

Korea Responsible Care Council

Issue No.26
2011 여름호

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“International Year of Chemistry” Chemistry – Our Life, our future

“International Year of Chemistry 2011”

The year 2011 marks the 100th anniversary of the establishment of the International Association of Chemical Societies and Marie Curie's acceptance of the Nobel Prize in Chemistry. In commemoration of chemistry's remarkable contributions to human welfare, the IUPAC and the UN have declared 2011 to be the “International Year of Chemistry” (IYC 2011). Under the theme of “Chemistry-Our Life, Our Future”, a variety of activities and events will be held and special commemoration events will also be hosted by the Korean Chemical Society in Korea.

History of Chemical Research

Chemistry is the science of studying the changes in materials. This science has been closely related to human life and has developed consistently throughout history. Since the age of industrialization, chemistry has played a crucial role in society. Humankind has since long been trying to study natural phenomena and the chemical elements that materials are composed of. Owing to these efforts, we can now combine elements to create new materials and enhance our quality of life.

Democritus, an ancient Greek philosopher (ca. 460 BC - ca. 370 BC), said “I can smell bread at a distance when someone bakes it in the kitchen. This means that very tiny pieces of bread floated in the air and entered my nose. Such materials consist of very tiny pieces which cannot be split further.” This observation proposed an ancient atomic hypothesis and established some basic concepts of chemistry. The alchemists of the Middle Ages arduously strived to turn cheap metals into gold on the basis of the “Five Element” theory. This led to the development of various tools for experimentation and methodologies to facilitate precise chemical experiments such as metal refinement. Robert Boyle (1627-1691) later established a sound footing for

the development of chemistry by separating chemistry from alchemy. He discerned the elements from materials and verified that atoms are the basic elements of materials. Antoine Lavoisier (1743-1794) is widely recognized as the "father of modern chemistry." He focused on making precise measurements during his chemical experiments, and he proposed the Law of Conservation of Mass based on the results of his combustion experiments. This sparked a period of systematic chemical research that led to an expanded understanding about the structures, characteristics, and transformations of materials. Friedrich Wöhler (1779-1848) synthesized urea, an element of urine, from inorganic compounds, which demonstrated that organic compounds can be made from inorganic compounds. This led to the establishment of organic chemistry.

Chemical Compounds and the Chemical Industry

The major role of chemistry is to synthesize rare expensive materials or materials not found in nature through artificial chemical reactions. Beginning in the late 18th century, the development of modern chemistry has enabled the mass production of various compounds. As industrialization necessitated the increased use of various high-purity chemical materials, chemistry-based manufacturing processes were developed further and upgraded. For instance, high-purity aluminum oxide (α -alumina) needs to be made from bauxite to produce aluminum. The Bayer process, which is the chemical means of purifying bauxite by subjecting it to high temperatures and pressures and washing it with a high-density solution of sodium hydroxide through hydrolysis, is used in the production of bauxite. As described above, chemistry progresses in tandem with industries to produce high-density materials.

Medical products, fertilizers, and pesticides have been produced since the late 19th century. These materials have helped to reduce disease and hunger and have stoked rapid growth in human populations. The Haber-Bosch process, a revolutionary finding in the chemical industry, was developed in the 20th century. Fritz Haber (1886-1934), a German chemist, developed a method for producing ammonia through the reaction of nitrogen gas and hydrogen gas. He won the Nobel Prize in Chemistry for this accomplishment in 1918.

Synthetic dyestuff and synthetic polymers have enhanced the quality of human life, but they have also led to the overuse of petrochemical products. The Modern information technology and electronic industries are also highly dependent on chemical technologies to enable the production and processing of new materials. The necessities of life, such as food, clothing, and shelter, are produced mostly from chemical materials through chemical processes.

Chemistry in Modern Industrial Society

The chemical industry has had increasing industrial implications in the development of other industries in the 20th century. As a result, the petrochemical industry has come to play a leading role in our society. Kerosene used to be a major energy resource prior to the 20th century, but the demand for gasoline quickly grew due to the rising production of motor vehicles and the development of high-precision equipment such as aircrafts. This also led to the development of chemical industries related to oil refining, as well as petrochemical companies producing various products from petroleum gas and naphtha. Chemistry thus became more closely linked to industry. For example, German chemists have studied coal liquefaction to produce raw materials for petrochemical products without petroleum in Germany because the nation lacked the means for oil production. The Fischer-Tropsch process was established through these efforts to enable coal liquefaction, which has helped to develop the basic chemistry and the chemical applications of hydrocarbons.

