

PROJECT EVALUATION:
A CASE STUDY OF COST REDUCTION IN CHANGING MACHINE
DESIGN

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Dedicated to My Family and Loves Ones

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ABSTRACT

The Palong Coco Mill Company has high investment in machinery, labor and time management. This is a main constraint for company to achieve the objective and goal. The project evaluation study on the current setup (Horizontal sterilizer) and a new system setup (vertical sterilizer) to determine which plant configuration can stand in long time and short time to reduce cost investment. The Palong Coco Mill Company has invested million Ringgit Malaysia into maintenance, labor, break down, operation and fuel power. The output production of crude palm oil is not increase year by year. Therefore the company tries to invest in changing the system configuration to vertical sterilizer system in order to achieve cost reduction in maintenance and labor and also increase the production output. The analysis for cost is using formula of economy; Microsoft office Visio, FORTRAN software was used for analyzing the data in this study was analyzed. The evaluation criteria such as capital recovery factor, annual cost, benefit-cost analysis and payback period are use in this case study. The outcome of data analysis is using the shows that the main problems with the current setup are high cost in maintenance and labor. Additionally, the safety inspection of current setup is poor. The new system is using vertical sterilizer result in good management in time arrangement and product transportation. The processing area of new plant is smaller than current setup of the plant. The costs for both setup are evaluate by economy engineering project evaluation criteria. The ratio of capital recovery of the plant setup new system to current plant setup is 4:1. This shows that amount withdrawal of new plant set is biggest and the account completely depleted in short period than current plant setup. The annual cost for current

plant is RM 4062241.00 more than the new plant setup which is RM 3679791. Thus, it is suggested that the company change the current set up into the new plant setup in order to achieve goal and solve a problem.

ABSTRAK

Pelaburan yang tinggi di dalam penyelenggaraan mesin, pekerja and pegurusan masa adalah masalah utama syarikat untuk mencapai objektive dan matlamat. Kajian Penilaian projek dilakukan pada system yang digunakan iaitu reka bentuk penstrilan melintang dan keatas system yang baru iaitu reka bentuk penstrilan menegak. Kedua-dua sistem dikaji dalam kos pembinaan projek sama ada dalam jangka pendek atau panjang. Kilang Palong Coco teleh melabur berjuta Ringgit Malaysia dalam penyelenggaraan mesin, pekerja, kerosakkan system, penanguhan pemprosesan , operasi and bahan api. Pelaburan yang terlalu tinggi tetapi tidak menambah pengeluaran walaupun bertahun pelaburan dikeluarkan. Syarikat cuba untuk menyelesaikan masalah dengan menggantikan reka bentuk penstrilan melintang kepada bentuk menegak untuk pengurangan kos dalam penyelenggaraan, pekerja dan juga meningkatkan hasil pengeluaran. Kajian keatas penilaian projek dilakukan untuk menentukan sistem yang baik dan untuk menggantikan system yang sedia ada. Penggunaan rumus-rumus ekonomi analisis, Microsoft office visio, Fortran software digunakan untuk menganalisis data yang diperolehi. Ciri-ciri penilaian adalah *capital recovery factor*, kos tahunan, kebaikan-kos analisis, kadar pemulangan dan waktu pembayaran balik modal digunakan. Hasil kajian menunjukkan kelemahan sistem rekabentuk melintang ialah kos penyelenggaraan dan kos pembayaran pekerja yang terlalu tinggi. Tambahan pula aspek keselamatan ke atas pekerja adalah lemah. Pekerja terlalu terdedah kepada bahaya semasa bekerja. Bagi system baru, pegurusan masa adalah singkat serta Mempunyai system pengangkutan yang baik dan sistematik. Penggunaan ruang pemprosesan yang kurang berbanding system lama. kajian

keatas pelaburan kos bagi kedua-dua system adalah dengan menggunakan ciri-ciri penilaian projek kejuruteraan. Nisbah pulangan modal bagi system baru adalah lebih besar berbanding system lama iaitu 4:1. oleh itu jjangka masa pemulangan modal bagi system baru adalah dalam jangka masa yang lebih pendek. Penggunaan kos tahunan system baru adalah RM 4062241.00 lebih tinggi berbanding system lama iaitu RM 3679791 pada jumlah hasil pengeluaran yang sama. Sebagai cadangan dari hasil analisis syarikat harus menggantikan system lama kepada system baru sepenuhnya untuk menyelesaikan masalah kos yang tinggi.

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LIST OF ABBREVIATIONS

AC	Annual Cost
AE	Annual Expenses
CPO	Crude Palm Oil
CRF	Capital Recovery Factor
FFB	Fresh Fruit Bunch
PP	Payback Period
PW	Present Worth

CHAPTER 1

INTRODUCTION

1.0 Global Competition

According to IIED, ProForest and Rabobank International (2004) the edible oils market is highly competitive. In particular, oil produced from soy can be used for many of the same end-uses as palm oil. This means that price concerns dominate the palm oil sector and social and environmental concerns are seen by many as secondary. Consequently, that Better Management Practice (BMPs) that confer an economic advantage by lowering production costs or increasing production per unit area of land are more the ones that are already best known and implemented.

