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SIDANG REDAKSI

KATA ALUAN PENGARAH POLITEKNIK BAGAN DATUK

Tn. Hj. NIDZAR BIN Hj. CHE ANI **M.IK**
PENGARAH POLITEKNIK BAGAN DATUK

Assalamualaikum Warahmatullahiwabarokatuh dan Alhamdulillah, syukur ke hadrat Allah S.W.T. Syabas dan setinggi tahniah kepada jawatankuasa pelaksana A Digest of the Naval Architecture @ PBD**,** Unit Penyelidikan, Inovasi dan Pengkomersilan, para pensyarah yang telah menyumbangkan tenaga dan hasil usaha yang padu sehingga terhasilnya A Digest of the Naval Architecture @ PBD. Usaha ini diharapkan dapat dijadikan wadah kepada para pensyarah untuk berinteraksi dan berkongsi pengalaman serta kajian-kajian yang telah dijalankan. Pendekatan ini sedikit sebanyak membantu Politeknik Bagan Datuk untuk mentransformasikan Pendidikan Tinggi Negara. Ini penting bagi membuka minda semua warga PBD khususnya untuk membudayakan bidang penyelidikan, berkongsi ilmu, mewujudkan inovasi serta memanfaatkan bersama masyarakat umum. Akhir kata, adalah diharapkan melalui hasil dan maklumat yang dihasilkan dalam Digest ini dapat dimanfaatkan sepenuhnya ke arah melahirkan komuniti yang berilmu, bermaklumat, kreatif dan inovatif. Sekian, terima kasih.

PRA KATA UNIT PENYELIDIKAN, INOVASI DAN KOMERSILAN

UNIT PENYELIDIKAN, INOVASI DAN KOMERSILAN
Ts. KHATIJAH BINTI JAMALUDIN

Assalamualaikum Warahmatullahiwabarokatuh dan Salam Sejahtera. Syabas serta setinggi-tinggi tahniah kepada jawatankuasa pelaksana A Digest of the Naval Architecture @ PBD, kerana berjaya menghasilkan penulisan penyelidikan di mana ia menunjukkan terdapatnya peningkatan budaya penyelidikan dalam kalangan pensyarah kita. Justeru, para pensyarah harus bersedia dan memastikan penyelidikan yang dihasilkan sentiasa berimpak tinggi dan mencapai petunjuk prestasi yang telah ditetapkan oleh pihak Politeknik Bagan Datuk. Diharapkan semua yang terlibat dalam penghasilan, A Digest of the Naval Architecture @ PBD, ini akan mengutip pengalaman dan memanfaatkan ilmu yang diperolehi sebagai satu saluran untuk mengembangkan kebolehan dalam aspek kreativiti dan inovasi dalam penyelidikan. Hasil penyelidikan yang berkualiti dan berimpak tinggi akan seterusnya memacu penghasilan inovasi yang berdaya saing. Akhir kata, semoga usaha ini dapat menyediakan platform kepada warga PBD untuk bersama menyumbang idea dan peranan bagi memastikan hasrat untuk membudayakan penyelidikan dan inovasi tercapai. Sekian, terima kasih.

SENARAI KANDUNGAN

DESIGN A NEW SHIP BASED ON PARENT SHIP BY ADDING STABILIZER FINS

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ABSTRACT

Fins stabilizer design is a project undertaken to enhance the stability of vessels. Fins stabilizer is new and will a key alternative to ship stability. Every ship that is manufactured certainly has a fixed stability, but it would start having problems after a long time. All the more, many of the older ships and ships created today are equipped with tools that can improve ship stability. However, the production rate of these devices is very limited. This project focuses on selecting the right design to be the main source of reference. This is due to the fact that designs have the right parameters and data. At present, one of the alternatives used is the ballast tank. This is because the design is feasible and easy to make. The parameters for this ballast tank were easily obtained from previous ships. With this fin stabilizer, any accidents can be avoided, because fin stabilizer has a high level of security. This project intended to improve ships stability while sailing.

Keywords: *Fins Stabilizer, Ship Stability, New Design, Parent Ship Comparison*

1.0 INTRODUCTION

The most common problems of a vessel are in terms of stability. Stability is a vital factor in ships during sailing. If the stability decreases, most likely an accident will occur while sailing. That why the perfect stability will make the ship safer. This study offers the planning method to resolve stability issue using fins stabilizer at the bottom part of the ship's hull forms. This method will reduce a ship's roll due to winds or waves. The stabilizing power of fins is generated by their movement through the sea and created by the flow of water above and below the hydrofoil shape. When the front edge of the fin is tilted up, water flow across the top of the profile produces lift due to a drop-in pressure while a lifting pressure is provided by flow along the underside. For

the current situation, the problem of ship stability was solved by a ballast tank method. In fact, in Malaysia, the methods using stabilizer fin technology to resolve the ship's stability are still being developed in our shipyards and construction companies.

2.0 METHODOLOGY

2.1 Design Specification

The design specification was based on the sequence of generating the following.

a) Functional requirement
b) Constraint

2.2 Design Selection

Design selection is the process of evaluating the concept in term of criteria, comparing the relative strength and weakness of the design, and selecting one design for further investigation and development. The design selection process is very important to determine the perfect method. Sketching was a main part of the design selection. This describes an early idea of a good fin stabilizer that we intended to produce. The sketch idea is shown in **Appendix.**

2.3 Criteria of Fin Stabilizer

The fin stabilizer criteria explain the fin standard applicable to the ship:

Table 1: Description of Criteria Selection

No	Criteria	Descriptions
i.	Safety	It about the safety of fin stabilizer applies on ship. The fin is not too sharp in the front of steel because it can be so dangerous to people who want to fix it if broke.
ii.	Reasonable Cost	The reasonable cost of apply the ship onboard are not too cheap or expensive because it easy to get in the shipping industry.
iii.	Endurance	The endurance of fin stabilizer must be in the strong conditions. If the fin is not to strong, small crack will be happen at the fin and make the fin broke and cannot be fix again.
iv.	Efficiency	The efficiency of fin must be in top conditions because it will use when the ship was sailing at the ocean and in the critical situations such as hurricane or other else.
v.	Maintenance	This is because the maintenance process will always be done to avoid any damage to the stabilizer fins or something else.
vi.	Difficulty of build the fins	Difficulty to build the fin on board must be in easy way. Because as the construction will involve high costs and considerable equipment.
vii.	Fins position	The positions of fin must be suitable for ship that used it.

(Source: www. ficanteri.com/marine_systems_components)

2.4 Decision Making

From the Table 2, have concluded that Design C will be our primary design. Design C is the perfect design after evaluating all characteristics that should to be taken into consideration in which design that suits the ship's purpose.

Table 2: Shown of the selected design was on higher Scale Point collected.

Design / Criteria	Design A		Design B		Design C	
	Achieved Standard (Yes/No)	Scale Point	Achieved Standard (Yes/No)	Scale Point	Achieved Standard (Yes/No)	Scale Point
Safety	No	1	Yes	3	Yes	3
Reasonable Cost	Yes	2	Yes	1	Yes	3
Endurance	No	1	Yes	2	Yes	3
Efficiency	Yes	2	Yes	3	Yes	2
Maintenance	Yes	2	Yes	3	Yes	3
Difficulty to Build	Yes	2	Yes	1	Yes	3
Fin Position	Yes	3	Yes	3	Yes	3
Total	**-**	**13**	**-**	**16**	**-**	**20**

2.5 Work Execution

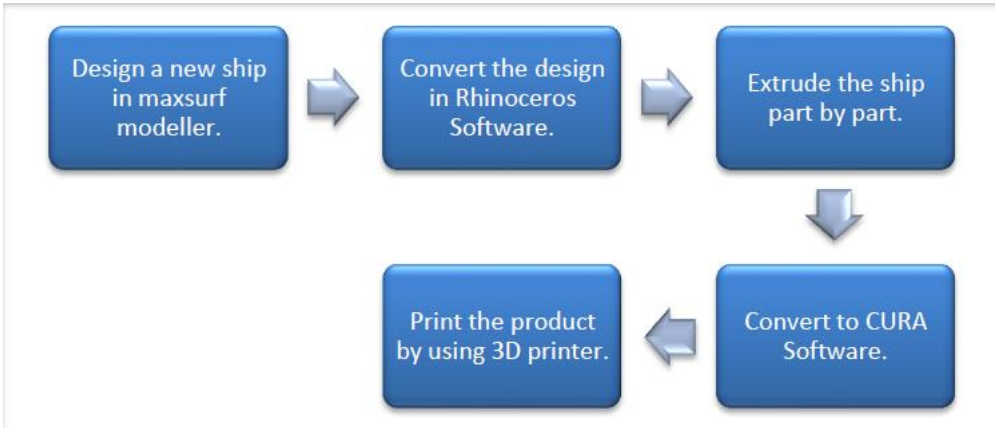

Figure 1: Work executions process.

3.0 RESULTS AND DISCUSSION

In this part, from the results, the stability of parent ship and with fin stabilizer can be determined. The comparison on both vessels had been calculated by Maxsurf Resistance and Maxsurf Stability.

Trawler with Fin		Trawler without Fin		Percentege
Displacement	44.9 t	Displacement	44.88 t	0.04%
Volume (displaced)	43.804 m^3	Volume (displaced)	43.781 m^3	0.05%
Draft Amidships	0.772 m	Draft Amidships	0.772 m	0.00%
Immersed depth	0.772 m	Immersed depth	0.772 m	0.00%
WL Length	21.572 m	WL Length	21.572 m	0.00%
Beam max extents on WL	6.208 m	Beam max extents on WL	6.208 m	0.00%
Wetted Area	92 m^2	Wetted Area	91.983 m^2	0.02%
Max sect. area	3.831 m^2	Max sect. area	3.829 m^2	0.05%
Waterpl. Area	78.857 m^2	Waterpl. Area	78.851 m^2	0.01%
Prismatic coeff. (Cp)	0.53	Prismatic coeff. (Cp)	0.53	0.00%
Block coeff. (Cb)	0.424	Block coeff. (Cb)	0.424	0.00%
Max Sect. area coeff. (Cm)	0.813	Max Sect. area coeff. (Cm)	0.813	0.00%
Waterpl. area coeff. (Cwp)	0.589	Waterpl. area coeff. (Cwp)	0.589	0.00%
LCB length	10.807 from zero pt. (+ve fwd) m	LCB length	10.807 from zero pt. (+ve fwd) m	0.00%
LCF length	10.486 from zero pt. (+ve fwd) m	LCF length	10.485 from zero pt. (+ve fwd) m	0.01%
LCB %	50.099 from zero pt. (+ve fwd) % Lwl	LCB %	50.095 from zero pt. (+ve fwd) % Lwl	0.01%
LCF %	48.607 from zero pt. (+ve fwd) % Lwl	LCF %	48.605 from zero pt. (+ve fwd) % Lwl	0.00%
KB	0.46 m	KB	0.46 m	0.00%
KG fluid	0 m	KG fluid	0 m	
BMt	4.014 m	BMt	4.015 m	-0.02%
BML	34.649 m	BML	34.665 m	-0.05%
GMt corrected	4.474 m	GMt corrected	4.475 m	-0.02%
GML	35.109 m	GML	35.125 m	-0.05%
KMt	4.474 m	KMt	4.475 m	-0.02%
KML	35.109 m	KML	35.125 m	-0.05%
Immersion (TPc)	0.808 tonne/cm	Immersion (TPc)	0.808 tonne/cm	0.00%
MTc	0.731 tonne.m	MTc	1.279 tonne.m	-42.85%
RM at 1deg = GMt.Disp.sin(1)	3.506 tonne.m	RM at 1deg = GMt.Disp.sin(1)	3.505 tonne.m	0.03%
Length:Beam ratio	3.475	Length:Beam ratio	3.475	0.00%
Beam:Draft ratio	8.042	Beam:Draft ratio	8.045	-0.04%
Length:Vol^0.333 ratio	6.12	Length:Vol^0.333 ratio	6.121	-0.02%
Precision	Medium 69 stations	Precision	Medium 69 stations	

Hydrostatic Data Table

Figure 2: Hydrostatic Data for trawler of added fin stabilizer on left view and parent ship data on right view.

