出國報告（出國類別：開會）

參加第 16 屆亞太區責任照顧會議(Asia Pacific Responsible Care Conference，APRCC)

服務機關：台灣中油股份有限公司
姓名職稱：邱秋閔 工業安全衛生管理師
派赴國家/地區：南韓
出國期間：108 年 11 月 6 日至 108 年 11 月 9 日
報告日期：108 年 11 月 15 日

摘要

本公司為強化工安意識及落實安全管理，推動製程安全管理(PSM)，第 16 屆亞太區責任照顧會議(Asia Pacific Responsible Care Conference，APRCC)於首爾舉行，本研討會內容為責任照顧與永續發展、與社區溝通及 PSM 最佳實務經驗分享。Responsible Care(RC)為 International Council of Chemical Associations (ICCA)架構下之分支，亞太地區共有 16 個國家加入。該會議中討論目前國際 RC 發展概況及如何永續經營，並邀請斯里蘭卡、南韓、歐盟及紐西蘭協會秘書長分享相關經驗；並由 BSEF 即 FPGs 分享企業案例執行。RC 也關注海洋塑膠等環保相關議題，日本、印尼、南韓分享近年來環境友善塑膠之開發。PSM 則由杜邦、AICM 講述基本概念，並經 FPGs、花王、PCS 等三間公司分享實務經驗。最後由 JCIA、TRCA、SPIK、BASF 向與會成員講解南韓、日本及台灣目前化學品運作於法規管理面上之要求。

目次

一.目的

本公司為強化工安意識及落實安全管理，積極推動製程安全管理(PSM)，本事業部已正式推動天然氣處理廠、注儲工程處之 PSM 建置，其中注儲工程處亦屬本事業部試點工廠，藉由符合性稽核方式進行評估，並依結果進行目標改善追蹤、管理。今年亞太地區責任照顧會議（Asia Pacific Responsible Care Conference, APRCC）研討會，由南韓責任照顧協會(Korea Responsible Care Council ,KRCC)主辦，於 2019 年 11 月 7 日至 8 日假韓國首爾 The Westin Chosun Hotel 舉行，會議主題設定為 The Next Challenges for Responsible Care。本次研討會主題為社會責任照顧(RC)面臨的挑戰、社區溝通、永續發展、PSM 經驗分享；推行 PSM 過程裡最重要的一環，即是與利害相關者(員工、社會大眾…等)之間的溝通，同時該利害相關者之訴求亦為建置 ISO45001 之重要元素；參加本次研討會所得到之資訊得以作為未來 PSM、ISO45001 建置、執行及管理之借鏡。

二. 過程

1. 出國行程

本次出國詳細行程(詳如表一)，共為期四天。108 年 11 月 6 日至桃園機場搭機，7 日至 8 日於韓國首爾參加 APRCC 研討會，會期總共兩天。

表一. 出國行程表

預定起迄日期	天數	到達地點	地區等級	詳細工作內容
108.11.06	1	南韓首爾	260	啟程、與 TRCA 秘書長/會員討論行程(出發/離開會場時間、各發表內容提問演繹)
108.11.07-108.11.08	2	南韓首爾	260	參加亞太地區責任照顧會議（Asia Pacific Responsible Care Conference, APRCC）研討會
108.11.09	1	台北	260	返程

2. 議程概述

Asia Pacific Responsible Care Conference(APRCC)為區域性化學和化學相關產業用以交換責任照顧資訊之平台，該會議每兩年召開一次，本次研討會由南韓責任照顧協會(Korea Responsible Care Council ,KRCC)於首爾召開。(詳如表二)

11 月 7 日

Plenary Session

介紹 International Council of Chemical Associations (ICCA)整體結構，再由該項下細分不同主題小組，能源與氣候變遷、責任照顧、化學品政策/健康議題及社會溝通等 4 個分支。

Session1

斯里蘭卡為新加入會員國，首先由該協會介紹該國現況；隨後由地主國、歐盟、紐西蘭分別說明 Responsible Care (RC)的重要性及面臨的現況。

Session2

由 session1 主題衍申出 RC 與永續發展之間的關係，並說明 Sustainable Development Goals(SDGs)與面臨的挑戰及機會；並由企業分享實務上如何朝向永續發展前進。

11 月 8 日

Session3

海洋塑膠廢棄物已成為全球關注議題， Alliance to End Plastic Waste(AEPW)計畫也成為關注焦點。近年來環境友善塑膠的開發成為國際趨勢，包括生物可分解塑膠，由 SKC、樂天化學說明研究進展。

Session4

由杜邦、AICM 講述 PSM 應具備之基本概念，並經 FPGs、花王、PCS 等三間公司分享實務經驗，詳細說明執行概況及成果。

Session5

JCIA、TRCA、SPIK、BASF 向與會成員講解南韓、日本及台灣目前化學品運作於法規管理面上之要求，以及目前推動所面臨之瓶頸。

表二. 研討會議程表

PROGRAM

NOV. 7, 2019 (DAY 1)

TIME	TOPIC	NOTE
08:00-09:00	Registration & Coffee	
09:00-10:30	Welcome & Admin briefing	
	Welcome remarks	
	Keynote Address	
10:30-11:30	Guest Presentation	
11:30-13:00	Lunch	
13:00-14:30	**PRESENT AND FUTURE OF RESPONSIBLE CARE**	
	Based on the introduction of RC implementation status (benefits and challenges) from APRO member countries, we are able to discuss and share ideas about the direction, challenges, and visions to implement RC in the future.	
	Presentation	TBD
14:30-15:00	Panel Discussion	TBD
15:00-15:20	Coffee Break	
15:20-16:50	**RESPONSIBLE CARE vs SUSTAINABILITY**	
	Since the Sustainable Development Goals (SDGs) were adopted from the United Nation General Assembly in 2015, chemical companies and organizations related to the Responsible Care are discussing how to define the relationship and roles between SDGs and RC. At this moment, we can review the contribution through RC for the sustainable development goals and discuss how the chemical industry can play a role in contributing the sustainable development goals in the future.	
	Presentation	TBD
16:50-17:20	Panel Discussion	TBD

* Above program can be changed depending on the situation

NOV. 8, 2019 (DAY 2)

TIME	TOPIC	NOTE
09:00-11:30	**COUNTERMEASURES AND CHALLENGES REGARDING PLASTIC ISSUES**	
	As plastic issues such as microplastic, marine debries, plastic waste, etc. are growing in importance worldwide, a member country or chemical company can present its view on how to countermeasure plastics issues and discuss its future plan and solutions to solve these challenges.	
	Presentation	TBD
11:00-11:30	Panel Discussion	TBD
11:30-13:00	Lunch	
13:00-14:30	**BEST PRACTICES OF PROCESS SAFETY**	
	A member country or chemical company shares the best practices of process safety to prevent damage to workers and communities caused by environmental safety accidents in chemical plants.	
	Presentation	TBD
14:30-15:00	Panel Discussion	TBD
15:00-15:20	Coffee Break	
15:20-17:20	**COMMUNICATION WITH THE LOCAL COMMUNITY**	
	Chemical companies are able to share major activities to communicate with local residents in nearby chemical industry sites, introduce communication skills such as risk communication, and discuss win-win strategies to form a consensus with local residents.	
	Presentation	TBD
16:50-17:20	Panel Discussion	TBD
17:20-17:30	Closing	

