

dimensions



INTERNATIONAL

BRINGING

Back to the
EMPTY QUARTER





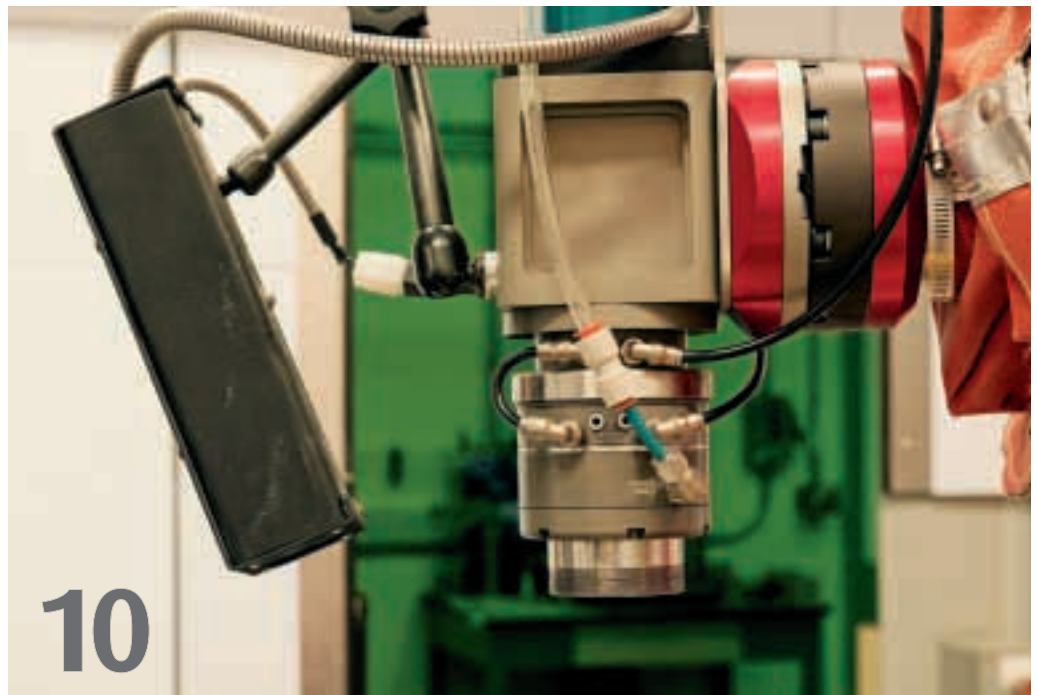
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Bringing Wildlife Back to the Empty Quarter

In the Rub' al-Khali (Empty Quarter), three Arabian animal species, some of which were on the brink of extinction, are once again roaming freely in the Shaybah Wildlife Sanctuary.

EXPEC ARC establishes innovative upstream laser technology for downhole applications

Saudi Aramco's EXPEC ARC has established a state-of-the-art, cross-disciplinary research facility for subsurface photonics (laser technology for downhole applications).



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Aramco Fuel Research Center Presents Octane-on-Demand Vehicle

The Octane-on-Demand demonstration vehicle is a collaborative project between the French energy research institute IFP Energies nouvelles (IFPEN) and the Aramco Fuel Research Center (AFRC) in Paris.



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China Development Forum lays groundwork for alignment

The China Development Forum provides opportunities for collaboration and further strengthening of the long-standing relationship between Saudi Arabia and China.

departments

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worldview Back Cover

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About the cover:

An Arabian gazelle takes care of a newborn at the Shaybah Wildlife Sanctuary. The sanctuary has seen reintroduced oryx, gazelles and ostrich all give birth to new offspring — a sure sign that these creatures have reacclimated to their new surroundings.

أرامكو السعودية
saudi aramco



BRINGING

Back to the **EMPTY QUARTER**

Saudi Aramco's restoration efforts highlighted at Shaybah sanctuary

Deep in the Rub' al-Khali —

the Kingdom's Empty Quarter — something remarkable has happened!

Three Arabian animal species, some of which were on the brink of extinction, are once again roaming freely across their ancestral homeland.

The Arabian oryx, sand gazelle and ostrich have long been missing from this legendary and unforgiving landscape. Once a common sight, they graced the Rub' al-Khali for thousands of years, but their numbers were decimated by hunters over the past century.

