Energy Management –
The smart way to manage spiralling energy prices

By: Engr. Leong Siow Meng, *MIEM, P.Eng*

INTRODUCTION

Malaysia, like any other countries in the world, has to adapt to the skyrocketing energy prices resulting from the further oil price shocks. It cost the government RM35 billion to keep domestic natural gas, petrol and diesel prices artificially low last year with direct subsidies and taxes foregone. The crude oil price was around US$52/barrel in January 2007. The fuel subsidy bill is expected to exceed RM45 billion as crude oil rose to US$135/barrel recently in May 2008.

In the Malaysia context, this global oil price hike has led to the petrol price increase to RM2.70 per liter from RM1.92; diesel price increase to RM2.58 per liter from RM1.58 on June 5, 2008. The electricity tariff will increase by 26 percentages for businesses from July 1, 2008.

It is time to re-focus and place greater emphasis to the use of energy efficient (EE) equipment and adoption of energy management (EM) practices. These measures may represent some of the "ripest low-hanging fruits" for achieving energy productivity within relatively short timeframe and hence, mitigating the full impact of fuel price hikes.

BACKGROUND

EE and EM practices are not new to the industries and yet these practices are not widely adopted. During the launching of the *Energy Efficiency and Conservation Guidelines for Malaysian Industries Part 1: Electrical Energy-use Equipment* organised by Pusat Tenaga Malaysia (PTM) on 31 July 2007, the participants had the opportunity to learn about energy management practices in Japan and Australia at the seminar following the launching. The distinct traits common to the energy conservation activities in both countries lied in their statutory requirements; integrated approach and infrastructural support system.

IEM had participated in the preparation of the above guidelines through the Electrical Engineering Technical Division and the Mechanical Engineering Technical Division. The former headed the working group that prepared the guidelines on transformers while the latter prepared the guidelines on pumps and air compressors. Other working groups were ASHRAE Malaysia Chapter on chillers, cooling towers, and fans and blowers; Suruhanjaya Tenaga on motors; SIRIM on lighting.

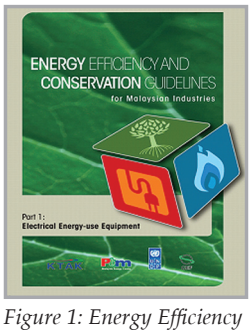

Figure 1: Energy Efficiency and Conservation Guidelines published by PTM

The guidelines were developed by PTM through the initiative of the Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP), under the stewardship of the Ministry of Energy, Water and Communications.

EE AND EM PRACTICES IN JAPAN AND AUSTRALIA

In Japan, energy management is mandatory for Type 1 designated factories which annually consume 3,000 kL-oil eq.(108,246 GJ/yr) or more and Type 2 designated factories or buildings which annually consume 1,500 kL-oil eq.(54,123 GJ/yr) or more. Similarly, energy management in Victoria, Australia, is compulsory for Category B factories, which consume 500 to 7,000 GJ/yr or emit 100 to 1,400 +CO_2 –e/yr, and Category C factories, which consume more than 7,000 GJ/yr or emit more than 1,400 +CO_2 –e/yr.

Both countries have the necessary infrastructural support and procedures for energy management, assessment, review, monitoring and reporting for compliance. Guidelines are available for the industries to adopt best practice in developing action plans and proposals for minimising energy use and greenhouse gas (GHG) emissions. Adopting greenhouse best practice approach has enabled their industries to achieve energy productivity and long-term sustainability in their economy and the environment.

Japan has undoubtedly achieved an impressive management of their non-indigenous energy resources. Japan has managed to scale down their Primary Energy Intensity per GDP from 1,562 toe/billion Yen in 1973 to 996 toe/billion Yen in 2004. In comparison with the world average Primary Energy Intensity per GDP of 316 toe/million USD (currency rate of USD as of 2000) and Malaysia's 531 toe/million USD as of 2004, Japan achieved the lowest in the world at 108 toe/million USD. Figure 2 shows the Primary Energy Consumption (tonnes in oil equivalent) per GDP with respect to the Japanese figure, which is set at 1.

