# THE DEVELOPMENT OF A SOFTWARE FOR CALCULATION OF LAYDAYS, DEMMURAGE AND DESPATCH

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**Abstract**: A software product development involves stages such as: analysis, design, writing, testing, debugging and maintenance. Although they are considered separate steps, there is a strong interdependent relationship among them, the ultimate goal being to obtain an efficient software solution that can evolve over time.

In accordance with this, a personal challenge was to develop a software in an academic scope with a friendly-use interface which can easy substitute the classical method calculation of lay-days, demmurage and despach for a ship which can load or unload cargo, helpful for both teachers and students. The main objective was to emphasize in more detail through the stages aforementioned the embodiment of the software EaSyCalc V.0.1., developed entirely in the Matlab software environment.

Key words: lay-days, demurrage, despatch, ship, Matlab

### 1. Introduction

Generally speaking, the code implementation represents the text writing using the format and the syntax of a desired programming language.

In our case the chosen language was what the Matlab software environment offers. It is very important to mention that Matlab is at the same programming time а language and а development system that integrates computation, visualization and programming in a user-friendly environment (easy-to-use), problems and solutions being expressed in an accessible mathematical language.

During the implementation stage of the code basically two files result. The first is the gross algorithm implementation and the second is the result of working with graphical user interface option, GUI, which the same Matlab environment software offers. Even if the two files are independently created, in the assembly stage both of them have been required.

The particularity that the final form of the program possesses is that it is an executable program that allows the user to install the software on any Windows operating computer, without a version of Matlab needing to have been installed.. The explanation for this is simple: the step to create the executable is performed using a compiler called Matlab Compiler, compiler integrated with Matlab software, which in turn uses a routine called Matlab Compiler Runtime (MCR). In larger terms, this routine is an independent set of shared libraries that are installed automatically with the first installation of an executable file created in Matlab, allowing the program running to run under optimal conditions.

# 2. The testing stage of EaSy Calc Software V .01.

In order to test our software we must perform an activity sequence of testing such as the following:

• The input dates

Based on the data provided by the charter party and the history of loading/discharge operations, the following data will be taken into account as input parameters for our program:

-Vessel name: MV Rapsody

-Commodity name: soya beans

-Cargo quantity: 6000 t

-Lay days: fixed

-Vessel arrived on roads: 16/11/2000 09:00

- -NOR tendered: 17/11/2000 10:30
- -Time allowed for loading/discharging): 04 00 00
- -Operation type: loading
- -Clause type: SHEX
- -Demurrage rate: 4000\$

-Despatch rate-: 2000\$

- Loading commenced: Thursday November, 17 2000 at 13:00

- Loading completed: Friday, 25 November 2000 at 17:00

- The laydays will start at 08.00 the next working day, the day the ship immediately forwarded the NOR

- The period from Friday 12:00 to Monday 08:00 will not count as lay days even if used

- Lay days worked before to the start of lay days will not count as lay days.

• The output data

According to the classical solving method, the result would be that we have 2 days and 13 hours of demurrage. After the conversion of this period to money, it will finally result that the charterer will have to pay the ship-owner demurrage worth of \$ 10.166.

