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| CALCULATE THE ESTIMATED TANKER BERTHING TIME BASED ON THE AMOUNT OF ETHYLENE LOADED*M. YUSUF, SUGIYANTO, YUDHIYONO(**yudhiyono82@gmail.com**),* *1)Afiliasi & Alamat Penulis Beserta Kode Pos* *Untuk Keperluan Blind Review, Nama, Afiliasi dan alamat tidak perlu ditulis sampai artikel dinyatakan diterima* *Jl. Marunda Makmur No. 1 Cilincing, Jakarta Utara. Jakarta 14150* |
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***ABSTRACT***

One of the problems that coauses dweling time remain high is the uncertainty of loading and unloading time also the time for documents processing. Impact this uncertainty is an additional cost being charged to ships by the authorities because of additional berthing time. Based on the berthing time report it is necessary to calculate the ideal time for processing document. Ship Document Processing include the clearence in document, processing document when the ship enter the port. Clearence out is processing document before the ship leave the port. Loading/Unloading proess includes of loading/unloading preparation. Loading/unloading preparation activities for Ethylene must be carried out by following appropriate procedures, this is because ethylene is volatile and flammable hazardous material. In fact Activities involving dangerous goods are regulated separately ini International Maritime Organisation Regulations.

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| *Kata Kunci : Berthing Time, Loading,Unloading* |

1. **INTRODUCTION**

Along with the devlopment of increasingly sophisticated technology, ships as a main of transportation at sea have progressed a lot in term of zise and technology used. At this time various kinds of cargo can be transported by using of ships. The type of ship used to transport cargo in liquid or gas form is a tanker.

Ethylene is a dangerous material because it volatile and flammable, therefore any activities involving hazardous materials is specifically regulated by International Maritime Organisation, the International Cobvention on safety of life at Sea (Solas) chapter VII and Standar “Carriage of Dangerous Goods” (Rukavina 2020). For officer on duty on Liquified gas Tanker must have minimum requirement qualification as regulated in Intenational Convention on Standar of Training, Certification and Watchkeeping for seafarers 2010 (STCW 2010) Chapter V Regulation V 1-2-1 for Basic qualification for liqufied gas tanker cargo operations and Chapter V Regulation V 1-2-2 for Advance qualification for liqufied gas tanker cargo

Activities loading/Unloading Ethtylene from and to the ship must comply with strict procedures and also carried out by competence officer on duty, to reduce the risk during loading/unloading process.

Ship berthing time for Ethylene cargoes consists of three different process, Clearence in process, loading/unloading process, Clearence out process. Based on

Based on the berthing time report for ships with eteline cargo, the estimated berthing time is calculated. It is hoped that with this calculation more certain ertimated berthing time, it will be easier to scheduling ships to enter the port. It is also to make sure the productivity process loading/unloading more eficient without ignoring safety factor..

1. **METHODE**

According on the data activity report of ship visiting at PT XXX which carries out clearence in activities, loading/unloading activities and Clearence out activities, Statistic calculations will be carried out to obtain a more precise time estimation, for each activities during the berthing time. From statistical calculations It is hoped that this can be used as a benchmark for each activity, so that a more certain berthing time can be estimated.

In order to obtain a more certain estimate of berthing time, it is necessary to calculate the average time of clearance in, loading/unloading, clearance out, normality test of for clearance in, loading/unloading, clearance out, correlation between amount of cargo on loading/unloading time, as well as the regression between of the amount of cargo on loading/unloading time.

1. **RESULT AND DISCUSSION**

When the ship docks at the port there are three different activities, that is clearance in process which documents are checked just before the loading and unloading of goods is carried out, the next activity is the process of unloading or loading of goods into or from the ship, the last process is Clearance out is the process inspection of documents after the process of unloading or loading the ship and before the ship is permitted to leave the port.

