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Responsible Care

Chemical Industry's Commitment to Sustainable Development

Issue No + 39

Intro Jang Yong-Seok, CEO of Covestro Korea

Special People centered safety, PCS

Issue 2017 APRCC (Asia Pacific Responsible Care Conference)

Members Focus Members News

RC Activity Key Activities of the KRCC Secretariat



 Responsible Care

Responsible Care

Issue No + 39

Responsible Care® is a voluntary program in the chemical industry and continues to promote the environment through safety and health improvement activities by pledging commitment and implementing it in management policy to protect the environment, safety and human health throughout its entire life cycle from the development of chemical products to their manufacture, sale, distribution, use and disposal.

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Serial number : 39
 Publisher : Sim Hong-seop
 Published by : Maekyung Buyers Guide Corp.
 Date of issue : December 13, 2017
 Tel : +82-2-558-5104
 E-mail : rcmaster@krcc.or.kr
 Website : <http://www.krcc.or.kr>





Covestro is a world-leading manufacturer of high-tech polymer materials for key industries including automotives, electronically and electronics, textiles, architecture and sports products, providing various product solutions.

Covestro was established as an independent company in Sep. 2015, when Bayer MaterialScience, materials science division, separated from Bayer Group. Covestro is equipped with strong technological know-hows accumulated over 150-year history as part of the Bayer Group's chemicals and plastics unit. As of 2016, more than 30 production sites around the world are operated with 15,600 people. With handling products directly related to people's safety, Covestro's commitment to safety is entirely on a different level. We have met with Jang Yong-Seok, CEO of Covestro Korea, to hear management philosophy and operation principle about safety and environment unique to Covestro. Jang Yong-Seok started working for Bayer Korea in 1996 and was inaugurated as CEO of Covestro Korea on Jun. 1st, 2016 with 20-year working experiences at Bayer.

◎ **The company name was changed in Sep. 2015. What does the new name mean?**

● As Bayer's MaterialScience was separated from Bayer Group in Sep. 2015, the company has taken the new name, Covestro. The name Covestro is made from a combination of words that reflect the identity of the new company. The letter C and O come from 'collaboration', and VEST means that the company invests well in state-of-the-art manufacturing facilities. The final letters STRO show that the company is 'strong' in innovation, 'strong' in industry with a 'strong' workforce.

The new name implies that it is important to reinforce Covestro's strengths even more rapidly, effectively and flexibly in the global competitive markets. I am convinced our colorful, vibrant identity and positive vision will inspire and motivate us on our new path of success in the future.

◎ **Please tell us about technological innovation examples and implementation direction briefly.**

● Covestro's products can be easily found in everyday life. They contribute to the fields of

energy, resources efficiency mobility, household items, and many more. In an era where 20% of greenhouse gases emission is caused by industrial activities, Covestro is putting utmost efforts on developing a variety of high-tech materials and manufacturing method that can increase energy efficiency and decrease emission of greenhouse gases.

In 2016, Covestro developed a process producing polyurethane by capturing carbon from carbon dioxide, a climate-damaging gas, and successfully commercialized it. In addition, it participated in the pioneer project, Solar Impulse, which is the world's first solar-powered aircraft project promoting the importance of new renewable energy, as an official project partner supplying





high-tech polymers and technological researches. Solar Impulse 2 successfully completed its journey around the world in 2016.

Polycarbonates division at Covestro has been developing high-tech plastics for lightweight and environment-friendly cars for the past 20 years. Polycarbonates reduce weight more than 30% and has 250 times hardness compared to glass. We will continue striving for providing mankind safer and more convenient lives through development of these high-tech materials and technologies.

☉ **Industry is always on discussion about environment and safety. How should we deal with problems in environment and safety?**

● As the world's first company that developed polycarbonates and polyurethanes, Covestro is operated under strict internal regulations. We take our responsibilities to develop environment-friendly products for future mankind and environment very seriously and engage in consistent investments and efforts.

Covestro strictly takes control of chemicals used in all plants around the world. Covestro's system fundamentally bans the use of chemicals and raw materials if they are deemed even as infinitesimally hazardous to humans and environment. Specifically, ingredients for each batch in production unit are analyzed, and a certificate signed by a person in charge of the

specific plant is supplied to client company. We only produce products that satisfy all of EU-REACH, which is regarded as the original format of the Act on the Registration and Evaluation of Chemicals (known as Korea REACH).

Consumers, especially parents, are concerned about the effect and safety of chemicals on health and environment, which is reasonable. Sometimes we, as a manufacturer of chemical materials, feel that their concerns and distrust for chemicals are not always based on scientific evidences; however, we acknowledge our social responsibilities and put our utmost efforts into developing products that can provide solutions for the concerns.

☉ **Please tell us about Covestro's implementation strategy and program targeting the safety of chemicals.**

● As there is much concern about chemical safety in society, we have a strict safety guideline at Covestro. We use a unyielding system for safety and do not use materials that should not be used.

HSEQ (Health, Safety, Environment & Energy and Quality) is one of Covestro's core values. It takes safety and health of employees, consumers and users as highest priority, protects environment and strives for sustainable development through enhancing quality and efficiency of products and production processes and

reducing energy consumption.

We take health, safety and environment as the highest priority in everything from research and development phase of chemicals, consumers and to users, encompassing production, sales, use, and disposal as a whole according to GPS (Global Product Strategy) of ICCA (International Council of Chemical Association). In order to promote safe handling practice of products and transparency within chemical industry, we provide consumers, related organizations, NGOs and the public information regarding chemicals through PSSs (Product Safety Summaries). PSSs (Product Safety Summaries) are shared through PS1 (Product Safety First) platform, and they are publicly available. Detailed information on safety assessment and effects on environment of our products are provided for consumers and related parties to communicate in terms of health and safety of our products.

☉ **What qualities do you look for in manpower and what is a principle of human resource development at Covestro?**

● What differentiates Covestro from other companies is 'compliance'. It can be understood as being law-abiding or ethical, and we see this as the first quality since our company is directly related to safety. We look for people who are very strict in self-discipline since it means they can engage in strict management of environment and safety.

In addition, C3 Values, which are Curious (full of curiosity), Colorful (accepting diversity), and Courageous (not afraid of new challenges), should be achieved by all employees at Covestro. We strive for making a better work environment with a variety of support systems

where creative manpower with C3 Values is fostered and provides the best performance.

☉ **Please tell us about future goals of Covestro Korea.**

● In the future, the world will experience even bigger changes than we imagine. Our goal is to actively lead the changes toward a positive direction rather than preparing for the changes in a passive way. It is a Global Covestro's goal as well as Covestro Korea's.