The chemical industry accounts for a substantial portion of modern industries. The oil-refining industry (which extracts energy resources from crude oil) and the petrochemical industry (which produces various raw materials and chemicals from petroleum gas and naphtha) have been growing consistently. More than 100,000 types of chemical products, including commodities such as plastics, solvents, cosmetics, and food additives, as well as other industrial materials, are being produced and have a great impact on our daily lives. The global chemical industry was estimated to be worth 1.9 trillion Euros, and there were more than 100,000 chemical manufacturers around the world as of 2008. The consumption of chemical products is closely related to the maturity of industries because chemical products are used in various industries. The consumption of chemical products accounts for about 6% of the total GDP in the Asia-Pacific region, which should demonstrate the large implication that chemistry has on the industries in Korea and its neighboring countries. Petrochemicals have greater industrial implications. Korea has the world's fifth largest petrochemical industry, which also has the fourth largest share in the nation's manufacturing sector. In 2010 alone, this industry is known to have added \$22.4 billion to the nation's trade surplus.

Future for Chemistry and Humankind

The chemical industry, including petrochemicals, plays a major role in producing energy

resources, a variety of raw materials, and products. This means that chemistry has a great influence on the expansion of production and profits in modern industrial society and that its industrial implications are increasing. The modern chemical industry, however, should not be focused only on expanding production and making profits. As described in the Haber-Bosch process, many watershed chemical discoveries have had a negative effect on humans. The fast-growing chemical industry improves the quality of human life, but it also results in negative side effects such as energy crunches and climate change, which must be addressed by the chemical industry. Many chemical organizations, including the Korean Chemical Society, have been trying to explore new directions for chemistry and industries under the theme of green chemistry.

Many chemists are involved in various research projects to develop new and renewable energies and to protect the environment. Industrialization based on chemistry has led to the consumption of increasing amounts of hydrocarbon fuels such as petroleum. It has also caused many problems, including the impending depletion of natural resources and the production of greenhouse gases. Many chemists are trying to resolve these problems by studying new and renewable energy resources. The development of solar cells and dye-sensitized solar cells that produce energy from sunlight is one of the major research projects in this direction, which also incorporates various chemical sectors such as electric chemistry, material chemistry, and physical chemistry. The development of the carbon collection system to reduce greenhouse gases such as carbon dioxide is another effort to alleviate climate change by chemically solidifying carbon dioxide gas.

While chemistry in the 20th century was focused on increasing production and developing new materials, chemistry in the 21st century shall become eco-friendlier by emphasizing the relationship between humans and the natural environment. This year is the "International Year of Chemistry," a watershed year in which we need to build a more systematic and competitive relationship between chemistry and related industries to establish a new foundation for strengthening our nation's competitive edge in the 21st century. We must also establish an eco-friendly chemical industry to protect our natural environment if we want to secure truly sustainable growth.

Sustainability Brings Success to Bayer

Sustainability Brings Success

Bayer is a global enterprise with core competencies in the fields of healthcare, nutrition, and high-tech materials.

Bayer has been maintaining its success in the industry over the past 147 years since it has established a sound business model for creating sustainable values, made investments for the future, protected the environment, and acted as a socially responsible enterprise for stakeholders. Bayer seeks sustainability by keeping a balance between its economic, environmental, and social responsibilities. Bayer's products and services are particularly focused on realizing and expanding sustainable values. Bayer's major businesses are closely related to efforts in finding solutions to crucial current problems such as maintaining long and healthy lives, protection of food and water resources for growing populations, and the prevention of climate change. Bayer's sustainable growth strategy and global activities under its mission statement of "Science for a better life" shall be described in this article.

1. Environmental Projects

Climate Protection: Bayer Climate Program

EcoCommercial Building (ECB) program

As part of the EcoCommercial Building (ECB) program—a central element of the Bayer Climate Program—the company established a partnership network with suppliers, construction firms, and architects to create tailored solutions for energy-efficient commercial and public buildings. The ECB that was constructed in Delhi, India, in early 2011 for the optimal use of energy and zero emissions is the first ECB in a subtropical region. The building consumes 70% less energy than other conventional buildings. Bayer has already used the ECB program for its own purposes, and has already built an emission-free children's daycare center at the Monheim site in Germany and a low-energy office building in Diegem, Belgium. Another EcoCommercial Building is planned

for the climate-neutral city of Masdar in Abu Dhabi in the United Arab Emirates as a partnership project.