* Above program can be changed depending on the situation

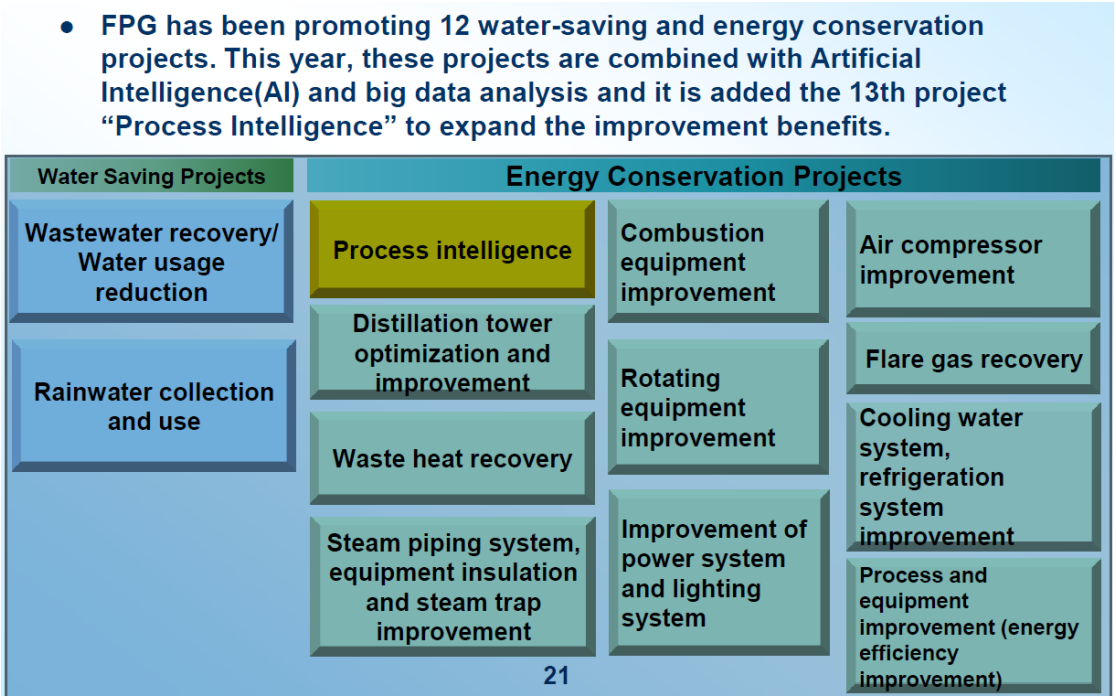
三.具體成效

本事業部參加該研討會主要目的為聆聽國際上 PSM 執行之經驗分享，但仍有部份主題適用於本公司其他事業部，除 PSM 外，另摘要兩個主題以茲參考。

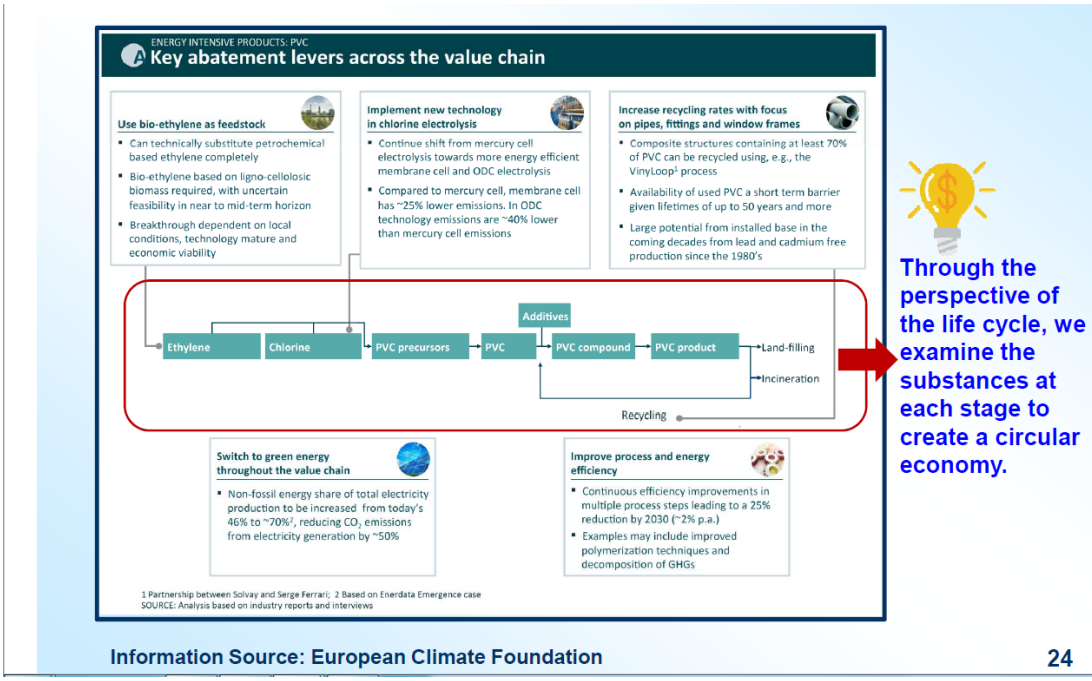
Session2 Responsible Care & Sustatinability

Topic：Implementation of Circular Economy Program in Mailiao Industrial Complex

Speaker：Dr. Cheng-Yu Yu(FPG)



FPG 將循環經濟概念轉換為 13 項實務運作策略



FPG 依據 ICCA 報導選擇石化廠可改善之切入點

Items / Year	Raw Materials	Water	Energy	Reduction of Wastes		
	Unit consumption (Ton/Ton)	Unit consumption (Ton/Ton)	Unit Standard Coal (Kg/Ton) *1	Emission (MM^3/yr) *2	Waste-water (Kton/d)	Solid wastes (Kton/yr)
2007	1.02	2.5	222	279.5	113.5	109.1
2018	0.98	1.72	202.9	13.0	85.2	108.0
Reduction ratio (%)	3.9	30.4	16.8	95.3	24.9	1.0

*1: 1kg standard coal calorific value = 7.0×10^3 Kcal
*2: emission to the flares, unit : MM^3/yr

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FPG 2007 年與 2018 年節能減碳之成效分析，CO2 溢散率降低 95.3%、水資源節省 24.9%、固態廢棄物減少 1%

