

Operating Manual

Version 1.0.3

May 30, 2016

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1. Features of the probabilistic exposure evaluation model

This tool (SWEEs: integrated Score-based Workplace Exposure Estimating system) is an advanced exposure evaluation tool which estimates exposure concentration in workplaces. It probabilistically treats the confidence interval of predicted value and dispersion in exposure concentration inside and between workers in order to estimate the exposure concentration distribution. With the probabilistic prediction for exposure concentration, this tool can assist managers with implementing self-management for exposure and render higher cost-effectiveness than do qualitative and deterministic evaluations which make safe estimates.

This tool is made with Advanced REACH Tool (ART), developed in Europe, as the model. The input is exposure-related information, which describes the exposure condition of the worker, such as work type, substance form, steam pressure, and presence/absence of local exhaust ventilation. By inputting exposure-related information, a certain exposure scenario is set, and the corresponding exposure concentration distribution is estimated. Moreover, by inputting limited exposure data particular to individual managers, it is possible to make more accurate predictions of exposure concentration distribution (Figure 1-1).

For the target substance forms, this tool can handle liquids mist or steam. The definitions of mist and steam are as follows.

Substance form	Definition
Liquid mist	Floating fine particles of liquefied steam
Liquid steam	Vaporized liquid

Table 1-1 Classification of substance forms

Unlike the probabilistic exposure evaluation tools based on the conventional numerical model which uses emission amount from the source and air velocity, this tool estimates the exposure concentration based on the exposure-related information of the workplace and the regression equation for exposure concentration. As the modifying factors for the model used in this tool are the ones based on the exposure concentration and exposure-related information in Europe, investigation in workplaces in Japan is not sufficient. Also, it remains to examine and correct the values of the modifying factors and the terminology. For this reason, it is possible that the output results cannot directly be used as actual proof. Organization of exposure data in Japanese workplaces would make a probabilistic exposure evaluation model with better accuracy.



Figure 1-1 Input and output structure of SWEEs

Exposure-related information prepared in advance by the user

- $\boldsymbol{\cdot}$ Work procedure of the worker to be evaluated (labor duration and work duration)
- $\boldsymbol{\cdot}$ Name of substance handled, steam pressure, working temperature
- Map of the workplace and amount of ventilation
- · Measured value of exposure concentration in the workplace (optional)

* This manual is written based on the following references: Fransman et al. (2010), Tielemans et al. (2011), Fransman et al.(2011), and Schinkel et al. (2011).

2. Program environment

2.1. Target OS

This software supports Windows7 and Windows 8.1. We do not provide performance guarantee for use with other OS. Also, the execution of this program requires Microsoft .Net Framework 3.5. Please install it if not yet installed.

2.2. Program start-up method

Start the program following the steps $(1) \cdot (2)$ shown below.

(1) Double-click SWEEs.exe (application) in the "SWEEs Ver.1.0" folder of CD.

🐌 ImageBars	2016/02/03 17:04	ファイル フォル…	
퉬 ImagesTable	2016/02/03 17:04	ファイル フォル	
SWFFs.exe	2016/02/03 18:55	アプリケーション	966 KB
🗟 SWEEs.exe.config	2015/12/18 11:16	XML Configurati	8 KB
🚳 ZedGraph.dll	2007/11/28 17:43	アプリケーショ	300 KB
ZedGraph.xml	2007/11/28 17:43	XML ドキュメント	1,457 KB

Figure 2-1 The folder structure of SWEEs Ver1.0 (with extensions)

%If the extensions are now shown, double-click SWEEs (application).

퉬 ImageBars	2016/02/03 17:04	ファイル フォル…	
ImagesTable	2016/02/03 17:04	ファイル フォル	
SWEEs	2016/02/03 18:55	アプリケーション	966 KB
🚯 SWEEs.exe	2015/12/18 11:16	XML Configurati	8 KB
🗟 ZedGraph.dll	2007/11/28 17:43	アプリケーショ	300 KB
🔮 ZedGraph	2007/11/28 17:43	XML ドキュメント	1,457 KB

Figure 2-2 The folder structure of SWEEs Ver1.0 (without extensions)

(2) Check that the top screen of "SWEEs Ver1.0" starts.



Figure 2-3 Top screen

2.3. Caution

This tool is normally displayed when the Windows screen size is 100 %, and the screen might be broken if the screen size is a different value. If the screen size is not 100 %, change the size to 100 % (below examples shows "small-100%" selected) in Control Panel > Display and start.

	コール パネル項目 🕨 ディスプレ	 イ ・ 4y コントロール パネルの検索 ク
コントロール パネル ホーム 解像度の調整	画面上の文字を読みやすくし これらのいずれかのオプショ 変更できます。一時的に画面	ます ます ンを選択することで、画面上のデキストやその他の項目のサイズを 上の一部のみを拡大するには、拡大鏡ツールを使用します。
ディスプレイの設定の変更 ClearType テキストの調整	◉ 小 - 100% (既定)(S)	プレビュー
カスタム テキスト サイズの設 定 (DPI)	⊚中(M) - 125%	
	◎大(L) - 150%	
関連項目		a
個人設定 デバイスとプリンター		道用(A)

Figure 2-4-1 Display setting (Windows 7)



Figure 2-4-2 Display setting (Windows 8.1)

3. Overall structure of SWEEs



*1: Near field and far field (See Figure 3-1)

Near field (nf): Spatial region within 1 m from the worker's mouth in the vertical, horizontal and depth directions (8 m^3)

Far field (ff): Work space other than the near field

*2: Modifying factors of SWEEs: In SWEEs, the model coefficients are called the "modifying factors".



Figure 3-1 Near field and far field in this tool

4. Detailed description of operating screen

This chapter provides detailed descriptions of all the operating screens of SWEEs.

4.1. Top screen



Figure 4-1 Top screen

ID	Item	Description
1	"Start" button	When clicked, it displays the screen for basic setting.
\bigcirc	"Pood file" button	It displays a file open dialog, use the information in the selected csv file
9	Read me button	to display screen for basic setting.

4.2. Screen for basic setting



Figure 4-2 Screen for basic setting

ID	Item	Description
1	"Name of analysis scenario" text box	Enter the name of analysis scenario. Arbitrary name of analysis scenario can be entered.
2	"Substance name" text box	Enter the substance name. Arbitrary substance name can be entered.
3	"Substance form" radio button	The current version, which selects liquid mist or liquid steam, cannot evaluate solid polish dust or solid dust.
4	"Setting" button for basic information	If clicked after entering name of analysis scenario and substance name and selecting substance form, input for the setting of working condition is enabled.
(5)	"Total work duration" text box	Enter the total work duration in minutes for the entered scenario.
6	"Work duration" text box for each task	Enter the work duration in minutes for tasks 1 - 4. If the modifying factors of near field for task 1 are not entered, entering time in the work duration text boxes 2 - 4 are disabled. Similarly, in order to enter the work duration for the next task, all input values for the previous task must be completed.
7	"Substance dependent (E)" text box	It displays the modifying factor value set in the screen for setting substance dependent (E).
8	"Activity dependent (H)" text box (for near field)	It displays the modifying factor value set in the screen for setting activity dependent (H).
9	"Localized control 1 (LC1)" text box (for near field)	It displays the modifying factor value set in the screen for setting localized control (LC).
10	"Localized control 2 (LC2)" text box (for near field)	If two local exhaust ventilation devices are set, it displays the modifying factor values in accordance with the second device type in the screen for setting localized control (LC).
(11)	"Surface contamination (Su)" text box	It displays the modifying factor value set in the screen for setting surface contamination (Su). The value of this item is common for near and far fields.
(12)	"Dispersion (D)" text box (for near field)	It displays the modifying factor value set in the screen for setting dispersion (D).
13	"Activity dependent (H)" text box (for far field)	It displays the value of the modifying factor set in the screen for setting activity dependent (H).
(14)	"Localized control 1 (LC1)" text box (for far field)	It displays the modifying factor value set in the screen for setting localized control (LC).
15	"Localized control 2 (LC2)" text box (for far field)	If two local exhaust ventilation devices are set, it displays the modifying factor values in accordance with the second device type in the screen for setting localized control (LC).
(16)	"source segregation (Seg)" text box (for far field)	It displays the value of the modifying factor set in the screen for setting source segregation (Seg).
17	"individual separation (Sep)" text box (for far field)	It displays the value of the modifying factor set in the screen for setting individual separation (Seg).
(18)	"Dispersion (D)" text box (for far field)	It displays the modifying factor value set in the screen for setting dispersion (D).
19	"Setting" button for modifying factors (for near field)	When clicked, it switches to the screen for setting the modifying factors for near field. For near field, it displays the screen for setting substance dependent (E). In order to enter values for the next task, all input values for the previous task must be completed. Similarly, if the task 2 (3) is not completely set, clicking the setting button is disabled for task 3 (4).
20	"Setting" button for modifying factors (for far field)	When clicked, it switches to the screen for setting the modifying factors for far field. For far field, it is set when there is a large source outside the 8 m ³ region around the worker's mouth. For far field, it displays the screen for setting activity dependent (H). If the modifying factors of near field for the same task are not set, clicking the setting button for far field is disabled. If the setting button is selectable, hovering the cursor over the button leads to a comment around the button, stating "For far field, it is set when there is a large source outside the 8 m ³ region around the worker's mouth."
21)	"Return" button	Clicking this button makes the system return to the top screen.
22	Status display	It displays the condition of the current setting. It highlights each status.
23	"Calculation" button	Ine system makes calculations based on the set modifying factors and displays the screen for estimation result.

*About modifying factors

Table 4-1 shows the characteristics and reasons for the assignment of the modifying factors in SWEEs.

Modifying factor	Abbreviation	Symbol	Information source	Characteristics (3-pattern
Substance emission potential (Substance emission	Substance dependent	E	"First principles" with respect to physiochemical properties	A. Takes a value common for near and far fields
potential) Activity emission potential (Activity emission potential)	Activity dependent	Н	Exposure data from calibration database, literature data, expert	B. Takes a value different for near and far fields
Localized control (Localized control)	Localized control	LC	ECEL database [*] and expert elicitation workshop	B. Takes a value different for near and far fields
Source Segregation (Segregation)	Segregation	Seg	ECEL database [*] , expert judgment	C. Factor only for far field
Individual Separation (Separation)	Separation	Sep	ECEL database [*] , expert judgments	C. Factor only for far field
Surface contamination (Surface contamination)	Surface contamination	Su	Expert judgment	A. Common for near and far fields
Dispersion (Dispersion)	Dispersion	D	Simulation with two-component box model	B. Different for near and far fields

Table 4-1 characteristics and reasons for the assignment of the modifying factors

* Exposure Control Efficacy Library (ECEL) database is an evidence database with collection of efficacy of management strategies for inhalation exposure. The database contains the efficacy evaluations for management strategy for exposure based on 433 pieces of data extracted from 90 reviewed papers from the four important academic journals in occupational health (Annals of Occupational Hygiene, American Industrial Hygiene Association Journal, Applied Occupational and Environmental Hygiene, and Journal of Occupational and Environmental Hygiene) (Fransman et al. 2008).

Source: Fransman et al. 2010. Added "Characteristics" column to the table.

4.3. Screen for setting substance dependent (E)

- □ SWEEs - [物質依存(E)の設定画面] - □	×
計算条件 物質名: toluene 物質形態: 液体ミスト 設定領域: 近接場 非近接場	
2 温度補正をしない場合 蒸気圧: 3 5 混合溶媒濃度予測 モル分率: 6 活量係数: 7	
8 温度補正をする場合 蒸気圧! 9 Pa 温度補正後の蒸気圧! 13 蒸気圧測定時の温度: 10 K 物質依存(E)の値: 14 沸点: 12 K	
モル分率: 16 済量係数: 17	
第二条数 第三条数 第三条数 第三条数 第三条数 第三条数 第三条数 第二条数 第二条 第二条 第二条数 第二条 第二条数 第二条数 第二条数 第二条数 第二条数 第二条 <	

Figure 4-3 Screen for setting substance dependent (E)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
\bigcirc	"Without temperature correction"	Check when not making the temperature correction for steam pressure.
	radio button	If this button is checked, inputting to ③ Steam pressure becomes enabled.
3	"Steam pressure" text box	Enter the value for steam pressure.
4	"Substance dependent (E) value"	When clicking (2) Calculation button, it calculates the value of substance
\odot	text box	dependent from ③ Steam pressure and displays the value.
"Mixed solvent concentration		With (2) "Without temperature correction" button checked, clicking this
(5)	estimate" check box	check box leads to a calculation of the substance dependent (E) based on
		molar fraction and activity coefficient.
(6)	"Molar fraction" text box	For calculating the substance dependent (E) with mixed solvent, enter the
		molar fraction.
$\overline{\mathcal{T}}$	"Activity coefficient" text hox	For calculating the substance dependent (E) with mixed solvent, enter the
\odot	Theory by coefficient beat box	activity coefficient.
		Check when making the temperature correction for steam pressure.
	"With temperature correction" radio button	If this button is checked, inputting to ⁽⁶⁾ Steam pressure, ⁽⁷⁾ Temperature
		during steam pressure measurement, (3) Boiling point, and (9) Workplace
8		temperature becomes enabled.
		After entering these values, clicking $\textcircled{12}$ Calculation button leads to
		displaying calculated results to 10 Steam pressure after temperature
		correction and (1) Substance dependent (E) value

-		
9	"Steam pressure" text box	Enter the value for steam pressure.
10	"Temperature during steam pressure measurement" text box	Enter the temperature during steam pressure measurement.
(11)	"Boiling point" text box	Enter the boiling point of the target substance.
(12)	"Temperature in workplace" text box	Enter the temperature in workplace.
(13)	"Steam pressure after temperature correction" text box	When clicking (12) Calculation button, it calculates steam pressure after temperature correction and displays it.
(14)	"Substance dependent (E) value" text box	When clicking (12) Calculation button, it calculates the value of substance dependent (E) based on temperature correction and displays the value.
(15)	"Mixed solvent concentration estimate" check box	With (3) "With temperature correction" button checked, clicking this check box leads to a calculation of the substance dependent (E) based on molar fraction and activity coefficient.
<u>(16</u>)	"Molar fraction" text box	For calculating the substance dependent (E) with mixed solvent, enter the molar fraction.
17	"Activity coefficient" text box	For calculating the substance dependent (E) with mixed solvent, enter the activity coefficient.
(18)	"Calculation" button	It calculates the substance dependent (E). With (2) "Without temperature correction" button checked, it calculates the substance dependent (E) based on the (3) Steam pressure. The calculation result is displayed in (4) Substance dependent (E) value. With (5) "With temperature correction" button checked, it calculates the steam pressure after temperature correction and the substance dependent (E) based on the values of -(6) Steam pressure, (7) Temperature during steam pressure measurement, (8) Boiling point, and (9) Temperature in workplace. The calculation results are displayed in (10) Steam pressure after temperature correction and (11) Substance dependent (E) value.
\sim		
(19)	"Return" button	Returns to the screen for basic setting.
(19) (20)	"Return" button Status display	Returns to the screen for basic setting. The current setting condition is displayed in the status bar. Near field is displayed in blue.

