

USER MANUAL – QUICK GUIDE

MAMPEC version 2.0

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The development of the first version of the MAMPEC model (version 1.02 released in 1999) was commissioned by the Antifouling Working Group (AFWG) of the European Paint Makers Association (CEPE) as subcontract within the project "Utilisation of more environmental friendly antifouling products", sponsored by the European Commission (DG XI; Contract # 96/559/3040/ DEB/E2). Between 2002 and 2005 further updates of the model (version 1.4-1.6) were prepared for CEPE for reasons of compatibility with upgrades of Windows XP and inclusion of standard EU and OECD emission scenarios. Version 2.0 was developed and tested in 2005 and 2006 for CEPE-AFWG, and includes some important new functionalities (advanced photolysis module, non-tidal hydrodynamic exchange, import/export functions).

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Installation

This short guide contains instructions for the installation of MAMPEC version 2.0, a short explanation of the different screens and modules in the model, and instructions to setup and execute calculations with the model. Further instructions and backgrounds are given in the help files incorporated in the model, technical reports and documentation distributed with the model, and the MAMPEC support website at www.delftsoftware.wldelft.nl

The program has been tested under Windows XP SP2 (Service Pack 2) and runs under Windows 2000. The program has been tested under the first release of Windows Vista, which appeared in 2007.

Minimum requirements: Pentium III with 64 MB memory. Hard-disk usage is 10 MB. Recommended are Pentium IV and higher, 512 MB memory. Make sure you have the proper administrative rights to install the program.

The program is provided on a CD-ROM or can be downloaded from the support website at Delft Hydraulics (www.wldelft.nl) and at www.cepe.org or www.antifoulingpaint.com.

CD-ROM: It is recommended to first print the installation instructions on the CD or website. Insert the CD-ROM in your drive. Use the run option of the Start button type : <CDROM>:\setup.exe and press enter.

The setup program may ask to install some new system files for the windows installer, please follow instructions and if necessary restart the setup.exe program.

The program will install itself in a proposed directory c:\Program Files\MAMPECv2. If necessary this can be changed to a different install directory. In the next screen the program will ask where the startup-icons need to be placed. Confirm the proposed standard option or adapt to your own wishes.

During the installation the program may notify you that versions of specific files to be installed are not newer than existing files on the computer and proposes to keep the existing version. We advise to confirm (Y)es to keep the existing version.

When the program is successfully installed a new MAMPECv2 item has been created in your All Programs menu.

When prior versions of MAMPEC exist on the computer (e.g. version 1.4 or 1.6) these do not need to be removed, as long as version 2.0 is installed in a different directory

WARNING: In Windows 2000: please do not use blanks in path names, this may give problems when not all required Windows 2000 Services Packs have been installed. Example: Do not install in 'Program Files' directory. We recommend use the suggested directory (C:\MAMPEC) or e.g. C:\MAMPECv2.

WARNING: Regional settings.

Due to differences between European countries in the usage of dots/comma's as decimal separator please be aware that the model has been adapted to meet different regional settings (in Windows\Settings\Control Panel\Regional settings) and that depending on the country, dots or comma's can be used as decimal separator. The model was developed with the English (US) settings, as this is the standard in most of the scientific literature and international computer programs. Settings tested include French (standard), German (standard), and Dutch (standard). Due to a bug in Microsoft Visual Basic this may not function properly for all regional settings. Especially when the Regional Settings have been edited by local users, the program may not function properly. When MAMPEC detects possible problems a warning message is provided.

In case of problems we recommend to use the English (US) settings (on some platforms rebooting after changing the settings may be necessary). Problems with regional settings can be detected by inspecting the proper representation of numeric data with commas and dots (e.g. in compound properties screen) or by examining the effect of variations before

and after the decimal separator and resulting changes in related input boxes.

Example: in the Model\Compound input panel any change in one of the six degradation rate constant boxes (in day^{-1}) should immediately result in the (grey, non-editable) calculated half-life (in day) boxes.

Main screen

When you start the MAMPEC model you have three main options:

- View the help file section with direct help and background information
- Start a new calculation
- View results from previous calculations

To view the help file press the button **Introduction** on the main screen

To start a new calculation press the button **Model** on the main screen

To view previous results press the button **Results** on the main screen

Additional menus accessible via the top menu-bar:

- **Help**: alternative way to access the help file section. This is always available during the modeling session. Access to the About screen with address information of the developers of the model
- **File**: access to utilities to **Import** or **Export** model scenario settings



Guided tour – starting a new calculation

This part will guide you through the necessary steps to perform a new calculation.