Safer, more convenient, and more exciting... We would like to make the world a brighter place, and for that, we constantly communicate with consumers to develop new products and technologies. The future that I would like to make is to become No.1 company that people, who are always ready to take new challenges, want to work for, and to create a company where all employees are happy.

☉ **Please tell us what you wish for industry, academia, research field, and government to accomplish sustainable development.**

● For sustainable development, chemical industry should recognize that we have social responsibilities, even higher than other industries. We should take responsibilities on environment, health and safety as the highest priority.

When academia engages in researches, companies develop products, and government establishes integrated management regulations, these social responsibilities should be taken into consideration. In addition, I hope that social culture would be established, which encourages those who try constantly, whether academia or industry, to provide better solutions, being accepted properly by consumers. 🌱



PEOPLE CENTERED SAFETY, PCS

Jo Pil-Lae, CEO of Alpha Safety
 Professional engineer in chemical safety,
 professional engineer in industrial machinery facility,
 professional engineer in construction equipment

In general, safety proceeds toward seeking fundamental measures that remove or minimize humans' influence, and it is the most optimal direction to take. For example, when welding automobile parts, use of robotic welding rather than manual welding will get the job done more safely.

Robotic welding can provide much safer operation than what humans do. However, there are still works that require humans efforts, such as installing an industrial robot or fixing a robot when it is out of order. This means that there are many aspects at the field that humans need to engage in to offer safe management. Would installing all pipes, equipments and valves at chemical plant with high-cost corrosion-resistant materials remove all the safety accidents completely?

It might reduce leakage risks caused by corrosion; however, problems of flange leakage, abrasion, external corrosion, rotary machine fatigue, sampling, filter replacement, accelerant replacement, Annual repair and maintenance, and motor and facility maintenance still remain along with potential risks related to those works. Facility safety is an essential element in chemical industry, but dealing only with facility safety will not remove or manage all the potential hazards. Therefore, work safety is of utmost importance in order to prevent accidents. People centered safety will be explained by separating job based safety and life based safety with the core remaining at work based safety. Therefore, people centered safety can be explained as work based safety. In this article, people centered safety will be introduced in terms of analyzing effectiveness of risk assessment, safety device or safety measure that possesses changing or moving flaws, writing and using safe work practices, and detailing job based safety and life based safety.

Effectiveness of risk assessment measures

Section 1 of Article 41 (2) of Occupational Safety and Health Act explains "risks shall be assessed whether they are caused by structures, machines, facilities, raw materials, gas, vapor, dust or work activities or other related works and hazards shall be identified accordingly. Following the results, the law and necessary measures shall be taken, and additional measures will be taken if it is deemed necessary to prevent workers' hazard and health risks." Implementing risk assessment is prescribed and the specific time, schedule, contents and methods are mentioned in notification of the Ministry of Employment and Labor. Before risk assessment system was introduced in Occupational Safety and Health Act, implementation measures for managing hazards were applied as other methods. Most items required in Occupational Safety and Health Act or safety regulations were instituted as preventative measures because similar incidents happened in the past. They do not have systematic format of risk assessment in general; however, these measures were introduced as effective methods that properly controlled hazards at the job site, hazards in work method, hazards in chemicals, hazards in energy or hazards in work environment. In other words, they are partial risk assessment based on past experiences.

As in <Table 1>, risk assessment measures for facilities, jobs and environment are stated in the law as control (management) measures for a variety of facilities, job sites, jobs, materials and risk energy. As industry develops, various hazards may be added, with most hazards remaining within the current category.

<Table 1> Subjects for risk assessment and general management measures

Subjects for risk assessment	Management measures for risks
Facilities, machines with risks	Safety certification, safety test, protection device, isolation, pre-job inspection, instruction training, qualification or competence verification
Job site safety	Safety passage, safe workbench, safety handrail, scaffolding, lighting, traffic rules, etc.
Dangerous job	Work plan, safe work permit, work standard (procedure) and training, hazards prevention plan (construction), pre-job inspection, wearing helmet, etc.
Hazardous materials	Work environment measurement, health diagnosis, installation of local ventilation system, wearing helmet, posting MSDS and training, work standard (procedure) and training, prohibiting subcontract, etc.
Dangerous substance	Safe work permit, work standard (procedure) and training, explosion prevention measure, explosion-proof electricity, dike, fire extinguishing facility, safe distance, process safety report, hazard prevention plan, management of contractors, etc.
Dangerous energy	Safety device, earthing and insulation, safe work permit, work plan, work standard (procedure) and training, wearing helmet, etc.
Others	Labor-management participation, safety management system, suspending work and evacuation, training on health management, training on general safety, work behavior training, etc.

Then, why do we need additional risk assessment, when there are measures that have been implemented up until now? Has this system or measure been proven insufficient to manage hazards and ineffective to prevent accidents? In my personal opinion, I would say they are



not. Among these measures, some were designed or installed with fundamental application, which makes them highly effective and appropriate. However, most are related to work, which requires a strict standard (procedure) to follow in order to create effectiveness. The problem depends on how safely the work is done; therefore, a variety of methods such as drawing up work standard (procedure), offering training and supervision, and issuing a permit have been used to make sure the work is safely performed. However, human beings are not perfect as machines, making errors. It would require performing risk assessment on facilities or works using more fundamental method in order to secure safety or choosing other methods to reduce potential hazards, or to keep people from getting close to danger zone, or using less hazardous and dangerous materials to diminish hazards. These measures should be constantly researched and developed for the future; however, in most cases, currently used method and facility will be in action when performing work, which makes it hard to anticipate dramatic result of accident prevention unless safety is focused while at work.

Safety device or safety measure that possesses changing or moving flaws

The Swiss Cheese Model, proposed by James Reason, a British psychologist, is a widely accepted theory that explains cause and effect of accidents. The model explains that all the safety devices (or safety measures) have flaws as there are holes in Swiss cheese created by aging process of unique bacteria. In other words, one safety device cannot completely protect against hazards and there is a possibility that safety device might not work. Therefore, installing different types of safety devices in parallel layers is generally used to prevent accidents since another safety device can prevent accident when one safety device does not work, which multilayered safety devices are in place. However, safety devices or measures can still create flaws depending on time, work method, and work condition. They may be removed, damaged, or malfunctioned, causing flaws. In addition, many non-daily activities occurring at the field use low reliability safety devices (procedures) rather than high reliability safety devices, which may result in safety devices (or safety measures) nullified. It is because safety devices can function properly only when work procedures are completely followed at all times.

