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Android Based Fuel Calculation System Application On MV. Pacific Bulk

FX. Mario Dwi Prasetyono [a,1,*], Andy Wahyu Hermanto [b,2], Mohammad Sapta Heriyawan [c,3]

[abc] Politeknik Ilmu Pelayaran, Jl. Singosari 2a Semarang, Indonesia
[1] fxmario14@gmail.com; [2] andy@pip-semarang.ac.id*; [3] hmsapta@pip-semarang.ac.id
* andy@pip-semarang.ac.id

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ABSTRACT

The work of calculating ship fuel for machinists can now be changed to automatic in the Android application . With this, work will be faster and more accurate. The aim of the research is to find out how to make applications and how the Android-based fuel calculation system works on MVs. Pacific Bulk. The method used is *research and development* and Bord and Gall development with 10 steps. The research results show that the use of Android applications in calculating fuel on MV. Pacific Bulk is very useful for making it easier and faster for machinists to calculate ship fuel. The design process for the Android-based fuel calculation application on the MV Pacific Bulk Ship was carried out using *Android Studio* as an *Integrated Development Environment* (IDE). It can be operated using an *Android cellphone* which will make it easier to calculate the remaining fuel on the MV. Pacific Bulk Ship.

1. Introduction

The shipping industry continues to grow along with the increasing need for sea transportation in global trade. Ships are an integral element in facilitating the movement of goods and passengers. Shipping has a key role in the globalization process, one of which is being the backbone of international trade, carrying goods from one country to another and facilitating economic exchange between countries throughout the world.

Fuel is a product of petroleum processing and is a liquid substance that has the ability to evaporate at low temperatures. The characteristics of the fuel oil that will be used for a particular purpose need to be known first. In this way, the purpose of using fuel will be in accordance with the objectives so that the combustion process can run optimally. Liquid fuel is a combination of hydrocarbon compounds obtained from nature or artificially. In the future, the possibility of liquid fuel originating from oil shale, tar sands, coal and biomass will increase. Petroleum is a natural mixture of liquid hydrocarbons with small amounts of sulfur, nitrogen, oxygen, very small amounts of metals and minerals [1]. Most conventional ships use petroleum as the main fuel. The types of petroleum fuel that are commonly used include heavy fuel oil (HFO), marine diesel oil (MDO). Accurate and efficient fuel calculations can make a significant contribution to operational cost savings. Currently, there is still a need for applications that can simplify and improve the process of calculating fuel on board ships so that it can be done easily and quickly.

Fuel calculations on ships usually still use a manual system which still uses paper or books where the paper is then photographed and sent to the office as a daily report of the remaining fuel in the tanks on the ship, this method may not be efficient in today's era where times are increasingly changing. progress and develop. With the Android system, we can make work easier, especially in helping fuel calculations quickly and accurately.

The application of Information and Communication Technology (ICT) in calculating fuel on board ships will make things much easier because the captured data will be stored properly and will make the retrieval process easier if needed at a later date. and can keep data consistent and guaranteed to be correct, because data from the field will be automatically saved, thereby minimizing data loss. The development of an Android application for calculating fuel on board ships has become relevant because many ship crews use Android-based devices as part of their equipment. This kind of application can provide a solution that is easy to use and can be accessed flexibly in various ship operational conditions.

As is known, previous research by Hermanto and Rajiman in 2023 regarding " *Fresh Water Generator Application Design* Using *Adobe Animate* " shows that operational aspects of the application can be carried out easily without requiring an internet connection [2]. Then Hermanto in 2022 regarding "Heart Rate Sensor System to Support Crew Fitness When Carrying Out Machine Watch Service" showed that the resulting heart rate measuring product can work very effectively [3]. Furthermore, Ali and Alferi in 2023 regarding "Design and Development of an Android-Based Mail Management Application at the Palopo City Regional Health Laboratory" also showed that designing an application using an Android base is considered easier to access [4]. This is a consideration for researchers as an alternative for using Android-based application design. The focus of this research is the design of a fuel calculation application that uses an Android base to make it easier for machinists or crew to work.

Based on this background, the author is interested in researching and creating an application to simplify fuel calculations on ships, the research taken is entitled "Design and Development of an Android-Based Fuel Calculation System Application on an MV. Pacific Bulk." The purpose of this research is to find out how to make an application, and how the Android application-based fuel calculation system application works on MV. Pacific Bulk.