Session3 Countermeasures and Challenges Regarding Plastic Issues

Topic：Biodegradable Plastics Market Status and Challenges & SKC PLA Film

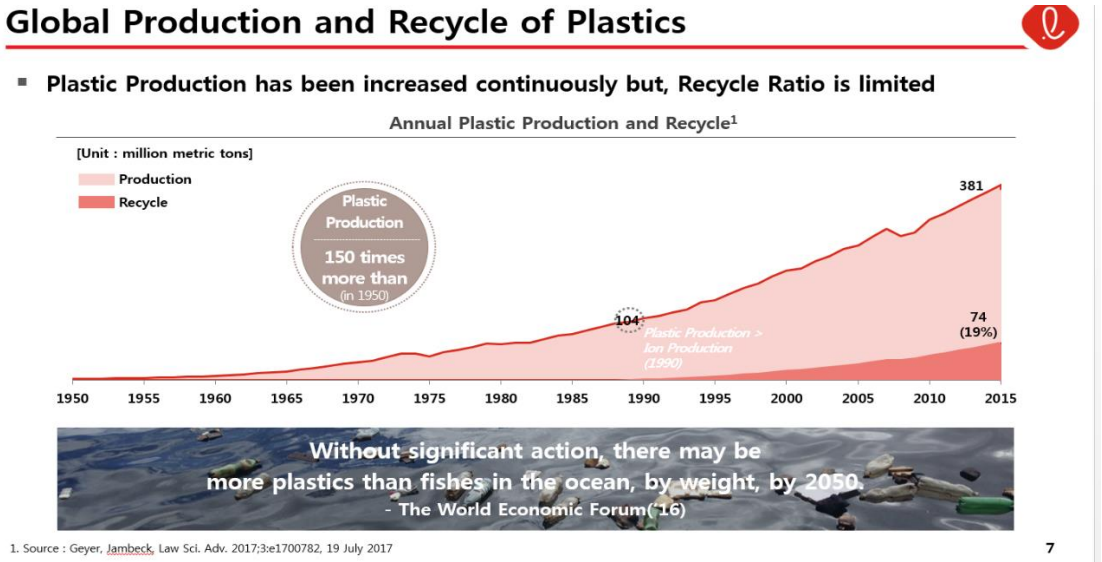
Speaker：Dr. Cheng-Yu Yu(SKC)

Topic：Recent Trends of Environmentally friendly Plastics

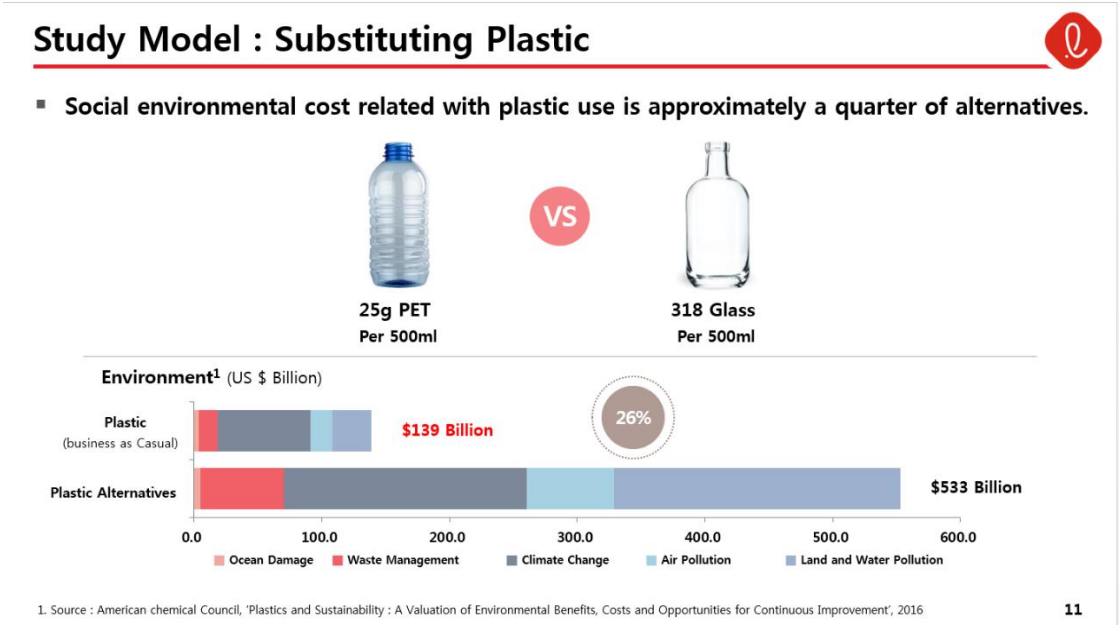
Speaker：Sang-hyun Park(Lotte)

Dr. Cheng-Yu Yu

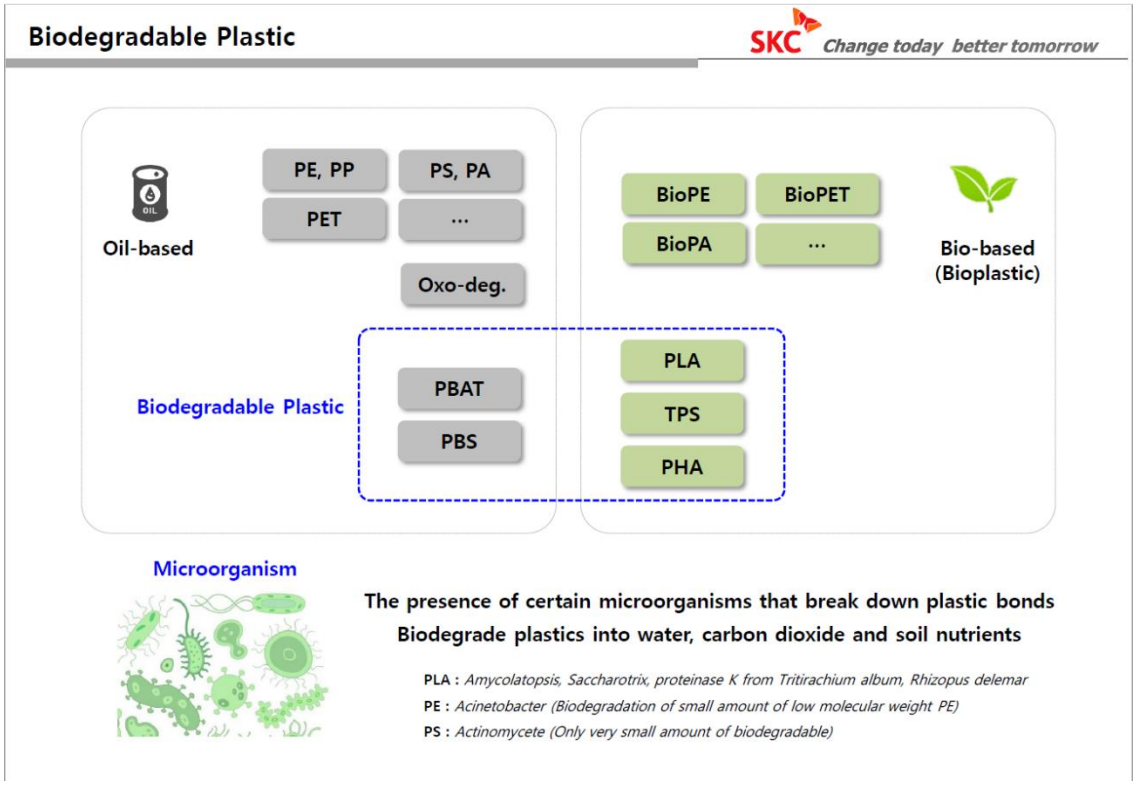
Sang-hyun Park



兩位演講者均強調塑膠垃圾數量成長快速但確無法有效回收造成嚴重污染



實務上研究顯示使用非塑膠製品之替代物(如玻璃)對環境危害更具大

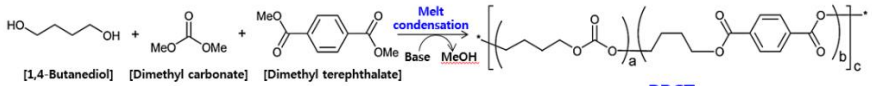


開發 Biodegradable 對環境友善之塑膠、尋找可高效分解塑膠之微生物成為趨勢

Lotte's Plastics 5Re – Replacement

- **Compostable PBCT – A New Environment Friendly Plastics by Lotte Chemical**

PBCT (Poly(butylene carbonate-co-terephthalate)



