



SHIPLY

SHIPLY

Life Cycle Tool

Technical MANUAL

University of Strathclyde

Department of Naval Architecture, Ocean &
Marine Engineering

SHIPLY

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- SOCIETAL CHALLENGES

- Smart, Green And Integrated Transport

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Table of Contents

Contents

Table of Contents	II
List of Figures	III
List of Tables	IV
1. Introduction	1
2. Java Version	2
3. Installation guide	3
4. Welcome page	6
5. Design and general information	7
6. Construction.....	9
6.1. Machinery.....	9
6.1.1. 12 Engine	9
6.1.2. 13 Battery.....	10
6.1.3. 14 Engine Transportation and 15 Battery Transportation.....	10
6.1.4. 16 Installation.....	11
7. Operation.....	12
7.1. 22 Operation profile	12
7.2. 23 Fuel oil 24 Lub oil.....	12
7.3. 25 Transportation	12
8. Maintenance.....	13
9. Scrapping	14
9.1. 31 Scrapping.....	14
9.2. 32 Transport	14
9.3. 33 Energy	14
9.4. 34 Material	14
10. Report.....	15
11. Comparison	16
12. General guidance	18

List of Figures

Figure 1 Welcome page with objectives, impacts, and approaches.....	6
Figure 2 Design tab for inputting general information.	8
Figure 3 Machinery application in construction tab.	9
Figure 4 Selections of the database.....	10
Figure 5 Default values in the engine database.	10
Figure 6 Default values in the transportation database.	11
Figure 7 Default values in installation/electricity database.	11
Figure 8 Oil database with default values.....	12
Figure 9 Material database.....	14
Figure 10 Comparison panel.....	16
Figure 11 Comparison results.	17

List of Tables

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1. Introduction

SHIPLYS LCT is designed and developed to evaluate ships' economic and environment protection performances considering the cradle to the grave life cycle of ships. Connected with the database developed by NTUA, SHIPLYS LCT is able to determine the life cycle cost, environmental impact, and risk RPN numbers and also convert all the factors into monetary terms for combination and comparison purposes. To achieve this goal, significant activities from four main life stages (construction, operation, maintenance, and scrapping) are identified and assessed using relevant data and formulas.

This manual describes how to use the SHIPLYS LCT, what functions are included and possible issues.

2. Java Version

This software is coded by the Eclipse and NetBeans which are shown below

Eclipse:

Version: Neon.3 Release (4.6.3)

Build id: 20170314-1500

NetBeans:

Product Version: NetBeans IDE 8.1 (Build 201510222201)

Updates: NetBeans IDE is updated to version NetBeans 8.1 Patch 1

Java: 1.8.0_102; Java HotSpot(TM) 64-Bit Server VM 25.102-b14

Runtime: Java(TM) SE Runtime Environment 1.8.0_102-b14

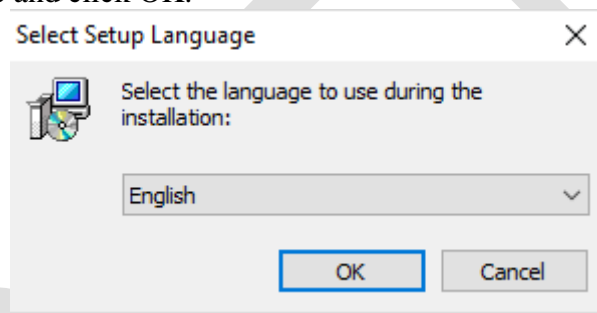
3. Installation guide

Perform installation corresponding to your Windows computer

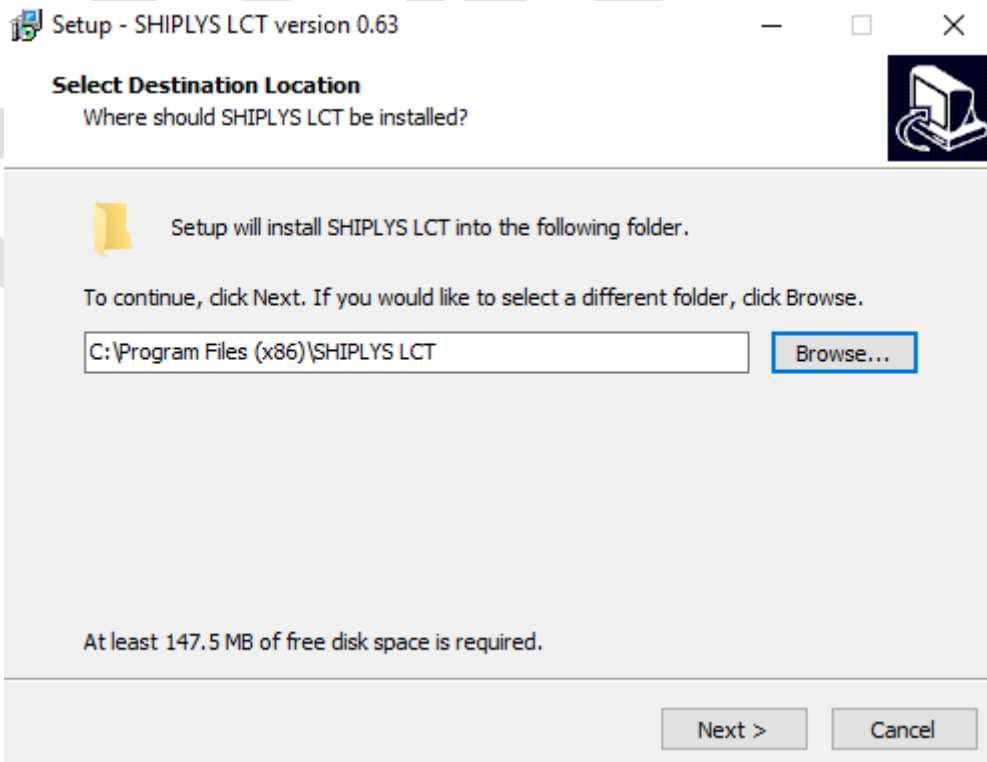
Notes:

