February 2004 ISSUE 0014 KDN : PP11456/4/2004

Ptm Malaysia Energy Centre

ENERGYSMART

ASEAN ENERGY AWARDS
Winners of NRSE-SSN Project Competition

- WASTE TO ENERGY : METHANE RECOVERY FROM ANAEROBIC DIGESTION OF PLAM OIL MILL EFFLUENT
- LOCAL COMPANIES GRAB AWARDS AT THE ASEAN ENERGY AWARDS 2003
- TOWARDS A GREENER SOUTHEAST ASIA

Malaysia's One Stop Energy Centre

Pusat Tenaga Malaysia

Pusat Tenaga Malaysia is a non-profit organisation administered by the Ministry of Energy, Communications and Multimedia. It serves to meet the need for a national energy research centre (focal point) that coordinates various activities, especially energy planning and Research and Development (R&D) undertaken in the energy sector.

However, the activities are not confined to R&D only but also include data gathering, compilation and strategic/policy analysis.

PTM serves as a "think-tank" for the Government as well as a one-stop agency for linkage with industries on energy matters.

PTM strives to be a proactive and internationally-recognised driving force in the promotion of sustainable energy solutions, in harmony with national aspirations and the environment. The emphasis is on R&D to ensure efficient and environment-friendly production and consumption of energy in Malaysia.

PTM offer :

- Data on energy statistics
- Consultancy on industrial and building energy audit
- Consultancy on renewable energy (RE) and energy efficiency (EE)
- Consultancy on energy research projects
- Rental of energy audit equipment
- A complete Energy Service Companies (ESCOs) Directory
- Regularly updated information on energy
- A well equipped resource centre
- In house publications (Energy Smart, National Energy Balance, etc)

Ptm
Malaysia Energy Centre

Please contact :
Hamiza Ibrahim/Syarifah Ilham Syed Ahmad/Noor Azlin Mahat
Pusat Tenaga Malaysia, Level 8, SAPURA@MINES, No. 7, Jalan Tasik, The MINES Resort City, 43300 Seri Kembangan, Selangor.
Tel : 03-8943 4300 Fax : 03-8941 1121 E-mail : pustema@ptm.org.my Website : www.ptm.org.my

Malaysia Energy Centre

CONTENTS

Editorial Team

Advisor
Dr. Anuar Abdul Rahman

Chief Editor
Hamiza Ibrahim

Editors
Ahmad Zairin Ismail
Jasmin Idris
Gayathry Venkiteswaran

Contributing Writers
Suhaimi Saad
Noor Maya Abd. Wahab
Noor Azlin Mahat

Guest Writer
S.L Tong
A. Bakar Jaafar

Secretary
Mohd. Razmi Rahmat

Divisions
Corporate Affairs and Business Development (CABD)

Energy Industry and Sustainable Development (EISD)

Policy Analysis and Research Management (PARM)

CEO'S Message

Malaysian companies are making headway in the promotion of sustainable energy, as they continue to bag awards in the prestigious ASEAN Energy Awards. The winning entries for 2003, Keck Seng (Malaysia) Berhad and Ban Heng Bee Rice Mill Sdn. Bhd. are indicative of the commitment by the Malaysian public and private sectors in renewable energy (RE), and the recognition that is accorded at the regional level for such initiatives. The Association of Southeast Asian Nations (ASEAN) first launched the energy awards for energy efficient buildings in 2000 through the ASEAN Centre of Energy (ACE) and the Energy Efficiency and Conservation Sub-sector Network (EE&C-SSN). Two years later, a new category was introduced for New and Renewable Energy Projects, reflecting the intensive efforts by the region's governments and private sector in fields such as renewable energy. The awards serve as a platform to generate interest and opportunities in the development of the energy sector in Southeast Asia. We are indeed proud of the two companies that emerged as the winner and runner-up for the New Renewable Energy Project Off-Grid Category, both scoring high on the selection criteria such as originality of design; environmental and social considerations; economic, technical and market considerations; operations and maintenance scheme; and replicability.

The ASEAN region is still largely fuelled by oil. In the year 2000, this fossil fuel made up about 54 percent of the primary energy mix, followed conservatively by natural gas (26.5 percent) and others. Clearly, the heat is on the ASEAN members to fulfil their commitments towards global sustainable development through the use of renewable energy (RE). ASEAN has developed a Plan of Action to develop the region's manufacturing capabilities in RE; to promote intra-regional cooperation of ASEAN made products, creating the conducive policy and institutional framework for the development of RE, and using RE for rural electrification.

ASEAN has developed a Plan of Action to develop the region's manufacturing capabilities in RE

Consistent with the ASEAN Plan of Action for Energy Cooperation 1999 - 2004, the EC-ASEAN Energy Facility (EAEF) Programme will focus on electricity interconnection, gas pipeline interconnection, clean coal technology, energy efficiency, and renewable energy. EAEF is a Programme of co-operation between the European Community (EC) and ASEAN. This programme will facilitate partnerships between ASEAN and European organisations in developing specific joint regional projects in the energy sector. The objectives are: 1) to increase the security of energy supply of ASEAN countries and indirectly of Europe; 2) to increase economic cooperation between the European Union and ASEAN countries; 3) to improve the environment at local and global levels; and 4) to facilitate the implementation of the Plan of Action. Four different categories of projects called "facility" will be available. These include: Increasing market awareness; adapting institutional frameworks; conducting feasibility studies, and implementing demonstration projects.