PBCT

Aliphatic Carbonate, Aromatic Ester Copolymer	The monomer ratio → Control Properties, Crystallinity, the Degree of Composting

Characteristics	Applications
Miscible with PLA	Film, Coating, Foam, Filament
Hydrolysis Resistance[1](0.1%)	
Compost ability (60% ↑)	

1. Hydrolysis(%) = (Initial Viscosity- the Viscosity after 3hours exposed in boiled water)/Initial Viscosity*100

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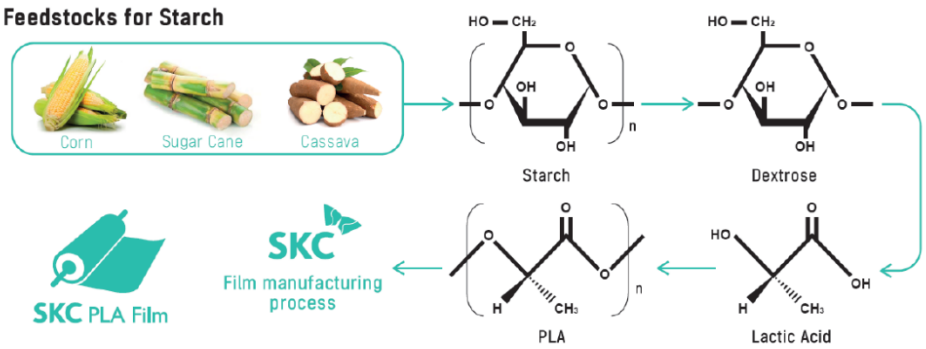
樂天企業開發 Biodegradable Polymer(PBCT)用以取代傳統塑膠

SKC PLA Film

SKC Change today better tomorrow

Eco-friendly biodegradable product in which PLA resin made of biomass raw materials such as corn is manufactured using SKC film manufacturing technology.



SKC 使用澱粉作為原料開發 Biodegradable Polymer(PL)用以取代傳統塑膠

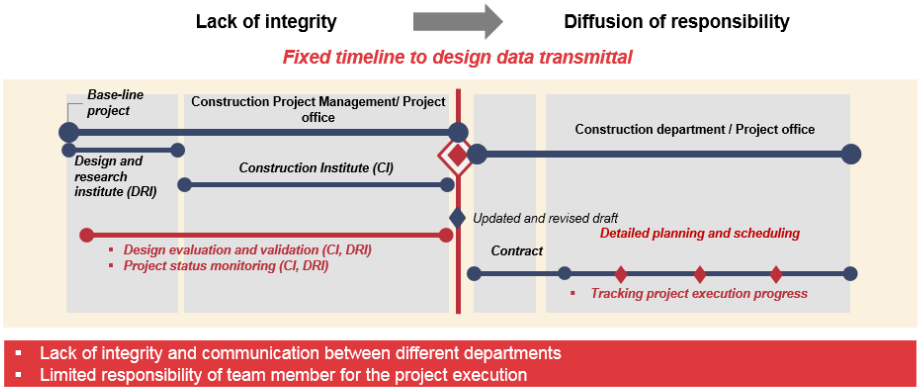
Session4 Best Practices Of Process Safety

Topic：Best Practice of Process Safety Management System during Design and Construction of Plants

Speaker：Sarang Mahajan(DuPont)

PSM 最佳切入時機點在於規劃階段而非後續補救

Lack of effective communication between different departments and institutional organizations



- Lack of integrity and communication between different departments
- Limited responsibility of team member for the project execution

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無法有效橫向溝通導致計畫執行延宕且執行結果不佳

Effective collaboration between Project Team, Operations and Corporate Center from initial phases of the evaluation ensures quality and accuracy of the results

		Business Planning	Facilities Planning	Project Planning	Project Execution	Facilities Operation
Structure		Function				
CC	Steering Committee	Control, tracking, consulting, decision alignment, resource allocation				
Site	Project Manager	▪ Responsibility for execution ▪ Control, tracking, consulting of Project Team				Transfer of the facility to Operations Update of database
	Expert on construction, design, P&ID, etc.	▪ Preparation/submission of data for each estimate class ▪ Consulting by an economist/expert from Investment Department ▪ Consulting by a cost engineer ▪ Consulting by a planner ▪ Control, consulting and tracking of a contractor (design institutions)			▪ Control, consulting and tracking of a contractor	
	Cost Engineer	▪ Cost definition of a relevant class at each project phase based on the data from experts on operations, design, construction				
	Economist/ Expert of Investment Dpt.	▪ Drafting a financial model and preparation of recommendations for IC based on the project cost at each phase, taking into account financial indicators and company goals			▪ Cost Control	
	Planner	▪ Schedule drafting, optimization, analysis			▪ Schedule control and consulting of a contractor	
	Operations	Engagement into check-up of readiness for operation Consulting Project Team				Operation

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PSM 應為全員(規劃、設計、操作、修護、工程)參與之活動

Topic：Journey of PSM Implementation at FPG, Taiwan

Speaker：Chen, Chin-Chuan(FPG)

New thinking in the PSM Program

● **Process Safety Program review–**

➢ **Dr. Sam Mannan made a total of 38 recommendations.**

■ Organizational-Board Oversight	■ Facility Siting-based on API RP-752
■ Organizational-FPG Center of SHE Role	■ Process Safety Management (PSM) Program
■ Organizational-MaiLiao	■ Process Hazards Analysis (PHA)
■ Outreach Issues	■ Management of Change (MOC)
■ Systemic Issues	■ Emergency Response Program
■ Mechanical Integrity Program	

• **The following 5 items Improvement projects should be priority.**

※	❖ Organizations to strengthen. ❖ Process Hazard Analysis. (PHA) ❖ Management of change. (MOC)	❖ Mechanical Integrity. (MI) ❖ Auditing and incident investigation.

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Dr. Sam Mannan 針對建置 PSM 給予 38 個建議(分屬於 Process Safety Program review、MI assessment program、Facility Siting Project、Incident investigation、PHA review program 等五大項下)

New thinking in the PSM Program

- **Re-organizing SHE (Safety, Health, and Environment)–**
  - **On August 15, 2010, the 7 top-level administrators of FPG Executive Board discussed the project for improving the industrial safety and environmental protection. Vice-chairwoman, Ms. Susan Wang is in charge of management of SHE.**
  - **SHE organization of FPG and human resources review-**
    - **Re-organize the SHE Center (esp. in Mailiao complex) ：The units of general affairs are expanding from 86 to 164 people.**
    - **The human resource arrangement on SHE affairs：Each unit of FPG has a full-time contact window on SHE affairs at any administration level.**
    - **Establishing enterprise-level Technical Specification Team: In March 2012, Technical Specification Team was established to figure out the practices of other related industries and set up standards.**

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重新評估工安環保部門人力配置，由 86->164 人；管線中心人力配置，由 43->114 人；專職安全主管共 462 人；

Process Safety

- **Process Safety Program–**
  - **SHE Manpower review (Dec. 2010) : To comply with the industry best practices in PSM, FPG set up designated PSM Coordinators at all levels, They who are in charge of the promoting and implementing PSM-14 elements.**
  - **Numbers of PSM Coordinators：**

Location	Taiwan	Mainland China	Vietnam	Total
persons	234	94	57	385

    - **In FPG-Taiwan, Title：Senior Engineer 123 (53%)、Job：Full-time 222 (94.9%).**
    - **PSM Coordinator SOP (Job Description)/Training and certification procedures issued. (Sep. 2012)**
    - **Arrange basic training / annual training / professional training.**

