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# Hanwha at the Frontier

# Hanwha Total Petrochemical :Leading the Way

Hanwha Total Petrochemical is currently undergoing Smart Plant Upgrades – a three-year 28 million US Dollar project to upgrade Hanwha plants into Smart Plants.



When the upgrade is complete in 2019, thousands of sensors will be installed to track the production line, detect faults, and monitor logistics across all of the company's plants in Korea.

Hanwha Total Petrochemical employees are the first in Korea to carry explosion-proof smartphones. Workers can now maintain voice communication and exchange data while operating in hazardous environments.

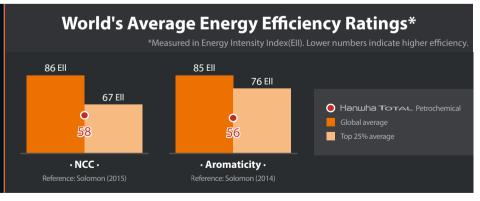


Specially insulated electronics are required when operating in petrochemical plants, as stray sparks and heat may cause fumes to ignite. Hanwha Total Petrochemical's explosion-proof smartphones have an added advantage over traditional walkie-talkies as they also allow for plant data to be sent and received while workers are on the move.

Smart Order allows customers to directly purchase
Hanwha TOTAL Petrochemical products online from desktop,
tablets or smartphones. Customers can then perform end-to-end
tracking of their orders from the plant to final delivery.



Hanwha Total Petrochemical is a global leader in energy efficiency and environmental sustainability. Its Energy Management Optimization System (EMOS) monitors and prioritizes energy usage in real time.



EMOS is a part of Hanwha Total Petrochemical's smart plant upgrade project. The system helps the company adjust energy use automatically and thereby reduce overall energy consumption and greenhouse gas emissions.

Hanwha Total Petrochemical aims to reduce energy costs across its plants by 2 to 4 percent annually. The company is developing more sophisticated green production technologies that have less impact on the environment, reduce waste and recycle by-products.



Hanwha Total Petrochemical's Safety, Health, Environment, and Quality Policy maintains some of the highest health and safety standards in the world. Our company promotes a safety-first work culture and mindset.



In recognition of Hanwha Total Petrochemical's commitment to safety, the company was awarded an International Safety Rating System Level 8 (ISRS 8) by the rating agency DVN GL.



The company is only one of a handful of companies in the world to achieve ISRS 8, the highest rating ever issued by DVN GL. Hanwha Total Petrochemical is hard at work to become the world's first organization to achieve ISRS 9 and ISRS 10, the highest ratings possible.

As a company that represents the nation of South Korea,

Hanwha Total Petrochemical has set a global standard for

plant operations and the manufacture of high-quality

petrochemical products.



# Hanwha at the Frontier

# Hanwha Chemical's ECO-DEHCH Plasticizer Finds a Home with Wallpaper Manufacturers



Jeil Wallpaper uses Hanwha Chemical's ECO-DEHCH in its products (Photo credit: Hanwha Chemical)

Hanwha Chemical's ECO-DEHCH plasticizer became commercially available only from June of 2017 but it has already built a loyal following. ECO-DEHCH has rapidly gained popularity among Korean wallpaper manufacturers for its ability to strengthen the durability and eco-friendliness of PVC-based wallpapers. This new compound is fundamentally different from most other plasticizers available on the market and it can also be used in everything from construction materials to food-grade plastic wraps.

ECO-DEHCH was developed by Hanwha Chemical, in association with the Korea Advanced Institute of Science & Technology, in response to consumer demand for plastic that is both safe and durable. Traditional phthalate-bonded plastic, while strong and lightweight, can cause long-term health issues in humans and its use has been strictly curbed by government safety agencies. Most non-phthalate plasticizers adopted as replacements, on the other hand, are safe for humans but not as effective.

