

### EXAMPLE 1 A Exposure to iron dust

The aim is to assess the exposure of three workers from Metalika, a metallurgy company, to dust (OELV 8 hrs TWA=10 mg/m<sup>3</sup>, inhalable fraction). The workers handle big bags to load the feeding hooper. It is assumed that the concentration of the contaminant in the air is very variable along the working shift.

The raw material used is iron metal powder with traces of manganese, nickel, molybdenum and copper.

The working shift is 8 hours a day with a 30 minutes break. The exposure time is therefore 450 minutes.

Sampling is carried out with an IOM head loaded with a glass fiber filter of 25 mm diameter and 1 micron pore size. The flow rate is 2 l/min and the sampling time 400 mins.

**Chemical agent:** iron dust (particulate matter, inhalable fraction)

**OELV 8 hrs TWA**=10 mg/m<sup>3</sup>

**Exposure time**=450 mins

**Exposure pattern**= variable

**Sampling time**= 400 min.

**SEG (Similar Exposure Groups):** 3 workers

**Loq(laboratory)**= 64 µg/filter

**LOQ**= Loq/V = 64µg/0,8 m<sup>3</sup> = 0,08 mg/m<sup>3</sup>

The concentration of iron dust analysed in the laboratory for the different working shifts is:

Shift	Sample reference	Iron dust concentration (mg/m <sup>3</sup> )	Sampling time (min.)
1	Metálíka-BIG bags 1	2, 103	400
2	Metálíka-BIG bags 2	1,229	400
3	Metálíka-BIG bags 3	0,830	400

### EXPOSURE ASSESSMENT USING THE CALCULATOR

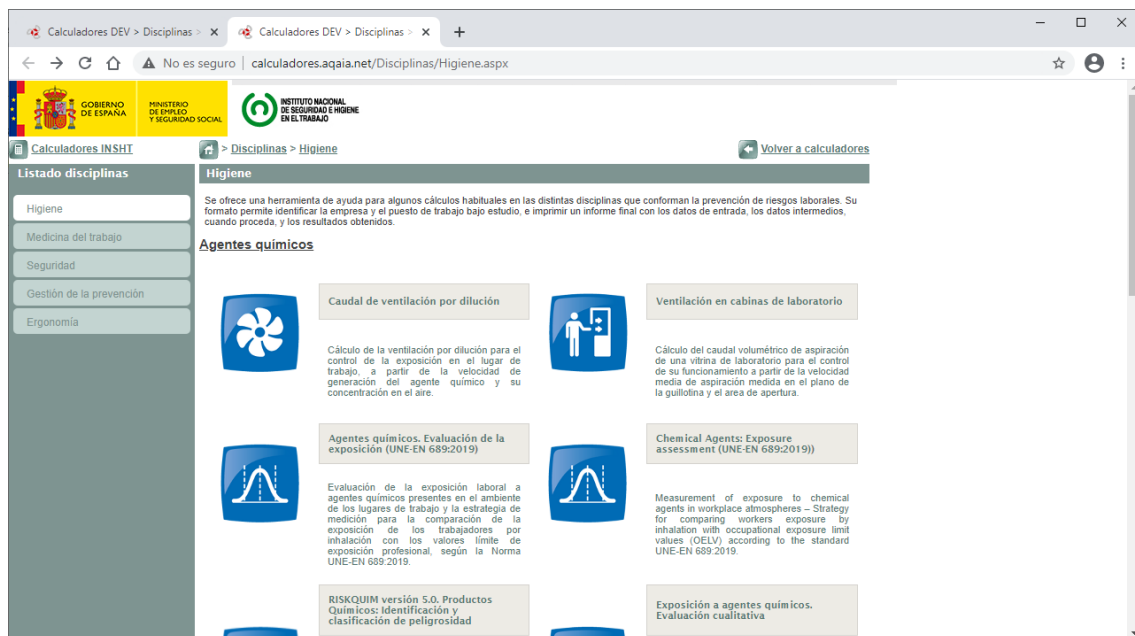
#### PRELIMINARY TEST

The preliminary test for assessment of the compliance of the exposure concentration with the OELV is carried out in accordance with the Standard UNE-EN 689. The assessment can be done using the calculator as follows:

- 1 .Access the webpage of INSST <https://herramientasprl.insst.es/>
2. Click on the Hygiene tab