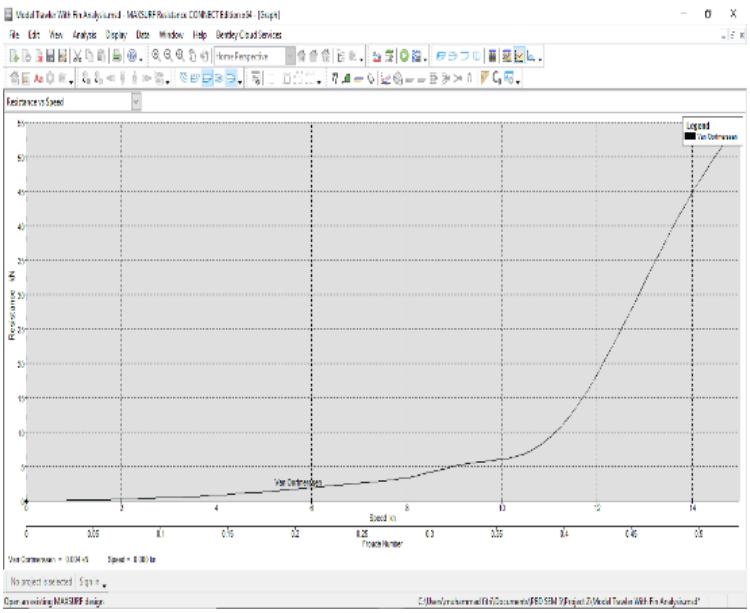

Figure 3: Graph from Maxsurf Resistance for trawler of added fin stabilizer

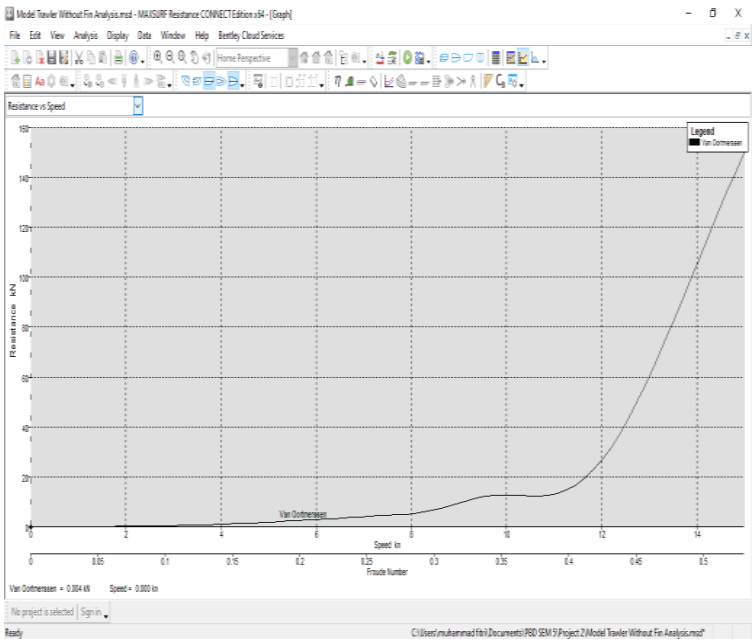

Figure 4: Graph from Maxsurf Resistance for trawler of parent ship data on right view.

Both the graphs above show the resistance of parent ship and with fin stabilizers using Van Oortmerssen Method. Based on that data, it can be concluded that the resistance of trawler with fin stabilizer (left side) is less resistance than a trawler without fin stabilizer. This concluded that trawlers without fins stabilizer (right side) has difficulty due to too many waves obstruct the hull while sailing.

3.2 Comparison on Stability using Maxsurf Stability for Both Designs.

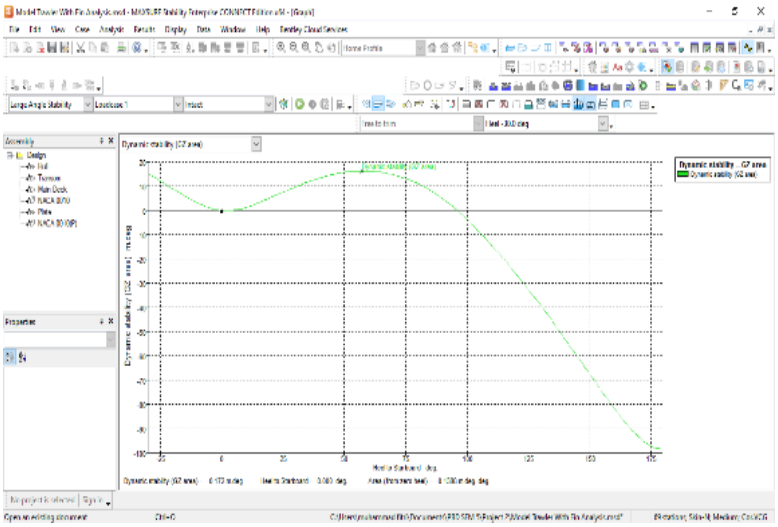

Figure 5: Graph from Maxsurf Resistance for trawler of added fin stabilizer

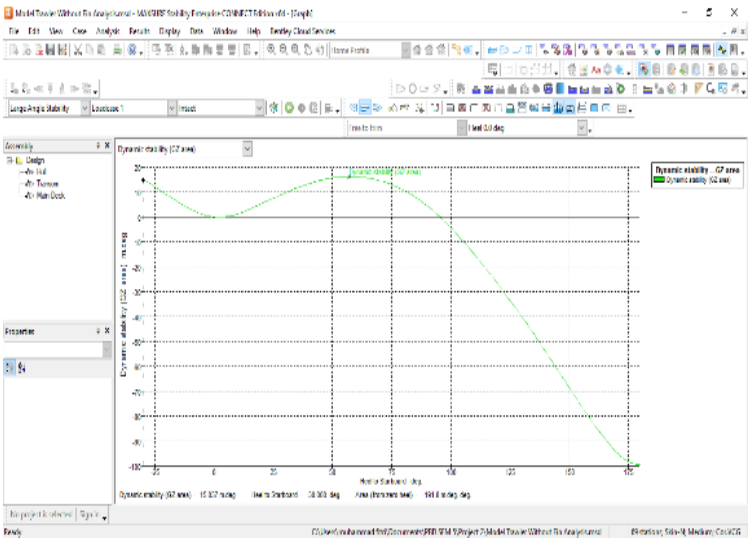

Figure 6: Graph from Maxsurf Resistance for parent ship data

Both the graphs in figure 5 and figure 6 above shows the resistance of parent ship and with fin stabilizers using load case analysis. Referring to the data obtained, it was concluded that the resistance of trawler with fin stabilizer is

less resistant than a trawler without fin stabilizer. This shows that the trawlers with fin stabilizer are much better in fulfilling the functions of a fin stabilizer where it provides resistance to the excess rolling of ship in either direction.

4.0 CONCLUSION

Ships with fin stabilizer are better than vessels without fin stabilizer due to its stability and balanced levels of the ship. In addition, it minimizes the damage to the ship and at the same time, the combination of fin stabilizer on these ships will have a huge impact on the shipping industry.

This study exposes the students to a variety of processes in producing design from sketching methods and finalize the accurate decision by design comparison criteria. Students also able to apply ship design knowledge through Maxsurf software in order to create the specific design based on parents ships parameter and implemented ship simulation in Maxsurft software. The most important process is the students gaining experiences and knowledges during created a product using CURA software and transferred to 3-Dimension printer.

Due to the changing sea state condition, the result of trawler with fin stabilizers maybe differs on certain points. This project can proceed with regard to the subject of simulation trawler with fin stabilizers at different sea state condition. The other suggestion for the next project is to produce a product that has a fin stabilizer that is movable or hydraulic. It will give different results to the fitted fin stabilizer as per this paper. Therefore, it requires more commitment and effort to create a deep study to produce the hydraulic fins.

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6.0 APPENDIX

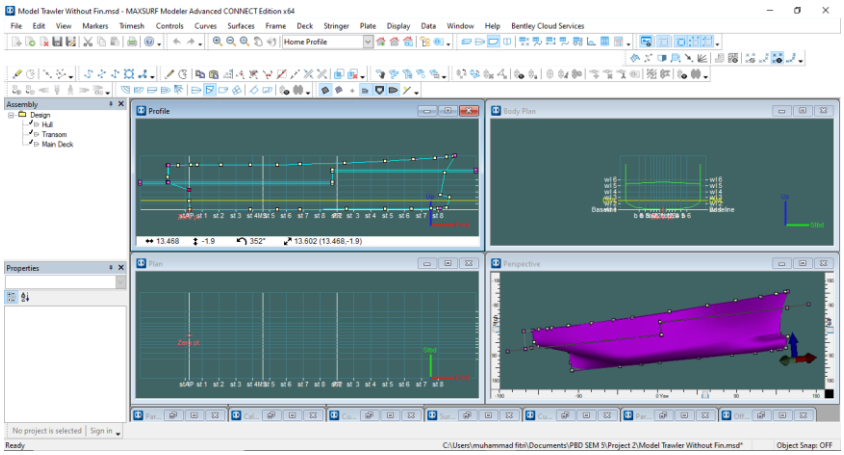

Figure A: Maxsurf Modeller

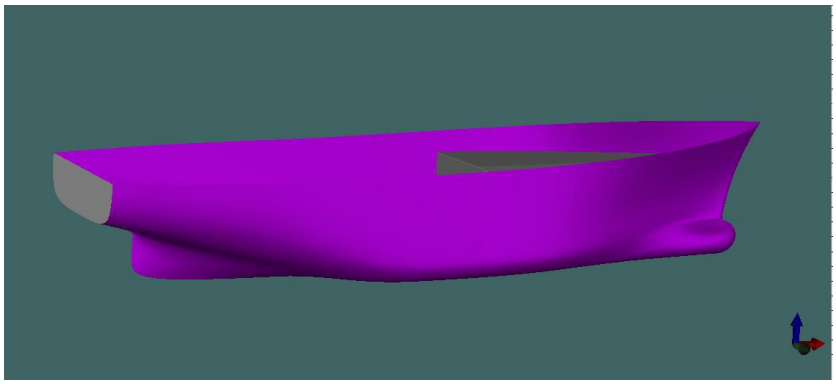

Figure B: Parent Ship

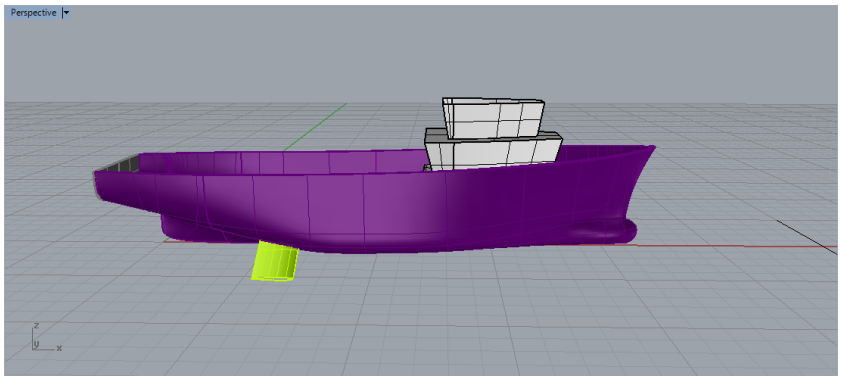

Figure C: Parent Ship with Fin Stabilizer in Rhinoceros model.