Despite being equipped with multiple steps of safety devices or safety measures, each safety device or measure still possesses inherent flaws, and they may be exposed simultaneously at the field due to changes or repairs in work. In this context, all safety devices and safety measures have changing flaws or moving flaws.

It is difficult to control potential hazards at all times with existing safety devices and measures since size or location of flaws may constantly change. Therefore, using a method focusing on supplier or supervisor such as having a simple slogan, instilling safety consciousness and enforcing laws in order to prevent accidents have limitations.

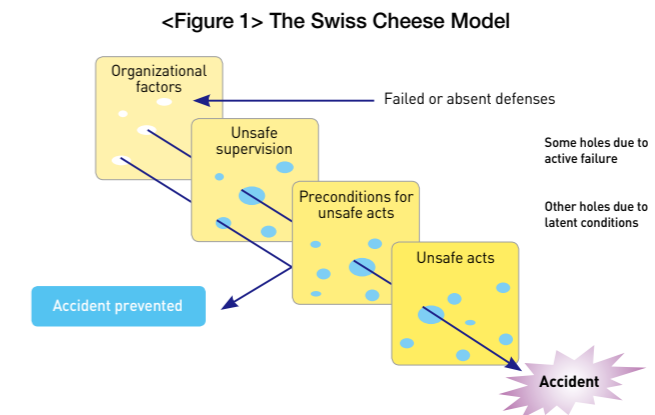
Hazards at the field are rarely removed unless intrinsic controls are taken such as changing process or material type.

Therefore, in most cases, potential hazards are controlled with layer of protections surrounding those potential hazards, which prevent them from being exposed externally. Protections are

classified into facility safety devices and administrative safety measures.

Facility safety devices have high reliability, but administrative safety measures are easily damaged due to human mistakes, resulting in low reliability. In other words, holes in each layer of protection indicated in "The Swiss Cheese Model" show the reliability status of each protection. Facility safety devices can have flaws while using due to malfunction or damage in protection device. Administrative safety measures have no effects if safe work permit system, safe work standard (or procedure), work plan, and safety education are not properly followed.

Most accidents are caused when two or more safety devices (or measures) are not properly worked (or operated) rather than one safety device or measure fails to activate, as shown in most accident reports. In other words, an accident rarely happens only due to one cause.



Drawing up and using Safe Operating Procedure (SOP)

In this article, the term SOP is used inclusive of Standard Operating Procedure (SOP) and Safe Work Practice (SWP). When I ask workers at the field this question, what answer would they give me? "Is SOP stronger or SWP stronger at your company? When I asked numerous people at various companies this question, the answer was very interesting since it was different depending on where workers were employed: foreign company or Korean company. While most Korean companies replied, "SWP is much stronger, most foreign companies said, "SOP is much stronger." What does this mean? Korean companies do not directly use SOP in most jobs.

Some companies manufacturing medicines use a similar system for a process related to manufacturing medicines (processes other than manufacturing are not applied); however, most companies do not either use SOP for each work or make major items of SOP as a checklist. While only companies with high safety consciousness draw up and manage SOP, most companies in Korea do not even retain the necessary SOP.

In addition, even though SOP is written up, it is rarely used in jobs. The method most Korean companies use is to prepare an operating (work) procedure for training, store the document in paper or computerized file, and offer regular refresh education as a mere formality. It is unusual



to check SOP before working.

Then, how can we know for sure that the work is performed as SOP states? It would not be easy to guarantee it. However, the completion status of the work should assure the quality of the job, so it can be assumed that the work probably was completed following the SOP. Therefore, SOP is regarded as a reference in Korea and applied accordingly.

How do foreign companies apply SOP? One foreign company that I know follows this procedure: when there is a work scheduled for today, SOP or a checklist (a checklist containing important items in each step of SOP) attached to SOP is printed out with the today's date and taken to the field. The work is proceeded as SOP states, completed and the checklist is signed to be submitted. This guarantees the specific work is safely performed. Therefore, the work that has SOP implies a guaranteed compliance of SOP, which means SOP is imposed stronger than work permit. SOP and risk assessment are inseparably related. Since improvement measures for risk assessment are included in SOP, complying SOP guarantees the implementation of risk assessment.

In other words, when performing risk assessment for a work, if there is SOP, SOP contents and actual works done at the field are inspected to figure out hazards. Afterwards, measures to manage hazards are included in this SOP, revising SOP, and the revised SOP is complied accordingly to perform the work safely.

In case there is no SOP, and there is a possibility that the specific work will be repeatedly performed, SOP needs to be drawn up and complied as the most effective safety measure against hazards relative to the work. In other words, SOP is a tool that provides a verified method to perform the work in the safest and the most efficient way; therefore, SOP compliance is an essential element for work safety.

SOP compliance is an improvement measure for risk assessment. If SOP is not applied to actual work and the work is performed relying on worker's experience, human errors may occur and SOP is neglected.

This may lead to the work being done unlike SOP states and hazards that may happen during job are overlooked or neglected, resulting in accidents. Therefore, for strict compliance of SOP, SOP must be drawn up for all the dangerous works. In addition, a checklist including essential items for safety and quality for the job needs to be created and managed for inspection and compliance.

Job based safety, JBS

If a company consists of employees who always perform jobs safely even when no one is around, it probably would provide the highest level of safety in the world. Considering safety as an important value would be the ultimate goal of all companies.

In order to accomplish this mindset, system-based safety needs to be retained and training to promote safety consciousness of employees and two-way communication are necessary. Dupont uses a term "Operational discipline". It can be translated as "a behavior performing a certain task", and means "the deeply rooted dedication and commitment by every member of an organization to carry out each task the right way every time." In other words, it is an idea about

the work behavior, that it is natural and worthwhile to perform the assigned task safely even when no one is looking.

Most accidents seem to be caused by unsafe behavior of workers rather than defects in facilities. In general, it is not an intentional violation to cause these accidents. Rather, they occur due to work environment, mistakes, or human errors by systematic flaws present in the company. How to reduce accidents caused by human errors has always been an issue and it is still ongoing. I think job based safety is required to prevent these human errors at work.

<Figure 2> shows a concept of job based safety that is used to secure safety while working. In general, Korean companies issue a safe work permit (SWP) to secure safety before starting work, confirm if it is ok to start the work, deliver workers simple precautionary measures related to work, and a supervisor or patrol manages the work. This method has been effective.

However, accidents constantly occurred at the jobs that had a SWP issued due to work condition and environment, which has led to the need for safety measures.

