

Hanwha Newsletter

01 A New Decade of Opportunities

- Pinpoint Precision: Hanwha Aerospace Flies High Through Automation
- Hanwha Aerospace Spreads Its Wings in the US

02 Hanwha Column

- 2020 New Year's Message from Chairman Kim

03 Press Release

- Hanwha Solutions Holds Vision-Sharing Event and Announces "Each Employee Must Be Part of the Solution"
- Hanwha Q CELLS Modules Help Power Facebook Data Center

04 Hanwha Worldwide News

Explore this month's news of Hanwha and its affiliates, taking the initiative in all corners of the world.



A New Decade of Opportunities

Pinpoint Precision: Hanwha Aerospace Flies High Through Automation

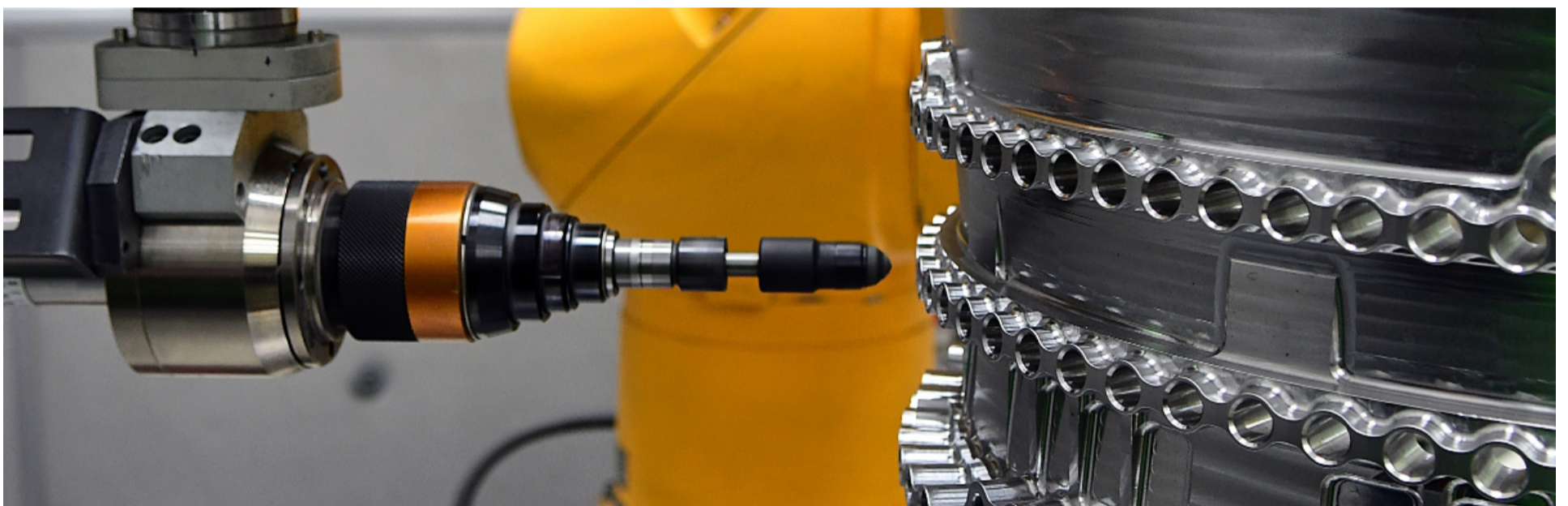
For the average air traveler, settling into their seat before departure, the question, “Who built this plane?” probably never crossed their mind.

The answer is much more complex than one might initially presume.

Most people have heard of Boeing and Airbus.

However, behind these manufacturers, there is an entire legion of companies that produces the vital parts and components needed to keep planes rolling out from the factories and onto the runway.

Hanwha Aerospace is quickly rising and establishing itself as a top player in the aerospace industry. It is relied upon by the world’s leading aerospace companies for its technological prowess and stringent focus on quality control.