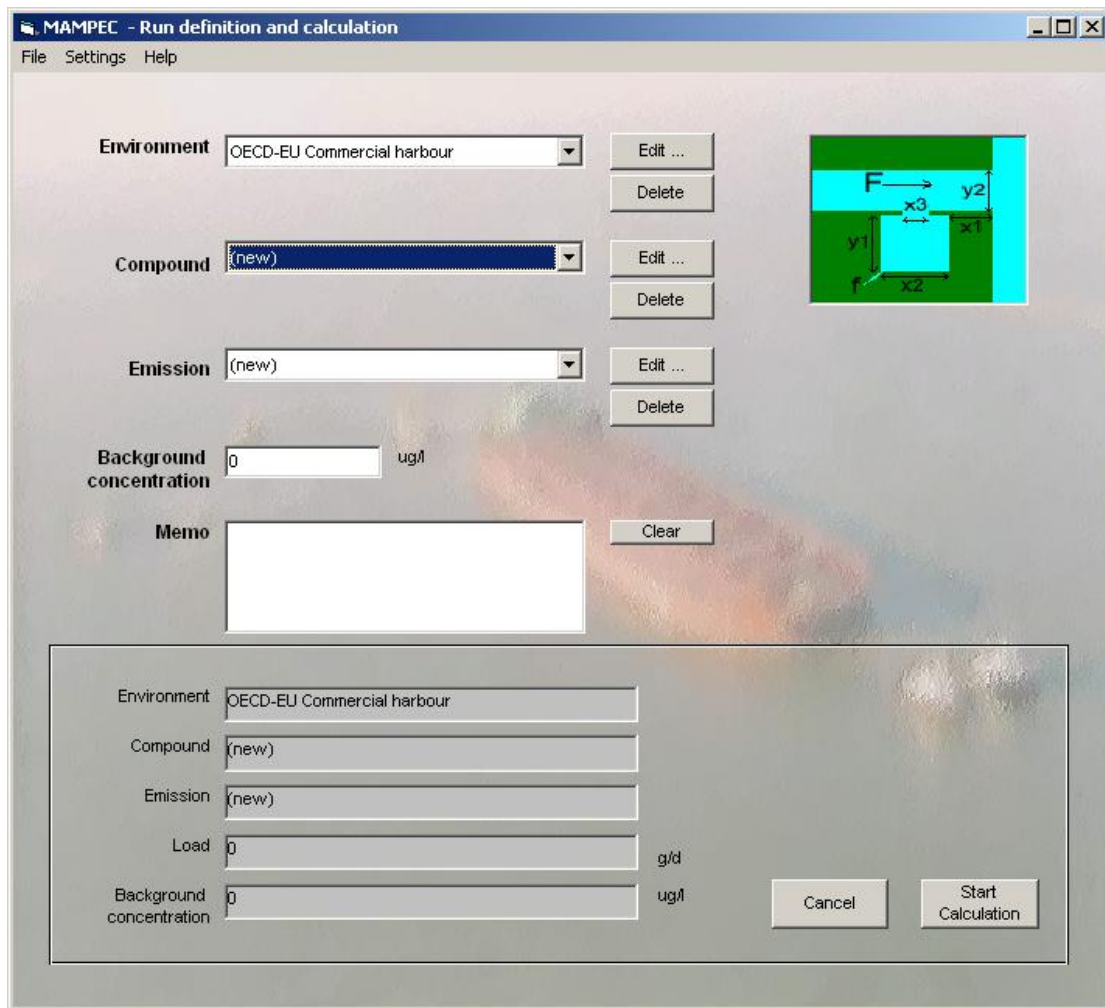
Start from the main menu and press the button **MODEL**



In order to calculate the concentration of a compound in an environment we need data of three types :

- Dimensions and properties of the environment (+ background concentration)
- Emission of the compound
- Compound behaviour in the environment.

In the next screen you can select predefined environments, compounds, and emissions. The default background concentrations are 0 mg/l. The standard EU-OECD scenarios (ESD-PT21) for environments and emissions have been added.



From this screen you can also edit/create new environments, compounds, emissions and background concentration options.

In the following example we will use existing definitions.

Example

From the dropdown box **Environment** select "Default Commercial Harbour"

(optional: press **EDIT** next to the dropdown box to view the settings and properties of this environment. Press **CANCEL** to close the Environment information window.)

From the dropdown box **Compound** select "Copper (total)"

(optional : press **EDIT** next to the dropdown box to view the settings and properties of this compound. Press **CANCEL** to close the Compound property information window.)

From the dropdown box **Emission** select "Default Commercial Harbour Cu (100%) "

(optional: press **EDIT** next to the dropdown box to view the settings this emission. Press **CANCEL** to close the Emission properties information window.)

In the bottom panel the selected settings are summarized for convenience.

Press button **Start Calculation** and confirm the message 'Calculating hydrodynamics'

The environmental concentration will now be calculated and presented in the results screen.

Results screen

You will see a pop-up box requesting the name to save this calculation (results and input). Change the proposed text to "Example 1" and press **ok**.

If required additional information can be entered in the Memo field.

The screenshot shows the MAMPEC Result screen window. At the top, there is a menu bar with 'File', 'Settings', and 'Help'. Below the menu bar, there is a 'Run' section with a 'Filter' input field, a 'Refresh list' button, and a dropdown menu showing 'Default commercial harbour Advanced Photolysis (Test) Default Commercial Harbour Biocide 100%'. A 'Delete run' button is also present. Below this is an 'Information' section with a table of parameters and a 'Memo' text area. The 'Information' table is as follows:

Environment	Default commercial harbour
Compound	Advanced Photolysis (Test)
Emission	Default Commercial Harbour Biocide 100%
Load	12230.625
Background conc.	0.00E+00

Units are indicated as 'g/d' and 'ug/l'. An 'Update memo text' button is located below the memo area. Below the information section, there are two tabs: 'Harbour' (selected) and 'Surroundings'. The 'Results' section contains a table of concentrations for different parameters and a 'Sediment after' dropdown menu set to '10' years.

Results	Total conc.	Dissolved	Suspended matter	Sediment after
Maximum concentration	7.46E-02 ug/l	7.36E-02 ug/l	2.10E-02 ug/g dw	4.41E-07 ug/g dw
95 % concentration	7.19E-02 ug/l	7.09E-02 ug/l	2.03E-02 ug/g dw	4.25E-07 ug/g dw
Average concentration	3.26E-02 ug/l	3.22E-02 ug/l	9.21E-03 ug/g dw	1.93E-07 ug/g dw
Median concentration	1.55E-02 ug/l	1.53E-02 ug/l	4.38E-03 ug/g dw	9.18E-08 ug/g dw
Minimum concentration	2.99E-03 ug/l	2.95E-03 ug/l	8.43E-04 ug/g dw	1.77E-08 ug/g dw

At the bottom of the window, there are 'Cancel' and 'Print ...' buttons.

The result window shows the calculated concentrations in the harbour (left tab in bottom panel) and the surroundings (right tab in bottom panel). Concentrations are calculated for water (dissolved and total), suspended particulate matter and sediment. As sediment mixing processes are slow, and attaining steady state may take years to decades, the user has an option to view the results after different time periods.

If the compound contains copper you can proceed with the copper speciation module for the dissolved concentrations by pressing button **Speciation** (this button is invisible for non copper containing compounds)

To display a print file with settings and results press button **Print**.

The shown text can be send to the printer (**Print**) or to an *.txt or *.rtf file (**Save**).

The *.txt file can be imported in programs like Excel (suggestion : select "tab" as the field separator).

Results of other model runs can be selected via the list-box. With the **Filter** panel the user can select specific scenarios. Fill in some meaningful text string (e.g. OECD, or Cu) and only the model run names containing the specific text string will then be presented . With the command **Show all** the complete list of model run names will be shown.