<Figure 2> A concept of job based safety (JBS)



As in <Figure 2>, using an existing work permit, precautionary measure and supervision poses a limitation in order to secure work safety since work permit focuses on "whether it is ready to perform work or it is authorized to perform the work". It hardly focuses on how to perform the work. In other words, a work permit is enough to manage risks for some jobs; however, in many cases, a work permit alone cannot precisely manage work risks as a whole. Therefore, in order to manage hazards that occur during work (for each step of work procedure), Job Safety Analysis (JSA) is needed. Furthermore, it is necessary to deliver (communicate with) workers the contents of work risk assessment (hazards that may occur during work steps and the methods to manage them) for compliance and safe conduction of works. Delivering precautionary measures by supervisor is focused on the supplier, which makes relaying the message difficult. Therefore, having a two-way communication about results of JSA is required to share work risks and countermeasures.

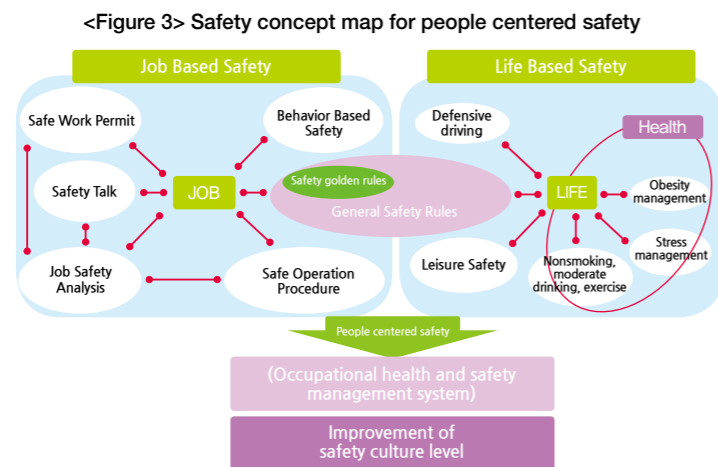


While foreign companies have been applying a work risk assessment for a long time, Korean companies started to apply it because a frequent risk assessment during “maintenance work” was enforced in notification of the Ministry of Employment and Labor. However, a risk assessment is still being implemented at the field in a rather passive way to comply with the law, so it would take time for the law to be established properly.

If a specific work is repeatedly performed, there is a need to draw up SOP and follow it to perform the specific work. SOP needs to be analyzed and managed based on Behavior Based Safety (BBS) for safe conduction of important works, and the existing methods such as field patrol and supervision needs to be utilized as well. If all works are performed following these, work safety will be secured.

People centered safety

People centered safety will be explained separating job based safety and life based safety. It summarizes methods that I have tried at the field in order to prevent accidents, various experiences and implementation methods performed by foreign companies. Additional elements may be added, and some elements can be removed. A basic concept map for People centered safety is shown in <Figure 3>.



The core of job based safety was explained before, so now I would like to explain general safety rules and life based safety. For details of general safety rules, please refer to General Safety Rules in KOSHA GUIDE G-62. Basic items may be considered as basic standards for safety and health that need to be complied by everyone who has access to the field. Some of the items described here are common sense related to safety; however, many people do not even keep up with the level of common sense.

This is why general safety rules customized to the condition of specific work field should be

drawn up in reference to KOSHA GUIDE for all workers to understand and comply with them. I think that the strict compliance of general safety rules can even prevent many accidents. In order to prevent severe accidents that can happen at the field, there is a need to choose 5-12 items as core elements, which are safety golden rules, for compliance.

When choosing safety golden rules, it is necessary to choose them based on workers' (field) opinions rather than supervisor's. It is recommended to receive workers' ideas or vote among about 20 ideas to choose essential safety standards. Recently, many companies implement this method to select safety rules or safety golden rules, namely, and chant in unison at each meeting, which is deemed beneficial to create a culture complying with safety golden rules and to contribute improvement in safety culture at the fields.

While the core of people centered safety is “job based safety”, “life based safety” is important as well. It is related to workers' health and safety outside the field. Workers' health is important issue since it affects safety of workers. Health is maintained by obesity management (cerebral and cardiovascular health management), nonsmoking, moderate drinking, and stress management. I won't go into details of workers' health other than mentioning it being important for job safety. Among life based safety, defensive driving (safe driving) of a vehicle is important. There is a need to provide training on defensive driving so that value of safety inside the field is regarded as important as the value of safety outside the field. In addition, leisure safety needs to be focused as well in order to prevent accidents during leisure activities. Many elements of general safety rules mentioned previously can be applied to life based safety.

People centered safety begins at job based safety, and it needs to be expanded to life based safety. Ultimately, occupational health and safety management system needs to be introduced for proper establishment of people centered safety.

In order to effectively remove and manage potential hazards in various facilities, works, and environment, systematic implementation by occupational health and safety management system is necessary for constant improvement of safety culture and safe work fields. Improvement in safety level by focusing on people centered safety is anticipated. 🌱





2017 APRCC



Community - Toward a Perfect Partnership".

At the main conference on the first day, Mr. Patrick Vandenhoeke, a President of RCLG Leadership Group, delivered a keynote speech emphasizing that RC may not satisfy all the requirements to accomplish a sustainable development, but it provides a foundation for sustainability (economy, environment, society).

He explained that RC can contribute to the establishment of a foundation for sustainability in terms of society through effective implementation of projects, resulting in protection of economy and environment, and process safety, which would lead to participation of local communities and safety and health of business fields.

At this event, there were heated discussions about RC-related issues such as the difference between sustainable development and RC, the method to support an implementation of regulation for RC process safety code, RC programs available for small- and medium-sized companies, balance (harmony) between environmental safety regulation and RC programs.

The 15th APRCC (Asia Pacific Responsible Care Conference), hosted by Singapore Chemical Industry Council, was held successfully at Carlton Hotel in Singapore from Oct. 30th to 31st with 150 environment safety personnel from 12 member countries in Asia-Pacific region. The theme for the event was 'Responsible Care programme - The Way Paved for Business Substantiality', and there were presentations and discussions about recent issues related to RC and the future direction of RC implementation and tasks.

APRCC has been held every other year since 1995 (in Hong Kong) with a purpose of bringing 12 member



* Australia, China (Hong Kong), India, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Thailand.

countries in Asia-Pacific region together for mutual development and improvement in an image of chemical industry through promoting RC activities and sharing exemplary cases. It has evolved into a conference that represents fields of environment and safety in Asia-Pacific region.