A robotic arm precisely trims excess metal off the internal casing of a gas turbine engine at Hanwha Aerospace’s Changwon smart factory

A trusted partner to the world’s leading aerospace companies

Hanwha Aerospace has been a trusted supplier and partner to the world’s top three aircraft engine manufacturers—General Electric (GE), Pratt & Whitney and Rolls-Royce for more than three decades.

As a sign of great trust, Pratt & Whitney entered into a risk & revenue -sharing program (RSP) with Hanwha Aerospace in 2015 and 2016. GE relies on Hanwha Aerospace to supply it with crucial components for its most advanced GE9X engines, having signed a new contract worth USD 300 million in 2019. That same year, Rolls-Royce deepened its relationship with Hanwha Aerospace, one of its top-ten suppliers. Now a member of Rolls-Royce’s Life of Engine Program, Hanwha Aerospace will provide cutting-edge Trent-series turbine engine components.

What allows Hanwha Aerospace to build and establish its reputation for quality and reliability?

The answer lies in the company’s impressive automated capabilities that enhance human ability to produce top-quality aircraft engine components.

Automating to prepare for the future

There is very little room for error in the aerospace industry. So, at its flagship manufacturing facility in Changwon, South Korea, Hanwha Aerospace invested USD 85.4 million to construct an 11,000 m² smart factory. All the automated systems in the smart factory allow Hanwha Aerospace employees to work more efficiently and precisely while providing tighter quality control.

The highly automated nature of the Changwon smart factory is a result of

Hanwha Aerospace’s long-term view. The company is intent on ensuring its production capabilities will remain on the cutting edge even thirty or forty years in the future.

With a spacious and brightly lit interior, the smart factory acts as a showcase for Hanwha Aerospace’s technological capabilities. It is filled to the brim with automated equipment that handles a large portion of the work which happens inside.



An automated guided vehicle delivers an engine component to a workstation at Hanwha Aerospace’s flagship plant in Changwon, Korea

Bright-orange automated guided vehicles (AGVs) glide along the floor. Using a collection of sensors and laser tracking, they bring in supplies from warehouses and move parts from one workstation to the next.

Elsewhere in the smart factory, cobots, or collaborative robots, which are robots that can safely operate around humans, are hard at work. They systematically

work on racks full of freshly cut aircraft engine components, precisely machining each and every one.

Maintaining precision and consistency at all times

At the Changwon smart factory, Hanwha Aerospace uses the Flexible Manufacturing System (FMS). This allows the company to manage operations from a central location and improve overall quality control.

The FMS monitors and maintains more than 80 different pieces of high-tech equipment, including the smart factory's AGVs, and the robots/cobots responsible for assembly, grinding, and welding to ensure consistent production.

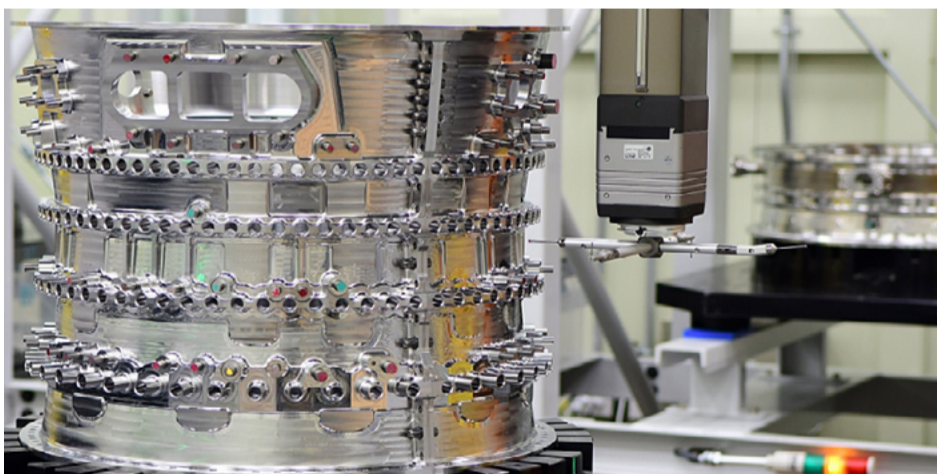
Most importantly, the FMS uses an extensive array of temperature sensors to maintain a precise interior temperature of 21-degrees Celsius 24-hours a day. This is vital when producing aircraft engine components. Even the slightest difference in the Changwon smart factory's interior temperature can cause metal parts to warp and render them useless.