• The execution environment

| y Calc SOFTWARE V.0.1 |                   |                     |                 | 1.44               |         | 100        |               |  |           |
|-----------------------|-------------------|---------------------|-----------------|--------------------|---------|------------|---------------|--|-----------|
| Help                  |                   |                     |                 |                    |         |            |               |  |           |
|                       |                   |                     |                 | -                  |         |            |               |  |           |
|                       |                   |                     | [               | - General informa  | tion    |            |               |  |           |
|                       |                   |                     |                 | Vessel name        | ····· N | IV Rapsody |               |  |           |
|                       |                   |                     |                 | Commodity nam      | e 🧃     | soya beans |               |  |           |
|                       |                   |                     |                 | Correct ground it. |         |            |               |  |           |
|                       |                   |                     |                 | Cargo quantity.    |         | 6000 t     |               |  |           |
|                       |                   |                     |                 | Lay days           | fixe    | d 🔻        |               |  |           |
| Fixed lay days        |                   |                     |                 |                    |         |            |               |  |           |
| Vessel arrived        |                   |                     | Date Day        | From               | To      | Percentage | Time to count | Remarks                                      |           |
| on roads              | 16/11/2000; 09:00 | dd/mm/yyyy<br>hh:mm | 18-Nov-2000 Sat | 08:00              | 12:00   | 100        | 00 04 00      | timpul nu conteaza dupa ora 12:00            |           |
| NOR tendered          | 17/11/2000: 10:30 | dd/mm/yyyy          | 19-Nov-2000 Sun | 00:00              | 00:00   | 0          | 00 00 00      | timpul nu conteaza                           | Add rov   |
|                       |                   | hh:mm               | 20-Nov-2000 Mon | 08:00              | 24:00   | 100        | 00 16 00      | timpul nu conteaza pana la ora 08:00         | Dalata es |
| Laytime               | 18/11/2000; 08:00 | dd/mm/yyyy          | 21-Nov-2000 Tue | 00:00              | 24:00   | 100        | 01 00 00      | se lucreaza                                  | Delete 10 |
|                       |                   |                     | 22-Nov-2000 Wed | 00:00              | 24:00   | 100        | 01 00 00      | se lucreaza                                  |           |
| loading/discharging   | 04 00 00          | DD HH MM            | 23-Nov-2000 Thu | 00:00              | 24:00   | 100        | 01 00 00      | se lucreaza                                  |           |
|                       |                   |                     | 24-Nov-2000 Fri | 00:00              | 24:00   | 100        | 01 00 00      | se lucreaza;staliile au expirat la ora 04:00 |           |
| Operation type        | Loading           | •                   | 25-Nov-2000 Sat | 00:00              | 24:00   | 100        | 01 00 00      | se lucreaza                                  |           |
|                       |                   |                     | 26-Nov-2000 Sun | 00:00              | 17:00   | 100        | 00 17 00      | incarcarea s-a terminat la ora 17:00         |           |
| Clause type           | SHEX              | •                   |                 |                    |         |            |               |  |           |
| Demurrage rate        | 4000              | s                   |                 |                    |         |            |               |  |           |
| Despatch rate         | 2000              | S                   |                 |                    |         |            |               |  |           |
|                       |                   | 1                   | Results 1       |                    |         |            | - Resul       | is 2   |           |
|                       |                   |                     | Total time used |                    |         | DD HH MM   |               | Demurrage                                    |           |
|                       | Calculate         |                     | Time lost       |                    |         | DD HH MM   |               | Despatch                                     |           |
|                       |                   |                     | Time saved      |                    |         | DD HH MM   |               |  |           |
|                       |                   |                     |                 |                    |         |            |               |  |           |

