

- ASEAN Regulatory Cooperation Workshop
- The Solas Container Weight Verification Requirement

A QUARTERLY PUBLICATION BY THE SINGAPORE CHEMICAL INDUSTRY COUNCIL LIMITED



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CHEM DIGEST



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Singapore Chemical Industry Council Limited

SCIC ANNUAL DINNER 2016 AND RESPONSIBLE CARE AWARDS 2015 PRESENTATION



Recipient of SCIC Distinguished Leadership Award – Mr Georges Grosliere

Recipient of SCIC Long-service Award – Mr Andrew Lim

Recipients of SCIC Appreciation Award – Ms Jaime Lim (L) & Ms Susan Chong (R)

On 18 March 2016, industry members and invited guests including representatives from various government agencies attended the SCIC Annual Dinner and Responsible Care Awards Presentation held at the Regent Singapore. Graced by Mr Sam Tan, Minister of State for Prime Minister's Office and Ministry of Manpower, this is an annual industry event where members gathered to celebrate their achievements in the Responsible Care implementation programme.

A total of 104 Responsible Care awards was presented to the winning companies during the evening including the Responsible Care Achievement, Gold, Excellence and Leadership awards.

SCIC awards were also presented to individuals as a recognition to their significant contributions to SCIC and the chemical industry. The recipients were:

SCIC Distinguished Leadership Award

Mr Georges Grosliere,
ExxonMobil Chemical Asia Pacific Pte Ltd

SCIC Achievement Award

Mr Seah Khen Hee,
Chairman of TC for Bunkering

SCIC Long-service Award

Mr Andrew Lim,
Pride-chem Industries Pte Ltd

SCIC Appreciation Award

Ms Jaime Lim, Ministry of Manpower
Ms Susan Chong, SDO@SCIC

SCIC wishes to take this opportunity to thank CWT Logistics Pte Ltd for sponsoring the Responsible Care Awards 2015 and extend our heartfelt gratitude to all members for their support towards making the evening a successful one.

RESPONSIBLE CARE AWARDS 2015 - RESULTS

CATEGORY - MANUFACTURERS

S/N	COMPANY NAME	AWARD WON	CODE
1	Air Products Singapore Pte Ltd	Achievement	<ul style="list-style-type: none"> Product Stewardship Code
2	Akzo Nobel Surface Chemistry Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Pollution Prevention Code
		Gold	<ul style="list-style-type: none"> Distribution Code Product Stewardship Code
		Achievement	<ul style="list-style-type: none"> Process Safety Code
3	Celanese Singapore Pte Ltd	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Process Safety Code
4	Chemical Specialties (Singapore) Pte Ltd	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code
5	Chevron Phillips Singapore Chemicals (Pte) Ltd	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Process Safety Code
6	Croda Singapore Pte Ltd	Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code
7	Dow Chemical Pacific (Singapore) Pte Ltd	Gold	<ul style="list-style-type: none"> Distribution Code
8	Rohm and Haas Chemicals Singapore Pte Ltd (The Dow Chemical Company)	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code Pollution Prevention Process Safety Code
9	Du Pont Company(Singapore) Pte Ltd	Excellence	<ul style="list-style-type: none"> Process Safety Code
10	Eastman Chemical Singapore Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code Process Safety Code
		Gold	<ul style="list-style-type: none"> Pollution Prevention Code
11	ExxonMobil Chemical Asia Pacific Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code Pollution Prevention Code Process Safety Code Product Stewardship Code
		Gold	<ul style="list-style-type: none"> Distribution Code
12	Infineum Singapore Pte Ltd	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
13	Kuraray Asia Pacific Pte Ltd	Gold	<ul style="list-style-type: none"> Distribution Code Pollution Prevention Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code Process Safety Code
14	Lubrizol South East Asia Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code
		Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code Distribution Code Process Safety Code Product Stewardship Code
15	Lucite International Singapore Pte Ltd	Excellence	<ul style="list-style-type: none"> Process Safety Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code Pollution Prevention Code
16	Mitsui Elastomers Singapore Pte Ltd	Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Process Safety Code
17	Mitsui Phenols Singapore Pte Ltd	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Pollution Prevention Code Process Safety Code
18	Petrochemical Corporation of Singapore (Private) Limited	Leadership	
19	Shell Chemicals Seraya Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code Process Safety Code
		Gold	<ul style="list-style-type: none"> Pollution Prevention Code
20	Singapore Oxygen Air Liquide Pte Ltd (ASU)	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Process Safety Code
21	Singapore Oxygen Air Liquide Pte Ltd (J5 ESG)	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Process Safety Code
22	Singapore Oxygen Air Liquide Pte Ltd (J3 SG)	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
23	Singapore Oxygen Air Liquide Pte Ltd (EGO AMK)	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code Process Safety Code

S/N	COMPANY NAME	AWARD WON	CODE
24	Singapore Oxygen Air Liquide Pte Ltd (EGO GF)	Gold	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Process Safety Code
25	Singapore Oxygen Air Liquide Pte Ltd (EGO AUO)	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code Process Safety Code
26	Singapore Oxygen Air Liquide Pte Ltd (Micron F10W)	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code
27	Singapore Oxygen Air Liquide Pte Ltd (EGO SSMC)	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code Process Safety Code
28	Sumitomo Chemical Singapore Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code
		Gold	<ul style="list-style-type: none"> Employee Health and Safety Code Process Safety Code
		Achievement	<ul style="list-style-type: none"> Distribution Code Pollution Prevention Code Product Stewardship Code
29	Sumitomo Seika Singapore Pte Ltd	Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code Process Safety Code
30	The Polyolefin Company (S) Pte Ltd	Excellence	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Process Safety Code Product Stewardship Code
		Gold	<ul style="list-style-type: none"> Distribution Code Employee Health and Safety Code Pollution Prevention Code