“The components we produce must operate flawlessly at temperatures exceeding 1,400 degrees Celsius. With some of those components, our margin-of-error is one micron. To compare, a human hair can be anywhere from 30 to 100 microns in thickness.”

-Sang-kyun Gam, General Manager at Hanwha Aerospace

“The components we produce must operate flawlessly at temperatures exceeding 1,400 degrees Celsius. With some of those components, our margin-of-error is one micron. To compare, a human hair can be anywhere from 30 to 100 microns in thickness,” explained Sang-kyun Gam, General Manager at Hanwha Aerospace.

“The FMS allows us to control what goes on in the smart factory with great precision,” he continues. “Because even a one-degree deviation in the interior temperature can cause enough metal expansion to make it impossible for parts to fit together precisely.”



A 3D-inspection machine takes measurements of the interior casing of a gas turbine engine manufactured at Hanwha Aerospace's Changwon smart factory

Maximizing quality through data analysis

To be even more precise in how it operates, Hanwha Aerospace implemented a digital twin-monitoring system at its Changwon smart factory. The digital twin provides an easy-to-understand platform from which operators can track the performance and capacity of each work station and quickly notice if anything needs additional human attention.

In near real-time, the digital twin utilizes IoT technology to monitor warehouse stocks, the location of each AGV and progress of each component in production, and any possible defects. This data is updated more than 20 times per second.

In near real-time, the digital twin utilizes IoT technology to monitor warehouse stocks, the location of each AGV and progress of each component in production, and any possible defects. This data is updated more than 20 times per second and shown on a digital depiction of the smart factory that can be toured through a computer interface.

“The digital twin allows us to see everything that’s going on at the smart factory. It makes it much easier for us to analyze our performance,” says Hyung-wook Nam, Managing Director of Production at Hanwha Aerospace. “We plan to build on this and develop an analytical AI system on top of the digital twin so we can get even better at catching product defects and preventing accidents.”

Aiming high, growing further

As aircraft technology keeps advancing, the components used in aircraft construction must progress alongside it. Hanwha Aerospace will stay ahead of the technological curve to continue distinguishing itself in the aerospace industry. It is already undertaking fact-finding trips around the world to benchmark other smart factories and find innovations to implement in Changwon. ■

A **New Decade** of Opportunities

Hanwha Aerospace *Spreads Its Wings* *in the US*



Hanwha Aerospace USA is a vital part of Hanwha Aerospace's expansion of its global operations

Hanwha Aerospace was proud to welcome EDAC Technologies into the fold in late 2019. Rechristened Hanwha Aerospace USA, it brings a well-honed competitive edge to Hanwha's burgeoning aerospace business.



Hanwha Aerospace USA's team members develop and produce cutting-edge aircraft engine components for major manufacturers like GE and Pratt & Whitney

Based in Connecticut, USA, with 600 team members operating out of four state-of-the-art manufacturing facilities, it specializes in the development and production of static and rotating components like engine cowlings and integrated bladed rotors.

Now, as Hanwha Aerospace strengthens its foothold in the aircraft-engine-component industry with major partnerships with **Rolls Royce**, **GE**, and **Pratt & Whitney**, Hanwha Aerospace USA is adding its own expertise into the mix.

Benjamin Adams, President of Hanwha Aerospace USA, spoke about the company with the Hanwha Newsroom and what it brings to the table as Hanwha Aerospace grows its American presence.

Q1. How is the transition going?

Very well!

Our employees are satisfied having been acquired by a global business that has no intention of selling us. That short cycle structure is what we previously experienced in the private equity space, which is essentially transitory capital.