Figure 1 - The execution environment - Example

### Program execution results

| EaSy Calc SOFTWARE V.0.1 |                   |                     |                |         |  |                       |   |              |  |             |
|--------------------------|-------------------|---------------------|----------------|---------|--|-----------------------|---|--------------|--|-------------|
| File Help                |                   |                     |                |         |  |                       |   |              |  |             |
| Finad law dave           |                   |                     |                |         | — General informat<br>Vessel name<br>Commodity name<br>Cargo quantity.<br>Lay days | tion M<br>e s<br>fixe | IV Rapsody<br>soya beans<br>6000 t<br>d |              |  |             |
| Vessel arrived           |                   |                     | Date           | Dav     | From   | To                    | Percentage                              | Time to coun | t Remarks                                    |             |
| on roads                 | 16/11/2000; 09:00 | dd/mm/yyyy<br>hh:mm | 18-Nov-2000 S  | Sat Sat | 08:00  | 12:00                 | 100                                     | 00 04 00     | timpul nu conteaza dupa ora 12:00            |             |
| NOR tendered             | 17/11/2000: 10:30 | dd/mm/yyyy          | 19-Nov-2000 S  | Sun     | 00:00  | 00:00                 | 0                                       | 00 00 00     | timpul nu conteaza                           | Add row     |
|                          | 111112000, 10.00  | hh:mm               | 20-Nov-2000 M  | Non     | 08:00  | 24:00                 | 100                                     | 00 16 00     | timpul nu conteaza pana la ora 08:00         | Delete rous |
| Laytime                  | 18/11/2000; 08:00 | dd/mm/yyyy          | 21-Nov-2000 T  | ue      | 00:00  | 24:00                 | 100                                     | 01 00 00     | se lucreaza                                  | Delete row  |
| Time allowed for         |                   | 101.000             | 22-Nov-2000 \  | Ved     | 00:00  | 24:00                 | 100                                     | 01 00 00     | se lucreaza                                  |             |
| loading/discharging      | 04 00 00          | DD HH MM            | 23-Nov-2000 T  | Thu     | 00:00  | 24:00                 | 100                                     | 01 00 00     | se lucreaza                                  |             |
|                          |                   |                     | 24-Nov-2000 F  | ri      | 00:00  | 24:00                 | 100                                     | 01 00 00     | se lucreaza;staliile au expirat la ora 04:00 |             |
| Operation type           | Loading           | •                   | 25-Nov-2000 \$ | Sat     | 00:00  | 24:00                 | 100                                     | 01 00 00     | se lucreaza                                  |             |
|                          |                   | _                   | 26-Nov-2000 S  | Sun     | 00:00  | 17:00                 | 100                                     | 00 17 00     | incarcarea s-a terminat la ora 17:00         |             |
| Clause type              | SHEX              | •                   |                |         |  |                       |   |              |  |             |
| Demurrage rate           | 4000              | s                   |                |         |  |                       |   |              |  |             |
| Despatch rate            | 2000              | S                   |                |         |  |                       |   |              |  |             |
|                          |                   |                     | - Results 1—   |         |  |                       |   |              | ts 2   |             |
|                          |                   | 1                   | Total ti       | me used | 06 13 0  | IO I                  | DD HH MM                                |              | Demurrage 10166 \$                           |             |
|                          | Calculate         |                     | Tim            | e lost  | 02 13 0  | 00                    | DD HH MM                                |              | Despatch 0                                   |             |
| <u>.</u>                 |                   |                     | Time           | saved   | 00 00 0  | 0                     | DD HH MM                                |              |  |             |
|                          |                   |                     |                |         |  |                       |   |              |  |             |

Figure 2 – The result after the execution

• Analyze the results

Comparing the results obtained with the classical method we can see that with Easy Calc Software we obtained the same one.

• Associate test verdict

The program passed the check test.

# 3. Other adjacent functions of the EaSy Calc V.0.1 softaware

In accordance with the previous section, the most important part, namely the functionality of the software, was successfully fulfilled. The following part is desired to be a general overview of the entire program and also of other adjacent functions that the program has.

To start with, when the program is launched in execution a start window opens (Figure 3).

launch, the program it is necessary to activate the START button from the start window. A new window will open (Figure 4). In this new window there is a menu which consists of two items: File and Help (Figure 5), but also a panel which allow us to set essential dates such as: vessel name, commodity name, the amount of freight, and also the most important, the type of lay days used in solving the problem: fixed or determinable. When we select the type of lay days, we have the option to start a new record (Figure 6) or to run a program already stored (Figure 7).

Also in the File tab beside the option presented before there are functions such as: Save, and New. The first of which, Save, allows us to save an already solved problem in a file (Figure 8), and the second the beginning of a new record.