- To perform installation, you must log onto Windows with the “Administrator” account; this enables the installation and uninstallation of client software.
- Even when you have logged on Windows with the “Administrator” account, the [User Account Control] dialog box may appear. In this case, click a button for allowing the operation, such as [Continue], and then continue.
- To complete this procedure, you must be logged in as an administrator

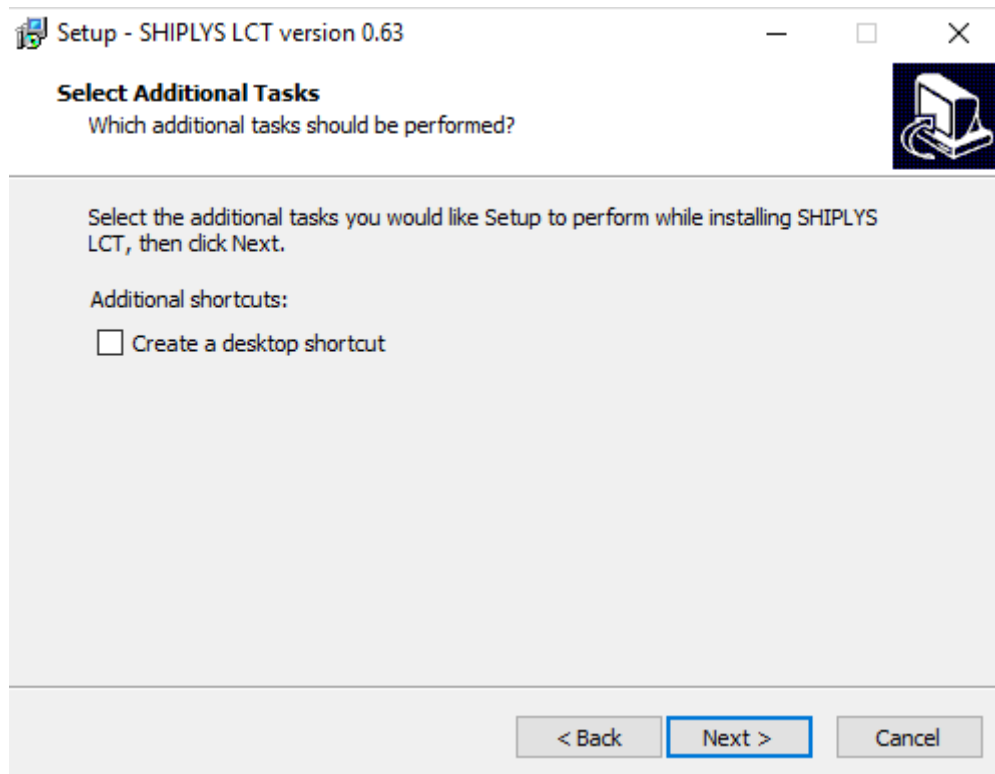
1. Click [LCT_setup V0.63.exe]
If the [User Account Control] dialog box is displayed, click [YES].
2. Select the language and click OK.



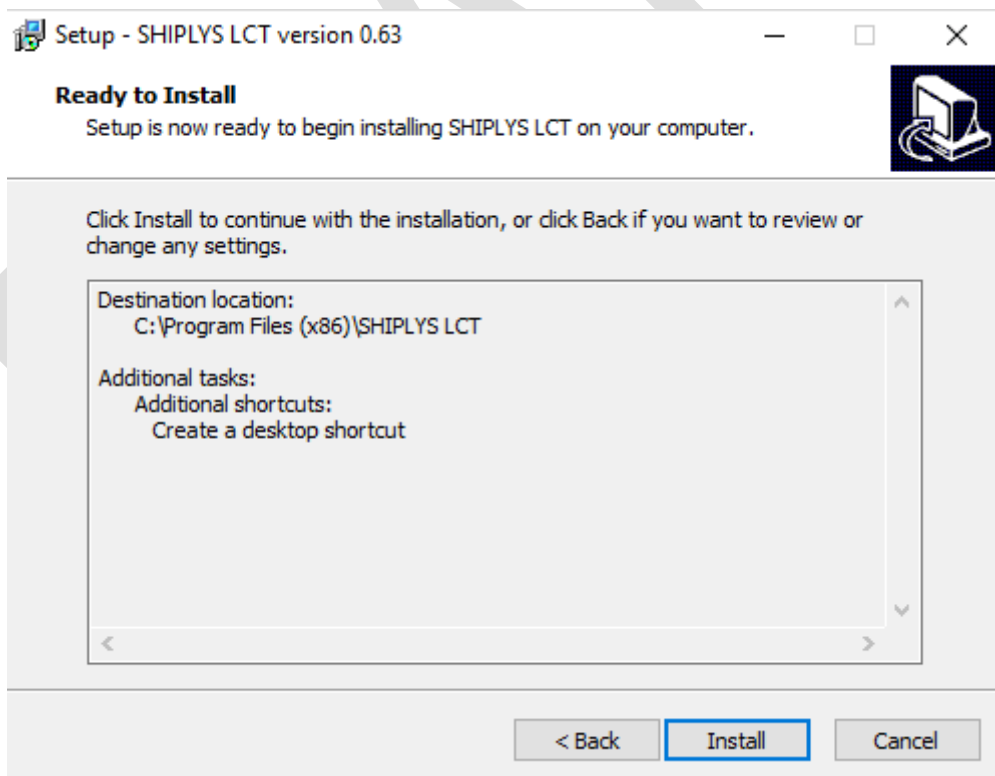
3. Select a location to store the project (or use the default location) and click Next.



