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Study on Implementation of Activity Based Costing (ABC) System On Determination of Indirect Costs in Ship Production

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Abstract

Currently, the development of the business especially in the maritime sector has quite rapid progress in Indonesia. Recently, the development of the shipbuilding industry is an effort to improve the competitiveness with the global market. With the increasing development of the shipbuilding industry in Indonesia, cost accounting as a cost information system is challenged to develop the shipbuilding industry which requires high product quality. This requires the company to make a decision related to proper budget planning so that the company does not experience losses. Activity Based Costing (ABC) System is a system to determine costs using activities as a classification of costs to produce indirect costs that are more systematic and relevant. Activity-based costing systems identify resources in the activities of each department so as to provide information about the cost of a product. it collects indirect costs and allocates them to various products in proportion to the product volume. Therefore, activity-based costing is able to provide an estimate of the product costs and individual activity costs used in the production well. The first step taken is classifying activities, associating various costs with various activities, determining homogeneous cost groups, and determining group rates. The second step of this stage is the determination of overhead prices determined from each cost group. Based on the results of calculations that have been made, it can be seen by comparing the calculation of indirect costs on the construction of 2x1800 HP tugboat ships according to traditional cost accounting methods with the Activity Based Costing System, the result is an indirect cost for the construction of the first 2x1800 HP tugboat is IDR 3,432,920,043 and indirect cost for the construction of the second 2x1800 HP tugboat is IDR of 2,231,760,472.

1. Introduction

The industry in the shipbuilding sector is being intensively developed by the Indonesian government. The Ministry of Industry noted that the national shipbuilding industry has made some progress with the increase in the number of shipyards to more than 250 companies with a production capacity of up to one million DWT per year for new building ships [1]. The government also secures and optimizes the use of the domestic market as a based load for the development of the shipbuilding industry. This is an opportunity for the company to be able to compete with the global market. Companies must be able to plan and control the ship production process so that they are able to provide quality results and are able to provide the right production price that competes with the global market.

In the production process of new building ships, many things need to be considered in the ship production process, one of which is cost. Cost is defined as a resource that is sacrificed (sacrified) and forgone which is measured in units of money that has occurred or is likely to occur [2, 3, 4]. Costs used for the production process must be calculated precisely and must be adjusted to the budget plan that has been planned in advance. In general, there are 4 cost classifications including production costs, marketing costs, administrative costs and financial costs [5].

The problem that has arisen so far is that the determination of costs only focuses on the costs involved in the production process, while the costs of non-production activities are not included in the budget plan for the project so that the company does not get a profit or even suffer a loss because of the profits obtained. allocated for costs outside the production process. Where, these costs are costs that cannot be identified directly into the product and the benefits can be enjoyed by several objects [6]. these costs will contain all of the labor, materials, equipment, and subcontract costs included in the overhead, for each activity [7]. This requires shipyard companies in Indonesia to make policies related to accurate and precise budget planning so that the company does not suffer losses.

Traditional method of costing is considered incompatible with the type of product produced by varying processes, because traditional methods tend to use a single cost driver to allocate all variable and overhead expenses so that costing does not provide accurate costing information [8]. cost determination using traditional methods can not determine accurately. Traditional costing methods are not flexible enough and cannot easily be adapted to fluctuations in demand [9]. Current costing must be dynamic and flexible so as to allow the calculation of various types of cost objects i.e. products, activities, etc [10].

Traditional costing methods have been considered outdated in determining production costs, so a cost accounting system called an activity-based costing system has emerged which can be used as a solution [11, 12, 13]. Activity based costing is defined as an activity-based cost information system [4]. In this sense, the determination of the cost of a product is made based on the activities carried out during the production process of a product. In addition, activity based costing system is an accounting system that focuses on activities in consuming resources to produce a product [14]. In determining these costs shelter overhead is allocated on a basis that imposes several factors. Activity based costing is a system of determining costs and assigning costs to a product using a variety of cost drivers by tracing costs from activities to products [15].

Activity based costing system differs from traditional methods, activity based costing system models the resources in each activity which then connects the product cost activities [16, 17, 18, 19]. The activity based costing system identifies resources in the activities of each department so that it is able to provide information about the cost of a product [20, 21, 22]. Traditional methods do not accurately reflect the indirect cost contributions to individual activities. Conversely, activity based costing collects indirect costs and allocates them to various products in proportion to the volume of the product [23]. Therefore, activity based costing is able to provide an estimate of product costs and individual activity costs used in production well [24].

