

dimensions

INTERNATIONAL



Artificial
REEFS
Enhancing Marine
Biodiversity in the
**Arabian
Gulf**

Hasbah: A Fine Pearl in the Arabian Gulf

The emergence of Hasbah gas field, along with neighboring Arabiyah, carries a promise of great prosperity to help power the Kingdom's economic diversification and power needs.

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Poised for Success: Saudi Aramco's Global Research Centers

Saudi Aramco has assembled some of the industry's brightest minds in our research centers in Saudi Arabia and abroad to further bolster our position as a world leader in energy technologies. The centers focus on a broad range of both upstream and downstream technologies and are all strategically located to leverage industry, academic and strategic partners.

dimensions
INTERNATIONAL

The Saudi Arabian Oil Company, also known as Saudi Aramco, was established by Royal Decree in November 1988 to succeed the original U.S. concessionary company, Aramco. The Aramco concession dates back to 1933.

Saudi Aramco's Board of Directors is chaired by His Excellency Khalid A. Al-Falih, Minister of Energy, Industry and Mineral Resources, and former president and CEO of the company. The Board of Directors, as steward for the Government's interest in the company, steers Saudi Aramco's business affairs, provides management with guidance in determining the company's mission and long-term strategy, oversees senior management succession planning, establishes internal controls, and assesses company opportunities, risks, and strategies for risk mitigation. The Board includes senior Saudi Government officials, heads of leading Saudi research and academic institutions, senior figures in the international oil, gas, and finance industries, as well as senior members of Saudi Aramco management.

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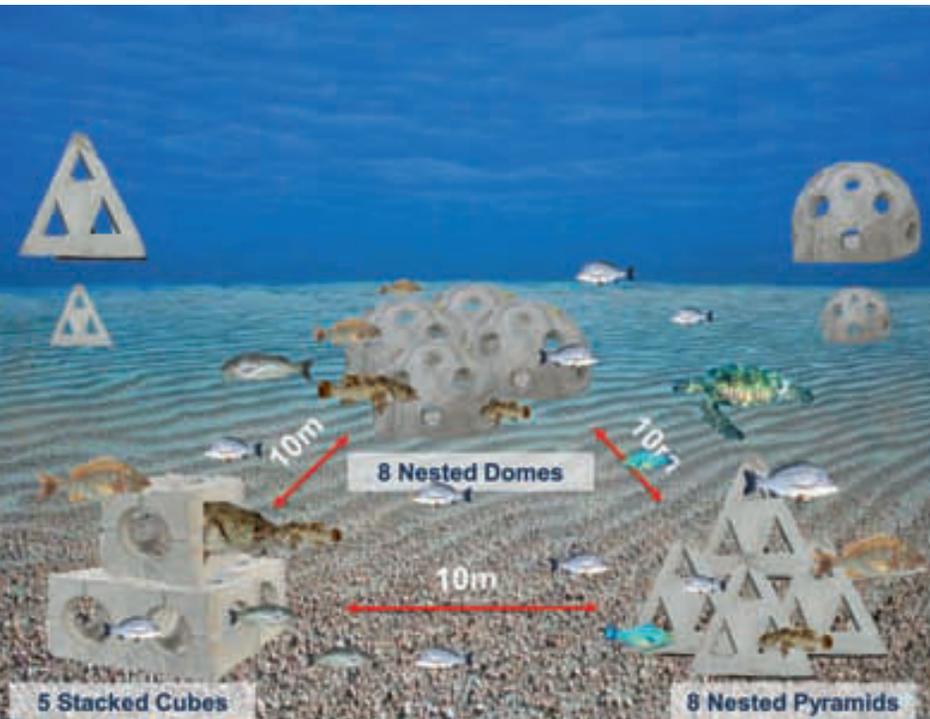
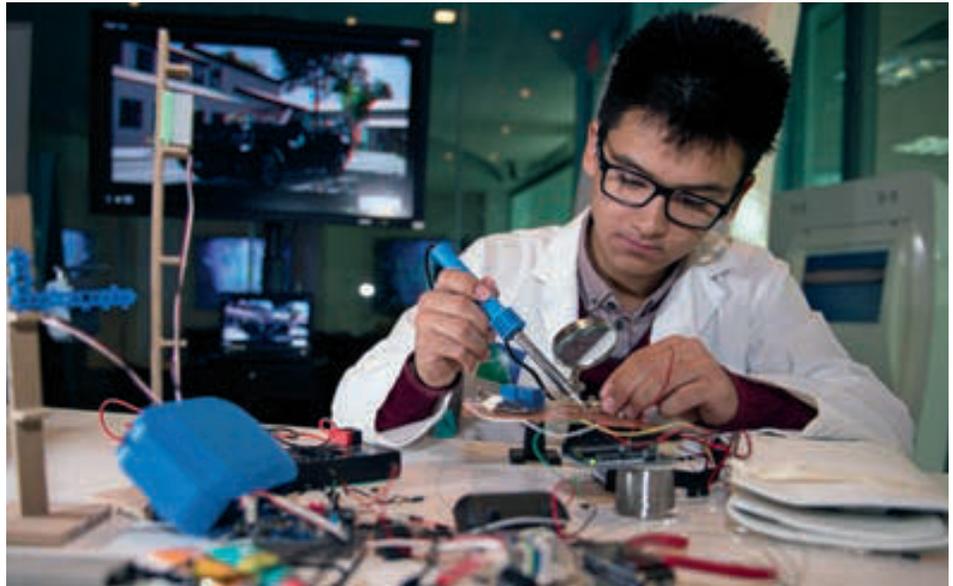
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Powering Innovation: Energizing Great Ideas into Reality

Saudi Arabia's new trajectory of growth and development puts a premium on establishing an innovative culture that recognizes — and develops — the best ideas being brought forward.



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Artificial Reefs: Enhancing Marine Biodiversity in the Arabian Gulf

Saudi Aramco's Environmental Protection Department is spearheading an ongoing initiative to ensure a viable habitat for marine life in the Arabian Gulf.

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About the cover:

The Arabian Gulf is home to a variety of fish that depend on coral reef structures for survival. Here, a Lemon Goby (*Gobiodon citrinus*) hides in some coral.

أرامكو السعودية
saudi aramco



HASBAH

A FINE

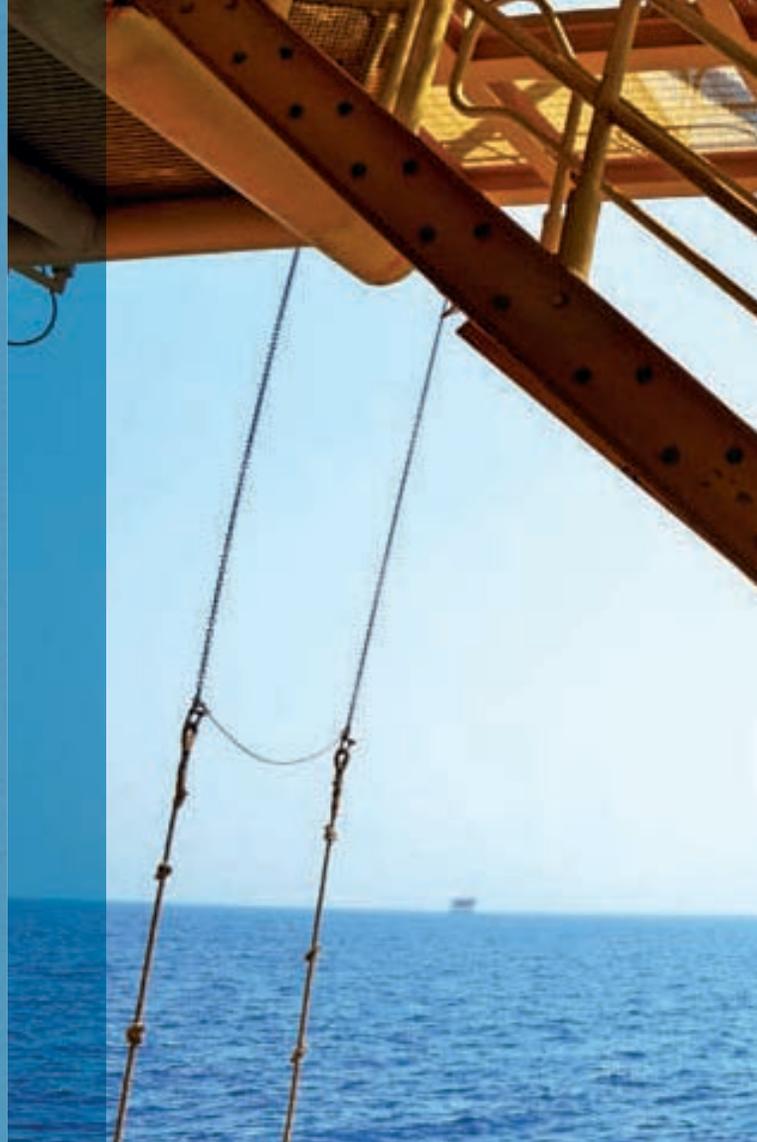
Pearl

IN THE

ARABIAN GULF

By ADIL A. AL-SADIQ
Photos by MUSLEH KHATHAMI

SAUDI ARAMCO'S GIANT HASBAH/ARABIYAH PROJECT GETS ITS NAME FROM TWO OFFSHORE FIELDS LOCATED OFF THE KINGDOM'S EASTERN COAST. THE ARABIYAH FIELD IS NAMED AFTER A NEARBY ISLAND OF THE SAME NAME. THE HASBAH FIELD ALSO HAS A NAME OF LOCAL SIGNIFICANCE.





In his 1981 book “Social and Economic Development in the Arab Gulf,” Irish Middle Eastern studies professor Tim Niblock described the Hasbah pearl as one of the rarest, most expensive, and most beautiful pearls in the region. Hasbah pearls were once a great source of income for those who lived along the Gulf shores. So when it came to naming the second field, Hasbah was a natural fit.