Now, Saudi Aramco's Shaybah Producing Department (SyPD) in collaboration with the Environmental Protection Department (EPD) has turned back the clock. The completion of the first stage of the Shaybah Wildlife Sanctuary, inaugurated by Saudi Aramco's Board of Directors in December 2016, has given these three species a new lease of life.

Some may argue that oil and gas operations are at odds with environmental management and biodiversity conservation. The sanctuary has shattered that perception. Representing the culmination of years of

BY

Jamsheed M. Din

PHOTOS BY

Mohammed Al Shaikh,
Moayed Al Qattan,
Jason Plews, AND
Jeremy Babbington



Top Left and right: One of the key environmental signals the Shaybah Wildlife Sanctuary is succeeding is that of the 68 sand gazelles there today, 14 are newborns conceived within the sanctuary. There have also been 13 newborn Arabian oryx recorded, as well as the fact that the 11 ostriches at the sanctuary have laid a total of 70 eggs. *Middle and bottom right:* During a baseline ecological survey in Shaybah the *Cistanche Tubulosa* plant species was identified. Recently, Fringed Toed Lizards were also discovered in the region. The baseline ecological surveys led by the Environmental Protection Department in coordination with the Shaybah Producing Department have shown the Rub' al-Khali to have a thriving eco-system.



IN ENVIRONMENTAL PROTECTION

The opening of the Shaybah Wildlife Sanctuary is a major milestone in the company's continual quest to place environmental protection at the heart of its operations.

This responsibility falls on the shoulders of Saudi Aramco's Environmental Protection Department (EPD), who played a significant role in the project, particularly when determining the ecological landscape in the Rub' al-Khali region.

The initial baseline desert survey to determine the feasibility of the project was undertaken in 2012 by EPD and the Shaybah Producing Department, focusing on the eco-system that thrived in the area.

Further studies by EPD revealed that the area potentially contained 18 mammal species — such as the desert fox, sand cat and Rub' al-Khali hare — 13 reptile species, and perhaps as many as 176 bird species, including 169 migratory species that fly over the area while traveling from Africa to Asia and beyond.

The project's success is testament to the company's environmental expertise and the sanctuary has many success stories, not least the return of the Arabian oryx. EPD's Christopher Boland noted that the Arabian oryx was the only animal species that was once formally classified as "Extinct in the Wild" by the International Union for the Conservation of Nature that has subsequently recovered to such a stable and sustainable population size.

The sanctuary also received significant support from the Saudi Wildlife Authority who provided the team with expert advice on how to manage the three native species of Arabian oryx, Arabian sand gazelle, and ostrich, in the harsh desert landscape.

"The successful creation of the Shaybah Wildlife Sanctuary represents the culmination of several years of collaborative efforts between numerous organizations, including the Project Management Team, the Facilities Planning Department, and the Saudi Wildlife Authority, working alongside the Shaybah Producing Department and the Environmental Protection Department," said EPD manager Omar S. Abdulhamid.

"The Sanctuary demonstrates that Saudi Aramco not only supplies energy to the world — but it does so with care for the environment."



Christopher Boland, Fahh Subaiei and Wayne Sweeting played crucial roles in the development of the Shaybah Wildlife Sanctuary.

hard work and dogged determination, it again symbolizes Saudi Aramco delivering on its promise to put environmental protection at the heart of its operations.

The Arabian oryx is the stuff of legends; it is from this majestic creature that the myth of the unicorn was born. But its revered status did little to protect it from the deadly gaze of hunters. In modern times as the use of 4x4 vehicles increased, poachers outpaced and hunted their desert prey with impunity.

The results were every environmentalist's worst nightmare — the near extinction of a species. By 1972, only four Arabian oryx remained alive in the wild. The world conservation community undertook a last gasp rescue effort to save the species, and the last lone survivors were captured not far from Shaybah and sent to U.S. zoological facilities for safekeeping and to commence a captive breeding program.

The ostrich suffered its fate even earlier than the oryx. Excessive hunting caused this beautiful creature to disappear from the Rub' al-Khali about 120 years ago, with the last wild ostrich recorded in the Arabian Peninsula about 1939.

Sand gazelles have also seen their numbers dwindle to alarmingly low levels across Arabia for the same reasons. With the loss of these iconic animals, the Rub' al-Khali suffered a tragic and what most considered to be an irreversible loss.