I have spoken with all our original equipment manufacturer (OEM) and Tier-1 customers about the merger and transition and they are all very positive about it.

We've also established a post-merger integration (PMI) team that is taking the lead with merger actions and we have good alignment on our objectives. The PMI team comprises members from our domestic leadership team and expats from Korea. As we kick off 2020, we are getting our functional goals and best-practice sharing coordinated so that Hanwha Aerospace USA and our parent company are stronger together as we enter this next decade.



Benjamin Adams, President of Hanwha Aerospace USA, on the shop floor at Hanwha Aerospace USA

Q2. What's changed since the acquisition?

I think the biggest change is an increased focus on mid and long-term goals. In the past, a lot of our decision making was focused on the short-term.

As mentioned earlier, we also have PMI team members from Korea living in Connecticut now. Having our new co-workers stationed locally and engaged in our daily operations is a positive from my perspective. We rely on these experts to be a conduit to the management and functional teams overseas.

Q3. Could you please explain how the acquisition makes Hanwha Aerospace more competitive?

The EDAC team brings decades of experience working with companies like GE and Pratt & Whitney to introduce new manufacturing concepts and develop and industrialize both static and rotating aircraft engine components. Outside of aircraft engine components, they provide several ancillary niche services like farm-out machining and high-energy beam special process. They're also a global leader in designing and building of specialty tools and ground support equipment for OEMs.

A part of Hanwha Aerospace's thesis is centered around accelerating OEM engagement. With the acquisition, we have strengthened geographic presence near supply chain players and OEMs, like Pratt & Whitney.

We're face-to-face with employees from Pratt & Whitney and GE every day. These

frequent engagements create clarity around the OEMs' current and future needs and help us make commercially responsible decisions as our business grows. Ultimately, Hanwha Aerospace USA's relationships with Pratt & Whitney and GE will expand. I predict we will sign more big deals and establish new product lines while improving customer satisfaction in the years to come.

Also, sharing best practices – specifically in manufacturing and engineering – will reduce inefficiencies in our global aerospace operations. Subject matter experts from Hanwha Aerospace USA have visited Korea and Vietnam and our functional leaders are hosting technical delegations from our partner sites as well.

Q4. Moving forward, what will Hanwha Aerospace USA be working on?

We are extremely focused on the delivery of our very large NextGen backlog. Additionally, the aerospace supply chain in the US is still fragmented. So, there are opportunities to expand our growth and capabilities in the region, both organically and through acquisition.

Hanwha Aerospace has impressive operations in Korea, Vietnam, and Singapore. I think – with the addition of our US operations – Hanwha Aerospace now has one of the best global manufacturing footprints in the aerospace industry. We'll have to see what new opportunities are complementary to our capabilities and work hard to take advantage of those that support Hanwha Aerospace's vision to become the number one partner to the world's leading aircraft-engine manufacturers.

In the wake of its successful merger, Hanwha Aerospace USA is bringing its cutting-edge R&D and production capabilities to the table. Moving forward, the company will play a vital role in its parents' globe-spanning organization and Hanwha's continued rise in the aerospace industry. ■

2020 New Year's Message from Chairman Kim



Dear Hanwha Family,

I wish you and your families a New Year full of happiness and good health. You have my deepest gratitude for devoting yourselves to Hanwha's future, especially in light of the internal and external challenges our businesses have had to overcome.

It's been ten years since we announced our Quality Growth 2020 vision. Looking back, our accomplishments have been significant. We've explored and identified new business opportunities amidst heightened trade conflicts and great uncertainty in the global economy. We overhauled our corporate structure to become more specialized so we could dominate in each of the industries we operate. All of you have been our foundation for change—the reason we have been able to reach this level of success and make great leaps and bounds over the past decade. From your accomplishments, we can all draw inspiration and encouragement to continue our efforts.