Today, the Hasbah and Arabiyah fields again promise great prosperity for the Kingdom, as they will help Saudi Aramco produce large quantities of nonassociated gas — as much as 2.5 billion standard cubic feet per day (Bscfd) — that will be processed at the Wasit Gas Plant (WGP) and then used to help power the Kingdom’s economic diversification and power needs.

Confidently and enthusiastically carrying out their tasks and assignments, young employees such as Abdullah A. Qarni (top left), Mane Ba-Alhareth and Mohammad A. Al-Bndari (bottom left), have helped set the pace at the important mega-project.

UNIQUE PROJECT HELPS FUEL THE KINGDOM

Hasbah/Arabiyah is only the second offshore nonassociated gas development project in Saudi Aramco history — the other being the Karan field development project. The Hasbah/Arabiyah fields were developed using single-well-head platforms, which were strategically distributed across the field.

The Hasbah and Arabiyah fields were discovered in 2008, and today, nonassociated gas produced from the fields is processed at the WGP, located 10 kilometers (km) southeast of the Khursaniyah Gas Plant.

The Hasbah/Arabiyah offshore gas facilities consist of various essential systems that make gas production and transport to the WGP possible. The facilities are operated under the Northern Area Gas Producing Department (NAGPD).

Hasbah consists of seven of the world’s largest gas production platforms, with a production capacity of 350 million standard cubic feet per day of nonassociated gas per well.

The wells in the Hasbah field were designed to withstand a pressure of an unprecedented 10,000 pounds per square inch (psi), and gas produced from the wells is directed to a tie-in platform, which in turn transfers gas to the WGP.

The designs of the Hasbah and Arabiyah fields are similar in terms of well size and production capacity. The Arabiyah field has six platforms that are pooled to a tie-in platform, which is also linked via subsea pipelines to the WGP.

YOUNG SAUDIS AT THE READY TO SERVE COMPANY AND KINGDOM

The company's ability to produce nonassociated gas is critical to the Kingdom's goal to use the gas for domestic power generation, thereby freeing up more high value liquids for industry and export.

To meet this challenge, Saudi Aramco plans to nearly double our gas supplies over the next 10 years to reach more than 20 billion standard cubic feet per day (Bscfd). This will increase the share of gas — the least environmentally polluting fuel — in the utility fuel mix to more than 70%, a percentage among the highest in the world. Last year, our gas production reached a record level with an average of 11.6 Bscfd.

These efforts also support domestic industry, which in turn, supports the local economy, said AbdulRahman M. Al-Qahtani, manager of NAGPD. "By developing this project, we were able to provide job opportunities for Saudis," Al-Qahtani said.

Khalid A. Al-Zamil, left, and Wael M. Alanazi are among the team of young Saudis, field experts, and supervisors who have helped bring the Hasbah/Arabiyah field project to life.

He noted that the unique design of the project provided significant challenges — especially in offshore areas — but lessons learned from the Karan field project helped the company prepare and train the Saudi workforce for these new challenges.

"In preparing our human resources, we had to develop training methods that met the unique design of the Hasbah/Arabiyah fields," he said.

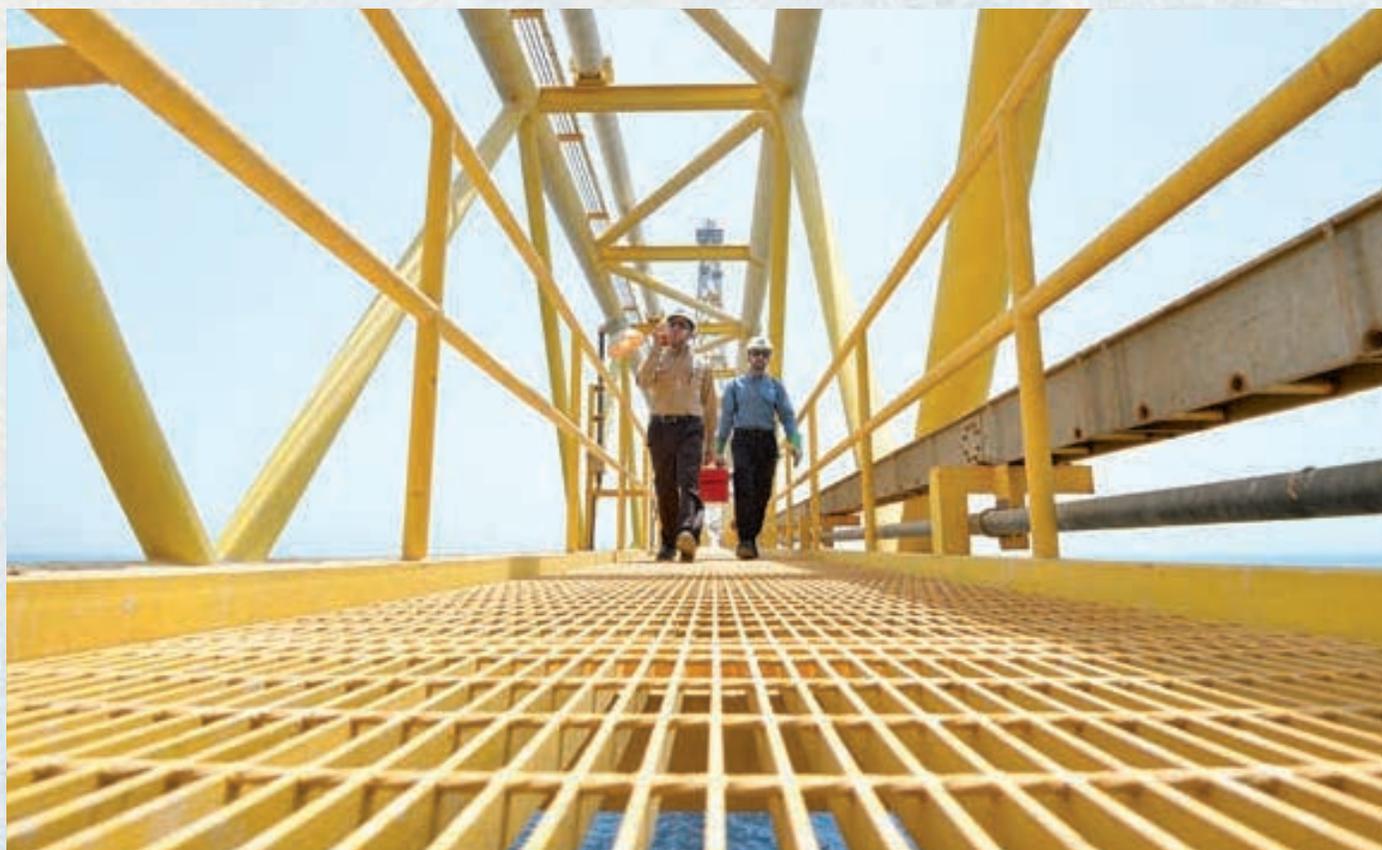
This started with the hiring of a number of young Saudis specifically for the project. These employees worked with engineers and helped in the preparation of the project's initial and detailed designs. The young Saudis also played a part in the pre-startup and equipment pre-testing before the project's final startup, Al-Qahtani said.

In addition to building a qualified and skilled Saudi workforce, the participation of companies experienced in high-pressure production fields was instrumental in the operation of the Hasbah field. By bringing these companies into the project, the young Saudi employees were able to learn from their expertise how to tackle challenges unique to these fields.

With both material and moral support from Saudi Aramco management, NAGPD developed a complete project roadmap that included providing suitable training for the new operating team — and that roadmap has proven to be a successful one.

CHALLENGES AND INNOVATIONS

Wind, rain, and rough seas have long been part of the challenges faced by those who work in offshore areas.





Ali H. Al-Khamis inspects the breaker on circuits for instrumentation in the area covering Hasbah to the Wasit Gas Plant.

“We had no control over weather conditions that greatly impacted our work and prevented us from meeting some milestones,” said Al-Qahtani. “But we devised a contingency plan that helped us overcome those challenges.”

For example, when contractor companies failed to supply some materials in time, those working on the project were able to quickly develop a number of innovations that allowed the company to meet the original commitments.

“This is evidence that the ingenuity of the Saudi youth is limitless,” Al-Qahtani said, noting that thanks in part to those innovative ideas, pre-startup of the project was able to take place in October 2015.

SPECIAL TRAINING PROGRAMS

Recognizing the importance of developing human resources for the Hasbah project, NAGPD turned to the Northern Area Training Department for help. The interdepartmental collaboration resulted in a program designed to help employees receive hands-on training from subject matter experts, including participation from operating system manufacturing companies.

Employees involved in the first phase of the operation participated in two four-week sessions. Al-Qahtani noted that the courses will continue to be offered until all employees have had a chance to attend, ensuring that they are qualified and ready to work at the Hasbah/Arabiyah facilities.

SAFETY BY DESIGN

As with all company facilities, safety was an integral component in their design, with each being built to Saudi Aramco’s safety and industrial security specifications and standards.

In addition to the participation of experts and consultants from the Loss Prevention and Inspection departments, NAGPD sought assistance from subject matter

experts in gas processing and production facilities from outside the company to ensure the compatibility of procedures, instruments, and equipment used in the construction of the project.

NEW CHALLENGES AND TECHNOLOGIES IN HASBAH

Engineering Division superintendent Ahmed F. Al-Mulhim supervises the engineering work on the project.

Al-Mulhim, who also worked on the Qatif and Manifa project management teams, was selected as the operating representative for the Hasbah/Arabiyah project during the detailed design stage. He previously worked in Sharjah, United Arab Emirates, and then at the Dammam Port, where the project’s gas wellhead platforms were manufactured by the Italian company Saipem. The project’s huge tie-in platforms were manufactured in Indonesia.

“For me, the challenge was to supervise both projects at Dammam Port and in Indonesia, as well as the preparatory work, before the project became operational,” Al-Mulhim said. Work then turned to the huge platforms — work that was done mostly offshore. “We were living in barges to be close to the contractor and the project management team,” he said.