Removing an existing calculation:

Removing the results from a calculation will not affect the input data. The environment, compound and emission data will remain intact.

From the Main menu choose button **Results**

On the results window :

Select the calculation you want to remove from the **Run dropdown box**

Press **Delete Run**

Press **Cancel** to close the results window

Note: input scenarios cannot be deleted if the calculation-run still exists. A warning is provided if the user tries to delete environment/compound/emission scenarios, while the run in which these scenarios are used still is intact. For removal of input-scenarios: first remove all runs in which these input-scenarios are used.

Warning:

Do not remove data from obligatory data fields, either accept or edit the default value, but do not leave these fields blank. If entries have been removed from obligatory data fields, and these fields have been left blank, the program may crash on some platforms, giving the message 'runtime error'. In case the program cannot be restarted, parts of the program may still be active in the background, and these task needs to be ended manually. This can be done by pressing Ctrl-Alt-Del simultaneously (which gives access to the Windows "close program" menu), selecting MAMPEC and pressing the 'end task' button.

Creating a new environment

From the main menu press button **Model**

In the Calculation window:

In the dropdown box **Environment** choose environment (new) and press button **Edit** next to the dropdown box.

You will be given the choice from 5 different types of environment. The next procedure is the same for all environments.

Select one type (e.g. Default estuarine harbour) and press ok.

You will see the Commercial harbour input window

MAMPEC Estuarine harbour definition

File Settings Help

Estuarine harbour - definition

Description

Default estuarine harbour

Reference

Environmental conditions

Tidal period	12.41	hour
Silt concentration	35	mg/l
POC concentration	1	mg OC/l
DOC concentration	2	mg/l
Chlorophyll	3	ug/l
Salinity	34	s.e.
Temperature	15	o C
Latitude	50	degrees NH
pH	7.5	
Depth mixed sediment layer	0.2	m
Sediment density	1000	kg/m3
Fraction organic carbon in sediment	0.03	
Nett sedimentation velocity	1	m/d

Layout

Length	x1	1000	m	x2	5000	m
Width	y1	1000	m	y2	500	m
Depth		15	m			
Mouth width	x3	2500	m			
Flow velocity (F)		1	m/s			

Exchange volume: 6.0262E+07 m3 / tide

80.35 % / tide

Calculate exchange volume : Input ...

Cancel OK

You can change the following fields:

Reference

memo field

Tidal period

specify in hours

Silt concentration

specify silt fraction < 63 μ in mg/l

POC concentration

specify particular organic carbon concentration in mg OC / l

DOC concentration

specify dissolved organic carbon concentration in mg OC / l

Chlorophyll

provide concentration of chlorophyll a in μ g/l. The value is used only in the calculations of the photolysis module. The default values provided are based on long term averages of the central and coastal parts of the North Sea.¹

Salinity

specify salinity in salinity equivalent

Temperature

specify temperature in degrees Celsius

pH

specify pH (-log [H₃O⁺])

Additionally sediment parameters need to be entered, which strongly affect the calculated sediment concentrations and time required to attain steady state:

Depth mixed sediment layer

provide depth of mixed sediment layer compartment in m

Sediment density

provide (dry weight) sediment density in kg/m³. For sandy sediments an indicative value is app. 1500 kg/m³; for silty sediments an indicative value is 500 kg/m³. As default an average value of 1000 kg/m³ is taken in the default scenarios.

Fraction organic carbon

provide organic carbon content (dry wt) of sediment as dimensionless fraction

Nett sedimentation velocity

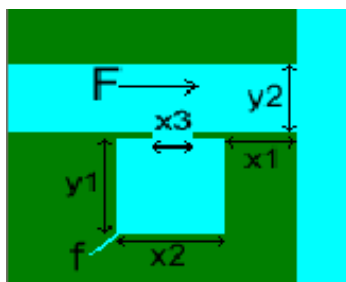
provide approximate nett sedimentation velocity in m/day. Note that this value is the resultant of different parameters, such as e.g. settling velocity, remobilisation

¹ McQuatters-Gollop, A, D.E. Raitos; M. Edwards, et al.(2007). A long-term chlorophyll data set reveals regime shift in North Sea phytoplankton biomass unconnected to nutrient trends. LIMNOLOGY AND OCEANOGRAPHY 52: 635-648.

Based on the dimensions (length, width) chosen for the environments the MAMPEC model creates a grid. For the harbours this is a 10 x 10 grid. For the river and coastal sections the number of grid cells depends on the dimensions defined in the input screen. The size of the grid cells is derived from the dimensions of the harbour.

Length (each side of harbour or marina)

x_1 in harbour and marina scenarios. Commercial and estuarine harbour scenarios: specify distance from the mouth (m). A similar length will be included in the Delwaq grid upstream of the harbour. Marina scenario: specify the length of the coastal stretch included in the calculation (m) on each side of the marina. Please keep within the dimension range of the harbour or marina. Advised value = equal to or less than 150% of harbour length (x_2). Using larger values may result in problems with the dimensions of the grid definition in the model and error-messages.



Length harbour

x_2 in harbour and marina scenarios. Specify length of harbour or marina (m). You are advised to round off to at least 10 m.

Width harbour

y_1 in harbour and marina scenarios; specify width of harbour (m). You are advised to round off to least 10 m

Harbour Mouth width

x_3 in harbour and marina scenarios. Specify width of harbour mouth (m)

Width river

y_2 in harbour and marina scenarios. Commercial and estuarine harbour scenarios: specify width of river (m). You are advised to round off to least 10 m. Marina scenario: section of coastal water included in the calculation. Please keep within the dimension range of the harbour or marina. Advised value = equal or 50% of harbour width

Depth

depth of the river and harbour (m), If the harbour depth is less, this needs to be specified in the Exchange Volume Calculation panel (see below)

River flow velocity

Commercial and estuarine harbour scenarios: specify flow velocity of the river in front of the harbour in m/s. Marina scenarios: provide estimate of average current

Exchange volume harbour with river

specify in $m^3/tide$ or calculate to use an advanced exchange volume calculation estimation based on (1) filling and emptying by the tide, (2) horizontal eddy in harbour entrance generated by the river or other current (3) vertical circulation due

to density differences between freshwater and seawater, and (4) flushing and vertical circulation from a small river discharging in the rear end of the harbour or marina.