Energy Efficiency Check

Bayer is devoting another sustainability project to the introduction of a new technology designed to reduce energy requirements, and subsequently the level of greenhouse gas emissions, by at least 30% in the electricity-intensive manufacture of chlorine, a basic material for the chemical industry.

Low Emission Company Vehicle: Bayer EcoFleet

The Group launched the “EcoFleet” initiative at the end of 2007 as part of the Bayer Climate Program and introduced incentive programs for using low-emission company vehicles. This involves employees making increased use of more fuel-efficient engine technologies and drive systems such as natural gas and hybrid technologies. Bayer is therefore looking to cut CO₂ emissions from its global vehicle fleet by 20% by the end of 2012. So far, these emissions have been cut by more than 10 percent.

1-1. Joint Youth Educational and Environmental Program with UNEP

Bayer is the first company in the world to enter a long-term partnership with the United Nations Environment Programme (UNEP) in the area of youth and environment. The cooperative effort focuses on children and young people from all over the world who are interested in environmental issues and committed to protecting the world around them.

1-2. International Children’s Painting Competition organized by UNEP and Bayer

Bayer and UNEP jointly hold the International Children’s Painting Competition for children from around the world aged from 6 to 14 to illustrate their own personal view of the environment—their wishes, fears, and hopes—every year. The theme of the annual competition has been set with the catchphrase of World Environment Day. More than 600,000 children from 92 countries have participated in the 19th competition in 2010 and drawn pictures under the theme of “Biodiversity.”

1-3. Bayer Young Environmental Envoy (BYEE) Program

The BYEE Program was launched under the environmental initiative of Bayer's Asia Pacific Division in 1996. It has been further globalized so that hundreds of students from 18 countries in Asia, Europe, and Latin America participate in the program every year. Bayer Korea has launched the "Bayer Young Environmental Envoy" program in Korea in 2004, selecting youngsters that have prepared for the program through environmental camp, projects, and interviews. These students are given the opportunity to participate in a one week-long environmental trip to Germany, home of Bayer's headquarters, with envoys from other countries.

2. Corporate Social Responsibility

Bayer enacts several corporate social responsibility programs such as long-term investment projects for social and corporate wellbeing as a responsible member of society. The company sponsors educational, research, environmental, sports, and cultural programs by spending about 44 million Euros in such programs every year. Bayer's major social contribution programs are as follows.

2-1. Healthcare: Extension of Cooperation with USAID

To give women in developing countries access to safe contraceptives at affordable prices, the company is extending its cooperation with the United States Agency for International Development(USAID), turning it into a partnership between a government development organization and a manufacturer that is unique in this field. Bayer has applied for the first marketing authorization in Ethiopia. Bayer will also apply in 10 other African countries in the next three years.

Working with its partners, Bayer is also committed to tackling neglected diseases, especially Chagas, tuberculosis, and African sleeping sickness, with WHO.

2-2. Nutrition: Systematic Expansion of Food Chain Partnerships

Bayer is working with farmers and other parties related to the agricultural industry through the

Food Chain Partnership to improve agricultural yields, food quality, and the incomes of farmers. The experts at Bayer are running Food Chain Partnerships in 40 countries across the world. The company plans to sponsor this program by 2012. Bayer is also conducting research on stress-tolerant plants to help plants become more tolerant to growing temperature changes and droughts caused by climate change, thus maximizing production.

3. Green Project of Bayer Korea

Bayer Korea is carrying out enterprise environmental projects at 4 plants, 2 HQ offices, branches, and an R&D center based on various strategies and programs. This project as a company wide is scheduled to be implemented from short-term/mid-term/long-term perspectives respectively by 2015, and KPI has been for the three different terms.