In Malaysia, the government announced the Fifth Fuel Policy to include RE as alternative fuel resources, and the Eighth Malaysia Plan contains provisions on the use of biomass for power generation with a specific target of five percent of the national grid by the year 2005. Since 1999, work has already begun to identify potential source of renewable energy and the Government also spent its efforts to raise awareness of the benefits of RE and the viability of such projects. Then, in October 2002, PTM was appointed as the agency to implement the Biomass-based Power Generation and Cogeneration in the Malaysian Palm Oil Mills Industry project (BioGen), whereby empty fruit bunches that are usually disposed as waste will be used to generate power. This project is co-funded by the Government of Malaysia, the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF). It aims to reduce the growth rate of GHG emissions from fossil fuel fired combustion processes, reduce unwanted waste residue from palm oil and to promote growth of power generation and co-generation.

PTM is also one of the beneficiaries of the EAEF. We have managed to secure three projects under the EAEF for 2003 and the implementation of the projects is expected to start soon. The three projects are:

i. Information for the Commercialization of Renewable In ASEAN (ICRA)

ii. Institutionalisation of Green Independent Power Producer (IPP) Network in the ASEAN Region

iii. Formulating an ASEAN New and Renewable Energy (NRE) Policy Framework

While these projects augur well for PTM's overall objectives, we are challenged by the need to ensure wide and meaningful participation of the private sector, preferably through government-private partnership. We have envisaged that a well-established market-driven initiative with solid public sector guidance will boost investor confidence in RE, and subsequently result in a sustainable energy future. The ultimate goal that should be shared by both parties is one of high efficiency levels, extensive use of decentralized technologies, heavy reliance on clean energy and gradual shift to renewable energy. At the regional level, the accumulated benefits of government-private sector partnerships in energy initiatives will significantly reverse the counter-productive trends in energy supply and utilisation.

PTM will continue to be in the middle of these noble efforts to bring RE into the mainstream of the political, economic and social activities. We will work hand in hand with our peers and partner organisations in the region to search for innovation in technology application and energy management that will contribute towards energy security and sustainability. For this, the ASEAN Energy Awards will remain top on PTM's agenda and we look forward to more Malaysian companies being recognised for their efforts.

Finally I would like to take this opportunity to extend my best wishes for the New Year.

DR. ANUAR ABDUL RAHMAN

Waste to Energy : Methane Recovery from Anaerobic Digestion of Palm Oil Mill Effluent

By : S.L. Tong and A. Bakar Jaafar
Novaviro Technology Sdn. Bhd.

INTRODUCTION

The palm oil industry in Malaysia has been expanding rapidly over the last four decades. Annual palm oil production has increased steadily and the production for 2002 stood at 11.9 million tonnes in crude palm oil and 1.47 million tonnes in palm kernel oil (MPOB, 2003). Concurrent to this production, a huge volume of POME, estimated at 35.7 million m^3, was generated in 2002 from a total of about 350 or so palm oil mills distributed throughout Peninsular Malaysia, Sabah and Sarawak.

"The palm oil industry in Malaysia has been expanding rapidly over the last four decades. Annual palm oil production has increased steadily and the production for 2002 stood at 11.9 million tonnes in crude palm oil and 1.47 million tonnes in palm kernel oil"

POME is recognised not only because of the large quantity generated but more significantly as a type of wastewater with the highest organic matters content where BOD and COD levels are at 25,000 mg/l and 50,000 mg/l, respectively (Ma et al, 1993). The treatment of the POME cost-effectively to an acceptable level for discharge to the ambient watercourse, therefore, continues to be a big challenge to the industry.

This paper briefly reviews the common POME treatment systems developed by the palm oil industry, which continue to be regarded as a regulatory obligation cost factor to the business operations, giving no economic returns. Nevertheless, the industry has started to look into new sources of incentives which may be derived from the CDM under the Kyoto Protocol 1997, if efforts to reduce the rate of methane emission from these treatment systems were to be implemented. In the mean time, the drive to develop new renewable energy sources have also begun to attract interests in POME where the high organic matters content is perceived as a substantial carbon and energy source. This paper will highlight a proven POME anaerobic digester technology, which offers an attractive energy source recovery while reducing GHG emission concurrently.

PALM OIL MILL EFFLUENT TREATMENT SYSTEMS

Organic Matters Content of Raw POME

Organic matters content in raw POME, as represented by BOD and COD, has been reported in a study on the survey of 17 mills to be in the range of 11500-35000 mg/l and 38800-81988 mg/l, respectively (Ma et al, 1993). The large variation in the value range has given rise to difficulties to derive a consistent and accurate estimate of the BOD and COD loads to the POME treatment system, the biogas generation capacity and GHG emission potential.

The large variations apparently have been contributed by two major factors: (i) the differences in milling process practices, especially on the water usage, and (ii) samples taken could have been subjected to different extents of cooling/de-oiling and initial sludge settling. The first factor will change the daily flow volume of POME but has little effect on the total BOD and COD loads. The second factor is basically a matter of reporting consistency. Better consistency is expected if the BOD and COD concentrations reported are based on samples taken from effluent feeding to the first stage of the POME anaerobic-aerobic system.