Based to Ship Visiting data report at PT XXX with ethylene cargo from August 2018 to July 2019 the following data is Obtained:

* 1. **Clearance In and Clearance Out Process**

Table 1 Time Table of CI and CO Process

Table 2 Statistic of CI and CO Process

|  |
| --- |
| **Descriptives** |
|  | *Clearance In* | *ClearanceOut* |
| Statistic | Std. Error | Statistic | Std. Error |
| Mean | 2.75 | .117 | 4.17 | .119 |
| 95% Confidence Interval for Mean | Lower Bound | 2.51 |  | 3.93 |  |
| Upper Bound | 2.98 |  | 4.41 |  |
| 5% Trimmed Mean | 2.77 |  | 4.11 |  |
| Median | 3.00 |  | 4.00 |  |
| Variance | .814 |  | .833 |  |
| Std. Deviation | .902 |  | .913 |  |
| Minimum | 1 |  | 3 |  |
| Maximum | 4 |  | 7 |  |
| Range | 3 |  | 4 |  |
| Interquartile Range | 1 |  | 1 |  |
| Skewness | -.196 | .311 | .638 | .311 |
| Kurtosis | -.727 | .613 | .456 | .613 |

According on the Descriptive Statistic table, result show that average time for Clearance In Process is 2.75 hours with variance data is 0.814, while for Clearance Out process it takes an average is 4.17 hours with variance data. Range of mean with interval convidence 95% for Clearance in (2.51 ≤ *µ*CI ≤ 2.98), and for Clearance out Jam (3.93 ≤ *µ*CO ≤ 4.41).

To Calculate the difference mean for Clearance In process and Clearance Out Proces it is necessary to carry out an Independent sample t-test, with a hypothesis:

|  |  |  |
| --- | --- | --- |
| H0 | : | *µ*ci =*µ*co |
| H1 | : | *µ*ci ≠*µ*co |

H0 rejected if significance of Indepen sample t test <0.05

Table 3 Independen Sample Test

|  |  |
| --- | --- |
|  | t-test for Equality of Means |
| t | df | Sig.  | Mean  | Std. Error  | 95% Confidence Interval  |
| Lower | Upper |
| Equal variances assumed | -8.52 | 116 | .000 | -1.423 | .167 | -1.754 | -1.092 |
| Equal variances not assumed | -8.52 | 116 | .000 | -1.423 | .167 | -1.754 | -1.092 |

Significance value of Independent sample t test is 0.00, (0.00 <0.05), this is resulted H0 being rejected, or there was difference mean of Clearance In process with mean of Clearance Out process (*µ*CI ≠ *µ*CO). Difference value of means betwen Clearance In process and Clearance Out process are 1.423 Hours. Clearance Out process takes 1.423 hours longer than Clearance In process.

To ensure Clearance in process with interval convidence 95 % (2.51 ≤ µCI ≤ 2.98) and Clearance out process with interval convidence 95 % (3.93 ≤ µCO ≤ 4.41) valid, It is necessary to carry out Normality test for Clearance in and Clearance out Process with Hypothesis

|  |  |  |
| --- | --- | --- |
| H0 | : | Clearance In Process have a normal distribution |
| H1 | : | Clearance In Process din not have a normal distribution |

Or

|  |  |  |
| --- | --- | --- |
| H0 | : | Clearance Out Process have a normal distribution |
| H1 | : | Clearance Out Process din not have a normal distribution |

H0 rejected if significance of Normality test <0.05

Table 4 CI Normality Test

|  |  |
| --- | --- |
|  | Kolmogorov-Smirnova |
| Stat | df | Sig. |
| Clearance In | .221 | 59 | .000 |
| Clearance Out | .252 | 59 | .000 |

Kolmogorov smirnov Normality test for Clearance In process show that value of Significance 0.00 < 0.05, as well as Clearance Out Process Kolmogorov smirnov Normality test show the value of significance 0.00 < 0.05. this means that both process did not have normal distribution.

Graphic1 CI With Lower and Upper bound

Graphic2 CO With Lower and Upper bound

As shown in graphic Clearance In and Clearance Out Process, most of the time it takes for Clearance In and Clearance out Process outside in area upper bound (red line ( )) and lower bound (orange line ( )). Boundary Clearance In Process are with confidency 95 % are 2.51 ≤ *µ*CI ≤ 2.98 and Boundary Clearance Out Process are with confidency 95 % 3.93 ≤ *µ*CO ≤ 4.41.

* 1. **Amount of Cargo and Loading/Unloading Process**

In General Loading/unloading time process proportional with amount of Cargo. To find out the level of loading and loading time process between Amount of Cargo, it is necessary to test:

1. Correlation test between Amount of cargo and loading/unloading time process.
2. Linear Regression test Amount of cargo and loading/unloading time process.