The 8th APRCC was held in Korea at Seoul Coex Intercontinental Hotel from Nov. 4th to 7th in 2003 with a theme of "Responsible Care and the

[Topic 1] Sharing a variety of views of RC on sustainable development

◆ A vision of chemical industries to constantly contribute to the sustainable development (Mr. Sohei Morita, Vice-Chairman of Responsible Care Leadership Group)

Although mankind faced great difficulties as a result of World War I and II in the 20th century, economic activities were expanded through scientific and technological developments, bringing humanity prosperity. At the same time, industrialization has resulted in negative impacts on natural environment. In order to solve this problem, a concept of 'environmental protection compatible with economic growth' has emerged in the mid to late 20th century.



In order to provide a clear guideline on sustainable development, United Nations adopted 17 Sustainable Development Goals, SDGs, as an agenda in 2015 through numerous discussions. There are 17 goals with 169 detailed targets and 230 indicators, and the agenda calls for implementation action by 2030.

2017 APRCC

• 17 Goals •

- | | |
|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. End poverty in all its forms everywhere | 11. Make cities inclusive, safe, resilient and sustainable |
| 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture | 12. Ensure sustainable consumption and production patterns |
| 3. Ensure healthy lives and promote well-being for all at all ages | 13. Take urgent action to combat climate change and its impacts |
| 4. Ensure inclusive and quality education for all and promote lifelong learning | 14. Conserve and sustainably use the oceans, seas and marine resources |
| 5. Achieve gender equality and empower all women and girls | 15. Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss |
| 6. Ensure access to water and sanitation for all | 16. Promote just, peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels. |
| 7. Ensure access to affordable, reliable, sustainable and modern energy for all | 17. Revitalize the global partnership for strengthened implementation methods and sustainable development |
| 8. Promote inclusive and sustainable economic growth, employment and decent work for all | |
| 9. Build resilient infrastructure, promote sustainable industrialization and foster innovation | |
| 10. Reduce inequality within and among countries | |

Responsible Care® was established by the chemical industry in 1985 as a voluntary initiative, creative program for environment and safety. There have been in depth discussions within ICCA about how the relationship between RC and sustainable development as well as sustainable development of chemical industry should be handled.

JCIA, as an effort to respond to it, actively participated in the discussion organized by ICCA in Jan. 2017, and established sustainable development goals TF in order to promote contribution made by Japanese chemical industry and to give a guidance to member companies.

• JCIA sustainable management goals T/F •

- Purpose: To actively participate related discussions by ICCA, re-establish RC in terms of sustainable development and increase contribution of Japanese chemical industry to sustainable development goals
- Participating companies: Sumitomo Chemicals, Mitsubishi Chemical Holdings, Mitsui Chemicals, Showa Denko
- Basic thoughts
 1. Japanese chemical industry has been operated for more than 100 years, and dealing with sustainable development while looking back upon industry's history has a great meaning.
 2. How has Japanese chemical industry contributed people's lives? What types of problems existed in the past? How were these problems solved?
- Debate content
 - TF reviews the economic growth since World War II and solutions for related problems, and recent innovation through functional materials, and examines history of Japanese chemical industry by period for introduction and implementation of Responsible Care
 - Not only providing solutions for current problems but for future problems related to 2030 sustainable development goals. About a method that utilizes our power to accomplish 2030 sustainable development goals
- Upcoming tasks
 - Understanding problems that we may be facing in the process of accomplishing SDG, and what solutions chemical industry can provide solutions for, and then considering what measures to take

While chemical industry should deal with all of SDG(sustainable development goals), T/F classifies SDG into three basic categories, economy, environment, and society. Dealing with SDG does not mean to start 'SDG activities' from the beginning but to contribute to accomplish SDG in various aspects through integration of activities for economic growth such as global expansion of business. In other words, RC and CSR are not only essential activities that carry out social responsibilities of a company but activities that can be developed to achieve SDG when they are integrated with fundamental activities for realization of sustainable society or with people for economic growth.



It is recommended for member companies to integrate activities that support company establishment and economic growth such as business strategies, as RC does. This means that contributing to SDG can accelerate a company's growth. We create innovation toward sustainable development goals with power of chemistry and contribute to healthy and prosperous lives of people. Furthermore, we provide support to solve environmental and safety problems, strive to engage in communications and deliver messages to related parties for encouraging contributions made by chemical industry.

[Topic 2] RC programs for small-and medium-sized companies

□ RC implementation by small- and medium-sized companies (David Sandidge, Senior Director, Responsible Care & Value Chain Outreach American Chemistry Council)

RC has contributed to reliability improvement through third party verification and system effectiveness test as the world-level environment-safety-health assessment movement by chemical industry. RC is implemented based on self-measurement and assessment (manpower, resources, changing the way of thinking). Transparency for regulation authority is achieved by advance action rather than not responding to environment regulation. Currently, RC is being implemented in 65 countries around the world, and RC chemical companies in the U.S. show differentiated and enhanced performances such as having 5 times higher safety than manufacturing companies, 62% decrease in transport accidents, and 51% reduction in process safety accidents since 1995.

RC is being implemented divided into different scopes of environment-safety-health management system(guideline, management system by third party, performance measurement, emphasizing 6 codes) and code system(environmental protection, process safety, industrial safety and health,

2017 APRCC

product responsibility, transport safety and supply chain, security, contribution activities and recognition by local communities).

We provide several services for RC member companies. These include offering preview of 'eligibility' of members, monthly coordinator conference calls, guideline and manual, RCMS / RC14001 implementation workshop and hosting annual RC conference, and providing consultation for employees and committee members. In addition, services such as coordinating communication between managing leaders and sponsors, selecting RC coordinator, understanding requirements, integrating current regulations, providing training and management, choosing project management method and EHS(environment, health, safety), developing RC expansion team, and implementing annual management-review are provided.

For these services, educational instruction materials, and websites(americanchemistry.com), educational video(AICM, for Responsible Care(ICCA website, RC leadership group library)) are used.

[Topic 3] Regulations and RC program(Leendert van Dijk, Eastman Chemical Asia Pacific Pte Ltd)

Through consistent improvement in health, safety and environment and honest communications with related parties, Responsible Care goes above and beyond the level required by the law, sharing its performances with employees, local communities and public. Furthermore, dynamic initiative has been developed constantly in order to solve challenges whose value chain is faced with chemical manufacturers.

Responsible implies to have a duty to do something, to take control or to care for others, and to take responsibility or criticism for main causes of problems. Care means a need to prepare for health, welfare and protection of people and objects, a serious caution or consideration.