Assuming a common milling operation with an effluent to FFB factor of 0.6 m^3 POME/tonne FFB, and approximately two to three days are allowed for cooling/de-oiling and intial sludge settling/acidification, the raw POME feeding to the anaerobic digestion and aerobic/facultative treatment system is expected to have BOD and COD concentrations in a narrower range of 20000-25000 mg/l and 45000-50000 mg/l, respectively.

It should be noted that certain mills in recent years have been trying to dry the empty fruit bunches (EFB) using screw press and the juices produced are combined with the POME. The EFB juice is known to have much higher BOD and COD contents and this can contribute to a significant increase in the POME BOD and COD.

Common POME Treatment Systems

Ponding System

Surveys conducted by the Malaysian Palm Oil Board (MPOB), previously known as Palm Oil Research Institute of Malaysia (PORIM), have shown that most of the palm oil mills (more than 85%) were using ponding system for the treatment of POME.

POME is readily amenable to biodegradation, but the very high level of organic matters necessitates the adoption of anaerobic digestion in the first stage of the treatment process to convert the bulk of the wastes to biogas and relatively low quantity of biosolids. In the ponding system approach, raw POME is allowed to go through a cooling/de-oiling tank/pond (1 day hydraulic retention time or HRT), acidification pond (2-4 days HRT) before feeding to anaerobic ponds of 5-7 metres depth (30-45 days HRT). The anaerobic process in deep ponds breakdowns a high proportion of the organic matter into methane, CO_2 and small amount of hydrogen sulphide. Methane generated is normally uncontrolled and escapes directly to the atmosphere. The treated effluent is further subject to an aerobic or facultative treatment in shallow ponds (1.5 metres) in order to meet the required discharge standards.

Ponding system has been popular because of the relatively low capital costs for the system although it requires large land area. The system is inherently difficult to control and maintain. The anaerobic ponds mixing depends on biogas generated, which is largely inadequate. Solids tend to build-up at the bottom of the ponds and problems of scum forming causing short-circuiting in the ponds contribute to shortening the HRT and hence lowering the treatment efficiency. The system requires regular desludging to maintain the necessary efficiency.

Open Tank Digester and Extended Aeration

A significant number of mills (5-10%) have built open top tanks instead of ponds for the anaerobic digestion process. Tank digesters have been built with about 20 days HRT. Similar to the ponding system, mixing is limited as this is effected mainly by the biogas generated, although the influent and effluent flow helps to a small extent. Similar to the ponding system, methane generated is uncontrolled and escapes directly to the atmosphere. The tank approach facilitates easier removal of solids build-up at the bottom on a regular basis, and thus maintaining the desired treatment efficiency. The digested effluent is further treated by the aerobic or facultative ponds or extended aeration system with approximately 20 days HRT. The effluent from the anaerobic digesters may also be diverted for land application.

Closed Tank Digester

Closed anaerobic tank digester method has also been developed but application has only been reported in two or three palm oil mills (Quah and Gilles: 1981, 1984; Chua and Gian, 1986). The biogas generated is captured and directed to flaring or used as boiler fuel or for power generation. The treated effluent from the anaerobic digesters may be discharged for land application or further treated by aerobic/facultative or extended aeration system to meet the effluent discharge standard of the Department of Environment.

Treatment Efficiency

For the controlled anaerobic tank digester method with mixing, the gross treatment efficiency has been estimated to be in the range of 90 – 95 % in terms of BOD removal (Yeoh and Chong, 1985). Corresponding COD treatment efficiency is expected in the range of 80 – 90 %. Methane content in the biogas generated has been reported (Quah and Gilles, 1981) in the range of 54 – 70 % with an average of 64 %. The major part of the balance of the biogas is CO_2 (36%) with traces of hydrogen sulphide (up to 2500 ppm).

The data reported by Ma et al (1993) in a survey of 17 palm oil mills show that the overall treatment efficiency for BOD and COD removal, combining anaerobic digestion and aerobic or facultative treatment for both the ponding and tank systems, was very high (>99% for BOD and ~97.5% for COD). However, considering the poor definition of the pond configuration, high bottom solids build up and scum forming in the ponding system treatment approach, the rate of biogas or methane generation from anaerobic digestion could be significantly lower than the theoretical potential based on COD removal.

The data in the same report on BOD and COD removal for open tank digestion followed by land application appears to be more directly applicable for the estimation of methane production potential based on the rate of COD removed during the anaerobic digestion process (97.7% for BOD from 22,380 mg/l to 513 mg/l; ~93% for COD from 63,800 mg/l to 4,550 mg/l). However, as mentioned earlier, it is not clear whether the BOD and COD values were the actual concentrations of the effluent being fed to the digester tanks.

It appears that the methane conversion factor (MCF) for the ponding system is probably the lowest among the three approaches and the most difficult to determine. The open tank digesters apparently are more efficient and the MCF may be measured more readily. For completely mixed closed tank digesters, the MCF should be close to 1.0 for the conversion of the COD to methane. Nevertheless, specific and reliable field measurement data are necessary to establish the MCF values under various treatment conditions. To date, no direct field measurements of methane from POME ponding system or open tank digester have been reported.

GREENHOUSE GAS EMISSION FROM POME TREATMENT SYSTEMS

Raw POME direct from the mill is normally allowed to go through a cooling/de-oiling stage and an initial sludge settling/acidification process before being fed to the anaerobic digestion ponds or tanks. The major part of the biogas or methane, which may be recovered or captured, is produced during the anaerobic digestion stage. An estimation of the Maximum Methane Producing Capacity during the anaerobic digestion ponds or tanks of the common POME treatment systems in Malaysia is presented below. Methane emission potentials from sludge oil and other sludge are not taken into consideration.