And, continue we must! For the next ten years, let us continue our qualitative growth. To this end, we need to accelerate how Hanwha qualitatively differentiates ourselves from the competition and how we can elevate our businesses to lead globally. In the next ten years, we need to achieve this goal through a disciplined execution of our strategy to make Hanwha the undisputed global leader in each of our core business areas. **And so, our next great leap in the decade to come will depend on how we establish first-in-class business positions and secure our sustainable value for the future.**

First, we must accelerate our digital transformation to achieve competitiveness in the Fourth Industrial Revolution.

Digital technology is already changing everything about the way we operate. We must, therefore, embrace the technological revolution this year, driving every one of our companies to digitize and bring about real change to capture growth opportunities. The adoption and application of technologies must focus on Hanwha's current and future strengths. From there, we must implement digital transformations across the board.

Next, each business needs to secure market leadership by executing a set of strategic management activities.

Our mid-to-long-term goal for each Hanwha company requires us to be forward-thinking and look externally to identify and invest in new business

models, as well as internally to develop a scalable corporate culture that is sustainable and innovative. We must be both focused and methodical in our approach to improve our core businesses and, in the coming years, generate higher business values and increase our growth potential. And we must do this even as the business landscape remains uncertain. We must secure vital business capabilities and resources for the future. We must do this while strengthening our competitiveness. And instead of imitating and following others, I urge you all to innovate and create value—the likes of which the world has never seen before.

We must evolve as a sustainable company whose growth is rooted in the deep trust shared between ourselves and our various stakeholders.

A company's pride is not simply in numbers like those from sales and profits. It's also about gaining the trust of a community that includes shareholders, customers, and employees. We must recognize that saving the environment, giving back to society, and running a company fairly and transparently are how Hanwha builds its long-term growth engines.

In particular, I have emphasized the company-wide practice of ethical management over the years. Now, this should move beyond my personal beliefs and become deeply rooted in all of us at Hanwha. Safety and compliance are among the various components of ethical management, and are the two solid wheels that will move Hanwha to a lasting future. All work done in Hanwha's name should always begin with the perfect practice of safety and compliance management.

Dear Hanwha Family!

As the saying goes, "Every cloud has a silver lining."
So, let us go further together this year, toward a hope-filled tomorrow.

Thank you.