### Safe, Durable, and Aesthetically Pleasing

Jeil Wallpaper, Seoul Wallpaper, and Hanwha Living & Creative are among the companies that have adopted ECO-DEHCH-bonded plastic to provide their customers with safer products. Subsequently, they're able to label their products "Phthalate Free" and meet the demands of the growing number of discerning consumers who expect safer products.

"It is our mission to provide customers with wallpaper that is both beautiful and eco-friendly," says Yoon Mu Yeol, Director of Seoul Wallpaper. "ECO-DEHCH allows us meet the expectations of our customers and we are only too happy to oblige by incorporating it into our products."

Hanwha Chemical bridged the gap between durability and safety with ECO-DEHCH, a hydrogen-based compound that is completely different from most non-phthalate plasticizers available on the market. ECO-DEHCH's chemical properties make it ideal for applications where aesthetics are as important as safety and durability.

The compound bonds more efficiently to plastic than other non-phthalate

plasticizers and will not molecularly separate over time. This results in ECO-DEHCH-bonded wallpaper remaining flexible rather than becoming brittle and cracking. The molecular bond between plastic and non-phthalate plasticizers also breaks down when exposed to sunlight, resulting in wallpaper that will gradually turn yellow. ECO-DEHCH has an entirely different molecular structure to those plasticizers, so wallpaper made with the compound will not yellow in the same way.

#### Rising to the Challenge

Hanwha Chemical is the only Asian company, and one of only three companies in the world, that has the necessary resources to develop and produce a plasticizer that uses hydrogen-bonding instead of phthalates or terephthalates. The limited number companies that use hydrogen-bonding is partly due to the product's incredibly high barrier to entry. Extremely high precision is required and the technology isn't readily available.

"ECO-DEHCH is optimized to catalyze with maximum efficiency," says Yoon Kyong Jun, the Chief Researcher who led ECO-DEHCH's development at Hanwha Chemical. "We had to manage the chemical reactions very carefully in order to create a product that is both high in quality as well as stable."

In recognition of his leadership in the creation of ECO-DEHCH, the Korea Industrial Technology Association presented Chief Researcher Yoon with the "Engineer of Korea Award" for June of 2016.

ECO-DEHCH has already been tested by the Food and Drug Administration (FDA) in the US and the General Society of Surveillance (SGS) in Switzerland. It has also been certified as an eco-friendly plasticizer. And as ECO-DEHCH continues to exceed expectations and gain more certifications around the world, Hanwha Chemical is expecting its popularity and adoption for use in everyday products to grow exponentially. Fast forward to the very near future, Hanwha Chemical will easily become recognized as the pioneer in chemicals that has set the standard for performance and eco-safety.



ECO-DEHCH is used to produce a wide variety of wallpapers at Seoul Wallpaper (Photo credit: Hanwha Chemical)

### **Press Release**

# Hanwha Q CELLS Japan Co., Ltd. *Introduced* Q.PEAK DUO and Q.HOME Solar Energy Solutions at PV EXPO 2018

- $\cdot$  Q.PEAK DUO solar modules and Q.HOME solar systems provide sustainable energy solutions to Japanese homes
- · Hanwha Q CELLS Japan Co., Ltd.'s proprietary technology provides higher energy output while lowering both installation costs and levelized cost of electricity



Hanwha Q CELLS Japan Co., Ltd. PV EXPO 2018 Booth Image

Hanwha Q CELLS Japan Co., Ltd. participated in the PV EXPO 2018 in Tokyo from February 28 to March 2. During the event, Hanwha Q CELLS Japan Co., Ltd. introduced its Q.PEAK DUO solar module and a hybrid energy storage system to the Japanese market.

PV EXPO is Japan's largest trade show for photovoltaic products and is one of the world's most influential solar energy exhibitions. This year's event featured around 1,600 exhibitors and more than 70 thousand visitors are estimated to have attended. Hanwha Q CELLS Japan Co., Ltd. had one of the biggest booths at the event and launched a variety of solar energy products intended for residential use.