The estimation of the Maximum Methane Emission from POME is based on the methodology of Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual and Workbook on the sections specifically for Wastewater. The input parameters are listed as follows for the palm oil industry in 2002:

Input parameters

A. Total Industrial Output (million t/yr), Crude Palm Oil	11.9
B. Degradable Organic Component (kg COD/ m^3 POME) (Assuming COD in POME input to anaerobic digestion at 50,000 mg/l)	50.0
C. Wastewater Produced (m^3 POME/ tonne CPO) (Assuming 0.6 m^3 POME/tonne FFB; 0.2 t CPO/t FFB)	3.00
D. Total Organic in Wastewater (million t COD/yr) (D = A x B x C)	1.785
E. Efficiency of COD Removal by Anaerobic Digestion	0.85

Estimation of Maximum Methane Emission from POME (2002)

F. Maximum Methane Producing Capacity (kg CH_4/kg COD)	0.25
G. Methane Emission from POME (million t CH_4/yr) (G = D x E x F)	0.379
H. Methane Emission Volume (million m^3 CH_4/yr at 273 K) (0.714 kg/m^3 CH_4)	531
I. GHG Emission, **CO_2-Equivalent** (million t/yr) (Based on Global Warming Potential of 1 kg of Methane relative to CO_2 over 100-year period = 21)	**7.96**

The above calculation shows that total methane emission from the anaerobic digestion systems for the treatment of POME was estimated at 0.379 million tonnes for year 2002. The emission of the GHG in CO_2-equivalent corresponds to 7.96 million tonnes, which is equivalent to approximately 5.53 % of the total GHG emission for Malaysia for 1994 at 144 million t CO_2e (Gurmit, 2000).

CASE REPORT OF AN ANAEROBIC DIGESTER SYSTEM FOR POME BIOGAS CAPTURE AND UTILISATION

A few reports on the utilisation of biogas captured from closed tank anaerobic digesters for power generation have been published by Quah's group (1981, 1984). There have been no further information on these systems.

A closed tank anaerobic digester system for POME biogas capture and utilisation at Keck Seng (Malaysia) Berhad, which was first reported by Chua and Gian (1986), has been in continuous operations for over 18 years practically without any interruptions. The system incorporates continuous feeding with complete-mix and floating roofs design for gas storage. **Plate 1** shows a view of the digester tank system comprising 2 x 2,500 m^3 tanks with floating roof and 1 x 2,500 m^3 tank with fixed roof.

Plate 1 : Floating roof closed tank anaerobic digesters for POME *biogas capture at Keck Seng*

The basic parameters and performance of the system are outlined in **Figure 1**. For POME from the 30 MT FFB/hr mill, incorporating significant contributions from the juice from EFB pressing, the total daily biogas output has been estimated at 11,200 m^3/d. The biogas composition has been maintained at fairly constant level with CH_4 at approximately 62.5% and CO_2 at approximately 37%.

The energy rate equivalent of the biogas output converts to 220 million kJ/d, or 52.7 million kCal/d, or 209 million Btu/d or 61 kWh/d. The biogas generated has been utilised for steam boilers and high-pressure heaters (see **Plate 2**) for the Palm Oil Refinery located within the industry complex of Keck Seng. The estimated savings from biogas usage in terms of displacement of diesel (4000 l/d @RM0.79/l) and medium fuel oil (2,500 l/d @ RM0.69/l) for the Refinery amount to a total of RM1.46 million for 2002.

Plate 2 : High Pressure Steam boilers Fired by biogas

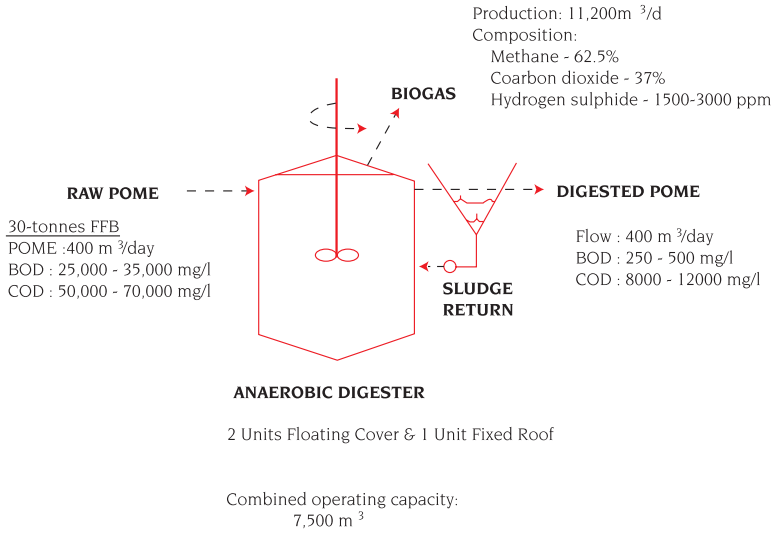


Figure 1: Basic parameters and performance of the KS anaerobic digester system.