Al-Mulhim conceded that it was challenging having to live aboard barges for two continuous months, but the young

BUILDING ON THE ENTHUSIASM OF YOUNG SAUDIS, SAUDI ARAMCO ASCENDS TO LIFT THE PROSPECTS OF A NEW GENERATION AND THE KINGDOM SIMULTANEOUSLY WITH OUR MASSIVE HASBAH/ARABIYAH MEGA-PROJECT. BY TAPPING THE ARABIAN GULF’S SUPPLY OF A CLEANER BURNING FUEL AND UTILIZING THE COMPANY’S REMARKABLE NETWORK AND FACILITIES, THE ENDEAVOR WILL HELP REPLACE LIQUID-BASED FUELS AS A SOURCE FOR POWER GENERATION WITH FEEDSTOCKS OF NONASSOCIATED GAS, ALLOWING MORE CRUDE OIL TO BE SOLD AND EXPORTED. THE PROJECT PROVIDES A SIGNIFICANT BOOST LOCALLY, ADDING JOBS FOR SAUDIS AND HELPING TO ELEVATE THE SKILLS OF A NEW GENERATION OF EMPLOYEES, THEREBY RAISING THE PROSPECTS OF THE COMPANY AND KINGDOM TOWARD A BRIGHTER FUTURE. YOUNG SAUDIS HAVE BEEN A KEY COMPONENT IN THE SUCCESS OF THE PROJECT.

employees embraced the challenge. “I was highly impressed by the enthusiasm of young engineers and operators, as well as their ability to quickly acquire the expertise from the staff who worked on previous projects,” he said.

The contractor, Al-Mulhim noted, was also very cooperative in training the various team members.

Al-Mulhim is proud of the team’s achievements on the project, in particular its ability to use technologies that hadn’t previously been used by Saudi Aramco. Some of these technologies included:

- Main feeders: A pipe containing three parts — 130,000 psi steel tubes (used to transfer monoethylene glycol and heavy diesel oil), fiber optics, and electrical cables — this technology helps solve the lack of space in offshore areas as it allows for the delivery of these essential utilities to each of the wellhead platforms through one feeder.
- Static synchronous compensators, or Statcom: This smart device, which works as a condensation unit and catalyst (smart voltage regulator), was used for the first time in the Middle East on the project. Typically, the longer electricity has to travel, the lower the voltage delivered, and the Statcom addressed this problem on the project’s 163-km long power cable.

A TEAM COMES TOGETHER IN HASBAH

Khalid A. Al-Zamil, head of the Hasbah Oil and Gas Division, joined the project at the stage of manufacturing the platforms in Dammam and Indonesia. Al-Zamil had to get to know the young Saudis and others working on the project

well so he could form an operation and maintenance team that would work seamlessly with the engineering team.

“When I joined the project, I found a stimulating and encouraging work environment, and when I met my team, I noticed that all the operators were young employees, with most having no more than five years of work experience,” said Al-Zamil.

Because of this, an extensive program was designed to train the young talents on how to operate the new machinery, equipment, and devices involved in the project, as well as to facilitate the transfer of equipment from suppliers.

The young team members were also trained in monitoring and understanding the operation of pipelines and cables installed between platforms, the main tie-in platform, and the WGP. Al-Zamil said they also had to ensure operators understood their assigned work and were aware of the importance of security and safety within the facilities.

“We have been able to capitalize on the enthusiasm and energy of the young people,” said Al-Zamil. “We have not only trained them on understanding the performance of the machines but also on understanding those machines’ exterior design and mechanisms.”

The team was trained on how to properly handle and maintain equipment in collaboration with suppliers and contractors responsible for the installations, thereby ensuring adherence to the highest specifications and standards.

The team also checks and inspects all equipment and valves, making sure that every tie-in and valve in the facility is 100% intact. “The inspection employee is required to sign off

LEFT TO RIGHT: AbdulRahman M. Al-Qahtani, Khalid A. Al-Zamil, Ahmed F. Al-Mulhim





on a test, as this promotes a sense of self-responsibility among the young employees. When we started operation, there were no leaks, making the initial operation successful and consistent with Saudi Aramco standards and specifications,” Al-Zamil said.

After completing training, verifying staff and equipment efficiency, and ensuring the availability of safety devices, preparations began for emergency training to ensure readiness and responsiveness in case of an accident.

READY FOR ANYTHING

A day before the operation, an undeclared emergency training session was conducted. Staff and personnel from the various supporting departments at the facility reacted swiftly and knowledgeably, which in turn assured management that safety and security would be maintained at startup and that all concerned parties would work together to ensure safety.

Then, on startup day, the NAGPD experienced unfavorable weather conditions, yet the startup was a success.

Personnel were split into two teams, and both teams

executed their tasks to perfection. The two platforms were operating with the tie-in platform within four hours.

NATIONAL RESPONSIBILITY

Work challenges in offshore circumstances require employees and officials to reside aboard large boats tied to the main platform, floating close to territorial waters — only 800 meters away. This sacrifice is balanced with the ability to not only operate a vital company facility but also to serve the Kingdom through producing natural gas, which promotes the nation’s economic capabilities.

Gas production in such significant quantities is the lifeblood of a critical economic component of the Kingdom’s long-term viability as it flows from the Hasbah and Arabiyah fields to the WGP, and then to the nation’s Master Gas System, where it is available to various industries and companies.

This, in turn, flows in the form of electrical power to the citizens of the Kingdom for household needs, as well as providing desalinated water that is used in all aspects of daily life. 🌍



Poised — FOR — Success

SAUDI ARAMCO'S GLOBAL RESEARCH CENTERS

— BY —
Julie L.
Springer

Establishing and sustaining a global research and technology presence is an integral component of Saudi Aramco's drive to achieve technology leadership, and we have assembled some of the world's brightest minds in our research centers in Saudi Arabia and abroad to further bolster our position as a world leader in energy technologies.

The first international research center was officially inaugurated in 2012 at Delft University of Technology in the Netherlands. Since then, others have been opened in Aberdeen, Scotland; Paris, France; Beijing, China; along with three in the United States: Boston, Detroit and Houston. In Saudi Arabia, our global research centers include Saudi Aramco's Research and Development Center (R&DC) and the Exploration and Petroleum Engineering Center – Advanced Research Center (EXPEC ARC) in addition to King Abdullah University of Science and Technology (KAUST).

Our global research centers leverage strategic hubs of innovation, with world-class research talent, supporting infrastructure and closer interaction with collaboration partners. By working with leading institutions all over the world,

Saudi Aramco continues to be at the forefront of research and development across the energy and petrochemical industries, developing and deploying the most efficient and effective technologies.

“Through our global research centers and technology offices we are able to leverage strategic hubs of innovation and world-class research talent,” says Ahmad O. Al Khowaiter, chief technology officer.

“Our collaboration partners provide intellectual and professional diversity, which represent key sources of innovation and competitiveness. Saudi Aramco's long-term corporate technology strategies covering upstream, downstream and sustainability technology can only be achieved through the input and support of our centers.”

THE DELFT GLOBAL RESEARCH CENTER

The Delft Global Research Center in the Netherlands concentrates on four domains of geophysics research: automatic converted-wave static correction technology, joint migration inversion technology, seismic data reconstruction technology, and full elastic waveform inversion technology in near surface characterization and data-driven seismic processing.

The center works on the research and development of novel algorithms and methods for seismic data acquisition, data processing, imaging and reservoir characterization.

Delft University is a center of excellence in academic R&D in the field of seismic exploration and serves as a platform to promote Saudi Aramco's upstream technology leadership in the region.

Our presence in Delft allows Saudi Aramco to develop step-change geophysical innovations addressing critical challenges in Saudi Arabia utilizing expertise and knowledge in place at Delft University and its surroundings. We can also identify new research talent to be considered for employment.

ABERDEEN TECHNOLOGY OFFICE

Situated at the heart of the upstream industry in Europe, the Aberdeen Technology Office (ATO) strategically serves to facilitate technology transfer and development of short- and long-term technology delivery portfolios required by Saudi Aramco's drilling and production operations.

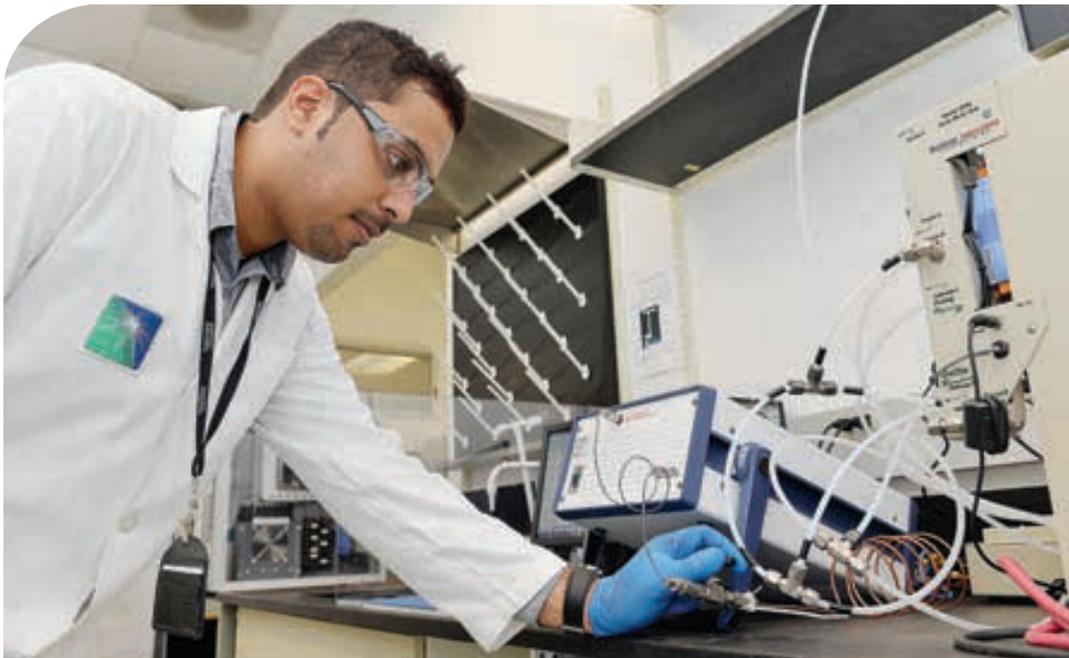
The center accomplishes this by interacting with innovation and developments in drilling, advanced completions and artificial lift technologies in the European area and by engaging academia, developers and research organizations in partnerships and collaboration. That knowledge and the technology are then transferred to Saudi Aramco.

