

Inspection Measurement Test Model Design Patrol Boats

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ABSTRACT.

Measurement is a process or an activity to determine a numerical quantity of an object with the purpose to find the best numerical value of its certain characteristics. The main points of measurement activities are: the purpose of the measurement, object of the measurement, the tools used and the process of how to do the measurement. The result of the measurement is only the estimation of the real values. Measurement, in general, means an activity using a certain chosen principle which could be qualified in some different ways. The procedure of measurement uses a selected method and usually written on a document called "the procedure of measurement" or "the method of measurement" which is written in detail to help the operator works without any further information. This paper will discuss about checking, measuring, and determining the deviation existed on the design process of making the ship patrol model, starting from the preparation until the test itself. The investigated model is characteristically specific for test and hopefully could be used as the standard of the best optimum model to get as accurate design result as the real ship.

KEY WORDS: *Measurement, determining, Inspection, ship patrol*

1.0 SUBTITLE

Indonesia needs patrol boats for coastal security. And later a

patrol boat of this kind will become residents of the Navy base in Indonesia. From the weight and limited capacity, this patrol boat will only sail in shallow sea waters not have big waves.

Patrol boats are vessels used for patrol duties that require the vessel to remain capable of operating reliably and well. To obtain good ship operation needs to be done on systematic planning phases of activities ranging from the preliminary design stage, stage hydrodynamic studies and detail design phase. This paper will discuss the inspection, gauging, and measurement deviation / irregularities that occurred during the design of the measurement in the work process modeling patrol boats ranging from early stage to the implementation stage of testing. This article is part of the WP. 5.0. Test Model Patrol vessel, which is part of the WBS. In WP. 5.0 Quality Control test engineering model patrol vessel in the form of inspection, gauging, and measurement deviations patrol boat design test model.

To be able to create and measure the well will require several key components. The component needs a model of ship models include: Software maxsurf dongle, AutoCAD, MS Word and MS Excel, a computer, printer, tracing paper, A3 and A4 paper, scale ruler and stationery. The activities are collecting and classifying images of ship models consisting of: Lines Plan, Body Plan, Water Lines, Sheer Lines Plan and Buttock.

Based on these data, the depiction of the actual ship is done using Autocad software to check whether the existing data provide a streamlined plan drawing line shape. Results depiction will be examined and re-evaluated and if the results indicate a depiction of line drawings which sometimes are not streamlined, it is necessary to the lines to be revised. Checks include all streamlined's and the determination of the deviation of the difference displacement vessel. Recommendations from this study is to make optimization of linesplan by dividing the section into 20 parts.

Measurement is the nature of an object or material that can be determined qualitatively and quantitatively. The value of a quantity is generally expressed in units of measurement times is a number, for example, rod length is 40.43 mm.

The true value of a quantity is the value that is consistent

perfectly with specific quantity rules, while the conventional value of a quantity is the value placed on a special scale that accepted, sometimes by agreement or custom, and in accordance with a specific purpose. Use of the term "measurement results" should be clarified whether it be the appointment, the result of tolerance or no tolerance and whether the values are the average results. Each measurement contains errors.

2.0 SHIP MODEL DATA KEY FIGURES.

To determine the main measure taken in a pre-planning, first need to be considered in general, especially on matters relating to the proportion of the primary and the coefficients of the shape, stability, full of water, the location of the center of gravity, the strength of the ship as well as the factor of economic and technology.

So in general, planner should have thought about the effect would be obtained as a result of a major measure taken. The main size from models are as follows: LoA = 3.50m, Lpp = 3.21m. B (width) = 0.89m, Depth (height) = 0.64m, Displacement = 124.8kg.

The first important step in a planning model of the ship is the determination and / or checking displacement which must be in accordance with the speed and weight of the desired point location. The first important consideration is how to get the proper displacement of speed, stability and strength. After the displacement is obtained, the next value that needs to consider is on form to be taken from the ship model the forms will be mainly determined by the size of the primary.