Exchange volume: 6.0262E+07 m³ / tide
 80.35 % / tide
 Calculate exchange volume: Input ...

By pressing the **Calculate** button the Exchange Volume Calculation panel appears, for entry of additional data for the exchange volume calculation with SILTHAR:

Calculate exchange volume

File Settings Help

Tidal difference: 1.5 m
 Max. density difference tide: 0.4 kg/m³

Non tidal daily water level change: 0 m

Fraction of time wind perpendicular: 0 -/-
 Average wind speed: 0 m/s

Flush (fl): 0 m³/s
 Max. density difference flush: 0 kg/m³

Harbour lay-out data, used for density flow exchange

Depth-MSL in harbour entrance h0: 15 m
 Exchange area harbour mouth, below mean sea level: 37500 m²
 Height of submerged dam: 0 m
 Width of submerged dam: 0 m

Cancel OK

Tidal difference

specify tidal range (m)

Max. density difference tide

specify density difference between river water and seawater (kg/m³)

Non tidal daily water level change

for use in area's where there is no of very small tidal motion; specify the average non-tidal daily water level change (m)

Fraction wind perpendicular

annual averaged fraction of the time that the wind direction is perpendicular to the harbour entrance, causing additional exchange

Average wind speed

average wind speed during the periods that the wind is perpendicular to the harbour entrance (m/s)

Flush (f)

specify the flux of the small discharge in the harbour (m³/s)

Max. density difference flush

specify density difference between Flush (f) and seawater (kg/m³)

The model offers an option to specify a submerged dam, restricting vertical exchange:

Depth-MSL (mean sea level) of harbour entrance

if harbour entrance depth is less than river depth, specify here in (m)

Exchange area harbour mouth, below mean sea level

the model provides an estimate based on previously provided dimensions. By providing specifications of the submerged dam this value is automatically corrected

Height and Width of submerged dam

provide dimensions of the submerged dam

Remark: the model cannot handle harbours with dams or locks, that prevent complete emptying at low tide, and that are open only several hours per day during high tide, such as e.g. in the Channel area. In this case we recommend to provide an effective tidal range that matches the water level changes inside the harbour. Example: Sutton harbour (Plymouth, UK) has a tidal range of app. 5 m, a maximum harbour depth at high tide of 3.5 m and locks that close when the water depth in the harbour is 3m. The effective tidal range then becomes 0.5 m.

Creating a new compound

From the main menu choose button **Model**

From the **Compound dropdown box** select (new)

Press button **Edit** next to dropdown box

You will see the compound property window.

Required input	
Compound description	Advanced Photolysis (Test)
Compound name	Advanced Photolysis (Test)
Molecular mass	317.7 (g/mol)
Saturated vapour pressure at 20 °C	1.0E-06 (Pa)
Solubility at 20 °C	6.3E+00 (g/m3)

	Depth and 24 h averaged degradation rates			Half life in days at 20 °C	
	Water	Sediment		Water	Sediment
Degradation rate - abiotic - at 20 °C	3.82E-02	8.13E+00 (1/day)	<input checked="" type="checkbox"/> Use Advanced ...	1.81E+01 d	8.49E-02 d
Degradation rate - photolytic - at 20 °C	9.2E-01	0.0E+00 (1/day)		7.5E-01 d	0 d
Degradation rate - biological - at 20 °C	1.76E-01	6.3E-01 (1/day)		3.92E+00 d	1.1E+00 d
Kd (only for metals)	0.0	(m3/kg)			

Parameters which can be estimated (required for organic compounds)		Additional information, needed only when using estimate missing values	
Octanol-water partition coefficient Kow	0.9 (10 log Kow)	<input type="button" value="Estimate missing values"/>	
Partition coefficient Koc	4.0 (10 log Koc (MgOC))	Melting temperature	260.0 °C
Henry's constant at 20 °C	5.0E-05 (Pa.m3/mol)	Acid dissociation constant pKa	0.0 (-)

References

Cancel OK

Please specify the following parameters:

Compound description

use any description

Compound name

use any description

Molecular mass

specify mass in g/mol

Choose between metal and organic compounds

select option button. For the white boxes input parameters are required. Grey boxes indicate that no input is necessary

Check box if compound contains copper

check/uncheck box; this will activate the Cu speciation module in the results screen

Saturated vapour pressure

specify saturated vapour pressure at 20 °C in Pa

Solubility at 20 °C

specify solubility at 20 °C in mg/l

References

memo field

For organic compounds only:

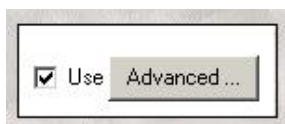
Degradation rate - abiotic -

specify first order depth averaged rate constant value at 20 °C . Please note that the resulting half life time is given on screen (screen (calculated as $T(1/2) = \ln(2)/k$)

Degradation rate - photolytic -

specify first order depth averaged rate constant value at 20 °C . Please note that the resulting half life time is given on screen (screen (calculated as $T(1/2) = \ln(2)/k$)

Advanced Photolytic degradation specification



By selecting this option the photolytic degradation will be calculated, based on specified wavelengths, absorption and quantum yields in the advanced screen (press button "Advanced" to access).

The photolysis module follows the parameterisation and routines in the EXAMS model of US-EPA (<http://www.epa.gov/ceampubl/swater/exams/exams>). Guidance for requirements for the evaluation of photolysis can further be found in a recent OECD proposal for a guideline for testing of chemicals (<http://www.oecd.org/dataoecd/45/3/39752963.pdf>)

Wavelength (nm)

provide the wavelength intervals for which absorption and Quantum-yield data can be entered. For up to 50 intervals data can be provided within the 280-850 nm range. The interval starts with the value entered and ends with the value in the next field.

Absorption

provide the molar absorptivity data (in $\text{cm}^{-1}(\text{M/L})^{-1}$) for the specific wavelength interval

Quantum-yield

provide the quantum yield for the specific spectral interval. The quantum-yield is the efficiency of the photochemical reaction and can be expressed in the number of moles of parent compound transformed to break down products per mole of photons absorbed, but usually is indicated as a dimensionless fraction.