As seen in the keynote for tightening regulations in Asia region, many countries consider revision in regulatory laws for chemicals. Side effects following this movement are an increase in non-tariff barriers, negative impacts on innovation, rise in export costs, waterfall effect(chemicals exist everywhere), and focus insufficiency(not accomplishing goals of safety and health improvement), and they are appearing in several fields.

As a solution for these side effects, RC protects workers and environment, encourages business and innovation, and prevents a non-tariff barrier. In particular, industry associations in each country can collaborate with government based on international experiences and shared common views, and strengthened cooperation (chemical industry and regulation authority) with 10 ASEAN countries is

much needed. For the question 'Is RC still needed in the midst of strengthened regulation?', we can say for sure that RC is absolutely needed.

RC is enabled with a license to operate by searching for a win-win method through focusing on the common goal with government cooperation. Playing a bridge role filling the gap between related parties with self-initiated attitude and constantly changing its role depending on regulatory environment and anticipation by related parties (people and government) are required.

In the current situation where new and detailed regulations keep increasing, there is a need to secure appropriate speed and complexity for all the parties (industry and government) to keep up with. In addition, an approach method by phases (waiting-jumping or flying) to accomplish the ultimate goal is needed. RC can wipe off these concerns and make a difference by offering a solution and complementing flaws. Cooperation among countries is essential in order to achieve regulation goals and protect humans and environment, and we need to encourage innovation while maintaining competitiveness of chemical industry.

During the APRCC, APRO (Asia Pacific Responsible Care Organization) meeting among representatives from 12 member countries of Asia-Pacific region was held on Oct. 31st at Carlton Hotel with President Mr. Sohei Morita and 20 people present. At the meeting, a report about RCLG (Responsible Care Leadership Group), ICCA board of directors was presented, Joint Capacity Building for 2018 was introduced, whether CPCIF(China Petroleum and Chemical Industry Federation) would be invited as a member country of APRO was discussed, and the venue for the next APRCC in 2019 was decided.



It was decided unanimously by 12 member countries that the 16th APRCC would be held in Seoul, Korea. Since the year 2019 marks the 20th year of founding the KRCC, hosting APRCC in Korea would carry a special meaning. For celebrating the 20th anniversary of founding the KRCC, attention and participation by domestic and foreign environmental safety representatives would be much appreciated. 🌱





Members Focus >>>



LOTTE MCC

Lotte MRC to change its company name to Lotte MCC

Lotte MRC, a subsidiary of Lotte Chemical and methyl methacrylate manufacturer, changed its company name. Lotte Chemical announced on Jun. 26th, 2017 that Lotte MRC changed its company name to Lotte MCC. The change followed the fact that its business partner was changed from Mitsubishi Rayon to Mitsubishi Chemical. Mitsubishi Chemical merged several subsidiaries including Mitsubishi Rayon and Mitsubishi Plastic in April. Lotte Chemical explained that the company name was changed at around when the office building of chemical subsidiaries was relocated in order to minimize confusion of the market and consumers. Lotte MRC, established on Aug. 2006, specializes in MMA manufacture. It operates MMA factory in Daesan, Chungnam and PMMA manufacturing facility in Yeosu, Jeonnam. Lotte Chemical and Mitsubishi Rayon invested 50% each.



SKC, seeking for global cooperation with Evonik, a German company

SKC announced on Oct. 10th, 2017 that it is in the process of global cooperation with Evonik that owns an original 'HPPO' technology, an environment-friendly PO (propylene oxide) manufacturing method. 'HPPO' process uses hydrogen peroxide as a catalyst to produce PO, not emitting hazardous materials. Only PO and water are created from this method; therefore, it is considered to be highly cost-effective and environment-friendly unlike processes that create other by-products. SKC is considering two plans for global cooperation. The first is for both companies to provide HPPO technology and engage in O&M of the HPPO factory. SKC announced on Oct. 10th, 2017 that it is in the process of global cooperation with Evonik that owns an original 'HPPO' technology, an environment-friendly PO (propylene oxide) manufacturing method. 'HPPO' process uses hydrogen peroxide as a catalyst to produce PO, not emitting hazardous materials. Only PO and water are created from this method; therefore, it is considered to be highly cost-effective and environment-friendly unlike processes that create other by-products. SKC is considering two plans for global cooperation. The first is for both companies to provide HPPO technology and engage in O&M of the HPPO factory. SKC succeeded the world's first commercialization

of HPPO method just 2 years after introduction of the technology, and the factory has been operating at more than 100% capacity for 10 years. SKC signed MOU with a few companies among five companies from China, the Middle East and European region that requested a partnership and is reviewing a collaborative plan with Evonik. The second plan is to cooperate in the field of hydrogen peroxide that is used in HPPO process. SEPK, a hydrogen peroxide manufacturer established as a joint venture between SKC and Evonik, is located near the HPPO facility. SKC is in the process of collaborating with Evonik to expand hydrogen peroxide business using expertise of SEPK. If the HPPO method is spread to the global market through the cooperation of two companies, sales is expected to greatly increase. The current global PO production per year is 9 million tons, which is USD 13.5 billion, and the production quantity by HPPO method is about 1.5 million tons, comprising only 16.7% of the total PO production, which shows a great growth potential of the HPPO method.



SK Global Chemical to acquire Dow Chemical's polyvinylidene chloride (PVDC) business

SK Innovation has acquired polyvinylidene chloride (PVDC) business of Dow Chemical, the largest petrochemical company in the U.S. It is the second M&A in the chemical business this year. SK Innovation announced on Oct. 11th, 2017 that its affiliate SK Global Chemical signed a business transfer agreement with Dow's PVDC unit.

SK Global Chemical will acquire the business unit as a whole including SARAN, Dow's PVDC trademark right, manufacturing facilities located in Michigan, related manufacturing technologies, and other intellectual properties. The value of the transaction is not being disclosed.

SK Global Chemical said, "With our move to acquire Dow's PVDC business as well as EAA(ethylene acrylic acid) back in February, we have approached one step closer to become a comprehensive chemical packaging company that encompasses major product groups of chemical field."

With the acquisition, SK Global Chemical secured high-value core material groups of multilayer packaging films, diversifying its business portfolios through synergy with existing technology, increasing consumer accessibility, thereby accomplishing its goal to develop customized products that combine technology and materials. In particular, it plans to tackle the Chinese market, the largest and rising market for packaging materials, with existing infrastructure and network, the company said.



Lotte Chemical to expand to synthetic rubber business... Completing an elastomer plant in Yeosu

A synthetic rubber plant of Lotte Versalis Elastomer in Yeosu was completed with a capacity of 200,000 tons of SSBR-EPDM facilities. Lotte Chemical held a joint venture completion ceremony on Nov. 23rd, 2017





with 200 people present including Huh Soo-Young, BU director of Lotte Chemical Corp., Kim Gyo-Hyun, CEO of Lotte Chemical Corp., Daniele Ferrari, CEO of Versalis, related personnel and client companies.