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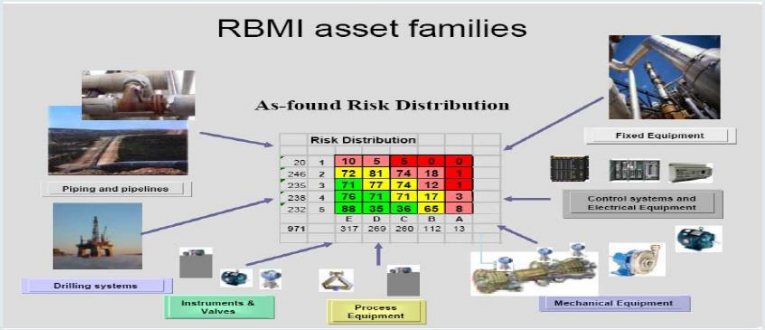
強化各層級 PSM 人力配置，台灣區域高階工程師 123 人、PSM 專責人員 222 人

Mechanical Integrity

- **Reliability Based Mechanical Integrity (RBMI)–**
  - **In order to promote the MI project as soon as possible, FPG-Taiwan conducted the professional software-RBMI.**
  - **In 2010, RBMI was carried out in Mailiao Complex. FPG has assigned 4 pilot plants to implement pipeline RBMI project. Currently it's carried out throughout the complex.**



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依據設備完整性可靠度建立預防性保養機制，並成立預防性保養部門；並建立完整檢查員系統、開始 public pipelines improvement project 用以有效改善管線系統

Process Safety

- **Process Hazard Analysis –**
  - **Establish the enterprise Risk Management Platform (2010): Formosa developed the risk management of electronic system. (web-based e-RMP) PHA–HazOp, FMEA/JSA/MOC/LOPA**

- Taiwan.
- Mainland China.
- Vietnam.

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建立風險管理平台，該平台含括風險評估、程序文件、教育訓練、績效量測、風險監控、運輸管理、意外事件資料庫

Topic：Disaster Prevention by Process Safety Assessment

Speaker：Zeng Wei-Ping(KAO)

Outline of Disaster Prevention Activities

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Main Activities	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Self Ignition	Accident occurred periodically; Develop own method of risk evaluation; Strengthen measures & education; Ongoing activity														
Runaway Reaction	Disaster occurred (Japan company); Investigate risk evaluation method; Reinforce manual; Facility recheck and measures														
Dust Explosion	Prepare a database of 537 powders														
Low Flash Point Substances	Check 175 tanks and 141 products														
Synchronization Stop with Earthquake	No any leakage or explosion accident during Great East Japan Earthquake														
MOC (Manage of Change)	Make a rule and reinforce its practice														
Safety Assessment	Decide SA procedure & apply to High-Pressure Gas Facilities														
HAZOP (steady state)															
2 Guidewords HAZOP (unsteady state)	Find out potential risk of High-Pressure Gas Facilities (17)														

Share above two activities for reduction of accident

近年來日本石化產業火災發生頻率上升，其中最常見的起因為自燃及過反應；透過增加監測頻率、改進監測方式、教育訓練、檢討操作程序可有效降低意外

Trouble of Self Ignition

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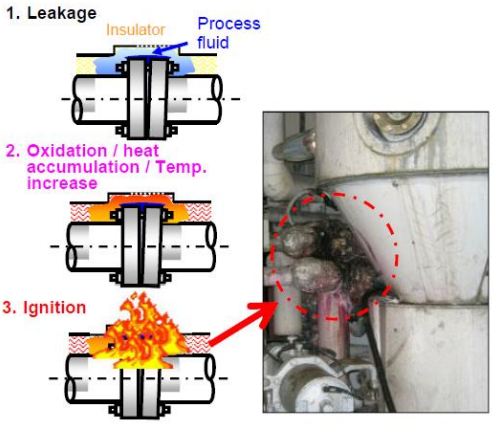
Spontaneous (Self) Ignition Phenomenon

A phenomenon in which a substance starts oxidation / accumulates heat at a temp. which is lower than its ignition point or flash point , as a result, occur a fire accident

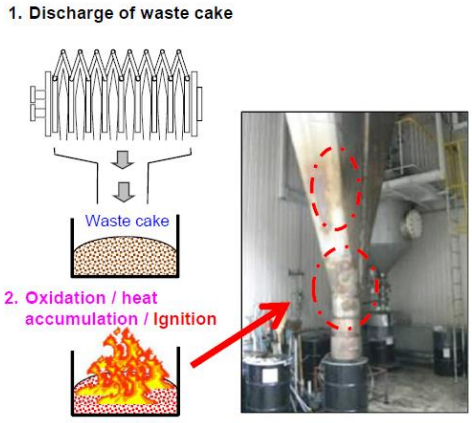
Trouble 1

Self ignition accident at piping flange



Trouble 2

Self ignition accident at filter hopper



Troubles of self ignition had occurred in several situation

自燃反應發生之場所及其發生原因，通常源於洩漏並伴隨氧化及能量累積

Risk Classification : Special Insulator Treatment for Flange

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Execution of aluminum foil in piping flange (for preventing penetration of process fluid into insulator)

➔ Reduce possibility of self ignition in case of leakage of process fluid from flange

1. Before aluminum foil execution

2. Aluminum foil execution

3. Insulation of aluminum foil packaging-1

4. Insulation os aluminum foil packaging-2

5. Construction of insulation

6. Completion

Judgement : Low risk of self ignition in a flange which is executed insulator by aluminum foil

➔ Periodic inspection for no-aluminum foil flange as a top priority, and execute aluminum foil

經過分析顯示震動造成法蘭鬆脫，為產生洩漏之主因；使用鋁箔包覆法蘭並搭配絕緣裝置(鋁箔包覆)可有效將風險等級由 Rank1 降為 Rank2

Background

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Disaster Occurred Caused by Runaway Reaction

Y1976	I Company, TCP Facility	Health Hazard : 220,000	
Y1982	D Company, AS Resin Facility	Death : 6;	Injury : 198
Y2012	M Company, Resorcinol Facility	Death : 1;	Injury : 25
Y2012	N Company, AA Facility	Death : 1;	Injury : 36

Trouble Occurred Caused by Runaway Reaction in Kao Group

1. KIT Furan Resin Facility (2008)

Power Failure ➔ Lose cooling function ➔ Abnormal Reaction

2. Huludao Alkaline Phenol Resin Facility (2017)

Power Failure ➔ Lose cooling function ➔ Abnormal Reaction

Cause : Under-estimation of runaway reaction risk
Subject : Development of thermal risk evaluation method

過反應容易造成嚴重損失，上圖為花王集團自 1976 年至今因過反應造成之人員傷亡及健康危害，下圖為部份事件發生之原因分析

Outline of Guideline

22/29

Standard of Thermal Risk Evaluation

1) Impact : Evaluation based on measurement result of ARC * ARC : Accelerated Reaction Calorimeter

		Press.	
		Design < Max Adiabatic Press.	Design > Max Adiabatic Press.
Temp.	Design < Max Adiabatic Temp.	'High'	'High'
	Design > Max Adiabatic Temp.	'High'	'Low' ~ 'Medium'

2) Possibility : Judgement by "T_{D24}" * +10 °C : measurement accuracy

(Temp. leads to runaway reaction after 24 hours (Data by ARC measurement))