The energy saving campaign and waste reduction program have been running at the plants since 10 years ago, and are now part of the daily operations. Various interesting campaigns and programs are implemented to encourage employees to participate in the green project in offices. The company is also working to strengthen marketing and R&D activities to add more eco-friendly elements to the product lineup. Such concepts are applied to the IT, purchasing, and logistic departments of company. As part of the headquarters' EcoFleet program, the company started replacing (200) gasoline-powered vehicles for salespeople with hybrid cars (Avante Hybrid) in March 2011. The company also plans to purchase hybrid versions of the Sonata and K5 that will be launched in June. Bayer has also formed an exclusive partnership with an environmentally friendly air carrier for employee business trips after reviewing its CO₂ emissions. Bayer Korea also installed new underground air-conditioning facilities at its headquarter building to reduce energy consumption. The average energy consumption actually declined by over 10% after this investment.

Our core belief at Bayer is that safety, environmental protection, product and process quality, and commercial efficiency are factors of equal importance in achieving our corporate objectives. We respect and support the objectives of Responsible Care and Sustainable Development as part of our commitment for management and as a responsibility shared by each employee.

Implementation, System, and Results of Environmental, Health, and Safety Strategies of Dow Chemical Korea

- On Self-Assessment -

Dow Chemical has announced a ten year EH&S development plan to innovate the environment, health, and safety (EH&S) sectors in 1995. The annual reports on the implementation of the project have been reported to the CEO, and the EH&S performances have been used in the evaluation for managing leaders in the company every year. Based on these efforts, the company improved the sectors by about 85% compared to their targets. Encouraged by this performance, Andrew Liveries, chairman and CEO of Dow Chemical, has announced the new 2015 Sustainability Goal, which incorporates new plans on EH&S in Washington in 2005. The new project has been evaluated at the end of year, and the results have been used to set the bonus payments for all the employees. Daily performances can be also checked on the Intranet Homepage. Among various EH&S assessments, Dow Chemical's annual injury/illness rate table is described below. It is difficult to directly compare the data with those of other companies since companies apply different criteria on injury/illness. The industrial data, however, can be used to clearly demonstrate improvements. As a result, Dow Chemical was awarded the Robert W. Campbell Award for its successful safety system in 2010.

Dow Chemical Korea has also set up the EH&S performance development program and reviewed the processes quarterly to achieve similar improvements. The company is focusing on maintaining its ODMS (Operation Discipline Management System), safety, environment, and health standards for plant operation, and LPP (Loss Prevention Principle) for the safe design of facilities and equipment at plants. The ODMS is a comprehensive set of guidelines and standards on safety, environment, and health, which incorporates the requirements of the RC Code and ISO9000 & 14000 standards.

■ Type of Assessment

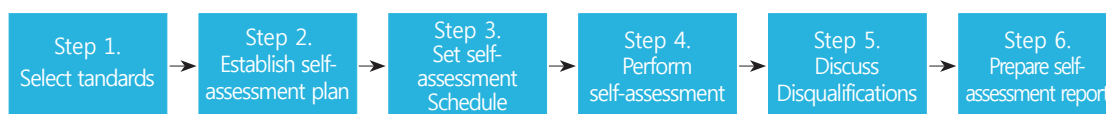
Dow Chemical employs a variety of assessment programs. As Kim Jung Hwan of DuPont noted

in the previous newsletter, the assessment team comprised of employees from various countries visit the plants every two to three years to perform periodic EH&S audits. The company is also running the RCPHA (Reactive Chemical and Process Hazardous Assessment) under the control of technology center; plants with newly designated plant managers or production managers should take the RCPHA within 3 months after replacement. The LOPA (Layer of Process Assessment), LPP (Loss Prevention Principle) gap assessment, and pre-start-up audits are also performed when facilities are modified or expanded. Self-Assessments for the inspection of standards including the Responsible Care Code on their own plans shall be described in this column.

Firstly, some of the terminology will be clarified to prevent confusion. Inspections usually refer to intensive examinations of the requirements under various programs, such as monthly fire extinguisher inspections. Reviews refer to the activities involving the examination of requirements on standards and review and modifying the content in specific procedure manuals. In contrast, self-assessments refer to the activities for checking whether specific organizations comply with the standards or legal regulations. The self-assessments performed by Dow Chemical shall be described below.

■ Assessment Procedure

Assessments are usually performed in accordance with the following procedure. Each step in the procedure of self-assessment shall be as follows.



Step 1. Select standards.