Half-life-time in default OECD environments

Pressing the **Calculate** button shows the calculated overall (time and depth averaged) half-lives (in hours) and photolytic degradation rate constants (in days^{-1}) in the three OECD-EU default environments. Use the **Save** button to save the input-parameters and return to the main compound definition screen.

Advanced photolytic degradation

Absorption characteristics

Wavelength (nm) 280 - 850 nm	Absorption (1/cm ² mol/l)	Quantum yield (-/-)	Wavelength (nm) 280 - 850 nm	Absorption (1/cm ² mol/l)	Quantum yield (-/-)
280	11810	0.15	400	30	0.15
282.5	11632	0.15	410	30	0.15
285	10757	0.15	420	30	0.15
287.5	9243	0.15	430	30	0.15
290	7552	0.15	440	30	0.15
292.5	5950	0.15	450	30	0.15
295	4525	0.15	460	0	0
297.5	3487	0.15	470	0	0
300	2849	0.15	480	0	0
302.5	2537	0.15	490	0	0
305	2404	0.15	503.75	0	0
307.5	2448	0.15	525	0	0
310	2567	0.15	550	0	0
312.5	2730	0.15	575	0	0
315	2953	0.15	600	0	0
317.5	3190	0.15	625	0	0
320	3427	0.15	650	0	0
323.1	3695	0.15	675	0	0
330	4095	0.15	700	0	0
340	3710	0.15	725	0	0
350	2315	0.15	750	0	0
360	950	0.15	775	0	0
370	267	0.15	800	0	0
380	75	0.15	825	0	0
390	45	0.15	850	0	0

Half life time in default OECD environments		Half life (hours)	Rate (1/d)
The actual photodegradation rate depends on the selected environmental conditions and will be calculated at run-time. The values below give the values for three default scenarios.	OECD-EU Commercial harbour	6.15E+01	2.70E-01
	OECD-EU Marina	1.64E+01	1.01E+00
	OECD-EU Shipping lane	1.14E+01	1.46E+00

Calculate

Cancel Save

Pressing the Calculate button shows the calculated half-lives (in hours) and photolytic degradation rate constants (in days⁻¹) in the three OECD-EU default environments.

Note: the settings in the advanced photolysis screen need to be saved; on some computers the lower part of the input screen may be hidden behind the bottom menu bar of windows and the buttons **Cancel** and **Save** are not shown.

Degradation rate - biological

specify first order depth averaged value at 20 °C . Please note that the resulting half life time is given on screen (screen (calculated as $T(1/2) = \ln(2)/k$)

Octanol - water partition coefficient

specify log(Kow)

Koc

specify log(Koc) (l/kgOC)

Henry's constant

specify in Pa.m³/mol

for metals only:

Kd

specify in m³/kg

Parameters which can be estimated (option for organic compounds)

For preliminary screening purposes for compounds for which some basic data are missing, several simple well known QSAR calculation modules have been implemented, and can be called upon via this section of the screen: 1) estimation of Log Kow from water solubility and melting temperature; 2) calculation of Henry's Law Constant (H) from vapour pressure, water solubility and molecular mass; and 3) estimation of the organic carbon partitioning coefficient (Log Koc) from Log Kow data. The QSARs used are documented in the technical report of MAMPEC v1.4.

Some basic data (melting temperature, pKa) need to be provided via the **Additional information..** panel (right). When the fields for **Kow**, **Koc** and **H** are empty, pressing the **Estimate missing values** button will yield the predicted values (indicated as highlighted in yellow to indicate that the reliability of the predictions is uncertain). Further guidance for the estimation of compound properties can be found in the EU TGD documents and programs and databases provided by US-EPA (<http://www.epa.gov/opptintr/exposure/pubs/episuitedi.htm>)

Creating a new emission scenario

From the main menu choose button **Model**

From the **Emission dropdown box** a number of predefined default emission scenarios can be accessed. The OECD-EU scenarios and the default MAMPEC scenarios are already included and cannot be changed. To define a new scenario select either **(new)** or select one of the default scenarios as a basis and adapt and save under another name.

Press button **Edit** next to dropdown box

	Class 1	Class 2	Class3	Class 4	Class 5	
Length class	0-10	10-50	50-100	100-150	150-200	m
Surface area	20	120	450	3061	5999	m ²
# Ships at berth	0	0	57	25.5	24.5	/d
# Ships moving	0	0	8.75	2.15	2.05	/d
Application factor	0	100	100	100	100	%
Leaching rate (at berth)	4	ug/cm ² /d				
Leaching rate (moving)	4	ug/cm ² /d				

You will see the emission scenario input panel. The emission scenario input screen of the MAMPEC model consists of the following elements (symbols are explained in the main MAMPEC report):

- input block for the total **emission** (E_{tot}), either calculated by MAMPEC (based on the category-specific settings) or provided by the user if such a figure is known from a specific emission inventory study. In the latter case the user-provided total emission estimate overrides previous calculations
- input block for **shipping characteristics**. The user can define 10 categories (length categories is used as default) of ships and provide for each of these categories: the estimated surface area (A_i) per ship for each of these categories, the number of ships present in the harbour at berth (N_{ib}) or moving in the harbour (N_{im}), shipping lane/open sea sector, the application factor (A_{p_i} %) of the antifouling product applied.

- input block for **leaching rate** for ships **at berth** (LR_b) or **moving** (LR_m)

Please specify the following parameters:

Emission

in g/day if a total emission figure is known from separate studies. In case you want MAMPEC to calculate the emission, leave this field blank. A user provided emission estimate automatically overrides estimates made by MAMPEC. Please note that pressing the **calculate button** replaces the user-provided figure or blank field with the MAMPEC estimation. The fields **by moving ships** and **by ships at berth** contain the calculation results from MAMPEC and must be left blank in case a user-provided figure is used.