On the broad operational front, the Agribusiness division has increased the palm oil extraction and kernel extraction to 20.3 per cent and 5.47 per cent respectively. Meanwhile, there was an increase in FFB (fresh fruit bunch) in the financial year. FFB per hectare for this year stands at a commendable 20.3 tonnes at the back of 1,907,259 tonnes produced given our profile of crops age. Cost competitiveness was the

contributing factor to this steady achievement. At the same time, our palm products achieved an average price of RM471.75 per tonnes for the year, another commendable achievement (Sarji, 2002).

Malaysia Palm Oil Board (2004) had report the aggregate worldwide market for organic foods based on the size of the retail market was estimated at USD 19 billion in 2001. The palm oil industry continued to contribute significantly to the country's economic development and foreign exchange earnings. Export earnings of oil palm products rose to a commendable RM 30.41 billion despite facing strong competition from other palm oil producing countries and unfavorable tariff treatment in some markets (Kolavalli, 2005).

1.1 General processing description

In the early stage, FFB is storage in loading ramp before through to processing. The FFB is sterile by sterilization using horizontal sterilizer with capacity 20 m/tonne. The temperature to cook and reach in to the center of the stalk at 100°C and time require to reach that temperature depend on the quality of FFB with three peak systems. When high-pressure steam is used for sterilization, the heat causes the moisture in the nuts to expand. When the pressure is reduced the contraction of the nut leads to the detachment of the kernel from the shell wall, thus loosening the kernels within their shells. The detachment of the kernel from the shell wall greatly facilitates later nut cracking operations.

The FFB is transfer to threshing station to feed the sterilize fruit down a separate chute which by passed the stripper to the threshing drum and to separate the fruitlet from the empty bunch. It is minimize the transfer of oil from loose fruit to the stalk. Unstripped bunch is separate the fruit from socket by bunch crusher using double process. The empty bunch through to bay before dispatch and empty bunch will burn as cleaning agent. The loose fruit before go through to press station should be through digestion process which consist of a steam-heated cylindrical vessel fitted with a central of rotating shaft carrying a number of beater (stirring arms).

The method of extracting is oil press station use spindle press screw by hydraulic presses. Oil extraction is pump through to clarifier tank after separation sludge oil and crude oil. Sludge oil will pump through to decanter. Crude oil will pump to vacuum dryer before storage in storage tank. Fiber is use as fuel in boiler system. The nut dried cracked to release the kernel and separated by hydro cyclones. Kernel is dried in silos to a moisture content of about 7 percent before packing. The Figure 1 below is show a standard palm oil flow process.