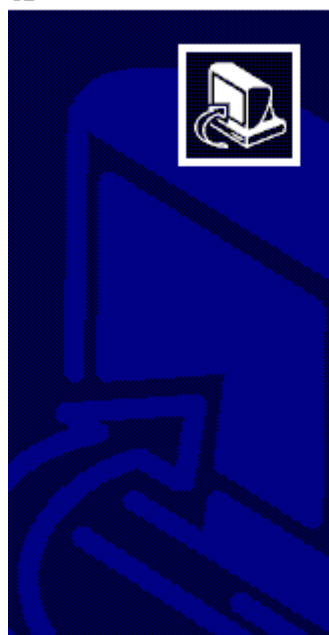
4. Select whether you would like to create a desktop shortcut or not. And click Next.



5. Check the installation location and addition tasks. And click Install.



6. Installation processing.
7. Choose whether you would like to launch the software after the installation. And click Finish



Completing the SHIPLYS LCT Setup Wizard

Setup has finished installing SHIPLYS LCT on your computer. The application may be launched by selecting the installed shortcuts.

Click Finish to exit Setup.

☒ Launch SHIPLYS LCT

Finish

4. Welcome page

Once the user starts the software the first page that comes up is the “Welcome” page. This page introduces the objectives of the software as well as the impact expectation and approaches used (Figure 1).

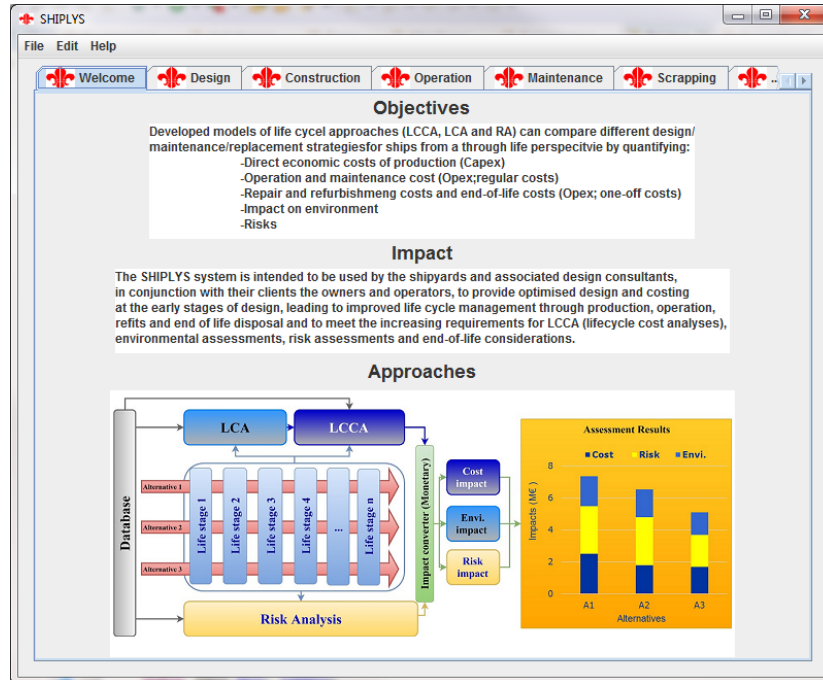


Figure 1 Welcome page with objectives, impacts, and approaches.

The Software has been developed in a user-friendly way and the user is just required to complete the information in the different tabs. Detailed information on the different tabs is given in the next sections.

5. Design and general information

After welcome page, the first tab is the “Design” tab which requires the user to input information regarding the evaluation target, such as case name, life span, present value, interest rate, sensitivity level and ship total price. Figure 2 shows the design tab and end user will need to input values/text in the text field (text box with default – “Value”) as no database is related to the information on this page. Below is a description of the input required in the Design tab:

- 0 Case Name: the user should introduce the name under which the report generated from the software will be saved as;
- 1 Life Span: is the total life cycle period of the target ship;
- 2 Present Value: can be considered by entering “1” in the text field; if not considering, enter code “0”;
- 3 Interest: interest rate is needed to calculate Present Value; If not calculating Present Value leave it as “0”;;
- 4 Sensitivity level: There are three sensitivity levels involved: average, minimum and maximum; These levels are related to the three sets of data for all parameters within the databases (average value, minimum value which is 10% below average and maximum value which is 10% above average); to apply the average value, enter “0” in the text field; to apply minimum value, enter “1” and to apply maximum value, enter “2”;
- 5 Ship total price: is estimated by the user and it is the related to Risk Priority Number.