### Promoting a New Sustainable Lifestyle



Hanwha Q CELLS Japan Co., Ltd.'s Q.PEAK DUO display at PV EXPO 2018

The Q.PEAK DUO is Hanwha Q CELLS' newest flagship solar module and features half-cell technology, six busbars, and Q.ANTUM DUO technology. Hanwha Q CELLS' proprietary Q.ANTUM DUO technology allows for the Q.PEAK DUO to have higher system performance while also lowering the levelized cost of

electricity (LCOE), thus providing an efficient and economical choice for Japanese consumers looking to adopt solar power for their homes.

Hanwha Q CELLS Japan Co., Ltd. also introduced the new HQJB-A series of hybrid energy storage systems. Intended for residential markets, the HQJB-A series enables customers to monitor and adjust their energy usage based on their individual needs. Hanwha Q CELLS Japan Co., Ltd. expects that this degree of control will entice Japanese consumers to create a new sustainable energy lifestyle.

The Q.HOME series of solar systems for residential use were on display at PV EXPO 2018. Comprising of a solar module, an inverter, and a battery, the Q.HOME solar system is an ideal product to meet Japan's steadily rising demand for residential solar energy solutions. As part of this demand, the Japanese government is planning to launch a project in 2020 to build zero energy homes that produce as much energy as they consume.

In addition to these residential products, Hanwha Q CELLS Japan Co., Ltd. presented a variety of commercial solar energy products and large-scale power generation solutions. As part of its promotion campaign during PV EXPO 2018, Hanwha Q CELLS Japan Co., Ltd. launched a television commercial message (TVCM) featuring Reina Triendl, its brand ambassador, on February 28. Ms. Triendl also hosted a product-related talk show, as she did in 2017, in order to raise brand awareness for the company's products. In addition, Hanwha Q CELLS Japan Co., Ltd. conducted presentations to introduce and explain its new products and technologies during the trade show.

### **Providing the Better Choice**

Hanwha Q CELLS Japan Co., Ltd. ranked second in the Japanese solar market in 2016. In January, Hanwha Q CELLS' Q.PEAK-G4.1 solar modules received the Smart HIT Grand Prize 2017 from SmartHouse, a Japanese monthly trade publication.

The modules were nominated for the award by major Japanese solar product distributors. In explaining its decision, SmartHouse said that Q.PEAK-G4.1 solar modules won as they were the most popular residential solar modules in Japan and provided an ideal balance between quality and cost.

"The Q.PEAK DUO module series fulfills the needs of the high-power module market", said Seong Woo Nam, Chairman and CEO of Hanwha Q CELLS. "We will do our best to continue developing breakthrough solutions to fulfill a full portfolio from residential to utility markets as a leading solar energy company."

# Hanwha Worldwide News

# Explore This Month's News of Hanwha and Its Affiliates, Taking the Initiative in All Corners of the World





Hanwha Advanced Materials

# Hanwha Advanced Materials (Beijing) Co., Ltd.

Hanwha Advanced Materials' Beijing Office Cleans Up Trash Before Lunar New Year

Hanwha Advanced Materials' Beijing office held a garbage pick-up day on February 12th. Employees walked along the main road in front of the office and picked up trash as part of an effort to develop positive personal habits.



# Sino-Korea Life Insurance Co., Ltd.

## Sino-Korea Life Insurance Co., Ltd. Receives Award for Public Service

This year on Jan. 29th, Sino-Korea Life Insurance Co., Ltd. received the 2017 Responsible Brand Award given during the 7th China Charity Festival, a major annual event that promotes and encourages public service.

The 2017 Responsible Brand Award recognized Sino-Korea Life Insurance Company's commitment to corporate social responsibility including its work last December when it held its third annual Love Saves Wordlessly First-Aid Training camp in partnership with the Red Cross. Thousands of people underwent rigorous training at training camps. The participants who successfully finished the training sessions received certificates of completion. With the skills and knowledge they gained, they would go on to provide first-aid in the event of emergencies.