T_{D24} < Process Temp.(T_P) + 10 °C : Possibility 'High' (Runaway reaction maybe Occur in 24h)
T_P + 10 °C < T_{D24} < T_P +30 °C : Possibility 'Medium' (Runaway reaction maybe Occur in a long time storage)
T_P + 30 °C < T_{D24} : Possibility 'Low' (Risk of runaway reaction is low even in a long term storage)

Risk of Runaway Reaction

		Impact		
		'High'	'Medium'	'Low'
Possibility of Runaway Reaction	'High'	I	II	III
	'Medium'	II	II	III
	'Low'	II	III	III

Risk I : Measures is necessary ← High possibility of runaway reaction and serious damage
Risk II : Measures should be applied based on discussion between related persons
Risk III : Acceptable risk

Publish a new guideline
➔ Facility recheck and implement additional measures

透過流體溫度、發生機率及發生後果之綜合評估(ARC 演算法)，可得到製程操作之最佳溫度、流量、反應時間，並公佈最新指導要點

Fundamental Committee Organization

Kao 25/29

Top Management

Secretariat

9 Committees

- **Safety Technology**
- Environment and Energy (Waste material & water treatment management, Energy saving)
- Maintenance Tech.
- Electricity
- Instrument
- Architecture
- Safety and Disaster Prevention
- Standardization
- Quality Engineering

Target :
- **Strengthen indispensable key technology for factory operation**
  - Develop new technology (environment, safety, disaster prevention)
  - Level up and inheritance of specialized technology
  - Cultivation / education of engineer
- **Continuation of stable production**
  - Standardization and global development of facility maintenance technology
  - Stable operation of basic facilities (Utility, waste water)
  - Risk management (Earthquake, fire incident, etc.)

Operation :
- **1 time of key technology committee per year**
  - Policy decision of technology development for important subject (January)
  - Progress report of activities (June)

Main Activities of Safety Tech. Committee

* **Self Ignition**
* **Runaway Reaction**
* Low Flash Point Substances
* Dust Explosion
* 2 Guidewords HAZOP (unsteady state)
* MOC (Manage of Change)
* Synchronization Stop with Earthquake

etc.

Members are included in each factory

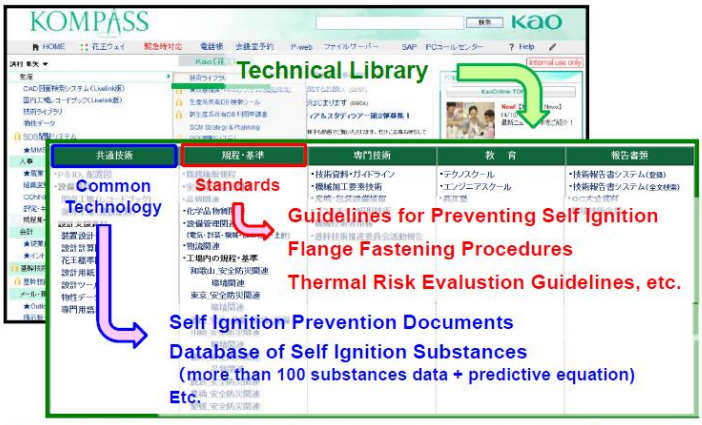
Promote activities of each committee in Kao group
➔ Strengthen safety and stable production

依據不同危害類型分別成立委員會，強調全員參與

Technology Information Sharing & Education Program

Kao 26/27

Share Technology Information on Kao Intranet

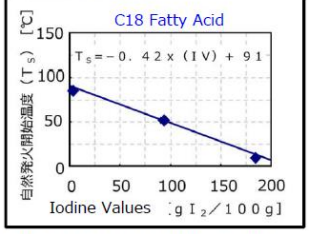


＊ Example : Database of Self Ignition Substances

Fatty Acid : SIT Data (T_s)

Product	Alkyl chain length	Iodine values (IV) [gI/100g]	T_s[℃]
Capryilic acid	C8	0.0	106
Lauric acid	C12	0.0	100
Stearic acid	C18	0.0	90
Oleic acid	C18F1*	89.9	56
Linolic acid	C18F2*	181.1	14

* F1, F2 : the number of unsaturated bonds



＊ More than 10,000 per year check 'Technical Library' ← Establishment of technology information sharing system in Kao Group

Education Program

* In-house technical training (Include related companies)
* Education for engineers (more than 100 per year)
* Education for operators (more than 100 per year)
* In case of SA or MOC of facilities, risk analysis of self ignition and thermal risk should be included

建立教育及資訊平台，內容包括共通技術、專業技術、標準規範、各項報告；SA 及 MOC 亦包含於教育項下

Topic：Disaster Prevention by Process Safety Assessment

Speaker：Bernard L W Leong(PCS)

Elephant analogy…

Elephant

- Size – processing facilities
- Trunk – pipeline *(elephant trunk hold 10 litres)*
- Detect presence – warning signs
- Trumpeting – alarm ("final" alarm)
- Stampede – catastrophic incident

Blind men

- Management
- Staff
- PSM system
- Work procedures
- Culture
- … etc

NOT SEEING THE ~~BUG~~ BIG PICTURE

Need to work together….

PCS Restricted Information

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製程安全最忌諱如盲人摸象，製程安全是一個巨大的架構，並非只需部份參與即可看到全貌，需要所有人都投入其中

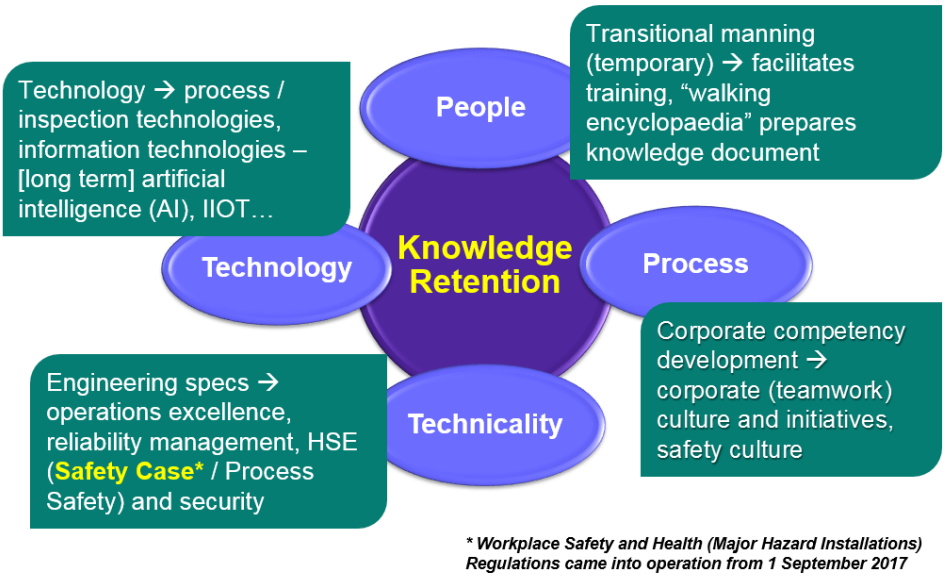
How about the Blind Men ?

