AVAILABILITY STUDY OF PALM OIL MILL

A project report presented in partial fulfillment of the requirements for award of Advanced Diploma in Mechanical Engineering of MARA Institute of Technology.

By:

MUSTAFA BIN MOHD AMIN

DEPARTMENT OF MECHANICAL ENGINEERING

MARA INSTITUTE OF TECHNOLOGY

SHAH ALAM 40450

NOVEMBER 1993

CONTENT

ACK	NOWLEI	DGEMENTS	i
ABS	FRACT		ii
1.0	INTF	RODUCTION	1
2.0	PROE	OUCTION AND EXTRACTION OF PALM OIL	3
	2.1	Origin and History	3
	2.2	Extraction of Palm Oil	4
		2.2.1 Reception of Fresh Fruit	
		Bunches (FFB) at the mill	4
		2.2.2 Sterilisation	4
		2.2.3 Stripping ·	5
		2.2.4 Digestion	6
		2.2.5 Oil Extraction	6
		2.2.6 Clarification and Purification	7
		2.2.7 Depericarping or nut/fibre	
		separation	8
		2.2.8 Mill Effluent Treatment	8
3.0	FUND.	AMENTAL OF THERMODYNAMIC AND DEFINITION	
	3.1	Basic Concept of Thermodynamic.	10
	3.2	System	10
	3.3	The specified Reference Environment.	11
i	3.4	Definition of Exergy	12
	3.5	Thermomechanical Exergy	13
	3.6	Chemical Exergy	13

an an Thailte			1°, "
4.0	COME	BUSTION PROCESS	14
	4.1	Combustion Losses	15
		4.1.1 Loss due to moisture contain in	16
		the fuel	
	2 	4.1.2 Losses due to moisture formed in	18
	4 	burning of hydrogen	2
	Y	4.1.3 Losses due to moisture in air	18
		4.1.4 Loss due to heat carried away in	19
		the dry chimney gases	f the
	,	4.1.5 Loss to radiation and unaccounted	20
	:	losses	7
			i i
5.0	BOIL	ER DESIGN FOR PALM WASTE FIRING	22
	5.1	Potential Waste Fuels	22
	5.2	Fuel Characteristics	22
	5.3	Fuel Properties In Design Consideration	25
6.0	Samp	le Calculation	31
	6.1	The Heat Balance	31
	6.2	The Heat Losses	33
		6.2.1 Losses from moisture in fibre	33
		6.2.2 Losses from moisture in Hidrogen	33
		6.2.3 Losses from Chimney	33
		6.2.4 Losses from moisture in air	34
	6.3	The availability analysis for the turbine	34
		6.3.1 The Turbine	34

ACKNOWLEDGEMENTS

I am indepted to Ir. Haji Mohd Shif bin Ismail for his valuable consultation and helpful guidance and supervision through this study.

I wish to express my gratitute to Tannamaram Palm-Oil Mill and Kampung Kuantan Palm Oil Mill staff for their consultation and providing enough data, information and the knowledges of palm oil mill to Mr. Y.Y. Wong, Oi Ah Bah, The Mill Manager for Tannamaram P.O.M and Kampung Kuantan P.O.M. and also Mr. Lim Khoo Khoon and their staff from Vickers Hoskins Sdn. Bhd.

I wish to thank the staff of Jabatan Kilang dan Jentera and all my the friends for the helpful guidance and the use of the facilities for the success of this project.

My deepest appreciation also go to my family for their encouragement and friends who involve directly and indirectly in my final year project.

i

ABSTRACT

The first law analysis provides an indication of the system perfomance whilst the second law analysis would pinpoint, the losses of the system as well the efficiency of the component in the system.

The methodology, which employ both the first and second laws is identify here as Availability Analysis.

In the view of waste in many common processes and practices in the industries, there is a reason for optimism that improving in energy utilization is possible. Improved utilization can come with reduction of available destruction within a device or process or with lessening of losses.

The aim this project is to analyse the maximum possible use of the available Palm Oil waste as the primary energy source for genarating steam to genarate power as well as the processing of Fresh Fruit Bunch.

The basic calculation for steam and power genaration are based on the existing Palm Oil Mill in the Kampung Kuantan Palm Oil Mill and Tannamaram Palm Oil Mill..

ii