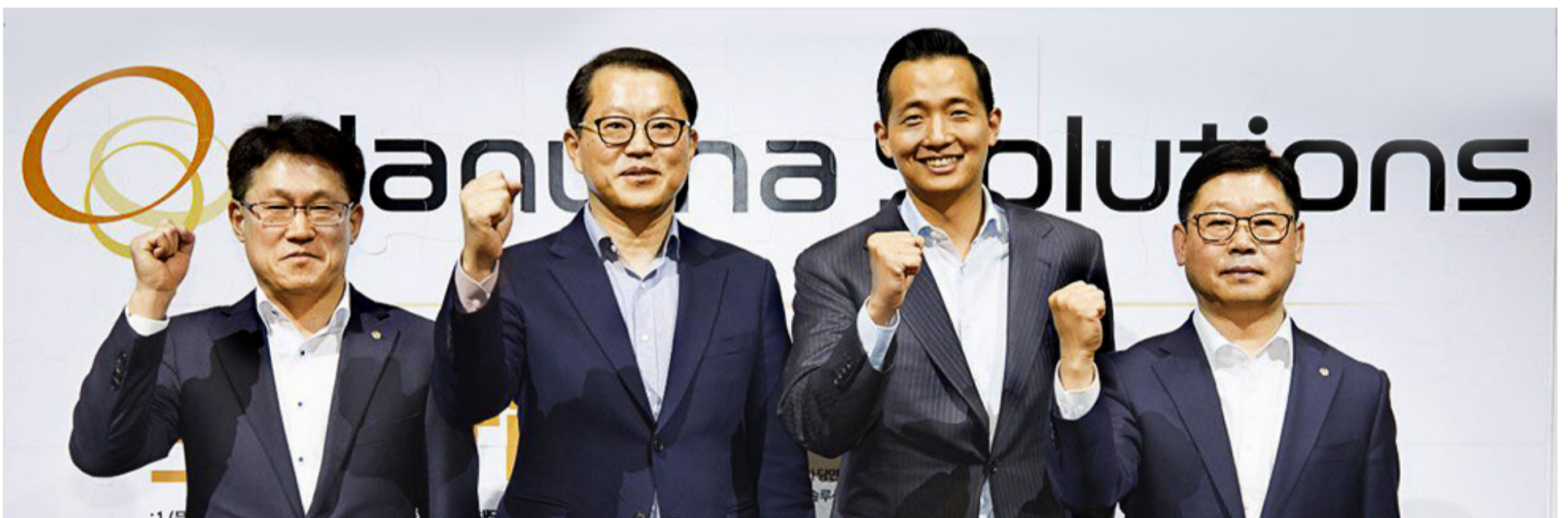
January 2, 2020

Seung Youn Kim
Chairman
Hanwha Group ■

Hanwha Solutions Holds Vision-Sharing Event and Announces “Each Employee Must Be Part of the Solution”

- Hanwha Solutions kicks off the new year with its first company meeting attended by business CEOs Hee Cheul Kim, Koo Yung Lee, and Doo-Hyung Ryu
- Hanwha Solutions is expecting to increase efficiency by consolidating resource, focusing its R&D capabilities on 3 industries, and improving its financial stability

“Each of us is here to contribute to a sustainable future by providing solutions to the issues faced by our customers, society, the environment, and climate. At Hanwha Solutions, everyone is a problem solver.”



Hanwha Solutions' senior management cheer on their newly launched company at its first official employee event

On January 6, employees gathered for Hanwha Solutions' first company meeting in the Hanwha Building auditorium in Seoul, Korea. The event kicked off the new year and the next decade of new possibilities. Chief Executive Officers Hee Cheul Kim of Q CELLS, Koo Yung Lee of Hanwha Chemical, and Doo-Hyung Ryu of Hanwha Advanced Materials were on hand along with Dong-Kwan Kim, President of Hanwha Solutions/Strategy Division who presented the Hanwha Solution's vision and direction.

This was the first official employee-only event for the newly formed Hanwha Solutions, a new company established by merging Hanwha Chemical, Hanwha Q CELLS, and Hanwha Advanced Materials. With its slogan “Technology for Sustainability,” Hanwha Solutions will be a key problem solver across diverse industries that increasingly face global uncertainties.

Back in 2018, Hanwha Q CELLS and Hanwha Advanced Materials merged, then on January 2nd this year at the Hanwha general shareholders' meeting, the formation of Hanwha Solutions was officially announced, representing the merger between Hanwha Chemical, Hanwha Q CELLS and Advanced Materials. The newly consolidated company is now the joint responsibility of its three business CEOs: Hee Cheul Kim (Q CELLS), Koo Yung Lee (Chemical), and Doo-Hyung Ryu (Advanced Materials).

By uniting the three businesses, Hanwha Solutions will be able to increase its business synergy. This synergy will help the new company achieve long-term, sustainable growth as it successfully implements advanced strategies that will improve management efficiency, expand R&D capabilities, and secure financial stability.

Strong intra-company synergy will be fostered through the consolidation and better

distribution/leveraging of resources. Hanwha Solutions will operate more efficiently by reducing costs and finding better ways to manage its finances. In turn, Hanwha Solutions will be able to consolidate R&D capabilities that can accelerate product development to lead the market and set new industry standards.

During the vision-sharing event, CEO Kim of the Q CELLS business said, “Together, let's turn Hanwha Solutions into a global leader in which each employee is a key to providing solutions.”

“Our three businesses merged to secure sustainable growth,” said CEO Lee of the Chemical business. “By combining our capabilities, we'll create a foothold from which Hanwha Solutions will leap onto the global stage.”

CEO Ryu of the Advanced Materials business said, “Let's make Hanwha Solutions the global leader in the future mobility market.”



