# 3. DEVELOPING ENERGY/EMISSIONS MANAGEMENT SYSTEM

Depending on the scale of your operations and the resources available it may be necessary to prioritise certain areas for initial action. Prioritisation criteria could include your main areas of energy use and/or significant emissions sources. Alternatively, benchmarks can be an effective way of identifying areas that could be readily addressed and hence prioritised.

## Assessing Your Company's Position by Benchmarking

Initial audit findings can be used to benchmark operations against industry standards. Benchmarks can also be used as a basis for establishing achievable reduction targets.

The Energy Indicator (EI) and Benchmarking System developed by the EMSD is an effective tool to establish benchmarks. The tool:

- Provides data on energy/emissions levels within particular industrial sectors, processes or building types;
- Allows organisations to compare their own performance with that of others in equivalent situations; and
- Provides advice on measures to improve energy efficiency.

The Benchmarking System can be used as a basis for identifying energy efficiency and hence indirect emissions reduction opportunities. By using information such as total electricity and fuels consumed, building floor areas, the number of computers, the number of staff, operating hours, etc., the System allows users to benchmark their company against similar operations in their industry sector online.

The EMSD System is currently available for 11 common industry groups in Hong Kong, as follows:

- Offices
- Commercial Outlets
- Hotels and Boarding Houses
- Universities, Post-secondary Colleges and Schools
- Hospitals and Clinics
- Private Cars
- Light Good Vehicles
- Medium Goods Vehicles
- Heavy Goods Vehicles
- Private Light Buses and
- Non-Franchised Buses

The EIs of each group are summarised in *Appendix B.*

Use of the online system (*www.emsd.gov.hk/emsd/eng/pee/ecib.shtml*) provides users with information on how efficiently they are using energy compared to average operations in Hong Kong, and hence allows for the identification of realistic energy reduction targets. Companies can use the EMSD's benchmarking system and associated EIs to review their current performance.

## Establishing Targets

Once areas for improvement have been identified, the EEM Team can establish specific energy consumption and air emissions targets. The targets should be **SMART**:

- **S**pecific: they say exactly what you mean.
- **M**easurable: you can prove that you've reached them.
- **A**chievable: you can reach them within a specified timeframe.
- **R**ealistic: they are about actions you can take.
- **T**ime-related: they have deadlines.

Example of **SMART** targets for energy efficiency and air emissions are provided below:

- *Reduce energy consumption by X% within Y year(s)*
- *Reduce $NO_x$ emissions from diesel generators by X% by January 200Y*

# No idea where to start? A benchmark can help

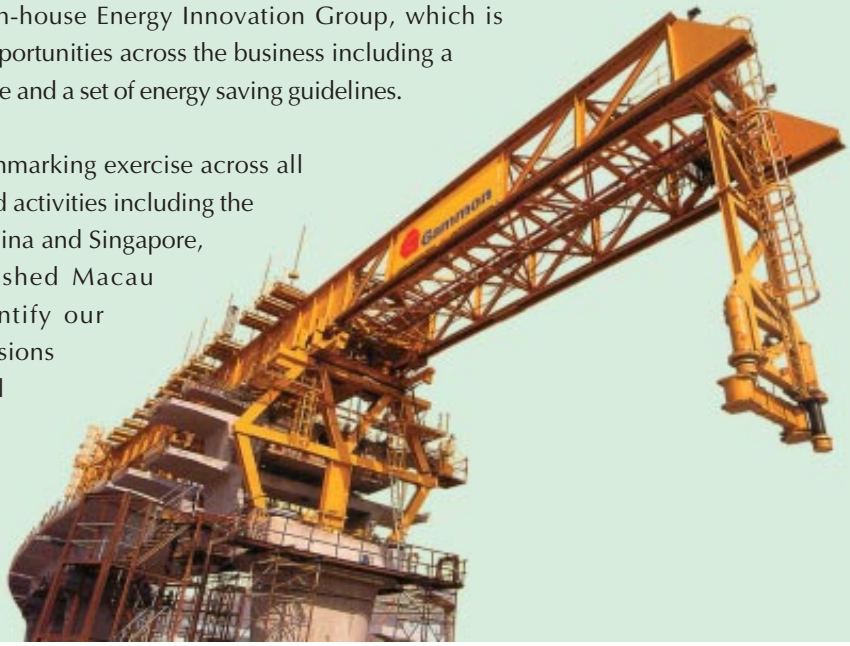
Businesses often find it difficult to evaluate whether their energy consumption and emission conform to environmental standards. A benchmarking system can certainly help.