For the management of Primary Energy Supply, Japan has managed to reduce from oil-dependence at 77.4% in 1973 to 49.7% in 2005. The reduction in oil dependence is understandable in view of the steep rise in oil prices. In 2005, Malaysia's total Final Use of Energy (by types of fuel) stood at 38,285 ktoe/yr, of which 60.11% was petroleum products, 18.23% was natural gas and 18.14% was electricity. Such total energy consumption increased from 29,699 ktoe/yr in 2000, of which 65.95% was petroleum products, 13.01% was natural gas and 17.72% was electricity. In view of Malaysia's finite oil and gas reserves, it will be prudent to promote EE and EM for improved energy productivity and efficiency of energy supplies so that our energy resources can be stretched for future generations.

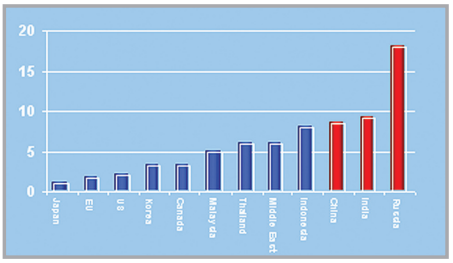

Figure 2: Primary Energy Consumption per GDP per country (source: ECCJ based on IEA statistics 2004)

WHAT IS ENERGY MANAGEMENT?

From the national perspective, energy management is the collective term for managing energy resources in accordance with the National Energy Policy, which encompasses three principal energy objectives as follows:

The Supply Objective:

- To ensure the provision of adequate, secured, and cost-effective energy supplies through the development of indigenous energy resources both non-renewable and renewable energy resources using least cost options and diversification of supply sources both from within and outside of the country.

The Utilisation Objective:

- To promote the efficient utilization of energy and to discourage wasteful and non-productive patterns of energy consumption.

The Environmental Objective:

- To minimise the negative impacts of energy production, transportation, conversion, utilisation and consumption on the environment.

Implementing effective measures to achieve such diversified energy objectives is a challenge. To achieve greater impact with sound energy management measures will require an integrated approach, which is to address all sectors that utilise energy and generate emissions to the environment. In this regard, the Ninth Malaysia Plan (9MP) has placed emphasis to ensure efficient utilisation of energy resources and minimisation of wastage. The 9MP encourages energy efficiency (EE) initiatives, particularly in the industrial, commercial and transport sectors as well as in government buildings.

As part of its service in the promotion of EE practice and dissemination of information, PTM has taken the initiative to develop a set of *Energy Efficiency and Conservation Guidelines for Malaysian Industries*. This set of guidelines was developed to assist industries through energy conservation to achieve energy efficiencies, conservation of natural

resources and reduction in greenhouse gases. For the first time, PTM has managed to coordinate and integrate technical contributions from some 60 professionals from both the public and the private sectors to produce this set of practical guidelines that provides useful information on best practice approach to energy efficiency and conservation for industries in particular and for buildings in general. It is hoped that the guidelines will generate greater awareness and wider market acceptance of energy efficiency and conservation so that energy productivity can be achieved.

As mentioned by the YB Minister of Energy, Water and Communications in his foreword to the guidelines, quote *"improving energy efficiency and application of best practice in design, operation and maintenance can bring valuable benefits to users by reducing energy cost; improving productivity and profitability; minimising energy wastage; and enhancing competitiveness. The nation will benefit with improved overall energy and environmental management as a result of producing more goods and services with less energy and fewer natural resources; and less waste and pollution"* unquote. Undoubtedly our country will become a net energy importer one day. However, with integrated and concerted effort, it is possible to delay being a net energy importer so that our future generations can still enjoy the healthy balance of payment without having to endure the full impact of the costs of energy at market rates.

WHAT IS ENERGY MANAGEMENT TO BUSINESSES?

For businesses, energy management is a management system which institutes systematic practices to enable effective utilisation of energy for improved productivity; minimise wastage; consistently generate consciousness amongst employees in energy saving; and ultimately achieve improved profitability. Energy management is important and should provide the impetus to carry out energy conservation. From the nation's point of view, establishing sound management practices is essential to achieve the *Utilisation Objective* as aspired in the National Energy Policy.