*Method for calculating the substance dependent (E)

The substance dependent (E: Substance dependent emission potential) is calculated from the substance's steam pressure P[Pa] (see below equation). Here, E=1 for p>30,000 [Pa] and $E=3.33\times10^{-4}$ for P<10[Pa].

$$E_i = \frac{p_i}{30,000}$$

In the case of toluene, for example, the steam pressure at 20°C is 2,930 Pa (=22 mmHg). Using the above equation, the substance dependent (E) is calculated as (E)=2,930/30,000=0.0977.

This indicates that the worker's exposure concentration is 0.0977 times lower than that in the case of handling substance with steam pressure of 30,000 [Pa].

Also, in the case of a mixture, the steam pressure of substance i in the mixture, $P_{i,mix}$, can be calculated based on the molar fraction χ_i and the activity coefficient γ_i . The activity coefficient of the substance is calculated using the xIUNIFAC^{*1} model (below equation).

$$p_{i,mix} = \gamma_i \times \chi_i \times p_i$$

In the case of a mixture, the substance dependent emission potential (E_i) can be calculated by the below equation.

$$E_i = \frac{p_{i,mix}}{30,000}$$

※1. Reference for the xIUNIFAC model

Randhol, P. and Engelien H.K. (2000) xlUNIFAC, a Computer Program for Calculation of Liquid Activity Coefficients Using the UNIFAC Model.

About temperature correction for steam pressure

When the substance's steam pressure during work is not known, the substance's steam pressure P_i (*T*) at temperature T is calculated by the Clausius-Clapeyron equation.

$$p_i(T) = p_i \cdot \exp\left\{-\frac{\angle H_v}{R}\left(\frac{1}{T_p} - \frac{1}{T}\right)\right\}$$

Here, P_i : Steam pressure of substance i at temperature T_p

R: Gas constant 8.314[J/K · mol]

 ΔH_v : Enthalpy of vaporization

$$riangle H_v = R \cdot \ln \frac{p_2}{101325} \frac{1}{\left(\frac{1}{T_2} - \frac{1}{T_R}\right)}$$

Here, P_2 : Steam pressure at temperature T_2 T_B : Boiling point of substance i

4.4. Screen for setting liquid mist for activity dependent (H)

4.4.1. Spraying liquid



Figure 4-4 Screen for setting liquid mist for activity dependent (H)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Work type" radio button	Select the applicable work type from the available work types. When selecting "Spraying liquid", the "Screen for work subtype" is displayed as shown in Figure 4-4.
3	Work subtype "Surface spraying" radio button	Select this for the work subtype of "Surface spraying".
4	Work subtype "Space spraying" radio button	Select this for the work subtype of "Space spraying".
5	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The ranges of input values are as follows. Spray speed User input : $0.1 \sim 3$ Spray direction User input : $0.3 \sim 3$ Spray technique User input : $1 \sim 3$ Spray region User input : $1 \sim 10$
6	"Score setting" radio button	This is selectable if (3) is selected. The modifying factor for activity dependent (H) is the product of the scores corresponding to the selectable parts.
7	"Score setting" radio button	This is selectable if $\textcircled{4}$ is selected. The modifying factor for activity dependent (H) is the score corresponding to the selectable part.

8	"Return" button	The modifying factor for activity dependent (H) is not set, and the system returns to the screen for setting substance dependent (E).
9	"Next" button	The modifying factor for activity dependent (H) is set, and the system moves on to the screen for setting localized control (LC).

4.4.2. Handling with open surface or reservoir



Figure 4-5 Screen for setting liquid mist for activity dependent (H)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Work type" radio button	Select the applicable work type from the available work types. When selecting "Handling with open surface or reservoir", the "Screen for work subtype" is displayed as shown in Figure 4-5.
3	Work subtype "Without stirring" radio button	Select this for the work subtype of "Without stirring".
4	Work subtype "With stirring" radio button	Select this for the work subtype of "With stirring".
5	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The ranges of input values are as follows. Without stirring Open area User input: 0.001-0.3 With stirring Open area User input: 0.001-0.3

6	"Qaana aattin a" na dia haattaa	This is selectable if ③ is selected. The modifying factor for activity dependent	
	Score setting radio button	(H) is the corresponding score.	
	"Coore cotting" radio button	This is selectable if ④ is selected. The modifying factor for activity dependent	
\bigcirc	Score setting radio button	(H) is the corresponding score.	
	"Return" button	The modifying factor for activity dependent (H) is not set, and the system returns	
8		to the screen for setting substance dependent (E).	
	The modifying factor for activity dependent (H) is set, and the system		
(9)	"Next" button	to the screen for setting localized control (LC).	

4.4.3. Handling solid substance contaminated with evaluated substance



Figure 4-6 Screen for setting liquid mist for activity dependent (H)

ID	Item	Description		
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.		
2	 (2) "Work type" radio button Select the applicable work type from the available work types. When select the applicable work type" radio button (3) "Handling solid substance contaminated by evaluated substance^{*1}", the "Select the applicable work type" is displayed as shown in Figure 4-6. 			
3	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The ranges of input values are as follows. Contamination area User input: $0.001 \sim 0.3$ Contamination rate User input: $0.1 \sim 1$		
4	"Score setting" radio button	Select one that applies. The modifying factor for activity dependent (H) is the product of the scores for (3) Contamination area ^{*2} and (4) Contamination rate ^{*3} .		

5	"Score setting" radio button	Select one that applies. The modifying factor for activity dependent (H) is the product of the secret for (2) Contamination area^{*2} and (4) Contamination rate^{*3}
		product of the scores for (5) containination area and (7) containination rate .
(6)	"Return" button	The modifying factor for activity dependent (H) is not set, and the system
۲		returns to the screen for setting substance dependent (E).
7	(7) "Next" button The modifying factor for activity dependent (H) is set, and the to the screen for setting localized control (LC).	The modifying factor for activity dependent (H) is set, and the system moves on
		to the screen for setting localized control (LC).

(Note on table)*1: Evaluated substance: the substance selected in the conditions for calculation and evaluated by SWEEs. In this example, it is toluene.

*2: Contamination area: Surface area of the solid substance

*3: Contamination rate: Rate of the evaluated substance attached to the surface of the solid substance.

4.4.4. Application of liquid product

•	_		SWEEs - [活	動依存(H)の液体	ミスト設定画面]			×
Ē 11	計算条件 1 物質名:toluene 物質形態:液体ミスト 設定領域:近接場 非近接場 作業分類 2 ②液体の調整 開放表面・液溜めでの処理 評価物質に汚染された ●液体製品の塗布 一 超高速での液体使用							
	作業分類	作業の サブ分類	作業の例	ħ	テゴリー変数	7 ב ג	選択	
	液体製品の 塗布	表面への塗布	ローラーや ブラシを使った 屋根・壁の 塗装、 ラミネート	塗布速度 [m*3/h]	x ≧ 3 1 ≦ x < 3 0.3 ≦ x < 1 0.1 ≦ x < 0.3 x < 0.1 ユーザー入力	0.1 0.1 0.01 0.001 3	O O O O O	4
	戻る 5) 修正係表 E	ጷ ≰ ≰ ¥ ¥ ¥ ¥ ¥ ¥ ¥ ¥ ¥ ¥ ¥ ¥ ¥	▶ 修正係数 LC _{rr}	多正係数 Su 修正係数 D _{rf}		*~ 6)

Figure 4-7 Screen for setting liquid mist for activity dependent (H)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Work type" radio button	Select the applicable work type from the available work types. When selecting "Application of liquid product", the "Screen for work subtype" is displayed as shown in Figure 4-7.
3	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The ranges of input values are as follows. Application speed User input $: 0.001 \sim 0.3$

(4)	"Score setting" radio button	Select one that applies. The modifying factor for activity dependent (H) is the	
\bigcirc		score corresponding to the selected item.	
	"Return" button	The modifying factor for activity dependent (H) is not set, and the system	
9		returns to the screen for setting substance dependent (E).	
0	"Next" button	The modifying factor for activity dependent (H) is set, and the system moves	
6		on to the screen for setting localized control (LC).	

4.4.5. Ultrafast liquid use

		SWEEs - [活	動依存(H)の液体	ミスト設定画面]		×
計算条件 1 物質名: toluene 物質系態: 液体ミスト 設定領域: 近接場 非近接場 作業分類 2 ○ 液体の噴霧 ○ 開放表面・液溜めでの処理 ○ 評価物質に汚染された ○ 液体製品の塗布 ● 超高速での液体使用						
作業分割	頃 作業の サブ分類	作業の制	ħ	テゴリー変数	スコア 選択	
招立法了	- 接续装架	全尾加丁造の	投 拝の速さ	高速 低速 ユーザー入力 (3		-4
液体使	などの使用	取り扱い	外気との 接触程度	高い (オーブンブロセス) ぎい (空気との接触が少ない) ユーザー入力 (3)		5
戻る		数 修正係数 H _{nf}	修正係数 LC _{nf}	修正係数 Su D _{rf}	次へ 7	

Figure 4-8 Screen for setting liquid mist for activity dependent (H)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
		Select the applicable work type from the available work types. When selecting
2	"Work type" radio button	"Ultrafast liquid use", the "Screen for work subtype" is displayed as shown in
		Figure 4-8.
	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box.
\bigcirc		The ranges of input values are as follows.
9		Stirring speed User input: $1 \sim 3$
		Degree of contact with air User input $: 0.3 \sim 1$
		Select one that applies. The modifying factor for activity dependent (H) is the
4	"Score setting" radio button	product of the scores corresponding to (3)Stirring speed* and (4) Degree of
		contact with air.

5	"Score setting" radio button	Select one that applies. The modifying factor for activity dependent (H) is the product of the scores corresponding to ③Stirring speed [*] and ④ Degree of contact with air.
6	"Return" button	The modifying factor for activity dependent (H) is not set, and the system returns to the screen for setting substance dependent (E).
7	"Next" button	The modifying factor for activity dependent (H) is set, and the system moves on to the screen for setting localized control (LC).

(Note on table)* Stirring speed: Stirring speed of the stirring device.

4.5. Screen for setting liquid steam for activity dependent (H)

4.5.1. Spraying liquid



Figure 4-9 Screen for setting liquid steam for activity dependent (H)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Work type" radio button	Select the applicable work type from the available work types. When selecting "Spraying liquid", the "Screen for work subtype" is displayed as shown in Figure 4-9.
3	Work subtype "Surface spraying" radio button	Select this for the work subtype of "Surface spraying".
4	Work subtype "Space spraying" radio button	Select this for the work subtype of "Space spraying".
5	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The ranges of input values are as follows. Spray speed User input : $0.1 \sim 3$ Spray direction User input : $0.3 \sim 3$ Spray technique User input : $1 \sim 3$ Spray region User input : $1 \sim 10$
6	"Score setting" radio button	This is selectable if (3) is selected. The modifying factor for activity dependent (H) is the product of the scores corresponding to the selectable parts.
7	"Score setting" radio button	This is selectable if $\textcircled{4}$ is selected. The modifying factor for activity dependent (H) is the score corresponding to the selectable part.

8	"Return" button	The modifying factor for activity dependent (H) is not set, and the system returns to the screen for setting substance dependent (E).
9	"Next" button	The modifying factor for activity dependent (H) is set, and the system moves on to the screen for setting localized control (LC).

