APPLICATION OF LOW COST AIR DRYING MODEL IN TRADITIONAL SHIPBUILDING

BAYO-PHILIP PATRICK

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Faculty of Mechanical Engineering
Universiti Teknologi Malaysia

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Special dedication to my beloved WIFE, DAUGHTER and PARENTS.....

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ABSTRACT

Studies have revealed that delay in production process and delivery is one of the major issues in traditional ship building activities in Indonesia. Some other studies have also established unpredictability of the traditional air drying time as the major culprit responsible for the increase in the length of production time, increase in overall project cost and distasteful client/shipbuilder relationship. In the attempt to address the situation, this study proposes a low cost air drying model as an alternative to the traditional air drying method and adopted Indonesia as the study area. Meteorological data for Indonesia were accessed via the internet. A controlled experiment was performed. Two sets of lumber samples named A and C were dried over a period of seven (7) days. Set A was laid in the model (an improvised green house) set up at an open roof terrace at Block P 23, Faculty of Mechanical Engineering, Universiti Teknologi Malaysia. Set C was equally set up next to Set A but exposed and unprotected from the elements of weather. Lumber weight, relative humidity, temperature and time were taking at intervals for the two sets A and C simultaneously. The data collected were analyzed using Microsoft Excel. Graphs were plotted and interpreted. Lumber drying schedule for both traditional method and the proposed Low Cost Model were developed using meteorological data for a particular area in Indonesia noted for traditional ship building. A comparative analysis of the two schedules was done and the advantages of the Low cost Model over the traditional method were established.

ABSTRAK

Kajian telah mendedahkan bahawa kelewatan dalam proses pengeluaran dan penghantaran adalah salah satu isu utama dalam aktiviti pembinaan kapal tradisional di Indonesia. Beberapa kajian lain juga telah mewujudkan ketidaktentuan masa udara tradisional pengeringan sebagai punca utama yang bertanggungjawab bagi peningkatan dalam tempoh masa pengeluaran, peningkatan kos projek keseluruhan dan pelanggan / kapal hina hubungan pembina. Dalam usaha untuk menangani keadaan kajian ini mencadangkan kos model pengeringan udara yang rendah sebagai alternatif kepada kaedah tradisional udara pengeringan dan pakai Indonesia sebagai kawasan kajian. Data meteorologi untuk Indonesia telah diakses melalui internet. Satu eksperimen kawalan dilakukan. Dua set sampel kayu bernama A dan C telah kering dalam tempoh tujuh (7) hari. Set A diletakkan dalam model (rumah hijau spontan) yang ditubuhkan di teres bumbung terbuka di Blok P 23, Fakulti Kejuruteraan Mekanikal, Universiti Teknologi Malaysia. Set C telah dinubuhkan sebelah Set A tetapi terdedah dan tidak dilindungi dari unsur-unsur cuaca. Berat kayu, kelembapan, suhu dan masa telah mengambil pada jangka bagi kedua-dua set A dan C serentak. Data yang dikumpul dianalisis menggunakan Microsoft Excel. Graf telah diplot dan ditafsirkan. Jadual Kayu pengeringan untuk kedua-dua kaedah tradisional dan cadangan Model Kos Rendah telah dibangunkan menggunakan data meteorologi untuk kawasan tertentu di Indonesia terkenal dengan pembinaan kapal tradisional. Satu analisis perbandingan dua jadual yang telah dilakukan dan kelebihan Model kos rendah berbanding kaedah tradisional yang telah ditubuhkan.

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CHAPTER 1

INTRODUCTION

1.1 General

This study begins with a history of Indonesia maritime culture and highlights the evolution of traditional wooden ship. It also identifies some of the peculiar problems associated with traditional shipbuilding process in Indonesia particularly the issue of delivery. It then goes on to examine ways of proffering a solution to the identified problem. The study through the application of experimental techniques investigated the air drying time of lumber in two specific conditions. In addition, the data collected from the model test is analyzed and applied. The study proposes and advocates the adoption of low cost air drying technique of lumber. The study posits that the adoption of the air drying technique has the capacity to impact positively on the production process in traditional shipyards and ultimately lead to optimization of the production process. Lastly, it suggests areas of interest for future studies.

1.2 Background of Study

Indonesia traditional ship is a product of an indigenous technology developed long before the advent of western culture along the Coast of Sulawesi Island. The ships are built traditionally in both method and equipment without any sketches or calculations. The building expertise is passed down from generation to generation, a knowledge that is further honed through daily practice with the help of each builder's instincts and natural gift. Still built by hand in the traditional manner, these majestic sailing ships are a living spirit of the golden age of sail, which ended in the West in the early twentieth century, but still thrives in the waters of Indonesia.

The beauty and efficiency is not a product of technical science, they are a product of the spiritual nature of these people and their culture. They are at one with their environment and they follow a path of least resistance in their lives and in their work. This philosophy contributes to the beauty and efficiency of their ship designs, and it comes from a basic and simple understanding of the world in which they live. This philosophy based nature and balance allowed the peoples of the Indonesian islands to produce solutions to practical challenges long before the societies of Europe were able to.

In as much as one would like to appreciate the people and their philosophy, it is also good to mention that a mix of local craft and beliefs plus modern and scientific ways of doing things will go a long way in transforming the practice of ship building in Indonesia. Advances in science and technology, and abundant information available on the World Wide Web has caused unprecedented changes in many areas of human endeavor. However, Indonesian traditional ship builders have not taken full advantage of available technology and information particularly in the preparation of lumber which remains one of the critical and most unpredictable stages in construction. They have failed to explore outside the ancient method of wood preparation other possible ways of making lumber ready for use in shipyards.

Nofrizal *et al*, 2012 has raised the drying lumber issue in traditional shipbuilding in Kepulauan Riau, Indonesia which is shown in Figure.1.1.