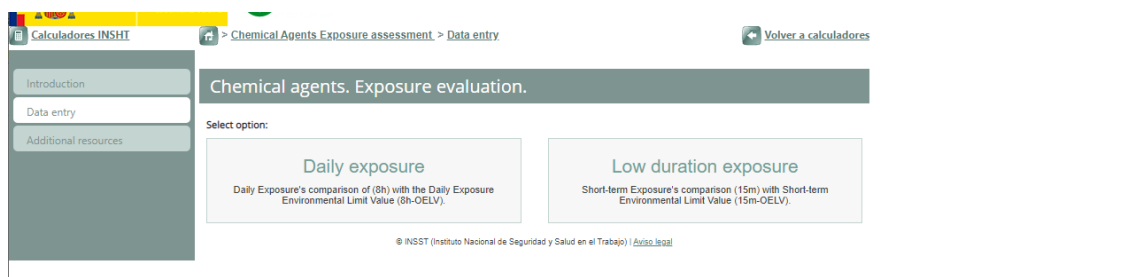


### 3. Click on the Chemical Agents Exposure Calculator (UNE-EN 689:2019)



### 4. Click on data entry

### 5. There are two choices: daily exposure and short-term exposure. Click on “daily exposure” since this is the exposure period being assessed.



6. For the assessment of daily exposures, the change of the chemical agent concentration over time has to be entered, prior to the data input. The default choice is “variable” but there are other options that can be selected from the dropdown list.

This window allows to input:

- A retrieval code that the program generates to recover the data saved. The first time data is entered this box is left blank. The code can be entered the next time to retrieve the data.
- Contextual information on the company name, date, job type, GES, etc although this is not a requirement.

Click on “VARIABLE EXPOSURE” and leave the remaining fields blank. Click on “NEXT”.

The screenshot shows a web browser window with the URL `calculadores.aqai.net/ChemicalAgentsExposureAssessment/8hOELV.aspx`. The page title is "Exposure to chemical agents. Comparison with long-term OELV". On the left is a sidebar with a menu containing "Introduction", "Entry", and "Additional resources". The main content area is titled "Input data" and includes a "Previous" and "Next" button. It contains three sections: 1. "Evolution of exposure to the chemical agent along the work shift" with radio buttons for "Variable" (selected) and "Constant". 2. "Numerical code" with a text input field and a "Load data" button. 3. "Exposure assessment credentials (optional)" with a "Company and address" text input field and an "Activity and/or Task:" label.

7. In this window enter the name of the chemical agent, OELV 8-hrs TWA, exposure time and LOQ. The input of the LOQ is optional, unless data is below the LOQ. There is a note with information on how to estimate the LOQ.

Enter the data required (10 mg/m<sup>3</sup>(OELV, inhalable fraction); exposure time: 450 mins; 0,08 mg/m<sup>3</sup>. Click on NEXT

The screenshot shows a web browser window with the URL `calculadores.aqai.net/ChemicalAgentsExposureAssessment/8hOELV.aspx`. The page header includes logos for the Spanish Government and the Instituto Nacional de Seguridad e Higiene en el Trabajo (INSST). The main title is "Exposure to chemical agents. Comparison with long-term OELV".

**Input data**

Input one or more chemical agents

Chemical agent	Long-term OELV	> Exposure time	LOQ (optional)
Particulates	10 mg/m <sup>3</sup>	450 min	0,08 mg/m <sup>3</sup>

Buttons: Previous, Next, Input chemical agent, Volver a calculadores

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8. This window allows to enter data on the different samples taken for each shift (sample reference, sampling time, chemical concentration). For each shift is possible to add several samples. Once a shift has been completed click on “add shifts” to input the data on the different shifts.

**Important note:** when “variable exposure” has been selected the total sampling time for a shift has to be 80% of the exposure time, except in those cases when the exposure period is below 2 hours. In the latter case, the sampling time has to be the same as the exposure time. If this condition is not met the program will indicate that there is an error and it is not possible to continue.

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calculadores.aqia.net/ChemicalAgentsExposureAssessment/8hOELV.aspx

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Chemical Agents Exposure assessment > 8hOELV

Volver a calculadores

### Exposure to chemical agents. Comparison with long-term OELV

Input data Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Work shift 3 Input work-shift

Work shift 3 Delete work-shift

Particles ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	400 min	6 mg/m <sup>3</sup>

Total sampling time 400 min Input sample

Previous Calculate without saving Save and calculate

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9. Click on “saving and calculate”. The program generates a code to recover the data entered. The calculator shows the result of the exposure assessment: the contextual information (if it has been entered), the decision on the compliance or not with the OELV, the retrieval code and a summary with the data entered for the different shifts: the daily exposures and the partial exposure indices.