4.5.2. Handling with open surface or reservoir



Figure 4-10 Screen for setting liquid steam for activity dependent (H)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Work type" radio button	Select the applicable work type from the available work types. When selecting "Handling with open surface or reservoir", the "Screen for work subtype" is displayed as shown in Figure 4-10.
3	Work subtype "No affected substance" radio button	Select this for the work subtype of "No affected substance".
4	Work subtype "Stirring surface" radio button	Select this for the work subtype of "Stirring surface".
5	"User input" text box	If the user wishes to enter a score value, the user enters in this text box. The ranges of input values are as follows. Without stirring Open area User input: 0.001~0.03 With stirring Open area User input: 0.003~1
6	"Score setting" radio button	This is selectable if (3) is selected. The modifying factor for activity dependent

		(H) is the corresponding score.
7	"O	This is selectable if (4) is selected. The modifying factor for activity dependent
	Score setting radio button	(H) is the corresponding score.
8	"D / " 1 //	The modifying factor for activity dependent (H) is not set, and the system returns
	"Return" button	to the screen for setting substance dependent (E).
	«NT 1221 11	The modifying factor for activity dependent (H) is set, and the system moves on
G	Next button	to the screen for setting localized control (LC).

4.5.3. Handling solid substance contaminated with evaluated substance



Figure 4-11 Screen for setting liquid steam for activity dependent (H)

ID	Item	Description
	"Conditions for	It displays the conditions for calculation set in the senser for basic setting
U	calculation"	It displays the conditions for calculation set in the screen for basic setting.
2		Select the applicable work type from the available work types. When selecting
	"Work type" radio button	"Handling of solid contaminated by evaluated substance", the "Screen for work
		subtype" is displayed as shown in Figure 4-11.
		If the user wishes to enter a score value, the user enters it in this text box.
\bigcirc	"User input" text box	The ranges of input values are as follows.
3		Contamination area User input: $0.003 \sim 1$
		Contamination rate User input: $0.1 \sim 1$

4	"Score	setting"	radio	Select one that applies. The modifying factor for activity dependent (H) is the
	button			product of the scores corresponding to (3) and (4) .
Ē	"Score	setting"	radio	Select one that applies. The modifying factor for activity dependent (H) is the
5	button			product of the scores corresponding to (3) and (4) .
	"Return" button			The modifying factor for activity dependent (H) is not set, and the system returns
6				to the screen for setting substance dependent (E).
7	"NT (2) 1			The modifying factor for activity dependent (H) is set, and the system moves on to
	"Next" button			the screen for setting localized control (LC).

4.5.4. Application of liquid product

••	\sim		SWEEs - [活	動依存(H)の液体	蒸気設定画面]		- • ×
計算条件 物質名 物質定領 設定領 作業分類	計算条件 1 物質名: toluene 物質形態: 液体蒸気 設定領域: 近接場 非近接場 作業分類 2 ③液体の喧嚣 開放表面・液溜めでの処理 評価物質に汚染された ● 液体製品の塗布 ● 超高速での液体使用						
ff=	業分類	作素の サブ分類	作業の例	b :	テゴリー変致	762	選択
液体	観品の塗 布	表面への塗布	ローラーや ブラシを使った 屋根・聖の 塗装、ト ラミネート	塗布速度 [m ⁺ 2/h]	x ≧ 3 1 ≦ x < 3 0.3 ≦ x < 1 0.1 ≦ x < 0.3 x < 0.1 ユーザー入力	0.3 0.1 0.03 0.01 0.003 3	
5	ĘĞ		修正係数 H _{ref}	▶ 修正係数 LC _{rr}	多正係数 Su 修正係数	6,	kγ.

Figure 4-12 Screen for setting liquid steam for activity dependent (H)

ID	Item	Description		
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.		
2		Select the applicable work type from the available work types. When selecting		
	"Work type" radio button	"Application of liquid product", the "Screen for work subtype" is displayed as		
		shown in Figure 4-12.		
		If the user wishes to enter a score value, the user enters it in this text box.		
3	"User input" text box	The range of input value is as follows.		
		Application speed User input $: 0.001 \sim 0.3$		
4	"O anno anttina" na dia haattaa	Select one that applies. The modifying factor for activity dependent (H) is the score		
	Score setting radio button	corresponding to the selected item.		

5	"Return" button	The modifying factor for activity dependent (H) is not set, and the system returns to the screen for setting substance dependent (E).
6	"Next" button	The modifying factor for activity dependent (H) is set, and the system moves on to the screen for setting localized control (LC).

4.5.5. Ultrafast liquid use

-			SWEEs - [活	動依存(H)の液体	蒸気設定画面]	- "	×
計	計算条件 1 物質名: toluene 物質形態: 液体蒸気 設定領域: 近後場 非近接場 作業分類 2 ○液体の噴霧 開放表面・液溜めでの処理 評価物質に汚染された 液体製品の塗布 ● 超高速での液体使用						
	作素分類	作業の サブ分類	作業の例	ħ	テゴリー変数	スコア 選択	
	語高速での	推排装置	金属加丁達の	批拝の速さ	高速	3 1 3 0	4
	液体使用	などの使用	玉 展創 上 波 切 取り扱い	外気との 接触程度	高い (オーブンブロセス) ぎい (空気との接触が少ない) ユーザー入力		5
	夏る	修止係到 E	× NS止係数 H _{nf}		Su D _{nf}	• w~	

Figure 4-13 Screen for setting liquid steam for activity dependent (H)

ID	Item	Description
1	1) "Conditions for calculation" It displays the conditions for calculation set in the screen for basic setting	
 (2) "Work type" radio button Select the applicable work type from the available work to "Ultrafast liquid use", the "Screen for work subtype" is d Figure 4-13. 		Select the applicable work type from the available work types. When selecting "Ultrafast liquid use", the "Screen for work subtype" is displayed as shown in Figure 4-13.
3	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The ranges of input values are as follows. Stirring speed User input: $1 \sim 3$ Degree of contact with air User input : $0.3 \sim 1$
4	"Score setting" radio button	Select one that applies. The modifying factor for activity dependent (H) is the product of the scores corresponding to (3) and (4) .
5	5 "Score setting" radio button	Select one that applies. The modifying factor for activity dependent (H) is the product of the scores corresponding to (3) and (4) .

6	"Return" button	The modifying factor for activity dependent (H) is not set, and the system
\odot		returns to the screen for setting substance dependent (E).
$\overline{7}$	"Next" button	The modifying factor for activity dependent (H) is set, and the system moves on
\bigcirc		to the screen for setting localized control (LC).

4.6. Screen for setting localized control (LC)



Figure 4-14 Screen for setting localized control (LC)

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Default is
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oves on to

(Note on table) Refer to Table 5-1(p.44) for classification of localized control.

4.7. Screen for setting surface contamination (Su) (for near field)



Figure 4-15 Screen for setting surface contamination (Su)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"User input" text box	If the user wishes to enter a score value, the user enters it in this text box. The range of input value is as follows. User input: $0\sim0.01$
3	"Score setting" radio button	Select one that applies. The modifying factor for surface contamination (Su) is the score corresponding to the selected item. The default is set without surface contamination.
4	"Return" button	The modifying factor for surface contamination (Su) is not set, and the system returns to the screen for setting localized control (LC).
5	"Next" button	The modifying factor for surface contamination (Su) is set, and the system moves on to the screen for setting dispersion (D).

4.8. Screen for setting dispersion (D)

To the modifying factor (Dnf) related to dispersion in near field, the score corresponding to short-time exposure is assigned if the work duration of the task is 60 minutes or below, and long-time exposure if the work duration is longer than 60 minutes. For this reason, screen with different score is displayed depending on the work duration entered in the basic setting.

計算条件 物質名:toluene 物質形態:液体蒸気 設定領域:近接場	SWEEs タスク1 作 タスク2 作 タスク3 作 タスク4 作	- [分散(D)の 業時間: 11分 業時間: - 業時間: - 業時間: -	設定画面]		-		
分散(D)の設定			1時間 8	ちたりの換気回動	x [ACH] 2		
		0.30	0 10	@ 3 D	0 100	300	
	0 30	7.9	6.7	4_ 9	2_6	1_6	
	0 100	3_ 3	3	2_ 1	1.5	1_ 1	
作業場の体積 [m^3]	() 300	1_8	1_6	1.4	1.1	1	
3	0 1000	1.2	1_ 2	1.1	1	1	
	0 3000	1	1	1	1	1	
(4) 戻る 修正係数 E 修正係数 H _{rf} 修正係数 LO _{rf} 修正係数 Su 修正係数 D _{rf} 5							

4.8.1. If the work duration is 60 minutes or below

Figure 4-16 Screen for setting dispersion (D) (If the work duration is 60 minutes or below)

ID	Item	Description			
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.			
2	"Number of ventilations per hour [ACH]" radio button	Select the number of ventilations per hour. The column of the selected radio button is displayed in blue. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects (1.4 in the above figure) The default is 3 times.			
3	"Volume of workplace [m^3]" radio button	Select the value that is closest to the volume of workplace. The row of the selected radio button is displayed in blue. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects. The default is 300m ³ .			
4	"Return" button	The modifying factor for dispersion (D) is not set, and the system moves on to the screen for setting surface contamination (Su).			
5	"Set" button	The modifying factor for dispersion (D) is set, and the system moves to the screen for basic setting.			

4.8.2. If the work duration is more than 60 minutes

\sim		SWEEs	- [<mark>分散(</mark> D)の	設定画面]		
計算条件 (1) 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非近接場		タスク1 作 タスク2 作 タスク3 作 タスク4 作 タスク4 作	業時間: 61分 業時間: - 業時間: - 業時間: -			
-分散(D)の設定						
			1時間る	5 たりの換気回惑	t [ACH] 2	
		0.30	0 10) 3)	O 100	300
	0 30	36	17	7	3	1_6
	0 100	12	6	2.7	1_5	1_ 1
作業堤の体 [■^3]	¥ 🖲 300	4_ 8	2_6	1_6	1.1	1
3	0 1000	2_ 1	1_5	1. 1	1	1
	3000	1_ 3	1. 1	1	1	1
④ 戻る 修正係数 修正係数 修正係数 修正係数 修正係数 修正係数 し の ● 戻る ● 株式 ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●						

Figure 4-17 Screen for setting the dispersion (D) (If the work duration is more than 60 minutes)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Number of ventilations per hour [ACH]" radio button	Select the number of ventilations per hour. The column of the selected radio button is displayed in blue. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects (36 in the above figure) The default is 3 times
3	"Volume of workplace [m^3]" radio button	Select the value that is closest to the volume of workplace. The row of the selected radio button is displayed in blue. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects. The default is 300m ³ .
4	"Return" button	The modifying factor for dispersion (D) is not set, and the system returns on to the screen for setting the surface contamination (Su).
5	"Set" button	The modifying factor for dispersion (D) is set, and the system moves to the screen for basic setting.

4.9. Screen for setting segregation (Seg) (for far field)



Figure 4-18 Screen for setting segregation (Seg)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
	"I loop input" tout hou	If the user wishes to enter the score value, the user enters in this text box.
2	Oser input text box	User input: $0.1 \sim 1$
3	"Score setting" radio	Select one that applies. The selected score is the modifying factor for segregation (Seg).
	button	Default is set to "No localized controls".
	"Determe" heatter	The modifying factor for segregation (Seg) is not set, and the system returns to the screen
4	Return button	for setting the localized control (LC).
Ē	"NI+" h++	The modifying factor for segregation (Seg) is set, and the system moves on to the screen for
9	Next button	setting the separation (Sep).

4.10. Screen for setting the separation (Sep) (for far field)



Figure 4-19 Screen for setting the separation (Sep)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"User input" text box	If the user wishes to enter the score value, the user enters in this text box. The range of input value is as follows. Spray speed User input : $0.1 \sim 1$
3	"Score setting" radio	Select one that applies. The selected score is the modifying factor for separation (Sep).
4	"Return" button	The modifying factor for separation (Sep) is not set, and the system returns to the screen for setting segregation (Seg).
5	"Next" button	The modifying factor for separation (Sep) is set, and the system moves on to the screen for setting the dispersion (D).

4.11. Screen for setting the dispersion (D) for far field

To the modifying factor (Dff) related to dispersion in far field, the score corresponding to short exposure is assigned if the work duration of the task is 60 minutes or below, and long exposure if the work duration is longer than 60 minutes. For this reason, screen with different score is displayed depending on the work duration entered in the basic setting.