WHAT ARE THE IMPORTANT CONSIDERATIONS OF ENERGY MANAGEMENT FOR BUSINESSES?

Good energy management should include the following considerations:

- Establishing management commitments.
- Instilling responsibility and awareness among employees.
- Utilisation of the most appropriate energy source.
- Optimisation of energy performance of equipment and operation through best practice approach.
- Minimisation of energy wastage.
- Conscious effort to mitigate further climate change impact.
- Establishing proactive plans and targets for continuous improvement.

The Energy Efficiency and Conservation Guidelines advocate the establishment of an energy management team which should consider the following energy management steps:

- Establishment of goal
- Carrying out studies and planning
- Implementation
- Create an improvement plan
- Implement revised plan
- Make assessment

Depending on the requirements, several methodologies for energy management may be considered by business organisations. Japanese have been successful in their implementation through such techniques as TQM; Kaizen by Sho-shudan (small group activities); and P-D-C-A (Plan, Do, Check, Action) circle activity. The important part of energy management is to establish target values such as energy intensity and equipment energy efficiency ratings as suggested in the guidelines. Energy management in Japan identifies three categories of energy conservation measures:

1. Enhancement of management and the improvement of operation (with minimal financial expenditure)
   a) To enhance energy management based on the existing setup.
   b) To review current operation and optimise the use of existing equipment.
   c) To minimise wastage.
   d) To monitor, take measurements, upkeep and maintain existing equipment incorporating best practices.
2. Improvement with the retrofitting and installation of equipment (with some financial expenditure)
   a) To retrofit existing facilities with energy efficient devices and/or equipment.
   b) To install additional equipment for the recovery of waste energy.
3. Long term measure with changes in process (involving higher financial expenditure)
   a) To introduce changes in process with updated technologies which employ energy efficient process, control instrumentation and equipment.

THE BENEFITS OF THE ENERGY EFFICIENCY AND CONSERVATION GUIDELINES

The guidelines provide practical energy-saving measures and best practice approach in design, operation and maintenance, which will be useful for industries. The application of the guidelines can bring benefits to industries, for example:

1. Help generate consciousness among employees in energy efficiency and conservation, and establish energy management in preparation for the impending *Energy Conservation Law*.
2. Provide best practice guidelines for eco-efficient techniques, methods or technologies currently available and in use.
3. Provide guideline in selection of energy-efficient equipment; reduction in operating costs; improving productivity and profitability; enhancing competitiveness.
4. Provide case studies to demonstrate actual best practice examples.
5. Help reduction in greenhouse gas emissions and improve energy sustainability.

For the country, the implementation of such guidelines will assist towards the following:

- Achieve nationwide EE practices in industries.
- Increase national productivity and services with less energy input.
- Sustain the national energy resources for future development.
- Reduce the energy supply needs.
- Reduce greenhouse gases emission to the atmosphere.
- Slowdown climate change and global warming.

These benefits and the so-called "low-hanging fruits" will not be fully realised without any specific requirement stipulated in statutory regulations. The much-anticipated Efficient Management of Electrical Energy Regulations submitted for approval and legislation (if legislated) in 2006 will apply to consumers who used an average of 6 million kWh or more per annum. The regulations will mandate the employment of an Energy Manager for these consumers.

Other legislation pending is the revision of Uniform Building By-laws, which is to incorporate the stipulation of MS1525 (Code of Practice on Energy Efficiency and use of Renewable Energy for Non-residential Buildings). In view of the current energy price scenario, greater impact to energy savings and productivity can be expected if legislative supports are instituted without further delay.

CONCLUSION

The development of the EE guidelines has marked a significant achievement in assembling and integrating local technical expertise of some sixty professionals from the private and public sectors to share their knowledge and experiences. The end result is a set of practical and useful guidelines, which were prepared by Malaysian practising professionals specifically for the industries. The guidelines provide practical energy-saving measures and best practice approach in design, operation and maintenance. The success in realising the benefits of adherence to the guidelines will hinge on the commitment of respective management and the establishment of specific legislative requirements. The application of the guidelines and energy management techniques can bring immediate benefits to industries and hence, mitigate the full impact of oil price hike. ■

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