Graphic 3 Graphic Amount of Cargo

Graphic 4 Time of Loading/Unloading Process

Table 5 Statistic of Amount of Cargo

|  |  |  |
| --- | --- | --- |
|  | Amount Of Cargo | Loading/Unloading time |
| Statistic | Std. Error | Statistic | Std. Error |
| Mean | 3511.29 | 3.735 | 12.44 | 1.011 |
| 95% Confidence Interval for Mean | Lower Bound | 3503.81 |  | 10.42 |  |
| Upper Bound | 3518.76 |  | 14.47 |  |
| 5% Trimmed Mean | 3513.68 |  | 11.67 |  |
| Median | 3514.00 |  | 10.00 |  |
| Variance | 823.140 |  | 60.354 |  |
| Std. Deviation | 28.690 |  | 7.769 |  |
| Minimum | 3399 |  | 4 |  |
| Maximum | 3581 |  | 42 |  |
| Range | 182 |  | 38 |  |
| Interquartile Range | 32 |  | 10 |  |
| Skewness | -1.623 | .311 | 1.547 | .311 |
| Kurtosis | 6.258 | .613 | 2.863 | .613 |

Average number amount of cargo based on statistical calculation are 35.29 (MT), for Interval confidence 95 % 3503.81 ≤ *µ*Amount of Cargo ≤ 3518.76. As for loading/unloading time process an mean 12.44 Hours was obtained with an interval of 10.42≤ µUnloading/loading time ≤ 14.47 for a 95% confidence level.

**Correlation Test**

To find out relationship between amount of cargo and loading/unloading time process, it is necessary to do a correlation test between amount of cargo and loading/unloading time process. Hypothesis for correlation between amount of Cargo and loaing/unloading time process is:

|  |  |  |
| --- | --- | --- |
| H0 | : | Amount of Cargo has correlation with the loading/unloading time. |
| H1 | : | Amount of Cargo has no correlation with the loading/unloading time. |

H0 is rejected if the value of significance (2-tailed) > 0.05

Table 6 of Pearson Correlation

|  |  |  |
| --- | --- | --- |
|  | Amount of Cargo | Loading/Unloading Time |
| Amount of Cargo | Pearson Correlation | 1 | .045 |
| Sig. (2-tailed) |  | .735 |
| N | 59 | 59 |
| Loading/Unloading Time | Pearson Correlation | .045 | 1 |
| Sig. (2-tailed) | .735 |  |
| N | 59 | 59 |

Significance value (2-tailed) for Pearson correlation as shown in table is 0,735. Pearson correlation Significance value > 0.05, means H0 rejected. Or Amount of Cargo has no correlation with the loading/unloading time process.

**Linear Regression Test**

The objective of the linear regression test is to formulate the loading/Unloading time Process according to amount of Cargo

*y* = *a* . *x* + *b*

*y* = Loading/Unloading time

*x* = Amount of Cargo

*a* =Koeficient of Amount of Cargo

*b* = Constanta

Linear regression test carried out by taking variable Amount of cargo as the independent variable and loadingh/unloading time as dependent variable. Hypothesis for Linear regression test is:

|  |  |  |
| --- | --- | --- |
| H0 | : | Amount of Cargo can be used to predict loading/unloading process |
| H1 | : | Amount of Cargo cannot be used to predict loading/unloading process |

H0 is rejected if the value of significance (2-tailed) > 0.05

Table 7 of linear regression model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .045a | .002 | -.015 | 7.829 |

Table 8 Table of Anova

|  |
| --- |
| **ANOVAa** |
| Model | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 7.083 | 1 | 7.083 | .116 | .735b |
| Residual | 3493.459 | 57 | 61.289 |  |  |
| Total | 3500.542 | 58 |  |  |  |

Table 9 Coefficients linear regression model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | -30.328 | 125.812 |  | -.241 | .810 |
| Amount of Cargo | .012 | .036 | .045 | .340 | .735 |

According of General model for linear regression and statitistical calculation result obtained:

***y* = 0.012. *x* – 30.328**

*y* = Loading/Unloading time

*x* = Amount of Cargo

From Anova Table show that value of significance is 0,735 > 0,05 means Amount of Cargo cannot be used to predict loading/unloading process

1. **Comparison Berthing Time based on Statistical Calculation with Actual Berthing Time Data**