Hanwha Solutions' senior management and employees celebrate their company's formal launch

Employees were asked to write their own vision statements and new year's resolutions on puzzle pieces. These pieces were then placed on a large board in the auditorium to symbolize that the employees' goals and Hanwha Solutions' goals are one and the same.

President Kim of Hanwha Solutions/Strategy Division explained, "The future business strategies we shared today are important, but Hanwha Solutions' vision can only be fulfilled if everyone gathered here today is able to realize his or her own individual vision." ■

Press Release

Hanwha Q CELLS Modules Help Power Facebook Data Center

· Walton EMC and Silicon Ranch Commissioned Project Serving Facebook's Newton Data Center Using 102.5 Megawatt of Hanwha Q CELLS Modules



Hanwha Q CELLS (or "The Company"), a world-leading total energy solutions provider, joined in celebrating the commissioning of the Bancroft Station Solar Farm on December 12th, Facebook's first solar project in the state of Georgia. Hanwha Q CELLS joined Facebook, Walton Electric Membership Corporation (EMC), Silicon Ranch, and state and local representatives to "flip the switch" on the 102.5 megawatt (MWAC) solar facility in a special ceremony at the project site.

Facebook chose Walton EMC as the power supplier for its data center in Newton County when it announced the facility in March 2018. As part of its agreement to supply 100 percent renewable energy for the center, Walton EMC announced a contract in December 2018 with Silicon Ranch, the U.S. solar platform for Shell and one of the nation's largest independent solar power producers.

The resulting solar project has yielded tangible economic benefits across the state. To support Facebook's data center and corresponding investments in Newton County, Silicon Ranch employed more than 675 people in Early County over the past ten months to assemble and install single-axis trackers that utilize NextTracker's TrueCapture smart control system, enabling more than 350,000 Q.PEAK DUO L-G5.2 solar modules to track the sun from east to west across more than 1,200 acres. The locally-sourced modules were among the first produced by Hanwha Q CELLS at its manufacturing facility in Whitfield County, which is the

largest of its kind in the Western Hemisphere.

"This project is representative of the cooperative approach to economic development across our state that has made Georgia a leader in innovative fields like solar energy," said Governor Brian P. Kemp. "The world-class solar modules manufactured by Hanwha Q CELLS in northeast Georgia and installed at Silicon Ranch's solar field in Early County are paving the way for leading companies with a focus on sustainability – like Facebook – to find a home in Georgia. That cooperation, facilitated by our outstanding local economic development partners like Walton EMC, is a large part of what has earned Georgia the title of No. 1 State for Business for seven consecutive years, and I am excited for the future of the solar energy industry in our state."

Hanwha Q CELLS CEO Hee Cheul (Charles) Kim remarked: "Celebration of this new facility coincides with the celebration of Hanwha Q CELLS' 20th anniversary, a timely reminder of how Hanwha Q CELLS strives to provide U.S. customers with high-performance modules, while leaving a positive impact on the economy of Georgia. Hanwha Q CELLS commends Facebook for its dedication to renewable energy sources as well as Silicon Ranch and Walton EMC for their commitment to delivering a world-class facility." ■

Explore this month's news of Hanwha and its affiliates, taking the initiative in all corners of the world.



China



Hanwha Chemical (Ningbo)

Hanwha Chemical (Ningbo) Teaches Fire Safety to Local Children

Because of the nature of its work, Hanwha Chemical (Ningbo) in China, takes fire safety very seriously. The company has extensive precautions in place to prevent fires and handle any that may occur. So, on November 26, 2019, Hanwha Chemical (Ningbo) visited a nearby elementary school in the Daxie Development Zone to share some of its know-how with young students.

Wang Xiaojun, head of Hanwha Chemical (Ningbo)'s Health, Safety, Environment, Quality (HSEQ) Team, puts together a training program that combined theory and practice to teach students about the basics of fire safety. Students learned how to report an emergency calmly and accurately, make their location known to rescuers, and safely evacuate dangerous areas. They also got to see demonstrations on how to don fire suits, use fire extinguishers, and



render basic first aid.