2. Method

The research method used in this research is *Research and Development* (R&D) with the approach used is the development of Borg and Gall to develop and test product innovations related to innovations in ship fuel calculation applications on MVs. Pacific Bulk. This method is used to validate and develop products [5]. There are 10 steps in *Research and Development* (R&D) research in the development of Borg and Gall, but in this research it only reached 9 steps, because researchers did not carry out mass product manufacturing but only created one product system which consists of potential and problem stages. , information gathering, product design, product trial I, product revision I, design validation, product revision II, product trial II, and finalization of the final product [6]. The author conducted research at MV. Pacific Bulk is a ship owned by the company PT. Deli Pratama Sea Transportation with *bulk carrier* ships loaded with coal . Data collection techniques are through observation, interviews, documentation, and using questionnaires or questionnaires given to respondents to find out opinions, attitudes, or behavior related to the research topic. This section is the most important part of research [7]. The data analysis used is descriptive data analysis, namely the results of the questionnaire distributed to respondents. This analysis functions to describe or provide an overview of the object being studied through sample or population data as it is without carrying out analysis and making conclusions that are generally accepted in research.[8].

3. Results and Discussion

In this section, the research results will be presented and a discussion of the research steps starting from the potential and problem stages, information gathering, product design, product trial I, product revision I, design validation, product revision II, product trial II, and finalization of the final product.

3.1. Result

The product created by researchers is an Android-based fuel calculation application, which was developed as an innovative solution to simplify and speed up work on ships. This research resulted in the conclusion that the manual fuel calculation process takes a long time. Therefore, a breakthrough is needed in fuel calculation methods to speed up the process and reduce the potential for errors caused by human factors. It is hoped that this Android-based fuel calculation application can be an effective tool in making this job easier. The workflow of this application is depicted through the flowchart in Figure 1, which shows the operational steps from entering fuel data to getting accurate and fast calculation results. With this application, it is hoped that efficiency and accuracy in fuel calculations can increase significantly, so that machinists can focus more on other important tasks.

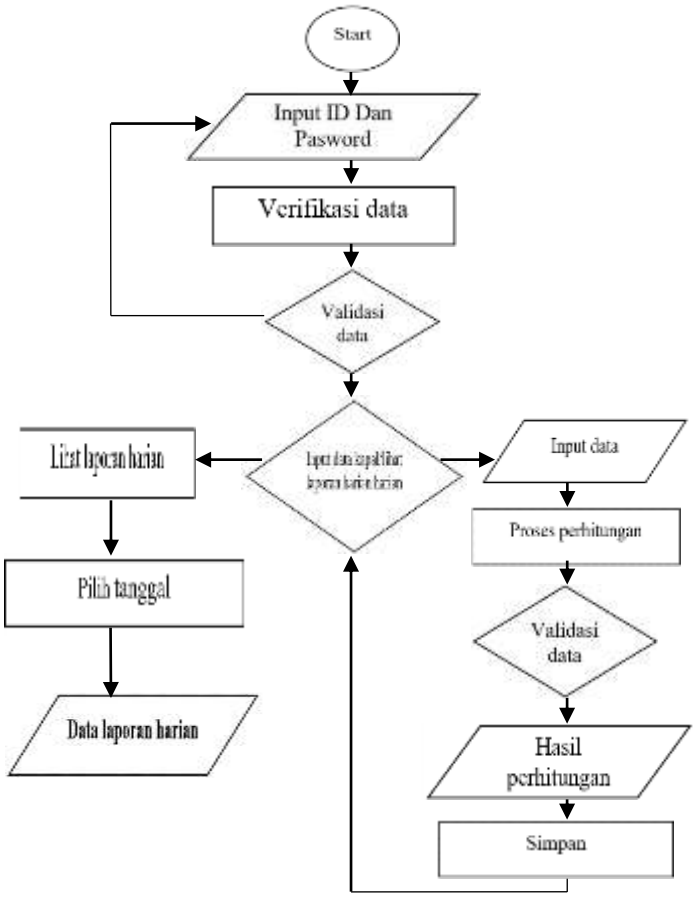

Fig.1. Flowchart of the Application

After going through the stages of problem analysis, information gathering, and product design and workflow , the researcher then carried out product I trials to determine whether the product could be used properly or not. In the trial phase this time the researcher only needed to enter numerical data in the small *trim column* and large *trim* by looking at a selection of *sounding table photos* from the ship's book to find the data as shown in Figure.2.