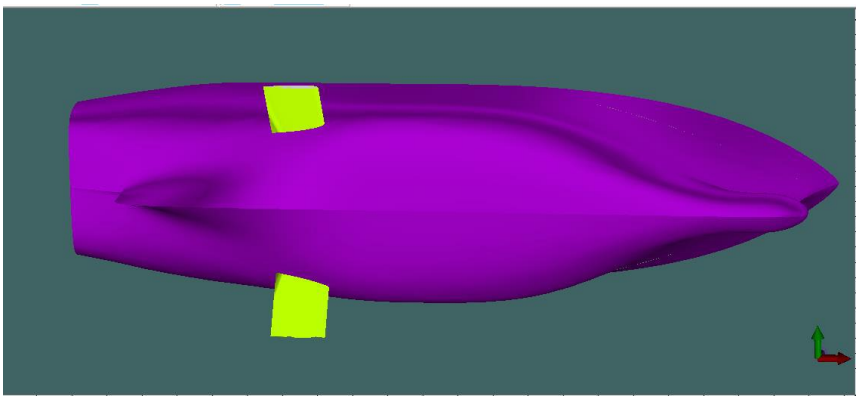

Figure D: View from Keel

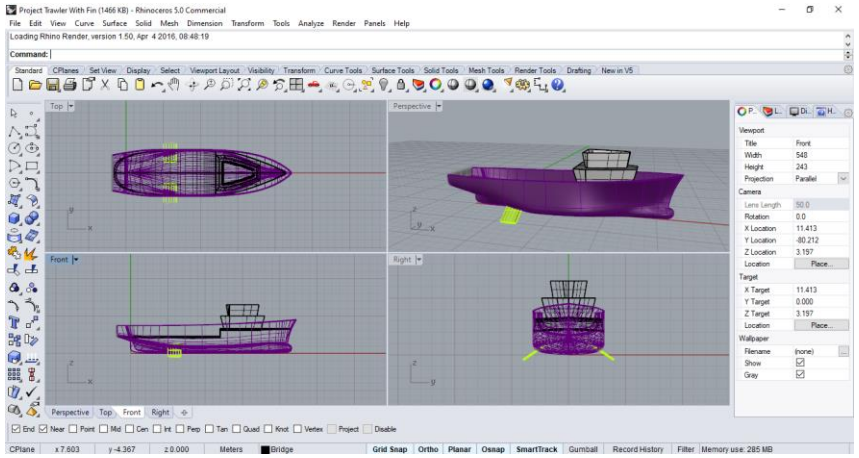

Figure E: Convert the design In Rhinoceros software

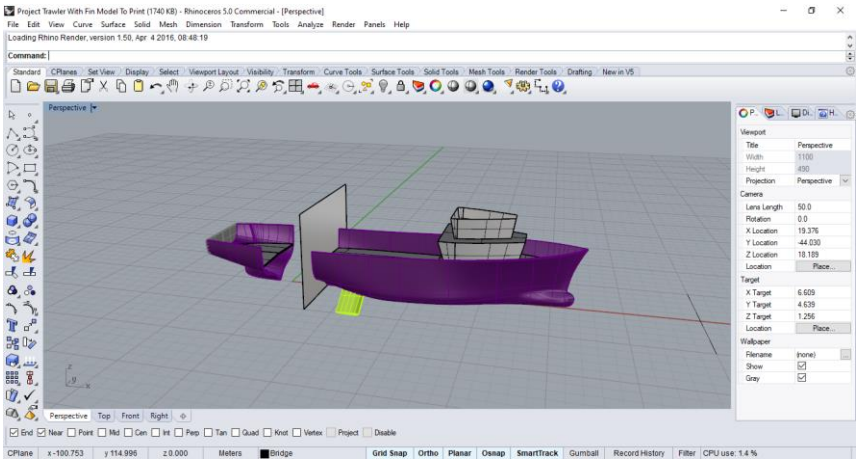

Figure F: Ship in Extrude Step (part by part).

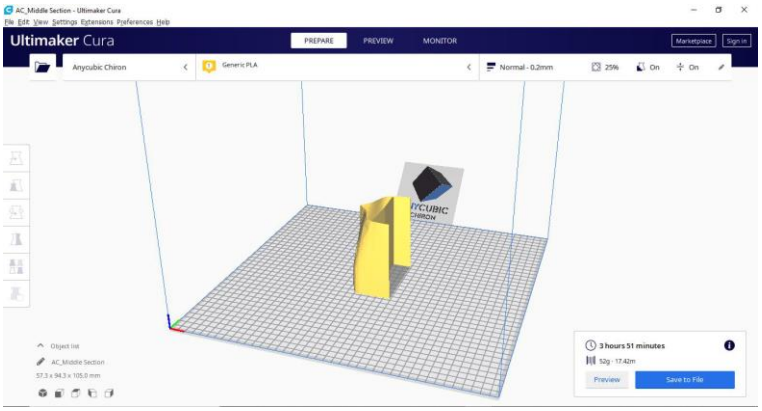

Figure G: Convert the design into CURA Software

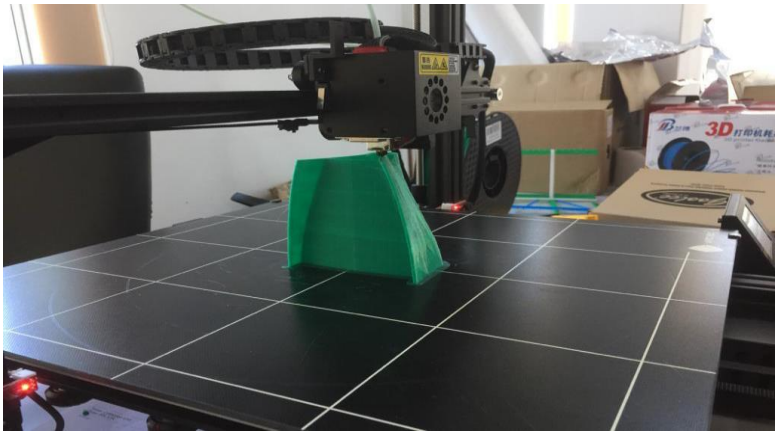

Figure H: Print the Product using 3D Printer

Figure I: The finishing product using 3D printer

IMPLEMENTATION OF GREEN TECHNOLOGY IN YACHT BOAT PROPULSION SYSTEM (SOLAR ENERGY)

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ABSTRACT

Research in the application of renewable energy has boosted in recent years. The fear of petroleum depletion in the future is forcing researchers to escalate the exploitation of renewable energy resources as an alternative to fossil fuel-based technologies in all fields. Ships as one of the key transportation in the world also need diesel oil as fuel for main propulsion systems and for diesel generators, which supply electrical needs. Solar energy has been considered as the most suitable renewable energy resources to replace the role of fuel in the ships. In this paper, the latest research on the utilization of solar energy in the ship are presented and analysed to develop a solar-powered boat. The best possible method to utilize the solar energy in the ship is by using catamaran boat, a type of yacht, with the flat top structure to provide room for placing solar panel or photovoltaic (PV) module. Due to budget constraint and other limitations, the undertaken project is only involved the making of a mini prototype of said catamaran. Overall, it is expected to further inform the public about the benefits of solar energy generated from environmental resources as well as saving the cost of ship operation.

Keywords: *Catamaran, Electric Propulsion, Green Technology, Solar Energy, Prototype, PV Module.*

1.0 INTRODUCTION

Nowadays, the shipping economics are booming due to the role of a ship for exporting and importing cargo. Other than saying trade, ships also serve as a cruiser for everyone mainly for vacationing. Therefore, the shipbuilding industry currently is still in demand (Tegmeyer & Meyer, 2020).

All of these vessels built presently are propelled with different type of propulsion. One of which has benefited from the use of solar energy. Solar energy is a technology created to harness radiant light and heat from the Sun. This solar energy has been widely used in many traditional technologies over

the last several centuries. For example, using the Sun to heat water and generating electricity through a heat engine. Today, many homes, factories and industries are installing PV modules to produce electricity [Solar Mag, 2020]. As a result, it is viable and significant to execute a project on the use of solar energy on ships. The ideal possible method to utilize the solar energy in the ship is by using catamaran boat, a type of yacht, with the flat top structure to provide room for placing PV module. [Kurniawan, A., 2016].

2.0 METHODOLOGY

In general, this project involves cabling and circuit installed to power the boat by harnessing the Sun. Other than that, the process of measurement and calculation is also involved in the production of this project. All of these processes have continuity and relevance to each other. Therefore, the work involves designing, assembling and modifying results and testing.

a) Selection of Components and Material Minimal costing is taken into consideration, as the final cost must fit with the existing product in the market in order to compete with other products. In addition to the cost, the materials used should also be tailored to the strength and use of the material. Material durability is studied to find the right material where it can support the catamaran production and function properly. In addition, the material structure is also considered so that the material selected can withstand extreme weather, temperature, pressure or load et al (Freire, S. 2008). The material to be used must be easy to obtain because the time taken for the production of the project can be short lived and the goods to be procured should also be in accordance with the design time of the installation or production of the project as the goods or materials need to be publicized elsewhere.

b) Hull and Superstructure Design and Printing Catamaran hull and circuit for PV module are planned based on the requirement. The hull design is then digitalized in MAXSURF Modeler for further development and analysis. The hull design from MAXSURF is carried to Rhinoceros 3D for completion of the prototype, which are designing the superstructure and a thicker hull for three dimensional printing. The final digital 3D model is afterwards sliced into layers by Ultimaker CURA and converted to 3D printerspecific .gcode file. The .gcode file of the prototype is then transferred to a 3D printer for printing.

c) PV System Installation The PV system is planned as shown in Figure 1. Once the prototype hull and superstructure is printed, the work on PV system installation is commenced. Solar Charge Controller is installed near to the 12V batteries to reduce any voltage losses and result in a more efficient system. The 12V inverter is connected to the batteries and not directly to the charger controller to prevent break down on the 12V DC motor due to excessive current. The PV module is then connected to the charger

controller and is tested until the green status indicator lights up on the charge controller. PV module is later fixed on the flat upper side on the superstructure [Day, L., 2020].

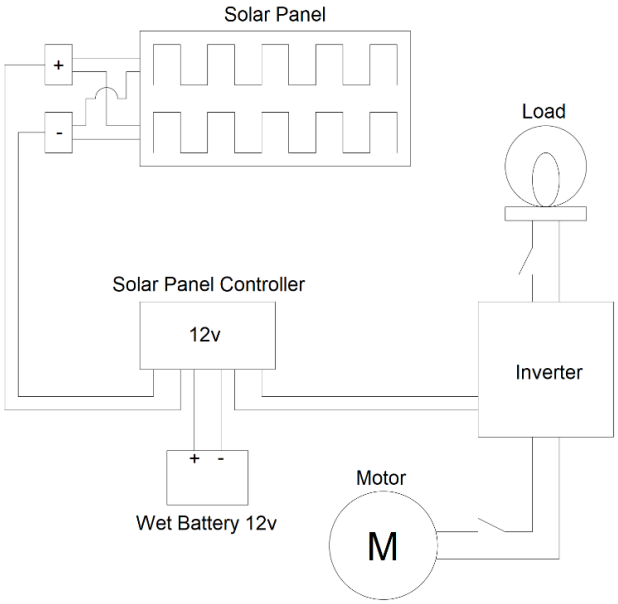

Figure 1. Solar Panel/PV Module System Schematics

3.0 RESULT AND DISCUSSION

Based on the previous section, the sophisticated components of the solar boat have been developed. If all the best technology on each component can be integrated, a high-efficiency solar-powered catamaran can be built. Hydrostatics data for the catamaran is shown in Table 1. The hull is then being analysed using MAXSURF Resistance that provides a wide range of calculation methods to help you estimate the resistance and powering requirements of the hull. A range of industry standard algorithms is provided, it is also possible to directly analyse the resistance of the hull using a Slender Body (Molland) method.

For the regression analysis methods (all methods except analytical), the resistance and power are automatically calculated whenever a change is made to the input data. The analytical results can only be obtained after solving the analysis, see using the slender Body Method. If the vessel type is Molland (Catamaran), MAXSURF Resistance will automatically generate a symmetrical mesh that is centred on the local demi hull centreline. The result for hull resistance is shown in Table 2 and Figure 2 and Figure 3.

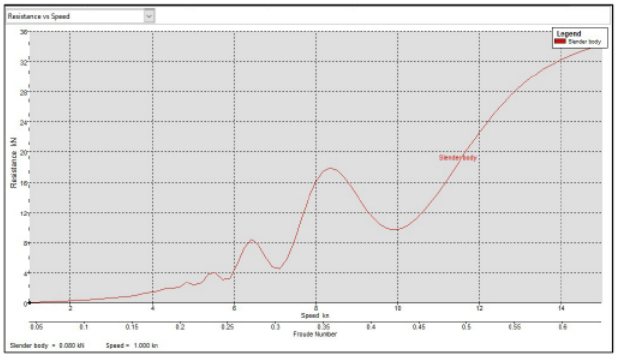

Figure 2. Resistance vs Speed Graph

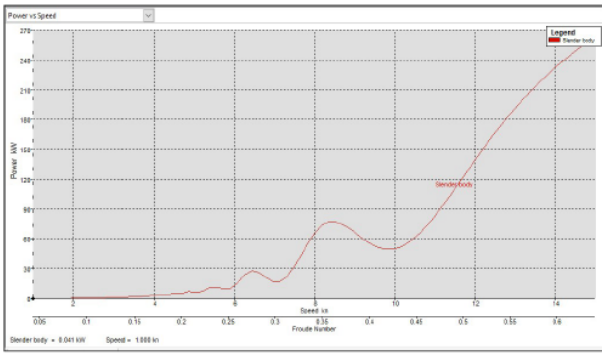

Figure 3: Power vs Speed Graph

Table 1: Hydrostatics Data

Measurement	Value	Units
Displacement	42.45	t
Volume (displaced)	41.418	m^3
Draft Amidships	1.5	m
Immersed depth	1.5	m
WL Length	14.774	m
Beam max extents on WL	6.2	m
Wetted Area	106.907	m^2
Max sect. area	3.06	m^2
Waterpl. Area	32.708	m^2
Prismatic coeff. (Cp)	0.916	
Block coeff. (Cb)	0.779	
Max Sect. area coeff. (Cm)	0.85	
Waterpl. area coeff. (Cwp)	0.922	
LCB length	6.801	from zero pt. (+ve fwd) m
LCF length	6.848	from zero pt. (+ve fwd) m
LCB %	46.035	from zero pt. (+ve fwd) % Lwl
LCF %	46.353	from zero pt. (+ve fwd) % Lwl
KB	0.823	m
KG fluid	1.5	m
BMt	5.025	m
BML	12.57	m
GMt corrected	4.349	m
GML	11.893	m
KMt	5.849	m
KML	13.393	m
Immersion (TPc)	0.335	tonne/cm
MTc	0.342	tonne.m
RM at 1deg = GMt.Disp.sin(1)	3.222	tonne.m
Length:Beam ratio	6.156	
Beam:Draft ratio	1.6	
Length:Vol^0.333 ratio	4.27	
Precision	Medium	59 stations