References

Memo field to include source data or other details

Length class

The user can specify labels for the (up to 10) length classes or other categories (length, DWT) for which surface area and shipping statistics (port arrivals) are known. The first 5 classes are indicated in the first screen. By pressing **More classes** the next 5 classes are present in the 2nd screen. An example of the default length classes is provided in the (non-editable) default scenarios.

Surface area

specify surface estimates for each of the (up to 10) categories. Default (wetted hull) surface areas are provided in the (non-editable) default scenarios and OECD-EU scenarios. For details of the surface estimation we refer to the MAMPEC main report.

ships at berth

specify the # of ships at berth, expressed as # present at any time of the day. See main report for instructions how this figure can be derived from total port arrivals and average residence time in the harbour.

ships moving

specify the # of ships moving, expressed as # present at any time of the day. See main report for instructions how this figure can be derived from total port arrivals and estimated average maneuvering time (arrival/departure) in the port.

application factor

specify the fraction (as %) of the ships painted with the specific product. Some (non-editable) default scenarios are provided for 100% and 20% application.

Leaching rate (at berth)

provide estimate for leaching rate (in microgram/cm²/day) for ships at berth. On recommendation of the CEPE-AFWG separate default figures are provided in the (non-editable) default scenarios (TBT: 4 ug/cm²/day; generic biocide: 2.5 ug/cm²/day) For Cu a value of 50 ug/cm²/day is recommended in the main report. In the new scenario option a default of 4 is used.

Leaching rate (moving)

provide estimate for leaching rate (in microgram/cm²/day) for moving ships, in case it is known that this affects the leaching rate. In the default scenarios this value is taken similar as the leaching rate of ships at berth. Please take notice that if this field in the new-scenario option is not changed a value of 4 is used.

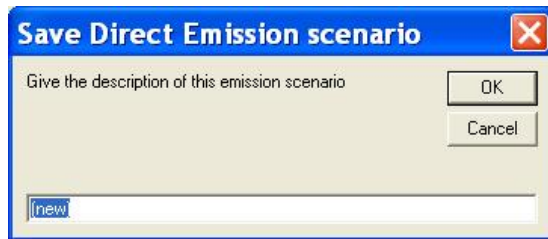
The default commercial harbour emission scenario is based on 12,539 ships per year (50% of port arrivals in 1996 in Rotterdam), which approximates the average number of port arrivals (11,916) during 1996 in 10 European ports (Genoa, Barcelona, Le Havre, London, Hamburg, Helsinki, Piraeus, Rotterdam, London and Felixstowe) and the shipping length-distribution of the port of Rotterdam (in 1996). The matching environment scenario is based on the hydrodynamics of Rotterdam and 50% of the port-area of Rotterdam.

OECD-EU scenarios

The environmental emission scenarios adopted for the Biocide Directive ² and approved for other OECD countries for commercial harbors, shipping lane, and marina have been included in the model.

OK - Saving the emission scenario

Pressing the OK button results in saving the emission scenario in the MAMPEC settings database. A pop-up window may appear asking to provide a unique name for the emission scenario.



² Van der Plassche E, Van der Aa E (2004) Harmonisation of environmental emission scenarios: an emission scenario document for antifouling products in OECD countries (ESD-PT21), Royal Haskoning, Nijmegen

Results screen

In this screen the final results calculated with MAMPEC and stored in the database are presented. The screen is accessed via the results button in the main start menu, or directly after a new calculation run.

Direct after a calculation you will see a pop-up box requesting to accept or adapt the proposed name to save this calculation (results and input). The proposed name is a combination of the scenarios for: environment, compound and emission. Another name can be provided by the user. Note that when pressing **Cancel** in the pop-up box the results can still be saved with the save as button

Results from previous runs can be accessed by selecting a run in the list-box under **Run**.

The screenshot shows the MAMPEC Result screen interface. At the top, there is a 'Run' section with a 'Filter' input field, a 'Refresh list' button, and a dropdown menu showing the selected run: 'Default commercial harbour Advanced Photolysis (Test) Default Commercial Harbour Biocide 100%'. A 'Delete run' button is also present.

Below this is an 'Information' panel with a table of run details:

Environment	Default commercial harbour
Compound	Advanced Photolysis (Test)
Emission	Default Commercial Harbour Biocide 100%
Load	12230.625 g/d
Background conc.	0.00E+00 ug/l

There is also a 'Memo' text area and an 'Update memo text' button.

At the bottom of the information panel, there are radio buttons for 'Harbour' (selected) and 'Surroundings'.

The main part of the screen is a 'Results' table with columns for 'Total conc.', 'Dissolved', 'Suspended matter', and 'Sediment after'. The 'Sediment after' column has a dropdown menu set to '10'.

Results	Total conc.	Dissolved	Suspended matter	Sediment after
Maximum concentration	7.46E-02 ug/l	7.36E-02 ug/l	2.10E-02 ug/g dw	4.41E-07 ug /g dw
95 % concentration	7.19E-02 ug/l	7.09E-02 ug/l	2.03E-02 ug/g dw	4.25E-07 ug /g dw
Average concentration	3.26E-02 ug/l	3.22E-02 ug/l	3.21E-03 ug/g dw	1.93E-07 ug /g dw
Median concentration	1.55E-02 ug/l	1.53E-02 ug/l	4.36E-03 ug/g dw	3.18E-08 ug /g dw
Minimum concentration	2.99E-03 ug/l	2.95E-03 ug/l	3.43E-04 ug/g dw	1.77E-08 ug /g dw

At the bottom of the screen, there are 'Cancel' and 'Print ...' buttons.

Delete run

activate to remove a run from the database. Removing a run does not affect the defined scenarios for environment, compound, and emission.

Save as

a copy of the selected run can be saved under a different name

Information

this panel summarizes information of the selected run: names of the scenarios for environment, compound and emission. The total load (g/d) of the emission scenario and settings for the background concentration (ug/L).