The European arm of Saudi Aramco Energy Ventures (SAEV) is also established within the center to build alliances with strategically significant and innovative technology companies and provide equity partnership at early stage opportunities, ultimately contributing to in-Kingdom economic development.

The center provides professional interaction and control

with existing projects, creating frequent updates to the Dhahran drilling and production teams. Projects can be planned and supported with ATO's access to resources of strategic partners.

At the Research and Development Center in Dhahran, Saudi Arabia, Hassan A. Khalaf, a lab technician, is performing the testing of lab-scale single cell solid oxide fuel cell (SOFC) performance using an electrochemical test unit that uses hydrocarbon fuel to produce power.





At the Beijing Research Center, Dongqing Cao, a petroleum engineer, conducts a micromodel displacement test.

ARAMCO FUEL RESEARCH CENTER, PARIS

The Aramco Fuel Research Center (AFRC) Paris was established as part of a 10-year partnership program with IFP Energies Nouvelle (IFPEN) located at the IFPEN complex in Rueil-Malmaison — Paris.

The location of the center allows Saudi Aramco to capitalize on IFPEN's established innovations, facilities, resources and industrial links to various European automakers to accelerate the innovation cycle of various fuel technologies pursued by Saudi Aramco's R&DC.

AFRC-Paris develops fuel/engine technology solutions where the benefits can be demonstrated to automakers and stakeholders on a real vehicle. Two ongoing research programs are currently motivated by the projected demand shift toward heavier distillates leading to a surplus in lighter distillates.

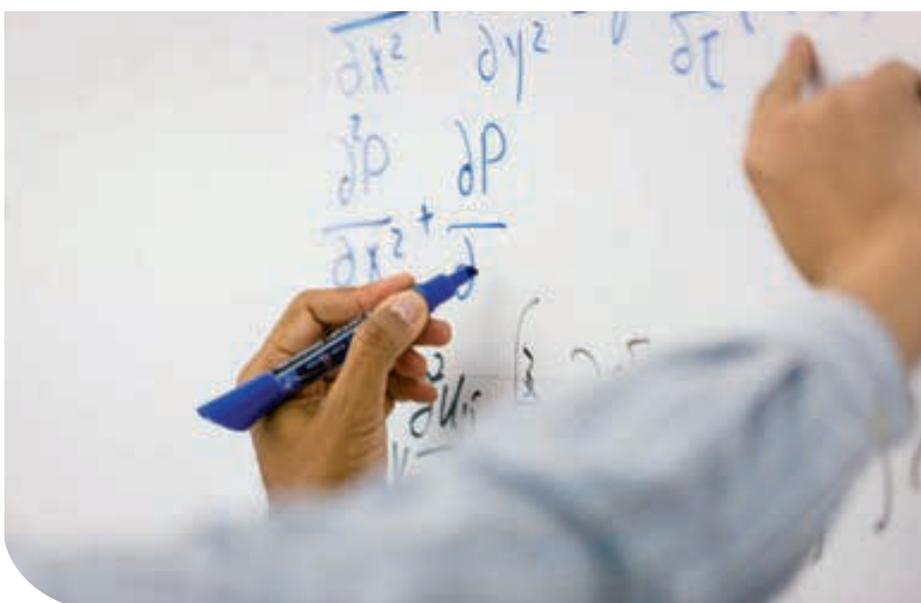
The first strives to demonstrate the potential of straight run gasoline in a diesel engine, while the second strives to demonstrate the fuel octane quality on-demand with a gasoline engine using a dual fuel approach. Both programs target positioning oil-based fuels as economically and environmentally competitive enablers for future transport technologies.

The role of AFRC is to take these concepts and develop them further to a stage where they can be demonstrated to automakers, and once the feasibility of these concepts is fully demonstrated, fleet demonstrations will be further pursued at the Aramco Fuel Research Center in Detroit.

BEIJING RESEARCH CENTER

The Beijing Research Center (BRC) is Saudi Aramco's first Far East-based global research center and conducts advanced research activities that ultimately introduce new proven technologies and provide specialized innovative technical services.

Beijing was strategically chosen as



Boston Global Research Center research chemist Jason Cox tests the synthesized nano-magnetite contrast agent material with a strong magnet. This injectable "NanoMapper" material was designed to enhance the clarity of electromagnetic imaging of fluid volumes from a wellbore out into the reservoir.

the location to diligently collaborate with its top R&D institutes, technology and service providers, and topmost universities.

The BRC focuses on the latest oil and gas upstream leading-edge technologies — mainly reservoir engineering, geophysics, and geology.

Through close collaboration with Saudi Aramco's EXPEC ARC scientists as well as local universities and institutes in Beijing, the BRC has made significant achievements in its research toward enhanced oil recovery challenges as well as advanced seismic imaging.

The BRC will fortify Saudi Aramco's EXPEC ARC endeavor in creating cutting-edge solutions to existing energy and petroleum challenges through innovative thinking and a state-of-the-art exploitation of technology. The created technologies will ultimately lead to enriched exploration exertions of oil and gas, increased recovery rates, and extended reserves, which will in return secure Saudi Aramco's standing as the world's number one energy provider.

KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY

Located in Daejeon, Republic of Korea, the Korea Advanced Institute of Science and Technology (KAIST) — also referred to as the Saudi Aramco KAIST carbon dioxide (CO₂) Management Center — is a joint collaboration established to conduct the research and development of new solutions for the management of carbon.

The center is located within

Researchers in Detroit are seeking major advances in engine technologies and fuel development. Aramco's fuel technology program is focused on reducing the overall environmental impact, cost and complexity of both current and future fuel engine systems.



the KAIST campus and is fully equipped and operational for students and researchers. The center provides innovative approaches to address scientific and technical challenges of carbon management and is promoting the continued use of safe and environmentally friendly petroleum products.

The main objective of the center is to conduct joint research that leverages the expertise and intellectual resources of both KAIST and Saudi Aramco to create new knowledge and develop innovative technologies addressing carbon emis-





Left: At the Aramco Research Center-Detroit, senior technician Steven Sommers installs engine components into a heavy-duty, on-road engine for testing, under the supervision of the Commercial Transport Fuels Research Team leader, Michael Traver (back left) and engine combustion specialist Yu Zhang.

The center supports research in computational reservoir modeling (parallel reservoir and basin simulation, massive visualization and scientific computing), advanced materials and nanotechnology for surface and subsurface applications, including membranes for natural gas separation.

The center also works to enable solutions for a range of downstream technology challenges with research

areas that include catalysis, gas separations and asset integrity, and has launched a collaboration with Sandia National Labs in Carlsbad, New Mexico that has shown first-in-kind experimental verification of the onset of corrosion in the presence of hydrogen sulfide and/or CO₂ via in situ transmission electron microscopy.

ARAMCO FUEL RESEARCH CENTER, DETROIT

The Aramco Fuel Research Center (AFRC) in Detroit leverages the Detroit automotive ecosystem to perform strategic transport research studies and conduct vehicle integration activities in support of new technology fleet demonstration.

The state of Michigan employs more industrial and mechanical engineers than any other state in the U.S. and plays host to nearly 400 automotive research and development (R&D) centers, giving the company's researchers access to leading industry partners, research organizations and academia. Cooperation with U.S. automakers is key to promoting joint technology development and the facilitation of subsequent prototyping and imple-



sions, including capture, storage, reduction and utilization.

The Saudi Aramco KAIST CO₂ Management Center will become the world's premier research center in CO₂ management by providing innovative technologies and strategies to reduce greenhouse gas emissions and help address the issue of climate change.

Successful collaboration between KAIST and Saudi Aramco through the CO₂ Management Center will also foster future projects and the exchange of innovative ideas between KAIST and Saudi universities and other world renowned centers of excellence engaged in carbon management research.

KAIST is considered one of the top universities in the world, with excellent research capabilities in novel material development and access to top talent.

BOSTON GLOBAL RESEARCH CENTER

Inaugurated in December 2013, the Boston Global Research Center houses over 16,300 square feet of lab and office space and supports Saudi Aramco's upstream and downstream operations.

The center is located in America's largest educational/research hub with more than a quarter million students attending over 60 universities and colleges. Large company and startup company R&D, defense and medical research complement this innovation ecosystem.

It is the ideal place to identify and evaluate game-changing technologies for the oil industry. Additionally, the center serves as a recruiting magnet of top talent for Saudi Aramco's R&D centers in Boston, Houston and Dhahran.

The center's upstream operations play an integral role in company's long-term strategy to create breakthrough advances in the discovery and recovery of hydrocarbons.

mentation of promising fuel/engine systems.

In support of Saudi Aramco's fuel technology vision, the center's strategic value is realized through generating competitive oil-based transport technologies, thereby mitigating erosion of the market for petroleum-derived fuels in the transportation sector.

The state-of-the-art facility focuses on next-generation fuel and engine systems and is used as a platform to innovate, develop and showcase low carbon footprint transport technologies; promoting the development and adoption of sustainable and cost-effective, oil-based transport solutions.

New fuel and combustion engine development and innovative carbon management technologies are a priority and will create improved engine/vehicle efficiency and support the reduction of CO₂ emissions from mobile sources.

THE HOUSTON RESEARCH CENTER

The Houston Research Center boasts over 60,000 square feet of lab and research space, making it the largest of Saudi Aramco's U.S.-based R&D centers. Situated in Houston's "energy corridor," the center is strategically located in a major hub for oil and gas R&D activities and is near chemical and oil field fluids manufacturers as well as service companies, R&D labs and top petroleum engineering universities.

Houston is also the headquarters of U.S. subsidiary Aramco Services Company, which has been a member of the city's business community since 1974.