In this example, the preliminary test is not conclusive. The result is “NO DECISION” and it is necessary to evaluate the exposure over two other shifts. The program also shows the retrieval code. In this example 893306

This information can be printed.

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Exposure to chemical agents. Comparison with long-term OELV

Result

Exposure assessment credentials.  
Company and address.  
Activity and/or Task:  
Location  
Worker/SEG  
Appraiser  
Start date Finish date  
Others

Previous New calculation Print

RESULT

**Exposure level**  
**NON-DECISION**

A decision cannot be made about the compliance of the exposure with the Long-term OELV Preliminary test for the evaluation of exposure to chemical agents in EN 689.

It's necessary to complete 2 more work shift with additional measurements.

Numerical code for saving data: 8395049

Baseline data

Work shift 1

Particules ( long-term OELV 10 mg/m<sup>3</sup>, exposure time 450 min , LOQ: 0,08 mg/m<sup>3</sup> )

Samples	Sampling time	Concentration
Sample 1	400 min	1,4 mg/m <sup>3</sup>
Total sampling time	Long-term exposure ED	Exposure index

## EXAMPLE 1B: Exposure to iron dust

The exposure assessment of the three workers from the company Metallika has not been finalised. It is necessary to evaluate the exposure during two more shifts so as to have at least five shifts. Then, the preliminary test has to be run again. The results from running the five shifts are:

Shift	Sample reference	Iron dust concentration (mg/m <sup>3</sup> )	Sampling time (min.)
1	Metálica-big-bags1	2,103	400
2	Metálica-big-bags2	1,229	400
3	Metálica-big-bags3	0,830	400
4	Metálica-big-bags4	0,590	400
5	Metálica-big-bags5	2,650	400

Repeat the previous steps in Example 1A from step 1 to 6.

7. In step 7 enter the retrieval code (8395049) to load the data already saved and click on “LOAD DATA”,

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calculadores.aqia.net/ChemicalAgentsExposureAssessment/8hOELV.aspx

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### Exposure to chemical agents. Comparison with long-term OELV

**Input data** Previous Next

Evolution of exposure to the chemical agent along the work shift

☒ Variable *i*

☐ Constant *i*

**Numerical code**

This calculator allows to save all data input for the work place assessment and let you to recover the data entering the code.

8395049 Load data

**Exposure assessment credentials (optional)**

Company and address:

Activity and/or Task:

Location:

Worker/SEG: Annotar

8. Click on “NEXT” and the program shows the screen with all the data input (chemical agent, OELV, exposure time and LOQ).

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calculadores.aqia.net/ChemicalAgentsExposureAssessment/8hOELV.aspx

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### Exposure to chemical agents. Comparison with long-term OELV

**Input data** Previous Next

Input one or more chemical agents

Chemical agent	Long-term OELV	>Exposure time	LOQ (optional) <i>i</i>
Particules	10 mg/m <sup>3</sup>	450 min	0,08 mg/m <sup>3</sup>

Input chemical agent

Previous Next

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9. Click on “NEXT” and the program shows the data entered for the three shifts.

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Volver a calculadores

Introduction  
Data entry  
Additional resources

### Exposure to chemical agents. Comparison with long-term OELV

Input data Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Jornada 1 Input work-shift

**Jornada 1** Delete work-shift

Particules ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	400 min	1,4 mg/m <sup>3</sup>

Total sampling time 400 min Input sample

Previous Calculate without saving Save and calculate

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10. Click “Add shift” and enter the data from shift number four.

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Introduction  
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### Exposure to chemical agents. Comparison with long-term OELV

Input data Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Work shift 4 Input work-shift

**Work shift 4** Delete work-shift

Particules ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	400 min	0,59 mg/m <sup>3</sup>

Total sampling time 400 min Input sample

Previous Calculate without saving Save and calculate

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11. Click on “ADD SHIFT” and enter the data from shift five.