Once all the above information is introduced proceed to the next tab.

The screenshot displays the SHIPLYS software interface with the 'Design' tab selected. The interface features a menu bar (File, Edit, Help) and a tabbed navigation system with tabs for Welcome, Design, Construction, Operation, Maintenance, and Scrapping. The main content area is organized into six input fields arranged in a 2x3 grid:

- 0 Case Name:** Includes a dropdown menu labeled '-select database-' and a text input field with the placeholder 'Value'.
- 1 Life Span:** Includes a dropdown menu labeled '-select database-' and a text input field with the placeholder 'Value'.
- 2 Present Value:** Includes a dropdown menu labeled '-select database-' and a text input field with the placeholder 'Value'.
- 3 Interest:** Includes a dropdown menu labeled '-select database-' and a text input field with the placeholder 'Value'.
- 4 Sensitivity level:** Includes a dropdown menu labeled '-select database-' and a text input field with the placeholder 'Value'.
- 5 Ship total price:** Includes a dropdown menu labeled '-select database-' and a text input field with the placeholder 'Value'.

The screenshot shows the SHIPLYS software interface with the 'Design' tab selected. The interface contains six input fields arranged in a 2x3 grid, each with a dropdown menu and a text input area. The fields are labeled as follows:

0 Case Name	1 Life Span	2 Present Value
-select database- Hybrid ship 1	-select database- 30	-select database- 0
3 Interest	4 Sensitivity level	5 Ship total price
-select database- 0.01	-select database- 0	-select database- 12000000

Figure 2 Design tab for inputting general information.

6. Construction

6.1. Machinery

One main task of the construction phase is the selection of machinery, including purchase, transportation and installation. Figure 3 shows the Machinery application in the construction phase.

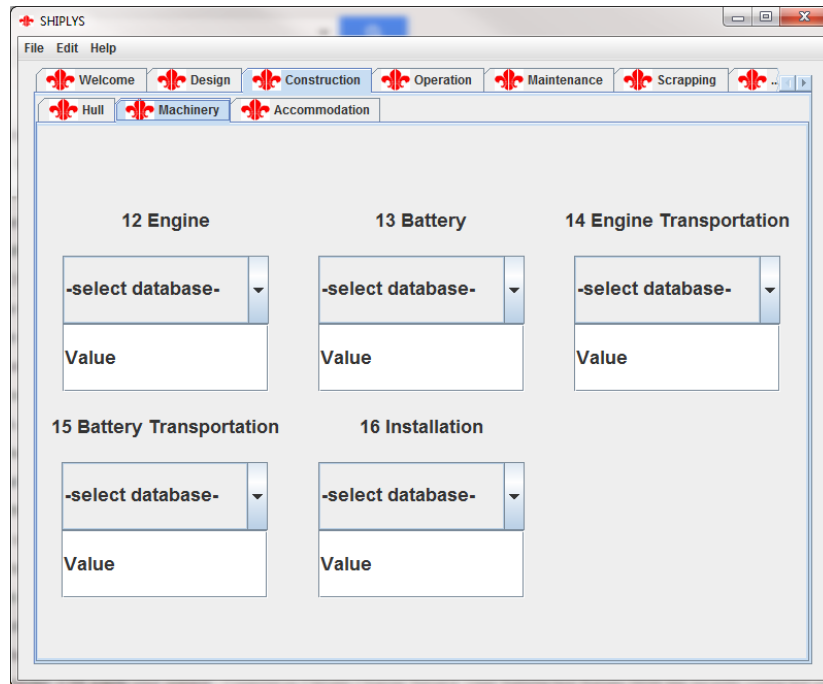


Figure 3 Machinery application in construction tab.

6.1.1. 12 Engine

The selection of engine is achieved by selecting “Engine” from the database list (see Figure 4).

The values for the parameters in the database can be edited based on user’s data if the database does not include the engine installed on the case study ship; This will be the case for all other activities in the software, this means that the selection of database and modification of data will be the same for all databases. Figure 5 shows the “Engine” database with its default values.

There is a risk assessment model in the database which needs the user to use their own judgements on the risk hazards identified:

- Frequency presents the frequency level of the hazard (1~10);
- Consequence presents the consequence level of the hazard (1~10);
- Mitigation presents the mitigation level of the action (1~10);
- The RPN is calculated based on the three values described above: $RPN = F * C * M$.

After entering new data or making decision on using default values, click “Update”. This procedure is the same for all databases used.