物質形態:液体蒸気 設定領域:近接場 :	非近接場	タスク2 作 タスク3 作 タスク4 作	業時間: - 業時間: - 業時間: -			
分散(D)の設定 			1時間2	あたりの換気回惑	t [ACH] 2	
		0.30	0 10	3	<u> </u>	300
	0 30	7	5_9	3_9	1_6	0.6
	0 100	2_ 5	2	1_3	0.5	0.2
作業場の体務 [■^3]	. 300	0_9	0.7	0_4	0_2	0.1
(3)	0 1000	0_3	0.2	0_ 1	0 ₋ 05	0_02
	0 3000	0_ 1	0_1	0_04	0_02	0_01

4.11.1. If the work duration is 60 minutes or less

Figure 4-20 Screen for setting the dispersion (D) (If the work duration is 60 minutes or less)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Number of ventilations per hour [ACH]" radio button	Select the number of ventilations per hour. The column of the selected radio button is displayed in green. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects (7 in the above figure) The default is 3 times.
3	"Volume of workplace [m^3]" radio button	Select the value that is closest to the volume of workplace. The row of the selected radio button is displayed in green. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects. The default is 300m ³ .
4	"Return" button	The modifying factor for dispersion (D) is not set, and the system returns on to the screen for setting the separation (Sep).
5	"Set" button	The modifying factor for dispersion (D) is set, and the system moves to the screen for basic setting.
4.11.2. If the work duration is more than 60 minutes

	\sim		SWEEs	- [<mark>分散(</mark> D)の	設定画面]		
計算条件 1 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非近接場			タスク1 作 ダスク2 作 ダスク3 作 ダスク4 作	業時間: 61 分 業時間: - 業時間: - 業時間: -			
-分散(D)の	設定						
				1時間。	もたりの換気回惑	t [ACH] 2	
			0.30) 10	() 3 D	<u> </u>	300
) 30	35	16	6_ 1	1_ 9	0_6
		0 100	12	5	1_ 8	0_6	0_2
作言	作業場の体積 [∎^3]	() 300	3_9	1 <u>.</u> 6	0_6	0.2	0_ 1
	(3)	0 1000	1_ 2	0 ₋ 5	0_2	0_06	0_02
		3000	0_4	0_2	0 ₋ 1	0_02	0_01
④ 戻る 修正係数 Hrr 修正係数 LCrr 修正係数 Seg 修正係数 Drr ⑤ 設定							

Figure 4-21 Screen for setting the dispersion (D) (If the work duration is more than 60 minutes)

ID	Item	Description
1	"Conditions for calculation"	It displays the conditions for calculation set in the screen for basic setting.
2	"Number of ventilations per hour [ACH]" radio button	Select the number of ventilations per hour. The column of the selected radio button is displayed in green. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects (35 in the above figure) The default is 3 times.
3	"Volume of workplace [m^3]" radio button	Select the value that is closest to the volume of workplace. The row of the selected radio button is displayed in green. The modifying factor for dispersion (D) is the value in the cell where the column in (2) and the row in (3) intersects. The default is 300m^3 .
4	"Return" button	The modifying factor for dispersion (D) is not set, and the system returns on to the screen for setting the separation (Sep).
5	"Set" button	The modifying factor for dispersion (D) is set, and the system moves to the screen for basic setting.

4.12. Screen for displaying estimate results



Figure 4-22 Screen for displaying estimate results

ID	Item	Description
1	Basic information	As basic information, it displays the name of analysis scenario, substance name, and substance form. It displays the above information as entered in the screen for basic setting.
2	"Exposure concentration estimate" text box	It displays the exposure concentration estimate calculated based on each modifying factor displayed in the screen for basic setting. This indicates the geometric mean of the prior distribution.
3	"90 % confidence interval" text box	It displays the lower (5 %) and upper (95 %) limits of the 90 % confidence interval of the exposure concentration estimate.
4	"Correct by measurements" check box	Checking this check box enables the input into the observed data. When entering the observed data and clicking ⁽¹⁾ Execute button, the system calculated the corrected values for exposure concentration estimate and geometric standard deviation and display them in ⁽⁵⁾ and ⁽⁶⁾ . Also, if ⁽⁹⁾ "After correction (posterior distribution)" in Estimated distribution section is checked, the graph of posterior distribution is displayed. As observed data, enter the number of observed values, geometric mean [mg/m ³], and geometric standard deviation. Refer to p.60 for geometric mean and geometric standard deviation of observed data.

ID	Item	Description
5	"Corrected exposure concentration estimate (geometric mean)" text box	It displays the geometric mean (geometric standard deviation) of the corrected exposure concentration.
6	"Corrected geometric standard deviation" text box	After checking $\textcircled{4}$ and entering observed data, click $\textcircled{10}$ Execute button, and the corresponding value is displayed.
7	Graph of exposure concentration distribution	It displays the probability distributions before and after the correction. For the display method, selection of probability density distribution or cumulative probability density distribution is available in (8). It is also possible to superimpose the distributions checked in (9). Controls such as expanding and shrinking of the graph are possible by mouse.
8	"Display method" radio button	Select probability density distribution or accumulated probability density distribution. The graph is displayed in the selected form.
9	"Estimated distribution" check box	It displays the graph of the checked distributions (prior distribution, posterior distribution, and/or likelihood function) When changing (a)Display method or (9) Estimated distribution, clicking (10) Execute button will display the corresponding graph.
10	"Execute" button	It executes the graphing display. When clicking ④ and entering the observed data or changing ⑧Display method or ⑨ Estimated distribution, clicking ⑩ Execute button will update the content of the graph.
(11)	"Return" button	Returns to the screen for basic setting.
(12)	"Report" button	The system moves on to the report screen.

4.13. Report screen

This screen enlists the input and output values. Here, modifying factors for near field are in blue, those for far field are in green, and those for both fields are in white. Also, in each display item, when the number of letters are too many and cannot be displayed in the grid, reduced letters which still carry the meaning will be displayed.



Figure 4-23 Report screen

ID	Item	Description
	Basic information	As basic information, it displays the name of analysis scenario, substance name, and
U	basic mormation	substance form. It displays the above information as entered in the screen for basic setting.
\bigcirc	Work conditions	As work conditions, total work duration and work durations of tasks 1- 4 are displayed. It
	work conditions	displays the values as entered in the screen for basic setting.
		It displays the items set in the screen for setting the activity dependent (H). In particular,
		work type, work subtype, category variables, and scores are displayed. If there are inputs to
3	Activity dependent	multiple tasks, the content of each task is displayed.
	(H)	XIn each display item, when the number of letters to be displayed are too many and cannot
		be displayed in the grid, reduced letters which still carry the meaning will be displayed.
		It displays the items set in the screen for setting the substance dependent (E). In particular,
		the following are displayed: presence/absence of steam pressure correction, measured steam
4	Substance dependent	pressure [Pa], temperature during measurement [K], boiling point [K], temperature in
	(E)	workplace [K], steam pressure after correction [Pa], and scores. If there are inputs to multiple
		tasks, the content of each task is displayed.
		It displays the items set in the screen for setting the localized control (LC). In particular,
		category variables and scores are displayed. If there are inputs to multiple tasks, the content
(5)	Localized control (LC)	of each task is displayed. If there are inputs to multiple tasks, the content of each task is
		displayed.
	~ ^	It displays the items set in the screen for setting the surface contamination (Su). In particular,
6	Surface	categories and scores are displayed. If there are inputs to multiple tasks, the content of each
0	contamination (Su)	task is displayed. This item is a modifying factor common for near and far fields.
		It displays the items set in the screen for setting the dispersion (D). In particular, number of
(7)	Dispersion (D)	ventilations [1/h], volume of room [m ³], and scores are displayed. If there are inputs to multiple
0		tasks, the content of each task is displayed.
	Segregation (Seg)	It displays the items set in the screen for setting segregation (Seg). In particular, category
(8)		variables and scores are displayed. If there are inputs to multiple tasks, the content of each
0		task is displayed.
		It displays the items set in the screen for setting the separation (Sep). In particular, category
(9)	Separation (Sep)	variables and scores are displayed. If there are inputs to multiple tasks, the content of each
Ŭ		task is displayed. This is item is only for setting modifying factors for far field.
		It outputs the items on the report screen (excluding graph information) in csy format. This
(10)	"csv output" button	csv file can be loaded by clicking the "Read file" button on the top screen.
		It prints the content of the report screen. When printing, two pages will be printed: one for
(11)	"Print" hutton	the input items and the other for the estimate results * When printing the format needs to
\bigcirc	Time button	he set to A4 landscane
	Exposure	It displays the following values calculated in the display screen for estimate results:
(12)	concentration	information for prior distribution (exposure concentration estimate $[mg/m^3]$ 90 % confidence
9	estimate	interval geometric standard deviation ART score ^{1} and $\ln \alpha^{2}$)
	estimate	If there is input to any of the absorred data item (number of absorred values, geometric mean
		geometric standard deviation) in the display screen for estimate results these values will be
		displayed. If there is no input the values for the number of observed values, sometrie mean
		and geometric standard deviation will be 0
	Correction by	In this scroon, double-clicking of the number of observed values, geometric mean, and
(13)	observed values	geometric standard deviation will display a dialog for sotting the absorved data, anabling the
	observed values	input of each value. After enter the values click the "Set" button, and the values will be
		reflected on the report screen and the system will calculate and display the corrected experime
		concentration estimate and corrected geometric standard deviation and display the posterior
		distribution graph
		answindung graph.

ID	Item	Description
(14)	Corrected exposure concentration estimate (geometric mean)	In the case of entering values for correction by observed values, the system makes a posterior estimation and displays the corrected values for exposure concentration estimate and geometric standard deviation.
15	Corrected geometric standard deviation	In the case of entering values for correction by observed values, the system makes a posterior estimation and displays the corrected values for exposure concentration estimate and geometric standard deviation.
16	Graph	It displays the graph according to (7) estimated distribution and (18) display method. Refer to "%Displayed content of graph" for the content of graph based on selection pattern.
(17)	"Estimated distribution" check box	Select the content to be displayed in the graph. If checking prior distribution, the prior distribution will be displayed. The same applies to posterior distribution and likelihood function. However, selection of prior distribution as well as cumulative probability density distribution in the display method will lead to display of 2-dimensional probabilistic exposure concentration distribution.
18)	"Display method" radio button	Select the graph display method from probability density distribution and cumulative probability density distribution.

(Note on table) *1: ART score: Value correlated to individual exposure concentration This can be obtained by interpreting the exposure-related information in the score basis.

 $\ast 2$: Lna: Intersection of ART score and the mixed effect model which expresses the regression equation for individual exposure concentration.

% Displayed content of graph

(A) Display method: Probability density distribution

- a-1) Estimated distribution: Prior distribution
 - Displays the probability density distribution of prior distribution.
- a-2) Estimated distribution: Prior distribution and posterior distribution
- Displays the probability density distributions of prior and posterior distributions.
- a-3) Estimated distribution: Prior distribution, posterior distribution, and likelihood function Displays the probability density distributions of prior and posterior distributions and
- likelihood function.
- a-4) Estimated distribution: No selection
 - Graphs does not show anything.
- (b) Display method: Cumulative probability density distribution
 - b-1) Estimated distribution: Prior distribution
 - It displays the 2-dimensional probabilistic exposure concentration distribution and its 90 % confidence interval graph for the prior distribution.
 - b-2) Estimated distribution: Prior distribution and posterior distribution

Displays the cumulative probability density distributions of prior and posterior distributions.

b-3) Estimated distribution: Prior distribution, posterior distribution, and likelihood function Displays the cumulative probability density distributions of prior and posterior distributions and likelihood function.

b-4)Estimated distribution: If nothing is selected, the graph does not show anything.







Figure 4-24 Example of graph for Display method: Probability density distribution



Figure 4-25 Example of graph for Display method: Cumulative probability density distribution

4.14. Screen for setting observed data



Figure 4-26 Screen for setting observed data

ID	Item	Description		
1	"Number of observed values" text box	Enter the number of observed values.		
2	"Geometric mean" text box	Enter the geometric mean of the observed data.		
(3) "Geometric standard deviation" text box		Enter the geometric standard deviation of the observed data.		
4	"Cancel" button	The set values are canceled.		
(5) "Set" button		The modified values for the number of observed values, geometric mean, and geometric standard deviation will be set.		

4.15. csv file output

The items to be outputted to csv file are as follows. Also, if there is no value in an item (e.g. Entering values only for task 1 and not for tasks 2 - 4), the output will be "-" (hyphen) for that item. In the output items, if there is no value for observed data and posterior distribution estimate, the output in the csv file will be 0.

Output item:

- Name of analysis scenario
- \cdot Substance name
- $\boldsymbol{\cdot}$ Substance form
- Total work duration
- Work duration
- Substance dependent (E) information
- Activity dependent (H) information
- · Localized control 1 (LC1) information
- Localized control 2 (LC2) information
- Segregation (Seg) information
- Separation (Sep) information
- Surface contamination (Su) information
- Dispersion (D) information

• Prior distribution estimate (estimate concentration, 90 % confidence interval lower limit, 90 % confidence interval upper limit, geometric mean, ART score, and lnα)

· Observed data (geometric mean, geometric standard deviation, number of observed values)

• Posterior distribution (exposure concentration estimate, geometric standard deviation)

The csv file images are shown below. Also, in the below figures the comments on the right after "#" are only for explanation purpose and will not be outputted in the actual csv files.