3.0 MAKING MODEL SHIP

The first step that should be done at the stage of making a boat model is moving plan drawing water line of image / data obtained from the buyer / Owner with a scale of 1: 1, because of the plans of the water line is this can be established models of ships the actual size that we will create.

In this outline plan there are some important terms or sense to be known, as described below:

- water line (Water line)

A water line is a horizontal cross-sectional areas of a ship which is cut by a flat surface lengthwise (horizontal). Line horizontal cut line which is called the water line (Water line) and from baseline in the bottom we named WL 0, WL 1, WL 2, WL 3, and so on

- Baseline (Base line)

Base line is the bottom line of the water, the base line is located must always be flat (even keel), so that the base line is always coincides with the keel line (keel) is at the bottom. As for the planned ship by leaning backward (rear trim), the angled base line with the keel,

- All ship size is always measured from the base line, eg the deck edge lines (Sheer)

The edge of the deck line is a curved line from the edge of the deck is drawn through the upper end of the deck beams. In drawing the outline plan one way to determine the lines of the

deck edge of this standarad is the length of the vessel from the AP to FP is divided into six equal parts, that is 1 / 6L of AP, 1 / 3L from the AP, Midship, 1 / 3L from FP and 1/6 of FP

- Line upright longitudinal pieces (Buttock line).

Elongated vertical line is the line of the cross section of a ship that was cut by the area of elongated upright vessel,

- straight lines cross section (Station)

Vertical line is the line cross section cross-section of a vessel which is cut by vertical transverse field. With this line of cross section can be planned arrest of the ship, where the pressure point, wide field of water lines, moment of inertia, etc.

Calculation of pre-planning can be described as follows:

1. Determination of displacement

Determination of the displacement can be calculated by the formula:

$$D = L \times B \times T \times C_b \times \rho \times c \dots\dots\dots (1)$$

2. Determination of major size and shape coefficient

3. Determination of the location of the pressure point lengthwise (LCB)

4. Examination of high metacentre

5. Examination of the overall weight of the ship models,

Tow draft (T), tall ship (H), the length of the ship and others.

Making the design drawings the ship is equal to the initial plan of making the ship. The shape of the body of the ship model in general is influenced by:

- The main measure
- Comparison of gradual size
- The coefficient of the ship model
- The shape of the vessel section
- Lines plan

The length of the ship affects the speed, strength lengthwise (L / H), total resistance (L / B). Price comparison L / B were great suitable for vessels with relatively high speeds but reduces the maneuverability and stability of the ship. While the price of L / B is small gives good stability but can add to the prisoners.

The width of the ship (B) mainly have an influence on a high metacentra, the addition of B (Displacement fixed, L and T fixed) will cause an increase metacentre (MG), the price of B / T major cause good stability.

Height (H) affect the Centre of Gravity (KG) and also on power boats, deck height is generally going to lead to a rise so high metacentre KG MG is reduced so that the stability is reduced.

Terms Draft (T) generally affects the high Centre of Buoyancy (KB), the addition of draft (T) on displacement D, L, B fixed price, generally will increase the price of KB.

Shape section boats there are basically two kinds of shapes U and V, V shape advantages namely CWL larger so that adds to the price of KB, MB, KM, MG, prisoners reduced, better seakeeping characteristics, as well as the center of higher displacement.

Pictures of the outline plan has several benefits, including:

To determine the shape of the hull will Check whether the lines already have a good shape or not (stream line) and if it has the characteristics of a good or not.

To be used as a guide / manual basis in making further such images: the image of the general plan, bodyplan, sheerplan, half breath plan and others.

Currently, the need to support image components not as complicated as previously done manually. By using the software program maxsurf dongle, AutoCAD greatly facilitate the depiction of a computerized and the results are more accurate and precise and does not require a long time. Ship model image component needs include:

- Maxsurf dongle software, AutoCAD, MS Word and MS Excel
- Computer hardware
- printer
- Tracing Paper, Paper A3 and A4
- ruler Scale
- Stationary.

Ship models consisting of:

Pictures of the model lines plan have utility as an image consisting of a curved shape pieces of the hull, both vertical piece or pieces extends horizontally lengthwise and crosswise pieces of the hull.