Berthing time process influenced by three main activities there are:

1. Clearance in Process
2. Loading/Unloading Time Process
3. Clearance Out Process.

Of the three processes above, berthing time can be made inti an equation:

BT = CI + LU + CO

BT = Berthing Time

CI = Clearance in with boundary 2.51 ≤ *CI*≤ 2.98

for confidence interval 95 %

CI = Clearance out with boundary 3.93 ≤ *CO*≤ 4.41

for confidence interval 95 %

LU = Loading/Unloading Process with

***y* = 0.012. *x* – 30.328**

**Lower Bound for Berthing Time**

BT = CI + LU + CO

BT = **2.51 + (0.012. *x* – 30.328) + 3.93**

BT = **0.012. *x* – 23.888**

**Upper Bound for Berthing Time**

BT = CI + LU + CO

BT = **2.98 + (0.012. *x* – 30.328) + 4.41**

BT = **0.012. *x* – 22.938**

Graphic 5 Comparison Berthing Time

Comparison between statistical Calculation and Actual berthing data show that, most of actual berthing time data does not lie in area between lower bound and upper bound area.

1. **CONCLUSION**

According from statistical calculation result obtained:

Table 9 Berthing Time Process

|  |  |  |
| --- | --- | --- |
| Process | Result | Conclusion |
| *Clearance In* | (2.51 ≤ *µ*CI ≤ 2.98) | Not normal distribution |
| *Clearance Out* | (3.93 ≤ *µ*CO ≤ 4.41) | Not normal distribution |
| Loading/unloading  | 0.012 *x* - 30.328 | * Amount of Cargo did not have correlation with Loading/Unloading process
* Amount of Cargo cannot be used to predict loading/unloading process
 |
| Berthing Time | 0.012. *x* – 23.8880.012. *x* – 22.938 | most of actual berthing time data does not lie in area between lower bound and upper bound area |

From table of berthing time process, data report of the berthing time of ship with ethylene cargo at PT XXX are not strong enough to be used as a foundation for estimating berthing time based on the amount of Cargo.

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**Tabel Pemeriksaan Isi Jurnal**

Bagian ini tidak termasuk dalam isi artikel. Bagian ini adalah bantuan untuk penulis dan juga editor jurnal untuk memeriksa isi jurnal. Sampai jurnal ini dinyatakan diterima, tidak diperbolehkan menghapus tabel ini. Silahkan beri tanda *check list* ($√)$ jika item tersebut **ada di dalam artikel**. Selanjutnya kualitas dan kedalaman isi dari masing-masing jenis pemeriksaan akan diperiksa oleh reviewer. Tabel ini hanya untuk memastikan setiap jenis pemeriksaan sudah ada di dalam isi artikel.

Tabel Pemeriksaan Isi Artikel

|  |  |  |
| --- | --- | --- |
| **No** | **Jenis Pemeriksaan** | **Tanda** |
| 1 | Abstrak : |
|  | Latar belakang |  |
|  | Tujuan& manfaat penelitian |  |
|  | Metode |  |
|  | Kesimpulan |  |
|  | Kata kunci |  |
| 2 | Pendahuluan : |
|  | Latar belakang permasalahan.  |  |
|  | Review studi terdahulu.  |  |
|  | Tujuan dan manfaat dari penelitian |  |
| 3 | Metode : |
|  | Deskripsi objek penelitian.  |  |
|  | Perlakuan pada objek penelitian.. |  |
|  | Metode / cara dan prosedur pemecahan yang digunakan untuk meneliti. |  |
|  | Alat dan/atau bahan yang digunakan dalam penelitian. |  |
| 4 | Hasil : |
|  | Hasil penelitian |  |
|  | Penjelasan hasil |  |
|  | Komparasi hasil dari variabel yang berbeda |  |
| 5 | Kesimpulan : |  |
| 6 | Format : |
|  | Ukuran kertas (A4) |  |
|  | Margin (20 mm) |  |
|  | Jarak antar kolom (12,5 mm) |  |
|  | Font (Times New Roman) |  |
|  | Persamaan matematika (2 kolom no border tabel, menggunakan equation editor, equation di center, nomor eq. di sisi kanan) |  |
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| 7 | Daftar Pustaka : |
|  | Minimal 10 acuan |  |
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