Self-assessments have three crucial factors, and the first is the way assessments are performed. All the standards contain checklists for self-assessments. The same checklist is used for the EH&S comprehensive assessment, an external audit, so that consistency can be maintained across all assessments. The standards shall be selected based on the understandings about the problems detected in previous EH&S comprehensive assessments, modifications in the processes, newly installed equipment, revisions in regulations, types of chemicals processed at plants, and identified weaknesses in process.

Step 2~3. Set plans and schedule for self-assessments.

The second crucial factor is the frequency of assessments. The frequency of assessments shall be based on the probability of accidents caused by the violation of certain regulations from among 92 standards and the severity of the results from such accidents. The inspections of important standards, such as those on management of modifications, separation of energy sources (usually red tag procedure manual) and operations in closed space, are performed annually. The frequency of assessments of other standards shall be set in accordance with the government regulations and the operational status of plants. The newly set schedules are prepared in Excel sheets as described in the attachments to be approved by the RC leaders and business EH&S leaders. The company, however, still performs many assessments every year because the assessments on all the guidelines must be performed at least every three years. If the self-assessment is scheduled on the Excel sheet, then the following assessment is automatically scheduled. The EH&S managers of plants can check the overall schedule and establish the annual assessment plans with the program.

The last crucial factor in self-assessments is the people performing them. Since self-assessments are usually performed by the plant operators themselves, they tend to understand detected faults and find it difficult to clarify accountability for the faults of their coworkers. This sometimes leads to skipping important findings, thus making the assessments meaningless. Outsiders are therefore included in the assessment team. These outsiders have a good understanding about the standards for various Dow Chemical Korea plants, and they usually participate in the audits of other plants to help inspectors gain a better understanding about the assessments so that they can detect and report defects and faults more objectively. The RC Group also participates to improve the quality of self-assessments. The staff members, who are dispatched from other plants for the self-assessment of a certain plant, can get opportunities for new experiences and to understand how to apply the standards to field operations through discussion with the examinees. They can also apply the standards in their workplaces more correctly by using what they have learned.

Step 4. Perform self-assessments.

The self-assessment team is usually composed of two to three inspectors under the EH&S manager. The inspectors examine documents and sites and conduct interviews with the relevant managers. They check whether the examinees have followed the proper procedures in the modification of assignments while checking the approval on safety operation, verifying

whether the work procedures and drawings properly reflect the results, and confirming whether appropriate trainings were offered to workers. Although the self-assessment may not officially incorporate all of items specified above, inspectors can examine all of them to get a broad view of the situation. Self-assessments are usually completed within a day, but some of them may last for 2 to 3 days since it takes longer when a variety of requirements need to be checked at once. The leader of the inspection team shall be allowed to assign tasks to inspectors or perform examinations with the inspectors for greater efficiency. The checklist attached to the standards help inspectors focus on the issues specified in the standards.

Step 5. Discuss disqualifications.

Some disqualified items are classified in a way so that inspectors don't completely understand the situation. They therefore need to discuss the disqualifications with previous inspectors and plant engineers to maintain consistency. Whether the detected problem is temporary or chronic, the severity of such a problem should be assessed. Violations of mandatory requirements or regulations shall be assessed with a severity of Grade 1. Such problems must be resolved within 14 days after the confirmation. Otherwise, the correction plans should be established and approved by the business leaders. The inspectors shall also notify the plant engineers about strengths found in the self-assessments.

Step 6. Prepare self-assessment report.

The plant EH&S managers, who lead the self-assessments, are highly recommended to promptly prepare their self-assessments reports. Otherwise, they must submit the reports to the plant managers within a week after the completion of the self-assessments. Important findings should be highlighted in the reports for examinees to easily understand what requires correction. The correction of legal violations shall be prioritized over other disqualifications, and the methods for resolving these violations shall be described. Positive aspects found in assessments should also be included in the report to raise the morale of the examinees.

■ Follow-up measures on assessments

Follow-up measures are more important than the assessments. Plant managers shall establish the plans for how and when to correct the problems detected in the assessments within a

week after receiving the reports, and then manage the implementation of these plans. The Dow Chemical staff shares the information and processes regarding the corrective measures through the Event & Action Tool, a web-based program. The inspectors of the next self-assessment will check whether the problems were corrected as planned. The corrective measures for resolving high-priority problems and legal violations should be promptly set up, and shall be reported to the business leaders for management.