CATEGORY – LOGISTICS AND SERVICE PROVIDERS

S/N	COMPANY NAME	AWARD TYPE	CODE BEING AWARDED
1	Connell Bros Co. (Singapore) Pte Ltd	Achievement	<ul style="list-style-type: none"> Distribution Code Employee Health and Safety Code
2	LTH Logistics (Singapore) Pte Ltd	Achievement	<ul style="list-style-type: none"> Distribution Code
3	Sembcorp Industries Ltd (Utilities Singapore)	Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Distribution Code Employee Health and Safety Code Pollution Prevention Code Process Safety Code
4	Vopak Terminals Singapore Pte Ltd (Penjuru Site)	Gold	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code Employee Health and Safety Code
5	Vopak Terminals Singapore Pte Ltd (Banyan Site)	Gold	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code
6	Vopak Terminals Singapore Pte Ltd (Sakra Site)	Gold	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code
7	Yang Kee Chemical Logistics Pte Ltd	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code
		Achievement	<ul style="list-style-type: none"> Community Awareness and Emergency Response Code

CATEGORY – TRADERS

S/N	COMPANY NAME	AWARD TYPE	CODE BEING AWARDED
1	Absotech Pte Ltd	Achievement	<ul style="list-style-type: none"> Employee Health and Safety Code
2	Bayer (South East Asia) Pte Ltd	Leadership	
3	Megachem Ltd	Achievement	<ul style="list-style-type: none"> Distribution Code
4	Shell Eastern Trading (Pte) Ltd	Excellence	<ul style="list-style-type: none"> Distribution Code Product Stewardship Code

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to conduct its 2016 Singapore Chemicals Research and Investment Guide that will reach **more than 70,000 industry professionals globally.**

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JTC - SCIC DIALOGUE



As part of SCIC's continued engagement between Industry and key government agencies, SCIC organised a dialogue session with JTC on 2 March 2016. This dialogue has provided a platform for both SCIC members and JTC to share updates, exchange ideas and collectively address mutual concerns. Some of the updates provided during this dialogue session included the Jurong Island checkpoint expansion, Jurong Island business continuity plan, Chemical Process Technology Centre adaptive reuse, JTC Policies and the new chemical hub at Tuas.

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ASEAN REGULATORY COOPERATION WORKSHOP – 26 - 27 JANUARY 2016



As part of a joint initiative from American Chemistry Council (ACC), the Japan Chemical Industry Association (JCIA) and Singapore Chemical Industry Council (SCIC) to advance chemical regulatory cooperation in the ASEAN region, the first ASEAN Regulatory Cooperation Workshop was held at The Federation of Thai Industries Chemical Industry Club in Bangkok from 26-27 January 2016.

With the establishment of the ASEAN Economic Community (AEC) on 31 Dec 2015, this initiative on regulatory cooperation provides an opportunity to engage governments on driving a more coherent, risk-based approach to chemicals management.

The purpose of this two-day Workshop was to equip ASEAN Industry association representatives with knowledge that will need to advocate effectively to their own governments to avoid regulations that are more resource intensive than required. The Workshop also provided an opportunity for participants to forge strong relationships, exchange latest regulatory updates and information, understand the challenges faced by the chemical industry in each country and establish cooperative plans to engage government moving forward.

The Workshop was well attended by industry association and company representatives from the Chemical Industries Council of Malaysia (CICM), Federation of the Indonesian Chemical Industry (FIKI), Chemical Industries Association of the Philippines (SPIK), Chemical Society of Vietnam (CSV), Federation of Thai Industries Chemical Industry Club (FTI CIC) and Singapore Chemical Industry Council (SCIC).

Perspectives from Malaysia, Philippines, Vietnam, Thailand, Indonesia and Singapore were also extensively shared at the

Workshop. The group discussions which were held following each section provided participants with the opportunity for an effective interaction and engagement.

The main focus of the Workshop were:

Importance of Regulatory Cooperation

Enhanced regulatory cooperation amongst ASEAN nationals would help to promote resource and cost savings for both government and industry through more efficient interaction of different regulatory regimes.

Importance on Industry coordination

The chemical industry is integrated together with many down-stream manufacturing sections, impacting virtually every sector of the economy. Therefore, there will be implications from divergent chemical control regulations throughout the supply chain.

Basic concepts of a risk-based approach to chemicals management

There was a special focus on transparency through the regulatory process, importance of stakeholder consultation, and taking a prioritized approach to regulation.

Basics of advocacy

The importance of an alignment amongst industry associations on the objective of regulatory cooperation within ASEAN member states, effective interaction with implementing agencies, and development of a suitable strategy according to the regulatory situation was shared.

There was a strong alignment amongst all participants on the regulatory cooperation concepts, and need to adopt cooperative risk-based approaches to regulation. Following this Workshop, a new network was established between the participating industry associations to share regulatory information and updates.

More information on the ASEAN Regulatory Cooperation Project can be found on SCIC's website in April 2016.

SAFETY CASE REGIME

In May 2013, a tripartite study trip to evaluate the suitability of Safety Case regime for Singapore was conducted led by Government of Singapore Agencies with SCIC and its members' participation

Following the mission study, in 2014, the Government of Singapore (Agencies) started to communicate a program of change to the Process Safety (PS) Regulatory Framework in various industry forums. The program of change to the PS regulatory framework was initiated by Agencies, which includes an update to the 1997 QRA guideline and implementation of the "Safety Case" regime. Safety Case refers to a case in which a Major Hazard Installation (MHI) presents to the regulators, setting out how risks from major accident scenarios has been reduced to "As Low As Reasonably Practicable" (ALARP) to ensure safe operations in a sustainable manner.

Recognising the needs and benefits for an effective PS regulatory framework for Singapore, and for the Industry to be proactively engaged, SCIC, represented by a team of Industry Managers and senior Process Safety and Risk Management Experts put forth a proposed Process Safety Framework in end 2014. The proposal included the support of Safety Case regime implementation in Singapore; and the adoption of a joint government/industry approach in the development of the Safety Case guidelines.

To support the enhancement of Process Safety regulatory framework in Singapore, the SCIC Board formed a Major Hazard Installation Committee in mid-2015. Led by one of the SCIC Board of Directors, Mr Stephen Fowler, General Manager of Shell Jurong Island, with participation by representatives of member companies

July 2015 saw the kick-off of the Government-Industry Joint Work group (JWG), consisting of experts from Industry (SCIC members) and Agencies. Key deliverables from the JWG consists of:

- Develop Technical Guidance for Safety Case regulatory regime, consistent with Seveso Directives
- Develop Safety Case Assessment Guide
- Develop strategy to build industry capability in implementing Safety Case
- Identify potential opportunities to harmonise Safety Case regime against existing regulatory requirements



Government-Industry Joint Workgroup (JWG).