The second tab, Help contains two sub-items: How to use (Figure 9) and About (Figure 10)



Figure 3 – Starting window

| EaSy Calc SOFTWARE V.0.1 |                       |   |
|--------------------------|-----------------------|---|
| File Help                |                       | , |
|                          | - General information |   |
|                          | Vessel name           |   |
|                          | Conmodity name        |   |
|                          | Cerm maeility         |   |
|                          |                       |   |
|                          | Lay days txed         |   |
|                          |                       |   |
|                          |                       |   |
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Figure 4 – Main window

| 📣 Ea | aSy Calc SOFTWARE V.0.1           |  |
|------|-----------------------------------|--|
| File | Help                              |  |
|      | New                               |  |
|      | Save fixed lay days               |  |
|      | Save determinable lay days        |  |
|      | Load fixed lay days example       |  |
|      | Load deteminable lay days example |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |
|      |                                   |  |

Figure 5 - Sequence program menu

|                            |           |                     |           | - î    | - General information - | -     | -          |               | 1        |         |    |   |
|----------------------------|-----------|---------------------|-----------|--------|-------------------------|-------|------------|---------------|----------|---------|----|---|
|                            |           |                     |           |        | Vessel name,            | • —   |            |               |          |         |    |   |
|                            |           |                     |           |        | Commodity name          |       |            |               |          |         |    |   |
|                            |           |                     |           |        | Cargo quantity          |       |            |               |          |         |    |   |
|                            |           |                     |           |        | Index                   | -     | - 11       |               |          |         |    |   |
| Tradition down             |           |                     |           |        | Ley ceys                | fixed | 1          |               | l.,      |         |    |   |
| - raed ay days             |           |                     |           |        |                         |       | 1.         | <b>.</b>      |          |         |    |   |
| Vessel arrived<br>on roads |           | dálitatní lyyyy     | Liate     | Uay    | From                    | 10    | Percentage | Time to count |          | Kemarks |    |   |
| NOR tendered               |           | ddinniyyyy          |           |        |                         |       |            |               |          |         |    | A |
| The F                      |           | htunn               |           |        |                         |       |            |               |          |         |    | 1 |
| Laytme<br>commences        |           | ddinniyyyy<br>hh.mn |           |        |                         |       |            |               |          |         |    |   |
| Time allowed for           |           | DO HH MM            |           |        |                         |       |            |               |          |         |    |   |
| keding/discharging         |           |                     |           |        |                         |       |            |               |          |         |    |   |
| Operation type             | Loading   |                     |           |        |                         |       |            |               |          |         |    |   |
|                            | 1         |                     |           |        |                         |       |            |               |          |         |    |   |
| Clause type                | SHEX      | 2                   |           |        |                         |       |            |               |          |         |    |   |
| Demurrage rate             |           | s                   |           |        |                         |       |            |               |          |         |    |   |
| Descelate colo             | -         |                     |           |        |                         |       |            |               |          |         |    |   |
|                            |           | _ •                 | Results 1 |        |                         |       |            | - Results Z   |          |         |    |   |
|                            |           |                     | Total tim | e used | -                       |       | THH MM     |               |          |         |    |   |
|                            |           | 1                   |           |        | -                       |       |            |               | venunsye |         | 2  |   |
|                            | Calculate |                     | Time      | lost   |                         | DC    | ) HH MM    |               | Despatch | _       | \$ |   |
|                            |           |                     |           |        |                         |       |            |               |          |         |    |   |