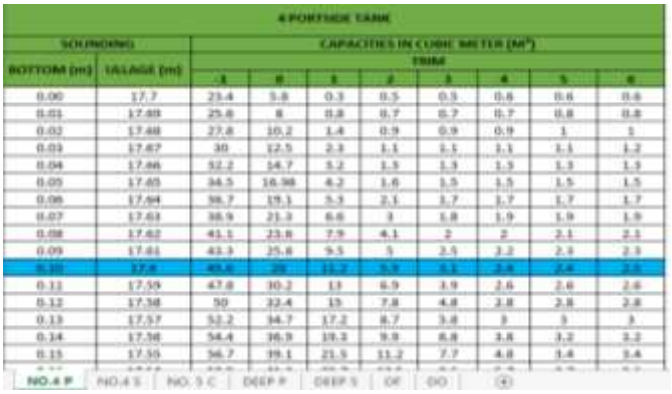

Fig. 2. *Sounding Table Books*

The data obtained by the author when carrying out research such as *the sounding, ullage and trim results* listed in the *Sounding Table book* were copied by typing into the *Microsoft Excel application* and then transferred to the Android application. Sound data , *ullage and*

The trims are put together in *a worksheet* and then named according to their respective tanks. For example, the 5C tank *worksheet* means it contains *sounding table data* from tank 5C and so on. The data copied into the *Microsoft Excel application* must match that in the *Sounding Table book* because if it is different it will affect the calculation results. By changing it from a photo of a *sounding table book* to a column form, it will make the appearance nicer and more attractive than when it was originally a photo of a *sounding table book* and also make it easier to search. This is as shown in Fig.3.

Tank Calculation MV Pasific

		TRIM							
SOUND (m)	ULLAGE (m)	-1	0	1	2	3	4	5	6
0,00	17,7	23,4	5,8	0,3	0,5	0,5	0,6	0,6	0,6
0,01	17,69	25,6	8	0,8	0,7	0,7	0,7	0,8	0,8
0,02	17,68	27,8	10,2	1,4	0,9	0,9	0,9	1	1
0,03	17,67	30	12,5	2,3	1,1	1,1	1,1	1,1	1,2
0,04	17,66	32,2	14,7	3,2	1,3	1,3	1,3	1,3	1,3
0,05	17,65	34,5	16,98	4,2	1,6	1,5	1,5	1,5	1,5
0,06	17,64	36,7	19,1	5,3	2,1	1,7	1,7	1,7	1,7
0,07	17,63	38,9	21,3	6,6	3	1,8	1,9	1,9	1,9
0,08	17,62	41,1	23,6	7,9	4,1	2	2	2,1	2,1
0,09	17,61	43,3	25,8	9,5	5	2,5	2,2	2,3	2,3
0,10	17,6	45,6	28	11,2	5,9	3,1	2,4	2,4	2,5
0,11	17,59	47,8	30,2	13	6,9	3,9	2,6	2,6	2,6
0,12	17,58	50	32,4	15	7,8	4,8	2,8	2,8	2,8
0,13	17,57	52,2	34,7	17,2	8,7	5,8	3	3	3
0,14	17,56	54,4	36,9	19,3	9,9	6,8	3,8	3,2	3,2

Fig. 3. *Sounding Table Data* on Android

After completing the first stage of revision of the data related to sounding, ullage and trim results, the second stage of testing was then carried out which focused on the display in the fuel calculation application, where *the background still needed to be replaced* so that the appearance in the application was more attractive when used in material calculations. burn. The results before revision and after revision of the application background are as shown in Figure. 4.

Fig. 4. *Background Views* Before and After Revision

Apart from that, there is also something that needs to be fixed in the calculation input menu page which is in *the table specific graphity* still requires you to enter numbers manually, the examiner suggested that *the specific graphity table* be filled in automatically because the numbers are patented so that it is easier and more practical, there is no need to fill it in and so it is faster to fill in. The results of this calculation are sent to the company every day. The results before revision and after revision of the *specific gravity table* are as shown in Figure. 5.

Fig. 5. Display of SG (*Specific Gravity*) Values in the Application Before and After Revision

After going through the second stage of revision, a third stage of testing was carried out which focused on the display in the fuel calculation application which still needed to be replaced in the results of the calculation, expert validation suggested the number after the comma (,) which still showed a lot so it needed to be simplified to after the comma (,) becomes just 2 numbers. From the results of a simpler calculation with two numbers after the comma, it will increase the clarity and readability of the data. This is as shown in Figure . 6.

Fig. 6. The 6 Numbers After the Comma Are Still Long in the Application Before and After Revision

Changing the calculation results to only display two decimal places is an effective way to improve clarity and precision. This helps avoid confusion that may arise from too long decimal numbers. With proper rounding, data becomes easier to read and understand, making it easier for users to make decisions based on the information presented. Additionally, it also provides a more professional and neat appearance to reports or calculation results.

The final stage is product refinement. This is the final stage of the process of creating an Android-based fuel calculation application on MV. Pacific Bulk. The product is made through several stages starting from stage 1 testing to stage 3 testing accompanied by revisions to obtain a product that is perfect and can be used well. After the product is finished, a validation test is carried out by a validator, where the product is tested by the validator to see whether the product is ready to use or not and also asks for suggestions to complete what is still lacking in the application in order to obtain perfect product results. From this validation, suggestions from the validator were obtained, including adding options to the calculation report as shown in Figure . 7 and added an automatic clock option as shown in Figure . 8.