MHI Leadership Forum held on 23 Feb 2016

The work of the JWG is overseen by a Joint Sponsor Committee consisting of SCIC board members and directors of MOM/NEA/SCDF which meet quarterly to steward JWG progress and discuss strategic issues.

At the time of this publication, the JWG has made excellent progress through close collaboration and weekly face-to-face work sessions.

- Technical guidance is in final draft ready for release for public consultation by April
- Assessment guide is progressing to complete by June 2016 as planned
- Capability building strategy has been developed and endorsed by Joint Sponsor Committee
- A MHI Leadership Forum was conducted to engage MHI's senior leaders
- Knowledge-building workshops has been scheduled starting April to equip MHI's with knowledge necessary to plan, resource and prepare for Safety Case implementation
- A Curriculum Development Advisory has been issued to guide potential training providers in the development of Expert workshops, which is aimed at equipping MHI's with necessary knowledge to prepare the Safety Case. Training expected to commence third quarter 2016

On the regulatory front, activities has been moving in locked-step to make Safety Case regime a reality. The formation of a Major Hazard Department, consisting of MOM, SCDF, NEA, as a single front to enhance

interface has been announced. Draft of MHI regulation has been issued for public consultation.

SCIC members who have been identified as MHI's would have been invited and attended the MHI Leadership Forum held on 23 February 2016. There is some near term work that will be necessary by MHIs consistent with discussion during the forum:

- Appoint a Safety Case Lead to coordinate preparation of Safety Case
- Form a Safety Case team. A multi-disciplinary team from managerial, supervisory and operational levels
- Allow Safety Case team time to plan, attend capability building programmes
- Set aside budget based on Safety Case team's plans

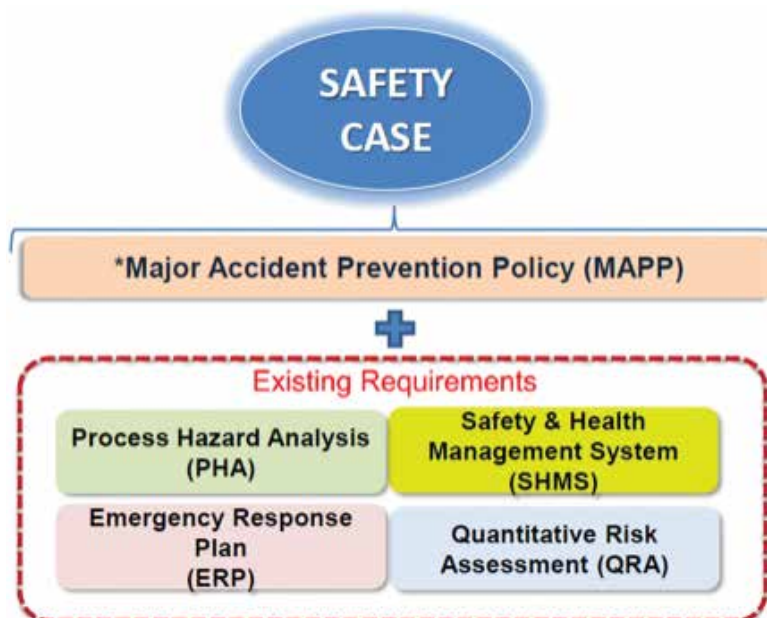
- Aim for submission of Safety Case by third quarter 2017

Meanwhile, the first Safety Case Knowledge Building training has been scheduled for 26 April. Notification will be issued shortly to MHI's. This training is geared to equip MHI's to commence preparation work necessary to implement Safety Case.

Stay tuned and please contact our SCIC Secretariat at secretariat@scic.sg if you have any questions.

Contributed by:
SCIC Major Hazard Installation (MHI) Committee

Illustration of the Process Safety Regulatory Framework



THE SOLAS CONTAINER WEIGHT VERIFICATION REQUIREMENT

We would like to remind all parties involved in the supply-chain by ocean freight that the International Maritime Organization (IMO) had amended the Safety of Life at Sea

Convention (SOLAS) requirements with regard to Container Weight verification.

Following this amendment which was announced in 2015, it now requires as a condition for loading a packed container onto a ship for export, that the container has to have a verified weight. The responsibility for the verification of the packed container's weight lies with the shipper. This requirement will become legally effective on July 1, 2016 and will be applicable globally. Shippers, freight forwarders, vessel operators, and

terminal operators will all need to establish policies and procedures to ensure the implementation of this regulatory change.

Please note that after that date, it will be a violation of SOLAS to load a packed container onto a vessel if the vessel operator and marine terminal operator does not have a verified container weight.

The SOLAS amendments allow two methods shippers may use to determine the container weight once the container packing process has taken place. The two permissible methods for weighing are:

Method 1, which requires weighing the container after it has been packed, or

Method 2, which requires weighing of all the cargo and contents of the container

and adding those weights to the container's tare weight as indicated on the door end of the container.

The estimating of the container weight is not permitted. The shipper (or by arrangement of the shipper, a third party) has a responsibility to actually weigh the packed container or to weigh its contents.

Under either of the two above described weighing methods, the weighing equipment used must meet national certification and calibration requirements. Further, the party packing the container cannot use the weight somebody else has provided, except in one specific set of defined circumstances which refers to individual, original sealed packages that have the accurate mass of the packages and cargo items clearly and permanently marked on their surfaces.

It is important to note that, for the shipper's weight verification to be compliant with the SOLAS requirement, it must be "signed". This means that a person representing the shipper is named and identified as having verified the accuracy of the weight calculation on behalf of the shipper.