It was against this backdrop that Saudi Aramco decided to intervene. An unlikely player in some people's minds, the company plotted the return of these species through a highly ambitious environmental project.

The efforts generated global media attention. In 1999, with royalty in attendance, Saudi Aramco inaugurated its Shaybah

mega-facility — an engineering feat with fully functional oil and gas operations in one of the most inhospitable places on Earth.

In 2011, Saudi Aramco management committed to new environmental protection initiatives across all operation areas. Shaybah was on the front line once again, but this time not for its hydrocarbon reserves. A new challenge had been set — to restore and safeguard the unique biodiversity and ecosystem in the area.

“Even as we were developing the Shaybah field, we recognized the majestic and special nature of the Rub’ al-Khali environment,” said SyPD manager Khalid H. Al Jamea. “Although the company has always gone out of its way to protect the environment, Saudi Aramco realized there was a golden opportunity to take it one step further by committing to establish an internationally significant wildlife sanctuary.”

Work began immediately. First up was a baseline survey in the area to map the geographic landscape and assess the flora and fauna present. What plants, and animals actually remained around Shaybah? How big should the sanctuary

be? Where should it be located? Answers were needed.

Initial desert surveys and feasibility work for the project was undertaken by the team in 2012. The surveys revealed that the Shaybah area was more than just sand dunes and *sabkhas* (salt flats). Although some key species were missing, it still contained a unique, important, and functioning eco-system, including at least 11 highly specialized desert plant species.



Although the last wild ostrich in the Arabian Peninsula was recorded nearly 80 years ago, Saudi Aramco has reintroduced the massive birds to the Rub’ al-Khali as part of its preservation efforts at the Shaybah Wildlife Sanctuary. The company’s efforts have garnered international attention.



Wayne Sweeting



Armed with this knowledge, Saudi Aramco forged ahead with its unwavering vision to protect some of the remaining pristine desert areas around Shaybah by accelerating the creation of a sanctuary.

In 2013, Faleh Subaiei, an Operations Engineering supervisor at SyPD, joined the team to lead the project. “Someone was needed to oversee the project, and I had project management experience — but it was in oil expansion,” said Subaiei with a smile. “I was excited but knew nothing about the subject. The specialists were using terms like biodiversity and floral genetics — it was like learning a new language, a new technical vocabulary.”

Subaiei had to learn fast, but the best subject matter experts he could hope for were in support. Within EPD, terrestrial ecologist Christopher Boland brought 20 years of research on endangered species and conservation experience in his native Australia. Meanwhile, Wayne Sweeting, a wildlife scientist with 15 years of experience directing the development and operational management of nature reserves in both the U.K. and the Arabian Peninsula, joined the team.

“We agreed to meet four primary goals. The first was to restore key native species in the Rub’ al-Khali — back to the

way it had been for thousands of years,” said Subaiei. “The second was to set aside and protect a significant portion of pristine Rub’ al-Khali wilderness to meet the company’s commitment to environmental stewardship.

“The third was to support academic research in the field of ecology and the environment, particularly in areas that will inform and optimize management of the sanctuary but also to advise and benefit desert conservation projects worldwide. And finally, the fourth was to provide a high quality environmental education and visitor experience.”

The project team formed an invaluable partnership with the Saudi Wildlife Authority (SWA), which had worked diligently over the past few decades breeding gazelle, oryx, and ostrich, and which could provide the initial animals to stock the sanctuary.

Additionally, teams from SyPD and EPD traveled to wildlife reserves in neighboring countries to better understand the scale of the task and to ensure the sanctuary would meet all international standards.

In typical Saudi Aramco fashion, only the best would do; no short cuts were taken in construction of the facility, which began in 2014.

“The Rub’ al-Khali is an iconic landscape, but to date, none of it was formally or physically protected, so we knew creating the sanctuary would be of national and international conservation significance,” said Boland.

A location was identified, no less than 637 km² in size, making it one of the largest fenced nature reserves in the world — certainly the largest built by an oil and gas company, another example of the company’s unwavering support for environmental protection.

The creation was a huge undertaking. Even the simplest of tasks can be challenging in Shaybah. For example, the building of the new 106 km perimeter road that surrounds the sanctuary would be a relatively straight forward task in most locations. Not in the Rub’ al-Khali.