The total methane captured and utilised as boiler fuel has been estimated to be about 1,407 t/yr. In terms of GHG emission avoided, this quantity converts to 29,547 t CO_2e/yr. In recognition of these achievements, the developer of the technology, Keck Seng (Malaysia) Berhad has been awarded the ASEAN Energy Awards 2003 for the Off-Grid Category in New Renewable Source of Energy Project Competition. Keck Seng and Novaviro Technology Sdn. Bhd. have recently entered into a licensing agreement for the latter to promote and commercialise the anaerobic digester technology in Malaysia and in the region.

REFERENCES

Chua, N.S. and H.F. Gian, 1986. Biogas production and utilisation - Keck Seng's Experience. In: *Proceedings of National Workshop on Recent Developments in Palm Oil Milling Techniques and Pollution Control*. Aug. 5-6, 1986, Kuala Lumpur

Gillies D. and S.K. Quah, 1984. Tannamaram Biogas Project. Proc. 2nd ASEAN *Workshop on Biogas Technology*, Kuala Terengganu, Malaysia. Working Group on Food Waste Materials, ASEAN Committee on Science Technology, pp. 277-292.

Gurmit Singh, 2000. *The Malaysian Scene: Contributions to Greenhouse Gas Emissions & Their Impacts*.

IPCC, 1996(Revised). Guidelines for National Greenhouse Gas Inventories: Reference Manual.

IPCC, 1996(Revised). Guidelines for National Greenhouse Gas Inventories: Workbook.

Ma A.N., S.C. Cheah and M.C. Chow, 1993. *Current Status of Palm Oil Processing Wastes Management in Waste Management in Malaysia*: Current Status amd Prospects for Bioremediation. B.G. Yeoh et al. (Eds), 1993, pp 111-136.

MPOB, 2003. Malaysian Palm Oil Board (MPOB) Website: http://mpob.gov.my.

Quah S.k. and D. Gillies, 1981. Practical Experience in Production and Use of Biogas. *Proceedings of National Workshop on Oil Palm By-Product Utilisation*. PORIM, pp 119-125

Yeoh B.G. and C.N. Chong, 1985. Biogasification of Palm Oil Mill Effluent – An Overview. ASEAN *Food Journal*, Vol. 1, No.4, pp. 151-156.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the valuable information provided by Messrs. Keck Seng (Malaysia) Berhad.

Local Companies Grab Awards at the ASEAN Energy Awards 2003

By : Noor Maya Abd. Wahab
Energy Industry & Sustainable Development

ASEAN Energy Awards (AEA) 2003 has marked a major achievement for renewable energy and energy efficiency practices in Malaysia. Malaysian entries have managed to stand out in the New and Renewable Sources of Energy (NRSE) Project Competition in the Off-grid category when two entries submitted were announced as the winner and runner-up respectively. The judging session for NRSE Project Competition was conducted

> *"ASEAN Energy Awards (AEA) 2003 has marked a major achievement for renewable energy and energy efficiency practices in Malaysia."*

in conjunction with the 10th Annual Meeting of ASEAN NRSE-SSN in Manila, Philippines on 28 - 30 May 2003.

For the Best Practices Competition for Energy Efficient Buildings, a Malaysian entry, Malaysia Electronics Materials (MEM) emerged as the 2nd runner up in the Retrofitted Category. The judging session was held in Jogjakarta, Indonesia on 3-4 June 2003. The award ceremony for the winners took place at the ASEAN Energy Awards Nights in conjunction with the 21st AMEM/SOME Meeting in Langkawi, in July 2003.

Malaysia's winning entries under NRSE Project Competition was Keck Seng (Malaysia) Berhad and Ban Heng Bee Rice Mill Sdn. Bhd. Keck Seng (Malaysia) Berhad operates an integrated palm oil processing complex in the Masai District of Johor. Designed and built in 1979, the factory stands out among its peers in the way that it emphasizes innovative indigenous technologies to maximize the use of palm oil wastes as fuel resource. The company has made significant advances in harnessing biogas and biomass residues from fruit fibres, kernel shells, empty fruit bunches and palm kernel expeller wastes, as well as developing new schemes to reduce steam consumption. The cost savings arising from these schemes amount to about RM 13 million per year. The returns on investment also have been attractive, with short payback periods.

Ban Heng Bee Rice Mill Sdn. Bhd. is situated in Pendang, in the state of Kedah, right in the heart of Malaysia's rice bowl. Being in operation since 1952, it is the biggest rice mill in Malaysia. The rice husk waste generated from its processes is used as fuel in a cogeneration plant to produce 470 kW of electricity. The cogeneration plant displaces 641 tonnes of fuel oil and 2,868,750 kWh of grid electricity per year. The company also achieved an annual saving of RM 1.6 million.

Malaysian Electronics Materials (MEM) was awarded the 2nd runner up for introducing the MEM Electricity Target Achievement System (METAS) in December 1999 as a guide to the management and staff on ways to reduce energy by eliminating unnecessary energy wastage and to continuously assist in restoring a friendly environment. The retrofitted building achieved total energy savings of 26.3 percent per year. Its Building Energy Index based on occupied air-conditioned areas is 185.4kWh/m^2 per year.

The ASEAN Energy Awards is an annual event undertaken by the New and Renewable Sources of Energy Sub-Sector Network (NRSE-SSN) and the Energy Efficiency and Conservation Sub-Sector Network (EE&C-SSN) of the ASEAN Energy Cooperation and the ASEAN Centre for Energy (ACE). Pusat Tenaga Malaysia (PTM) is the lead coordinator of the NRSE-SSN, whereas for the EE&C-SSN, PTM is the country's focal point.