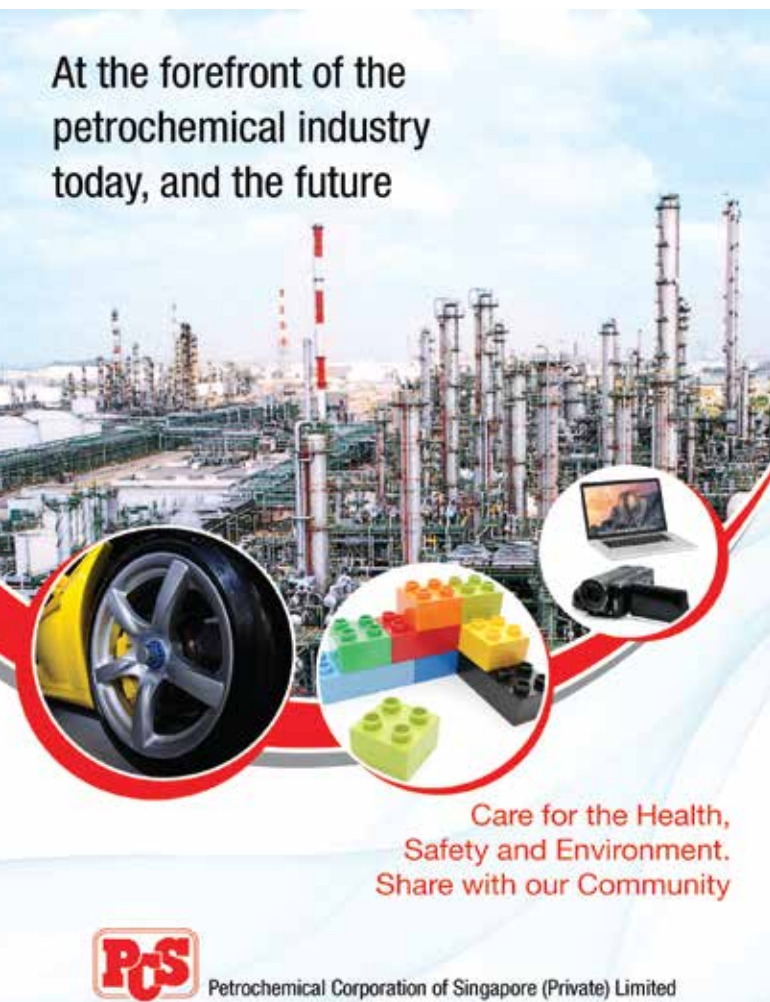
In case a container does not have a signed shipper weight verification this can be remedied by weighing the packed container at the port. However, if the port terminal does not have the equipment to weigh the container and provide a verified weight, alternative means must be found to obtain a verified container weight.

It needs to be noted that if the container weight cannot be verified by the above stated methods, the packed container may not be loaded on to the ship.

While the implications for the shippers are clearly stipulated, it is presently still unclear how the actual enforcement will be done starting July 1, 2016.

Contributed by:
SCIC Logistics & Distributions Committee

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SCIC - SMALL AND MEDIUM-SIZED ENTERPRISES (SME) COMMITTEE

The SCIC-SME committee was formed in 2015 to represent the SME members of SCIC through:

- Addressing pertinent issues and challenges faced by the SME community within the chemical industry
- Partnering with key stakeholders to developing initiatives and programmes to address those issues and concerns
- Capability building (HSE, Regulatory Compliance etc)

This page will be a regular feature in the ChemDigest where bite-sized information will be presented to all SME members. For this issue, we would like to highlight to members the requirements for the **Globally Harmonised System of Classification and Labelling of Chemicals (GHS)**

GHS Implementation Deadlines

MANUFACTURERS / SUPPLIERS TIMELINE	TIMELINE
Single Substances	
All hazardous substances except ozone depleting substances, chemically unstable gases, aerosols, sensitizers (based on GHS purple book Rev 2)	Feb 2012
Ozone depleting substances, chemically unstable gases, aerosols, sensitizers (based on GHS purple book rev 4)	1 July 2015
Mixtures	1 July 2015

USERS	TIMELINE
Single Substances	
All hazardous substances except ozone depleting substances, chemically unstable gases, aerosols, sensitizers (based on GHS purple book Rev 2)	End 2012
Ozone depleting substances, chemically unstable gases, aerosols, sensitizers (based on GHS purple book rev 4)	1 July 2015
Mixtures	1 July 2016

As a SME, what does it mean to you?

If you Sell:

Your product packaging must be affixed with a proper GHS Label
You must provide a GHS-compliant Safety Data Sheets (SDS), NOT MSDS

If you Buy:

Local products being sold to you must be affixed with a proper GHS label
Your supplier must provide you with a GHS-compliant Safety Data Sheets (SDS), NOT MSDS

If you Store:

Your storage area must display proper GHS signage

These are all regulatory requirements. If you need help or more information, contact the SCIC secretariat office today.

More information on GHS can be found at: <https://www.wshc.sg>

Contributed by:
SCIC Small and Medium sized Enterprises (SMEs) Committee

QUANTITATIVE RISK ASSESSMENT (QRA) FOR CHEMICAL PROCESS INDUSTRIES

What is Risk?

Risk is defined as the product of Consequence and frequency (probability of an incident happening leading to specified consequence).

What is QRA?

Quantitative Risk Assessment (QRA) is a methodology developed for systematic risk analysis based on engineering evaluation and mathematical techniques that combine estimates of likelihood and consequences of potential accidents associated with an installation or operation. It is also termed Probabilistic Risk Analysis (PRA) in some countries. This methodology evolved in nuclear, aerospace and electronics industries since early 1980s, and has seen wider application in chemical process industries over the last two decades.

Application in Chemical Process Industries

QRA provides company management with useful data to support risk-based decision making, be it in design options evaluation for Capital Expenditure (CAPEX) projects or prioritization of risk reduction efforts and emergency response planning for existing facilities. Legislative requirements for QRA are also imposed by regulatory bodies in various regions - for examples, the United Kingdom, Europe, Singapore and Australia - in support of land use planning.

The QRA Process

Development of a QRA consists of the following steps:

- Hazard Identification
- Scenario Development
- Frequency Analysis
- Consequence and Impact Analysis
- Risk Estimation and Presentation
- Risk Evaluation
- Identification and prioritization of potential risk reduction measures

These are illustrated in Figure 1.

The hazard identification is often done using Process Hazard Analysis (PHA) techniques such as Hazid Identification (HAZID) / What-if and Hazard and operability study (HAZOP). Based on the risk rankings determined in these studies, representative major accident scenarios involving accidental release of hazardous materials can be selected for detailed analysis in QRA. A well-defined representative set of scenarios is crucial to ensure that valuable findings are attained from the resource-intensive QRA exercise, and a realistic risk profile of the installation is produced.