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Volver a calculadores

### Exposure to chemical agents. Comparison with long-term OELV

Input data Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Work shift 5 Input work-shift

Work shift 5 Delete work-shift

Particules ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	400 min	2,65 mg/m <sup>3</sup>

Total sampling time 400 min Input sample

Previous Calculate without saving Save and calculate

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12. Click on “SAVE AND CALCULATE” to get the results.

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Volver a calculadores

### Exposure to chemical agents. Comparison with long-term OELV

Result Previous New calculation Print

Exposure assessment credentials.  
Company and address.  
Activity and/or Task:  
Location  
Worker/SEG  
Appraiser  
Start date Finish date  
Others

RESULT

**Exposure level**  
**NON-DECISION**

A decision cannot be made about the compliance of the exposure with the Long-term OELV Preliminary test for the evaluation of exposure to chemical agents in EN 689.

It's necessary to complete 2 more work shift with additional measurements, and apply the statistical test.

Numerical code for saving data: 5355339

Baseline data

Work shift 1

Particules ( long-term OELV 10 mg/m<sup>3</sup>, exposure time 450 min , LOQ: 0,08 mg/m<sup>3</sup> )

Samples	Sampling time	Concentration
Sample 1	400 min	1,4 mg/m <sup>3</sup>

Total sampling time	Long-term exposure ED	Exposure index

In this case the result is “NO DECISION” and more measurements are required to have at least six and to run a statistical test.

The program generates a new retrieval code and shows a summary of the data entered for each shift.

## Example 1C: Exposure to iron dust

The exposure assessment of the three workers from the company Metallika has not been finalised. It is necessary to evaluate the exposure during at least one more shift to have at least six shifts to run the statistical test. The results for the six shifts are:

Jornada	Referencia muestra	Concentración partículas (mg/m <sup>3</sup> )	Tiempo muestreado (min.)
1	Metálica-big-bags1	2,103	400
2	Metálica-big-bags2	1,229	400
3	Metálica-big-bags3	0,830	400
4	Metálica-big-bags4	0,590	400
5	Metálica-big-bags5	2,650	400
6	Metálica-big-bags6	1,720	400

1.Repeat steps 1 to 5. Click on the option “VARIABLE” and enter the new retrieval code 5355339.

The screenshot shows the 8hOELV web application interface. The browser address bar displays the URL: `calculadores.aqai.net/ChemicalAgentsExposureAssessment/8hOELV.aspx`. The page title is "Exposure to chemical agents. Comparison with long-term OELV". The interface includes a sidebar with navigation links: "Introduction", "Data entry", and "Additional resources". The main content area is titled "Input data" and contains the following sections:

- Evolution of exposure to the chemical agent along the work shift:** Two radio buttons are present: "Variable" (selected) and "Constant".
- Numerical code:** A text input field contains the code "5355339", and a "Load data" button is next to it.
- Exposure assessment credentials (optional):** Three text input fields are provided for "Company and address.", "Activity and/or Task:", and "Location".

At the bottom of the page, the text "Workcat/SEG" and "Análisis" are visible.

2. Click on “LOAD DATA” and NEXT. The program shows the first screen with the saved data (OELV, LOQ, exposure period).

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calculadores.aqai.net/ChemicalAgentsExposureAssessment/8hOELV.aspx

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Exposure to chemical agents. Comparison with long-term OELV

Input data

Previous Next

Input one or more chemical agents

Chemical agent Long-term OELV >Exposure time LOQ (optional)

Particules 10 mg/m<sup>3</sup> 450 min 0,08 mg/m<sup>3</sup>

Input chemical agent

Previous Next

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3. Click on “NEXT”. The program shows the data from the first shift with a drop down list that allows to see the data from all the input work shifts.

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Volver a calculadores

Exposure to chemical agents. Comparison with long-term OELV

Input data

Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Jornada 4 Input work-shift

Jornada 4 Delete work-shift

Particules ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	400 min	0,59 mg/m <sup>3</sup>

Total sampling time 400 min Input sample

Previous Calculate without saving Save and calculate

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4. Click on “ADD SHIFT”. The program shows a screen to enter the data from shift six.

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### Exposure to chemical agents. Comparison with long-term OELV

Input data Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Work shift 6 Input work-shift

**Work shift 6** Delete work-shift

Particles ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	0 min	0 mg/m <sup>3</sup>

Total sampling time 0 min Input sample

Previous Calculate without saving Save and calculate

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5. Enter the reference for the sample, the dust concentration and the sampling period.