The Awards are divided into two groups; New and Renewable Sources of Energy (NRSE) Project Competition and Best Practices Competition for Energy Efficient Buildings. Each group is subdivided into few special categories. NRSE Projects Competition is categorized into On-grid Category and Off-grid Category. Thirteen submissions were endorsed and nominated, of which five entries entered under the on-grid category and eight for the off-grid category.

For the Best Practices Competition for Energy Efficient Buildings the categories are; New and Existing Category, Retrofitted Category, Tropical Category and Special Submission Category. Seventeen submissions were received for all four categories competed. The full list of the winners for AEA 2003 is as below:

New and Renewable Sources of Energy Project

Off-Grid Category		
Winner	:	Keck Seng Berhad Integrated Palm Oil Processing Complex-Biogas Project of Malaysia
Runner-up	:	Ban Heng Bee Ricemill Sdn. Bhd., Malaysia, Ricehusk-fired Cogeneration Power Project
On-Grid Category		
Winner	:	Bo Keo Hydro Electricity Project of Thailand
Runner-up	:	Phuket Island Wind Turbine Generation Project, Thailand

Best Practices Competition for Energy Efficient Buildings

New and Existing Building Category		
Winner	:	Central Academic Building, Shinawatra University, Thailand
1st Runner-up	:	Capital Tower Building of Singapore
2nd Runner-up	:	RCBC Plaza of Philippines
Retrofitted Building Category		
Winner	:	Grand Hyatt Regency Hotel Building of Singapore
1st Runner-up	:	Gran Melia Hotel Building of Indonesia
2nd Runner-up	:	Malaysian Electronics Materials (MEM)

The awards will continue in the near future for the benefit of renewable energy and energy efficiency technologies and their development in ASEAN and Malaysia in particular. It is hoped that this regional recognition will serve as an indirect platform for investors to market their emerging technologies and at the same time be recognized at the international level for their outstanding achievement and contributions.

The ASEAN Energy Awards for year 2004 is open for registration and interested project owners, both for NRSE Project Competition and Best Practices Competition for Energy Efficient Buildings categories are invited to register their interest with PTM. For more information, please visit PTM's website at www.ptm.org.my or the ASEAN Center for Energy's website at www.aseanenergy.org.

"The awards will continue in the near future for the benefit of renewable energy and energy efficiency technologies and their development in the ASEAN and Malaysia in particular. It is hoped that this regional recognition will serve as an indirect platform for investors to market their emerging technologies and at the same time be recognized at the international level for their outstanding achievement and contributions."

Towards a Greener Southeast Asia

Author : Suhaimi Saad
Policy Analysis & Research Management

The Association of Southeast Asian Nations holds a group of dynamically developing economies within the Asian region. Since its establishment in 1967, the association has forged a greater regional cooperation in various fields such as the economy, social development and foreign relations. Over three decades of cooperation, the region has seen dramatic changes especially in economic development. For years, Southeast Asia thrived with economic activities, making

> *"The Association represents the collective will of the nations to bind themselves together in friendship and cooperation and, through joint efforts and sacrifices, secure for their peoples and for posterity the blessings of peace, freedom, and prosperity."*
>
> *(The ASEAN Declaration, Bangkok, 8 August 1967)*

it one of the fastest growing regions in the world. The GDP growth for the whole of ASEAN for example, stood at 7.3% in 1996 before taking a dip to -7.14% in 1998 due to the economic crisis. Since then, the economy has picked up albeit at a slower pace with an annual growth rate of between 3% and 5%.

Fuelling the Region

Being able to quickly bounce back on track from the gloomy 1998 economic crisis certainly shows the economic resilience of the region. However, the fundamental strength has to be made stronger in order to keep pace with the fast changing global economic conditions. The development of the ASEAN Free Trade Area (AFTA) for example, will certainly be a major boost to ASEAN's inter-trade, making its industries more competitive and efficient. Riding on the benefits would be the manufacturing sector, the backbone for quite a number of Southeast Asian countries. With growing industries, its energy and electricity demand is another important element that should be kept in check. In the last decade, the booming economy with its power hungry industries and improved socio-economic condition have resulted in an increase of an average of 7.5% in final energy consumption. The economic growth for that period was an average of 4.9%.

In terms of Primary Energy Mix, it appears that Southeast Asia is still largely driven by oil and natural gas. In the year 2000, oil took the largest chunk of the energy mix at 54.1% followed by natural gas (26.5%) and coal (11.2%). The remainder was made up of hydro and other fuel types. (*The* ASEAN E*nergy Secretariat*).