Each of the representative scenarios is further developed in detail by setting the isolatable sections, process parameters, associated hazardous material inventory,

release sizes and duration, which form the input data for QRA.

Frequency analysis begins with leakage parts-count (pipe length, flanges etc.) and application of relevant historical failure rate data (failure rate data from UK HSE, OREDA etc.) to determine the likelihood of the initial release scenarios. Consideration for existing and planned risk reduction measures is built into event sequence models such as Fault Trees and Event Trees. The frequencies of various incident outcomes (e.g. Pool/Jet / Flash Fires, Explosion and Toxic exposure) are then calculated based on the probabilities of failure for the risk reduction measures considered.

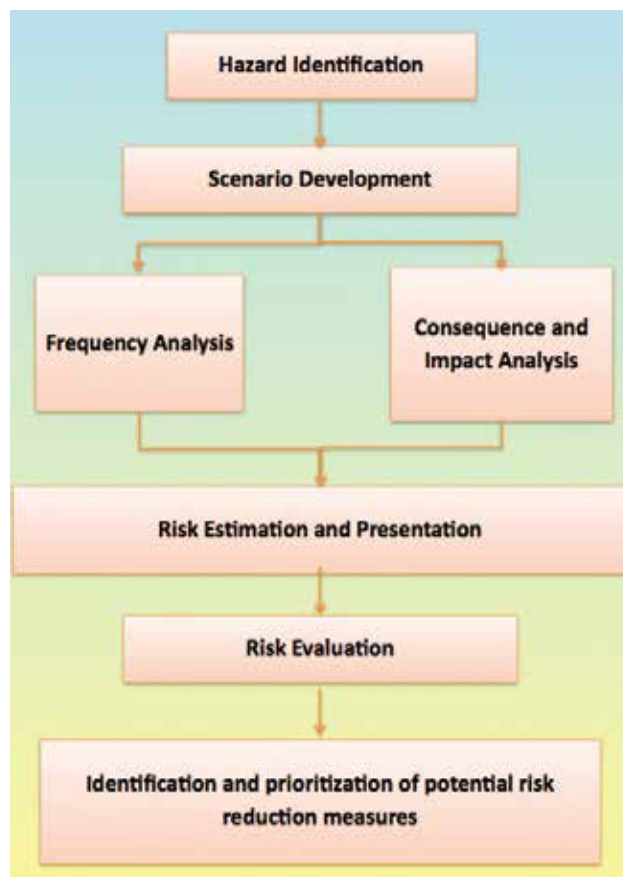


Figure 1. Key Stages of QRA Process

Consequence analysis involves source term models for characteristics of releases (e.g. jet/pool/flashing/aerosols) and dispersion modelling to estimate the extent of vapour cloud, followed by fire and explosion modelling. These are usually done by proprietary software packages. Factors such as meteorological conditions, site topography, degree of confinement and congestion have significant influence in the modelling outcome, and therefore, should be reviewed and confirmed beforehand. Impact of various outcomes on people and structure are then estimated using Effects Models.

Risk estimation is performed by combining the results from consequence/impact and frequency analysis. The risk of all selected representative scenarios are summed up and presented in different risk measures typically in terms of Individual Fatality/Injury risks for workers and general public at various locations of concerns, and Societal Risk. Individual Fatality and Injury risks are often graphically presented as Iso-risk contours (Figure 2) or Risk Transects, and Societal Risk is plotted in an F-N curve (Figure 3).

The risk results are compared against corporate and/or government acceptance criteria for compliance assessment. Most of the regulatory jurisdictions imposing QRA requirement also require demonstration that the risks are reduced to As Low As Reasonably Practicable (ALARP). Key risk

contributors can also be identified to help organisations prioritize their risk reduction resources.

As evident from above QRA is a very rigorous process with output of risk in numerical terms. However, it is a resource-intensive process with extensive man-hours of highly specialised skilled staff required for each step of the process. Thus QRA study is typically conducted for potentially high risk scenarios only.

Limitations of QRA

Uncertainties in QRA can arise from the selection of representative scenarios, as well as the assumptions and input data applied in the subsequent steps of a QRA. It is important that these uncertainties are recognised in interpretation of QRA results, especially in making comparison against absolute risk criteria. The degree of uncertainties can be checked by sensitivity analysis to ensure reasonably realistic results. These uncertainties can be minimized by involving experienced expertise in QRA projects, peer reviews, use of well-established historical failure databases, and checking the results against actual incident records.

QRA Requirements in Singapore

The Singapore government implemented the first QRA guidelines in 1997 as part of land planning approval process. In October 2015, a set of revised QRA guidelines was issued based on technical advice from UK HSL and engagement with local industry players

including SCIC QRA Work Group. The first version of QRA Guideline required the risk from an industrial site based on specified consequence criteria to be confined within the site's fence line. The revised QRA guideline has taken a risk based approach.

The revised QRA guidelines will come into effect on 1 April 2016. Key changes seen in the QRA guidelines include:

- Fully risk-based criteria
- Risk estimate for onsite occupied buildings
- Risk estimate for potential offsite escalation
- Specific technical guidance on failure rate data, risk modifiers and consequence modelling assumptions
- ALARP demonstration

Details of Revised QRA Guidelines are available on NEA website: <http://www.nea.gov.sg/anti-pollution-radiation-protection/central-building-planning/overview-on-central-building-planning>

- **Revised QRA Guidelines Criteria** (Updated as at Oct 2015)
- **Revised QRA Guidelines Technical Guidance** (Updated as at Oct 2015)
- **Revised QRA Guidelines Submission Format** (Updated as at Oct 2015)