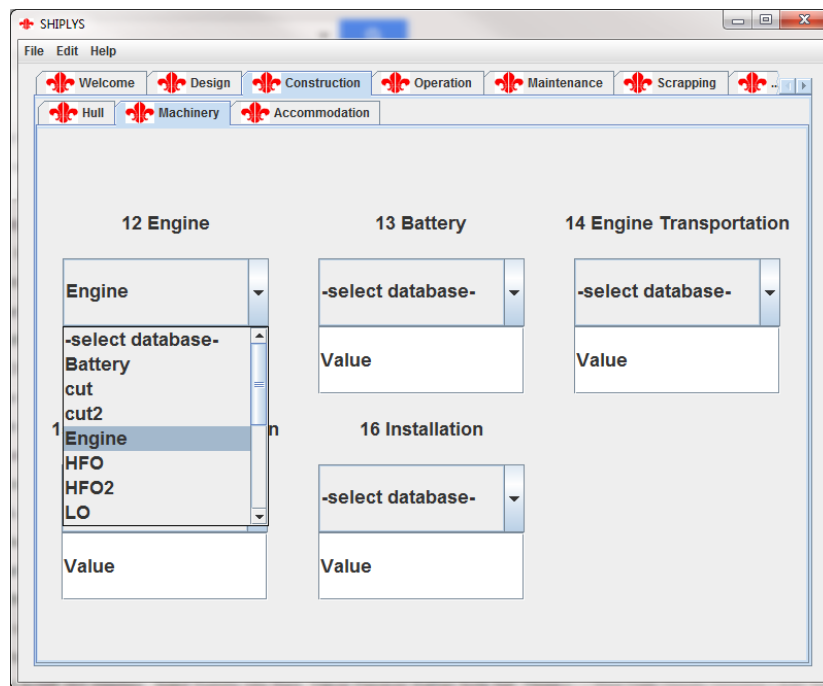


Figure 4 Selections of the database.

The screenshot shows the '12 Engine Database' window. It contains a table titled 'Database selection' with columns: Type, Average, Minimum, Maximum, and Unit. The table lists various engine parameters and their default values. Below the table is an 'Update' button.

Type	Average	Minimum	Maximum	Unit
Engine_const...	Average	Minimum	Maximum	Unit
No. of Engines	3	3	3	
Engine weight	3.2	2.88	3.52	ton
Engine price	10000	9000	11000	€
Engine output	106.8	96.12	117.48	kW
SFOC	212.6	191.34	233.86	g/kWh
SFOC_LO	50	45	55	g/kWh
Risk hazard	Frequency	Consequence	Mitigation	
No.1 G/E fails	2	2	1	
No.2 G/E fails	2	2	1	
No.3 G/E fails	2	2	1	
No.1 Motor Fa...	2	6	2	
No.2 Motor Fa...	2	6	2	
No.1 DC Varia...	1	6	2	
No.2 DC Varia...	1	6	2	

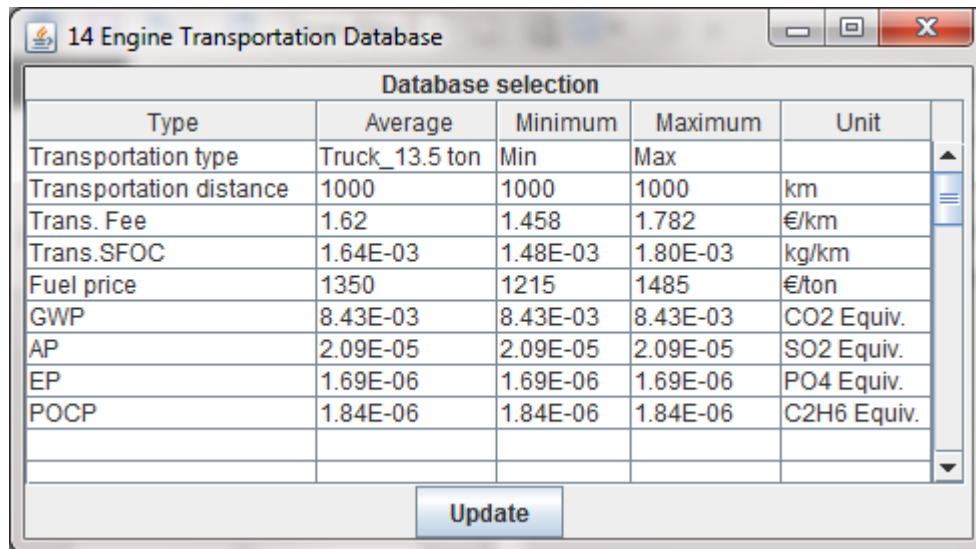
Update

Figure 5 Default values in the engine database.

6.1.2. 13 Battery

6.1.3. 14 Engine Transportation and 15 Battery Transportation

Two databases are currently available to be used in the transportation sections of the software. These are called “truck” and “truck2” and each of them includes the distance, fee, SFOC, fuel price and environmental impact parameters shown as Figure 6.



The screenshot shows a window titled "14 Engine Transportation Database". Inside, there is a table titled "Database selection" with the following data:

Type	Average	Minimum	Maximum	Unit
Transportation type	Truck_13.5 ton	Min	Max	
Transportation distance	1000	1000	1000	km
Trans. Fee	1.62	1.458	1.782	€/km
Trans.SFOC	1.64E-03	1.48E-03	1.80E-03	kg/km
Fuel price	1350	1215	1485	€/ton
GWP	8.43E-03	8.43E-03	8.43E-03	CO2 Equiv.
AP	2.09E-05	2.09E-05	2.09E-05	SO2 Equiv.
EP	1.69E-06	1.69E-06	1.69E-06	PO4 Equiv.
POCP	1.84E-06	1.84E-06	1.84E-06	C2H6 Equiv.

Below the table is an "Update" button.