Filter / Refresh

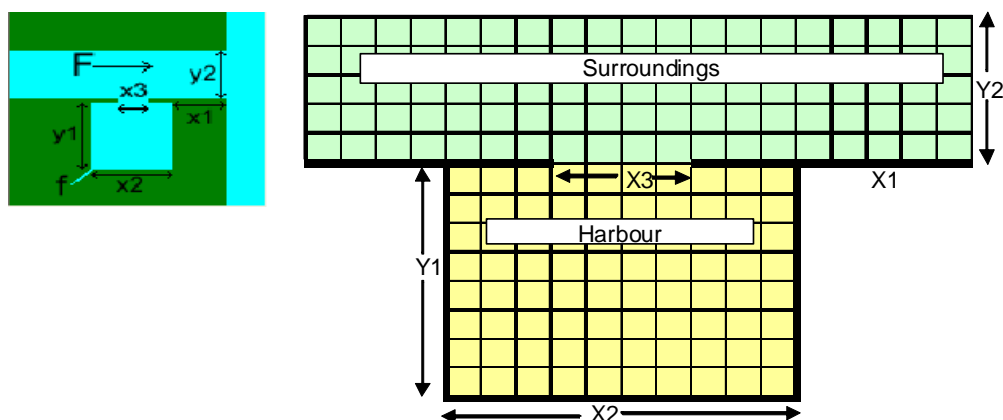
Results of other model runs can be selected via the list-box. With the **Filter** panel the user can select specific scenarios. Fill in some meaningful text string (e.g. OECD, or Cu) and only the model run names containing the specific text string will

then be presented . With the command **Show all** the complete list of model run names will be shown

Fill in some meaningful text string (e.g. OECD, or Cu) and press **Refresh list**. Only the model run names containing the specific text string will then be presented.

Results

The result window shows the calculated concentrations in the **Harbour** (left tab in bottom panel) and the **Surroundings** (right tab in bottom panel).



Concentrations are calculated for water (in ug/L, both dissolved and total, which includes compounds bound to SPM), suspended particulate matter (SPM; in mg/kg dry wt) and sediment (in ug/g dry wt). The DELWAQ module calculates concentrations for each grid cell. Summary statistics (maximum, P₉₅, average, median and minimum) for the spatial distribution in the harbour area and the surroundings are stored in the database and presented in the results-screen. An option to provide a graph of the spatial distribution is not supported in the current version.

As sediment mixing processes are slow, and attaining steady state may take years to decades, the user has an option to view the sediment concentration results for different time periods (1-10 year).

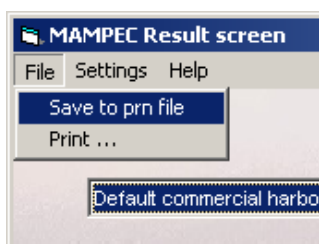
Conversions to SPM or sediment concentrations on an organic carbon basis need to be done manually (based on the POC and f_{oc} settings provided in the environment screen). However, advanced users may access the database of the model, as sediment and SPM concentrations in the model and database are handled on organic carbon basis (see note for advanced users).

Print

To display a print file with scenario settings, results of the calculations, date and model version number, press the button **Print**. The shown text can be send to the printer (using the **Print...** button) or can be saved as a *.txt or *.rtf file (using the ":" **Save as..** button). The *.txt file can be imported in programs like Excel.(suggestion: select ":" as the field separator).

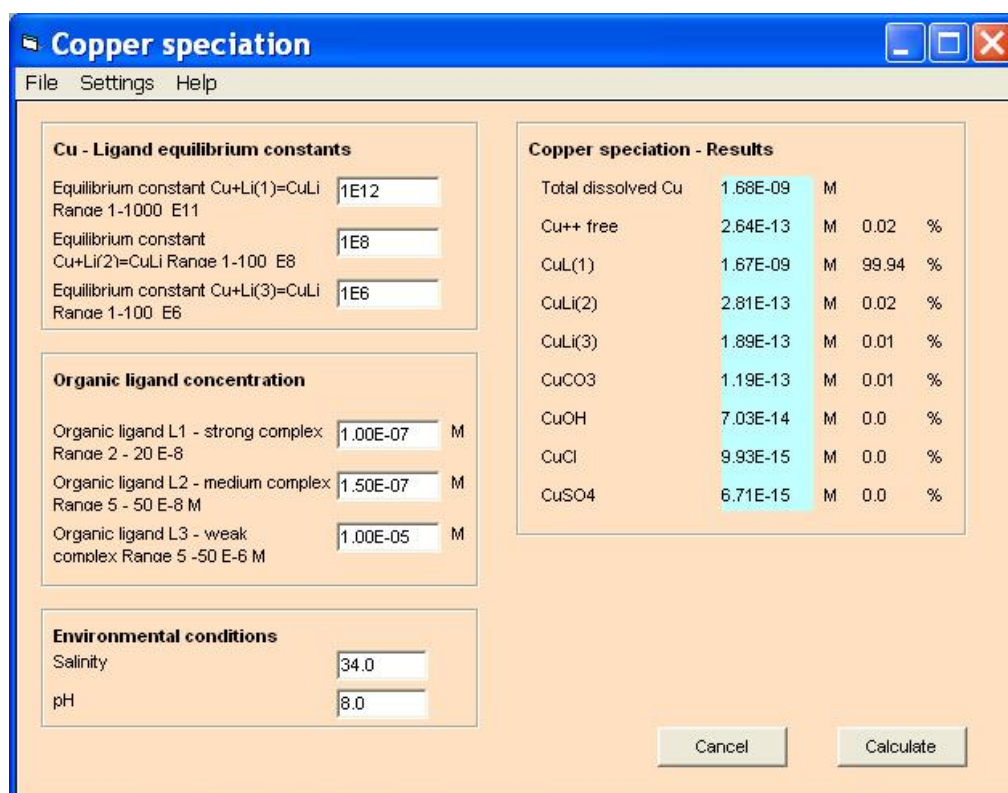
Save to prn file

In the top menubar, pressing **File** and **Save to prn** results in saving the results in a *.prn file, that can be imported in Excel. Import in Excel with tab as the field separator



Speciation

If the compound contains copper you can access the copper speciation module by pressing button **Speciation** (this button is invisible for non copper containing compounds).