"Basically, benchmarking refers to comparing current performance against other similar operations." Mr Peter Rawlings, Environmental Manager of Gammon Construction Ltd, explained. "When you purchase a new car and compare its kilometres per litre against other cars, that is benchmarking – you are seeing how something performs when compared to others."

In 2003, Gammon began to benchmark the environmental performance of its Hong Kong operations by firstly collecting a comprehensive and representative data set. This involved all project sites, requiring all to return monthly environmental data forms with information on electricity and diesel consumption, waste generation and water usage. The 2003 data was then standardised and utilised to generate a series of key performance indicators (KPI's) that were used for future monitoring of other operations. Subsequent yearly data is compared through the KPI's to track improvements and changes in performance.

"The KPI's cover fuel consumption by our plant, equipment and vehicles, which is an indirect measure of exhaust emissions, and other indirect emissions from electricity consumption and the materials and chemicals we procure," Mr Rawlings elaborated. "We have also established an in-house working group comprising representatives from our different operating units to develop an action plan to reduce our air quality impacts arising from transportation, on-site plant usage, electricity consumption and chemicals usage."

For example, Gammon has the largest plant fleet in Hong Kong, comprising over 1,300 pieces of plant assets. To manage and minimise environment impacts, a comprehensive Preventive Maintenance Programme has been developed and implemented, providing a baseline level of performance for the plant fleet so as to ensure that all plant and equipment is in optimum operating condition. Another example is the creation of an in-house Energy Innovation Group, which is investigating energy efficiency opportunities across the business including a prototype energy-efficient site office and a set of energy saving guidelines.



"In 2005, we extended the benchmarking exercise across all areas of Gammon's operations and activities including the main offices, support services, China and Singapore, as well as our newly established Macau operation. We now also quantify our equivalent carbon dioxide emissions and our use of Montreal Protocol substances, and year 2005 marked our first year in fully reporting on greenhouse gases across all of our regional businesses," Mr Rawlings said.

# Managing Energy Efficiency by Objectives and Targets

Mr Andrew McCusker

"Energy efficiency is also business efficiency," MTR Corporation's Operations Director, Mr Andrew McCusker said.

Energy management is particularly important to MTR which transports some 2.5 million passengers every day, moving them around 53 stations with over 100 trains. Given such high volume of people and mechanical movement, the optimisation of energy is viewed as a continual process to achieve the long-term goal of improved cost efficiency and operational excellence.

Obviously, the railway operations managed by MTR is a huge network. Traction and air-conditioning are the two major areas of MTRC's electricity consumption. In addressing the electricity need of moving trains and the supporting infrastructure, the company has used the advanced technology to improve the energy efficiency. The installation of chopper system and the replacement of traditional motor alternators with solid state inverters has improved the energy efficiency by 17% and 10% respectively. As for air conditioning, individual cars are managed by a weight cell to adjust the temperature according to passenger-load. Platform screen doors, while enhancing the safety of passengers, also help reduce air-conditioning cost by 10%.

Many other energy saving measures have been taken ranging from ventilation to lighting. One of the most recent initiatives is the installation of LED lighting in car saloons under a trial scheme in cooperation with a local university.

For such highly mechanical and complicated business involving 6,500 employees, it has not been an easy task for the management to motivate everyone in the MTR Corporation, including the frontline staff, to work towards a common goal.

The key to MTR's success is to set objectives and targets, which will be incorporated into business plans. "Even if it is a trivial objective of say half a percentage of energy and if the management follows on that objective, people will have that in their business plan," said Mr McCusker. With clear business plans, managers and department heads are all well informed of the targets and know where to start, he added.

The Review Group of Energy Consumption has been set up to establish energy reduction targets and develop management plan. Under the Committee there are a number of task forces and working groups across different departments to ensure that the company's targets are well understood by all staff.