PALM OIL PROCESSING UNIT

OPERATIONS

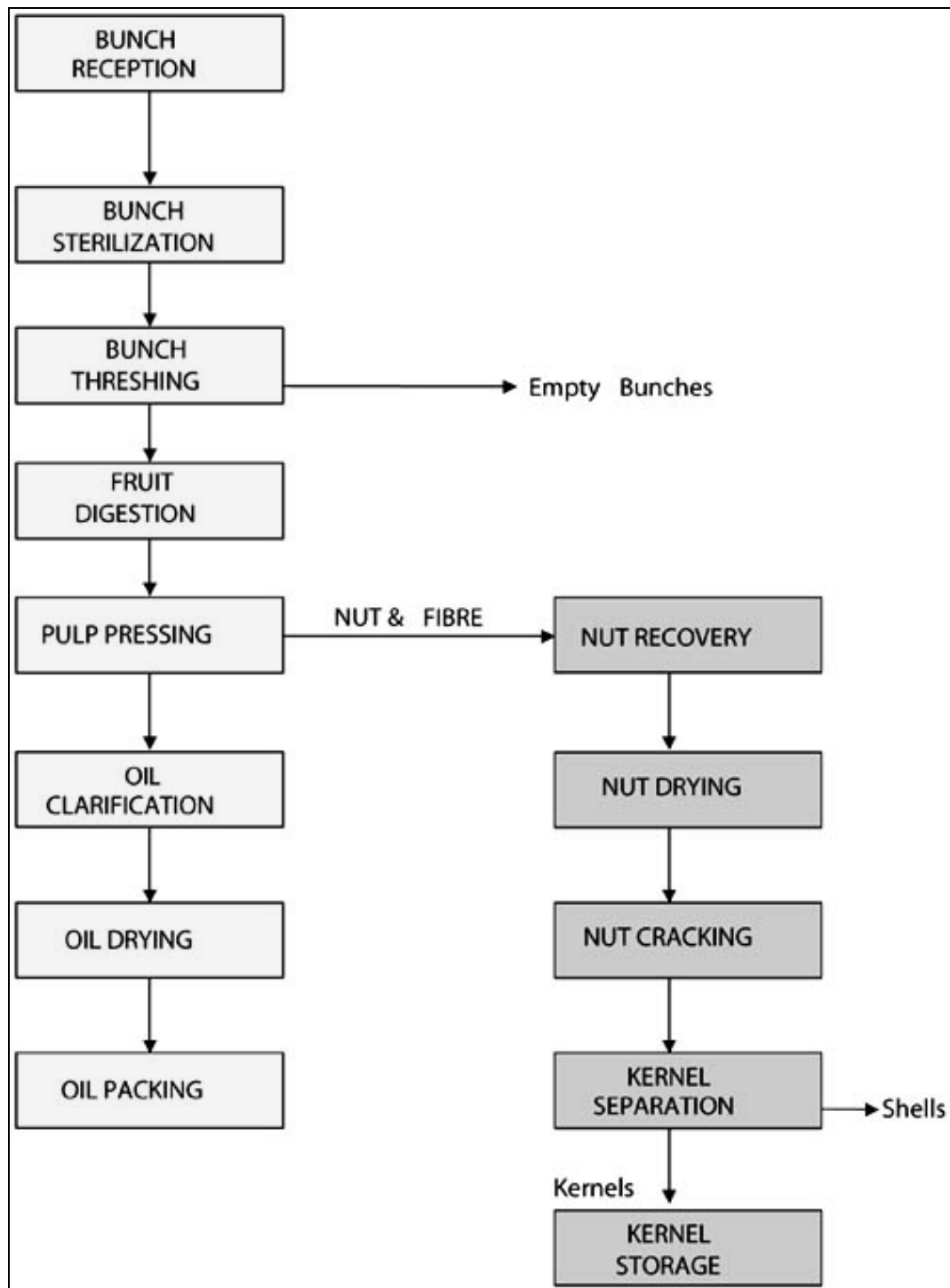


Figure 1: Schematic diagram of palm oil processing

1.2 Plant layout for palm oil processing system with horizontal sterilizer

The changing of machine will affect the layout of palm oil processing. All of plant layout design is related to cost and safety in operation and maintenance. The old plant layout design is more complicated than the new plant layout. According to Hunt (1993) had mention that a cost-effective design (plant layout) is the result of a balance consideration in initial cost, safety and long term effect of a design on operation and maintenance.

The old plant layout is using bigger space area of 34,900,087m². There are 3 railway are use for cages movement series and are connected with 3 horizontal sterilizer with 22.5m/tones each sterilizer. Design of system has 2 open door systems and 18 loading ramp doors with each ramp is 300mx500m. The cages movement is using manual system inlet and outlet system. There no recovery tank system.

The new plant layout system has 5 loading ramp for storage FFB. The conveying of FFB is using the conveyer connected to vertical sterilizer. The conveyer is semi auto system to transport the FFB. Area space of new system is 567,009m² smaller spaces. There are 4 vertical sterilizer with capacity is 15m/tones. The addition of recovery tank to avoid oil losses and the sterilizer are connected to threshing system with conveyer.

The FFB is storage in loading ramp. The hydraulic system is use to control the gate to insert the FBB on the conveyer. The conveyer is transport FFB through to

vertical sterilizer without turn back. The FFB is inlet into sterilizer and 60 minute to cook. After 60 minute the FFB come out from the bottom of the sterilizer and through the threshing by conveyor. The operation of all sterilizer is same time. The oil losses are covering by piping system and through to recovery tank.

1.3 Problem statement

The old system uses the cages to storage the FFB to transport the FFB from loading ramp to sterilizer. The cages system is need high maintenance cost in short time. In long run time the cost maintenance is more than the company invests in machinery. Cages need maintenance after 10 month of operation and replace after 3 year. The labor cost of old system is higher because it needs the operator to control and manual working process. One station should have minimum 2 operators to control the flow process. Avoid the pending work cause of stuck of FFB, chain of cages is unconnected, control chain to load the cages by crane, pull and push the cages to horizontal sterilizer manual insert system. The ratio of pending working is higher than working time.

The maintenance department should have the expert operator such as foremen and technical personal. The worker for maintenance need time study to follow the standard work procedure. The maintenance management must have an application of time-study and work-measurement technique (Higgins, 1998). The time of maintenance take longer time to finish the maintenance operation.

The old plant configuration of using the horizontal sterilizer system has no recovery oil losses system that covers the oil losses in high quantity. The horizontal sterilizer has 4 condensate vents that cause the oil blow down and oil losses through to

effluent. The oil losses should to recycle into clarifier tank and fat tank. More space area is usage to locate the machinery and the flow operation. The machinery and piping system are complicated and provide the low safety protection.

1.4 **Objectives of the study**

1. Identify the problems associated with current setup of plant configuration.
2. Collect data and information for new machine set-up.
3. Analyze the current and new alternative plant configuration in term of cost.