the "quantities of petroleum products loaded and refueled at the SS". (For details, refer to Ⅳ. Examples of Calculations" for further details.)

When estimating quantities released at SS, the "Emission Factor for Each Designated Product / Designated Chemical Substance" listed on the following page shall be utilized, as is listed in the table on the following page.

[4] Other Considerations for Estimating Quantities Released

(1) Since the content percentage (the average in industry) for designated chemical substances (particularly for toluene) in premium gasoline and regular gasoline were found to be different from investigation results as shown in the table (page 1), different emission factors have been obtained from calculations even for the same substances in those two types of gasoline.

(2) Any seasonal variation is ignore, as the fact that the values are considered on an “annual basis” which compensates for the effects arising from any such seasonal variation.

(3) Any breathing losses from fuels in underground storage tanks are ignored in calculating quantities released, as daily changes of temperature within underground storage tanks are a

little and quantities released are negligible compared with the case of storage tanks on the ground.

Table: Emission Factor for Each Designated Product / Designated Chemical Substance at SS

Designated Petroleum Product	Designated Chemical Substance	Emission Factor During Loading from Tank Trucks into Underground Tanks	Emission Factor During Refueling from Dispensing Equipment to Motor Vehicles
Premium Gasoline	Benzene	0.0021277	0.0026793
	Toluene	0.0246417	0.0310303
	Xylene	0.0028771	0.0036231
	Ethylbenzene	0.0006483	0.0008164
	1,3,5-trimethylbenzene	0.0001204	0.0001516
Regular Gasoline	Benzene	0.0025759	0.0032437
	Toluene	0.0107540	0.0135421
	Xylene	0.0020498	0.0025812
	Ethylbenzene	0.0005316	0.0006694
Kerosene	Xylene	0.0000009	

Note 1: The emission factors in the above table have been calculated based on the "Content of Designated Chemical Substances in Fuel Oils Handled at SS" (the average in industry)", in the table given in the earlier parts of this manual The numeric values from the MSDS for respective SS have not been utilized.

Note 2: It has been determined that the above emission factor for kerosene is both during loading and the filling operations into customers' containers.

IV. Examples of Calculations

[1] Examples of Calculations for Regular Gasoline (Benzene Content)

<Facility Profile>

Equipment utilized: underground tanks (gasoline service station)

Vapor return equipment: not installed

Substance stored: regular gasoline

Annual quantities of regular gasoline handled: quantity loaded of 1,000 kl, quantity refueled of 960 kl

(1) Estimating the Quantity of Benzene Released During Loading and Refueling

As the emission factors differ for fuel loading and vehicle refueling, the quantities of benzene released have been calculated for both operations.

[Quantity Released During Regular Gasoline Loading]

= quantity of regular gasoline loaded (kl/year) × emission factor during regular gasoline loading (kg/kl) = 1,000 kl/year × 0.0025759 kg/kl= 2.5759 kg/year

[Quantity Released During Regular Gasoline Vehicle Refueling]

= quantity of regular gasoline refueled (kl/year) × emission factor during regular gasoline refueling (kg/kl) = 960 kl/year × 0.0032437 kg/kl = 3.113952 kg/year

(2) Estimating the Quantity of Benzene Released to the Atmosphere

The quantity of benzene released to the atmosphere shall be calculated by adding together the quantities released during fuel loading and vehicle refueling, as described in the above (1).

[Quantity of Benzene Released to Atmosphere]

= quantity of benzene released during regular gasoline loading + quantity of benzene released during regular gasoline refueling

= 2.5759 kg/year + 3.113952 kg/year = 5.689852 kg/year

The quantity of benzene released subject to reporting = 5.7 kg/year

(to 2 significant digits)

Regular gasoline also contains more than 1% by mass of toluene, xylene and ethylbenzene. The

quantities of these designated chemical substances released shall be calculated by using the emission factors described earlier, employing the same method of calculation as that used for the estimation of the quantity of benzene released.

[2] Examples of Calculations for Kerosene (Xylene Content)

<Facility Profile>

Equipment utilized: underground tanks (gasoline service station)

Substance stored: kerosene

Annual quantities of kerosene handled: quantity loaded of 1,000 kl, quantity refueled of 800 kl

*The quantity refueled is limited to the motor vehicle refueling quantity on the actual premises of SS.

<General Case: Vapor Return Equipment Not Being Installed >

As with the previously described method of calculating the benzene content of regular gasoline, the quantities of designated chemical substances released shall be calculated by multiplying the emission factors (described in Table of Emission Factors) of for kerosene both during regular gasoline loading and refueling by the annual quantities of kerosene both loaded and refueled.

Quantity of Xylene Released
= [quantity of kerosene loaded × quantity of kerosene refueled] × [emission factor for xylene contained in kerosene]
= [1,000 kl/year + 800 kl/year] × 0.0000009 kg/kl
= 0.00162 kg/year

The quantity of xylene released subject to reporting = 0.0 kg/year

(to 2 significant digits)

It has been determined that no difference was made between the emission factor used for kerosene during loading and that used for kerosene during vehicle refueling.

[3] Examples of Calculations for Regular Gasoline (Benzene Content - Special Case for Calculations Pertaining to (1), Above)

For SS that employ vapor return equipment during the loading of regular gasoline into underground storage tanks, the quantity of benzene released during fuel loading shall be multiplied by 0.15, prior

to being added to the quantity of benzene released during vehicle refueling.

[Quantity Released During Regular Gasoline Loading]

= [quantity loaded] × [emission factor during regular gasoline loading] × [percentage of vapor not returned]

= 1,000 kl/year × 0.0025759 kg/kl × 0.15

= 0.386385 kg/year

[Quantity Released During Regular Gasoline Vehicle Refueling]

= [quantity refueled] × [emission factor during regular gasoline vehicle refueling]

= 960 kl/year × 0.0032437 kg/kl

= 3.113952 kg/year

Quantity of Benzene Released to Atmosphere

= [quantity of benzene released during regular gasoline loading] + [quantity of benzene released during regular gasoline refueling]

= [0.386385 kg/year] + [3.113952 kg/year]

= 3.500337 kg/year

The quantity of benzene released subject to reporting = 3.5 kg/year

(to 2 significant digits)

V. Downloading Forms for Reporting

The following procedures can be used to download PRTR Reporting Forms / Calculation Methods from the web site of the Zensekiren.

(1) Access the home page of the Zensekiren web site.
http://www.zensekiren.or.jp/

(2) Click on the box that reads "PRTR System", which is located in the bottom right corner of the home page. The following menu items will then be displayed:

> Download Menu <PRTR Reporting Form / Calculation Methods>
>
> 1) Vapor return equipment not installed
> 2) Vapor returned during both fuel loading and vehicle refueling
> 3) Vapor returned only during fuel loading
> 4) Vapor returned only during vehicle refueling
>
> Click on the required selection from the above menu to download the file in Microsoft Excel format.

(3) Select the appropriate conditions for your SS facility, from the above menu then download the Microsoft Excel file to your PC. (The full set of tables, incorporating automatic calculation software for the quantities of each designated chemical substance released, will be downloaded.)

(4) Open the files that you have just downloaded and follow the instructions for the automatic calculation software, entering the quantities loaded and refueled for premium gasoline, regular gasoline and kerosene, for each SS.

(5) Each of the numerical values for the quantities of benzene, toluene, xylene, ethylbenzene and 1,3,5-trimethylbenzene released that are subject to reporting, are automatically calculated and output under the appropriate columns on the reporting form.

Please contact the following organizations if you have any questions or inquiries pertaining to this manual:

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