The screenshot shows the "Copper speciation" window. It has a menu bar with "File", "Settings", and "Help". The window is divided into several sections:

- Cu - Ligand equilibrium constants:**
 - Equilibrium constant Cu+Li(1)=CuLi Range 1-1000 E11:
 - Equilibrium constant Cu+Li(2)=CuLi Range 1-100 E8:
 - Equilibrium constant Cu+Li(3)=CuLi Range 1-100 E6:
- Organic ligand concentration:**
 - Organic ligand L1 - strong complex Range 2 - 20 E-8: M
 - Organic ligand L2 - medium complex Range 5 - 50 E-8 M: M
 - Organic ligand L3 - weak complex Range 5 -50 E-6 M: M
- Environmental conditions:**
 - Salinity:
 - pH:
- Copper speciation - Results:**

Total dissolved Cu	1.68E-09	M		
Cu++ free	2.64E-13	M	0.02	%
CuL(1)	1.67E-09	M	99.94	%
CuLi(2)	2.81E-13	M	0.02	%
CuLi(3)	1.89E-13	M	0.01	%
CuCO3	1.19E-13	M	0.01	%
CuOH	7.03E-14	M	0.0	%
CuCl	9.93E-15	M	0.0	%
CuSO4	6.71E-15	M	0.0	%

Buttons for "Cancel" and "Calculate" are located at the bottom right.

In this screen the hypothetical speciation of Cu following a 3 organic ligand model is presented (see help topic copper complexation). The user can provide different stability constants for the defined ligands and different settings for pH and Salinity and with **Calculate** estimate the expected speciation

Importing and exporting data

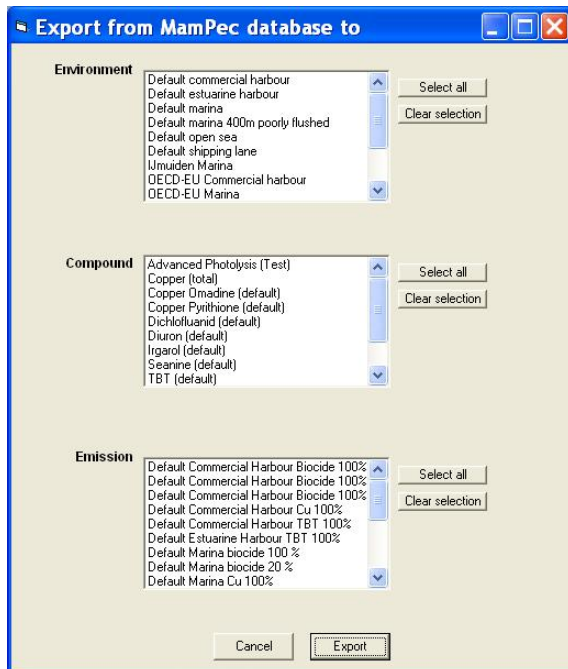
In MAMPEC v2.0 the settings of scenarios can be exported or imported from an access database. This allows the easy exchange of settings between different users and avoids errors with typing new settings. Results of the model runs do not need to be exchanged, as MAMPEC can easily rerun the different scenarios. The database (mampec.mdb) itself is password protected, in order to safeguard integrity of the model settings of the different scenarios and model runs..

Export settings

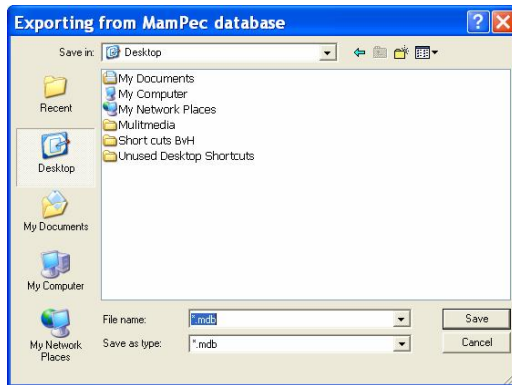
Select <File> and <Export> from the top menu of the first screen;



you now see a screen in which you can select the scenarios to be exported. Multiple scenarios can be selected and exported. Select the scenarios by clicking. Use **Select all** and **Clear selection** if necessary.



To export the file press <**Export**> and provide a file-name and save at the location that you wish (e.g. My Documents/MAMPEC Exercises)



Import data

Importing files works in a similar way. Select **File** and **Import** from the top menu of the first screen of MAMPEC and select the location and the access-file with the settings you want to import. You now see a screen in which you can select the scenarios to be imported. Multiple scenarios can be imported in the same run. Select one or all of the available scenarios and press **Import**. The settings are now being imported and will be added to the existing mampec.mdb.

References

Additional background information and a description of the model formulations can be found in the publications indicated below. Most of these documents have been included as pdf-files with the model.

Background and modelformulations MAMPEC v1.4

Van Hattum B, Baart AC, Boon, JG (2002) Computer model to generate predicted environmental concentrations (PECs) for antifouling products in the marine environment - 2nd edn. accompanying the release of Mam-Pec version 1.4, IVM Report (E-02/04), Institute for Environmental Studies, Vrije Universiteit, Amsterdam, Netherlands.

OECD-EU environmental emission scenarios for BPD:

Van der Plassche E, Van der Aa E (2004) Harmonisation of environmental emission scenarios: an emission scenario document for antifouling products in OECD countries (ESD-PT21), Royal Haskoning, Nijmegen

Emission scenarios and hydrodynamic background:

Van Hattum, B., A. Baart, and J. Boon (2006). Emission estimation and chemical fate modelling of antifoulants. In: Konstantinou, I.K. (Ed.). Antifouling Paint Biocides. Handbook of Environmental Chemistry Vol. 5/O, Springer Verlag, Berlin (Germany), pp. 101-120.

(pdf copy not included with model)

Photolysis, exchange at low tidal conditions, new harbour scenario in MAMPEC v2.0:

Boon, J, A. Markus, A. Baart (2007). Antifouling model to predict environmental concentrations (MAMPEC) - Technical background additional features of MAMPEC version. Delft Hydraulics / WL, Delft, Netherlands.

Application to regions with low tidal exchange:

Baart AC (2003) Mam-Pec, application at low exchange conditions. Report Z3662, WL| Delft Hydraulics, Delft

The model and documentation are freely available via websites of CEPE (www.cepe.org) and the organizations of paint producers (www.antifoulingpaint.com). A helpdesk and support-website will be operational soon at delftsoftware.wldelft.nl