The center plays an integral role in Saudi Aramco's

long-term strategy to create breakthrough achievements in the discovery and recovery of hydrocarbon resources by focusing on several upstream disciplines to include quantitative geology, advanced seismic imaging, unconventional productivity enhancement, reservoir engineering aspects of unconventional resources, smart fluids for production and advanced drilling fluid research.

KING ABDULLAH UNIVERSITY OF SCIENCE & TECHNOLOGY RESEARCH CENTER

Located in Thuwal, Saudi Arabia, the KAUST Research Center provides access to world-class talent (researchers and students) and currently undertakes research activities related to reservoir engineering, computational modeling, advanced nanomaterials, chemicals, carbon management and renewable energy.

Saudi Aramco recently broke ground on the construction of a new, state-of-the-art research facility within the Research Innovation Park at KAUST. Expected to be completed in 2019, the center will be 11,300 m², housing 132 scientists and researchers.

The facility, which includes laboratories and offices, will focus on research in chemicals, intelligent systems, solar energy, reservoir engineering, computational modeling and environmental protection.

Some of Saudi Aramco's notable robotic technology, the Saudi Aramco Inspection Robot (SAIR), the Shallow Water Inspection & Monitoring Robot (SWIM-R) and Robotic Dust Mitigation (RDM) were developed at KAUST. 🌐

Below: At the Aramco Research Center-Houston, Katherine Hull, chemist and Production Technology Team member, works to prepare a fracturing fluid for high-pressure, high temperature and pH measurement testing.



Powering

INNOVATE

**Energizing
great ideas
into**

REALITY

by

SAMANTHA J. HORSEMAN

How many times have you had a great idea and never bothered to dedicate the energy toward making it happen? Or worse still, you had a great idea and saw it become a reality by someone else — who took the risk and initiative to do so.

+

+



ATION

+

Inventors range from electrical engineering students to manager level.

+

THESE THOUGHT-PROVOKING QUESTIONS

were recently addressed in three engaging sessions that were collaboratively organized between the Leadership Development Division [LDD], the Management & Professional Development Department [M&PDD], the Ibtikar Innovation Board, and the IT Future Center. The sessions were held at the Ras Tanura Leadership Center, Ras Tanura, at the North Park 2 Auditorium, and at the IT Future Center in Dhahran.

The sessions featured an inspiring keynote address from a visiting Canadian inventor, Brent Baier, CTO and founder of Iron Will Innovations Inc. Baier shared his story of how he energized and turned his great idea (the peregrine glove system) into reality. He shared a story of empowerment, risk taking, collaboration and determination.

Baier's story hit the hearts of many inventors in the audience, and he shared his lessons learned along the journey of innovation and entrepreneurship. These stories included a theme about never giving up, striving to be your best, and perseverance.

His key learnings resulted in his product being sold in over 50 countries, showcased in the movie "Pacific Rim," and furthermore becoming the preferred reference by NASA in the wearable technology industry.

As a way to drive the key message, the keynote was followed by an insightful panel discussion with contributions from Saudi Aramco's and Saudi Arabia's innovation stakeholders. These key stakeholders included Ali Al Qahtani, Ibtikar board secretary, Steven Morgan, Intellectual Property (IP) counsel from Law, Adnan Al Asaly, Technology Oversight and Coordination (TOC) Group, Trey Goede, Venture Capital Group of Wa'ed (the Saudi Aramco Entre-

preneurship Center), and a well-known Saudi entrepreneur Fatima Batook, CEO, TIMA® Company Ltd. This panel shared their insights of how employees can energize and turn great ideas into reality.

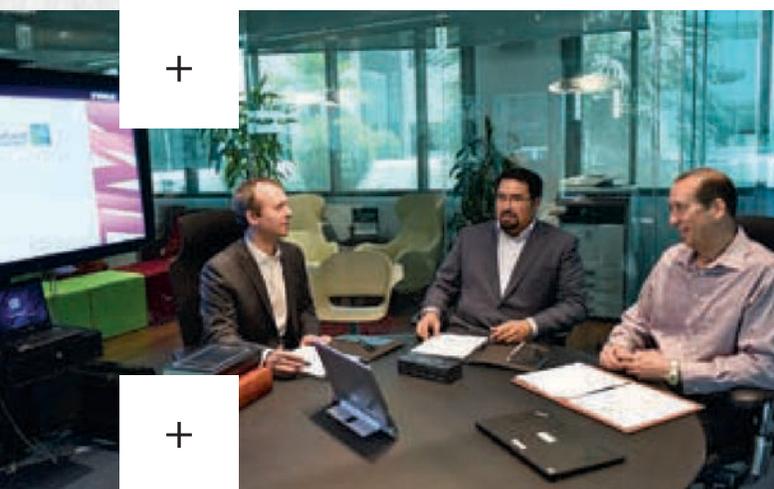
SAUDI VISION 2030

The panel discussion was moderated by the Human Energy Management (HEM) group and Abdullah Al Abdullah from the Ibtikar Team. The first panel question set the scene to further explore innovation at Saudi Aramco and Saudi Arabia, being positioned around Saudi Vision 2030. The panel highlighted why innovation is more critical than ever, considering that Saudi Arabia is on a new trajectory of growth and development.

Saudi Vision 2030 was highlighted as a roadmap that will see the Kingdom transformed from a state dependent on oil to a much more productive, and proactive country for economic growth and development. The panel discussed how this roadmap will set a path to raise the level of productivity to accomplish structural, economic and social changes within the Kingdom. In doing so, this will ensure the stability of the state for future generations.

Below left: Discussions with IP Counsel, Law and Technology Oversight and Coordination (TOC) at the e-factory, IT Future Center.

Below right: Brent Baier, CTO and Founder of Iron Will Innovations Inc., shares his success and challenges on his entrepreneurial journey.





Above: The panelists are key stakeholders of innovation in Saudi Aramco and the Kingdom. Fatima Batook, Adnan Al Asaly, Steven Morgan, Ali Al Qahtani and Trey Goede.

Right: Ron Monsen, inventor from UPDC, with augmented virtual reality technologies, investigating the human computer interface and haptics in the virtual world.

It was agreed by the panel members that this is the goal that lies at the heart of Saudi Vision 2030 and it can be achieved through strategically leveraging innovation, as this will be the sustainable tool for remaining ahead of the curve in technological advancement.

INNOVATION

Panelists also agreed that innovation is an essential investment for every company. This was highlighted by a quote from Ali Qahtani, who said, “The key common denominator of the most successful companies worldwide is a focus on innovation, their ability to reinvent themselves, adapt to a changing business environment, customer demands and competition. With this in mind, Saudi Aramco is adopting



industry best practices to establish and improve an innovation program that will be an integral part of our culture and to empower employees to innovate.”

As the old adage goes, “the proof is in the pudding.” Morgan and Al Asaly shared a Saudi Aramco story of innovation success, which clearly demonstrated how great

ideas are energized and turned into reality. This success story involved one of the panelists, Batook. They explained how they had successfully licensed five patents from the Saudi Aramco IP portfolio to Batook's company, and how she is taking these patents to the market. Batook is now building a smart e-shirt for the Kingdom.

Al Asaly said, "Moving this technology forward to the market is only the beginning toward a full-fledged intelligent sensing solution. The inventor and team have clearly demonstrated their innovative capabilities in executing an

idea that can create an impact. TOC is pleased to commercialize this technology as a way to diversify its portfolio and to contribute to local content."

Furthermore, Morgan highlighted the success of this licensing and commercialization by stating "Jack Welch said 'leaders create a vision, articulate the vision, passionately own the vision and relentlessly drive it to completion.' That is what this Saudi Aramco inventor did in developing a technology, which is now licensed to TIMA® Company Ltd. to implement that technology into a useful commercial product."

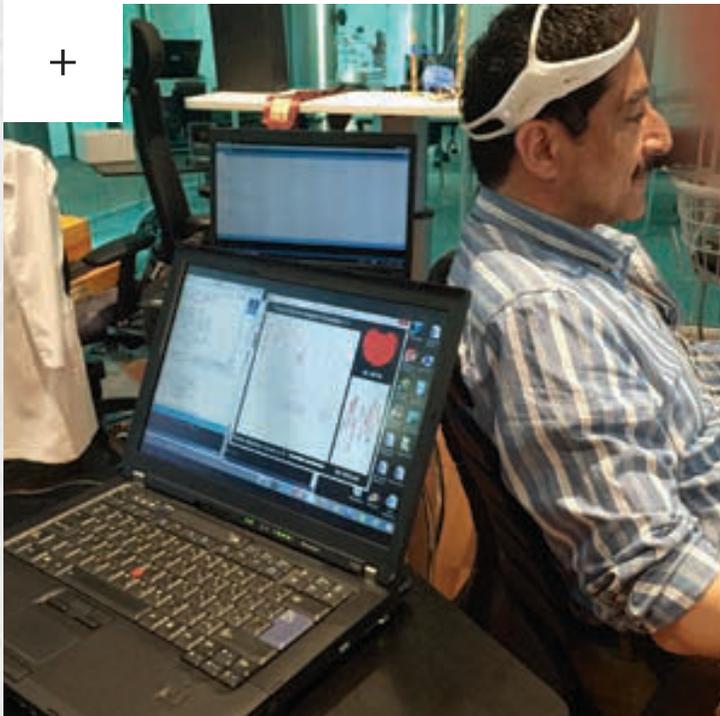
Additionally, Goede explained how the Venture Capital Group has investment funds available for local entrepreneurs to establish new companies or to grow existing small- and medium-sized enterprises in the Kingdom.

Goede said, "The Venture Capital Group is always looking for innovative investment opportunities in Saudi Arabia. We have already made 14 investment commitments to Saudi entrepreneurs over the past three years. This specific case is extremely exciting for us, because the IP creator is a Saudi Aramco employee, and the company that secured a licensing agreement from Saudi Aramco is a very impressive company called TIMA® Company Ltd., founded by an extremely talented Saudi entrepreneur, Fatima Batook."

In closing, Batook shared her insights from the session, saying "Today proves that Saudi Aramco is more than an oil company, as it also looks toward the future of our country in innovation and creativity, which fits perfectly with Saudi Vision 2030. It's our honor and immense pleasure to have signed with Saudi Aramco to use intellectual properties developed by a Saudi Aramco inventor, to create and develop a new venture for TIMA® Company Ltd. with wearable technology."