Table 2: Resistance Table

Speed (kn)	Froude No. LWL	Froude No. Vol.	Slender Body Resist, (kN)	Slender Body Powder (kW)
1000	0.043	0.088	0.1	0.041
1.350	0.058	0.119	0.1	0.097
1.700	0.073	0.15	0.2	0.188
2.050	0.088	0.181	0.3	0.322
2.400	0.103	0.212	0.4	0.513
2.750	0.118	0.243	0.6	0.781
3.100	0.132	0.274	0.7	1.15
3.450	0.147	0.305	0.9	1.596
3.800	0.162	0.336	1.3	2.527
4.150	0.177	0.366	1.5	3.305
4.500	0.192	0.397	2	4.547
4.850	0.207	0.428	2.7	6.828
5.200	0.222	0.459	2.7	7.249
5.550	0.237	0.49	4	11.484
5.900	0.252	0.521	3.3	9.986
6.250	0.267	0.552	7.4	23.68
6.600	0.282	0.583	7.7	26.285
6.950	0.297	0.614	4.8	17.159
7.300	0.312	0.645	5.8	21.799
7.650	0.327	0.676	11	43.383
8000	0.342	0.707	16	66.001
8.350	0.357	0.737	17.9	76.863
8.700	0.372	0.768	16.6	74.487
9.050	0.387	0.799	13.9	64.741
9.400	0.402	0.83	11.3	54.749
9.750	0.417	0.861	9.9	49.458
10.100	0.432	0.892	9.8	51.039
10.450	0.447	0.923	11.1	59.471
10.800	0.462	0.954	13.2	73.378
11.150	0.477	0.985	15.9	90.94
11.500	0.492	1.016	18.7	110.469
11.850	0.506	1.047	21.4	130.609
12.200	0.521	1.077	24	150.531
12.550	0.536	1.108	26.2	169.274
12.900	0.551	1.139	28.2	186.865
13.250	0.566	1.17	29.8	202.938
13.600	0.581	1.201	31.1	217.444
13.950	0.596	1.232	32.2	230.855
14.300	0.611	1.263	33	242.513
14.650	0.626	1.294	33.6	253.359
15000	0.641	1.325	34.2	264.125

Based on the result, it is best to implement the solar energy on a catamaran with a flat top due to hull will reduce drag by making use of a very thin and pointed hull design. Catamarans are also very light, which further reduces drag and displacement because the multihull design eliminates the need for a keel counterweight, as the same purpose (righting the ship) is served by hull spacing . Other than the hull design, the decision to choose solar energy as an alternative to fossil fuel is the right one since it is highly reliable and easy to maintain. Solar panels have no moving parts, so visual checks and servicing are enough to keep systems up and running. Solar panels are also built to withstand hail impact, high wind, and freeze-thaw cycles. Solar panel systems can produce power in all types of weather. On partly cloudy days, they produce as much as 80% of their potential energy. Even on extremely cloudy days, they can still produce about 25% of their maximum output. Solar energy burns no fuel, hence producing no atmospheric emissions of greenhouse gases that are harmful to the earth.

4.0 CONCLUSION

The technology to establish solar-powered boat is developing in advance. Building a fully solar-powered ship is not just a daydream anymore. However, the research in this field must be continuously done in order to increase the efficiency of the system. Based on the recent publication of the solar-powered boat technology development, some researchers are considered references to build a solar boat. A catamaran boat with top flat structure is the best possible boat to provide adequate spaces to install the PV module. The presence of solar yacht boat not just in Malaysia can reduce sea pollution from oil spills besides lowering the cost of operating a ship. Many other countries is already on pursuit to substitute fossil fuel with another alternative. It is a blessing that our country Malaysia is right beside the equator, which means most of the weather is either sunny or rainy. Ship can use 100% energy prom PV module during sunny and hot day. The batteries will also be completely charged during sunny weather and can be used during cloudy weather. There is also no risk of oil spills and no greenhouse gas emission since the system burns no fuel.

Hence, it can be concluded that the problems regarding ship operation, fossil fuel extinction and pollution of ecosystem can be resolved by switching to solar energy as an alternative.

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6.0 APPENDIX

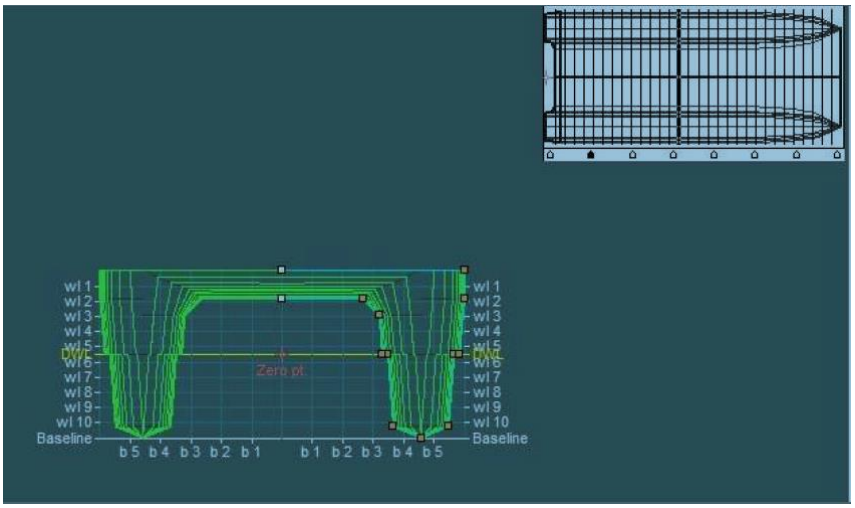

Figure A: Body Plan in MAXSURF Modeler

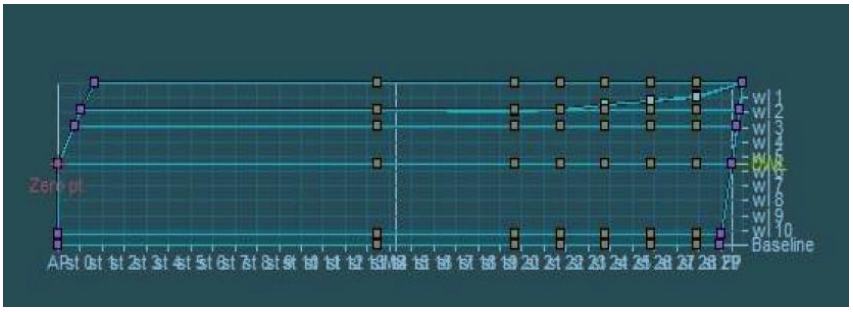

Figure B: Profile Plan in MAXSURF Modeler

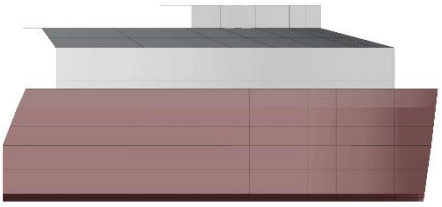

Figure C: Profile Plan in Rhinoceros 3D

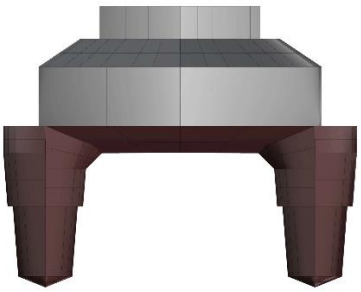

Figure D: Body Plan in Rhinoceros 3D

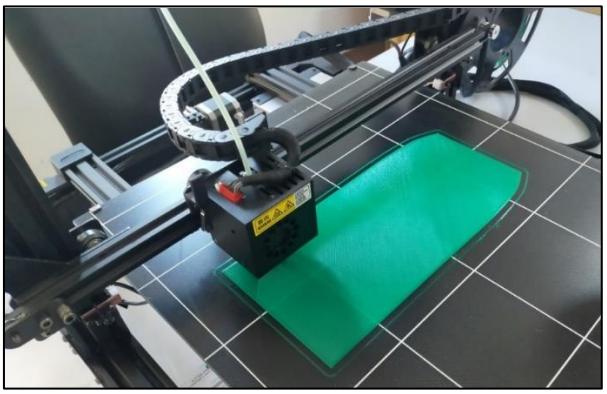

Figure E: Printing Process using 3D Printer

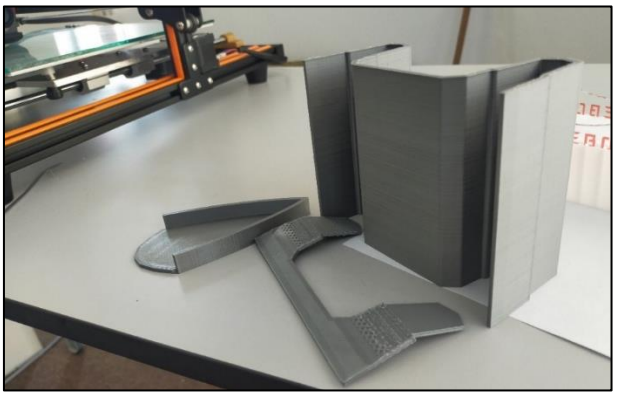

Figure F: Final Product using 3D Printer

EFFECT OF BULBOUS BOW SHAPE TO REDUCE SHIP RESISTANCE

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ABSTRACT

Ship resistance is one of the primary elements affecting the intent of a ship. Tanker boat is a ship with a small wet surface area that able to reduce drag and improve ship power. Generally, a bulbous bow is implemented to reduce wave resistance because the bulbous shape is believed to attenuate the bow wave system. Additionally, the bulbous bow also tends to reduce viscous resistance. When the stream around the physical structure is tranquil, the total ship resistance can be shortened significantly if the optimum bulbous bow is held. In this field, the primary aim is to set out the bulbous bow shape in tanker boat which makes the smallest ship resistance by maxsurf resistance and maxsurf modeler. Generating the variation of the bulbous bow shapes applies the one-to-one correspondence of the cross section parameter (ABT) and lateral parameter (ABL). The resolution of investigation shows that application of bulbous bow on can increase upwards to 31% of the total resistance of the ship.

Keywords: *Ship Resistance, Bulbous Shape, Boulbous Bow, maxsurf resistance.*

1.0 INTRODUCTION

Ship bow forms have a significant effect on the ship resistance components, especially wave making resistance component and throughout the years, ship hydrodynamic researchers invent different forms to minimize ship resistance. Ship resistance components are expressed with the method of estimation by different experimental, empirical and numerical method beside that study the outcome of some parameters on resistance components and recommended the optimum scope of each parameter.

Bulbous bow can help to bring down a ship's resistance and thus to keep the fuel consumption up to 15%, however, it is also seen as a menace to a struck ship in collision accidents because it may generally get through

the side casing of the vessel, which may cause the leakage of hazardous commodities. Focus of ship shape is to avert the dangerous consequence of ship-to-ship collision accidents through the bulbous bow shape (Liu. Y, et. al., 2014).

A bulbous bow is a protruding bulb at the bow of a ship just below the waterline. The bulb modifies the way the water runs around the hull, reducing drag and thus increasing velocity, range, fuel efficiency, and constancy. Ships with bulbous bows generally have a 12 to 15 percent better fuel efficiency than similar vessels without them. (Deddy, C., et.al., 2018).

Increases the ship's water line length, somewhat increasing, the ship speed, scaling down the installed power requirements and thus the fuel oil consumption. Works as a robust "bumper" in the event of a collision. Allows the installation of the bow thrusters at a foremost position, making it more efficient. Allows a larger reserve of flotation or a larger ballast capacity forward. Reduces the pitch movement. (Marinegyaan, 2017).

