SLP SOCIETY of LOSS PREVENTION news
In the Oil, Chemical & Process Industries (Singapore)
OCTOBER 2003
MITA NO.: 132/06/2003

# Successful Training Courses —

## Gas, Vapour and Dust Explosions and Electrostatic Hazards

We successfully conducted the two training courses that we wrote about in the July Newsletter. Mr. Ian Pavey, Principal Electrostatics Specialist from Chilworth Technology, conducted the two courses at the Orchard Hotel on September 16 and 17. There were 29 attendees over the two days. People came from the pharmaceutical, petroleum refining, petrochemical, power generation and chemical logistics industries. Participants appreciated the opportunities to share experience with each other and to discuss their real life risk and safety issues with Mr. Pavey. If participants did not know it before, they sure know it now. Electrostatic phenomena are a fact of life and are present in more places than we suspect. Hence the special place of electrostatic hazards in the study of gas, vapour and dust explosions. Participants now know how little energy (minute actually) from an electrostatic discharge is needed to set off a gas, vapour or dust explosion. There is definitely a respect now about electrostatics.

Participants covered the theory about gas, vapour and dust explosions. They also learned about the operational and engineering steps that may be taken to prevent such accidents from happening or in the case of an accident, how to protect plant and equipment from excessive damage.

*Ian Pavey about to demonstrate that icing sugar can explode.*

*What is Ian going to do next?*

*Electrostatic charges on a plastic sheet - - you can't see it but it's there.*

Mr. Pavey conducted experiments in the class to demonstrate how explosions happen – participants saw how icing sugar could produce an explosion if the sugar particles (dust) were dispersed in the correct proportions in air (the oxidant). Participants also saw how electrostatic charges are generated by friction. A person can set a gas/air mixture alight by simply pointing a finger at the gas stream. Magic? No, simply an electrostatic discharge from the tip of a finger that has been previously charged.

Since electrostatic charges cannot be eliminated entirely, engineers and plant operators have to understand electrostatic phenomena and to come out with engineering and operating solutions eg. the wearing of safety shoes that have soles that conduct static electricity away instead of retaining the charge. Would an operator who knows the reason for the safety shoe design knowingly flout the safety precaution? Not very likely!

SLP is proud to announce that the two courses have been recognized by the Ministry of Manpower for its continuing education scheme for Registered Safety Officers. Each of the courses is worth 7 Safety Development Units (SDU's). SLP members and other attendees for the two courses would have earned 14 SDU's towards their next registration as Registered Safety Officers. Participants received a Certificate of Attendance to prove this.

*A happy Tan Teck Bee from Chiyoda Singapore receiving his certificate.*

An assessment, carried out after the course, has shown that participants have generally benefited from the course. They assessed the courses as being relevant to their jobs. A few attendees wanted the subjects to be covered in more depth. This is a good sign. They want to know more. Attendees also asked for more case studies and practical applications to be discussed during the class. This shows the practical bent of the participants. A few topics suggested for inclusion in the courses can actually be a whole course by themselves eg. how to conduct a risk assessment for explosion and electrostatic hazards. How big is the demand for such a course? SLP could certainly look into it if there is a sufficient demand. Readers could respond to this by e-mail to our Secretariat.

These two courses, Gas, Vapour and Dust Explosions and Electrostatic Hazards were certainly successful and met a need from the industries that SLP serves – the oil, chemical and process industries in Singapore.

*By Ngiam Tong Yuen*

# EDITORIAL

SLP has been busy the past few months. It feels as though we were enjoying our newly restored freedom after the constraints of the SARS outbreak.

The articles in this issue of the Newsletter show this burst of energy. In July we had our first Roundtable Discussion on Security Awareness. Security management is now part and parcel of plant management and it is not going to get any easier. Thus the roundtable discussion saw many enthusiastic and knowledgeable people who came to share and learn. The participants at the first roundtable even decided to have a Security Roundtable Discussion II. This is scheduled for October 31, 2003. Watch out for the announcement !

We had an interesting visit to the NEWater Plant in August. Singaporeans are breathing easier because of the technological developments that have led to water recycling and reuse.