■ Conclusion

The effective implementation of self-assessments offers opportunities to check how effectively standards are applied to the operations at plants, find weaknesses in operations, and detect the causes for such problems. The inspectors, who have a good understanding of the overall plant operation, can inspect the plants in depth and share their experiences with the inspectors from other plants. It is easy, however, to skip self-assessments if a well-structured schedule is not established. The self-assessments also become useless if the problems detected by the inspectors are not properly corrected. The success of self-assessments thus depends on how much the plant managers support those inspection programs. You must explain the importance of self-assessment to plant managers if assessments are to become more effective. I hope this article will be helpful in the implementation of self-assessments at your plants.

Third Party Verification

Owing to the need for the chemical industry to demonstrate to stakeholders that companies are meeting their Responsible Care obligations, the CAIA Board instituted a third-party verification process. Signatory companies go beyond self-assessment of the implementation of Responsible Care and adopt a verification process carried out by third and trained auditors.

Third party verification of Responsible Care is mandatory for all CAIA members who have been Responsible Care signatories for more than two years. Audit protocols based on Responsible Care Management Practice Standards are used by members to assist them in preparation for and in the execution of third party verification of their Responsible Care implementation status. Auditors who conduct the Responsible Care verification audits make use of standardised question sets or Auditor Guidance Documents to assess the effective implementation of Responsible Care Management Practice Standards.

To date 76 business units representing 44 member companies have undertaken third party audits. 37 business units have completed their second verification audit and 7 have completed their third verification audit. The CAIA website displays a list of signatory companies who have successfully completed their Responsible Care third party verification audits, as well as the outcome of the audit.

Depending on the outcome of the verification audit, signatory companies are grouped into three categories.

1. Significant Responsible Care practices in place.
2. Considerable Responsible Care practices in place.
3. Developing Responsible Care practices in place.

Verification audits are required to be repeated every three years by auditors trained in the Responsible Care ethics, Guiding Principles and Management Practice Standard requirement.

Such auditors should also have extensive experience in the auditing of safety, health, and environmental management systems. Third Auditors, who have attended a training course in Responsible Care, have been approved to undertake these audits.

To accommodate smaller enterprises, customised audit protocols have been developed that consider the size of facility and the type of processes of the company. Non-applicable sections of the protocols were excluded for such enterprises resulting in the consuming and more affordable.

The South Africa Safety Quality Assessment System(SQAS) is accepted as third party verification of Responsible Care for haulier companies who have completed their SQAS audits successfully are displayed on the CAIA website.

Responsible Care fits in well with other management systems such as ISO14001 and OHSAS 18001 and there is synergy between Responsible Care requirements and the requirements of these systems. Responsible Care should be integrated and implemented together with the company's existing management systems and should be evaluated together with these systems. Audit protocols include compatibility matrices between Responsible Care and other management systems. This facilitates the simultaneous auditing of these management systems and Responsible Care resulting in a reduction of auditing time and cost.

RC Committee Activities(Dialogue with Society)

Companies in the chemical industry are voluntarily implementing environmental protection, safety and health measures in their responsible Care activities and communicating the results of these activities to the public, thereby improving mutual understanding with society. The RC committee supports these activities through its dialogue WG and holds training sessions for members to improve their skills in communicating with local communities. The RC committee itself also discloses the results of its activities in its quarterly journal titled JRCC News, and in this Responsible Care Report as well as at briefings on the report's contents.

〈Dialogue with Local Communities〉

The dialogue meeting, which started in 1996, have been held regularly in 15 areas across the country. Through these meetings, Members have been continuing local dialogue with a range of stakeholders including community residents, local government officers, school teachers and NGOs. These meetings have thus played an important role in helping companies to deepen mutual understanding with their stakeholders.

Members in each of the areas believe that it is important to continue these dialogues. Accordingly, they devise measures to encourage more local residents to participate in the meetings. For example they conduct prior surveys to identify themes that will interest local residents and incorporate the results when deciding on the program for the meetings, organize factory tours as part of the meetings, and increase the time for direct dialogue through panel discussions and Q&A sessions. At the meetings, members avoid using technical terms as far as possible and make more use of photos and diagrams as reference material in order to give easy-to-understand explanations of their corporate activities. Participants have begun to raise hard-to-answer questions and make difficult requests on issues that could be further improved, which implies that mutual understanding has deepened as hoped.