The motion of a ship through water requires energy to overcome resistance, i.e. The force working against the movement. As the resistance of a full-scale ship cannot be measured directly the knowledge about the resistance of ships comes from model tests. The total resistance of calm water can be split into three primary components: frictional resistance, residual resistance and air resistance. (Babicz, J, 2019)

Established along the recent data from bulk carrier resistance it is demonstrated that the impedance value of this kind of ship is quietly high. Therefore, this research focused on reducing the resistance of the ship as low as possible by changing its shape and shape of bulbous bow in bulk carrier to reduce the resistance of the ship using Maxsurf software.

2.0 METHODOLOGY

This chapter will discuss the research methodology that will be taken out in this study. The purpose of this study to reduce the ship resistance of bulbous bow and to compare the initial data to the current information:

2.1 Data Collection

The generated information will be collected to determine the best and suitable data for the bulbous stem. Software used to locate bulbous bow data is Maxsurf. Maxsurf can visualize and optimize vessel shapes with the complete set of integrated naval architecture tools. It also can create fair hull shapes, comply with stability requirements, minimize power requirements, and ensure crew and passenger comfort in varying sea states. Minimize structural weight while ensuring scantling compliance through initial modelling and stress analysis of beam and plate structures. Maxsurf used to redefine shape excellence for any size vessel.

2.2 Data Analysis.

Data analysis is to recover the important item that used in proses to make the final data before comparison data. Data analysis can identify the detail of the ship include item, value, and units.

a) Ship Resistance

Ship resistance has been worked out by naval architects as a means of predicting ship performance from preliminary experiments with theoretical accounts.ical accounts.

b) Data Comparison

In comparison data, the data resulting data is collected and compared with existing data and new data. The purpose of the comparison is to find the best and less resistance data that can be used in bulbous bow.

3.0 FINDING AND DISCUSSION

The data and the result from maxsurf Modeller and Maxsuf Resistance will be analysis and conclude the result. The new shape will be shown in 3D perspective view and the new offset data will be extracted from the Maxsurf Modeler. The percentage of resistance will be compared to get the result and to answer the objective of this project.

3.1 Comparison of New Shape and Original Shape

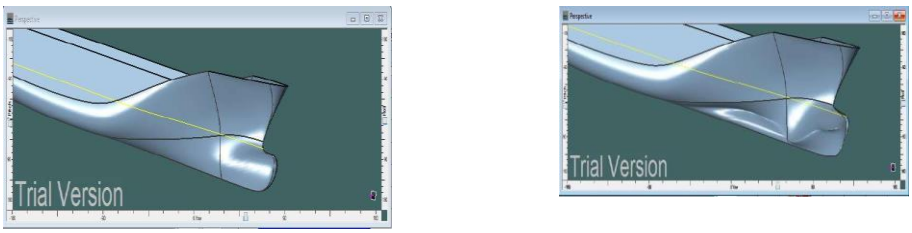

Figure 1 shows the differences in shape of bulbous bow compared to the original shape of bulbous bow.

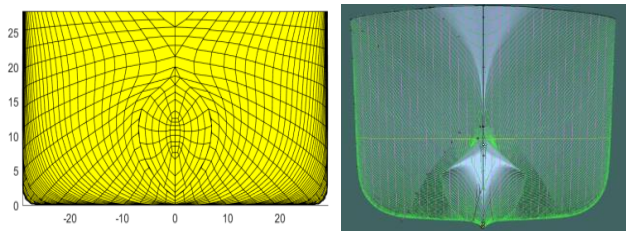

Figure 2: Lines plan of the bulbous bow

3.2 Comparison of Curved Area

This figure shows the difference of curves of area for both shapes. There are different shapes of the curve at station 180 m FP.

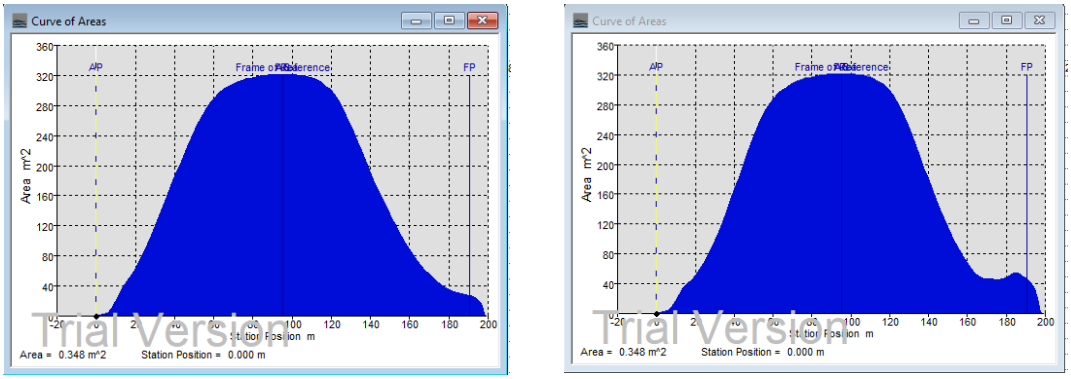

Figure 3 : Curve of Area

3.3 Resistance Vs Speed

The figure 4 below shows the graph generate from maxsurf resistance software. It shows that when the speed is increased the resistance also increase for both shapes.

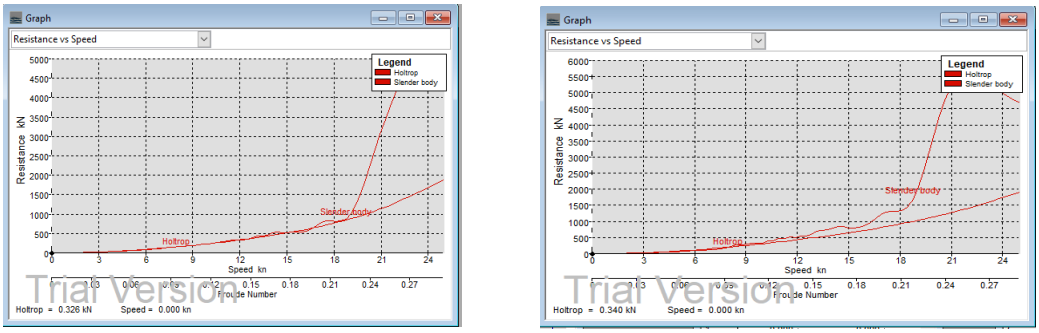

Figure 4 : Graph Resistance versus Speed

3.4 Offset Data

This table shows the offset data for new and preliminary data. They're increasing of 70.3 % in bulb transverse area of 45.775 m^2 compare to the preliminary area 26.877 m^2.

Table 1: Area of preliminary and new shape of bulbous bow

Item			% Different
	Premilinary	New	
Prismatic Coeff	0.58	0.545	6.0
Bulb Tranverse Area (m^2)	26.877	45.775	70.3
Bulb Height from Keel (m)	5.797	5.975	3.0

3.5 Comparison of Wave Pattern

Figure below shows the difference of wave pattern that's been created by two different shapes of bulbous bow. This fact explained that the wave resistance can also reduce drag force.

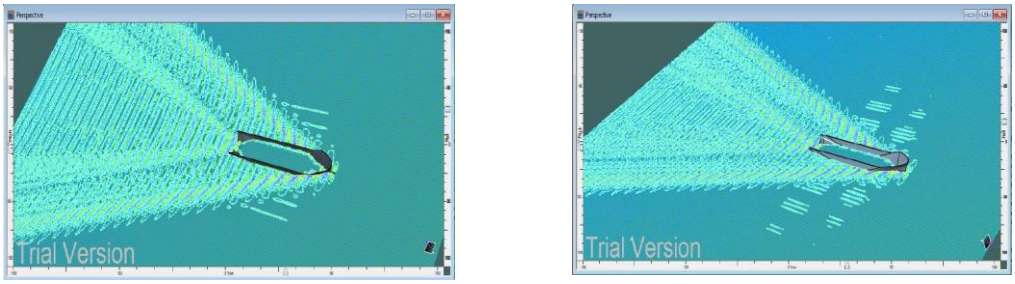

Figure 5 : New bow and original bow wave pattern

4.0 DATA ANALYSIS

Data from Maxsurf resistance is extracted to create a comparison between speed and immunity. It establishes that when the speed is increase the value of resistance is increased. The highest percentage of different of resistance at 10 knots which has reached 31.1 percent.

This graph demonstrates the dispute in new shape and preliminary shape of bulbous bow resistance. From the graph the resistance for a new shape is higher than preliminary shape.

Figure 6 : Resistance vs Speed

5.0 CONSLUSION

Maxsurf modeler is used to create a new shape of bulbous and Maxsurf Resistance used to calculate the resistance for the new shape of bulbous bow. Maxsurf modeler is used to reshape the bulbous bow and then reached the purpose bulbous bow to reduced the wave and ship resistance. The curved area data show that the new shape has a bit bigger curved area than the preliminary shape. On the slender body perspective, the new shape that has created produce a smaller resistance than the preliminary shape. Based on analysis result, it was found that the ship resistance value for the new shape of bulbous bow is increased from the preliminary shape.

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DESIGN A PLEASURE CRAFT WITH CATAMARAN

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ABSTRACT

Multihulls are studied under the same criteria as mono-hull and giving a clear comparison between old and new multihull designs and mono-hull particularly with regard to capsize in wind and waves. Pleasure Craft is a recreational yacht with is use a chine hull, single hull or mono-hull. Catamaran hull in pleasure craft has lower resistance compare to mono-hull.

keyword: *pleasure craft, mono-hull, catamaran, Design software, resistance*

1.0 INTRODUCTION

Throughout history the oceans have been important to people around the world as a means of transportation. That's make transport like a backbone of world trade and globalization. In order to continue as one of the most effective ways in carrying goods around the world, there will be improvement in hull design. There are few types of hull such as multihulls have many superior facts than similar size of mono-hull.

Mono-hull are crafts with better "self-righting" capabilities in the events of the worst case knocked down situation, particularly sailboat. By returning to an upright position we still have full access to on board safety equipment, life raft, dinghy, floatation devices, and strobe lights. This project concentrates on the concept on an easy to handle pleasure motorboat constructed as a catamaran.

Multihulls are crafts with more than one structural body, usually of two, three or five hulls, namely catamaran for two, trimaran for three, pentamaran for five hulls. The uses of multiple hulls resulted in a vessel with a lot of space. It is particularly well suited for the carrying passengers and low density cargoes. Multi-hulls design produce a very stable platform, particularly suitable for the

usage in fast ferries and have natural buoyancy, making them unsinkable. They can capsize in a bad accident but it's better to be rescued floating on the waters surfaces than sinking to the bottom in the monohull. Plus moving around on a flat deck is much safer than on a deck at an angle.

2.0 METHODOLOGY

2.1 Design Stage and Data Collection

During the design stages some changes had been made from the previous design by using design software. The data collected based on the result after the changes of the design are made. Then to ensure the accuracy of the data, validation is performed concurrently with software development and data collection. Validation is based on Maxsurf and AutoCAD.

Results from using the methodology show that data validation is a necessary part of change data collection. Without it, as much as 50 percent of the data may be erroneous. Feasibility of the data collection methodology was demonstrated by applying it to a project in study innovation. The application showed that the methodology was both feasible and useful. The application include classification. From the multi substance referred the student identify a data to create the offset table. Based on the offset table the student use maxsurf professional quick start to identify the type of vessel length, beam and draft to create an offset table for a 15 m catamaran.

In this project the chine hull catamaran had been chosen compare to previous design which is catamaran with round bilge hull. The offset data for 15m catamaran from maxsurf library design was used as a reference and limitation to design catamaran with chine hull. In order to design chine hull by adjusting the limit by using software maxsurf. Then offset data from maxsurf was exported to Microsoft excel which will later be imported to AutoCAD.