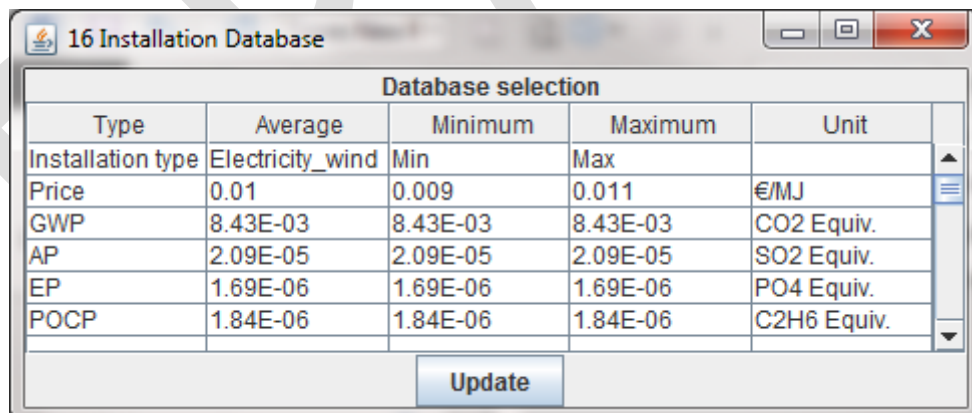
Figure 6 Default values in the transportation database.

Similarly, users can modify the database based on their own data and click “Update” before returning to the Machinery tab

Advice: the data related to environmental impacts should be kept as default because these characteristics will not be varied greatly.

6.1.4. 16 Installation

The installation section considers the energy used for installation which could be from different sources. For example, for Scotland, the electricity could be from wind power. There are currently two databases that can be selected, these are “windpower” and “windpower2”. Each database includes the price and the environmental impact parameters as presented in Figure 7.



The screenshot shows a window titled "16 Installation Database". Inside, there is a table titled "Database selection" with the following data:

Type	Average	Minimum	Maximum	Unit
Installation type	Electricity_wind	Min	Max	
Price	0.01	0.009	0.011	€/MJ
GWP	8.43E-03	8.43E-03	8.43E-03	CO2 Equiv.
AP	2.09E-05	2.09E-05	2.09E-05	SO2 Equiv.
EP	1.69E-06	1.69E-06	1.69E-06	PO4 Equiv.
POCP	1.84E-06	1.84E-06	1.84E-06	C2H6 Equiv.

Below the table is an "Update" button.

Figure 7 Default values in installation/electricity database.

7. Operation

7.1. 22 Operation profile

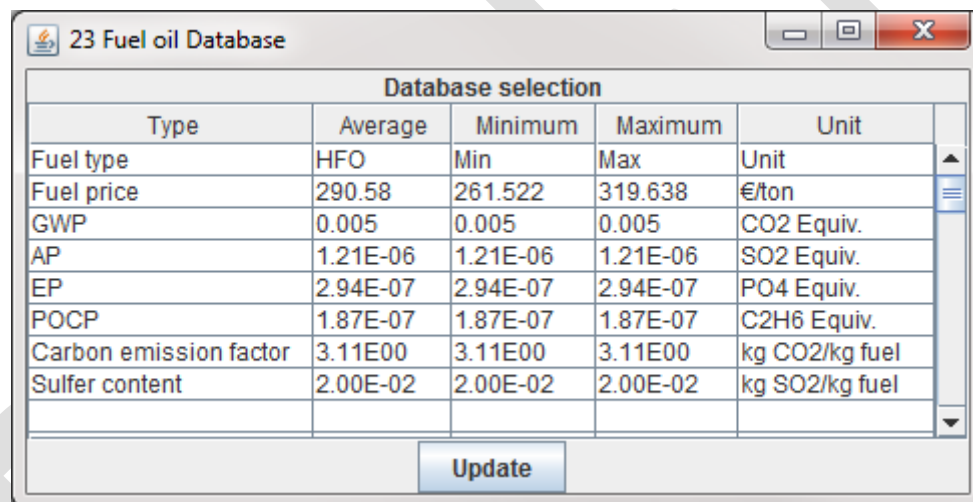
Operation profile considers the working hours only as the SFOC and power output are defined in the construction phase. Here the user should select the “Operation” database from the list.

As before the user can modify the database based on their own data and click “Update” before returning to the Operation tab.

7.2. 23 Fuel oil 24 Lub oil

There are two types of oil to be considered: fuel oil and lub oil. The parameters of lub oil will be considered for fuel oil but three more parameters are included in fuel oil database: carbon emission factor, sulphur content and NO_x factor. These three are required to calculate the CO₂ and SO_x generated while burning of fuel.

For fuel oil the user can select either the “HFO” or the “HFO2” database while for lub oil the user can select the “LO” or the “LO2” database. An example of the database is shown in Figure 8.



The screenshot shows a software window titled "23 Fuel oil Database". Inside, there is a table titled "Database selection". The table has five columns: "Type", "Average", "Minimum", "Maximum", and "Unit". The rows list various fuel oil parameters with their default values. At the bottom of the window, there is an "Update" button.