Most recently, we successfully conducted the training courses on Gas, Vapour and Dust Explosions and Electrostatic Hazards. Participants have rated the courses as being relevant to their jobs. Some have even asked for more – more related courses and at greater depth. Your Executive Committee would be very pleased to put on more relevant courses if there is a demand. So get going with your e-mail to our Secretariat with your preferences.

HazMat is an important subject and we have a book review on it.

Our President, Richard Gillis, has made an excellent case for membership of SLP in his message. You should use his arguments in your discussions with your colleagues and friends who are not SLP members. Maybe even persuade your company/employer to join as a Corporate Member. In this game, there are only winners.

Finally, we would like to point you towards our website. Sam Tsen, our Hon. Treasurer, is the webmaster. He is not only knowledgeable about such matters, he is also an enthusiast. This is an unbeatable combination. Go to http://www.slp.org.sg. You will not be disappointed.

# PRESIDENT'S MESSAGE

**Why Join a Professional Society?**

The reasons why people join, or do not join, professional societies is a question that the Executive Committee of the SLP has been pondering. We are not alone as many professional societies are seeking ways to service their profession, increase their membership base and so become more robust and be able to provide additional services to their members. In many ways the situation is like a chicken and an egg.

So what can a professional society, and the SLP in particular, offer its members?

There are several reasons why people join associations. The American Society of Association Executives conducted a survey of professional membership associations to determine why members join. The top answers, in order of preference, were:

- the ability to make professional contacts and the opportunity to network with people who can impact your profession and give you access to new opportunities,
- friends, jobs, and information,
- being part of the profession and,
- peer recognition.

Consequently joining a professional society is beneficial in providing tangible and intangible benefits for professionals throughout their entire careers.

**Networking**

This is important in the specialised area of safety, health and the environment where many professionals are a one-person department. Consequently there is little peer contact in their organization. In a professional association you can become acquainted on a first name basis with colleagues from other organizations. The result is not just contacts, but a genuine friendship among individuals who are all deeply involved in similar activities.

Networking also allows members an opportunity to establish contacts with other organizations, such as consulting and academia. This can have positive benefits for the parent organization as the personal knowledge developed can assist in areas such as choosing a consulting organization or even identifying people from students to professionals whom you may wish to recruit for your organization.

The SLP has a diversified range of members from academics with research specialities, professionals in their respective fields of safety, health or the environment and people in more generalist positions. This provides opportunities for cross-fertilisation which comes from people in closely allied professions. In safety, health and the environment there are many areas of overlap where a different perspective can provide a breakthrough.

**Knowledge**

It has been said that the half-life of the knowledge we acquire at universities for our degrees is five years. It is because of this that many professional organizations (and now the safety officers in Singapore) have a requirement that members of their profession are continuously engaged in professional development. Professionals must continuously upgrade their skills to stay current and competent.

Professional societies provide a wealth of information in their conferences, meetings, courses, plant visits, publications and seminars. The professional societies help to provide the bridge between the academic knowledge gained at university to the application of that knowledge in the workplace. The university provides the tools and education necessary to be a professional. The professional society helps in broadening the experience base for the effective deployment of that knowledge. The parent organization also benefits as the professional society enables members to excel in the performance of their profession in minimising the risks facing their organisation and so help reduce costs/create profits for their employers or clients. This makes membership in a professional organization a win-win situation for the professional and the employer.

Many people become health, safety and environmental staff by default and have not received any formal training in the professions. Professional organizations help by providing knowledge to assist these people in being able to perform their new responsibilities competently.

**Personal and Organizational Status**

Active participation in professional societies creates a profile for the participants. Participation can be in the form of writing articles for the society journal, participation at society meetings, participating in committees or making presentations. These help to establish the quality of the professional. For their company, active participation in a professional society by its employees helps these employees to establish their competency and capability and so, by inference, the quality of their organisation.

**Advocacy**

The ability to influence the direction of professional areas such as regulations, national standards, codes of practice and technical references is a benefit of being a member of a professional society. There is strength in numbers that a professional society can provide. Many professional societies are invited to be represented in standards organizations and government committees. Through this representation professionals have a means of influencing the technical direction.