According to Mr McCusker, the Corporation needs to create a culture of continual improvement, by giving recognition and reward to staff who have contributed to energy saving practices, so that staff will wholeheartedly take part in the programmes and campaigns.

# Developing An Action Plan

After establishing reduction targets, an Action Plan should be developed. Responsibility and timelines for implementing the actions should be defined. Responsibilities for action should not be limited to the EEM Team. Some actions, for example, turning off computers and lights, will require the support of many staff members. The action plan will therefore need to include internal communication and raising awareness.

For actions that may take longer to implement, consideration should be given to setting interim goals and metrics for tracking progress. For example, due to cash flow constraints, the replacement of CRT with LCD monitors within small enterprises may need to be staggered over a longer time frame and an interim target of replacing 40% by year end may be appropriate.

Section 4 provides some examples and references for the types of actions that can be included within EEM action plans.

Consideration should also be given to identifying audit and performance monitoring schedules within the action plan. Some actions may require regular monitoring to ensure implementation, while overall progress against targets might just be measured on a semi-annual or annual basis. Further discussion on audit and reporting is provided in section 5.

### Example of an Action Plan

| Reduction Target | Responsible Person | By when |
|---|---|---|
| e.g. replace all conventional fluorescent tubes with energy efficient tubes in area A | AB Cheung | 31/3/07 |
| 1. | | |
| 2. | | |
| 3. | | |

# Sustain Energy Saving Programme by Adopting Knowledge-based Approach

"To implement an energy saving programme, three key factors are critical, top management's support, committed staff and knowledge." Ir Cary Chan, Head of Technical Services of Swire Properties said. "To get buy-ins, we need to be able to use information and knowledge to demonstrate to top management the tangible and non-tangible values of implementing energy reduction measures".

Swire Cooling Towers at Festival Walk – The largest conversion from air-cooled to water cooled air-conditioning plant at that time.

Swire Properties' investment portfolio in Hong Kong comprises mainly office and retail premises, as well as serviced apartments and other luxury residential accommodation, totaling about 1.16 million $m^2$ of gross floor area. Together they consumed over 220 million kWh of electricity in 2005 at a cost of about HK$250 million. In comparison with 2002, a saving of 11 million kWh of electricity per year was achieved after the implementation of energy saving programme.

"In 2002, we consolidated our company-wide energy saving efforts by formalising an energy task force, the Technical Efficiency Team to manage energy issues, develop and monitor energy conservation measures," Ir Chan said. "Air conditioning and lighting systems are two of the key areas we focus on since their electricity consumption represented over 80% of that of a commercial building."

The energy saving measures they've taken range from simple, low cost measures to more capital and knowledge intensive initiatives.

Relatively simple energy saving initiatives were then taken, for example, to replace lighting supplies with more energy efficient equipment such as T-5 tubes, and to review operation schedules so that lighting equipment was used only where and when necessary. On the other hand, the retrofit of air conditioning plants from air-cooled to water-cooled, and from constant air volume to variable air volume systems, required more investments. For air-conditioning systems, estimating annual energy savings is a challenging task as the efficiencies and hence the energy consumption of air-conditioning plants depend on a lot of variables such as outdoor temperatures, humidity, occupancies, etc. which are changing from hour to hour and day to day.

"Before implementing any energy reduction measures, past operating data are collected for at least a whole year to construct the relationship between the air-conditioning plants' efficiencies and the various changing factors. Such becomes our knowledge to our systems and forms the basis for our feasibility studies and our three year energy saving plans. To sustain our energy saving programme, we have adopted a knowledge-based approach through the continuous capturing and analysing of data in order to explore new opportunities for improvements. By adopting this approach, we have successfully derived and implemented a number of control strategies in the past two years, resulting in substantial energy reduction. Two notable ones are static pressure reset for variable air volume systems and the variable primary chilled water flow system at Festival Walk," Ir Chan said.

To move forward, the company is in the process of building a large database to capture and store all operating data from the Building Management Systems. Software is being developed in-house to automatically analyse data from the database to identify/diagnose faults of the air-conditioning plants and monitor its efficiencies. By making use of their knowledge base, the Technical Efficiency Team is able to generate more optimisation strategies.

This proves the old proverb – " Knowledge is Power." In Swire's case, knowledge saves energy, continually.