From a leadership development perspective, Brent W. Mattson, director of M&PDD, stated that "This session demonstrated that if we continue to take powering innovation seriously, this will be the thriving catalyst that will continue to provide Saudi Aramco with a competitive advantage in creating a multi-industry capacity, not just through oil and gas ventures. In addition, it will provide

Left: Testing in the indoor human computer interface (HCI) and outdoor (with valve actuator) e-factory lab. Tests were conducted for the Predictive Personal Protective Equipment and Plant Supervisory System prototype.





The entire team that developed and launched the powering innovation sessions. **Row 1:** Panelists and Keynote — Fatima Batook, Adnan Al Asaly, Steven Morgan, Ali Al Qahtani, Brent Baier, and Trey Goede. **Row 2:** Rasha Bubshait, Geoff Rogers, Mohammed Abdrabbuh, Amal Bawazeer, Abdullah Al Abdullah, Lisa Bradford, Rinan Farhad, Manea Al Khalifa, and Ali Abusaud.

the Kingdom with the ability to have the technological advancement that enhances leadership growth and job opportunities for future generations.”

For employees wanting to learn more about innovation opportunities in the company, the HEM team based at the IT Future Center can share the success of the e-factory. The e-factory is a hub that empowers innovators, inventors, intrapreneurs, and entrepreneurs through collaboration across the entire innovation ecosystem.

The e-factory energizes, connects and sustains the “idea value chain” with expertise in collaboration with the expert panelists: IP specialists, patent attorneys, licensing and commercializing specialists, venture capitalists, and investors.

Through creating and collaborating with this chain of expertise, the e-factory is able to generate great ideas, take them to proof of concepts, to prototypes, and finally, to patents. Most importantly, the expertise from these panelists, who are part of the e-factory team, has demonstrated this through commercializing products ready for the market and in-Kingdom business ventures.

SUCCESS AND INSPIRATION

The successful outcomes of the e-factory are the impressive patent portfolio, award winning prototypes and projects, and

commercialization and licensing of Saudi Aramco’s IP, which will create new in-Kingdom companies in partnership with the Venture Capital Group. The e-factory is located at the IT Future Center, North Park 3, Building 3302 in Dhahran.

The success and inspirational message that followed this session was outstanding. So much so that one participant developed an entire blog post about “powering innovation.”

As a summary to his blog post, Ali Al Shehri, from the Support Business Applications Department of Information Technology, stated, “The message at the end was clear. Saudi Aramco is committed to support and foster innovations, not only inventions related to Saudi Aramco core businesses, but also other innovations that could be commercialized. It was a great event and I am very glad that I attended it. A credit has to be given to the organizers of the session, HEM, LDD, and M&PDD in collaboration with the IT Future Center and Ibtikar. The organization and selection of guests were excellent. I hope to see this type of organization continued in future events.” 🌐

Blog post: https://mysite.aramco.com.sa/personal/alsham0y/Blog/_layouts/15/start.aspx#/default.aspx

Artificial REEFS

Enhancing
Marine
Biodiversity
in the

Arabian Gulf

BY

Ronald A. Loughland, Ph.D.

AND

William H. Bass Jr.



Healthy corals provide food and protection to different marine organisms, including fish species that we consume.

Coral reefs are invaluable sources of ecological and economical richness. These ecosystems serve as nurseries for numerous marine species, provide shelter to more than 25% of all known marine fishes and act as natural barriers against coastal erosion. Plants and animals inhabiting coral reefs are normally dependent on hard substrates for growth. For this reason, hard surfaces on which to live are often the most limiting resource for coral reefs, as these unoccupied hard substrates are generally scarce.

In the marine environment, areas available for colonization are either created naturally by disturbances that clear the substrate (e.g., storms), or artificially by the immersion of structures in the water. In the latter case, artificial substrates have been a useful tool to promote the growth of marine life, mitigate impacts on natural habitats and provide additional dive sites for tourism purposes. In the Arabian Gulf, the use of artificial reefs dates back centuries, when different materials, including date palm trunks, stones, and pottery, were sunk in coastal areas to increase the abundance of fishes for human consumption.

Various kinds of disturbances, both natural and human induced, have impacted coral reefs worldwide leading to their overall degradation and loss, and the Arabian Gulf is no exception. Prolonged increases in sea surface temperatures have resulted in wide-scale coral bleaching, which in turn has led

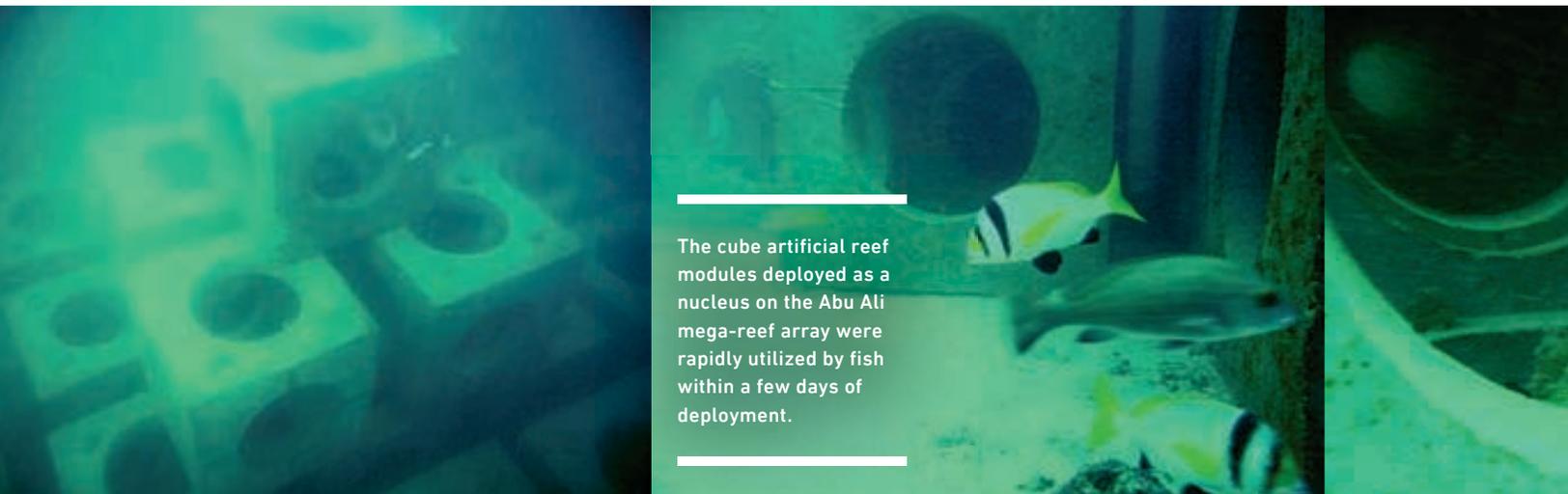


to the collapse of many natural coral reef habitats. This phenomenon has impacted not just corals, but also the many diverse reef species and fish that use the reef structures as refuges and feeding resources.

A HUMAN SOLUTION TO HUMAN PROBLEMS

Currently, most of the coral reefs in the Arabian Gulf are under risk of disappearance due to a combination of climate change factors and human activities such as fishing, dredging and marine pollution. Artificial reefs are now being used throughout the Arabian Gulf to mitigate impacts on coastal habitats and marine resources.

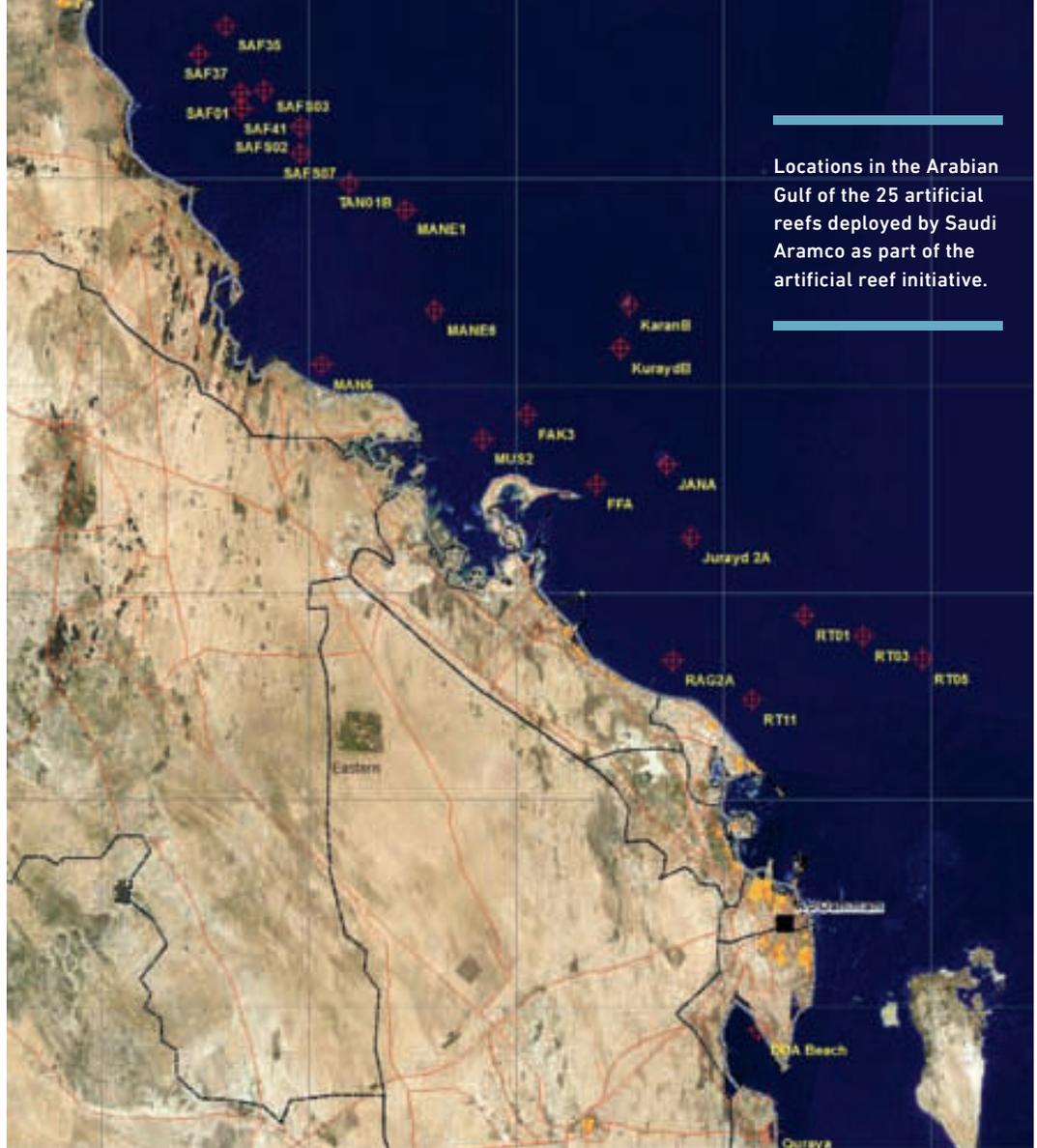
These purpose-built structures provide a hard surface that is rapidly colonized by different organisms, including some that serve as food for humans. There are two types of artificial reefs, those that are created intentionally with a