Established in 2013 with a 50:50 joint venture between Lotte Chemical and Versalis, 'Lotte Versalis Elastomers' completed SSBR and EPDM facility with 26-month construction period.

The facility is equipped with annual production capacity of 200,000 tons of high-functional synthetic rubber. Currently, it is in a stage of testing operation and is planned to start commercial operation next year. The company estimates annual sales of 500 billion won in synthetic rubber business.

SSBR (Solution Styrene Butadiene Rubber), produced with raw materials of butadiene and styrene, is considered as an essential material in manufacturing environment-friendly tires with low energy consumption and high durability.

"It is a strategic joint venture that utilizes strengths of both Lotte Chemical and Versalis. Lotte Versalis Elastomers will become a global chemical company with stable product portfolios through establishing new, high-value businesses.", Lotte Chemical said.



GS Caltex with large investments, to go and beyond of oil refiner and expand into petrochemical industry

GS Caltex is carrying out a plan to build NCC and PE facilities. According to a source in oil refinery industry on Nov. 14th, GS Caltex is reviewing to establish NCC and PE facilities in Yeosu, Jeonnam, with capacity of 700,000 tons and 500,000 tons, respectively, with a goal to start construction in Jan. 2019.

The investment cost is estimated to be USD 2 billion (approx. 2.2430 trillion won). GS Caltex will be the 7th company in Korea that retains NCC, after LG Chemical, Lotte Chemical, Yeochun NCC, Hanwha Total, SK Innovation and Korea Petrochemical.

The reason why GS Caltex is reviewing a plan to build new NCC and PE (polyethylene) production facilities in Yeosu plant in Jeonnam is because its traditional oil business of refining and selling light oil has its limitations for growth.

GS Caltex would like to take advantage of a rising demand for ethylene and propylene globally, which has resulted in a large-scale investment. According to the industry, the plan seems to have high business value since it will encompass the upstream, which decomposes naphtha, the first step in petrochemical process, into ethylene and propylene, and downstream, which produces polyethylene. GS Caltex is focusing its effort in optimization of overall value chain from the step of purchasing, refining to selling crude oil.

Its move to invest in petrochemical industry facilities including NCC is interpreted as a part of optimization effort. GS Caltex representative said, "We will seek to maximize profitability through a cooperation with U.S. Chevron."



BASF to acquire SOLVAY's global polyamide business...for 2 trillion won value M&A

BASF, a German chemical company, is to acquire polyamide business of SOLVAY, a Belgian chemical company. According to Korea BASF and chemical industry sources, the purchase price for SOLVAY's polyamide business would be debt-free basis of €1.6 billion (2.16 trillion won).

M&A between BASF and SOLVAY is subject to consultations with the relevant parties of SOLVAY and then will enter a binding purchase agreement.

Both companies aim to close the transaction in the third quarter of 2018 after regulatory approvals have been obtained by each authority and the formal consent of a joint venture partner has been received.


BASF plans to strengthen its engineering plastics portfolio through acquisition of SOLVAY's polyamide business. Particularly, it will expand the company's position as a solution provider for the automotive, construction, industry applications, and consumer industries.

BASF representative said, "The deal will help boost exposure to markets in Asia and South America, and strengthen BASF's polyamide 6.6 value chain through increased polymerization capacities and integration into ADN(adipodinitrile), a key raw material." For the year 2016, the net sales of the polyamide business to be purchased from SOLVAY was €1,315 million and EBITDA to around €200 million.



Dow Chemical Korea to support a building renovation for community children's center with ChildFund Korea

On Sep. 28th, Dow Chemical Korea revealed that a building renovation program to improve a community children's center facility was implemented with ChildFund Korea. The activity implemented with ChildFund Korea is a program to support a building renovation of childcare center in order for children to live in safe and clean environment. In particular, mattresses applied with Dow's polyurethane and environment-friendly paints using Dow's coating technology were used for this project.

Employees and executives at Dow Chemical Korea participated in an activity to make safe and clean environment for children at Igseon-won in Cheonan on Sep. 21st and at Eden Iville nursery school in Seoul on Sep. 28th, replacing mattresses and paints. Yoo Woo-jong, President of Dow Chemical Korea said, "This project is aligned with our past programs that helped children in need such as supporting children's safety, installing yellow carpet and providing children's meal services. We expect children to grow in healthy environment through the program that improves the welfare of community children's facilities." 





2017 the 3rd implementation council was held

The Korea Responsible Care Council hosted 'The 3rd Implementation Council' on Sep. 7th, 2017 at the conference room of Korea Responsible Care Council with Park In, the executive committee director (a managing director of LG Chemical) and 12 people from 8 member companies present. At the implementation council, product liability cases were presented by member companies and a RC liability checklist was examined. Kim Han-gi, the Vice president of Global talent management institute, introduced product liabilities including the definition, scope of works, and major cases related to product liabilities in the U.S. and China.



'Open 2017! Joyful Chemical Society' was held

'Open 2017! Joyful Chemical Society' was held for 4th and 5th graders in Yeosu (Sep. 2nd), Seosan (Sep. 9th), and Ulsan (Sep. 16th). The event has been held since 2003 in order to provide students opportunities to participate in easy and fun chemistry experiments through chemistry 'field activities' and 'playground' programs and to establish a network joining local communities and chemical industry.

This year's event, with a theme 'Chemistry in everyday life', was successfully held with participation of 994 students from 132 elementary schools in Seosan, Ulsan and Yeosu regions. At the opening performance, a magic show promoting chemical industry was presented, introducing cases that use chemical reactions in everyday life. Many students said that they enjoyed the event since they could participate in various chemistry experiments firsthand. 53 people from 3 member companies volunteered as a team guide to lead the children safely, and helped parents and students have more interests in chemistry that has a close relationship with everyday life.