Type	Average	Minimum	Maximum	Unit
Fuel type	HFO	Min	Max	Unit
Fuel price	290.58	261.522	319.638	€/ton
GWP	0.005	0.005	0.005	CO2 Equiv.
AP	1.21E-06	1.21E-06	1.21E-06	SO2 Equiv.
EP	2.94E-07	2.94E-07	2.94E-07	PO4 Equiv.
POCP	1.87E-07	1.87E-07	1.87E-07	C2H6 Equiv.
Carbon emission factor	3.11E00	3.11E00	3.11E00	kg CO2/kg fuel
Sulfur content	2.00E-02	2.00E-02	2.00E-02	kg SO2/kg fuel

Figure 8 Oil database with default values.

7.3. 25 Transportation

The transportation section in the Operation tab relates to transportation of fuel and/or lub oil. If not applicable leave as “0”.

See Section 6.1.3 for further details.

8. Maintenance

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9. Scrapping

9.1. 31 Scrapping

In this section the user should select the “Scrapping” database from the dropdown menu. The only parameter defined in “Scrapping” database is the price of scrapping.

The user can modify the database based on their own data and click “Update” before returning to the Scrapping tab.

9.2. 32 Transport

See Section 6.1.3 for further details.

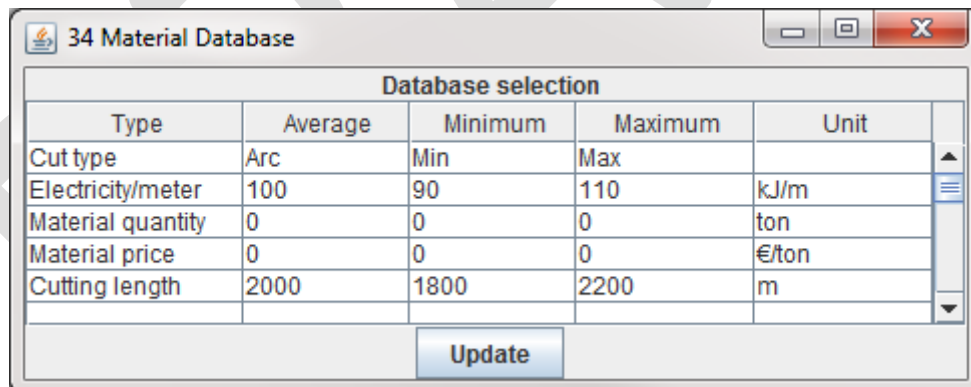
9.3. 33 Energy

This section relates to the energy consumption during scrapping phase. See Section 6.1.4 for further details.

9.4. 34 Material

Two databases can be used from the list, the “cut” or the “cut2” database. For activities like cutting, there will be not only energy consumption but also materials used to be considered. The user can input the energy consumption based on operation (such as kJ/meter, kJ/m²). Also, if there is any material consumption related to scrapping, it can be included by considering the material quantity and price as shown in Figure 9.

The user can modify the database based on their own data and click “Update” before returning to the Scrapping tab.



The screenshot shows a window titled "34 Material Database". Inside, there is a table titled "Database selection" with the following data:

Type	Average	Minimum	Maximum	Unit
Cut type	Arc	Min	Max	
Electricity/meter	100	90	110	kJ/m
Material quantity	0	0	0	ton
Material price	0	0	0	€/ton
Cutting length	2000	1800	2200	m

Below the table is an "Update" button.

Figure 9 Material database.

10. Report

After selection and modification of parameters/databases the software is ready to run. In the Report tab, the user should click the “Calculate” button. This will run the software and generate a report and several graphs.

The initial report of will be shown in the text area and a report (excel file) for further comparison will be generated and saved (with the name given in the “Design” tab) in the “Report” folder within the folder where the software is installed..

The graphs created will be for Global Warming Potential (ton CO₂e), Acidification Potential (ton SO₂e), Eutrophication Potential (ton PO₄e), Photochemical Ozone Creation Potential (ton C₂H₆e), Life Cycle Cost (USD), Risk Assessment (RPN) and Total Life Cycle Cost (USD). These graphs can be copied into other software and also be saved as images (PNG).

11. Comparison

The comparison tab is used to compare different alternatives/designs after generating individual reports. The user can select the generated reports described in Section 10 and load them by clicking the button “select file”. The default names of different alternatives/designs are shown in Figure 10 and can be changed by the user by deleting/writing over the default text. The user will be able to compare up to three reports. Click the “Compare Results” button and a plot comparing the Total Life Cycle Costs results will be generated as shown in Figure 11.