Activity Based Costing provides a solution for aggregating indirect costs into several categories and then applying the results to products and services, respectively (direct costs). By using various indirect cost groups and cost triggers, activity based costing can provide a more accurate cost description for determining costs and prices for shipyard products and services, because it is necessary to develop cost accounting in the shipbuilding industry, especially in shipbuilding as a support. so that the shipyard company can compete [25].

With the background that has been mentioned, this research aims to first get the results of observations of the indirect cost determination method carried out in ship building at the current shipyard, the second to identify the triggers for activities in the construction of new building ships based on the activity based costing method (ABC) system, the latter gets a formulation of the indirect costing approach using the activity based costing (ABC) system method.

2. Methods

The hybrid (PV/ Gasoline) model to be described by simulation. Small fishing hull as the object in this study that has specification as Table 1. Specification and power requirement calculation generally discussed on [9]. Solar panels were installed as hull rooftop, as shown in Figure 1.

Table 1. Small Fishing Hull Specification

Dimension	**Notation**	**Value (m)**
Length Overall	L_{OA}	7
Length Between Perpendicular	L_{BP}	6
Overall Wide	W	2
Height	H	1,5
Depth	D	0,9

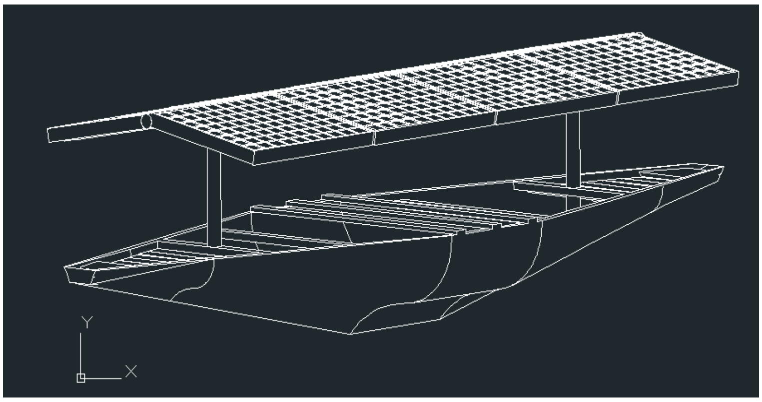

Figure 1. PV Installed as Hull Rooftop

2.1. Fishing Vessel Hull Hybrid Propulsion Model

The battery pack will supply energy for DC motor to actuate hull propeller. When battery energy just 30% remaining, the interchange controller will switch on the gasoline generator. After the generator switched on, interchange switch moves to rectifier output, then DC motor supplied by a generator. When a battery is fully charged, switch moved to use energy stored in battery. Battery State of Charge (SOC) supplied by PV and generator described as [10]:

$$E_{ESS(s,t)} = E_{ESS(s,t-1)} + \left(E_{Gasoline(s,t)} + E_{PV(s,t)} - E_{load(s,t)}\right)\eta_{ch} = E_{ESS(s,t-1)} + \Delta P.h.\eta_{ch} \quad (1)$$

Calculations to estimate hull resistance refer to Equation 10 are $R_T = 440,05\,N$, $R_{T+15\%\,margin} = 506,06\,N$. So total required power $E_{Watt} = 1.685\,KW$. Therefore 3 kW *gasoline engine* or 8 solar panels @200WP cangive thrust for the hull at 12 km/hour service speed.

3. Results and Discussion

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Energy form PV can be used to cruise as long 12 Hours 46 minutes after there is no stored energy in the battery and solar intensity is low; genset will charge as long 4 hours 10 minutes to reach 100% battery SOC. Propeller angular velocity from eq. (7) and eq. (8) shown in Figure 7. Figure 7 shows the angular velocity sustained at n = 1200 rpm as given set point, although the transition between generator to PV occurs.

4. Conclusion

The design of hybrid (PV/gasoline) propulsion for fishing vessel hull was conducted by simulation. Total weight of the hull is 3 Ton with 300 Kg harvested fish and two person fisherman. Gasoline engine with rated 3KW dan eight solar panels with rated @ 200 WP in 4 series-2 string configuration operate alternately depend on battery SOC. Simulation shows that with variation of solar intensity, the hull still able to maintain cruise at 16.5 Km/hour vigorously although power is being switched from PV to generator vice versa.

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