Figure 6 - New record for fixed lay days

| elp                   |                   |            |              |          |                                |       |                           |                  |  |        |
|-----------------------|-------------------|------------|--------------|----------|--------------------------------|-------|---------------------------|------------------|--|--------|
|                       |                   |            |              |          | General informa<br>Vessel name | tion  | MV Rapsody                | ]                |  |        |
|                       |                   |            |              |          | Commodity name                 |       | Commodity name soya beans |                  |  |        |
|                       |                   |            |              |          | Cargo quantity.                |       | 6000 t                    | l.               |  |        |
|                       |                   |            |              |          | Lay days                       |       | fixed                     | 1                |  |        |
| - Fixed lay days      |                   |            |              | 1        |                                |       |                           | 4.<br>           |  |        |
| Vessel arrived        | 10/11/2000-00-00  | ddimmionou | Date         | Day      | From                           | T     | o Percent                 | ige Time to coun | it Remarks                                   |        |
| on roads              | 10/11/2000, 03:00 | hh:mm      | 18-Nov-2000  | Sat      | 08:00                          | 12:00 | 100                       | 00 04 00         | timpul nu conteaza dupa ora 12:00            | 444    |
| NOR tendered          | 17/11/2000; 10:30 | ddimmlyyyy | 19-Nov-2000  | Sun      | 00:00                          | 00:00 | 0                         | 00 00 00         | timpul nu conteaza                           |        |
| Lautera               | 10/11/2000-09-00  | htem       | 20-Nov-2000  | Mon      | 08:00                          | 24:00 | 100                       | 00 16 00         | timpul nu conteaza pana la ora 08:00         | Delete |
| commences             | 10/11/2000, 00.00 | hh:mm      | 21-Nov-2000  | Tue      | 00:00                          | 24:00 | 100                       | 01 00 00         | se lucreaza                                  |        |
| Time allowed for      |                   | 00.000.000 | 22-Nov-2000  | Wed      | 00:00                          | 24:00 | 100                       | 01 00 00         | se lucreaza                                  |        |
| loading/discharging - | 04 00 00          | UU HH MM   | 23-Nov-2000  | Thu      | 00:00                          | 24:00 | 100                       | 01 00 00         | se lucreaza                                  |        |
|                       |                   |            | 24-Nov-2000  | Fri      | 00:00                          | 24:00 | 100                       | 01 00 00         | se lucreaza;staliile au expirat la ora 04:00 |        |
| Operation type        | Loading           | •          | 25-Nov-2000  | Sat      | 00:00                          | 24:00 | 100                       | 01 00 00         | se lucreaza                                  |        |
|                       | -                 |            | 26-Nov-2000  | Sun      | 00:00                          | 17:00 | 100                       | 00 17 00         | incarcarea s-a terminat la ora 17:00         |        |
| Clause type           | SHEX              | •          |              |          |                                |       |                           |                  |  |        |
| Demurrage rate        | 4000              | s          |              |          |                                |       |                           |                  |  |        |
| Despatch rate         | 2020              | S          |              |          |                                |       |                           |                  |  |        |
|                       |                   |            | - Results 1- | 5        |                                |       |                           | - Resu           | its 2  |        |
|                       |                   |            | Total        | tme used | 06 13 1                        | 00    | DO HH MM                  |                  | Demurrage stores S                           |        |
|                       |                   |            |              |          |                                |       |                           |                  | 10100  |        |
|                       | Calculate         |            | Ti           | me lost  | 02 13                          | 00    | DD HH MM                  |                  | Despatch 0 S                                 |        |
| -                     |                   | -          | Tim          | e saved  | 00 00                          | 00    | DO HH MM                  |                  |  |        |