Families were encouraged to participate in these first-aid training camps. Children learned basic first-aid procedures and practiced in emergency rescue drills with their parents. They also received tips and tricks on how to take care of themselves in emergency situations.





Sino-Korea Life Insurance also ran the Trees N^2 campaign in support of Hangzhou Yang Lingzi Special Education School, the largest special education school in Zhejiang Province. Believing that every child deserves love and attention, money was raised for the school by selling students' artwork to the employees at Sino-Korea Life Insurance Co.



Hanwha Total Petrochemical

# Hanwha Total Petrochemical Trading (Shanghai)

### Hanwha Total Petrochemical Undergoes Compliance Training

Hanwha Total Petrochemical's Audit Team held training workshops on compliance for all Chinese subsidiaries from January 30 through February 1, 2018. About 50 employees from the Chinese subsidiaries received training on the law, regulations



and codes of conduct to prevent and reduce the risk of employees engaging in illegal activities.

Topics covered included antitrust law, anti-bribery, confidentiality, and privacy. Through the training, veteran and new employees learned how risk management and Hanwha's Code of Conduct were integral to the operations and strategy of Hanwha Total Petrochemical. The employees were reminded of their importance and their responsibilities to identify, manage, and report potential risks before they occurred both upstream and downstream. They were taught that it was up to them, as employees, to protect the assets of the company, its reputation and the customer values.



# Japan



# 🔂 Hanwha Hotels & Resorts

# Acropark Golf Corp.

#### New Year's Greetings from Ocean Palace Golf Club & Resort

Happy New Year! Ocean Palace Golf Club & Resort (OPGC) was pleased to announce a wonderful start to 2018.

The OPGC family prepared and served Osechi Ryori, traditional foods eaten in Japan to celebrate the New Year. The meals were packaged in jūbako boxes and served to club members. A traditional mochitsuki ceremony was also held for the members in the clubhouse restaurant to usher in the New Year.

2018 marked the beginning of a new look for the hotel. New wallpaper radiated a brighter and more refined ambiance to the hotel. New carpeting in the clubhouse lobby further contributed to a refreshing and welcoming atmosphere.



Renovations include replacing furnishings and redesigning the golf course. The changes to the appearance of the hotel inside and out will continue through the rest of 2018.

We would like to thank Hanwha Group for making all of this possible and hope that everyone will appreciate Ocean Palace Golf Club & Resort's new look once the work is completed.



# Hanwha Q CELLS Japan Co., Ltd.

### Hanwha Q CELLS' Q.PEAK-G4.1 Solar Modules Rated #1

In the January 2018 issue of SmartHouse Magazine, a monthly trade Japanese publication, the Smart HIT Grand Prize 2017 was awarded to Hanwha Q CELLS' Q.PEAK-G4.1 Solar Modules for its industry-leading energy generation, storage, and conservation capabilities.

Q-PEAK-G4.1 Solar Modules is engineered in Germany and feature highperformance monocrystalline Q.ANTUM solar cells. The modules are primarily available in 60-cell and 48-cell configurations. There is also a 38-cell module that is exclusive sold in Japan.

By offering more size combinations, Hanwha Q CELLS has been able to increase its line-up of solar power systems to fit Japan's many different roof-size requirements. The result has been higher solar power adoption rates.

SmartHouse Magazine is a specialized magazine that focuses on housing construction materials, energy devices, and Zero Energy Houses. The Smart HIT magazine annually awards companies in three product categories: photovoltaic power generating systems, electrical power storage systems, and environmentallyfriendly water heaters. Hanwha Q CELLS rated # 1 in the photovoltaic power generating systems category, ahead of Panasonic and Canadian.