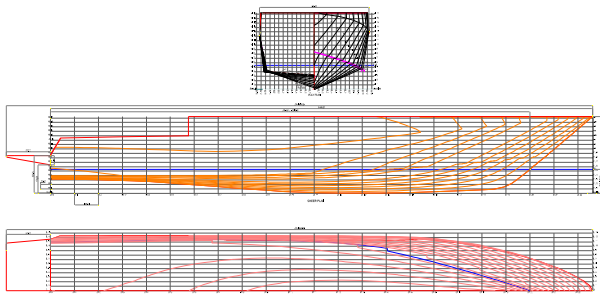


Figure 1: Linesplan

Figure Lines Plan is the initial stage of the step of making test models so that images of work is also necessary to control the process. This activity results from the process of working drawings (drawings Body Plan) from the re-measurement of the design will be done by using one measure long dimension of existing (high accuracy), namely an iron bar at a drawing table in the room design part. The results of these activities tabulated in the image below as follows:

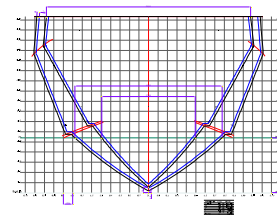
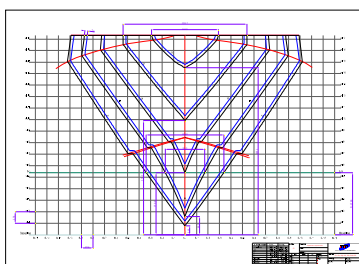


Figure 2:Frame Section

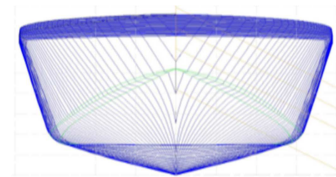


Figure 3: body plan projection

Images of body plan have utility as an image projection of the shape of the hull crosswise, where the vessel is cut crosswise with a predetermined division station

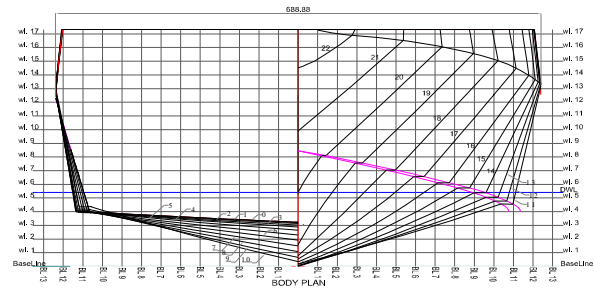


Figure 4 : Body plan

In addition there is also a picture image Bodyplan half breadth plan and sheer plan. In the process of this activity is the result of working drawings (drawings Half Breadth Plan) of the design part will also be performed repeated measurements using one measure long dimension of the existing (high accuracy) that the bar of iron on the drawing board in the design section, while the results of the examination half breadth plan shown below

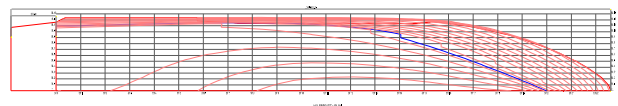


Figure 5 : Halfbreadth plan

Sheer Image Plan is the initial stage of the step of making test models so that images of work is also necessary to control the process.

In the process of this activity, the result of working drawings (drawings Sheer Plan) of the design part will also be performed repeated measurements using one measure long dimension of the existing (high accuracy), namely an iron bar at a drawing table in

the room design part. The results of the examination of working drawings is shown below:

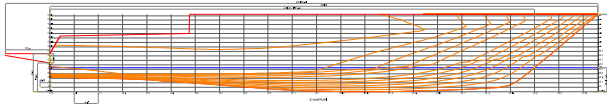


Figure 6: Sheerplan

Water Lines while images are projected image of the shape of the hull is cut lengthwise (horizontal), the lines are horizontal slices named WL1, WL2 etc.