#Basic setting	# Basic Setting
Analysis scenario, Substance name, Substance form	# Recorded items
Scenario1, toluene, liquid steam	
#Work conditions (work duration) Total work duration, Task 1 duration, Task 2 duration, task 3 duration, Task 4 duration 480, 17, 5, -, -	# work conditions #Recorded items
#Substance dependent (E) substance dependent	# Modifying factor for
Task No, Steam pressure correction, Measured steam pressure [Pa], Temperature during n point [K], Temperature in workplace [K], Steam pressure after correction [Pa], Mixed Activity coefficient, Score	neasurement [K], Boiling solvent, Molar fraction,
1, Absent, 2930, -, -, -, Absent, -, -, 0.097667	
2, Present, 2930, 293, 384, 308, 6069, Absent, -, -, 0.2023	
3, , , , , , , , , , , ,	
4, -, -, -, -, -, -, -, -, -, -	

#Activity dependent (H)	# Modifying factor for					
activity dependent						
Task No. Work type (nf). Work subtype. Category variable 1. Category variable 2. Work type (ff). Work subtype.						
Category variable 1, Category variable 2, Score #Recorded items						
1, Spraying liquid, Surface spraying, Spray speed [L/min], $x \ge 3, 3$, Handling of contaminated solid substance, -,					
Contamination area[m ²], $x \ge 3, 0.3$ # Values related to task 1						
, , Surface spraying, Spray direction, Horizontal or vertical, 1, , -, Co	ntamination rate[%], $x \ge 90, 1$					
, , Surface spraying, Spray technique, High, 3, , -, -, -, -						
2, Handling of contaminated solid substance, -, Contamination area	$[m^2], x \ge 3, 0.3, -, -, -, -$					
	# Values related to task 2					
, , -, Contamination rate[%], x \geq 90, 1, , -, -, -, -						
,, , , , , , , , , , , , , , , , , , , ,						
3, -, -, -, -, -, -, -, -, -	# Values related to task 3					
,, , , , , , , , , , , , , , , , , , , ,						
, , , , , , , , , , , , , , , , , , , ,						
4, -, -, -, -, -, -, -, -, -, -	# Values related to task 4					
, , ¯, ¯, ¯, ¯, ¯, ¯, ¯, ¯, ¯, ¯, ¯, ¯,						
, , , , , , , , , , , , , , , , , , , ,						
#Localized control (LC)	# Modifying factor for localized control					
Task No., LC, Category variable (nf), Score, Category variable (ff), Sc	core # Recorded items					
1, LC1, Other booth-type hood, 0.1, Other booth-type hood, 0.1	# Values related to task 1					
, LC2, No localized controls, 1, No localized controls, 1						
2, LC1, Other booth-type hood, 0.1, -, -	# Values related to task 2					
, LC2, No localized controls, 1, -, -						
3, LU1, -, -, -, -	# Values related to task 3					
, LO2, -, -, -, -						
4, 101, -, -, -, -	# values related to task 4					
, LU2, •, •, •, •						
#Segregation (SEG)	# Modifying factor for segregation					
Task No. Category variable 1. Category variable 2. Score	# Recorded items					
1 No localized controls No localized controls 1	# Values related to task 1					
9	# Values related to task 1 # Values related to task 2					
2, , , , 3	# Values related to task 2					
4	# Values related to task 4					
-, , ,	" varaco related to task r					
#Separation (SEP)	# Modifying factor for separation					
Task No., Category variable 1, Category variable 2, Score						
1, No localized controls, No localized controls, 1	# Values related to task 1					
2, -, -, -	# Values related to task 2					
3, -, -, -	# Values related to task 3					
4, -, -, -	# Values related to task 4					
#Surface contamination (SU) #1	Modifying factor for surface contamination					
Task No., Category, Score						
1, Monitoring once or more per month, Prevention of contaminant le	ak by sampling and periodic cleaning, 0 #					
Values related to task 1						
2, Default (No cleaning habit, No protective clothing, No entire closu	re), 0.01 # Values related to task 2					
3, -, -	# Values related to task 3					
4, -, -	# Values related to task 4					
#Duion distribution estimate	# Pagult of prior distribution actimate					
Fetimate concentration[mg/m^3] 90% confidence interval lower li	mit (5%) 90% confidence interval upper limit					
(95%) geometric standard deviation ART score ln α	init (5707, 5070 confidence interval upper initi					
171 99 34 613 854 61 2 65 0 0044602 10 56						
111.00, 01.010, 001.01, 2.00, 0.0011002, 10.00						
#Observed data	# Observed data					
Geometric mean[mg/m^3], Geometric standard deviation. Number of	f observed values					
255, 2, 10						
#Posterior distribution estimate	# Result of posterior distribution estimate					
Exposure concentration estimate [mg/m^3], Geometric standard dev	viation					
250, 21, 1.2384						

5. Operating Guide for SWEEs

This chapter describes the operating methods of SWEEs.

This part shows the method for estimating the exposure concentration for a worker (defined as worker A) who handles toluene in the work conditions and management method described in the next page.



Figure 5-1 Flow of the entire system

Work example

Work content of worker A who handles toluene

Task 1	Task 2
(Application)	(Drying)

Daily labor duration: 480 minutes (8 hour labor/day)

Volume of workplace: 500 m³

Number of total ventilations: 3 times/hour

 $\langle Work \text{ conditions of task } 1 \rangle$

Work duration: 17 minutes

Work temperature: 20 °C (steam pressure of toluene at 20°C: 2,930 [Pa])

Substance form: liquid (steam)

Work activity: Application by spray, spray speed (3.0 [L/min] or higher), horizontal spray, use of new spraying device.

Presence/absence of localized control and device type: installation of booth-type local exhaust ventilation



Presence/absence of exposure from far field: present (the material in machine drying in task 2 is close by. It is enclosed by a separate booth-type local exhaust ventilation)

Presence/absence of surface contamination: absent

 $\langle Work \text{ conditions of task } 2 \rangle$

Work duration: 5 minutes

Work temperature: 35 °C

Work activity: Drying work (surface area $3m^2$ or more, machine/hand dry of applied material with contamination rate 90% or higher)

Presence/absence of localized control and device type: installation of booth-type local exhaust ventilation

Presence/absence of exposure from far field: absent

Presence/absence of surface contamination: present (no cleaning habit)

5.1. Start the top screen

Start the "top screen" following "2. Method for program installation". Push the "Start" button to move to the screen for basic setting.



Figure 5-2 Top screen

5.2. Make the basic setting

In the screen for basic setting, enter the name of analysis scenario, substance name, substance form, and work duration.

In the basic information section, enter "Scenario1" in name of analysis scenario and "toluene" in substance name.

The items can also be entered in Japanese; for example, " $\because \forall \forall \forall 1$ " and " $\vdash \mu \perp \checkmark$ ".

Select "Liquid steam" for substance form in the "Liquid mist/Liquid steam section".

Push the "Set" button in the top-right corner of the screen.

*Dot not enter comma (",") in for the name of analysis scenario and substance name. If commas are entered, they will be replaced by under bars ("_") before proceeding.

★/書記 認新によりまな・ ○	apprint		物質形態:	
御知之 7 5 4 4 1 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	oluene		○ 液体ミスト ○ 固体	(研磨ダスト 設定
業伊辺で設立				1912 h
#e1/1/1/0/02/AE	タスカ1	47.72	47.73	47.74
総作業時間(分)	作業時間(分)	作業時間(分)	作業時間(分)	作業時間(分)
) 后接根 非) 后接根	近接根 非近接根	近接根 非近接根	治疗症 非治疗症 根
物質依存(E)	ALTER OF ALALIEN	ALIX-0 FALIX-0	ALTER W SPALTERS	ALIX" FRLIX
活動依存(H)				
局所管理1(LC1)				
局所管理2(LC2)				
発生源囲い込み (Seg)				
個人囲い込み(Sep)				
表面滂染(Su)				
分散(ⅅ)				
	設定設定	設定設定	設定設定	設定設定
戻る	基本 33.9 33.9	92.02 92.03 92	(24) 濃度 事後	計算

Figure 5-3 Screen for basic setting: Setting basic information

Here, liquid steam refers to vaporized liquid and liquid mist to floating fine particles of liquefied steam.

Total work duration in "Setting of work conditions" section, work duration of "Task 1", and "Set" button become available. Enter the daily total labor duration "480" minutes in the total work duration and "17" minutes in the work duration of task 1.

•		SWEEs - [基本設定	画面]	- • ×
基本情報 解析シナリオ名: 物質名:	Scenar io1 toluene		 物質形態: ○ 液体ミスト ○ 固(● 液体蒸気 ○ 固(¥研磨ダスト 設定 本ダスト
作業状況の設定				
	タスク1	タスク2	タスク3	タスク4
総作業時間(分) 480	作業時間(分)	作業時間(分)	作業時間(分)	作業時間(分)
物質依存(E)	近接場 非近接場	近接場 非近接場	近接場 非近接場	近接場 非近接場
活動依存(H)				
局所管理1(LC1)				
局所管理2(LC2)				
発生源囲い込み (Seg)				
個人囲い込み(Sej	p)			
表面汚染(Su)				
分散(D)				
	設定	設定設定	設定設定	設定設定
戻る	基本 設定 タスク1 設定	9スゲ2 設定 9スゲ3 92 設定 設定 8	スク4 歳 推定 推定 推定	計算

Figure 5-4 Screen for basic setting: Setting work conditions of task 1

As shown above, the setting of name of analysis scenario, substance name, substance form, and exposure time for task 1 is completed. In case of multiple tasks, complete the setting of modifying factors for task 1 before proceeding to the setting of work conditions of the next task.

- 5.3. Set the modifying factors for task 1
- 5.3.1. Set the modifying factors for near field
 - Next, set the modifying factors for task 1.

Push the "Set" button for near field of task 1.

r . 100.000		311113 - [基本政定	imiter 1	
本 情報 解析シナリオ名: S 物質名: t	cenario1 oluene		 物質形態: ○ 液体ミスト ○ 固体 ○ 液体蒸気 ○ 固体 	◎ 「新磨ダスト 設定
業状況の設定				
	タスク1	タスク2	タスク8	タスク4
総作業時間(分) 480	作業時間(分) 17	作葉時間(分)	作業時間(分)	作業時間(分)
物質依存(E)	近接場 非近接場	近接場 非近接場	近接場 非近接場	近接場 非近接場
活動依存(H)				
局所管理1(LC1)				
局所管理2(LC2)				
発生源囲い込み (Seg)				
個人囲い込み(Sep)				
表面汚染(Su)				
分散(D)				
	股定	設定設定	設定設定	設定設定
戻る	基本 タスク1	92.52 92.53 92	· 24 濃度 事後	計算

Figure 5-5 Screen for basic setting: Setting modifying factors of task 1

Here, near field in SWEEs refers to the spatial region within 1 m from the worker's mouth in the vertical, horizontal and depth directions (8 m^3) and far field (ff) to the space other than the near field.

5.3.1.1. Substance emission potential (E)

Moves on to the screen for setting the substance dependent (E). For task 1 the work temperature is same as the temperature during steam pressure measurement, so there is no need for temperature correction for steam pressure. Thus, select "Without temperature correction" radio button.

Enter substance's steam pressure [Pa].

Here, enter the steam pressure of toluene at 20°C, "2930" [Pa], and push the "Calculate" button. The substance dependent (E) is entered.

• -	SWEEs - [物質依存(E)の設定画面] - 🗆 🗙
 計算条件 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非近接場 	
蒸気圧の設定	
 ● 温度補正をしない場合 蒸気圧: □ 混合溶媒濃度予測 	2330 Pa 物質依存(E)の値:
モル分率:	
活量係数:	
 温度補正をする場合 蒸気圧: 蒸気圧剤定時の温度: 沸点: 作業場の気温: 豊合治線濃度子瓶 モル分率: 済量係数: 	Pa 温度備正後の茲気圧: K 物質体存(E)の値: K K
戻る E	修正係数 H _a 修正係数 LO _a 修正係数 Su 修正係数 D _a 後正係数 次へ

Figure 5-6 Modifying factors: Substance emission potential (E) (Setting steam pressure)

Push "Next" at the bottom of the screen.

物質名:toluene 物質形態:液体蒸気				
設定領職:近接場 非近接場 蒸気圧の設定				
Second of Back				
 温度補正をしない場合 				
蒸気圧:	2930	Pa	物質依存(E)の値:	
□ 混合溶媒濃度予測				
モル分率:				
活量係数:				
○ 温度補正をする場合				
蒸気圧:		Pa	温度補正後の蒸気圧:	
蒸気圧測定時の温度:		К	物質依存(E)の値:	
沸点:		К		
作業場の気温:		К		
□ 混合溶媒濃度予測				
モル分率:				
活量係数:				計算

Figure 5-7 Modifying factors: Substance emission potential (E) (Setting completed)

5.3.1.2. Activity emission potential (H_{nf})

Moves onto the screen for setting Activity emission potential (H_{nf}) (screen for setting the activity dependent (H) of liquid steam).

First, select the category applicable for the work content of task 1 from the following categories: ①"Spraying liquid", ②"Handling with open surface or reservoir", ③"Handling of solid substance contaminated by evaluated substance", ④"Application of liquid product", and ⑤"Ultrafast liquid use". In this example, the work activity of task 1 is "application by spraying", so select "Spraying liquid", and the screen for work subtype corresponding to "Spraying liquid" is displayed.



Figure 5-8 Modifying factors: Activity emission potential (H_{nf}) (selection of work activity)

Next, set the work subtype applicable for the work content of task 1 and category variable. In this example, according to the work content, select "Surface spraying" for work subtype, " \geq 3L/min" for spray speed, "Horizontal or Vertical" for spray direction, and "High" for spray technique.