For more information about the Hanwha Q.PEAK-G4.1 Solar Modules, visit: http://www.q-cells.jp/products/pdt\_quality/module#peak







## Hanwha Advanced Materials Holds Graduation Ceremony for New Employee Overseas Training Program Participants

On February 12, at its headquarters in Seoul, Korea, Hanwha Advanced Materials held a ceremony for new employees who recently completed the company's New Employee Overseas Training Program. This is the third group to have gone through the program. They were deployed overseas at subsidiaries in the US, Europe, and China from last August to January.

The New Employee Overseas Training Program was conceived as a way to accelerate the careers of select employees at Hanwha Advanced Materials by giving them a global perspective of the business through experiences gained at subsidiaries abroad.

At the graduation ceremony that was attended by Hanwha Advanced Materials CEO Lee Sun Suk, the program graduates presented their experiences, training, and learnings from the program in areas such as production, support, and development.

"It was a meaningful opportunity for me to gain expertise in production management and at the same time, experience the local culture," said U-Kyung Chae, who recently returned from his training in the US. "I am definitely going to



apply what I learned during this training to how I work in the future."

The New Employee Overseas Training Program began in 2015 and takes place during the second half of every year for 6 months. During their assignment abroad, employees learn about international corporate work practices, participate in cultural exchanges, undergo language training, and receive mentoring. All expenses of the program is covered by the company.

A total of 34 employees have completed the program since its inception. A fourth group of six employees will depart for their overseas training experience in the second half of this year.



# Hanwha's Corporate Film Won a Gold Award at the 2017 Mercury Excellence Awards

Hanwha Group became the first Korean corporation to win gold at the Mercury Excellence Awards in the United States. The Group won for its corporate film in the 2017 Corporate Promotional Video category. The award was presented by MerComm, an independent awards organization that evaluates corporate PR productions and communications activities.

Hanwha's award-winning corporate film was produced in 2016 to reflect the Group's reorganization efforts and to demonstrate a consumer's point of view from a global perspective. The film was screened at the World Economic Forum in Davos, Switzerland from 2016 to 2018 as a way to promote Hanwha Group's position as a world leader. The film is also widely shown at sales sites, conventions, and exhibitions.

The film introduces global audiences to Hanwha Group through the voice of its employees and corporate partners. The video tells a personal and authentic story based on Hanwha Group's corporate values of "Trust" and "Loyalty".



In addition to the Mercury Excellence Award, Hanwha Group also received recognition from the ASTRID Awards and ARC Awards, both also presented by MerComm. Building on this success, Hanwha plans to continue spreading the Group's values and business goals through various promotional materials.

Hanwha Group's corporate film can be seen at the Hanwha Newsroom



# Hanwha Hotels & Resorts Aquarium Division Exchanges Knowledge With Japanese Aquarium

On January 24th and 25th, Hanwha Hotels & Resorts, Korea's largest aquarium operator, hosted its first academic exchange with Japan's Nagoya Port Promotion Foundation that operates the Port of Nagoya Public Aquarium.

The meeting, as part of an MOU signed in 2017, was to encourage sharing of knowledge and experience between the two participating organizations on



exhibitions, educational program and breeding program research results.

"We will share knowledge of breeding, keeping, and health maintenance of cetaceans and turtles," said Lee Gyu-Keun, Managing Director of Hanwha Hotels & Resorts' aquarium division. "We will also talk in-depth about the structure and procedures of Hanwha Marine Medical Center so that we can develop our aquarist expertise."

Managing Director Lee continued to speak about his hopes for future cooperation between the two organizations, "We will establish a system of cooperation between our aquariums so that we can embark on joint marine ecosystem research and biological exchanges."

The Port of Nagoya Public Aquarium has been recognized by the Japan Association of Zoos and Aquariums (JAZA) for making significant contributions to the breeding of endangered animals. In particular, the aquarium has been lauded for its breeding of the Loggerhead sea turtle. More than 9,000 baby turtles have been hatched since 1995.

"The aquarium is a place where we develop a respect for life," said Hiroshi Nitto, Director of the Port of Nagoya Public Aquarium at the conclusion of the academic exchange. "We must try to give children and adults as true of an impression of aquatic life as possible."