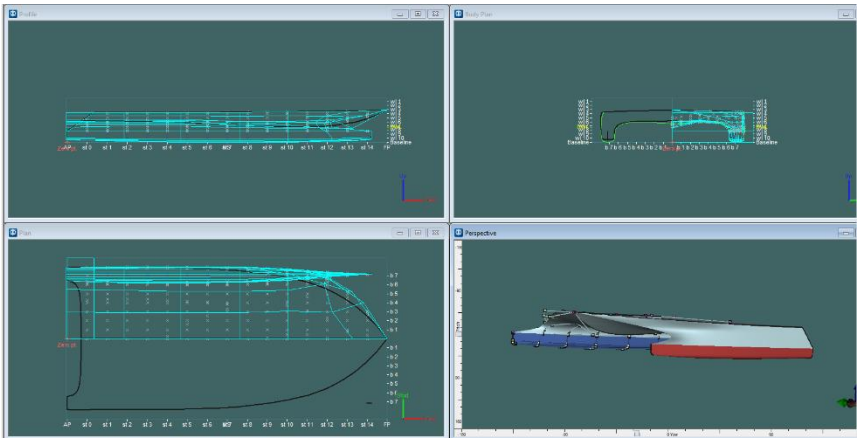


Figure 1: The Actual Pleasure Craft Without the Modification of Catamaran Hull

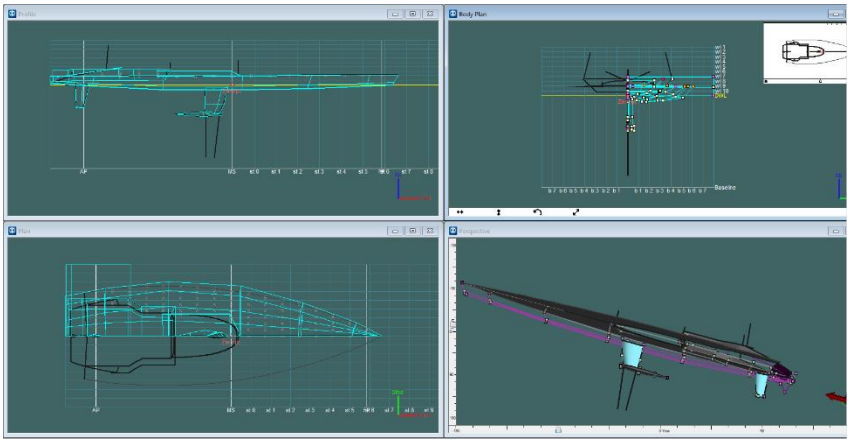


Figure 2: The Pleasure Craft with The Modification Of Catamaran Hull

In figure 1 and figure 2 shown four view of window in Maxsurf designed pleasure craft customized from mono hull to catamaran hull. The designed is created in the Maxsurf Modeler.

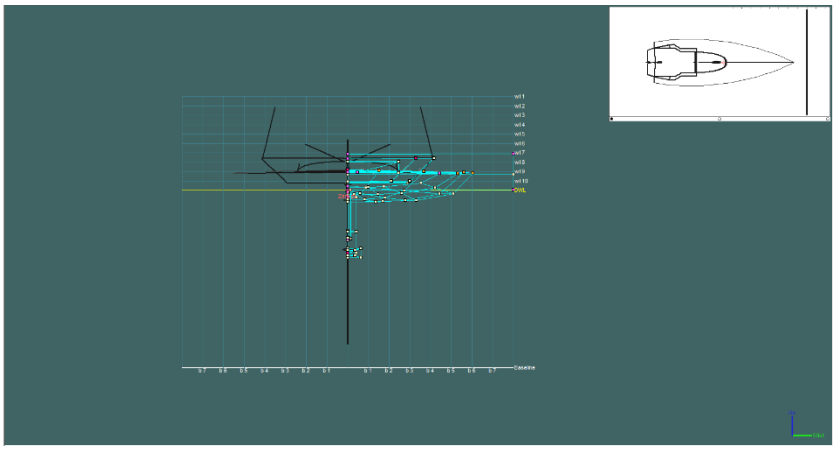


Figure 3: Comparison between Old Design & New Design with Body Plan View (Old Design)

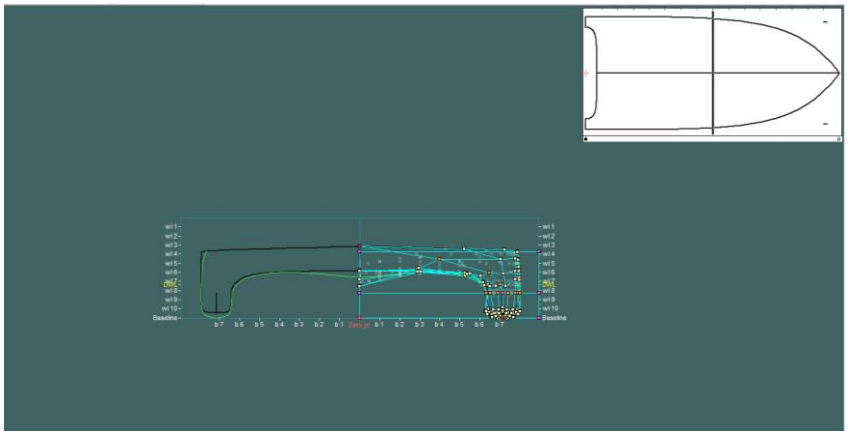


Figure 4: Comparison between Old Design & New Design with Body Plan View (New Design)

AutoCAD software is used to draw line plan and general arrangement plan. However it is easier to draw hull form that by exporting the catamaran design in Maxsurf to AutoCAD by exported as a."dxf" format. Thus the export file can now be opened in AutoCAD. Unnecessary lines are deleted and the lines from each view is arranged in a new file after which it is saved. After completed the lines plan in AutoCAD format then continue to draw General arrangement of the catamaran

Figure 5 Lines Plan of Pleasure Craft

2.2 Research instrument

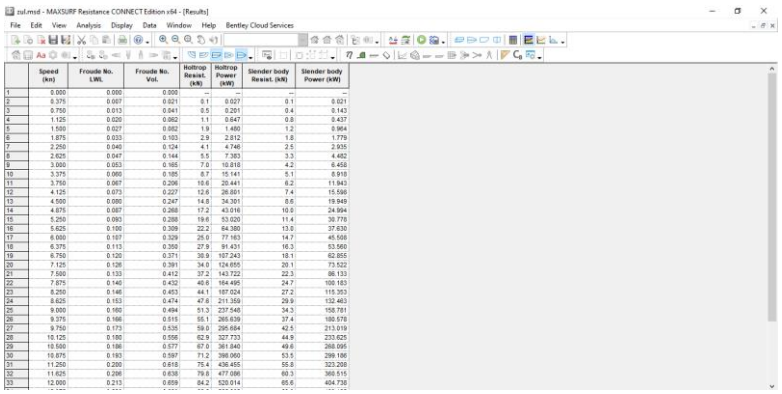
Maxsurf and AutoCAD software are used for hull modelling purposes of the pleasure craft with catamarans hull. AutoCAD is a 2-D and 3-D computer-aided drafting software application used in architecture, construction, and manufacturing to assist in the preparation of blueprints and other engineering plans. In addition Maxsurf software is used to create high-quality hull surfaces and can be used for hull analysis and CAD/CAM functions.

2.3 Data Analysis Method

The design pleasure craft by using catamaran is done by using Maxsurf software to ensure the catamaran concept that been chosen is fairness and suitability for construction to increase ship buoyancy. Besides that to improves design with accurate performance prediction. Then to optimize vessel, pleasure craft design for competing requirement. Create data for the previous reference. After that, adjust the data based on hydrostatic data. The data is compared with previous data to cross check without error. Then offset data from Maxsurf was exported to Microsoft excel which will later be imported to AutoCAD. The data exported used to draw line plan and general arrangement plan in AutoCAD software.

3.0 RESULT AND DISCUSSION

In this project pleasure craft is re-design by using catamaran hull because catamaran hull will reduce ship resistance. Resistance analysis is conducted by using Maxsurf Resistance software. In the Maxsurf resistance the model of pleasure craft by using catamaran hull is tested for ship resistance with different speed of ship. The graph of resistance against speed is plotted in the software and shown that the resistance for pleasure craft with catamaran hull had lower resistance compared to previous design which is mono hull.



	Speed (kn)	Froude No. LWL	Froude No. Vol.	Holtrop Resist. (kN)	Holtrop Power (kW)	Slender body Resist. (kN)	Slender body Power (kW)
1	0.000	0.000	0.000	--	--	--	--
2	0.375	0.007	0.021	0.1	0.027	0.1	0.021
3	0.750	0.013	0.041	0.5	0.201	0.4	0.143
4	1.125	0.020	0.062	1.1	0.647	0.8	0.437
5	1.500	0.027	0.082	1.9	1.480	1.2	0.964
6	1.875	0.033	0.103	2.9	2.812	1.8	1.779
7	2.250	0.040	0.124	4.1	4.746	2.5	2.935
8	2.625	0.047	0.144	5.5	7.383	3.3	4.482
9	3.000	0.053	0.165	7.0	10.818	4.2	6.458
10	3.375	0.060	0.185	8.7	15.141	5.1	8.918
11	3.750	0.067	0.206	10.6	20.441	6.2	11.943
12	4.125	0.073	0.227	12.6	26.801	7.4	15.598
13	4.500	0.080	0.247	14.8	34.301	8.6	19.949
14	4.875	0.087	0.268	17.2	43.016	10.0	24.994
15	5.250	0.093	0.288	19.6	53.020	11.4	30.778
16	5.625	0.100	0.309	22.2	64.380	13.0	37.630
17	6.000	0.107	0.329	25.0	77.163	14.7	45.508
18	6.375	0.113	0.350	27.9	91.431	16.3	53.560
19	6.750	0.120	0.371	30.9	107.243	18.1	62.855
20	7.125	0.126	0.391	34.0	124.655	20.1	73.522
21	7.500	0.133	0.412	37.2	143.722	22.3	86.133
22	7.875	0.140	0.432	40.6	164.495	24.7	100.183
23	8.250	0.146	0.453	44.1	187.024	27.2	115.353
24	8.625	0.153	0.474	47.6	211.359	29.9	132.463
25	9.000	0.160	0.494	51.3	237.546	34.3	158.781
26	9.375	0.166	0.515	55.1	265.639	37.4	180.578
27	9.750	0.173	0.535	59.0	295.684	42.5	213.019
28	10.125	0.180	0.556	62.9	327.733	44.9	233.625
29	10.500	0.186	0.577	67.0	361.840	49.6	268.095
30	10.875	0.193	0.597	71.2	398.060	53.5	299.186
31	11.250	0.200	0.618	75.4	436.455	55.8	323.208
32	11.625	0.206	0.638	79.8	477.086	60.3	366.515
33	12.000	0.213	0.659	84.2	520.014	65.6	404.738

Figure 6: Maxsurf Resistance (Graph Resistance Vs Speed)

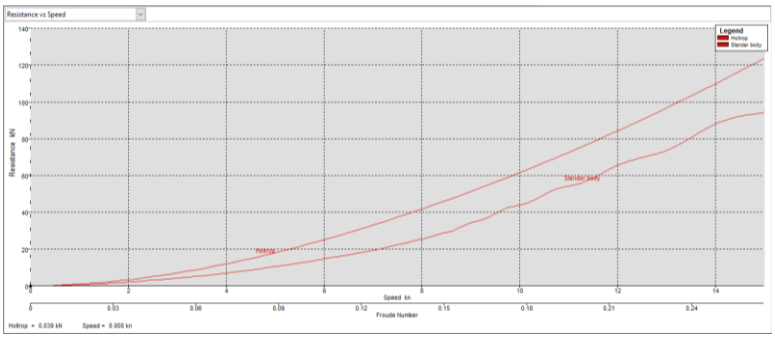


Figure 7: Maxsurf Resistance (Table of Resistance)

Pleasure Craft is a recreational yacht with is use a chine hull, single hull or mono-hull. Catamaran hull interior in pleasure craft has better stability and faster speed than the other conventional types of ship. It can give one's pleasure or comfort, luxury, attract most people. Multi-hulls design produce a very stable platform, particularly suitable for the usage in fast ferries and have natural buoyancy, making them unsinkable. Beside that's, by re-design pleasure craft with catamaran hull also provide better safety level than the other mother ship which is avoiding from sinkable and capsize. Plus moving around on a flat deck is much safer than on a deck at an angle.

4.0 CONCLUSION AND RECOMMENDATION

In this project detail definition relating to catamaran hull forms for pleasure craft by designed hull drawn with MAXSURF. As a result of the project study which has carried out the hull modification on pleasure craft, it can be concluded that it has achieved the objective of the study of creating a new hull for pleasure craft. This project will help the development of using catamaran hull form in ship industry in Malaysia. Chine hull forms is used intended to design semi-planning craft. The displacement hull forms use full for load carrying but low speed. So the planning hull designed for speed but power requirement are too high.

Thus, Semi-planning craft is selected for our design, pleasure craft. MAXSURF is used largely because it easy to use. So, lines plan are drawn in AutoCAD. Catamarans are very stable and have natural buoyancy, making them unsinkable. Yes, they can capsize in a bad accident, but it's better to be rescued floating on the water's surface than sinking to the bottom in a mono-hull. Plus, moving around on a flat deck is much safer than on a deck at an angle.

Based on this project the recommendation to improve the project in future research by having sister ship as a reference. The sister ship data will be reference for dimension and offset data to re-design new hull form design. Besides that’s, by having sister ship the resistance result of the new design and previous design can be compared to analyse accuracy of the analysis.
Furthermore in future study it recommended for detail analysis of the design such as stability, seakeeping and manouvering of pleasure craft with catamaran hull. Moreover detail analysis can be conducted by using software of model testing. Then result for both analysis can be compared for more accurate result.