Industry (KRCC 22 member companies)

Platinum: Tongsuh Petrochemical, Lotte Chemical, SK Global Chemical, LG Chem, Yeochun NCC, Hanwha Total

Gold: Kumho Petrochemical, Daelim Industrial, Korea Petrochemical, Dupont Korea, Dongwoo Fine Chem, Lotte Fine Chemical, BASF Korea, Ineos Styrolution Korea

Silver: Lotte MCC, Samnam Petrochemical, AK Petrochemical, Evonik Korea, Air Liquid Korea, LG MMA, Kolon Industries, TRINSEO Korea

Government/Institute

Ministry of Trade, Industry and Energy / Ministry of Environment / Jeonnam Yeosu City / Chungnam Seosan City / Ulsan Metropolitan Office of Education / Jeollanamdo Office of Education / Chungnam Seosan Office of Education / Korea Petrochemical Industry Association

Academia (Teachers' groups in 3 regions)

Jeonnam region (Teacher's bonding over chemistry), Chungnam region (Support group for reinforcing science education in Seosan), Ulsan region (Ulsan science education research institute)

Participated in 2017 APRCC (Asia-Pacific RC Conference)

The 15th APRCC (Asia Pacific Responsible Care Conference), hosted by Singapore Chemical Industry Council, was held successfully at Carlton Hotel in Singapore from Oct. 30th to 31st with 150 environment safety personnel from 12 member countries in Asia-Pacific region.

The theme for the conference was 'Responsible Care programme - The Way Paved for Business Substantiality'. There were presentations and discussions about the recent issues related to RC, support measure for implementation of RC process safety code, RC programs available for small- and medium-sized companies, balance (harmony) between environmental safety regulation and RC programs.



Participated in 2017 APRO (Asia Pacific RC Organization) meeting

APRO (Asia Pacific Responsible Care Organization) meeting was held on Oct. 30th at Carlton Hotel in Singapore. President Mr. Sohei Morita (JCIA, Japan Chemical Industry Association) and 20 representatives from APRO member countries were present at the meeting.

At the meeting, a report about RCLG (Responsible Care Leadership Group), ICCA board of directors was presented, Joint Capacity Building for 2018 was introduced, whether CPCIF (China Petroleum and Chemical Industry Federation) would be invited as a member country of APRO was discussed, and the venue for the next APRCC in 2019 was decided.

It was decided unanimously by 12 member countries that the 16th APRCC would be held in Seoul, Korea. Since the year 2019 marks the



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NEWS

RC Activity



20th year of founding the KRCC, hosting APRCC in Korea would carry a special meaning. Celebrating the 20th anniversary of founding the KRCC, attention and participation by domestic and foreign environmental safety representatives would be much appreciated.

2017 the 4th implementation council was held

The KRCC hosted 'The 4th Implementation Council' at Jeju Maison Glad Hotel on Thursday Nov. 16th, 2017 with Park In, the executive committee director (a managing director of LG Chemical) and 15 people from 12 member companies present. At the council, Kim Gyeong-ok, RC advisory committee member, presented a case study on CSR activities of chemical companies and 'Recognition by local communities and emergency response' checklist was examined.

In addition, a plan to distribute and utilize RC checklist for RC member companies and related cooperating firms was discussed. The council plans to review RC checklist for revisions and changes by the first half of 2018 and make a manual by the second half of 2018, if necessary, to increase checklist utilization.

2017 KRCC annual workshop was held

'2017 KRCC Annual Workshop' was held at Jeju Maison Glad on 16th and 17th of Nov. 2017.

Lee Jong-hoo, President of the KRCC, and 50 people from 27 member companies attended the annual workshop. A special lecture by Mr. Ramabhadran, Dupont Sustainable Solutions was about management of operation risk, and a method for human resource development in preparation for the fourth industrial revolution was presented by Yoon Gyeong-ro, director of Global Talent Management Institute. Furthermore, there was a lecture on persuasion method achieving good outcomes, and exemplary cases in environmental safety were presented. (①Kim Hange (RC advisory committee member)- Integrative environmental safety management for chemicals in the future ②Choi Chang-wook (Department head at BASF Korea)- Introducing Global EHS Audit System) 🌱

Information on main activities of the KRCC in the first half of 2018



○2018 the 1st board of directors meeting and the 19th regular general assembly

Date: Monday, Feb. 12th, 2018

Location: TBD

○2018 Responsible Care Leadership Group (RCLG) Meeting

Date: March, 2018

Location: TBD

○2018 the 1st implementation council

Date: March, 2018

Location: Conference room at the council

About: Developing RC checklist

○Hosting 2018 briefing session on petrochemical environmental policy

Date: April, 2018

Location: Korea Chamber of Commerce and Industry

○Hosting a workshop to establish safe culture in chemical plants

Date: March, 2018

Location: Ulsan (TBD)



Members

Regular Members

- Air Liquid Korea
- AK Petrochemical
- ARKEMA
- Axalta Coating Systems Korea
- BASF Korea
- Bayer Korea
- Capro
- Conell Bros
- Covestro Korea
- Daelim Industrial
- Daesung Industrial Gases
- Dongwoo Fine Chem
- Dow Chemical Korea
- Dowcorning Korea
- Dupont Korea
- Eastman Fiber Korea
- Evonik Korea
- GS Caltex
- Hanhwa Chemical
- Hanhwa Total
- Hanju
- Hansu
- Hyosung
- Ineos Styrolution Korea
- ISU chemical
- Kolon Industries

- Korea Alcohol Industrial
- Korea ASK Chemical
- Korea Petrochemical
- KPX Chemical
- KR Copolymer
- Kumho P&B Chem
- Kumho Petrochemical
- Lanxess Korea
- LG Chem
- LG MMA
- Lotte Advanced Materials
- Lotte BP Chem
- Lotte Chem
- Lotte Fine Chem
- Lotte MRC
- Merck
- OCI
- Polymirae
- Samnam Petrochemical
- SH Energy Chemicals
- SK Global Chemical
- SKC
- Taekwang

- Tongsuh Petrochemical
- TRINSEO KOREA
- Yeochun NCC
- Yongsan Chemical

Associate Members

- Korea Petroleum Association
- Metropolitan Process Safety Council
- Korea Fertilizer Industry
- Korea Petrochemical Industry Association
- Korea Specialty Chemical Industry Association
- Korea Chloride Alkali Industry Association
- Korea Chemicals Management Association
- Korea Testing & Research Institute

Detailed programs and schedules will be announced later. Your interests and participation will be much appreciated.



Information on "2018 1st board of directors meeting and 19th regular general assembly"

The KRCC invites executives and employees of member companies to the '2018 1st board of directors meeting and 19th regular general assembly', which will be held to discuss results of businesses implemented by the KRCC, project plans and budget for 2018. We will appreciate your participation and advices on implementation of Responsible Care by chemical industry.

Date: 11:00~13:00, Monday Feb. 12th, 2018
Location: The Plaza Hotel (119 Sogong-ro, Jung-gu, Seoul)
Invitees: CEOs, executives, employees, and coordinators of member companies