Contributed by:
SCIC Process and Engineering Committee

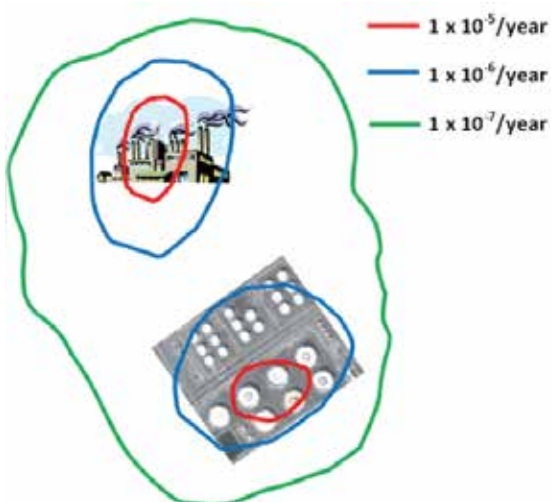
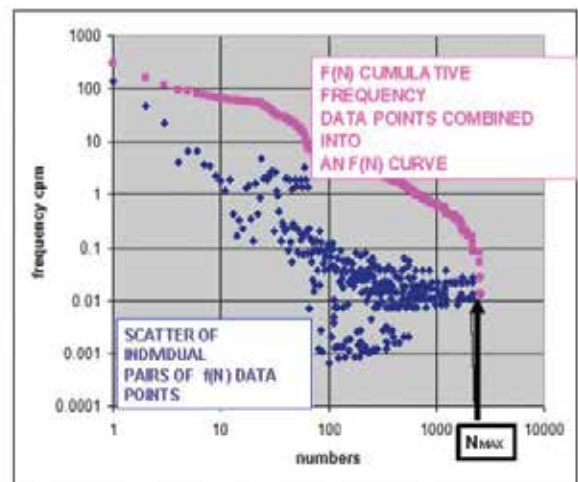


Figure 2. Sample Individual Risk Contours



Taken from an internal HSE communication "An Example of the use of Frequency -Consequence Data in Decision Making" David Corder 7.11.05

Figure 3. Sample F-N Curve

WELCOME NEW MEMBERS



SCIC would like to welcome the following companies:

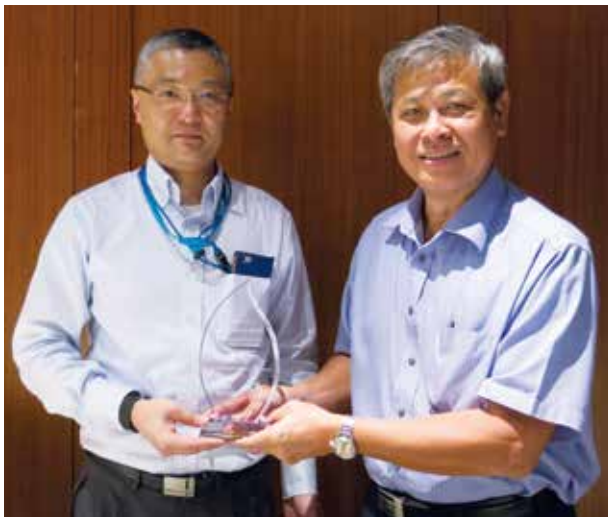
■ CALGON CARBON ASIA PTE LTD

"Calgon Carbon is an acknowledged leader – nearly 75 years in production - in the activated carbon and reactivation industry for many liquid and vapor phase applications, with complementary expertise in ultraviolet disinfection and oxidation, ion exchange technology, and ballast water treatment. Calgon Carbon has 25 global offices and 17 manufacturing and reactivation facilities and provides solutions for more than 700 distinct market applications."

■ ChemAdvisor Asia Pte Ltd

'We are a team of experts in chemical regulatory compliance, striving to be an indispensable source of Environmental, Health, Safety and Transportation information. Our offices are located in Singapore, Belgium, and USA, and we support our clients with their global compliance efforts in the areas of SDS preparation, chemical registrations and compliance check.'

APPRECIATION OF CONTRIBUTIONS RENDERED TO SCIC DIRECTOR - MR KAZUYUKI SAKATA



The Board and Secretariat of SCIC would like to extend our heartfelt appreciation to Mr Kazuyuki Sakata of Singapore Oxygen Air Liquide Pte Ltd for his commitment and contributions towards SCIC during his tenure as a Director of the Board from Jan 2013 to Dec 2015 and Co-sponsor of the SCIC Regulatory Affairs Committee. SCIC extends its best wishes to Sakata-San in his new assignment.

NEW MEMBER TO SCIC BOARD OF DIRECTORS

SCIC would like to extend a warm welcome to the following Director as the newest board member of SCIC:



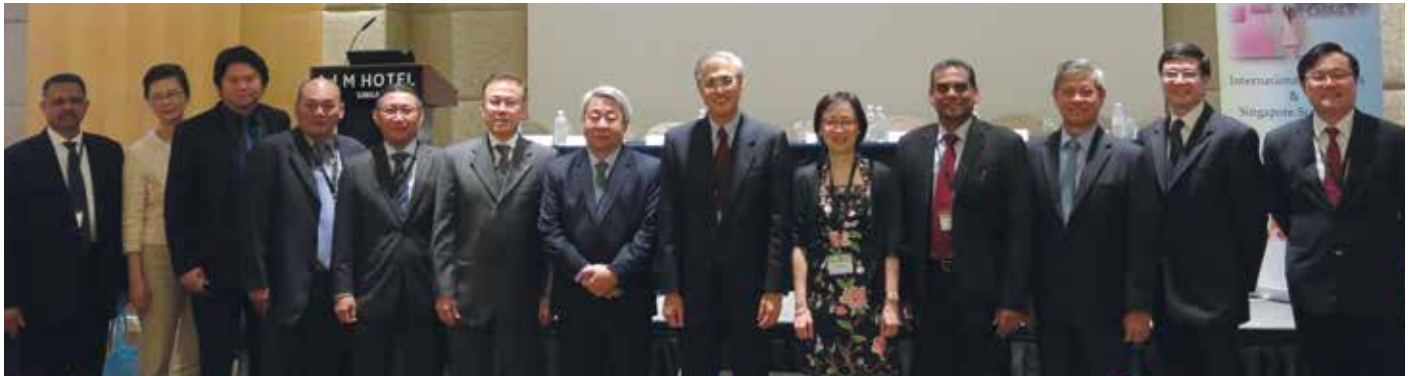
Mr John David Leblanc,
Managing Director,
Singapore Oxygen Air Liquide Pte Ltd

LET'S USE THE POWER OF IDEAS TO CHANGE THE GAME.