With sand dunes in the area reaching up to 300 meters high, some of the largest in the world, and the temperature rising to 55 degrees Celsius in the summer, the installation of the road network required unrelenting determination and extensive resources, including the use of heavy vehicles and a fleet of bulldozers. “Before we installed the roads, it took half a day just to travel the 12 kilometers to the sanctuary entrance. Now, with the roads in place, we can patrol the whole 106 kilometer perimeter in three hours. Only Saudi Aramco, with its deep desert construction expertise, could have pulled this off,” said Sweeting.

The sanctuary is enclosed by security fencing made from a specially designed material that uses a large gauge wired mesh that minimizes the buildup of the shifting Rub’ al-Khali sands along its length. It also allows small animals to pass in and out of the sanctuary — an important aspect of supporting the wider ecosystem in the area.

By 2016, everything was in place for the animal's historic return to the Rub' al-Khali. The SWA brought the ostrich by truck from Taif, and the gazelle and oryx from the SWA breeding centers near Riyadh.

Every care was taken to ensure a smooth transition of the animals back into the Rub' al-Khali. In line with international animal welfare and conservation standards, a three-stage reintroduction procedure was implemented. When the animals arrived, they were quarantined in 50 m x 50 m enclosures for one month. Here, veterinarians monitored the animals closely to ensure they recuperated from their long journey and were healthy. Medications or vaccinations were administered where required, and numbered ear tags were fitted to track the age, parentage, medical history, and population size of the animals in the future.

Once healthy, strong, and settled, the animals are released into a pre-release area consisting of a fenced *sabkha* flatland area of about 1 km², with water holes, sun shades, and feeding stations provided. Here the animals begin to explore and acclimatize to their new surroundings.

In the last stage, the animals were released into the wider 637 km² sanctuary, roaming free with limited human assistance but under the watchful eye of the sanctuary security rangers.

For the first time in decades, Arabian oryx, Arabian sand gazelles and ostrich are roaming around in the eastern

BACK FROM

The Arabian oryx is the only large mammal species to be formally classified as extinct in the wild by the United Nations that has subsequently recovered to a stable and sustainable population size.

The Arabian ostrich, once hunted to near extinction, again roams the red sands of the Rub' al-Khali, laying dozens of eggs to propagate the species' ongoing survival.

All of this has been made possible by Saudi Aramco's extensive efforts in creating a massive wildlife sanctuary in the Kingdom's southeast.

And the sanctuary, developed by the Shaybah Producing Department in collaboration with the Environmental Protection Department, protects a number of other species, including foxes, birds, plants, and even lizards.

As Phase 1 of the sanctuary comes to a close with the company's efforts to create a 637 km² sanctuary that was inaugurated by the company's Board of Directors in December, a second phase continues with the delivery of more animals and the construction of several support facilities.

Still, the preservation of species indigenous to the region remains the crowning achievement of all the efforts.



Omar S. Abdulhamid



Khalid H. Al Jamea

The Shaybah Wildlife Sanctuary project brought together the Environmental Protection Department and the Shaybah Producing Department as they sought to restore the ecosystem in the Rub' al-Khali.



Rub' al-Khali. But there was always a worry — having been away for so long, would they reacclimatize?

The results have been spectacular. Of the 68 sand gazelles today, 14 are newborns conceived within the sanctuary. The Arabian oryx has seen its numbers reach 39, including 13 newborns. The 11 ostriches at the sanctuary have also laid dozens of eggs.

“A key measure of success was that the oryx and gazelles gave birth and that all the offspring survived. This is a clear indicator that the animals are settling in well,” noted Loay Al Azzam, conservation officer at the sanctuary. “These are the first animals of these species born here in at least 60 years.”

Al Azzam is employed by the Jordanian Royal Society for the Conservation of Nature (RSCNJ), who are pioneers in oryx and animal conservation. RSCNJ is contracted to operate the sanctuary due to their vast experience in similar conservation projects.



Global conservation significance

“To successfully re-establish any large bodied species is a rare conservation achievement globally. To establish three species into a desert — the harshest of environments — is just extraordinary. It’s incredibly rewarding — one of the highlights of my career,” said Boland. “Seeing the iconic oryx once again standing proud among the awesome sand dunes of the Rub’ al-Khali is spectacular.”