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### Exposure to chemical agents. Comparison with long-term OELV

Input data Previous Calculate without saving Save and calculate

Input samples for every work-shift and agent

Input data Work shift 6 Input work-shift

**Work shift 6** Delete work-shift

Particles ( Long-term OELV >Exposure time 450 min)

Samples	Sampling time	Concentration
Sample 1	400 min	1,72 mg/m <sup>3</sup>

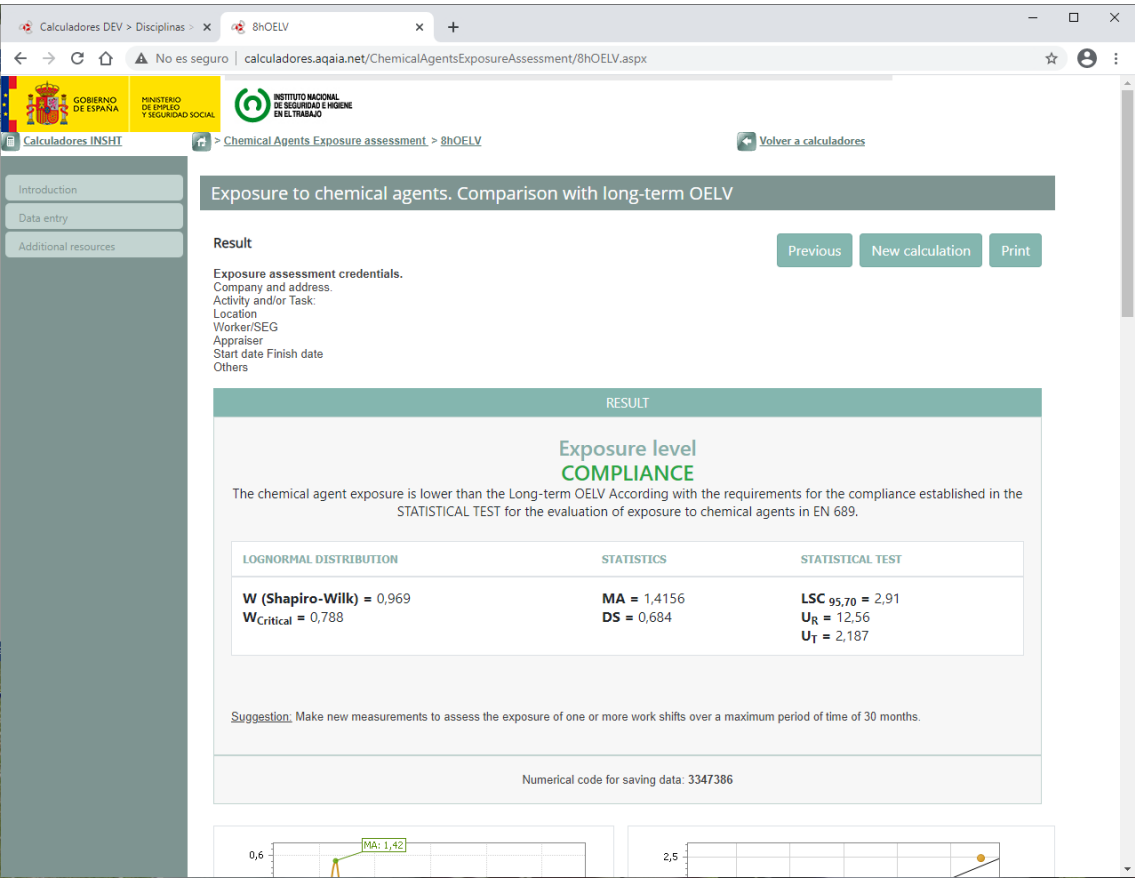
Total sampling time 400 min Input sample