ASEAN Primary Energy Mix (in ktoe)

Fuel Type	1990	%*	1995	%*	2000	%*
Natural Gas	25,523	18.8%	41,876	22.3%	62,949	26.5%
Coal	12,499	9.2%	18,526	9.9%	26,524	11.2%
Oil	89,105	65.5%	113,648	60.6%	128,460	54.1%
Hydro	7,596	5.6%	11,448	6.1%	16,620	7.0%
Others	1,361	1.0%	1,982	1.1%	2,901	1.2%
Total	136,084		187,480		237,454	

** Percentage share*
Source: www.aseanenergy.org

Environmental Consideration

It is without doubt that fossil fuels will still continue to serve the nations as major sources of energy. In addition, it is projected that the increasing consumption pattern of fossil fuels is also expected to hold. Notwithstanding the fact that fossil fuels are of paramount importance in fuelling the economy, our reliance on it does have some negative implications. As far as the environment is concerned, CO_2 emissions in the region should not be neglected. In1990, the region emitted a total of 361 million tonnes of CO_2, and eleven years later, our emissions have doubled to about 722 million tonnes of CO_2. The region's emissions may be a diminutive figure relative to the world's CO_2 emissions of 23,683 million tonnes (about 3%) but the increasing trend is alarming. The same trend applies to CO_2 emissions relative to the Gross Domestic Product (GDP) values of some ASEAN countries as shown in the table below:

CO_2 Emissions per million GDP (constant)

Metric tonnes of CO_2 per million USD

Countries	1980	1990	1998
Brunei	1206.1	1209.8	966.2
Cambodia	-NA-	205.7	206.5
Indonesia	1266.2	1191.5	1179.4
Lao PDR	-NA-	178.6	178.7
Malaysia	865.7	959.9	1277.6
Myanmar	-NA-	-NA-	-NA
Philippines	648.2	665.4	925.4
Singapore	1126.8	776.1	835.4
Thailand	764.6	858.5	1212.8
Vietnam	-NA-	1646.2	1732.3

Source: *World Resources Institute*

Greening the Green Region

Greening the region requires a two-pronged approach by taking care of both the supply and demand sides. The former is to reduce the supply of fossil fuels amid growing economic activities whilst the latter refers to reducing energy consumption at the end-users. However, one country alone will not be able to make much difference. Obviously, it requires concerted efforts. Fortunately, by virtue of its fundamental principle in ensuring effective cooperation among members, ASEAN has laid out its Plan of Action for Energy Cooperation in its quest to achieve greater economic integration. The main objective is, of course, to make the economic development more efficient and cost-

effective. Directly or indirectly, such cooperation will benefit the whole region in terms of environmental improvement.

Referring to the Malaysian experience, the CO_2 emissions from electricity generation was at 13.7 million metric tonnes in 1990 (*World Resources Institute*). At that time the electricity generation was largely fuelled by diesel and fuel oil. As the country progressed, a large chunk of the generation mix began to skew towards natural gas which accounted as high as 71% in 1999. The CO_2 emissions from power generation in that year was 27.7 million metric tonnes. Although the total emissions is on the rise, its emissions on a per MW basis in power generation has been reduced from 2,613 tonne/MW in 1990 to 2,174 tonne/MW in 1999. On that grounds, assuming a significant fuel substitution in the region, the overall CO_2 emissions could be reduced.

By its nature, Southeast Asia is already a 'green' region. Blessed with lush vegetation, tropical rainforest and fertile agricultural land, we have what it takes to provide a plethora of alternative fuel sources. Biomass from wood and palm oil industry, mini-hydro, wind, solar and geothermal are just some examples of readily available renewable energy (RE) resources. Most importantly, these are clean resources, and some have proven to be economical. A lot of research has been done in the utilisation of RE particularly in power generation. Pusat Tenaga Malaysia, for instance, is currently undertaking a UNDP/GEF funded project on "Biomass-based power generation and cogeneration in the Malaysian palm oil industry". Apart from strengthening the various frameworks such as policy, information, financing and technological development, the project will also develop a number of Full Scale Model (FSM) projects in Malaysia. Further north, Thailand has hosted the EC-ASEAN Cogen project covering other forms of RE. Lessons learned from these projects could easily be shared among member countries. What is most important is the possibility of exporting the know-how and technology to member countries, thus reducing the investment cost from economies of scale.

ASEAN has also taken some initiatives on the demand side by promoting energy efficiency (EE) programmes. One such initiative is the ASEAN Best Practices for Energy Efficient Buildings Competition. Another development is the launching of the standards and labeling to further promote awareness on ASEAN's energy efficient products.

Looking Forward

The hidden benefits of being mostly a developing region is in the opportunities for external funding for research and development projects. Surely, the countries have benefited much in the know-how and technological transfer. Key to this is the willingness to share the information and learn from each other. It shouldn't be difficult since ASEAN has provided a strong foundation through its various integration programmes. In the spirit of 'Prosper thy neighbour', building a greener ASEAN is an achievable dream.

Malaysia Energy Centre

PTM NEWS

"Malam Anugerah 2003" A Night to Remember

Malam Anugerah 2003 – a truly memorable event for all PTM staff was held at the Marriott Putrajaya Hotel on 4 October 2003. The dinner, which was organised by the Corporate Affairs and Business Development (CABD) Division with its theme "Santai", was graced by the presence of Y.Bhg. Dato' Dr. Mohd. Ariff Araff, a member of the PTM Board of Directors. This annual event was attended by 110 guests comprising PTM staff and their families as well as members of various organisations.

The ceremony began with the welcoming speech by Dr. Anuar Abdul Rahman, Chief Executive Officer of PTM, followed by the opening speech by Y.Bhg. Dato' Dr. Mohd. Ariff Araff. The event was enlivened by the performance of PTM's live band, "Tenaga Sakti". The highlight of the evening was the announcement of the "Researcher of the Year 2003" and the "Employee of the Year 2003" awards. The first award went to En. Nik Ahmad Aznizan Nik Ibrahim from the EISD Division while the latter was awarded to En. Khairul Mohd. Anua from the CABD Division.