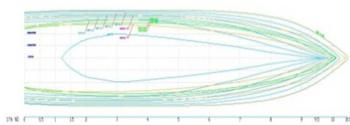


Figure 7 : Waterlines

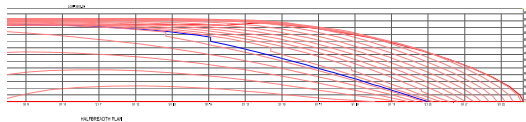


Figure 8: Waterlines

Sheer plans to have a function as a projection image of the shape of the hull lengthwise if the vessel is cut lengthwise in accordance with the division buttock vertical line that has been determined

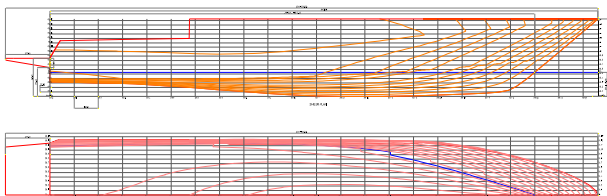


Figure 9: Buttock lines

Buttock lines are projected image of the shape of the hull is cut lengthwise upright. From the shape of these lines can be known whether the water line that we want is good enough or not. To determine the quality of good planning is basically planning that meets customer demand and fulfill the necessary requirements in terms of technical and economical. Regarding the request of the buyer, of course, the planning should be sought as far as possible to meet the demand, although it can happen that the demands requested by the customer is not completely satisfied. Some technical drawings and data obtained from the Owner that Linesplane, General arrangement, Table Offset and Hydrostatic, then adjusted to test an BTH (LHI)

Table 1: Top Size Model

Item	Simbol	Dimensi	Unit
Length over all	Loa	33.140	m
Lengthbetween perpendiculars	Lpp	27.110	m
Breadth	B	6.200	m
Depth	D	3.250	m
Draught (full load)	T	1.350	m
Displacement (full load)	Δ	80980	kg

Table : 2 Scale

Quantity	Scaling Factor	Model	Proto type
Linear dimensions	9	1 m	9.00 m
Area	9^2	1 m ²	81.00 m ²
Volume	9^3	1 m ³	729.00 m ³
Time	$\sqrt{9}$	1 sec.	3.00 sec.
Velocities	$\sqrt{9}$	1 m/sec.	3.00m/sec.
Angle	-	1 deg.	1 deg.
Mass	1.025×9^3	1 kg	747,22 ton.

After determining the scale model of the ship and then determined the type or types of fabrication model of the ship, where the ship then the data can be input to maxsurf dongle software to determine the characteristics of ship models. Some of the primary data for the manufacturing of ship models that LOA, LPP, LWL, T, B, and H. From the data obtained from the data Owner scaling is done to determine the dimensions of the ship model and perform retouching / fairing as necessary. '

4.0 RESULTS AND ANALYSIS ACTIVITIES

Depiction of the process of ship models starting from rechecking the base size of the vessel, namely, re-examination: Length (m) Width (B), height (H) and draft (T) where the next plan / calculate more accurately the shape of the hull with fixing lines plan , the details of construction, the distance of each ivory. At this stage made also estimate the weight and center of gravity of the construction. The final step is to do is to make working drawings with instructions / instruction detail construction

Based on these data, the actual depiction of the ship can be done with Autocad to check whether the existing data provide a streamlined plan drawing line shape. If the results indicate a depiction of the images do not line it needs to be streamlined fairing on the lines. Revised data is then necessary to offset new offsets based on data derived from streamlined lines after the fairing.

In addition to checking the streamlined shape of horizontal lines in the outline plan of ship models mentioned above, check

the amount of displacement vessels based on the data offset a new flagship model that needs to be done. This data is then compared to the large displacement of the actual ship owner, so the magnitude of the difference of the value of the resulting displacement should not be more than 0.3%.

In addition, major data as well as data supporting the vessel need to be grouped based on the needs of data for each ship model of working drawings, to facilitate the implementation of the verification and manufacture of ship models later.