But the sanctuary is more than just a safe haven for the three species. A detailed scientific survey to catalog and map the entire biodiversity present inside the sanctuary is underway. Already, the results have revealed three plant species only found within the Rub’ al-Khali and nowhere else on the planet.

Sweeting believes that over time additional species will be discovered — some may even be unknown to science. With careful safeguarding it is hoped the number of rare species will increase.



After arriving at the sanctuary, animals are first released into the fenced *sabkha* flatland area of about 1 km². Once acclimatized, they are released into the wider sanctuary.

station, and operations building will be constructed. This will enhance academic partnership between Saudi Aramco and other academic institutes such as the King Abdullah University for Science and Technology, paving the way for future environmental-based research in the area.

In Hail, hundreds of miles northwest of the Rub' al-Khali, ancient rock art dating back thousands of years clearly depict ostrich, gazelle and oryx, highlighting the long and special relationship between humans and these animals. Their history in the peninsula is literally etched in stone.

Now, due in no small part to the Shaybah Wildlife Sanctuary, these animals seem sure to remain a part of the landscape for many years to come, their future secure under the custodianship of Saudi Aramco.

For Al Jamea, the sanctuary epitomizes Saudi Aramco's unique approach to its operations and its care for the Kingdom.

"This project is important to us as it meets our citizenship commitments. We are more than an energy company — we are stewards of the environment and we will always strive to leave a lasting environmental benefit wherever we operate." 🌍

The international research community is beginning to take notice. Recently, professors from King Abdullah University of Science and Technology, Tottori University in Japan, and Kings Park Botanic Gardens Authority in Australia, have visited the sanctuary with interest in initiating academic projects.

In December, Phase 1 of the Shaybah Wildlife Sanctuary was inaugurated marking a significant milestone for all involved.

Phase 2, to be completed over the next couple of years, will see further delivery of animals until the optimal numbers are achieved within the sanctuary. Additionally, a research



EXPEC ARC establishes innovative upstream laser technology for downhole applications

BY HEATHER F. BENICE

This commitment has led Saudi Aramco's Exploration and Petroleum Engineering Center – Advanced Research Center (EXPEC ARC) to establish the Upstream High-Power Laser Laboratory — a state-of-the-art, cross-disciplinary research facility for subsurface photonics. In this facility, skilled young Saudis will collaborate with scientists from around the world to solve upstream challenges of the future.

A PROMISING AREA OF RESEARCH

Subsurface photonics is a promising area of upstream research that will become crucial for the future of the recovery, and production, of hydrocarbons. In this field, collabo-

Saudi Aramco is committed to pursuing solutions that allow the company to unlock resources in new ways, using methods that are flexible, efficient, and help preserve the environment.

rations are essential to promote innovation and success. Therefore, during its first years of operation, the laboratory began partnerships with renowned institutions — in-Kingdom and around the globe — to design novel optical fibers, create innovative laser sources, and lead the development of downhole laser tools.

Laser technology is unique in that it grants a high degree of control and precision on how the energy is delivered, oriented, and utilized. Furthermore, advances in laser technology and material engineering have progressively increased the output power and beam quality of lasers, and reduced the price per kilowatt to single-digit figures.

These traits make laser technology versatile and adapt-

Opposite: The team at the Upstream High-Power Laser Laboratory includes (from left) Damian Alerigi (modeling and fiber optics), Haitham Othman (thermal dynamics and operations), Abdullah Al-Harith (chemist, laser rock/fluid interaction), Victor Hilab (senior sample acquisition and support), Sameeh Batarseh (team lead and principal investigator), and Karam Chand (laser laboratory operations). The facility allows young Saudis to collaborate with scientists around the world to solve upstream challenges of the future.

able to numerous applications in the oil and gas industry. It brings many advantages over traditional methods for Drilling and Workover: A higher rate of penetration, and reduced costs for tripping, casing, and bit replacement. It also requires a smaller surface footprint, compared to current drilling and stimulation systems; and is a waterless alternative to fracturing.

Small footprint, compact, economical, moveable, sporadic maintenance, directional, and waterless — these are the essential elements for a healthy and environmentally friendly technology.