Figure 7 - Example stored in the program

| 🎗 Tools * 📓 🕙 * 词   |       | 🕴 Screen 1 | -2 of 2 🔹 🄌   | Uiew Options 🔹 🗙 Close |
|---|-------|------------|---|------------------------|
|   |       |            |   |                        |
| STANDARD TIME SHEET   |       |            | 21-Nov-2000 Tue 00:00 24:00 100   | 01 00 00               |
| 1.Vessel name: MV Rapsody   |       |            | se lucreaza<br>22-Nov-2000 Wed 00:00 24:00 100  | 01 00 00               |
| 2.Commodity name: soya beans  |       |            | 23-Nov-2000 Thu 00:00 24:00 100<br>se lucreaza  | 01 00 00               |
| 3.Cargo quantity: 6000 t  |       |            | 24-Nov-2000 Fri 00:00 24:00 100   | 01 00 00               |
| 4.Lay days: fixed   |       |            | se lucreaza; stallile au expirat la bra 04:00<br>25-Nov-2000 Sat 00:00 24:00 100<br>se lucreaza | 01 00 00               |
| 5.Vessel arrived on roads: 16/11/2000; 09:00                        |       |            | 26-Nov-2000 Sun 00:00 17:00 100   | 00 17 00               |
| 6.NOR tendered: 17/11/2000; 10:30                                   |       |            | 12 matul time unode 02 10 00  |                        |
| 7.Laytime commences: 18/11/2000; 08:00                              |       |            | 14 mina last.02 12 00   |                        |
| 8.Time allowed for loadind/discharging: 04 00 (                     | 00    |            | 14.11me 1036.02 13 00   |                        |
| 9.Operation type: Loading   |       |            | 15.Time saved:00 00 00  |                        |
| 10.Clause: SHEX   |       |            | 16.Demurrage:10166\$  |                        |
| 11.Rate off demurrage:4000 \$                                       |       |            | 17.Despatch:0\$   |                        |
| 12.Rate of despatch: 2000 \$  |       |            |   |                        |
| 13.Laytime calculation  |       |            |   |                        |
| 18-Nov-2000 Sat 08:00 12:00<br>timpul nu conteaza dupa ora 12:00    | ) 100 | 00 04 00   |   |                        |
| 19-Nov-2000 Sun 00:00 00:00<br>timpul nu conteaza                   | ) 0   | 00 00 00   |   |                        |
| 20-Nov-2000 Mon 08:00 24:00<br>timpul nu conteaza pana la ora 08:00 | ) 100 | 00 16 00   |   |                        |
|   |       |            |   |                        |

Figure 8-Save a new record

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| 🛃 EaSy Calc V.0.1 Help  |  |
|---|--|
| EaSy Calc V.0.1 Help<br>EaSy Calc V.0.1<br>SOFTWARE PROGRAM FOR THE CALCULATION OF LAYDAYS,<br>DEMURRAGE AND DESPATCH<br>The program has a menu bar with 2 tabs. First of them called File has 5<br>items: New, Save lay days fixed, Save lay days determinable, Load lay<br>days fixed example, Load lay days determinable example. The second,<br>is called Help and contain 2 sub items: How to use, and About.<br>The principal part of the program is concerned in the first menu.<br>•The first item New allow us to begin a new registration and solve the<br>problem we have. |  |
| problem we have.<br>•Save fixed lay days alow us to save a problem with fixed kay days,<br>already solved in a word file<br>•Save determinable lay days alow us to save a problem with<br>determinable lay days, already solved in a word file<br>•Load fixed lay days- alow us to load a stored example.<br>•Load determinable lay days-alow us to load a stored example.  |  |
| ок  |  |

Figure 9-How to use

| About EaSy Calc V.0.1   | X |
|---|---|
|   |   |
| FaSy Calc V 0 1 Software  |   |
| (C) The MathWorks, Inc.   |   |
| (-),  |   |
| Written by Elena Bebo   |   |
|   |   |
| The program was completely made by using the Matlab   |   |
| language. The purpose of accomplishing such a program<br>was strictly academic, namely helping the students and |   |
| professors when it comes to solving the problems based<br>on the calculation of lavdays, demurrage and despatch |   |
| · · · · · · · · · · · · · · · · · · ·   |   |
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Figure 10-About

### Conclusion

The main objective of developing such a software was to accomplish another way of solving, in which teachers, students, and those interested can address and solve problems involving lay days, demurrage and despatch.

On the one hand, this method, based on the classic solution, namely that presented within classes of Commercial Operation of the ship, has managed to create an innovative environment from the point of view of graphic presentation and in terms of solving speed.

On the other hand, when we regard the entire process as a whole and because the research had a technological product as final goal, accomplishing such a program could be viewed as bringing a small but visible contribution to what is called the technological influence change upon phases of economic cycles

However, we must take into consideration the fact that the program is a first version and with any software that appears in versions, further improvement is desired, such as the possibility of including several clauses, printing functionality directly from the program and why not, improved graphics.

Personally, I believe that my goal was achieved, thus succeeding in completing a project through which I can emphasize my personal interest for two important things, namely solving problems involving lay days, demurrage and despatch, and my passion for the Matlab language.

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