Process Safety Management / Staff Management / Corporate Culture

- understand hazards and risks
- effective controls in place to manage risks
  - ✓ routine check/test to ensure "effective" is sustained

使用 3R 策略確保危害風險評估均維持在最近狀態，欲解決問題首先須承認問題存在；善用分析及合成能力拆解並重新架構所有已被辨識之區塊

Competency Development, Knowledge Retention



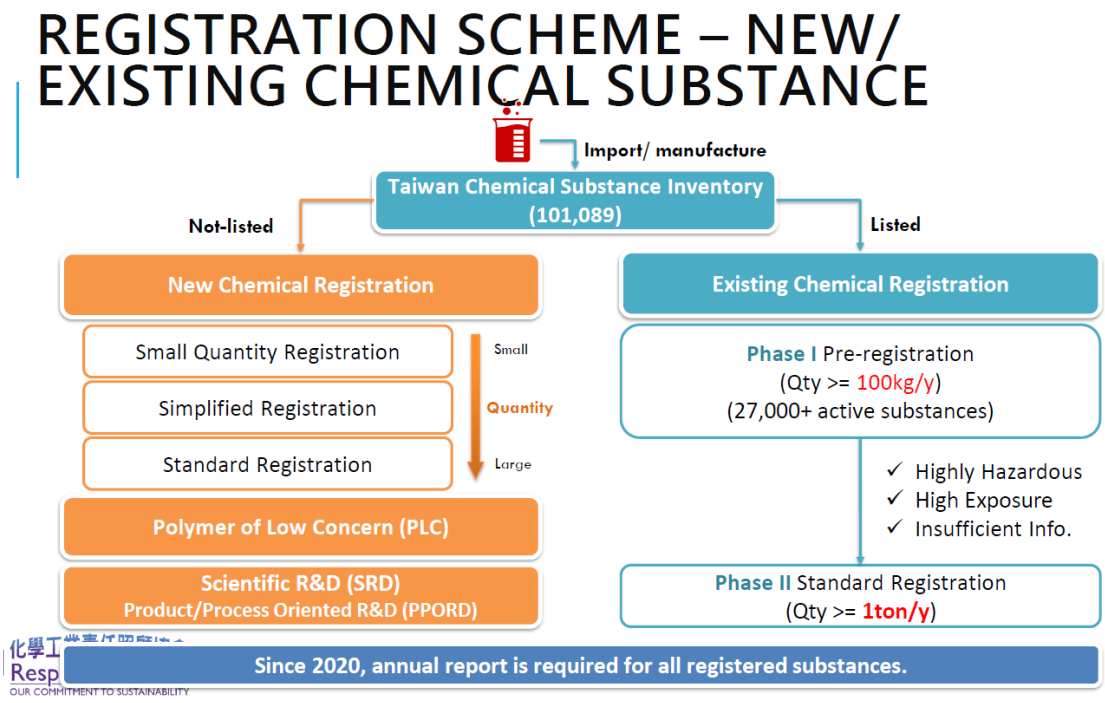
** Workplace Safety and Health (Major Hazard Installations) Regulations came into operation from 1 September 2017*

超過 90%事故均源於人因，透過降低人員流動、提高人員經驗及技術、增加人員福利、提早面對退休造成之人力缺口，可有效降低人因所造成之損失

Session5 Communication With The Local Community

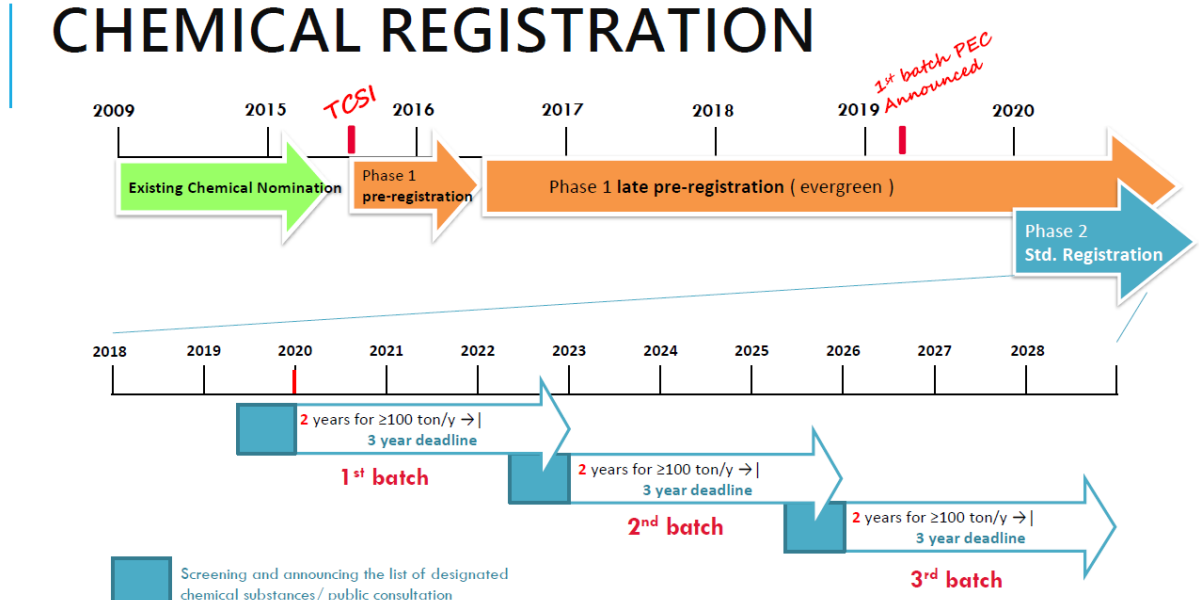
Topic：Taiwan Chemical Management Regulatory Landscape

Speaker：Renata Hsu(TRCA)



台灣將於 2020 年開始執行修訂後之新化學物質及既有化學物質資料登錄辦法，橘色部份為新化學物質、藍色為既有化學物質，均須有年度報告；自 2019/1/1 起，經核准登錄之新化學物質及既有化學物質，登錄人應於核准登錄後每申報前一年製造及輸入新化學物質或既有化學物質之數量資訊。