■ 来=1+ 「質名: toluene 「質形態: 液体」 「定領城: 近接 「 を分類 「液体の噴霧(。 蒅気 湯 非近接場 〇 開放表面・液溜2	めでの処理 〇 評価	物質に汚染された 〇)液体製品の塗布 🔵 超高速	での液体使用	1
作素の)サブ分類	作素の例	ħ	テゴリー変数	スコア	選択
		[x ≧ 3	3	۲
				0.3 ≦ x < 3	1	0
			戦 我 速度 [L/min]	0.03 ≦ x < 0.3	0.3	0
			[2]	x < 0.03	0.1	0
				ユーザー入力		0
· · · · ·		スプレー涂装。		すべての方向	3	
• • • • • • • • • • • • • • • • •	表面への分散	吉虫管理対策		水平または重直方向	1	0
			电波力网	垂直方向のみ	0.3	0
				ユーザー入力		
				高い	3	۲
			(圧縮ガスの	ぎいまたは圧縮なし	1	0
			程度)	ユーザー入力		0
				大きい	10	۲
○ 空間噴雪	気中への分散	吉虫撃除の ■射やスプレー	戦器領域	小さい	1	0
	[ユーザー入力		
○ 空間 戦 義	気中への分散	吉虫駆除の 噴射やスプレー	戰 靈領基	小さい ユーザー入力	1	0

Figure 5-9 Modifying factors: Setting activity emission potential (H_{nf})

As shown above, the activity emission potential (H_{nf}) of near field for task 1 is set.

Push "Next" at the bottom of the screen.

5.3.1.3. Localized control (LC_{nf})

Moves on to the screen for setting the localized control (LCnf).

Select presence/absence of localized control for task 1, and according to the type of local exhaust ventilation, set the localized control (LC_{nf}) in near field.

In this case, there is one booth-type local exhaust ventilation of type other than draft chamber, horizontal/downward laminar flow booth, glove bag, or glove box, so set "Booth-type hood" \rightarrow "Other booth-type hood (0.1)" for LC1, and "No localized controls (1)" for lC2.

和中 名:toluene 形態:液体蒸気	10.44410				
「観歌:江傍場 別 第5日(10)の記(15)	7月1日1日1月1日1日1日1日1日1日1日1日1日1日1日1日1日1日1日1日				
自理(LC)の設定	h = 1	11 - 本 み		1.01	1.02
	10 J = 1	り _{えい} 第五十	1		
	M3	着道注(表生神を)	0.1	ŏ	Ö
発	生抑制技術	ノックダウン式	0.7	ŏ	ŏ
		ぎレベル (封じ込め)	0.1	ŏ	0
	封じ込め	中レベル(封じ込め)	0.01	Õ	0
		高レベル(封じ込め)	0.001	ŏ	Õ
	レシーバー式	キャノビーフード	0.5	0	0
	7 - F	その他のレシーバー式フード	0.2	0	0
	外付け式フード	固定型外付け式フード	0.1	0	0
		携帯型外付け式フード	0.5	0	0
		装着抽出型外付け式フード	0.1	0	0
		ドラフトチャンパー	0.01	0	0
局所排氨		水平層流/下降流型ブース	0.1	0	0
装置		グローブバッグ(換気なし)	0.01	0	0
	ブース式	グローブバッグ(換気又は負圧)	0.001	0	0
	7 - F	飯スペックのグローブボックス	0.001	0	0
		中スペックのグローブボックス	0.0003	0	0
		高スペックのグローブボックス	0.0001	0	0
		その他のブース式フード	0.1	۲	0
	その他のシステム	その他の局所排気装置	0.5	0	0
	素 (四)	は システム	0.2	0	0
1	-#-17	ユーザー入力1		0	0
-	/ ///	ユーザー入力2		0	0
戻る	修正係数 修	正係数 修正係数 修正係数	修正係數		×~

Figure 5-10 Modifying factors: Setting localized control (LCnf)

Also, up to two localized controls can be set. In case of setting two types, select the type of local exhaust ventilation applicable for LC2. Refer to Table 5-1 (p.51) for classification of localized control.

As shown above, the localized control (LCnf) for task 1 is set. Push "Next" at the bottom of the screen.

Type of p	rovision	Description	Item
Control t	echnology	Technology for	Wetting method: Moisturize or apply water before or
		controlling the	during the work to control the solvent.
		generation of organic	Knockdown method: Moisturize or apply water after
		solvent in the room	the work to control the solvent.
		air (other than local	
T		exhaust ventilation)	
Enclosur	е	Seal the emission of	Install a cover on machines, open parts of container to
		the source and	low- modium- and high-loyala
		enclose	low, meanum, and mgn levels.
		(Figure 5-11)	
Local	Receiving	It sucks organic	Canopy hood: A self-standing hood suspended above
exhaust	hood	solvent from the	the source like a canopy. This is used when there is
ventilat		source with constant	vapor flow by thermal buoyancy and contaminant flow
ion		air flow (Figure 5-12)	in a particular direction.
			Other receiving hood: It creates a constant air flow and
			sucks the diffusing organic solvent.
			It takes a form of grinder, circle, or rectangular.
	Capturing	It creates air flow and	Fixed capturing hood: A fixed capturing hood, and
	hood	sucks organic solvent	suction region and ventilation rate depend on the
		(Figure 5-13)	Work.
			with which the worker can offectively collect organic
			solvent
			On-tool extraction capturing hood: A hood in which the
			work device and the hood are integrated.
	Booth-	The source is almost	Draft chamber: This has a sliding door on the booth-
	type hood:	completely enclosed	type opening surface, and the work can insert tools or
		in the hood, and	hands to work.
		organic solvent is	Horizontal/downward laminar flow booth: This makes
		effectively sucked	air flow in either horizontal or downward direction
		(Figure 5-14)	and sucks from the booth wall or ventilation plate
			Clove bag (No wontilation wontilation on nogetive
			pressure). A large plastic has which covers the work
			device.
			Glove box (low-, medium-, and high-spec): Closed
			container designed to allow only hands inside in order
			for work with blocked outside air. The sides of the box
			are directly connected to gloves.
			Other booth-type hood: It surrounds the source, as it
			is normally opened for work. The worker stand on the
			opened surface, inhales clean air from behind, and
	Other	Lecal	Work facing inside.
	Other	Local exhaust	other than the above
	systems	other than the above	
Steam co	llection syste	\mathbf{m}	Collection system which stores gasoline and volatile
			liquid substance as liquids and gas as gaseous
			substance and does not allow them out to the
			environment. The stored substances are reused.

Table	5-1 Categories of localized control



(a)Low level



Figure 5-11 Enclosure system

(c)High level





(b) Other receiving hood (grinder-type)

Figure 5-12 Receiving hood



(a)Fixed capturing hood hood



(b)Movable capturing hood

Figure 5-13 Capturing hood



(c)On-tool extraction capturing



(a)Draft chamber





(b)Horizontal/downward laminar flow booth Figure 5-14 Booth-type hood

5.3.1.4. Surface contamination (Su)

Moves on to the screen for setting the surface contamination (Su). Since there is no surface contamination in this example, select "No surface contamination".

範面涛染(Su)の設定				
	カ テ ゴ リ ー	237	選択	
済録習慣なし、保	護醫なし、全体包囲なし	0_01	0	
→愛的な清鐘習慣		0 ₋ 003	0	
確実な効果が期待 例)疑監曇具を使 メンテナン:	できる済 緑智費 6月した日常の済緑、鉄碱や朝御装置による予勝 ス、防護職の使用	0 ₋ 001	0	
表面汚染なし 月→度以上のモニ: 又は、定期的な済	タリング・サンフリング、 瞬による汚染物質の変 れ防止	0	۰	
ユーザー入力			0	

Figure 5-15 Modifying factors: Setting surface contamination (Su)

As shown above, the modifying factors for surface contamination (Su) are set. Push "Next" at the bottom of the screen.

5.3.1.5. Dispersion (D_{nf})

Moves on to the screen for setting the dispersion (D). To the modifying factor (D_{nf}) , the score corresponding to short exposure is assigned if the work duration of the task is 60 minutes or below, and long exposure if the work duration is longer than 60 minutes. For this reason, screen with different score is displayed depending on the work duration entered in the basic setting.

In this example, the work duration is 17 minutes, so the scores for short-term exposure are displayed. According to the conditions of workplace, enter "3 times" [ACH] for number of ventilations per hour and "300" [m³] for volume of room.

		SWEEs - [分散(D)の設定画面] - □					
計算条件 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非	近接場	タスク1 イ ダスク2 イ ダスク3 イ ダスク4 イ	業時間: 17分 業時間: - 業時間: - 業時間: -				
分散(D)の設定							
			1時間る	5 たりの換気回動	[ACH]		
		0.30	○ 10) 3 2	0 100	○ 30 🖬	
	30	7.9	6.7	4. 9	2.6	1_6	
	O 100	3.3	3	2. 1	1.5	1. 1	
作業堤の体積 [=^3]	. 300	1_ 8	1_6	1.4	1.1	1	
	0 1000	1. 2	1.2	1. 1	1	1	
	0 3000	1	1	1	1	1	
	1]	
戻る	修正係数 E	修正係数 H _{nf}	修正係数 LC _{nf}	修正係数 Su	修正係数 D _{nf}	設定	

Figure 5-16Modifying factors: Setting dispersion (D_{nf})

Push "Set" at the bottom of the screen. As shown above, the inputting of modifying factors of near field for task 1 is completed. Push "Next" at the bottom of the screen.

Moves to the screen for basic setting.

Check that the modifying factors of near field for task 1 are displayed and that the "Set" button is selectable.

metric file 解析シナリオ名: 物質名:	Scenar io1 toluene		物質形態: ○ 液体ミスト ○ 固体 ○ 液体支充 ○ 固体	本研磨ダスト 設定
作業状況の設定				4 / / 5 4
	タスク1	タスク2	タスク8	タスク4
総作業時間(分) 480	作業時間(分) 17	作業時間(分)	作業時間(分)	作業時間(分)
物質依存(E)	近接場 非近接場 0.097667	近接場 非近接場	近接場 非近接場	近接場 非近接場
活動底存(H)	9			
局所管理1(LC1)	0.1			
局所管理2(LC2)	1			
発生源囲い込み (Seg)				
個人囲い込み(Sep)				
表面滂染(Su)	0			
分散(⊅)	1.4			
	設定設定	設定設定	設定 設定	設定設定

Figure 5-17 Checking the modifying factors on the screen for basic setting (task 1, near field)

5.3.2. Set the modifying factors for far field Set the modifying factors of far field for task 1. Push "Set" in the column of far field for task 1.

		SWEEs - [基本設定	[画面]	
基本情報 解析シナリオ名: 物質名:	Scenar io1 tolvene		 物質形態: ○ 液体ミスト ○ 固(● 液体蒸気 ○ 固(本研磨ダスト 設定 本ダスト
作業状況の設定				
	タスク1	タスク2	タスク3	タスク4
総作業時間(分) 480	作業時間(分) 17	作業時間(分)	作業時間(分)	作業時間(分)
	近接場 非近接場	近接場 非近接場	近接場 非近接場	近接場 非近接場
物質依存(E)	0.097667			
活動依存(H)	9			
局所管理1(LC1)	0.1			
局所管理2(LC2)	1			
発生源囲い込み (Seg)				
個人囲い込み(Sep)			
表面滂染(Su)	0			
分散(D)	1.4			
	設定設定	設定設定	設定設定	设定 設定
戻る	基本 没スク1 設定	92.72 92.73 92 92 92 73 92	2.04 演度 事後 推定	計算

Figure 5-18 Screen for basic setting: Setting of far field for task 1

5.3.2.1. Activity emission potential (Hff)

Moves onto the screen for setting liquid steam activity dependent (H). According to the work content of this example, select the same item applicable for the work content of near field for task 2. Since the work activity of near field for task 2 involves drying paints, select "Handling of solid substance contaminated by evaluated substance" from the work activity categories. Also, select " $\geq 3m^2$ " for contamination area and " $\geq 90\%$ " for contamination rate.



Figure 5-19 Modifying factors: Setting activity emission potential (Hff)

Push "Next" at the bottom of the screen.

5.3.2.2. Localized control (LC_{ff})

It displays the screen for setting the localized control (LC). In this example, it is the same local exhaust ventilation as of near field for task 1, so select "Other booth-type hood" for LC1 and "No localized controls" for LC2. Also, up to two localized controls can be set. In case of setting two types, select the type of local exhaust ventilation applicable for LC2. Refer to Table 5-1 (p.13) for classification of localized control.

件 名:toluene					
17.账:液体杂页 通域:近接揭 非:	所接場				
理(10)の設定					
	カテゴ	リー本教	752	LC1	LC2
	対	筆なし	1	0	
		湿潤法(発生地点)	0.1	Ŏ	Ŏ
完全	E抑制技術	ノックダウン式	0.7	Ŏ	Ŏ
		ぎレベル(封じ込め)	0.1	0	0
1	すじ込め	中レベル(封じ込め)	0.01	0	0
		高レベル (封じ込め)	0.001	0	0
	レシーバー式	キャノピーフード	0.5	0	0
[7 – F	その他のレシーパー式フード	0.2	0	0
	外付け式フード	固定型外付け式フード	0.1	0	0
		携帯型外付け式フード	0.5	0	0
		装書抽出型外付け式フード	0.1	0	0
		ドラフトチャンパー	0.01	0	0
局防排気		水平層達/下降達型ブース	0.1	0	0
委直		グローブバッグ(換気なし)	0.01	0	0
	フース式	グローブパッグ(換気又は負圧)	0.001	0	0
) - F	ぎスペックのグローブボックス	0.001	0	
		中スペックのグローブボックス	0.0003	0	0
	ſ		0 0001		
	200001751	ての他のノース式フート	0.1		
	ていたいジステム	てり他の身所挿気装置	0.5	8	
		1-#-1.71	0.2	0	
- L-	- ザー入力		-	-	
		ユーザー人力2		0	
= *	修正係数	正係数 修正係数 修正係数	修正係數	~	Vitro.