SLP Exco. will continue making the case for membership, both individual and corporate. Members and readers should have this “ammunition” ready whenever there is a discussion about why joining a professional organization, in particular the SLP, is a sure winner for all parties.

# NEWater from old

The FANTASTIC Virtual guide - - she knew all the answers!

SLP visitors all excited about what they are about to discover.

Singaporeans are aware, from a very young age, that we have a water problem. But what exactly is the problem? First we have to say that we are referring to fresh or potable water – the type that we can drink and use in our homes for cooking and washing.

But why do we have a problem. Singapore is not a desert. It has heavy rainfall. If we go by the rainfall, we are more than adequately supplied. Many nations would die to have as much rain as we have. We are also surrounded by the sea! (To be fair, sea water is salty and it should not enter the equation at this stage.)

If water use is restricted to domestic purposes only, our problem is very small indeed. However, the demand for fresh water is very much bigger than what is consumed in our homes. Why? The reason is because the same water that we drink is used in large quantities in factories, hotels, shopping centres, offices, educational establishments, military camps and other places. Of course, water in these places is used for drinking too but this use is very small compared to other uses. We could, of course, use non-potable water for industrial and commercial purposes. Some of this is already done. For example, sea water is used for cooling in oil refineries and petrochemical plants. Some factories in the Jurong area use industrial water. When two grades of water, say potable water and industrial water, are distributed, two sets of pipelines need to be laid to move the water around. This obviously is a costly proposition. There are other problems too eg. cross contamination which could lead to a serious health problem. In addition, some industries need fresh water in their manufacturing processes eg. food and drink factories and wafer fabrication plants.

The problem for Singapore is not lack of raw water supply per se. It is a problem of balancing supply with demand -- it doesn't rain evenly throughout the year and from year to year. We don't have a large river that flows constantly. Thus we need to store water in reservoirs – the reservoir level will rise during the rainy season and fall during the dry season. (The challenge, of course, is not to let the reservoir run dry.) This is where we run into a limitation. We just do not have enough land to set aside for reservoirs. The government has built many reservoirs in the last 20 or 30 years and has also started collecting rain water from non-traditional sources eg. run-off from roads and built up areas. These initiatives have helped to some degree but does not solve the problem completely. The critical question remains, can Singapore have enough fresh water on a sustained basis – year in, year out, rain or no rain.

There is also the ever present issue of the water agreements with Johore. By 2061, the second agreement will run out. What happens then?

Fortunately for Singapore, the technology for water re-use and re-cycling has reached such a stage that it is feasible to consider the wide spread re-use and re-cycling of fresh water resources. It makes economic sense to now re-use and re-cycle fresh water. Ultra filtration and reverse osmosis (RO) can now be used to produce water from what is essentially effluent from sewage treatment plants. The wonder is that the water produced from these water factories is purer than any filtered and purified water from a natural source ie. a river or a conventional reservoir. In fact, salts have to be added back to the product so that this NEWater will have some taste. Fresh water can now be produced from "used" water at an economic rate. The tyranny of the weather/rain cycle has now been broken. Water from this process will, of course, never be as cheap as natural water from rain. But this is missing the point. For Singapore, with its abundant rain, NEWater will never be the only source of potable water. It will be a supplement for what will come from our reservoirs. (A related process is sea-water desalination but we are not considering it here.)

The future face of potable water can now be seen at the NEWater Plant in Bedok, not far from Changi Airport. The plant produces 9 million gallons per day(mgd). Currently, the product, called NEWater, is used directly by wafer fabrication plants which require ultra- pure water in their manufacturing process and by a small number of commercial/public buildings eg. Changi General Hospital for their air conditioning cooling towers. A small amount of NEWater, 2 mgd, is pumped into our reservoirs. This represents less than 1% of our potable water consumption. The NEWater is mixed with water in the conventional reservoir and undergoes a process of naturalisation. The reservoir water is treated and purified one more time in a conventional waterworks before it reaches our homes and other places to be consumed or used in other ways. This indirect use of NEWater is being done more for psychological rather than scientific reasons. It is not difficult to imagine that, in the not too distant future, that Singaporeans will be regularly drinking NEWater directly. Many Singaporeans have already done so. All visitors to the NEWater Visitor Centre receive bottles of this water and happily drink it.