#### Hanwha Q CELLS Golf Team Has a Strong Start to 2018

Hanwha Q CELLS Golf Team is proud to announce the team's first victory of 2018. Min Young Lee won the 2018 Daikin Orchid Ladies Golf Tournament at Japan's Ryukyu Golf Club on March 4.

In the opening tournament of the JLPGA season, Ms. Lee began the final day of the tournament in fifth, but played a strong game to win the tournament with a final score of 11-under-par. This is her third career win in the JLPGA.

Fellow Hanwha Q CELLS Golf Team member Chae Young Yoon also made a strong showing, finishing second with a score of 9-under-par.

Meanwhile, in the LPGA, Nelly Korda and Ji Eun Shin of Hanwha Q CELLS Golf Team also had strong performances at the HSBC World Women's World Championship in Singapore. Both scored 16-under-par at the end of the tournament. Unfortunately, they fell just short of Michelle Wie, who scored 17-under-par, and shared second place.



Hanwha Q CELLS Golf Team looks forward to build on this successful opening to the 2018 golf season and hopes to see more victories in the coming year.



### Hanwha Total Petrochemical Conducts Compliance Training in China

Last July, Hanwha Total Petrochemical conducted its 2018 management briefing session at its plant in Daesan, Korea. Kim Hee Cheul, CEO of Hanwha Total Petrochemical, thanked attendees for all of their hard work. CEO Kim spoke on market trends petrochemical industry and shared with them the company's goals for 2018.

During his remarks, CEO Kim predicted that 2018 will be a good year for the petrochemical industry, and that the global economy will continue to recover and grow. He said, however, that it is necessary to be prepared for all possible contingencies given the current geopolitical risks on the Korean Peninsula: rising oil prices, and the weakening of the Korean Won.

CEO Kim also stressed that Hanwha Total Petrochemical would have to work hard to minimize risks and maximize worker safety in order for the company to truly rise above the competition and become a global leader. He said that Hanwha Total Petrochemical should make no concessions when it comes to making sure employees are safe because they are the most important part of the company.

CEO Kim took the time to directly speak with all the employees in a Q&A session. The management briefing was streamed online with other Hanwha Total



Petrochemical's workforce based elsewhere, so they too could have a chance to hear from CEO Kim.





# Hanwha Azdel Inc.

#### Hanwha Azdel Holds 2018 Kickoff Meeting

Hanwha Azdel held its 2018 Kickoff Meeting on February 15 where George Bondurant, Chief Manufacturing Officer, spoke with employees. Mr. Bondurant described the company's achievements last year and went on to share the goals for this year.

The meeting was a chance for employees to come together and share in the common goal of working together to achieve the company's 2018 goals.





# Mexico



Hanwha Advanced Materials

# **Hanwha Advanced Materials** Mexico S. De R.L. De C.V.

## Hanwha Advanced Materials Mexico Delivers Hope to the Children Suffering Cancer on the Valentine's Day

Hanwha Advanced Materials Mexico participated a recycling campaign from the Alianza Anticancer Infantil, a charity organization in Monterrey that helps children suffering from pediatric cancer. Alianza Anticancer Infantil was founded in 1996 to provide medical treatment to pediatric cancer patients up to 20 years old while offering education to their families.

Last year, Hanwha Advanced Materials Mexico launched a program to recycle plastic lids and bottles to raise money for Alianza Anticancer Infantil.

This year, the Human Resources team started the recycling program again and placed plastic lid collection boxes, next to the vending machines for employees at work. A total of 12 boxes of plastic lids were collected.

On Valentine's day, Hanwa Advanced Materials Mexico President Seonpil Yoo and 6 members of his staff visited the children. Hanwha Advanced Materials officials gave away toys while sharing cupcakes and conversations with the children and their families.



President, Seonpil Yoo said "I hope this opportunity is only the first step to helping and finding ways to contribute more to Mexican Society."