Figure 5-20 Modifying factors: Setting localized control (LCff)

Push "Next" at the bottom of the screen.

5.3.2.3. Segregation (Seg)

It displays the screen for setting segregation (Seg). In this example, the source in task 2 enclosed in a booth-type local exhaust ventilation different from that for task 1, and there is entire ventilation. So, select "Partial enclosure of the source" and "ventilation" (0.3).



Figure 5-21 Modifying factors: Setting segregation (Seg)

Push "Next" at the bottom of the screen.

5.3.2.4. Separation (Sep)

Moves to the screen for setting the separation (Sep). In this example, since there is not enclosure that separates the worker from the source, select "No localized controls" (1).

	SWEEs - [個人囲い込み(Sep)の設定	[画面]		
計算条件 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非近	按場			
個人国い込み対策				
	囲い込み	換気の 有無	7 T T	選択
完全な		換気あり	0 <u>.</u> 1	0
個人間い込み	発生源 作業者	換気なし	0_3	0
_ 部分的な		換気あり	0_3	0
個人問い込み	発生源 作業者	換気なし	0.7	0
対策なし		対策なし	1	•
ユーザー入力				0
戻る	修正係数 H _{rr} 修正係数 修正係数 Seg Sep	を 修正係 D _{ff}	数	次^

Figure 5-22 Modifying factors: Setting the separation (Sep)

Next, push "Next" at the bottom of the screen.

5.3.2.5. Dispersion (D_{ff})

Moves on to the screen for setting the dispersion (D).

The modifying factors for dispersion differ for near and far fields. According to the work duration entered in the basic setting, the list of the scores is displayed.

In this example, the work duration is 17 minutes, so the modifying factors for short-term exposure are displayed. According to the work conditions, enter "3 times" [ACH] for number of ventilations per hour and "300" [m³] for volume of room.

	SWEEs - [分散(D)の設定画面] - ' 資条件					
計具条件 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非	近接場	タスク1 作 ダスク2 作 タスク8 作 ダスク4 作	:業時間: 17分 :業時間: - :業時間: - :業時間: -			
分散(D)の設定						
			1時間3	5 たりの換気回動	ţ[ACH]	
		0.30	0 10	3	O 10 0	300
	30	7	5_9	3_9	1.6	0_6
	<u> </u>	2.5	2	1_3	0.5	0_2
作柔堪の体装 [ョ*3]	300	0.9	0_7	0_4	0.2	0 ₋ 1
	0 1000	0.3	0 <u>.</u> 2	0 ₋ 1	0_05	0_02
	0 3000	0_1	0 ₋ 1	0_04	0_02	0_01
戻る	修正係数 H _{ff}	修正係数 LC _{ff}	修正係数 Seg	修正係数 Sep	修正係数 Dff	設定

Figure 5-23 Modifying factors: Setting the dispersion (Dff)

Push "Set" at the bottom of the screen.

As shown above, dispersion $(D_{\rm ff})$ is set, and the inputting of all the modifying factors for task 1 is completed.

Moves to the screen for basic setting. Check that the modifying factors for task 1 are displayed and that the "Set" buttons in the columns of work duration and near field for task 2 are selectable.

5.4. Set the modifying factors for task 2 Enter the modifying factors for task 2. Enter "5" minutes for work duration of task 2.

解析シナリオ名:	Scenar io1				物質形態:	ミスト () 同位	に研磨ガスト	10 m
物質名:	toluene				 液体 	は 二日 二日 二日 二日 二日 二日 二日 二日 二日 二日	ドダスト	832.445
業状況の設定一								
	タスク1		タスク2-		タスク3-		タスク4	
総作業時間(分) 480	作業	寺間(分)	作業	時間(分)	作業	時間(分)	作業	寺間(分)
	近接場	非近接場	近接場	非近接場	近接場	非近接場	近接場	非近接場
物質依存(E)	0.097667							
活動依存(H)	9	0.3						
局所管理1(LC1)	0.1	0.1						
局所管理2(LC2)	1	1						
発生源囲い込み (Seg)		0.3						
個人囲い込み(Sep)	1						
表面污染(Su)	0							
分散(D)	1.4	0.4						
	設定	設定	設定	設定	設定	設定	設定	設定

Figure 5-24 Screen for basic setting: Setting work duration of task 2

Since, there is not exposure from far field in task 2, set the modifying factors of only near field. Push the "Set" button for near field of task 2.

作業状況の設定――								
	タスク1		タスク2		タスク3		タスク4	
総作業時間(分) 480	作業	時間(分)	作業	時間(分)	作業	時間(分)	作業	+間(分)
	近接場	非近接場	近接場	非近接場	近接場	非近接場	近接場	非近接場
物質依存(E)	0.097667							
活動依存(H)	9	0.3						
局所管理1(LC1)	0.1	0.1						
局所管理2(LC2)	1	1						
発生源囲い込み (Seg)		0.3						
個人囲い込み(Sep)		1						
表面滂染(Su)	0							
分散(ⅅ)	1.4	0.4						
	設定	設定	設定	設定	設定	設定	設定	設定

Figure 5-25 Screen for basic setting: Setting modifying factors of task 2

5.4.1. Substance emission potential (E)

Since the work temperature of task 2 is 35 °C, temperature correction of steam pressure is necessary. Select the "With temperature correction" radio button. Enter the following items before pushing "Calculate" button: steam pressure of toluene at 20°C (steam pressure before correction) "2930" [Pa], temperature during steam pressure measurement "293" [K] (20°C), boiling point of toluene "384" [K] (110.6°C), and work temperature "308" [K] (35°C) .The steam pressure after temperature correction and substance dependent (E) is entered.

•	SWEEs - [物質依存(E)の設定画面]	- 🗆 ×
計算条件 物質名:toluene 物質形態:液体蒸気 設定領域;近接場 非近接場		
 な気圧の設定 	Pa 物質体存(E)の値:	
 ・ 温度確正をする場合 菜気圧: 菜気圧測定時の温度: 沸点: 作業場の気温: ・ 仕業場の気温: ・ 日本の分率: 活量係数: 	2930 Pa 温度補正後の蒸気圧: 6069 293 K 394 K 306 K	計算
戻る 修正係数 E	「 修正係数 特正係数 修正係数 しつ _# の の の の の の の の の	**~

Figure 5-26 Modifying factors: Temperature correction of substance emission potential (E)

Push "Next" at the bottom of the screen.

5.4.2. Activity emission potential (H_{nf})

Moves onto the screen for setting liquid steam activity dependent (H).

Since the work activity for task 2 involves drying paints, select "Handling of solid substance contaminated by evaluated substance" from the work activity categories. Also, select " $\geq 3m^2$ " for contamination area and " $\geq 90\%$ " for contamination rate.

	♥ サブ分類	作素の例	ħ	テゴリー変数	232	選択
	ĺ		ĺ	x ≧ 3	0.3	۲
		[1 ≝ x < 3	0.1	0
		評価物質に 汚汚の取売また 道具質の取売また 取売まま面 作う途を動 での活動	汚染面積	0.3 ≣ x < 1	0.03	0
			[=^2]	0.1 ≦ x < 0.3	0.01	0
評価物質に 汚染された 固形物の 国 処理 国	に 評価物質に			x < 0.1	0.003	0
	の 固形物の処理			ユーザー入力		0
				x ≧ 90	1	۲
			汚染率	10 ≦ x < 90	0.3	0
			[*]	x < 10	0.1	0
				ユーザー入力		0

Figure 5-27 Modifying factors: Setting activity emission potential (Hnf)

Push "Next" at the bottom of the screen.

5.4.3. Localized control (LCnf)

Moves on to the screen for setting localized control (LC).

Since a local exhaust ventilation of same type as in task 1 is used, set "Booth-type hood" \rightarrow "Other booth-type hood (0.1)" for LC1 and "No localized controls (1)" for LC2.

Refer to Table 5-1 (p.13) for classification of localized control.

Push "Next" at the bottom of the screen.

5.4.4. Surface contamination (Su)

Moves on to the screen for setting surface contamination.

Since the workplace in this example does not have a cleaning habit, select "No cleaning habit, No protective clothing, No entire closure."

算条件 物質名:toluene 物質形態:溶体菜気			
設定領域:近接場 非近接場			
· 面 涛染(Su)の設定			
カテゴリー	232	選択	
清掃習慣なし、保護醫なし、全体包囲なし	0_01	•	
一 业的 な清 錄 習 微	0 <u>-</u> 003	0	
確実な効果が期待できる済録習慣 ● (別)録絵表具を使用した日常の済録、機械や制錬装置による予防 メンテナンス、防調層の使用	0_001	0	
表面汚染なし 月一歳以上のモニタリング・サンプリング。 又は、定期的な済録による汚染物質の遅れ筋止	0	0	
ユーザー入力		0	
月一波以上のモニタリング・サンプリング、 又は、定期的な済静による汚染物質の溢れ筋止 ユーザー入力] 0	

Figure 5-28 Modifying factors: Setting surface contamination (Su)

Push "Next" at the bottom of the screen.

5.4.5. Dispersion (D)

Moves on to the screen for setting the dispersion (D). Similar to task 1, enter "3 times" [ACH] for number of ventilations per hour and "300" [m³] for volume of room.

		SWEEs	- [分散(D)の	没定画面]		_ 0
·算条件 物質名:toluene 物質形態:液体蒸気 設定領域:近接場 非	近接場	タスク1 作 タスク2 作 タスク8 作 タスク4 作	業時間: 17分 業時間: 5分 業時間: - 業時間: - 業時間: -			
)散(D)の設定						
			1時間3	あたりの換気回動	¥ [ACH]	
		0.30	0 10	3 2	0 10	300
	30	7.9	6.7	4_ 9	2_6	1_6
	<u> </u>	3.3	3	2. 1	1_5	1.1
作業場の体装 [■*3]	300	1.8	1.6	1.4	1. 1	1
	0 1000	1.2	1.2	1. 1	1	1
	0 3000	1	1	1	1	1
戻る	修正係数 E	修正係数 H _{rt}	修正係数 LC _{rf}	修正係数 Su	修正係数 D _{nf}	設定

Figure 5-29 Modifying factors: Setting dispersion (D_{nf})

As shown above, the inputting of all the modifying factors for task 2 is completed. Push "Set" at the bottom of the screen.

Moves to the screen for basic setting.

5.5. Calculate the exposure concentration

This displays the exposure concentration estimate and probability density distributions of exposure concentration. Check that the total work duration, work durations of task 1 and task 2, and the modifying factors are entered in the screen for basic setting, and push the "Calculate" button at the bottom of the screen.

	時間(分) 非近接場
其来(內(U)05%) 女スク1 女スク2 女スク3 女スク4 体育 第40 ロード ロード	時間(分) 非近接場
	時間(分) 非近接場
近接場 非近接場 近接場 非近接場 近接場 非近接場 近接場 非近接場 近接場 近後場 近後場	非近接場
	4FX218/00
局所管理1(LC1) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	
局所管理2(LC2) 1 1 1	
発生源囲い込み (Seg) 0.3	
個人囲い込み(Sep) 1	
表面污染(Su) 0.01	
分散(D) 1.4 0.4 1.4	
192 192 192 192 192 192 192	設定

Figure 5-30 Calculation of exposure concentration

5.6. Display estimate results

Moves to the screen for displaying estimate results. The estimate results are displayed in "Exposure concentration estimate" and "90 % confidence interval". This values refer to, respectively, the geometric mean of exposure concentration for works with same work scenario (same work condition and management methods), and the 90 % confidence interval which indicates the accuracy of the estimate made by SWEEs. This indicates that the exposure concentration at the workplace is in the range of 34-855[mg/m³] with the probability of 90 %.



Figure 5-31 Calculation of exposure concentration

5.6.1. Display prior distribution graph

On the right side of the screen, the probability density distribution graph for exposure concentration estimate is shown in orange curve. This distribution is called the "prior distribution".

基本情報 解析シナリオ名: 物質名:	Scenario1 toluene	5WEES - [推正結果の収示皿曲] 物質形態: 液体蒸気	
 ・催定結果 ・ ・ ・	: 33 [mg/m [*] 3] 513 [mg/m [*] 3] 513 [mg/m [*] 3] 525 525 525 525 525 525 525 52	0.005 0.004 1000 0.001 1000 0.001 0.001 0.000 0.001 0.001 0.000 0.001 0.000 0.001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00	1200
戻る	基本 設定 タスク1 設定	表示方法 推定分布 ● 確率密度分布 ● 補正前(季前分布) ● 環境確率密度分布 ● 補正前(季前分布) ● 構正教(事後分布) ● 未建 ● な史 92.02 ※22.22 ※2.24 ※22 ※2.24 ※22 ※2.24 ※22 ※2.24 ※22 ※2.24	乾行

Figure 5-32 Display of prior distribution

% If the graph's scale does not match the screen, right-click the mouse and select "Set Scale to Default" to adjust.