A new type of floodlit pitch is having a positive impact on the people of a Brazilian favela. How it's powered could help generate renewable energy elsewhere. Laurence Kemball-Cook, a winner of Shell's LiveWIRE scheme, developed technology that creates power from a combination of kinetic energy from the players' footsteps and solar power. We believe today's ingenuity could answer tomorrow's energy challenges. Search **#makethefuture** on Google.



LAUNCH OF WORLD'S FIRST STANDARD – TR 48 : 2015 TECHNICAL REFERENCE FOR BUNKER MASS FLOW METERING



A strong quality and standards infrastructure has helped to grow the local bunkering industry and enabled Singapore to become the top bunkering port in the world.

The continuous drive for the best bunkering practices will encourage even more ship owners to stop over in Singapore. The innovative use of the mass flow metering (MFM) system in Singapore will provide an automated, transparent, accurate and secure way of measuring the amount of bunker fuel delivered to ships. This will replace the current manual tank gauging method of bunker delivery measurement.

To guide the industry in the above transition, a Technical Reference for Bunker Mass Flow Metering (TR 48 : 2015), which sets out clear requirements for the measurement and system integrity in bunker fuel transfer, was launched on 16 February 2016. TR 48 : 2015 will take effect on 1 June 2016 to support the MPA's regulation on the use of MFM for marine fuel oil deliveries in Singapore. The MPA regulation will take effect on 1 January 2017.

The launch of this standard attracted more than 200 participants from bunker surveying companies, bunker suppliers, bunker craft operators, tanker owners, shipping/ bunkering associations. The seminar brought the participants through the journey taken in establishing this world's first standard and the key highlights of the new TR 48 : 2015 was also shared. The seminar featured presentations on bunker MFM industry experiences from the perspectives of the buyer, supplier and tanker operator.

In addition, a presentation on the brave new world for bunker surveyors was also provided to address the changing role of bunker surveyors in the bunker MFM regime. Extensive consultations at various stages of the development of the TR helped to ensure that the TR would meet the needs of the industry. Pre-trials and official trials played a key role in the setting of particular requirements as well as the close collaboration with key agencies for this

industry helped in the preparation of the industry for this world's first TR.

We would like to acknowledge the following experts who were very dedicated in their contributions and participated based on their individual capacity in the development of TR 48 : 2015 as well as the close guidance by its parent committee, the Technical Committee for Bunkering, led by Mr Seah Khen Hee.

NAME	CAPACITY	NOMINATING ORGANISATION
Capt. Yoon Peng Kwan	WG Convenor	Pacific International Lines Pte Ltd
Dr Parry Oei	WG Co-convenor	Maritime and Port Authority of Singapore
Mr Jackson Koh	WG Member	Maritime and Port Authority of Singapore
Mr Wu Jian	WG Member	National Metrology Centre (NMC)
Mr Lim Yong Seng	WG Member	Weights and Measure Office, SPRING Singapore
Mr Woon Siew Kien	WG Member	Maersk Singapore Pte Ltd
Mr Richard Ho	WG Member	APL
Mr Bhavin Mehta	WG Member	Emerson Process Management, Singapore
Mr Mohamed Abdenbi	WG Member	Endress+Hauser (S.E.A.) Pte Ltd
Mr Teoh Seng Eng	WG Member	Mogas Flow Lab Pte Ltd
Ms Celeste Yeong	WG Member	Sinanju Tankers Pte Ltd
Mr Lim Han	WG Member	Hong Lam Marine Private Limited
Mr Simon Neo	WG Member	Piroj International Pte Ltd
Mr Douglas Raitt	WG Member	Lloyd's Register (FOBAS)
Ms Thng Hui Hien	WG Member	Shell Eastern Trading Co.
Capt. Rahul Choudhuri	WG Member	Veritas Petroleum Services (Asia) Pte Ltd
Mr Dennis Sim	WG Member	CCIC Singapore Pte Ltd
Mr Darrick Pang	WG Member	Metcore International Pte Ltd
Mr Ken Lim	WG Member	ExxonMobil Marine Fuels
Mr Kwok Fook Sing	WG Member	Individual capacity
Mr Chong Kam Wah	WG Member	Individual Capacity
Mr Thiang Cheong Sheng	WG Member	Ocean Tankers Pte Ltd
Capt. Mohammad Mominul Hoque	WG Member	Maritec Pte Ltd
Mr Anthony Nah	WG Member	Pacific International Lines Pte Ltd
Mr Seah Khen Hee	In attendance	TC for Bunkering Chairman
Mr Kenneth Kee	In attendance	TC for Bunkering Member
Mr Lee Wai Pong	In attendance	TC for Bunkering Member

“Singapore's bunkering industry competes not only on price and efficiency but also being a trusted hub for quality, quantity and dispute resolutions. Singapore developed and implemented a number of world-first standards for ensuring accurate and fair bunker fuel purchased in Singapore waters, which helped entrench our position as the world's top bunkering hub. The new TR 48 will further strengthen the trust and raise efficiency in our bunkering industry by shortening each bunker delivery of about 12 hours by as much as 3 hours.

I would like to commend and thank our dedicated standards partners in the Technical Committee on Bunkering and its Working Group under the Chemical Standards Committee for their tireless efforts in bringing TR48 to fruition.”

Ms Choy Sauw Kook,

Assistance Chief Executive (Quality & Excellence), SPRING Singapore

To view full press release on 16 Feb 2016 - "Enhancing Singapore as World's Leading Bunkering Hub through Standards", please visit URL link below:

<http://www.mpa.gov.sg/web/portal/home/media-centre/news-releases>

LAUNCH OF REVISED SS 532 : 2016 CODE OF PRACTICE FOR THE STORAGE OF FLAMMABLE LIQUIDS



The Launch of the revised SS 532 : 2016 Code of practice for the storage of flammable liquids was held on 26 February 2016 with 240 participants from petrochemical plants, refineries, oil storage facilities, facilities processing or storing flammable and combustible liquids to associations/institutions of fire engineers, professional engineers and safety officers.

In the update of SS 532, the fire safety requirements for laboratories were largely excluded from the scope of the revised SS 532 except for some requirements. Laboratories would need to be guided by the SCDF's Fire Code until the new standard on Fire Safety for Labs is completed in FY 2016. Changes were made to the sections on minor storage and safety cabinets, package storage and handling, storage in tanks, piping and tank auxiliaries, operations and firefighting facilities. Consultations with industry, both

during and after the standard was completed, helped in ensuring that the standard met with the needs of industry partners.