In fiscal 2009, the RC Committee held local dialogue meetings in six areas, which helped Members foster communication with local residents. Participants at these meetings now include

representatives of local NGOs, school teachers, government officials, labor union members and university students, in addition to nearby residents.

The RC Committee has been holding annual risk communication training seminars fiscal 2004 with the aim of supporting these local dialogue meetings. The seminars are designed to help Members improve their communication skills in giving more intelligible explanations at the meetings. The committee holds a meeting of representatives if these local dialogue meetings twice a year, at which participants report on their local meetings, as well as, share problems identified in each area and methods to make improvements. These biannual meetings are expected to help improve the quality of the dialogue.

In fiscal 2008, the RC committee established a system to support individual facilities held dialogue meetings under the system.

〈Dialogue with Citizens〉

The RC Committee has also been actively organizing dialogue meetings with ordinary citizens.

On November 16, 2009, the Committee held a dialogue meeting with consumers focusing on the chemical industry's responses to global warming, inviting four people from three consumer organizations. At the beginning of the meeting, a lecture was given on the concept of cLCA and on the contributions made by chemical products to reducing CO2 emissions, using the actual cLCA results. The lecture was intended to increase participants' awareness of the chemical industry's contributions to reducing CO2 emissions.

The committee held a dialogue meeting on the same theme in Tokyo on December 7, 2009 with the participation of 11 consumers from seven organizations. Consumers are now increasingly interested in reducing CO2 emissions as an issue related to their daily lives, and companies to exchange opinions on the issue.

The Committee also held a dialogue meeting on the chemical industry's responsible to global warming with teachers of science at junior high schools in Tokyo on March 13, 2010. At the meeting, which was the third of its kind, participating teachers actively raised questions to company representatives. The meeting has established to company representatives. The meeting has established itself as a regular event.

〈Report Presentation〉

The RC Committee has been holding public meetings to present the contents of its Responsible Care Report in Tokyo and Osaka every year. In addition to Members, the Committee

invites representatives of governmental agencies, consumer organizations, labor unions, universities and mass media companies. In fiscal 2009, the committee held a meeting in Tokyo on December 10 attended by 100 people, and one in Osaka on December 15 attended by 83 People.

At both of the meetings Director Taguchi of the JCIA's technology Affairs Department gave a lecture titled "New measures to reduce greenhouse gases" on cLCA analysis, which the ICCA had used to investigate the climate change problem-a problem that was attracting much attention from the public. Subsequently the Committee explained its Responsible Care Report 2010 and related data.

In addition, Daicel Chemical industries, Ltd., Mitsubishi Chemical Corp. and Mitsubishi Rayon Co., Ltd. Gave presentations on the measures they were taking to prevent occupational accidents, reduce waste and conserve energy.

The Committee conducts a questionnaire survey of participants after these meetings and incorporates the results in organizing the next meeting. In the last survey, 83% of respondents answered that their understanding of Responsible Care had either "improved" or "greatly improved" as a result of the meeting, which was clearly providing a lot of participants with a meaningful opportunity to learn about Responsible Care. Some respondents evaluated the lectures and presentations given by companies as useful while others thought that they were too technical. The Committee will find a way to solve this conflicting need at a later date.

● Kumho Petrochemical Participates in Spring Disaster Prevention Campaign

The employees of Kumho Petrochemical Co., Ltd.'s Ulsan Rubber Plant participated in the "Spring Disaster Prevention Campaign" on April 14 as an increasing number of vacationers embark on spring outings.

More than fifty employees and members of the Kumho Petrochemical, Ulsan Civil Union for Safety and Ulsan Disaster Rescue Group participated in this campaign to distribute leaflets containing information about yellow dust, hiking safety regulations, rules for preventing forest fires, the 2011 national disaster prevention drill, and (more than 1,000) anti-dust masks to citizens to help them enjoy safe spring outings.

The participants also reminded citizens of the regulations that prohibit climbers from carrying matches and lighters, entering restricted areas, and throwing away cigarette butts on mountains to prevent forest fires that are frequently caused by dry climate.

They also encouraged the elderly or people with respiratory diseases to reduce outdoor activities and wear long sleeve shirts and masks when they go out because of the frequent occurrence of yellow dust storms caused by the westerlies. Citizens were also recommended to wash their hands and feet clean after returning home to prevent various illnesses caused by yellow dust.

The employees of Kumho Petrochemical's Ulsan Plant also participated in environmental activities on the Taehwa River in Ulsan with the staff from the Nam-gu Office and Taehwa River Office on April 22.