The plant produces NEWater by a 3-stage process. First the feed, received from a neighboring water re-cycle plant, undergoes ultra-filtration. The output from this step then goes through reverse osmosis (RO). This is the core technology for the NEWater Process. Water molecules are forced through the pores of the RO membrane while larger matter/molecules are kept back ie. prevented from passing through the pores. Thus bacteria, viruses and chemicals eg. salt and drugs are separated from water. The product is now an ultra-pure water. Most RO plants in the world would only apply these two steps. In Singapore, there is a third step ie. radiation by ultra violet light (UV). This is an extra precaution to provide more psychological comfort to Singaporeans. The product is stored in large tanks before it is distributed to customers eg. wafer fabrication plants or is sent away for bottling. As mentioned above, 2 mgd are returned to our reservoirs.

The NEWater Visitor Centre is a modern educational establishment set up by the Public Utilities Board (PUB) to educate Singaporeans on all aspects of water as a resource and its importance to the survival of any country. Visitors will find out that large numbers of people on this planet Earth have no or inadequate access to good potable water. Singapore is one of the fortunate countries to have reliable potable water on tap. While we do have a water problem, we should put the problem in perspective – we have abundant rainfall and we now have the technology to make the best use of the water resources we have.

Nine SLP members were fortunate to have had the opportunity to visit the Centre on August 26. They were hosted by Mr. Lim Keng Hwa and Ms Julie Tan who were the guides. After the tour, SLP members had a very interesting and detailed question and answer session with Ms Chong Mien Ling, a civil engineer with PUB. Members were also treated to some refreshments and of course the best thirst quencher of all, NEWater. Richard Gillis presented a memento to Ms. Ling to round off the day.

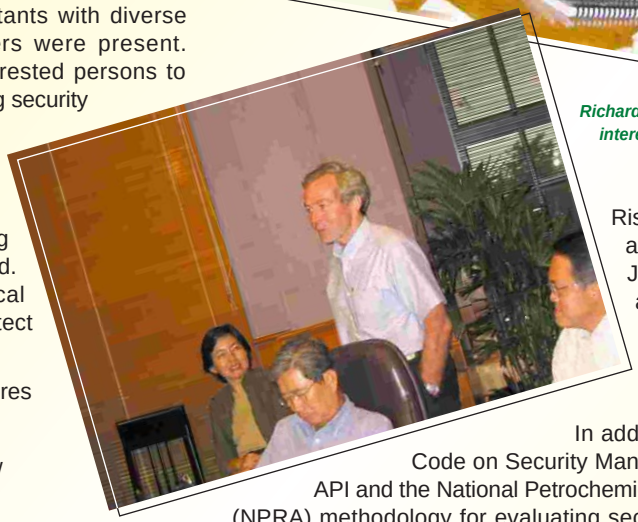
Members who want more information on NEWater may consult the website www.pub.gov.sg/newater.

***By Ngiam Tong Yuen***

# SLP's 1st Security Awareness Roundtable Discussion

*Everyone fully engaged.*

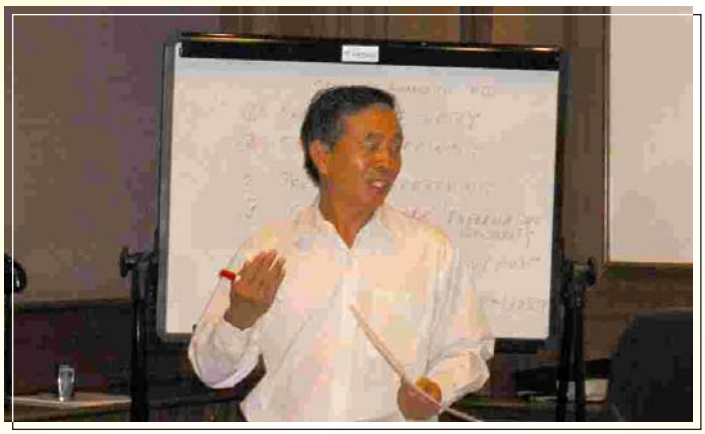
The 1st Security Awareness roundtable discussion was held at Jurong Country Club on July 28,2003. This roundtable discussion was a departure from our usual format of having one person speaking to an audience. In this case, all participants had an equal chance to speak. The event was well attended -- 27 SHE and Security practitioners from JTC, PSA, Jurong Port, Shell, ExxonMobil, Dupont, Pfizer, SRC, Chevron Phillips, consultants with diverse backgrounds and expertise and SLP members were present. The purpose was to provide a platform for interested persons to share their experience and best practices regarding security management.