“We are building capabilities, training young Saudi researchers on high-power lasers, probing new means to guide the interactions between light and rocks, and matter in general. Our research encompasses many areas of photonics and petroleum engineering, along with fundamentals,

applications, and the operation of the system,” explained Sameeh Batarseh, laser program team leader with EXPEC ARC’s Production Technology Division.

THE POWER OF LASERS

A high-power laser beam can melt or vaporize rocks, depending on the beam’s energy and the rock’s properties. For example, the light can be controlled to vaporize stuck pipes or drill rocks; the latter avoids fishing or well deviating, the former prevents melt and reduces material disposal, said Batarseh.

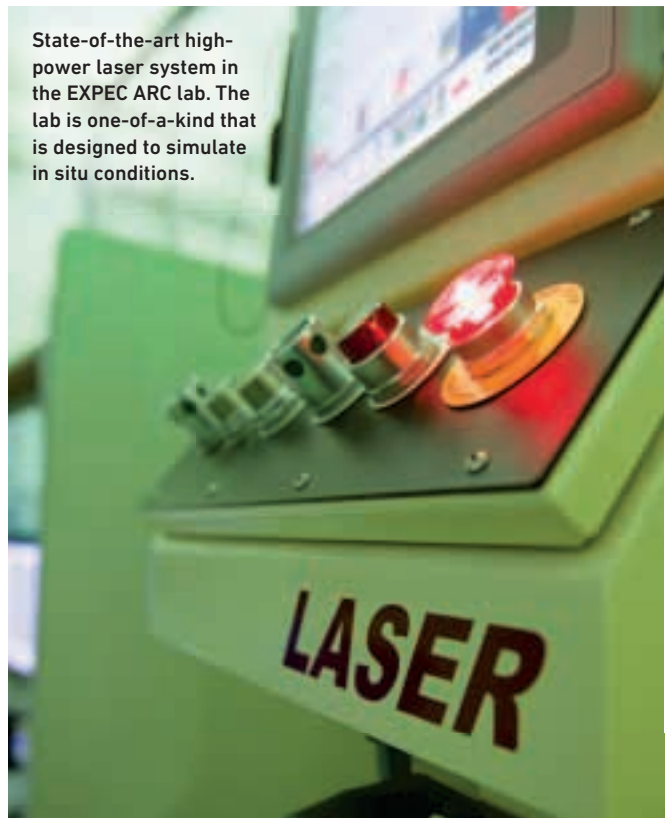
“Changing the beam parameters and the light can break the cementations between minerals and create a clean



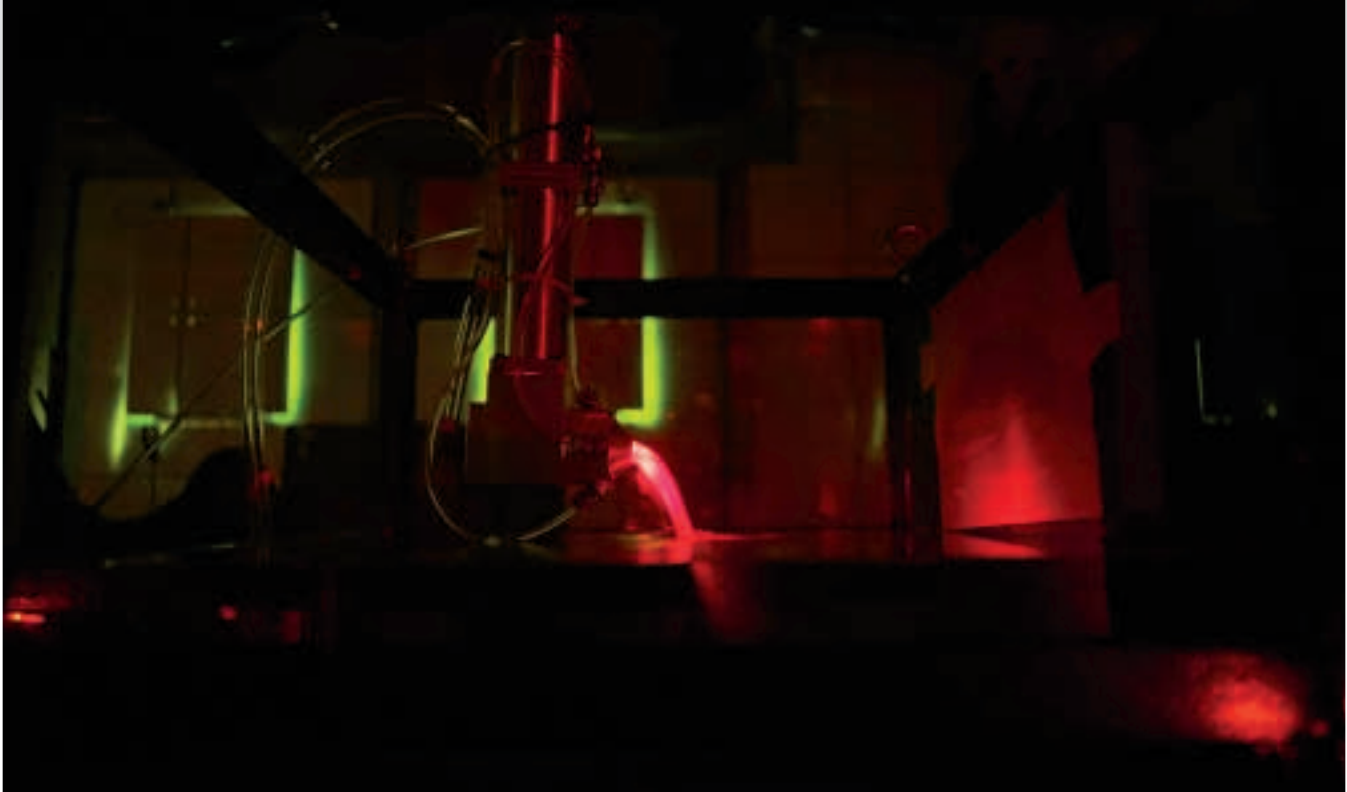
High-power laser head, uniquely designed to handle downhole applications.