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FISHING BOAT WIDTH MODIFICATION AND STABILITY

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ABSTRACT

The present research was conducted in order to investigate stability performance of fishing boat after width modification.Initial boat width 6.78m, extended up to 1.5m and 1.8m on both side.Stability was studied with aid of maxsurf stability and modeller.Load applied at three variaous location to indentify stability of the fishing boat.Result shows failure starts at 1.8m extention and termendous stability failure occured. Application of Maxsurf stability in boat width modification provided reliable result.

Key Word: Boat,stability,modification, failure and width .

1.0 INTRODUCTION

According to the statistics of The New Straits Times, most of the incident of capsized and sank ship is caused by the improper modification of ship that will affect the stability of a ship. So, this project is about width modification of fishing boat and investigate modification influence on stability of a fishing boat. Every year, huge number of modification of boats is recorded especially on the modification of width. This kind of modification will indirectly affect the stability of the ship. According to The Star Online on 26 July 2018, a Chinese fishing vessel sinks in Penang waters. Another problem appear when a deck cargo ship has sunk some 3.3 nautical miles east of Tanjung Sepang. Based on the information, the ship sustained damage to its engine causing its wheel ship to be inoperative. This is due to the overload of cargo because the width of ship has been modified and affected the engines performance that causes the engine unable to sustain the damage affected to the ship. This accident is believed to be due to improper modifying to gain more capacity on the ship. Due to this action the capacity of ship exceed the specified limit and sank.

This project is considered to make better impact on width modification at once enhance the safety stability of a fishing boat. Most of modification on ship and boat will affect the outcome of ship stability, therefore the research about the impact of width modification on fishing boat ship stability need to be done. This is due to unaware of the owner regarding to the sensitivity of the boat stability after the boat or ship modification. The owner should consider the after effect of the modification. The ship must be taken to the certified naval architecture for further research about the modification. The finding of this study will contribute more effectiveness of stability in width modification of boat. This research is expected to ensure the safety of fishing boats that have been modified, in advanced can reduce the statistics of the incident of ship capsized and sink to save more lives and priceless property.

2.0 METHODOLOGY

This research required technical method of research that is using a model of fishing boat in maxsurf modeller that have been transferred to maxsurf stability, with normal characteristics of fishing boat and change it width by added 1.5 m and 1.8 m from the original width.

2.1 Data Collection Method

The researcher applied methods of data collection techniques in order to collect adequate and relevant data to address the research objectives of this study. Nonetheless, the researcher used qualitative research method. This data need to be process in order to determine whether the ship stable or not. By using the maxsurf application, the boat stability analyzed by the program.

2.2 Research Instrument

Research design is the crucial part of the research as it includes all the four important considerations: the strategy, the conceptual framework, the identification of study on and the tools and procedures to be used for collecting and analyzing data. The research design basically is divided into several types for example qualitative research and quantitative research. There are two ways that had been chosen in this project. The width of the fishing boat in this project has been increased and reduced parallel with stability of fishing boat.

Stability comparison with three different size of width. The original ship that been used have width of 6.78m and stable. Once stability of this ship is calculated and recorded. The width of the original ship is added by 1.5m and 1.8m and the stability is calculated also recorded. The data is used to compare stability of modified. Merely to detect change in stability of the fishing boat by adding 1.5m and 1.8 m.The results of this experiment used to classify the level of stability of the boat while on operation.

3.0 DATA ANALYSIS

Data analysis was a very important segment in the research. Drew et al (2008) believed that in the qualitative research data analysis probably carries more negative connotations than any other single part of the research process. This could be attributed to the fact that in qualitative studies, data are usually recorded in the form of words, descriptions, opinions and feelings rather than numbers. Furthermore, data analysis is the process that most differentiates quantitative from qualitative research. The fishing boat model width modification is done by using maxsurf software to ensure the stability concept that used is fair enough and suitable. After that, the offset data of the three fishing boat analyzed and exported to Microsoft excel and to Autocad.

4.0 RESEARCH SUMMARY

Research studies about stability of fishing boat performances and their application to the fishing boat shows that maxsurf is reliable software on such studies. This study aims to describe the effect of the modification of fishing boat and its stability performances. Comparison between the three different width length of fishing boat and the stability performances. The design presented in this study also comprehended other aspects such as implication of the difference. All the results and data compared in table 1 shows failure angle of stability.

Table 1. Angle of stability.

MODIFICATION	Load Case	Angle of Vanishing Stability
ACTUAL	Middle	146.0
1.5m	1.5m	151.6
1.8m	1.8m	Not Available (Fail)

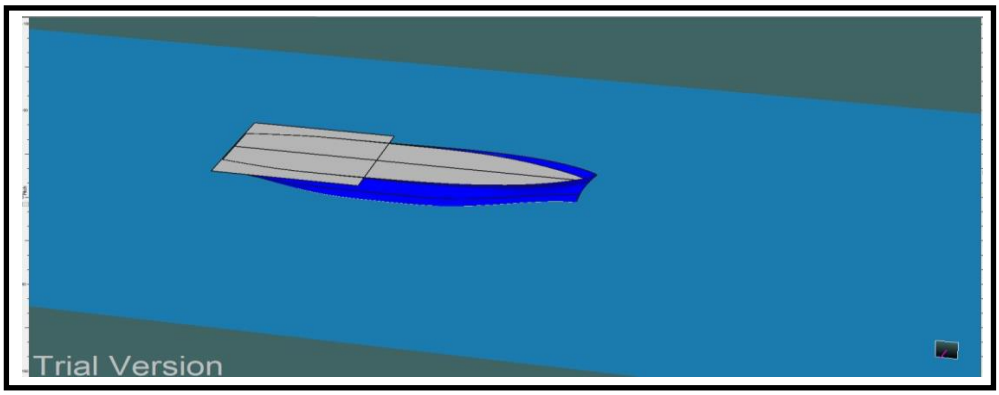

Figure 1: Vessel Design 2 (1.5m)

5.0 CONCLUSION

Finding of failure angle of stability and application of maxsurf in boat modification shows the achivement of objective of this project. This final year project which is carried out through two semester needs a lot of researches and its theory and method of study. It is essential to understand that the stability of ship is depending on several factor such as block coefficient , centre of gravity centre , centre of buoyancy and so on. From result and discussion, it is proved that the the weight of five crew on the platform of the second model is stated that it is not affecting the stability of ship. But it is possible for the ship to heel when a large load added on the platform. Final result shows that a small number of crew with a standard weight cannot harm or does not change the stability of ship.This research is considered a successfully proved that the third model with 1.8 m platform has failed on stability analysis. The stability result of vessel with 1.5 m platform with original vessel is almost as the same.

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THE DEVELOPMENT SEED COLLECTOR TOOL FOR LOOSE PALM FRUIT

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ABSTRACT

Seed Collector Tool for Palm is a project that is aimed at solving the problems faced by oil workers in oil palm plantations. The idea is obtained after undergoing the review process before the project is implemented. The problems identified are workers in oil palm plantations have difficulty collecting the remains of a broken oil seeds of fruit bunches. In addition, workers take some time to collect palm kernel corresponding resolution. The tool can collect seed oil in large quantities without the use of labour completely and save time quotes. It is also possible to separate between the seeds and waste time. With this project, can solve the labour's problem in the oil palm plantation. Its use is effective in addition to producing quality work, it's also helps to maintain a healthy life style in doing a job.

Keywords*: Development, Lost Palm Fruit, Manual Application.*

1.0 INTRODUCTION

Palm Oil Seed Collector Tool is a product that is designed to simplify the process of collecting oil palm seeds that get loose more effectively than manual techniques. This tool uses a completely mechanical concept and durable material that is lightweight metal. Can be used to dump oil palm seeds that get loose. Scooping palm kernel uncoupled in large quantities at a time, thus helping to separate between palm kernel and waste - a waste by shaking the device. In the production of these products, many factors that should be considered and studied as the quality, effectiveness and affordable products are widely accepted. Thus, the objectives themselves are the main target for a certain product. The objective of this product is to simplify the process of

collecting oil palm seeds that get loose after cutting ripe oil palm fruits. Turn drive is revolutionizing the conventional technology. Finally, able to save time collecting palm kernel uncoupled.

2.0 METHODOLOGY

2.1 Assemble Drawing

The device is fully designed using durable metal without using any motor or electrical wiring. Consisting of a handle, plunger, scoop, shaft and basket. The plunger lies in changing the position of the tool holder for angle between the handle and basket. Scoop fastened to the shaft using the bolt screws.

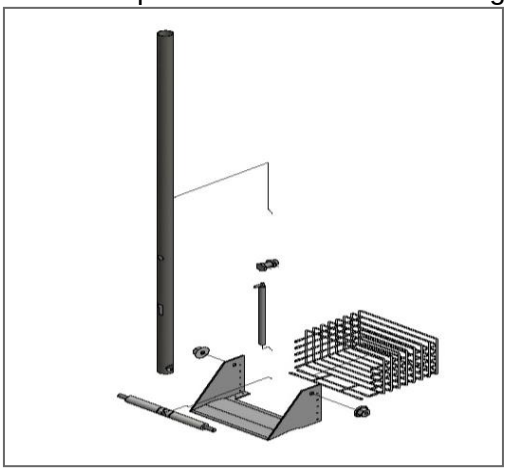

Figure 1: Assembly Drawing

Table 1: List Part

Item	Quantity	Part Number	Description
1	1	Scoop	Steel Plate
2	1	Plunger	Steel Rod 1/4''
3	1	Shaft	-
4	1	Basket	Steel Rod 2mm
5	1	Handle	Steel
6	1	Bolt & Nut	-

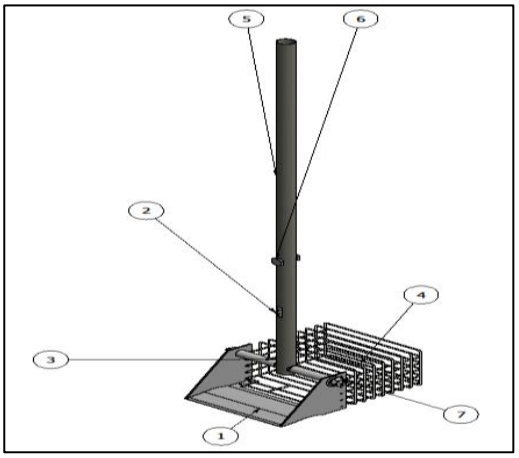

Figure 2: Final Drawing

Figure 3: Product Fabrication

Figure 4: Final Product

3.0 DISCUSSION

This tool can be produced after the discussion and selection of three early sketch of the product. After selecting the product design, material selection process suitable for producing the product. Some problems occurred during testing tools that palm kernel out of the body but the problem can be solved by changing the distance between the spokes sport back.

3.1 Functionality

This tool can be used to collect oil palm seeds that get loose after cutting process oil palm fruits that ripen at once can separate the oil palm seed and waste. In addition, the handle can be adjusted in order to facilitate used to take him. Has three adjustable angle between the handle and body for user comfort.

3.2 Durability

These devices are manufactured using durable materials such as mild steel to ensure long lifetime. In addition, can be exposed to a variety of warm weather and rain. The product surface has been coated with paint to prevent corrosion.

3.3 Project cost

Costs are important because they affect the total cost spent on the project. If the project costs are minimized likely potential for marketing the project is high. This is because a good project can be marketed at a reasonable price. The project cost Palm Seed Collector Tool are listed in Table 2.

Table 2: Product Costing

Component	Detail			Price (RM)
Skru, bolt dan nat	5			unit 2.50
Rod Besi 1”	1.5			Meter 22.50
Rod besi ¼”	1			Meter 8.00
Jejari besi 2mm	2			Meter 14.00
Plat besi	1	(15”	x	15”) 12.00
Cat spray can	1			unit 8.00
			Total	**81.00**

This product has been tested in terms of time to get better results than older techniques of collecting palm kernel uncoupled using a hand. Testing time has been taken at random from several plants and palm kernel number. The time it takes on average, and split test results are listed in Table 3

Table 3: Different Time Taken for Old and New Method

Method	Time Taken (sec)
Old	120
New	60

4.0 CONCLUSION

Oil Palm Seed Collector Tool can solve the problem of oil palm plantation workers to collect palm kernel uncoupled especially for smallholders and private. The tool is easy to use for employees without requiring complex techniques. In addition, these tools are easy to carry anywhere because the handle can be adjusted to be short and mild. Using durable materials to ensure a long lifespan. Through trial tool in oil palm plantations, this tool is very effective and speed up the collection over time the old technique of using hands to collect palm kernel. Finally, we can achieve the objectives of the project.