*Richard Gillis posing an interesting question.*

The discussion was free flowing with participants actively sharing their knowledge and voicing their opinions on the challenges facing plant managements in this increasingly critical field. Topics discussed included the following physical security measures and internal controls that protect people, property and information:

a. Perimeter protection and access control measures
b. Computer network and information security
c. Pre-employment background screening for new employees
d. Security Awareness training for employees and contractors
e. External security threats
f. Security review and audit



*Tay Cheng Pheng ably leading the discussion.*

Mr. Loh Kim Hock, Head, Risk and Security of JTC gave a very informative briefing on Jurong Island security systems and state-of- the-art security technology and hardware installed at the Jurong Island security checkpoint.

In addition, the Responsible Care Code on Security Management Practices, and the API and the National Petrochemical and Refiners Association (NPRA) methodology for evaluating security risks were discussed. Participants proposed that these guidelines be posted on the SLP website for reference. This has been implemented.

Participants all agreed and understood that the demands put on security at operating facilities had dramatically changed since the September 11th terrorist attacks. It is clear that facility management now face new threats from intentional acts posed by changing world political and social conditions. Plant managers have no choice but to face and deal with these security threats.

Participants felt that it was useful to further discuss this subject and unanimously agreed that a follow-up be organized in October 2003. This second roundtable discussion has been set for October 31.This discussion will focus on logistics and distribution security and safety. MPA, Coast Guard and SCDF officers are being invited to participate.

We are looking forward to another interesting discussion at Security Awareness II.

***By Tay Cheng Pheng***

## We want to hear from you

The SLP Newsletter is circulated among members and other like-minded organizations. We are always seeking to improve the quality of this publication.

We welcome contributions of interesting news that cover loss prevention in the oil, chemical and process industries.

Please send your contribution or any queries to:

**SLP Secretariat**
**c/o The Institution of Engineers, Singapore**
**70 Bukit Tinggi Road**
**Singapore 289758**
**Tel: 6469 5000 Fax: 64671108**
**E-mail: secretariat@slp.org.sg**
**http://www.slp.org.sg**

# & SME's PART 2

COSHH ESSENTIALS

In Part I of this article, we introduced you to the fundamentals of COSHH (Control of Substances Hazardous to Health Regulations). This British initiative is designed to help small and medium sized enterprises to comply with the regulations. COSHH Essentials presents a simple approach that a person could use with a minimum of training. Part II will deal with how to translate the information developed for Hazard Bands and Exposure Bands into a real life application in a workplace.

The Control Approach is divided into 4 levels based on the sophistication of engineering required.

1) General ventilation
2) Engineering control
3) Containment
4) Special (requires assistance from an expert)

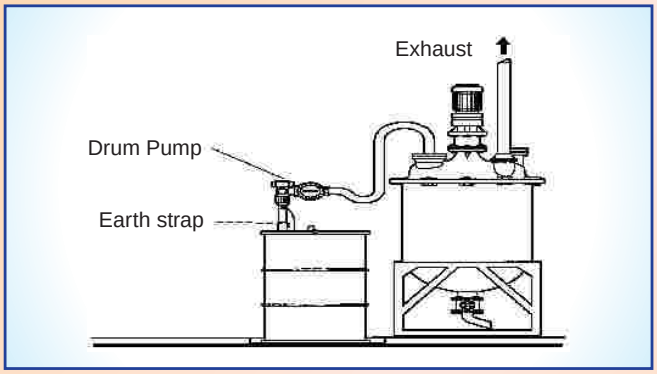
Exposure Predictor: Solids

| Hazard Band | EPS4 | EPS3 | EPS2 | EPS1 |
|---|---|---|---|---|
| A | Control Strategy 2 | Control Strategy 1 | Control Strategy 1 | Control Strategy 1 |
| B | Control Strategy 3 | Control Strategy 2 | Control Strategy 1 | Control Strategy 1 |
| C | Special | Control Strategy 3 | Control Strategy 2 | Control Strategy 1 |
| D | Special | Special | Control Strategy 3 | Control Strategy 2 |
| E | Special | Special | Special | Special |