Lab experiment showing high-power laser perforation in rocks. The penetration is three seconds in length.



State-of-the-art high-power laser system in the EXPEC ARC lab. The lab is one-of-a-kind that is designed to simulate in situ conditions.



Advanced lasing experiment, merging a high-power laser beam in fluid environment to simulate downhole conductions.

hole without damage or melt. Increasing or decreasing the power and the same light can be used to melt the rock and improve loss circulation, treat formations, and seal thief zones in the wellbore,” said Batarseh.

When a laser beam impinges on a rock, a portion of the incident energy is absorbed and transformed into thermal energy. As a result, the stone heats up, and what follows depends on the energy flow and its intensity. If the power is moderate, and continuously delivered, the rock first melts, then it will dissociate and spall, and finally, it will evaporate. If the energy is high enough or pulsed rapidly, it can

sublimate or spall the rock at once. Therefore, the morphology of the material reshapes and its properties change. The high-power laser laboratory investigates how to control these phenomena, and how to alter it to produce variegated results and applications in distinct environments, e.g., downhole.

“In the past, we characterized the effects of high-power laser irradiation on rocks, we identified mechanisms to control the energy flow, and determined potential applications,” Batarseh explained. “We proved that laser and laser-assisted technologies are a non-damaging, flexible, and



Laser team members prepare a sample for a test with the high-power laser. From left are Victor Hitab, Haitham Othman, Abdullah Al-Harith, and Sameeh Batarseh.

cost-effective alternative to drilling, completion, and stimulation of oil and gas wells.”

To prove the concept, various rock types were first irradiated with high-power lasers and later meticulously examined. The experimental data demonstrated that high-power lasers could cut and bore rocks at ambient pressure, and that high pressure and stress enhanced the laser’s ability to perforate reservoir rocks.

This equipment will allow the team to create downhole environmental conditions in the lab and test new scenarios and techniques. For example, the group is planning an experiment to evaluate the laser’s capacity to penetrate a combination of steel, cement, and rock under confining stress, at high temperature, and in the presence of fluids.

FIELD TRIALS

In the field, the team is planning to use a similar laser system and optics to those used and developed in the laboratory. Yet, to attain the final goal, the laser beam should propagate with little (optical) loss over tens of kilometers underneath the earth — enduring a harsh environment — before it can reach the laser head and hit the rock.

Optical fibers will be used to transmit the high-power laser beam from the surface to the subterranean target. The optical cable will be designed to fit in a coiled tubing unit for field deployment, to withstand the unique characteristics of the environment, and to mitigate the effects that ensue from transmitting a high-power laser beam through a kilometer-long fiber.