CHRONOLOGY OF EXISTING CHEMICAL REGISTRATION

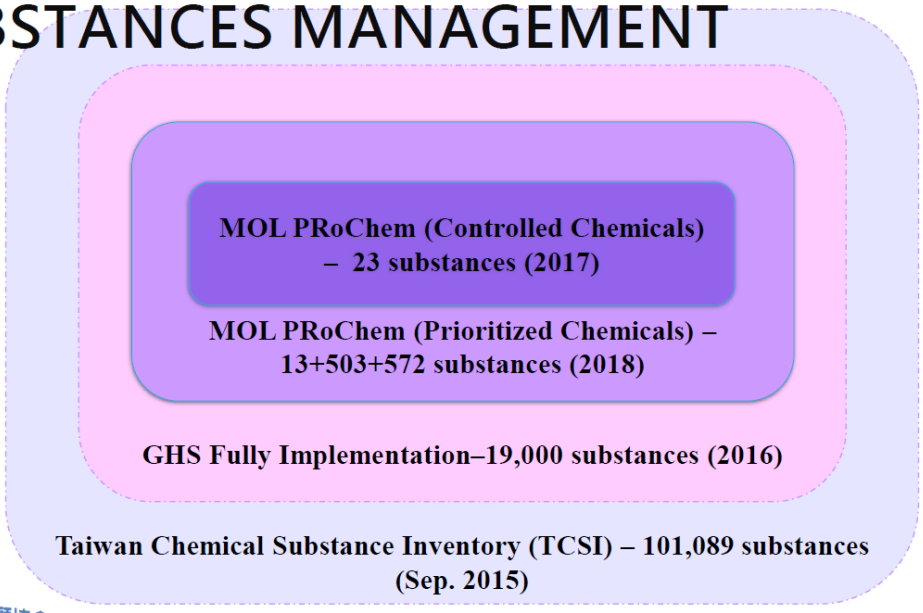


NEW CHEMICAL SUBSTANCE REGISTRATION

Category \ Annual Tonnage	< 100 kg	< 1 ton	1 - 10 ton	≥ 10 ton	≥ 100 ton	≥ 1,000 ton
科學研發用途 Scientific R&D	(報請備查)		Simplified Registration	Standard Registration (Level 1)		
低關注聚合物 Polymer of Low Concern	(需經事前審定確認)		Small Quantity Registration			
限定場址中間產物 On-site Isolated Intermediate/ 聚合物 Polymer/ 產品與製程研發用途 Product/Process Oriented R&D	Small Quantity Registration		Simplified Registration	Standard Registration (Level 1)		
New Chemical (Normal case)	Small Quantity Registration	Simplified Registration	Standard Registration	Standard Registration + Hazard/ Exposure Assessment Report		
			Level 1	Level 2	Level 3	Level 4
致癌、生殖細胞致突變性或生殖毒性物質第一級 CMR Cat. 1	Standard Registration		Standard Registration + Hazard/ Exposure Assessment Report			
	Level 1		Level 2	Level 3	Level 4	

新化學品依申報用途、運作數量所區分出不同級距，可分為少量登入、簡單登入及標準登入。此外，除了基本該檢據之物理性/健康風險危害，當新化學物質運作(或輸入)數量每年達 10 噸以上須額外檢送曝露劑量、危害評估報告

SCOPE OF MOL EXISTING CHEMICAL SUBSTANCES MANAGEMENT



化學工業責任照顧協會 Responsible Care® OUR COMMITMENT TO SUSTAINABILITY

台灣既有化學品管理法規所涵蓋的範圍。優先管理化學品用於保護 18 歲以下青少年、懷孕婦女；管制化學品則依特定化學物質危害預防標準，共 23 項化學物質。

SDS CBI PROTECTION APPLICATION FOR TAIWAN

Chemical Substance with following hazards is not allowed to apply

1. Acute toxicity, category 1, 2, or 3
2. Skin corrosion/irritation, category 1
3. Serious eye damage/eye irritation, category 1
4. Respiratory or skin sensitization
5. Germ cells mutagenicity
6. Carcinogenicity
7. Toxic to reproduction
8. Specific target organ systemic toxicity (single exposure)
9. Specific target organ systemic toxicity (repeated exposure)
10. OEL, and others.

CBI Applicable Items

- Chemical Identification
- CAS NO (effective Jan 1 2020)
- Concentration
- Name of manufacturer, importer, or supplier

Information needed for CBI application

1. Information of Applicant/ Representative
2. Information Items Applied to Be Withheld
3. Hazardous Chemical Ingredients Information

Proof of trade secret

4. Documents that prove information that has been identified as a national security or a trade secret cause.
5. Countermeasures undertaken to protect information of national security or trade secrets.
6. Assessment of economic interests to the applicant and their competitors.

Proof of Hazard Classification

7. Explanations and Proof Regarding Hazard Classification of Hazardous Chemical Ingredients *(very challenging to proof!)*

化學工業責任照顧協會 Responsible Care® OUR COMMITMENT TO SUSTAINABILITY

上開為台灣 SDS 及 CBI 之保護措施。左上為化學品禁止操作、使用、製造、輸入之樣態；右下則要求對化學品進行危害分類

四.心得與建議

本次研討會主題討論社會照顧責任、化學品管理、製程安全管理、塑膠製品環境污染、永續發展等五項議題，其中與工業安全衛生最為相關為製程安全管理及化學品管理，塑膠及永續發展則偏向環境保護。僅管會議中所討論之環保議題與本事業部實務執行並無相關性，但仍具有供本公司其他事業部/研究單位參閱之可行性，故本報告將就環保與工安分別陳述：

環保：

首先廠區內廢水、廢熱回收系統進行整合，探其原因有超過 2/3 的水浪費在冷卻系統及蒸發溢散，故該公司推動 13 項 water-saving and energy conservation 計畫，針對製程系統，減少冷卻水之使用，同時避免冷卻水之蒸發溢散，建立餘熱回收系統回收餘熱用於發電；透過生命週期的觀點，檢討石化產品生產過程中的每一個階段，建立循環經濟體系，包括改量生產技術(JELCLEER Filters、MBR+RO、UF+RO 等技術進行廢水回收)、使用綠色能源、強化能源利用效率、減少能源浪費(陶瓷複材噴砂方式降低耗電量)等方式。

塑膠製品由源頭生產環境友善塑膠，令人訝議的部份為透過統計分析，結果顯示塑膠替代材料對環境造成之經濟損失遠超過塑膠製品之四倍，因此對環境友善之最佳解法應為 5R(回收、減量、再使用、再利用、原料取代)。印尼透過回收塑膠將其再製為路面鋪材，已執行此計畫超過 15 年；韓國樂天及 SKC 兩家公司則投入生物可分解之塑膠原料(原物料來自於澱粉等生物材料取代石化原料)之開發，目前與製鞋、紡織業者合作生產回收再製之產品。

職對於非本事業部之業務推展方向並不熟悉，但是本公司石化廠區應該均有設置餘熱回收系統、廢/雨水回收，惟建議可與 FPG 相關回收系統比較其效率，若 FPG 廠區回收效益較高則可參考其使用之技術及改善節點；雖然本公司屬上游石化產業，但是否投入環境友善之塑膠開發或廢料回收再利用，以作為善盡企業社會責任

的一環，仍具討論空間。

工安：

基礎建設工程如果因 PSM 機制失效，往往造成重大的人員及經濟損失，檢討近 10 年內超過 30%之油氣產業達到第一次產品產出時，總花費平均超過預算金額一倍，其原因源於規劃階段沒有妥善討論(採購、承攬…等)，顯示 PSM 最佳切入點應於初步規劃階段。在此階段需要大量的跨部門橫向溝通，因此需要簡化相關程序及增加頻率，確保參與人員思維及理解上的一致性，DuPont 透過成立完整團隊、計劃切割執行、減少不必要的設計、主動投入 SHE 管理，達到預計目標，甚至更佳。

FPG 之所以投入大量資源執行 PSM，源於事故發生後政府分階段要求 45 個工廠停爐，直到交出製程安全相關檢討及改善。因此邀請國外學者協助列出 38 項建議事項並逐步改善，首先人力資源對於工安人力需求開始傾斜，成立專門技術團隊、擴充管線中心、設立預防保養部門、建立檢查員制度；隨後設立訓練中心，強化各層級教育訓練，包括意外事故調查委員會、技術講座分享。

KAO 則分享該企業近年意外事故實例，透過一系列評估及演算，找出新的改善方法以有效降低發生風險，其中製程設計為重要事項，操作條件設計錯誤往往導致嚴重災害。但透過教育訓練則可以降低發生頻率。

Session 4 整體而言，技術問題不論，PSM 最重要的部份均為全員參與、跨部門高度橫向溝通、大量人力投入。FPG 於執行 PSM 方面，投入 222 個專責人員、123 高階工程師、專責工安人員 462 人，如此才能完整達到預期效益。本事業部參與 PSM 之業務相關人數(專責、高階長官)尚有上升之空間。