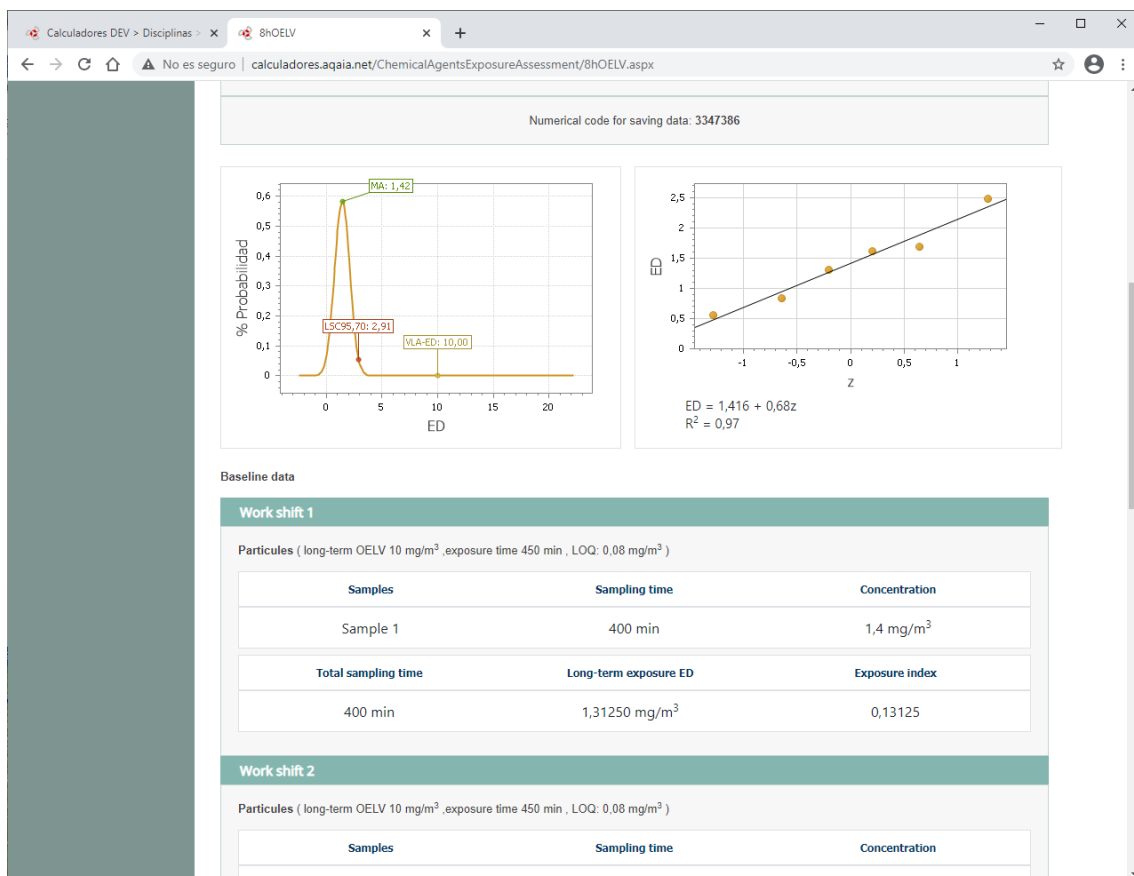
Previous Calculate without saving Save and calculate

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6. Click on “SAVE AND CALCULATE” to run the statistical test and obtain a new retrieval code.

The program shows the contextual information (if it has been entered), the compliance of the exposure with the OELV 8hrs TWA, recommendations to carry out periodic measurements, the graphs, the daily exposures and the exposure index for each shift. This information can be printed.





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calculadores.aqai.net/ChemicalAgentsExposureAssessment/8hOELV.aspx

**Work shift 1**

Particules ( long-term OELV 10 mg/m³ ,exposure time 450 min , LOQ: 0.08 mg/m³ )

Samples	Sampling time	Concentration
Sample 1	400 min	1,4 mg/m³
<b>Total sampling time</b>	<b>Long-term exposure ED</b>	<b>Exposure index</b>
400 min	1,31250 mg/m³	0,13125

**Work shift 2**

Particules ( long-term OELV 10 mg/m³ ,exposure time 450 min , LOQ: 0.08 mg/m³ )

Samples	Sampling time	Concentration
Sample 1	400 min	0,9 mg/m³
<b>Total sampling time</b>	<b>Long-term exposure ED</b>	<b>Exposure index</b>
400 min	0,84375 mg/m³	0,08438

**Work shift 3**

Particules ( long-term OELV 10 mg/m³ ,exposure time 450 min , LOQ: 0.08 mg/m³ )

Samples	Sampling time	Concentration
Sample 1	400 min	1,8 mg/m³
<b>Total sampling time</b>	<b>Long-term exposure ED</b>	<b>Exposure index</b>
400 min	1,68750 mg/m³	0,16875

**Work shift 4**