When some data after Autocad are applied to data that does not fit, that makes the lines formed is not streamlined, then some of the data is also necessary disesuaikan and rounded figure, with particular regard to the level of tolerance permitted.

In cases where the data provided by the owner is not complete, it is necessary to recalculate the beginning to complete it. This recalculation is done by entering the actual ship data obtained from the above mentioned Autocad software into perhitungankarakteristik vessel, such as maxsurf dongle-Pro, to obtain data as well as data hydrostatics actual ship stability.

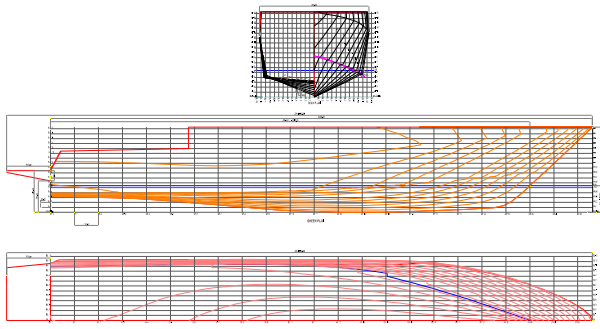


Figure 10: Lines plan.

Data below will show one of the measurement results on BL-laden and CL-half B

Table 3: Shear Plan

Name Drawing :		Sheer Plan	
No. Drawing :		C - 0179 - 0213 - 04	
Station	Data (mm)	Actual (mm)	Deviasi (mm)
20	331.3	331.0	-0,3=OK
19	437.2	437.0	-0.2 = Ok
18	459.8	459.5	+0.2 = Ok
17	466.4	466.0	-0.11 = Ok
16	472	472	+0.62 = Ok
15	476.9	477	-0.22 = Ok
14	480.3	480.0	-0.3 = Ok
13	481.3	481.0	-0.3 = Ok
12	480	480	0 = Ok
11	476.9	477	+0.1 = Ok
10	471.7	471.5	-0.2 = Ok
9	462.8	462.5	-0.3 = Ok

8	451.4	451.0	-0.4 = Ok
7	439.7	439.5	-0.2 = Ok
6	428.3	428.0	-0.3 = Ok
5	417.4	417.0	-0.4 = Ok
4	407.5	407.5	0 = Ok
3	401	401	0 = Ok
2	397.3	397.0	-0.3 = Ok
1	394.4	394.0	-0.4 = Ok
0	391.8	391.5	-0.3 = Ok

Table 4: Half Breadth plan

Name Drawing :		Half Breadth Plan	
No. Drawing :		C - 0179 - 0213 - 05	
Station	Data (mm)	Actual (mm)	Deviasi (mm)
20	201.6	201.5	-0.1= Ok
19	243.1	243.0	-0.1= Ok
18	275.2	275.0	-0.2= Ok
17	299.7	299.5	-0.2= Ok
16	317.7	317.5	-0.2= Ok
15	327.6	327.5	-0.1= Ok
14	332.2	332.0	-0.2= Ok
13	334.4	334.0	-0.4= Ok
12	335.1	335.0	-0.1= Ok
11	335.2	335.0	0.2= Ok
10	335.1	335.0	-0.1= Ok
9	335	335	0= Ok
8	334.8	335	-0.3= Ok
7	334.7	334.5	-0.2= Ok
6	334.6	334.5	-0.1= Ok
5	334.5	334.5	0= Ok
4	335.7	335.5	-0.2= Ok
3	334.4	334.0	-0.4= Ok
2	334.5	334.5	0= Ok
1	334.5	334.5	0= Ok
0	334.5	334.5	0= Ok

5.0 CONCLUSION

This paper discusses ways in the planning and optimization of the number of sections on the test model ship Linesplan . Optimization section number on the test model ship linesplan is required as the basis for designing the construction of the cross-section or frame section on the test model ships, in order to get results the optimal design in terms of functionality, performance, cost and time modeling. At the beginning linesplan design, the number of sections is divided into 20 sections to follow the curve shape of the test model ship , then refined by dividing the total number of section 10 section by section the same distance,

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