This launch provided the participants with an overview of the standards relating to petroleum processes and products which was presented by Mr Khong Beng Wee, Chairman of the Technical Committee for Petroleum Processes and Products. Mr Mak Chee Wah, Convenor of the Working Group on SS 532 highlighted the key changes of revised SS 532. Invited speakers, Mr Mohamed Salleh

from LTH Logistics (S) Pte Ltd and Mr Louis Hwang, from Engineers 9000 Pte Ltd presented the 'Safety Needs Addressed by SS 532' and 'Regulatory Aspects Addressed by SS 532' respectively.

We would like to acknowledge the following experts for their dedication and contribution based on their individual capacity in the extensive revision of SS 532:

NAME	CAPACITY	NOMINATING ORGANISATION
Mr Mak Chee Wah	WG Convenor	ExxonMobil Asia Pacific Pte Ltd
LTC Han Fook Kuang	WG Member	Singapore Civil Defence Force
Mr Michael Yan*	WG Member	Vopak Terminals Singapore Pte Ltd
Mr Edmund Hoe	WG Member	Stolthaven Singapore Pte Ltd
Mr Nadarajoo Suppiah	WG Member	Shell Pulau Bukom Manufacturing Site
Mr Goh Seng Woon	WG Member	ExxonMobil Asia Pacific Regional Project Centre
Mr Low Teck Lye	WG Member	Singapore Refining Company Pte Ltd

*Retired as of Sep 2015

SCDF - SCIC RESPONSIBLE CARE COLLABORATION AND RECOGNITION SCHEME

Responsible Care signatory members who have achieved Responsible Care Gold Award for CAER Code and have also met the standard equivalent to SCDF's CERT audit (documentation) requirement would be recognised under the SCIC-SCDF Responsible Care Collaboration and Recognition Scheme developed by SCIC and SCDF.

This recognition scheme allows the organization to seek exemption for the documentation assessment component under the annual SCDF CERT audit scheme in WY2016 (April 2016 – March 2017).

Companies recognised under the SCIC-SCDF Responsible Care Collaboration and Recognition Scheme 2015:

- Lubrizol South East Asia Pte Ltd
- Petrochemical Corporation of Singapore (Private) Limited
- Vopak Terminals Singapore Pte Ltd (Penjuru Site)
- Vopak Terminals Singapore Pte Ltd (Banyan Site)

WSHC-SCIC RESPONSIBLE CARE COLLABORATION AND RECOGNITION SCHEME

Responsible Care signatory members who have achieved Responsible Care Achievement Award or higher for Employee Health & Safety (EHS) would be recognised under the SCIC-WSHC Responsible Care Collaboration and Recognition Scheme which was developed by SCIC and WSHC in 2015. This recognition scheme allows the organization to seek direct entry to WSHC's bizSAFE Level 3.

RESPONSIBLE CARE AWARDS 2015 – PANEL OF JUDGES AND ORGANISING COMMITTEE

The Singapore Chemical Industry Council wishes to thank the panel of judges of the Responsible Care Awards 2015 for their time, effort and commitment towards the unenviable task of reviewing and judging award submissions from Responsible Care signatory companies.

PANEL OF JUDGES

Co-chairs

Mr Leaw Tiew San
CWT Logistics Pte Ltd

Mr Ng Chee Wai
Petrochemical Corporation of Singapore (Private) Limited

Members
Mr Lim Koon Teck
Ministry of Manpower

Ms Lim Kai Yun
National Environment Agency

CPT Saw Guang Zheng
Singapore Civil Defence Force

Mr M Sintha
CWT Logistics Pte Ltd

Mr Ooi Tiat Jin
Absotech Pte Ltd

Mr Tommy Chng
BASF South East Asia Pte Ltd

Ms Dahliyah Hamid
Bayer (South East Asia) Pte Ltd

Ms Loh Yin May
Celanese Singapore Pte Ltd

Mr Tay Cheng Pheng
Chevron Phillips Chemicals Asia Pte Ltd

Mr Andrew Ong
Dow Chemical Pacific (Singapore) Pte Ltd

Mr Vinay Narsimha Nayak
DuPont Company (Singapore) Pte Ltd

Mr Christopher Varel
ExxonMobil Chemical Asia Pacific Pte Ltd

Mr Yeo Soo Hock
Infineum Singapore Pte Ltd

Ms Zanna Tan
Sembcorp Industries Ltd
(Utilities Singapore)

Ms Hannah Yu
Shell Chemicals Seraya Pte Ltd

Mr Varian Han
Shell Eastern Petroleum (Pte) Ltd

Mr Chai Ming Han
Shell Eastern Trading (Pte) Ltd

Mr Lim Choon Meng
Singapore Oxygen Air Liquide Pte Ltd

Mr Thet Naing
Sumitomo Chemical Singapore Pte Ltd

Mr Tay Khoo Eng
The Polyolefin Company (S) Pte Ltd

ORGANISING COMMITTEE

Mr Johan Lim
CWT Logistics Pte Ltd

SCIC RESPONSIBLE CARE COMMITTEE

SCIC SECRETARIAT OFFICE



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WELCOME NEW RESPONSIBLE CARE MEMBER COMPANY

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DATE	EVENTS
12 April 2016	16th National GHS Awareness Seminar
14-15 April 2016	Training course on Regulatory, Technical & Safety Requirement of ISO Tank course
26 April 2016	Safety Case Knowledge-building Workshop
27 April 2016	Process Safety Management Seminar
19-20 May 2016	Asia Petrochemical Industry Conference (APIC) 2016
27 May 2016	Learning & Sharing Session – Role of human error in Process Safety
April 2016	Training Workshop On Globally Harmonized System (GHS)_for Chemical users
May 2016	Training Workshop On Globally Harmonized System (GHS)_for Chemical users
June 2016	Training Workshop On Globally Harmonized System (GHS)_for Chemical users

*** Note: SCIC may change/ amend the events listed above without any prior notice.*

For more information on the dates of these training courses, you may visit our website at www.scic.sg or contact **SCIC secretariat@scic.sg**



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