The celebration ended with a thousand smiles and hopes that the special occasion will continue to be a moment of appreciation and gratitude to all the staff.

Speech and Writing Skills Training

A two-day training on "Speech and Writing Skills" for PTM staff was organised on 17 and 18 November 2003. The main objectives of the training were to improve the staff speech writing skills and techniques and to increase the speed and impact of the staff writing skills. The training was conducted by En. Abu Hasan Adam.

A practical session was held at the end of the programme, where staff were divided into groups and presented their selected topics. It is hoped that the training had enhanced staff skills and knowledge, hence their quality of work.

ISO 9001: 2000 Internal Quality Audit

As part of the ISO requirement to ensure the effectiveness of the overall PTM's Quality Management System, an Internal Quality Audit was conducted from 11 to 14 November 2003.

The audit was lead by En. Suhaimi Saad of PARM and assisted by the selected auditors from each division. The audit completed with a few minor Non-Conformance Records (NCRs).

Majlis Jamuan Hari Raya

PTM took advantage of the month-long Hari Raya Aidilfitri to organise a gathering for its staff on 19 December 2003. Although small in scale, the gathering was important to foster stronger relationship among PTM staff. The event was also made lively with the presence of SAPURA representatives.

Congratulations to the Newly-Weds

PTM management and staff would like to congratulate Pn. Hasliza Mokhtar (PARM) and En. Khairul Mohd. Anua (CABD) on their marriage and wish them a happy married life.

Malaysia Energy Centre

ASEAN ENERGY AWARDS 2004

Best Practices Competition for Energy Efficient Buildings

PUSAT TENAGA MALAYSIA (PTM) would like to invite owners/managers of buildings with best practices in energy efficiency in Malaysia to participate in the ASEAN Energy Efficient Building Competition organised by ASEAN centre for ENERGY (ACE). The Competition is divided into four (4) categories, namely:

Category	Description
New and Existing Building	A new or existing building (not more than 5 years old), which is built to be energy efficient. No retrofitting done.
Tropical Building	A building (not more than 5 years old), which has not less than 500 m^2 of Total Gross Floor Area (GFA) excluding car park area. Air-conditioning area up to 50 percent of GFA.
Retrofitted Building	An existing building (more than 5 years old), which has undergone major changes and improvements to improve energy efficiency.
Special Submission	Special projects, which study, apply and/or develop innovative technologies that could be applied to reduce energy consumption in buildings.

Interested Project Owners or Managers are invited to submit their **LETTER of INTEREST** or to contact the Secretariat **BEFORE 29 February 2004** at:

The AEA 2004 – Buildings Secretariat PUSAT TENAGA MALAYSIA
Level 8, SAPURA@MINES, No. 7, Jalan Tasik, The MINES Resort City, 43300 Seri Kembangan, SELANGOR DARUL EHSAN

Contact Persons: En. Nik Mohd Aznizan Nik Ibrahim & Pn. Azah Ahmad
Tel. No. : (03) 8943 4300 ext. 411 & 412 • Fax No.: (03) 8922 3290 • Email: nik@ptm.org.my / azah@ptm.org.my
Website : http://www.ptm.org.my

Further information on this Competition can be obtained from
http://www.aseanenergy.org

W O R K S H O P S & S E M I N A R S

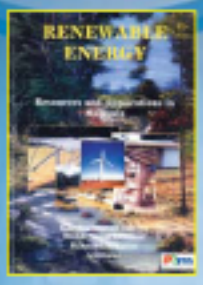
DATE	VENUE	EVENTS
8-10 Apr 2004 (tentative)	To be confirmed	**2nd Workshop on National, Solar, Hydrogen and Fuel Cells Roadmap** For details on the workshop, please contact : **Cik Wan Nadia Kamaruddin**

Malaysia Energy Centre

Publications Generated by PTM

Sustainable Energy Development

PUBLICATIONS



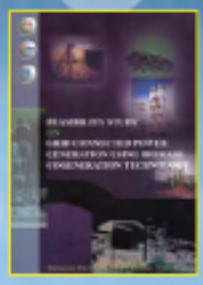
Renewable Energy

Koleksi Poster RE & EE 2000

Koleksi Esei ITD & KT 2001

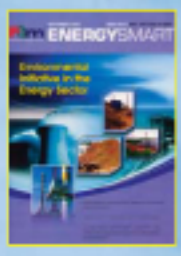
Sistem photovoltaik suria 'Solar Home Kits'

Preliminary study into the green energy revolving fund



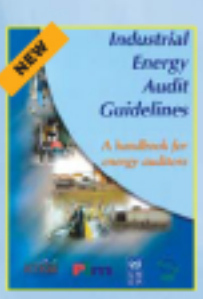
Feasibility study on grid connected power generation using biomass cogeneration technology

National Energy Balance 1999 and 2000 (Also Available on CD)



PTM Bulletin Issue 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13

Annual Report 1999, 2000, 2001 and 2002



Industrial Energy Audit Guidelines

Malaysian ESCO Directory

For further details, please contact:

Corporate Affairs and Business Development Division,
Pusat Tenaga Malaysia, Level 8, SAPURA@MINES,
No. 7, Jalan Tasik, The Mines Resort City, 43300 Seri Kembangan, Selangor
Tel : 603 8943 4300 Fax : 603 8941 1121 / 8945 1121 E-mail : pustema@ptm.org.my Website : www.ptm.org.my