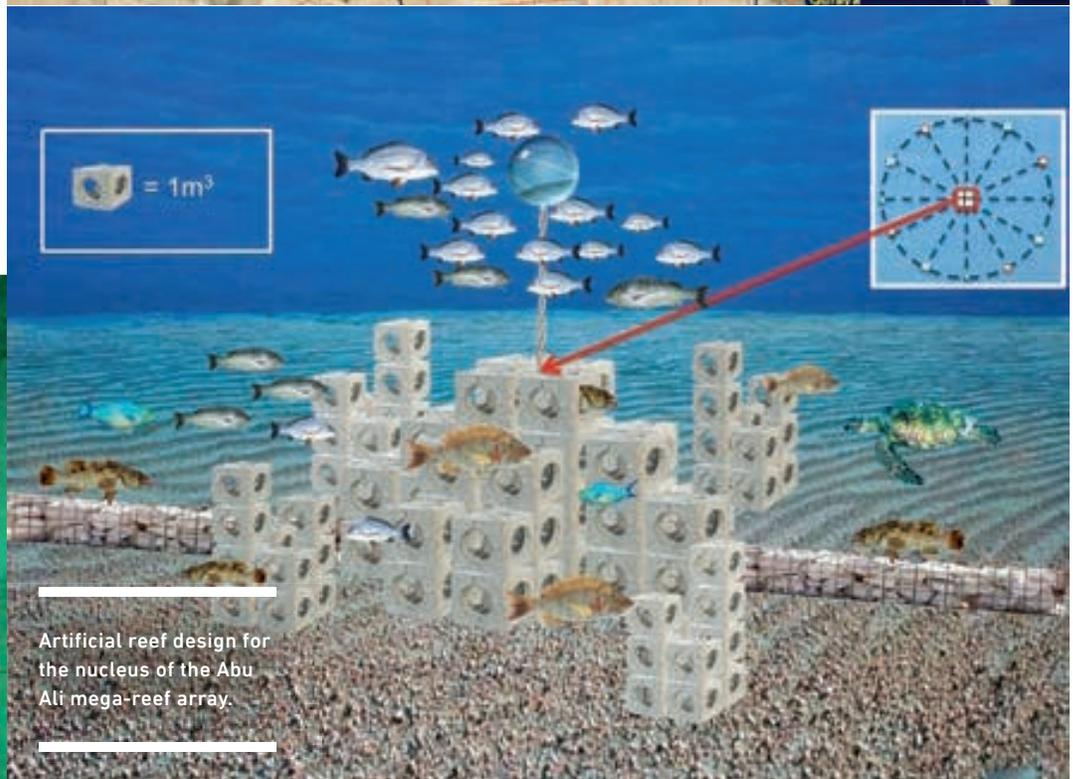
The cube artificial reef modules deployed as a nucleus on the Abu Ali mega-reef array were rapidly utilized by fish within a few days of deployment.

specific purpose (planned) and those that occur accidentally (unplanned). Planned artificial reefs are engineer designed structures built with specific materials and shapes that enhance the attraction of marine organisms. Unplanned artificial reefs are structures that are built for a different functional purpose but become habitats colonized by marine life; examples of these are break walls, ports, piers, offshore oil and gas facilities, and sunken vessels.

In the Arabian Gulf there are thousands of oil and gas-related structures such as well platforms, loading terminals, and pipelines that act as artificial reefs by providing substrate for the development of marine communities. Due to safety and security protocols, human activities around these oil and gas structures are restricted, which prevents disturbances (e.g., fishing) to the marine communities living on and around these structures and also on the natural habitats surrounding these areas, therefore acting as *de facto* marine protected



Locations in the Arabian Gulf of the 25 artificial reefs deployed by Saudi Aramco as part of the artificial reef initiative.



Artificial reef design for the nucleus of the Abu Ali mega-reef array.

areas. Recently, it was documented that there was a direct relationship between fish abundance and the number of oil and gas facilities occurring in the Arabian Gulf.

Alternatively, the use of purpose-built reef structures for artificial reef development has been increasing recently in the Arabian Gulf, and some artificial reefs have been successful in attracting important marine organisms, including corals and commercial fishes like Grouper (or *Hamour*).

There has been a continuing effort by Saudi Aramco since the 1970s to increase knowledge of marine biology in the Arabian Gulf, efforts that have led to the publication of one of the earliest books in the region concerning marine and coastal natural resources “*Biotores of the Western Arabian Gulf*,” followed later with Saudi Aramco’s publication of the “*Marine Atlas of the Western Arabian Gulf*.”

Saudi Aramco has also been actively promoting the growth of marine life with both planned and unplanned artificial reefs. In addition to the offshore oil and gas facilities, Saudi Aramco sank two boats in the last two decades in an early attempt to establish artificial reef habitats in the Arabian Gulf. The first boat sank was the *Jana-2*, a 22 meter long tugboat sunk 120 km north of Dhahran in 1998. The second boat, the *Ma’agla*, a 516 meter long pilot transport, was sunk 120 km north of Jubail in 2004.

Before sinking, the boats were cleaned of all harmful materials. These boats were sunk in places with scarce corals and flat topography, and today they host a diverse array of marine life. Although the boats provide a good base on which reef organisms can flourish, these structures tend to be short lived and slowly disintegrate, with the base collapsing and the entire new reef also eventually collapsing. As a result, Saudi Aramco has advanced its approach in developing artificial reef habitats and



is now creating more permanent, stable and long-lived artificial reef structures throughout the Arabian Gulf.

STUDIES UNDERWAY FOR MORE REEFS

Currently, there is an initiative underway at Saudi Aramco’s Environmental Protection Department to install planned artificial reefs in strategic locations throughout the Arabian Gulf. To choose the best place to deploy these reef structures, a scientific study was conducted during Phase 1 of the project. This involved developing a matrix to evaluate over 80 sites along the Arabian Gulf coast from Safaniyah in the north to Al Qurrayyah in the south.

At each location factors such as water depth, sediment type, existing habitats, coral cover, fish and invertebrate biodiversity, and the proximity to Saudi Aramco offshore



structures (protection from disturbance and leveraging existing benefits of structures and surrounding “protected areas”) were all assessed. The matrix allowed the sites to be ranked according to their suitability and the best 25 sites were selected for Phase 2 of the project, involving the deployment of 728 various artificial reef modules.

There were two types of artificial reef arrangements in Phase 2 of the project. The first configuration consisted of three distinct shapes (cubes, pyramids and domes) forming small artificial reefs, which were used at 24 of the selected sites. These shapes were deployed as nested arrays, which involved placing smaller modules inside larger modules to provide a more complex reef structure. Doing so eliminated



from Phase 1, which was adjacent Abu Ali Island.

The deployment of the reefs at the 25 sites was completed in September 2015.

MONITORING PROGRESS

Seasonal monitoring of the 25 artificial reefs occurred in the winter months — 6 months following deployment and again in the summer months, 12 months following deployment. The monitoring allowed the various locations in the north and south, and the various shapes (i.e., cubes, pyramids, and domes) as well as the mega-reef array with its limestone corridors to be evaluated. The evaluation examined productivity, species biodiversity and fish assemblages and numbers. The results of the monitoring indicated that the central part of the Arabian Gulf — specifically the region of Manifa, Abu Ali, Jubail and Ras Tanura — was the area with the highest abundance of reef fishes, the highest biodiversity of reef organisms, and was the most productive in terms of overall biomass. The mega-reef incorporating limestone corridors has already been colonized by many different species of reef organisms, and the reef is now home to numerous species of fish and is a vibrant thriving new ecosystem.

The next phase in this project — Phase 3 — is being developed to deploy additional mega-artificial reef arrays at nine ideal sites in the Arabian Gulf using the best module shapes and configurations as determined from the monitoring of the reefs deployed in the Phase 2 study. The reefs to be developed in Phase 3 as a result of rigorous scientific studies will create

large void areas that are often used by large predator fish such as *hamour*, which therefore reduces the overall biodiversity on the artificial reefs.

The second configuration was a mega-reef array incorporating a nucleus of stacked cubes providing vertical relief, which was surrounded by 12 satellites of smaller reef modules of different shapes, all connected by continuous corridors of limestone baskets (1,291 baskets in total), with the overall array resembling a wagon wheel (i.e., radiating spokes of limestone corridors from the nucleus and outer circumference of limestone corridors connecting all satellites).

The limestone corridors provide a good growing base and become ideal for providing a natural reef connection between the nucleus and all the satellite reefs, thereby allowing reef organisms to move easily between different artificial reef structures within the mega-reef array. The mega-reef array was developed at the best site identified by the matrix study

The Arabian Gulf is home to a variety of fish that depend on coral reef structures for survival. Artificial reefs are also important for many commercial fish species.



new productive reef habitats, enhancing the Arabian Gulf’s fisheries resources and offshore biodiversity while also providing resilience to impacts from climate change.