Going into 2020, Hanwha Chemical (Ningbo) plans on expanding its efforts to teach children about fire safety. The company hopes that children who learn how to fight fires and use electricity safely will be able to share that knowledge with their families and the rest of society and improve safety all around.



Indonesia



PT. Hanwha Life Insurance Indonesia

PT. Hanwha Life Insurance Indonesia Helps Develop Safe Spaces for Children to Play

In November of 2019, PT. Hanwha Life Insurance Indonesia teamed up with humanitarian organization Wahana Visi Indonesia. Together, they helped set up RPTRA Anggrek Rawasari, a "Child-Friendly Integrated Public Space" in Central Jakarta. This is the second time the two organizations collaborated in support of Jakarta's push to create safe outdoor spaces.

"We are here to support Jakarta's drive to create more child-friendly outdoor spaces," said David Yeom, CEO of Hanwha Life Indonesia at RPTRA Anggrek Rawasari's opening ceremony. "Kids need more interaction with the environment and each other."



In 2020, PT. Hanwha Life Insurance Indonesia will continue supporting Jakarta's plan to open more public areas where parents can take their children. The company will work with Wahana Visi Indonesia again to develop a third "Child-Friendly Integrated Public Space" by the second half of this year.

Indonesia



PT. Hanwha Life Insurance Indonesia

PT. Hanwha Life Insurance Indonesia Goes for Gold with New Brand Ambassador

On December 7, 2019, in front of hundreds of fans and media at fX Sudirman shopping center in Jakarta, Indonesia, PT. Hanwha Life Insurance Indonesia unveiled its K-Health Bucket List Plan and introduced its newest brand ambassador: Korean Olympic gold-medal badminton player Lee Yong-dae.

The K-Health Bucket List Plan is an insurance starter package that helps younger people understand the importance of having life insurance. Customers meet premium payment milestones to receive rewards and access to activities that will let them scratch items off their bucket lists.

Lee Yong-dae is the perfect brand ambassador for the K-Health Bucket List Plan. Indonesians are badminton fanatics, with local interest in Lee skyrocketing after he



won gold at the 2008 Beijing Summer Olympics.

“Hanwha Life and I want Indonesians to play badminton to become healthier and earn more rewards from the K-Health Bucket List,” Lee told the fans who were present. “In addition to physical and mental health, sound financial planning is also very important when you wish to fulfill your dreams. Those of you who’ve been wanting to visit Korea, you can fulfill that dream through the K-Health Bucket List.”

Thailand



Hanwha Chemical (Thailand)

Hanwha Chemical (Thailand) Celebrates 30th Anniversary with CSR Outing

To mark its milestone 30th anniversary, Hanwha Chemical (Thailand) showed its dedication to the local community by helping a primary school in Phichit Province.

At Bhaan Nongbua Primary School, Hanwha Chemical (Thailand) management and staff arrived with donations of stationery and sports equipment. Everyone also pitched in to give the school a fresh coat of paint and plant a vegetable garden on campus for students to eat healthy and focus more on their studies.



Vietnam



Hanwha Life Insurance (Vietnam)

Hanwha Life Vietnam Celebrates the Opening of Customer Service Center

Hanwha Life Vietnam hosted a celebratory event to commemorate the opening of its new customer service center in Ho Chi Minh City, which will play a major role growing the company’s business in southern Vietnam. CEO Seungjoo Yeo joined Back Jong Kook, General Director of Hanwha Life Vietnam, at the ceremony.

“You’ve had fast-tracked growth over the past ten years,” said CEO Yeo during the service center’s opening event. “Hanwha Life Vietnam is a prime example of our globalization strategy and you will have our full support as you continue your strong growth in the future.”



After the ceremony, CEO Yeo paid a visit to Hanwha Life Vietnam’s Ho Chi Minh City headquarters to meet with employees and encourage them to continue their hard work. He also met with department heads to provide guidance and advice for the future. ■