● Daelim Industrial Holds Ceremony for "Management-Union Resolution on Accident-free T/A (Turn Around)"

Daelim Industrial Division held a ceremony for the "Management-Union Resolution on Accident-free T/A (Turn Around)" on April 1 before the T/A of the plant in 2011. The CEO, labor union chairman, executives, and employees of the company and partner firms participated.

Han Joo-hee, president, and the chairman of the Daelim Labor Union gave the opening addresses at the ceremony, which



was followed by reading of the resolutions by the representatives of management and union, exchange of accident-free flags, and cake cutting for the campaign. Participants made their resolutions to prevent safety accidents during the T/A of plant.

The T/A project is the company's largest renovation project, which will be implemented at its four plants. The project is expected to last for one to one and a half months. All the participants in the large-scale T/A project are paying close attention to field safety control and the prevention of safety accidents.

● Honam Petrochemical Acts to Improve the Chemical Industry's Image and Gain Consumer Trust

The Ministry of Environment granted a certificate of Green Company and signboard to Honam Petrochemical Corp.'s Daesan Plant since the plant was designated as a green company on March 4. The company's executives and employees of the company earned this certificate by implementing preventive environmental programs for more effective environmental management and making consistent environmental improvements. The company pledged to increase their environmental efforts to adopt more eco-friendly operations and continue to be more socially responsible as a green company.



● Introduction of a New Member Company

- Air Liquide Korea Co. Ltd. (CEO: Jean-Francois Deschamps)

Air Liquide Korea Co. Ltd. is an industrial gas manufacturer that was founded in 1996. The CEO and the executives of the company are actively involved in the environment, safety, and health sectors. The company is expected to proactively participate in RC after joining the KRCC.

● 2011 1st Board of Directors Meeting and The 12th Ordinary General Meeting

The KRCC held 2011 its 1st board of directors meeting and 12th ordinary general meeting in the Emerald Room at Lotte Hotel at 11:00 on January 27, 2011. About 55 executives representing member companies, RC coordinators, and people related to the chemical industry participated.

The participants of the general meeting reviewed and approved the 2010 business and financial audit reports, 2011 business plan and budget schedule, revisions of articles, and executive appointments submitted by the secretariat. Some members proposed to publicize the "International Year of Chemistry, 2011" through these projects this year.

● Teacher's General Meeting on "2011 Come! Fun World of Chemistry!" of KRCC Held

The KRCC held the 2011 Teacher's General Meeting at T-won in Seoul Station at 11:00 on February 26, 2011. Lee Chang Soo, chairperson of the Public Activities Committee and director of Rohm and Haas Korea Co., Ltd., and 12 teachers from various regional teachers' associations participated.

Based on the recommendation for outreach programs on water with children and teenagers in celebration of the "International Year of Chemistry, 2011," the members agreed to map out programs that are closely related to water and chemistry. The KRCC also granted funds for program development to regional teachers' associations in this meeting.

● Implementation Committee of KRCC Held

The KRCC convened at its first meeting of the Implementation Committee in the meeting room of KRCC at 14:00 on May 3, 2011 with 14 members including Kim Kyung Ok, chairperson of the Implementation committee and director of BASF Korea. In this meeting, Kim described the "RC Implementation Plan," and the members discussed the "Review on the Implementation of RC Fundamental Features," "RC Code Improvement," and "KRCC Seminar."

● KRCC Unveils “Chemical Industry Promotional Animation”

The KRCC unveiled an animated cartoon, “Chemistry Kid Reporters” to promote the values and importance of the chemical industry through friendly cartoon characters and storylines that target kids (elementary school 5th graders) in January 2011.

“Chemistry Kid Reporters” features a story about three kid reporters, Youngsoo, Zea, and Yuri, who visit the Chemical Industry Exhibition Hall and virtually experience the past, present, and future of the chemical industry. They recognize the importance of the chemical industry and are inspired to become chemists in the future through their experience.

The promotional animation is scheduled to be shown to kids participating in the “2011 Come! Fun World of Chemistry!” festival, an outreach program hold by KRCC. The cartoon clips will also be distributed to the member companies of KRCC, local education offices, elementary schools, and neighboring petrochemical industrial complexes to promote the chemical industry during plant trips by students and visitors.