Exposure Predictor: Liquids

| Hazard Band | EPL4 | EPL3 | EPL2 | EPSL |
|---|---|---|---|---|
| A | Control Strategy 2 | Control Strategy 1 | Control Strategy 1 | Control Strategy 1 |
| B | Control Strategy 2 | Control Strategy 2 | Control Strategy 1 | Control Strategy 1 |
| C | Control Strategy 3 | Control Strategy 3 | Control Strategy 2 | Control Strategy 1 |
| D | Special | Special | Control Strategy 3 | Control Strategy 2 |
| E | Special | Special | Special | Special |

The actual method of use of the chemical and the control strategy are then looked up to find the appropriate task specific guidance sheet. These sheets contain advice on what to do and not to do to manage the chemical for the specific activity. The sheets also include a diagram of the essential engineering features, e.g. from sheet 213, emptying a drum at control level 2.




The anticipated exposures from following the COSHH Essentials is:

| Hazard Band | Target Airborne Concentration Range |
|---|---|
| A | 1-10 mg/m$^3$ dusts, 50-500 ppm vapour |
| B | 0.1-1 mg/m$^3$ dusts, 5-50 ppm vapour |
| C | 0.01-0.1 mg/m$^3$ dusts, 0.5-5 ppm vapour |
| D | <0.01 mg/m$^3$ dusts, <0.5 ppm vapour |
| E | Seek specialist advice |
| S | Prevention or reduction of skin and/or eye exposure in addition |

The COSHH Essentials process has some limitations. The main limitation is that not all unit processes are covered but the system is evolving and new sheets are being generated. The COSHH Essentials is a generic guidance document and so may adopt a cautious approach in some circumstances. The system is also dependent on suppliers accurately allocating R phrases for proprietary products.

The technical basis for COSHH Essentials is in the Annals of Occupational Hygiene - 1998, volume 42(6). The Guidance document is a loose leaf manual - COSHH Essentials. Easy steps to control chemicals, HSG193, ISBN 0 7176 2421 8, Her Majesty's Stationery Office, 1999, £15.

However for ease of use by SMEs the UK HSE has made the system available on the internet at http://www.coshh-essentials.org.uk/

In summary the COSHH Essentials approach provides SMEs with a user-friendly approach to applying a complex regulation. It is an innovative method of ensuring that methods to comply with legislation are made available to those who most need help - the SMEs. A 1-day training course is sufficient for a person to become competent in the process.

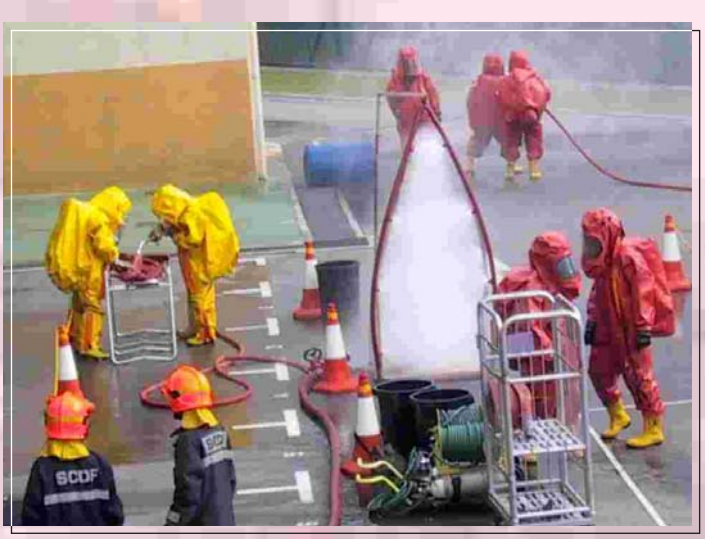
Note: This article is based on a paper by the writer that was presented at a recent Risk Management seminar organized jointly with SPRING Singapore. If you need the complete text, please refer to SPRING's website.