Fig. 7. Added *Save Button* to Report Results

Validator 1 suggests adding a *save button* so that users can save the results of this report in the cellphone gallery automatically and the results of this report can be saved in the form of a photo in the cellphone gallery.

Fig. 8. Automatic Clock Options

Validator 2 suggests adding the hour option that was previously typed manually to an automatic option allowing users to enter the hour in the column quickly. The ability of an application to

automatically add time to a user's schedule according to predefined rules and preferences is known as the Auto Add Hours feature. This feature automates scheduling to save users time.

Discussion

Based on the application development and creation process Android based fuel calculation system on MV. Pacific Bulk , researchers can draw conclusions, including:

1. The design process for the Android-based fuel calculation application on the MV Pacific Bulk was carried out using Android Studio as an Integrated Development Environment for Android application development and required several stages, namely:
   a. Application logic development is implemented using the Java and Kotlin programming languages which follow the *Model-View-Controller* (MVC) system architecture to separate the application logic, interface and control flow.
   b. *Database integration* with *SQLite* is carried out to store data that is input and processed in the application
2. Operation of the design and construction of an Android-based fuel calculation system application at MV. Pacific Bulk, there are several steps to operate this application, including:
   a. The first display when opening this application is a login page where new users must register first if they want to use this fuel calculation application by registering pressing the sign up option, if successful enter *the username and password* that was registered earlier then press login to enter the next page . The login display is as shown in Figure 4
   b. After successfully logging in, the user will be directed to the second page *of the dashboard display* , where there are 2 options, namely the option to input calculations and view reports. On this page, if the user wants to calculate fuel, he can select the calculation input option which will calculate the remaining fuel in the tank, while the view report menu is used to view the previous day's report.

Fig. 9. *Dashboard Menus*

   c. After selecting the calculation input option, a display of options for calculating the tank to be calculated will appear. In the calculation input display there are sections that need to be filled in including date, time, location and today's trim so that later in storage you can see the data entered by selecting the date to be searched. After entering the date, time, location, trim data, the user can choose to calculate the tank that will be calculated, for example the user wants to calculate a 4S tank, then the user selects the 4S calculation option and if he wants to calculate the 4P tank the user can select the 4P calculation option, and so on if he wants to calculate the tank. the others.

Fig. 10. Pages Tank Count

d. After selecting the tank that will be calculated we enter the calculation display where the user can enter the numbers according to the existing column, to enter numbers for the small trim and large trim there are options in Figure 2 *view trim image* where we can see and choose to Enter the numbers for the large *trim* and small *trim* according to the sounding results on the same day. In this section, the only things you need to fill in are the small *trim* , big *trim* and today's *trim columns.* The other columns will be automatically filled in if you enter small *trim* , large *trim* and today's *trim* . For the calculation page as shown in Figure.11.

Fig. 11. Calculation Pages

e. After entering the small trim and large trim it will automatically calculate and the results will come out below automatically, after that the user needs to continue the work by entering today's *trim* and it will automatically be filled in by multiplying the result times today's trim. After the results come out, they are multiplied by sg (specific *gravity*) and the results will come out in the form of MT (*ton matrix*). If you have got the results, press save and you can continue calculating in another tank. This is as shown in Fig.6.

f. After the tank calculations in Figure 10 are complete, click on the save button option, then all the calculation results are captured, and produce a recap of the remaining tanks as in Figure 12. If you want to save, click the save button again so you can save it when viewing the report. and the results will be reported for daily reports to the office.

Fig. 12. Calculation Summary Results

g. After everything is calculated, you can see in the view report section in *the dashboard menu* as in Figure 9, there is a choice of date to view the previous day's report. After viewing the report the user can select the date to search as shown in Figure 13.

Fig. 13. Date Options View Previous Reports

After selecting the date to be viewed, something like Figure 12 will appear where the user must save the image by pressing save and the image will be automatically saved to the gallery. The results will be reported to the company..

4. Conclusion

The design process for an Android-based fuel calculation application at MV. Pacific Bulk is carried out using Android Studio as an *Integrated Development Environment* (IDE) for Android application development and requires several stages, namely application logic development and *database integration* with *SQLite* . This operation can be done by downloading the *link* *https://bit.ly/TankCalculation* . With this application, it will be easier for ship engineers or crew to carry out fuel calculations easily, quickly and can be done anywhere using an Android cellphone. Thus, understanding how to use this application is very important. After the user carries out the calculation process in the application, it would be good to *save the file* used and it will be saved automatically, so that if the next day they are looking for previous fuel remaining data, they can look for it in the date option.

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