8	SWEEs - [推定結果の表示画面] - □ ×
基本情報 解新シナリオ名: Scenario1 物質名: tolvene	物質形態: 液体蒸気
推定結果 	● 事前分布 ● ●
戻る 夏を 夏定 夏定	タスク? タスク3 タスク4 温度 車使 レポート 設定 設定 設定 単位 推定 単位

Figure 5-33 Adjusting the graph

5.6.2. Bayes update

This uses the observed values from the workplaces to update the estimates and estimates the geometric mean and probability distribution after the correction.

The probability distribution after the correction is called the "posterior distribution". Selecting the "Correction by observed values" check box enables the selection of the text boxes in the observed data section. Also, un-check the check box for prior distribution at the bottom right and select the check box for posterior distribution. Next, enter the observed data. Enter "10" for number of observed values, "255" for geometric mean [mg/m³], and "2.0" for geometric standard deviation, and push the "Execute" button.

		SWEEs - [推正結果の表示画面]
基本情報 解析シナリオ名: 物質名:	Scenario1 toluene	物質形態: 液体藻気
推定結果		
 場露濃度の推定値 [171. 90%(言頼区間: 下限(5X) ^{84.} 上限(95X) ^{854.} ✓ 観測値による神 観測値の数: 	: 99 [mg/m^8] 813 [mg/m [^] 8] 61 [mg/m [*] 8] 山正を行う 10	
幾何平均値: 幾何標準偏差: 補正後の曝露濃度 補正後の幾何標準()	235 [mg/m [*] 3] 2 2 力推定值(幾何平均值): 250.21 250.21 [mg/m [*] 3] 嘉差: 1.2384	
戻る	基本 92.21 93中	表示方法 ● 確率密度分布 □ 累積確率密度分布 □ 常証前(事前分布) □ 常証前(事前分布) □ 常証前(事前分布) □ 常証前(事前分布) □ 常証前(事前分布) □ 常正前(事前分布) □ 常正前(事前分 □ 常正有) □ 常正前(事前分 □ 常) □ 常 □ 常 □ 常 □ 常 □ 常 □ 常 □ 常 □ 常

Figure 5-34 Bayes update by observed data

*Method for geometric mean and geometric standard deviation of observed values.

Geometric mean \bar{x} of observed values $x_1, x_2, \cdots x_n$

$$\bar{\mathbf{x}} = \sqrt[n]{x_1 \cdot x_2 \cdots x_n}$$

In Excel, use geomean () function to find geomean (x_1, x_2, \cdots, x_n) .

Also, geometric standard deviation of observed values $x_1, x_2 \cdot \cdot \cdot \cdot x_n$

Let $y_i = \ln x_i$

$$\exp\left(\sqrt{\frac{(y_1 - \bar{y})^2 + (y_2 - \bar{y})^2 + \dots + (y_n - \bar{y})^2}{n}}\right)$$

In Excel, use stdev() function to find stdev $(y_1, y_2, \cdots y_n)$, and enter the output value into exp(), which calculates the geometric standard deviation of the observed values.

5.6.3. Display posterior distribution

The posterior probability density distribution of exposure concentration is the red curve, and the distribution of observed data is displayed in blue as the likelihood function.

•2	SWEEs - [推定結果の表示画面]	- 🗆 ×
基本情報 解析シナリオ名: Scenario1 物質名: toluene	物質形態: 液体蒸気	
推定結果		
 ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・	事後分布 尤度関数 0.009	
	表示方法 ● 確率密度分布 □ 累積確率密度分布 □ 累積確率密度分布 □ 補正前(事前分布) □ 補正後(事後分布) □ 尤度関数 □ 大度関数	7
戻る 基本 設定 タスク1 設定	92.72 92.73 92.74 濃度 事後 設定 設定 設定 単後 推定	-

Figure 5-35 Display of posterior distribution

5.6.4. Superimpose prior and posterior distributions

Check "Before correction (prior distribution)" check box in the "estimated distribution" section and push "Execute".



Figure 5-36 Superimposing prior and posterior distributions

The superimposed graphs of prior and posterior probability density distributions are displayed with appropriate scale.

Figure 5-37 Display of superimposed prior and posterior distributions

5.6.5. Display cumulative probability density distribution

From "Display method", select "Cumulative probability density distribution" and push "Execute".

Figure 5-38 Display of cumulative probability density distribution

The superimposed graphs of prior and posterior cumulative probability density distributions and likelihood function are displayed with appropriate scale.

基本情報 解析シナリオ名: 物質名:	Scenar ic1 toluene	物質形態: 液体蒸気	
 推定結果 喝露濃度の推定値 [71. 30%言報区部: 下限(5%) 94.(上限(95%) 854. ① 観測値による補 観測値の数: 幾何平均値: 幾何平均値: 幾何標準編墨: 補正後の場露濃度の 補正後の場露濃度の 補正後の見何標準編 	: 39 [mg/m*3] 11 [mg/m*3] 61 [mg/m*3] 正を行う [10 255 [mg/m*3] 2 D推定億(気何平均(直): 250.21 [mg/m*3] 麗葉: 1.230	事前分布 事後分布 尤度関数 12	
戻る	基本 設定 設定	表示方法 推定分布 · 確率密度分布 · 補正前(事前分布) · 累積確率密度分布 · 補正前(事前分布) · 潮面注後(事後分布) · · · · · · · · · · · · · · · · · · ·	町行 ポート

Figure 5-39 Display of superimposed graphs of prior and posterior cumulative probability density distributions and likelihood function

5.7. Enlist estimate results

5.7.1. Display the input and estimated values.

Push "Report" at the bottom of the screen.

9	SWEEs - [推定結果の表示画面] - ロ ×
基本情報 解新シナリオ名: Scenario1 物質名: toluene 推定結果	物質形態: ;液体蒸気
 瑞羅濃度の推定値: 171.33 [mg/m[*]3] S0X信律報匹間: 下隊(G) 24.613 [mg/m[*]3] 上限(96X) 954.61 [mg/m[*]3] 上限(96X) 954.61 [mg/m[*]3] Y 観測値に以る: 和正を行う 観測値に以る: 10 幾何年均値: 255 [mg/m[*]3] 幾何僅準編毫: 2 Ma正後の嘎霧濃度の推定値(幾何平均値):	事前分布 事後分布 尤度関数 12
	 表示方法 通車密度分布 ● 累積確率密度分布 ● 「補正常(事前分布) ● 「補正常(事前分布) ● 「補正常(事前分布) ● 「 補正常(事前分布) ● 「 大度関数
	92.02 92.03 92.04 濃度 事後 上小小小 設定 設定 設定 推定 推定

Figure 5-40 Output of estimate result report

The system moves on to the report screen. In the report screen, the list of the input information is displayed.

Figure 5-41 Report display of input information

Move down the scroll bar on the right to show the estimate results by SWEEs.

Figure 5-42 Display of estimate result report

5.7.2. Correct observed values

In "Correction by observed values", double-click the value of either the number of observed values, geometric mean, or geometric standard deviation Screen for setting the observed data pops up.

Figure 5-43 Display of estimate result report

In the setting of observed data, change the number of observed values from "10" to "15", geometric mean from "255" to "230", and geometric standard deviation from "2" to "3", and push the "Set" button.

🖳 観測デ	-90設定 - 🗆 ×
観測値の数	15
幾何平均値	230 [mg/m^3]
幾何標準偏差	3
	キャンセル 設定

Figure 5-44 Screen for setting observed data

The values set for the observed data are reflected in the probability density distribution graph on the right.

Figure 5-45 Update of observed data
5.8. Output estimate result report

Scroll up to the top of the screen and push the "csv output" button in the right bottom corner. A file selection dialog for saving pops up.



Figure 5-46 File output in csv format

In the file selection dialog, enter the file name to be saved.

It outputs the items on the report screen (excluding graph information) in csv format. The output csv file can be loaded by clicking the "Read file" button on the top screen.



Figure 5-47 Saving the csv file

5.9. Print the estimate result report

Push the "Print" button in the right bottom corner of the screen.

• 2								SWEE	Es - [レポ・	-卜画面]						- 🗆	×
																- 2	•
9200																~	
																2	
92.94	-											~					
																~	
	-			1.000		-		-					14				
后所管理	(LC)									表面污染((\$v)						
		カデゴリー実象 スコン		237	カテゴリー実搬		究療	237	カテゴリー				237				
2221	LC1	その他の	のブースヺ	ポフード	0, 1	その他のブース式フード		0. 1	92.91	月一県以上の(19)351、約219391や定期的清掃による汚染物質の混れ防止			0				
	LC2		対策なし		1	対策なし		1	タスク2 デフォルト(清掃習慣なし、保護総なし、全体包囲なし)			(体包囲なし)	0.01				
タスクマ	LC1	その他の	りブースず	オフード	0, 1				-	22.23	(*)						
	LC2		対策なし		1					92.74	(+)				: • :		
22.23	LCS								-								
	rc5																
9,2.94	LCI								-								
	LC2		1				5.00 P										
当数(D)							発生原因	L12 & (Seg)			個人回い込	A (Sep)					
	論訊回数 [1/h]	署屋住積 [m~3]	237	動気回数 [1/h]	部屋住積 [m~3]	237		カテゴリ	一大安	237		カテゴリ	一突敗	237	0ev2	Ħ	
\$2.01	3	300	1.4	3	300	0.4	9,2,91	部分の悪い込み	前にあり	0,3	9,2.91	対策なし	対策なし	1	ED.8		
\$2.02	3	300	1.4	•		100	32.92				92.92						
\$2.08	-	-	-			(* :	92.91				9291				:近接場	データ	
92.94	-	- 53				-	22.24	1.000	-		2224	-			: 仲近哲	18 7 - 9	
SEECerist 表上ボート 端環環境の推定値: 171.88 [ss:/s ⁻¹ 3] 30%fmbuzDB: 下程(53) 04.019 [ss:/s ⁻¹ 3] 上版(93) 044.01 [ss:/s ⁻¹ 3] 上版(93) 044.01 [ss:/s ⁻¹ 3] 此の標準編集: 2.65 端层スコア: 0.0044002 10.0																	

Figure 5-48 Printing the file

A page setting dialog as below is displayed. Set the printing orientation to "Horizontal" and push the OK button. The items displayed on the report screen are printed.

	ページ設定						
	Restances and a second						
用紙							
サイズ(Z):	A4 (210x297mm) v						
給紙方法(S):	プリンターの設定に従う						
印刷の向き	余白 (ミリ)						
◉縦(0)	左(L): 10 右(R): 10						
〇 横(A)	上(T): 10 下(B): 10						
	OK キャンセル						

Figure 5-49 Page setting dialog

6. Acknowledgment

This tool is part of the accomplishment in the 2012 New LRI First Assigned Tasks by Japan Chemical Industry Association (general incorporated association). We hereby express our gratitude.

7. References

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- 4. Tielemans, E., Warren, N., Fransman, W., vanTongeren, M., McNally, K., Tischer, M., Ritchie, P., Kromhout, H., Schinkel, J., Schneider, T and Cherrie, J.W. (2011) Advanced REACH Tool (ART): Overview of Version 1.0 and Research Needs, *Annals of Occupational Hygiene*, 55 (9), 949–956.
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Mechanistic model ... continues

Near field Cnf

 $C_{nf} = \left(E_{nf} \times H_{nf} \times LC_{nf1} \times LC_{nf2}\right) \times D_{nf}$

 E_{nf} : modifying factor for emission potential (near field) H_{nf} : modifying factor for activity dependence(near field) LC_{nf1} : modifying factor for local management LC_{nf2} : modifying factor for local management D_{nf} : modifying factor for dilution (near field)

Similarly, the far field exposure concentration is calculated. C_{ff}

Modifying	factor	data	sources
-----------	--------	------	---------

9

10

Modifying factor	symbol	Sources			
Substance	Ε	Physicochemical properties of			
dependent		chemical substance			
potential					
Activity dependent	Н	Exposure data used for calibration.			
potential		Expert judgement			
Local control	LC	ECEL database [*] , expert meeting			
Segregation	Seg	ECEL database [*] , expert judgement			
Separation	Sep	ECEL database [*] , expert judgement			
Surface pollution	Su	Expert judgement			
Dispersion	D	2 box model simulation results			

*ECEL (Exposure Control Efficacy Library) Database comprised of (Annals of Occupational Hygiene, American Industrial Hygiene Association Journal, Applied Occupational and Environmental Hygiene, Journal of Occupational and Environmental Hygiene) .90 referred papers and 433 datasets. (Fransman et al. 2008).

Linear mixed effect model considers... Variation among enterprises, facilities, tasks, and workers. $ln(Y_{ijk}^{\Box}) = ln(\alpha) + ln(C_t) + \delta_i + c_{ij} + \varepsilon_{ijk}$ $Y_{ijk}^{\Box}: \text{ chemical exposure level of } i\text{-th scenario, } j\text{-th enterprise, } k\text{-th observation}$ $ln(\alpha): \text{ intercept}$ $\delta_i: \text{ random effect of } i\text{-th scenario}$ $c_{ij}: \text{ random effect of } i\text{-th scenario and } j\text{-th}$ enterprise $\Re: \text{ schinkel et al.}(2011):$ $\delta_{ijk}: \text{ error}$ $\delta_{ijk}: \text{ error}$

Fin