***By Richard Gillis***

# Hazardous Materials Incidents

By Chris Hawley, Publisher: Delmar Thomson Learning, 2002, ISBN 0-7668-4296-7

This book by Chris Hawley, a Fire Specialist with the Baltimore Country Fire Department, USA, is an invaluable reference book for first responders from public emergency services and private emergency response teams. The book begins by reviewing U.S. laws, regulations and standards on hazardous materials, emergency response planning and workplace safety.




*Officers from Jurong Island Fire Station performing a HAZMAT drill.*

Subsequent chapters provide in-depth information about:

- Recognition and identification
- Information resources
- Protection including health hazards, exposure levels and types of personal protective equipment and their limitations
- Protective actions ranging from incident management systems and rescue through evacuation and sheltering in place, and methods of decontamination
- Product control and air monitoring including the use of various types of gas detectors
- Terrorism awareness
- HazMat and law enforcement activities

This book is marked by its risk-based response philosophy – first understand the risk and the consequence of taking a certain course of action. What makes this book outstanding is that it not only provides technical information, it also provides many case studies of Hazmat incidents. In line with current developments, it addresses terrorism awareness training. Chris Hawley has much practical advice for readers. Numerous examples of HazMat applications bring the learning process vividly to life, and provide readers much food for thought. A total of 216 photographs and diagrams are used to illustrate the text.

This book meets and exceeds the objectives for operations personnel as prescribed by NFPA 472 Standard for Professional Competence of Responders to Hazardous Materials Incidents.

***Book Review by Fong Mun Seong***

# Welcome

## We extend our warm welcome to the following:

### Ordinary Member

**Mr Ramesh Jaggi**
RK is from SUT Sakra Pte Ltd
A chemical engineer, R K has extensive experience in operations, consulting and HSE areas in the chemical, oil and petrochemical industries. He has served in various management positions in MNCs such as Shell, Colgate-Palmolive and ExxonMobil. Jaggi is presently Asst. Vice President (HSEQ & Materials Management) of SUT Sakra Pte Ltd, a multi-utilities and service provider at Jurong Island. He is a registered Environmental Auditor with IEMA, UK

**Mr Daniel Steele**
Daniel is from Chartered Semiconductor Pte Ltd
Born in the USA, Daniel has a BS in chemistry from Virginia Commonwealth University. He began his career as a quality assurance chemist. Over the years he has worked for several chemical and environmental consulting firms. For the five years prior to coming to Singapore he was an EHS & Chemical Operations Manager for Motorola. His plant was the first Motorola semiconductor fab in the US to obtain ISO 14001 certification. At Chartered Semiconductor he is Director of EHS Security and Building Services. He has experience in Business Continuity Planning. Daniel is married with no children. His wife, Jessica , is Panamanian and is a chemical engineer also working for Chartered. His hobbies include reading, horse back riding, scuba diving and jogging.

### Corporate Member

**Vopak Terminals Pte Ltd**
**Contact person: Mr Michael Yan Kin Tuck**
Vopak Terminals Singapore Pte Ltd started in Singapore in 1980. It was previously known as Van Ommeren Tank Terminals Singapore. This Van Ommeren operation was the first independent terminal for petroleum products and is situated at Pulau Sebarok. Today, the company is the largest independent terminal operator in Singapore with a total storage capacity of 1.4 million cubic meters. It operates three terminals in Singapore, one at Pulau Sebarok, one at Sakra, Jurong Island and one at Penjuru.

### Associate Member

**Ms Lylian Law**
She provided secretariat support for SLP for 2 years. Lylian is known to many members as a very warm and friendly person. SLP is pleased to have Lylian as an Associate Member so she can continue to participate in our activities. Ms Law is currently working as merchandising manager at The Fullerton Singapore.

As always, we hope to see you all at our activities and look forward to your contributions.

***By Gan Hui Hui***