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21ST CENTURY EDUCATION FOR SUSTAINABLE SKILLS PROVIDED BY POLYTECHNICS IN MALAYSIA

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ABSTRACT

This paper reviews the current trends of 21st century education, and presents the current set of platforms that are used to teach, specifically in Polytechnics. This paper focused at the Technical and Vocational Education and Training (TVET), an initiative introduced by the government to help improve the skills of students from polytechnics, and sustain their skills through trainings and certifications. Other components that were also addressed in this paper include Industrial Revolution 4.0 (IR 4.0), Lifelong Learning, Blended Learning, and 2U2I, 3U1I Industry Collaboration.

Keyword: TVET, Industrial Revolution, Lifelong Learning, Blended Learning

1.0 INTRODUCTION

The Education Ministry, in their recent Malaysia Education Blueprint stated that there would be an increase in need for an additional of more than 1 million Technical and Vocational Education and Training (TVET) workers by the year 2020. The Blueprint focused significantly on higher education developments and classified 12 National Key Economic Areas under the government's Economic Transformation Program. As such, in their 2019 Budget, the government had set up a special allocation for TVET which falls under of the key economic area, to create a more competitive environment as well as training programs to meet the current industry needs.

Abdullah (2016) stated that records with the Malaysian Qualifications Agency (MQA) revealed that all TVET programs in Malaysia are offered at the Certificate, Diploma and Degree levels. This courses were offered by seven ministries that include the Education Ministry which has offered the most TVET programs to a great number of students. Consequently, qualifications for academic and vocational education offered by Polytechnics and Community Colleges under the Education Ministry are accredited by MQA, while programs offered by skills training institutions are accredited by the Department for Skill Development of the Human Resources Ministry.

It is certain that the vision of the Polytechnics in Malaysia is to be a leading-edge of TVET institutions. In accordance with that, the missions of the department are to;

1. Provide wide access to quality and recognized TVET programs,
2. Develop holistic, entrepreneurial and balanced graduates,
3. Capitalize on smart partnership with stakeholders, and
4. empower communities through lifelong learning.

With an improved focus and direction given by Prime Minister and acting Education Minister Tun Dr Mahathir Mohamad to fulfil the national agenda of Vision 2020, TVET education makes every effort to deliver skilled Malaysian workforce which has an impact on the industry (Rasul, Ashari, Azman, & Rauf, 2015). It was projected by the Education Ministry that almost 70,000 students register every year to take up TVET programs at 36 polytechnic institutions in the country. Polytechnic and Community College Education Department senior director Zainab Ahmad stressed that the TVET fund is not enough as TVET institutions are not rich organisations. She further stated that with smaller amount of budget given, the department has to spend wisely on operations as well as development as they had to stay relevant to cater to the industry's requirements. The fund was used for machines, equipment which were used in training programs as well as teaching and learning at 36 polytechnics and 102 community colleges nationwide. The department is mindful that the industry is a priority and its curricula must fulfill MQA requirements.

2.0 TECHNICAL AND VOCATIONAL EDUCATION TRAINING (TVET) IN HIGHER EDUCATION

The acronym TVET also stands for 'Towards Victory in Educational Transformation'. University Teknologi Malaysia's Corporate Fellow, Professor Zulkifli Abdul Rani said as the government is working towards creating 65% TVET workforce by 2020 in accordance with the country's vision to be recognized as a developed nation, appropriate allocations are necessary. Proper funding for TVET is greatly required as without a consistent funding, institutes will not be able to provide excellent input for its students.

Hence, there is a dire need to ensure that the right incorporation between various key stakeholders involved in TVET programs takes place as by ensuring that Professional members representing regulators from the government, academicians from polytechnics, universities, industry and consultants are working together. Besides restructuring and revamping TVET training programs, key stakeholders such as the government, polytechnics and the industry need to be in par with decisions involving areas of priority for the courses offered. This is to produce competent and highly skilled graduates to meet the industry's demand.

As it has been studied, the industry needs highly skilled TVET graduates with leadership qualities and a good command of English. The overall framework on restructuring and transforming TVET training programs needs to be revisited to reflect the current condition of relevant industries. The programs offered in the institutions need to address the country's dependency on foreign workers especially in the skilled job categories. TVET institutions must be equipped with the knowledge that exposes both lecturers and students to the real world. Many industrialists state that the TVET institutions must assist the industry in identifying training that suits its requirements and those collaborations must focus on regular site visits and specific duration of industrial hands-on training. As such, there have been various efforts that were taken through programs to strengthen and sustain the bond between the industries and educational institutes such as IR 4.0, Lifelong Learning and Blended Learning, 2U2I/3U1I and APEL.

2.1 Industrial Revolution 4.0 (IR 4.0)

Zain (2008) mentioned in his study that the Fourth Industrial Revolution (IR 4.0) is likely to change how we live, work, and communicate. It is also expected to change the things we value and the way we value them in the future. Presently, we can already see changing business models and employment trends. According to The World Economic Forum, an estimated 65% of children in the current education system will end up working in jobs that has not even been created. Automation and artificial intelligence are change agents in 4IR that will make certain groups of employees redundant, replacing them with new workers with the needed skills or with machines that can do the job cheaper. With technological advances, jobs with these three qualities, automated, repetitive, based on rules, are most likely to be replaced. Like the industrial revolutions in the past, IR 4.0 will create new jobs, and will also eliminate some of the existing jobs.

Deputy Human Resources Minister, Datuk Mahfuz Omar stated that parents should bestow more confidence and support on their children taking TVET as this field is capable of producing the local manpower needed by the industry and nation to face Industrial Revolution 4.0 (IR4.0) as the government sees TVET as a necessity. As such, it has been made easy for those who study in Polytechnics to be eligible to continue their education at the degree level through Universiti Teknikal Malaysia (MTUN) network project. MTUN members comprised four public universities which are Universiti Malaysia Pahang (UMP), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Teknikal Malaysia Melaka (UTeM) and Universiti Malaysia Perlis (UniMAP). These institutions made history with the introduction of the bachelor's degree program in technology (Bachelor of Technology). MTUN was launched in 2019 and it was believed to be a significant milestone that complemented the Technical and Vocational Education Training (TVET) system in Malaysia. It further reflected the government's commitment in

promoting and acknowledging TVET as the driving force in the country's development and that it helped to revive TVET by including it in the country's main stream education and not as a second class alternative, the negative perception viewed by some previously. The collaboration of many parties involved to develop the curriculum had made the program more practical and flexible, fine-tuned to meet the needs of the country in meeting the challenges of the Fourth Industrial Revolution (IR 4.0) as seen in the figure illustrated below.

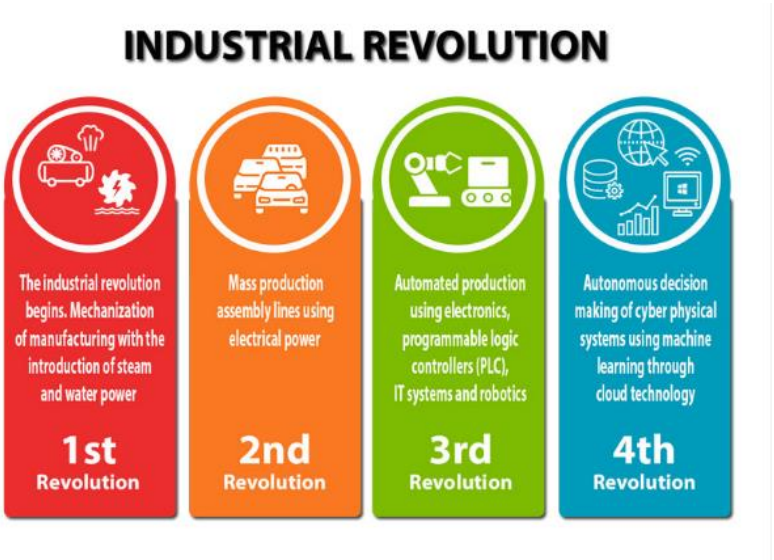

Figure 1: Fourth Industrial Revolution (IR 4.0)

2.2 Lifelong Learning and Blended Learning

The transformation of vocational education, which began in 2011, has encouraged the trend in the education setting in the country. This transformation has promulgated a shortcut for students to get their diploma qualification at vocational colleges after they finish Form Three. Indeed, the expansion of the vocational stream in the education system has been practised in many countries as the number of students gets bigger in line with technological advancement and economic demands of a particular country. TVET also aims to produce a labour force competent in certain areas, hence internationalisation is one of the platforms to expose students and lecturers to the development of TVET abroad. TVET students compete on the international stage and TVET institutions partner with industries and foreign universities to gain exposure. Recently a delegation from vocational colleges went to China to look into internationalisation programs. The delegation visited colleges in Beijing that offer technical courses similar to our vocational programs in Malaysia. The visit also opened up an opportunity for students to learn about living and learning abroad through dialogue sessions with the Malaysian Students Association in Beijing during the campus tour. The visit

was also designed to look at pedagogical practices that had been used to delivers lessons to TVET students in their institutions.

The report from the delegation's chief show that lifelong learning is not just for the youth, but for the employed and unemployed adults which focuses on continuous training, education and lifelong learning. As such, the introduction of Accreditation of Prior Experiential Learning (APEL) has been a great way to allow adults with certain years of experience to upgrade themselves and skills by enrolling into institutions. To make things even better, the blended learning system has also been brought into the picture to allow students study from afar. Meaning, students need not attend face-to-face lecturer all the time, but they may learn in different platforms which is online. For the Polytechnics, the CIDOS system has been implemented and used in all institutes, where lecturers are allowed to record and deliver their lectures online. This also includes test, tutorials and even submission of assignments online which has enabled TVET students to study and work simultaneously. Lifelong learning and Blended learning has been deemed as one of the most effective way to allow TVET students to continue their studies.

2.3 2u2i, 3u1i And Industry Collaboration

The 2U2I acronym is used to indicate learning that occurs on and off campus in various combination such as 3 years in university, 1 year in industry (3U1I), 2 years in university, 2 years in industry (2U2I) and 2 years in university, 1 year in industry (2U1I). The 2U2I program increases the chances of students entering the digital industry after their graduation. Students spend two years at the university to master theories and another two years doing hands-on practice in the industry. Universiti Teknologi Malaysia is collaborating with the Malaysian Digital Economy Corporation (MDEC) to develop a data engineering academic program using the 2U2I concept. It's very relevant for the fourth industrial revolution, which blends technologies with the physical, digital and biological spheres. 2U2I has been expanded to 16 programs covering areas like database management, entrepreneurship, oleo chemistry, and bioinformatics till date.

Subsequently this, directly involves the collaboration of big industries such as Honda, AirAsia, Schlumberger and many more. Students at Polytechnics are required to attend at least a 6 months' internship programs with industries related to their field. Libunao and Peter (2013) stated that the Industrial-Education Collaboration through in-service attachment training program for polytechnics' lectures in Malaysia was also initiated as a call for lifelong learning due to information overload, the advent of high-functionality systems, and a climate of rapid technological change. As such the Department of Polytechnic Studies in Malaysia opened CISEC (Collaboration, Industrial Services and Employment Centre) in all polytechnics to facilitate

networking and collaboration between the Industry Polytechnic and provide services and respond to industry needs, particularly those involving collaboration and job placement of graduates. CISEC also works towards increasing employability and job availability polytechnic graduates and escalate the rate of polytechnic graduates' skills. It is also the function of the unit to provide career counseling, planning and preparation of graduates for the working world.

3.0 CONCLUSION

Technical and Vocational Education Training (TVET) programs have always been seen as the vehicle to prepare aptly-skilled human capital but somehow the general perspective is that they fall short in terms of the level of skills and knowledge needed for the industry to forge ahead. Graduates who have qualified from TVET institutions previously do not have a clear career pathway to further their studies and secure jobs that are highly technical in nature (Kamarudin & Teh, 2017). The Government of Malaysia recognizes that in order to fulfil the aspiration of being an advanced economy and an inclusive nation, continued improvements in the human capital base are essential. Aspiring to become a high income nation while interacting with the forces of globalization require the presence of a highly skilled workforce. Malaysia's workforce in 2017 was made up of 27.5% high-skilled workers. Semi-skilled and low-skilled workers represented 59.7% and 12.8% of the workforce respectively. In the 11th Malaysia plan, the government hopes to have a 35% high skilled workforce. Thus, while improving employability, the system aspires to focus on Industry-led curriculum and work-based learning to ensure that TVET graduates are industry-ready and equipped with the relevant skills.

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