For more information on Saudi Aramco’s artificial reef initiative please contact the principal author at the Environmental Protection Department ronald.loughland@aramco.com. 🌐

abbrev.

Saudi Aramco news in brief



HE Khalid A. Al-Falih, HE Ali I. Al Naimi, and Amin Nasser perform ceremonial groundbreaking activities for a new Saudi Aramco Research Center at King Abdullah University of Science and Technology in Thuwal.

Saudi Aramco, KAUST break ground on new research center

THUWAL, SAUDI ARABIA — Saudi Aramco recently broke ground in Thuwal on the construction of a new, state-of-the-art research center at King Abdullah University of Science and Technology (KAUST), with an expected completion date of mid-2019.

The groundbreaking ceremony was attended by HE Ali I. Al Naimi, consultant to the Royal Court and Chairman

of the KAUST Board of Trustees; HE Khalid A. Al-Falih, Minister of Energy, Industry and Mineral Resources, Chairman of the Saudi Aramco Board of

Directors, and Vice Chairman of the KAUST Board of Trustees; Amin Nasser, president and CEO of Saudi Aramco; Jean-Lou Chameau, KAUST president; and several government, academic, and business dignitaries.

The new center, which will be an 11,300 m² research facility housing 132 scientists and researchers, will be designed to support Saudi Aramco's upstream and downstream research domains, as well as environmental protection research efforts.

Shaybah Wildlife Sanctuary inaugurated

SHAYBAH, SAUDI ARABIA — In the sand dunes of Shaybah, deep in the Rub' al-Khali (Empty Quarter), Saudi Aramco's Board of Directors recently inaugurated a facility of an altogether different kind.

The 637 km² Shaybah Wildlife Sanctuary is the result of a joint effort between the Shaybah Producing Department and the Environmental Protection Department.

Located adjacent to Saudi Aramco's mega-facilities in the area, the fenced sanctuary protects dozens of native plant and animal species.

This outstanding initiative bears testimony to the company's commitment to care for the environment wherever it operates and is further proof that oil and gas operations and environmental protection can exist hand in hand.

Among the wild animals featured at the Shaybah Wildlife Sanctuary are the Arabian oryx, which were once near extinction but have been revived over the past 45 years. (Photo: Musleh Khatham/MPD)





Arabic calligraphy master Nobuko Sagawa, right, speaks about the intricacies of her art to a group in Tokyo. The event was designed to help embrace different cultures first-hand.

Aramco Asia-Japan works to open

TOKYO, JAPAN — Aramco Asia-Japan, with an eye to enhancing its corporate social responsibility activities by bridging Arabic and Japanese cultures, recently brought Arabic calligraphy to the attention of the general public via a venue run by Japan's third largest newspaper medium *Mainichi Daily*.

Special guest Nobuko Sagawa — a Japanese Islamic calligrapher who often travels between Saudi Arabia and Japan as an Arabic artist — spoke at the event, which was packed with enthusiastic attendees.

Unfurling the world of Arabic calligraphy for the audience, Sagawa mesmerized the crowd with the art form's beauty and complexity. As she introduced her pen — or "qalam" in Arabic — she explained the chief differences between Arabic and Latin fonts.

Whether it was in Arabic or Japanese, she helped them embrace different cultures first-hand, using a pen made of bamboo to entertain the audience with her artistic strokes — even writing the names of a few of the participants in Arabic.

A global commitment

LONDON, U.K. — Saudi Aramco recently joined forces with nine

members of the Oil and Gas Climate Initiative (OGCI) in announcing a \$1 billion investment to develop and accelerate the commercial deployment of innovative, low emissions technologies.

The 10 OGCI members pledged an investment of \$100 million each over the next 10 years toward the new OGCI Climate Investments Initiative (OGCI CI).

Led by the heads of 10 oil and gas companies that plan to lead the industry response to climate change, OGCI member companies — BP, CNPC, Eni, Pemex, Reliance Industries, Repsol, Royal Dutch Shell, Statoil and Total — together with Saudi Aramco, which is a founding member of the OGCI, represent one-fifth of the world's oil and gas production.

In a joint statement, the heads of the 10 oil and gas companies said: "The creation of OGCI CI shows our collective determination to deliver technology on a

large scale that will create a step change to help tackle the climate challenge. We are personally committed to ensuring that by working with others, our companies play a key role in reducing the emissions of greenhouse gases, while still providing the energy the world needs."



Young Saudis move to the next stop on an orientation tour on their first day at the recently opened Saudi Arabia Drilling Academy in Abqaiq. (Photo: Musleh Khathami/MPD)

Following through on a vision: Saudi Arabia Drilling Academy opens

ABQAIQ, SAUDI ARABIA — With human capital at the center of Saudi Vision 2030, along with the development of a generation of qualified

young Saudis in all industries

Amin Nasser, Saudi Aramco president and CEO, joins fellow CEOs from major industry leaders around the world for a signing ceremony in London concerning a pledge to collectively invest \$1 billion over the next 10 years to develop and accelerate the deployment of technologies designed to arrest the advancement of climate change.





Prize certificate.

being key to the Kingdom's success, the Saudi Arabia Drilling Academy (SADA) was opened recently in Abqaiq.

Supported and funded by private drilling companies, SADA is provided with logistic support by Saudi Aramco and the Technical Vocational Training Center. A total of 34 drilling companies currently operating in the Kingdom sponsor SADA's students.

The academy is an integral part of our efforts to be a key driver to help train more than 30,000 Saudis needed to work in the energy industry. About 90,000 Saudis will need to be trained to meet the industry growth plans for the Kingdom.

The academy building, accommodates 471 students distributed among 22 classrooms — of which 14 are for academic training in English, mathematics, and science, and eight are for practical training.

Aramco Asia-Korea wins National Sharing Grand Award

SEOUL, KOREA — Aramco Asia-Korea (AAK) won the National Sharing Grand Award from the Minister of Health and Welfare for its outstanding contributions to sustainability and social welfare in a grand ceremony held in Korea Broadcasting System headquarters.

The Grand Award, known as one of the most prestigious awards in the donation field, is annually given to individuals, groups, associations and companies to recognize their deep engagement in various forms of donation activities in Korea.

Through this award, AAK achieved the early success of recognition as a corporate citizen in Korea by implementing various donation activities since its establishment four years ago.

A deal to promote solar energy, sustainable energy

TOKYO, JAPAN — Ahmed Alkhumaini, representative director of Aramco

Asia-Japan, and Kazuo Hotate, executive vice president of the University of Tokyo (UTokyo), recently signed a Memorandum of Agreement (MoA) on the Global Solar plus Initiative (GS+I) in Tokyo.

The initiative, launched in 2010 by UTokyo and two other key organizations, focuses on building a sustainable global energy system that provides adequate and stable energy products. It also draws support from major Japanese corporations with which it has entered the second phase in Saudi Arabia following the successful, first five-year development period.

GS+1 covers a wide range of subjects such as chemistry, material sciences and policy initiatives, which are supplemental to Aramco's business development and research and development.

Saudi Aramco's CAN-15 wins prestigious Japan Petroleum Institute Award

TOKYO, JAPAN — Saudi Aramco and its Research and Development (R&D) collaboration partner, JGC Catalysts and Chemicals — a leading catalyst developer and manufacturer in

Japan — have been awarded the 2015 International Technology Exchange Award by the Japan Petroleum Institute.

The winning technology "Hydrocracking Catalyst for Heavy Oil Mixed with Deasphalted Oil" was developed jointly between Saudi Aramco R&D (Oil Upgrading R&D Division) and JGC



Kazuo Hotate, right, and Ahmed Alkhumaini shake hands after signing a Memorandum of Agreement on initiatives designed to support an effort to improve energy efficiency and investigate the potential of solar power through research and experiments based in the Kingdom.



Ahmad O. Al Khowaiter, on behalf of Saudi Aramco, receives the International Technology Exchange Award from Japan Petroleum Institute officials.

Aramco, Tottori University in Japan collaborate on drylands research

TOTTORI, JAPAN — Ryota Teshima, president of Tottori University, and Ahmed Alkhunaini, representative director of Aramco Asia-Japan, signed an agreement on dryland research collaboration in Tottori recently, in recognition of the achievements of Tottori University's Arid Land Research Center in the field of dryland studies and scientific development covering different regions around the world.

Sand certainly is synonymous with Saudi Arabia's landscape. On the other hand, Japan is known for its lush greenery and waterways. No desert exists in the country.

However, there are more than 30 sand dunes nestled along the shoreline of Japan. They are mound-shaped or bank-like terrain features created by sand accumulation from wind. 🌐

The sand dune in Tottori spreads 16 km from east to west and 2.4 km from south to north.

Catalysts and Chemicals Ltd., with the support of Japan Cooperation Center Petroleum.

The collaboration began in 2007 to develop a catalyst system for the Riyadh Refinery hydrocracking unit, targeting extended catalyst life while

increasing or maintaining distillate yields and quality.

The developed catalyst, Novel Heavy Oil Hydrocracking Catalyst (CAN-15), was deployed at the Riyadh Refinery hydrocracking unit. The catalyst has been in operation for two years, and its performance exceeded expectations yielding additional valuable distillate volumes.



worldview



Snow Covered Mt. Hallasan in Jeju Island, South Korea

Mt. Hallasan is a massive shield volcano (a volcano formed by its fluid lava flows) and the highest mountain in South Korea. The area around the mountain is designated as a national park.

As an avid outdoorsman, John Junhyung Park often goes hiking in the mountains during his time off. During a recent outing with friends, he was hiking down Mt. Hallasan in Jeju Island when the snow became too deep on their current trail and prevented their passage. They finally made their way down hours later after finding another trail.

Park used a Canon 40D camera and EF-S 17-55 mm F2.8 IS USM lens to capture the image. He lives in Seoul, Republic of Korea, and is a Public Affairs coordinator at Aramco Korea. Park has worked for Aramco Korea for four years.