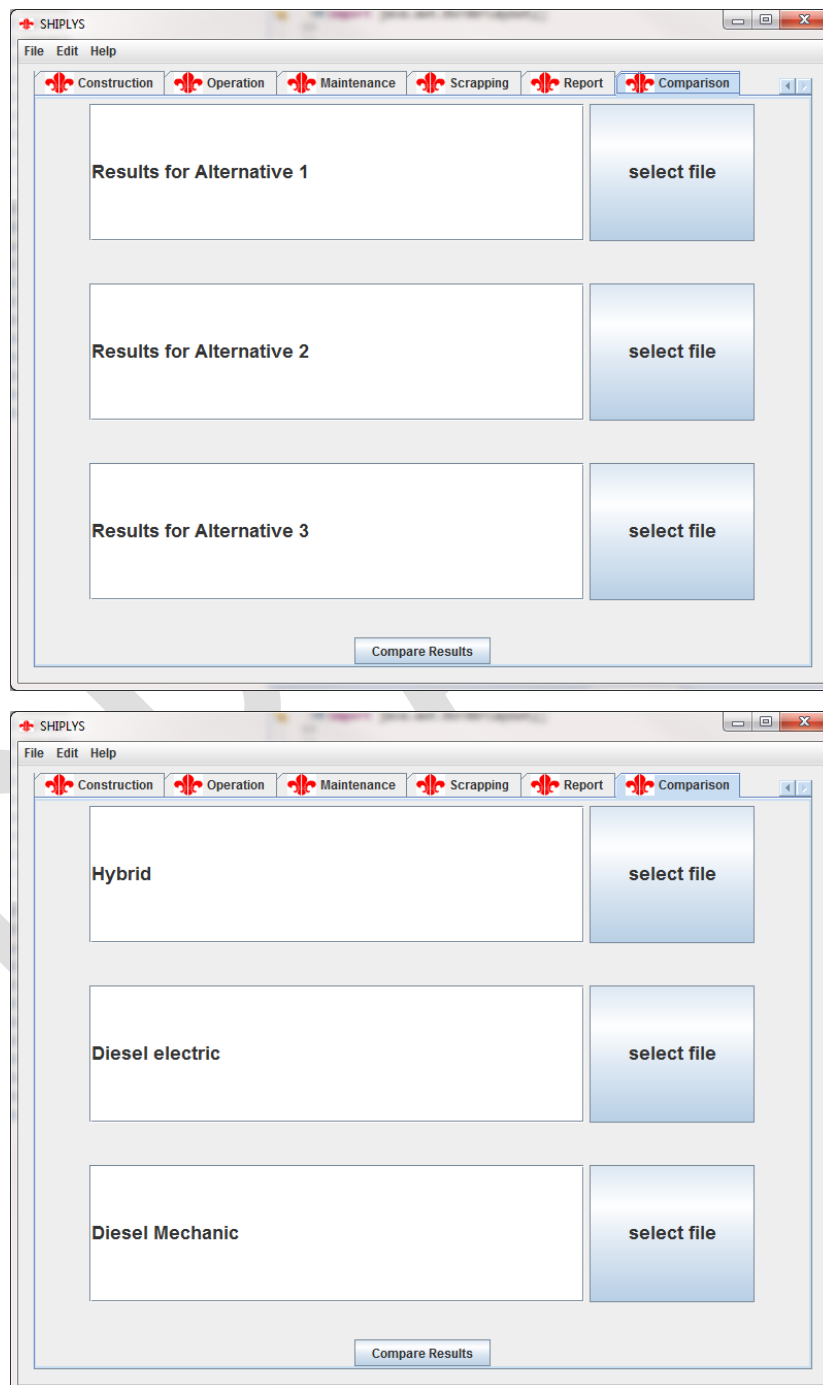


Figure 10 Comparison panel.

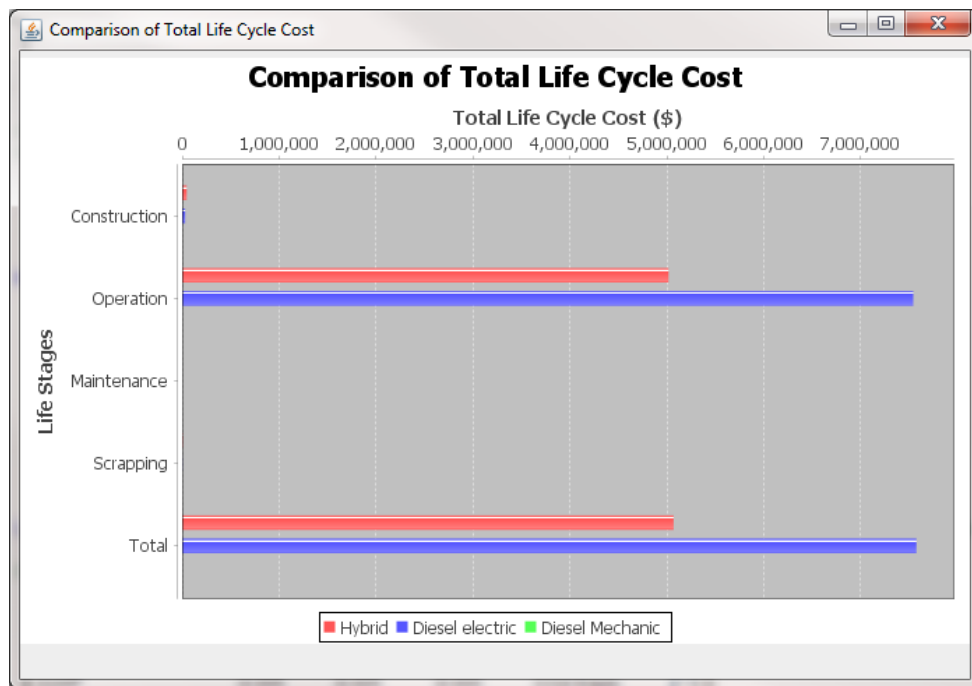


Figure 11 Comparison results.

12. General guidance

When using databases the user must click “update” before returning to main menu. This will load the database and any changes made to their parameters.

Note that whenever the user restarts the software the databases go back to the default values.

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