Figure1.1: Drying lumber issue in traditional ship production in Kepulauan Riau, Indonesia.

It is in the light of the above statement that this study will like to identify from literature different ways of preparing lumber for use in traditional shipyards and proposed a low cost model that may help in impacting the practice of traditional ship building in Indonesia positively.

1.3 Problem Statement

Literature reviewed revealed that several studies have identified some of the specific issues central to traditional ship construction in Indonesia. Mufti *et al*, 2012, lamented the lack of a blueprint or formal sketches as well as calculations on performance during the design stage. The study stated that the traditional ship

designs are derived from the replication of an existing ship that is serving its purpose well or from informal conversation between the shipbuilders and the client.

In another study, E. Prayetno *et al*, 2012, dwelt on quality control issues in traditional shipbuilding. The study mentioned that there is no standard quality control measure in the choice of materials. The master builders depend heavily on their senses specifically visual assessment and on the job experience acquired over the years. There is no scientific approach to quality control.

Moreover, A. Deah *et al* 2012, addressed safety issues from the perspectives of occupational safety and policies .The study observed that at the construction stage most of the builders failed to take necessary precautions to arrest issues that can expose workers to fatal injuries and jeopardize their health. For instance workers are not provided with the required safety wears such as helmet, boot, hand gloves that can protect them against injuries. Furthermore, the study highlighted non compliance to specified safety regulations at the point of ship building as laid down by government appointed regulatory agencies.

It is important to mention that some other studies have identified delivery as one of the critical issues in traditional ship building process. Surhan *et al* 2012, mentioned that the traditional shipbuilding process follows a certain unique procedure, a procedure which been handed down from one generation to another generation. The study posited that the unique procedure adopted by the builders was often fraught with flaws. These observed flaws make it almost impossible to give a definite start or completion date for a given project.

One of the major flaws cited by Surhan et al 2012, centred on the refusal of the builders to take advantage of available knowledge in modern day science and technology. The preparation and processing of wood for construction till date still

take place in the open air. Consequently, wood air drying time remains dependent on prevailing weather conditions. Hence, it is difficult to estimate or project the time required to air dry a given quantity of wood needed to build a specific ship size.

Modern technology nowadays however, does allow wood drying to be carried out in diverse ways instead of just drying outside under the sun. This makes room for better and consistent results as the process can be partly or fully controlled. Not only that, it can also help in the projection of air drying time of wood and also encourage the application of scheduling tools at the construction stage. Application of scheduling tools in return may be an advantage in the optimization of the overall ship production process.

The focus of this study is to discuss and address lumber air drying time, and also develop a model that can be used in air drying time calculation. The ultimate goal is to propose a low cost air drying model which may be used to predict the time required to prepare a specific needed quantity of lumber for a given size of ship. This study believes that the proposed model with the ability to predict time for air drying of lumber will eliminate non standardization of time which has been a familial and perennial problem and hence the optimization of the overall production process through the application of scheduling tools.

1.4 Objective of Study

The objectives of this research are as follows:

i. To establish from literatures the different methods employed in drying of lumber.

ii. To develop a low cost model that can be used to predict the air-drying time of lumber.
iii. To conduct an experiment for estimating air-drying times of lumber in two specific conditions
iv. To generate a comparable schedule of lumber air-drying time in specific conditions.

1.5 Research Questions

The research work has actually raised a few questions in order to have a clear understanding of the implications of the research prior to when the final results will be obtained. These questions are:

i. What are the major building materials in traditional shipbuilding?
ii. Where are the materials located?
iii. How are the materials treated or prepared?
iv. What are the likely challenges in material preparation?
v. What are the likely consequences of the challenges in 4 above?
vi. How can the challenges in 4 above be eliminated?

1.6 Scope of Study

The scope of this study includes the following:

i. It is experimental in nature
ii. It is a quantitative study
iii. It is not a case study.

iv. Limited to study of traditional ship in Indonesia.
v. It is not a study of physical properties of lumber though it may involve a little of discussions on physical attributes of lumber

1.7 Significance of the Study

This study is significant because traditional wooden ship continues to be the vessel of choice for Indonesian fishermen. However, the unplanned work environment plus the exposure of both workmen and materials to the elements of weather make the production process especially lumber drying time highly unpredictable. Consequently, the builders often times find it difficult to prosecute contract jobs and deliver the finished product within the time specified in the contractual agreement.

Failure on the part of the builder to deliver has implications for builder-client business relationship as well as economic implications for both the builder and the client. The study of this nature has the potential to improve in a measurable manner the quality of the work environment as well the organisation of work within the shipyard. It can also help in the introduction of standardization of work breakdown which may encourage the use of scheduling tools. This study is of the opinion that the use of scheduling tools will ultimately lead to optimization of production processes within the sphere of traditional shipyards. In addition the optimization of the process may

i. reduce project duration
ii. reduce project costs
iii. improve project efficiency
iv. improve builder/client business relationship

1.8 Expected Results

Upon the completion of the experiment and analysis of data collected it is expected that:

i. The proposed model should be able to predict the time required to air dry a specific quantity of wood.
ii. The cumulative time required for air drying maybe translated into the overall production process and hence generate a practicable and an effective scheduling structure which may be put to test on real shipyard environment.

1.9 Research Arrangement

The arrangement of this research is shown below:

i. The chapter one is the introduction to research problem which comprises of research background, problem statement, scope of study, and expected result.
ii. Chapter two is conducting a literature review of existing research studies.
iii. Chapter three is the research methodology
iv. Chapter four is the data collection, analysis, and results.
v. Chapter five is the discussion of the result obtained in Chapter 4.
vi. Finally, chapter six is a conclusion, recommendation for future work.

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