This requires an unprecedented innovation in optical fiber technology. It is an ambitious endeavor — its outcome a suite of solutions, capabilities, and breakthroughs that will make Saudi Aramco the leader in high-power laser delivery for downhole applications.

Every material absorbs, reflects, transmits, and scatters light with different magnitudes, depending on the wavelength or frequency of the incident light. In an optical fiber, the primary challenges to overcome are absorption, scattering, and material degradation.

The first arises from the intrinsic properties of the material, its electronic and molecular arrangements. The second ensues from the micrometric defects inherent to any fabrication process. The latter occurs due to the thermal and mechanical stresses induced by the high-power beam and the environment conditions.

To abate and control these effects, and ultimately improve the transmission of the high-power laser beam to target, the team at EXPEC ARC is currently investigating innovative concepts, optical fibers, and materials that will create the first ultra-low loss and long-length optical fiber for high-power laser delivery.

“EXPEC ARC has maintained a steady perseverance in acquiring the most sophisticated tools and resources to support our strategy: develop high-impact technologies for our proponents,” said Ali Al-Meshari, EXPEC ARC manager. “The addition of the laser lab to our facilities is the result of extensive, dedicated, and influential research, which has proven to be of high-impact and value to Saudi Aramco’s upstream business and future. The products of this research have the potential to change the way the industry unlocks reserves in conventional and unconventional reservoirs.”

“All of us at Saudi Aramco are working toward the same goal — to remain the world’s most reliable supplier of energy. It’s a responsibility we take very seriously. In that sense, laser technology is a game changer for the oil and gas industry. It allows us to harvest the power of light to unlock petroleum resources with unprecedented efficiency, reliability, and adaptability. It is a powerful solution for the future.”

— NASIR K. AL NAIMI, vice president of
Petroleum Engineering and Development

Custom designed high-power laser head and beam manipulator, preparing for laser drilling experiment.



ARAMCO FUEL
RESEARCH CENTER

PRESENTS

OCTANE- ON-DEMAND VEHICLE

BY NIALL A. HIGGINS

Saudi Aramco's commitment to technological innovation was in full view earlier this year, when the Aramco Fuel Research Center (AFRC) in Paris presented the latest development in its energy efficient, Octane-on-Demand (OoD) demonstration vehicle.



The Octane-on-Demand demonstration vehicle is based on a production Peugeot 308 passenger vehicle. The AFRC team added a second fuel tank and fuel delivery system to the vehicle to accommodate the dual fuel setup. Using a RON 71 gasoline in combination with ethanol as the high octane fuel, the tailpipe CO₂ emissions were reduced by 4%. The total well-to-wheel CO₂ emissions benefit of the system, including the fuel manufacturing, is estimated to be 13%.

A FRC, which has a collaborative research agreement with the prestigious French energy research institute IFP Energies nouvelles (IFPEN), has been working on the project since July 2013.

“The objective of this project was to demonstrate that advanced engine fuel technologies can reduce the carbon dioxide (CO₂) emissions of conventional passenger vehicles,” said AFRC director, Pierre Olivier Calendini. “In the past three years, around 30 personnel have been working on the project from the IFPEN side, alongside six from AFRC and numerous partners such as Peugeot Citroen SA (PSA), one of the major French automakers. Several other companies were also brought in from outside to assist with the project.”

Saudi Aramco research scientist Kai Morganti prepares the combustion laboratory in Dhahran to evaluate different fuels for the Octane-on-Demand concept.

These efforts culminated in the successful integration of OoD technology in a Peugeot 308 passenger vehicle.

The OoD concept is a synergistic engine fuel technology that uses two fuels with different octane quality to match the specific requirements of the engine at different operating conditions. An oil-derived fuel is used for engine starting and most urban driving, while a small amount of the high octane fuel is delivered to the engine under more extreme driving conditions to suppress engine “knock.” This combination enables the engine to operate more efficiently than it could otherwise do using only the oil-derived fuel.

The technology has been fine-tuned over the last four years in a joint effort between the research teams in Paris and Dhahran — Saudi Aramco’s headquarters in Saudi Arabia. These efforts evaluated a range of different fuels and engine

More than 10 research papers have been presented by Saudi Aramco researchers on the Octane-on-Demand concept at international conferences. The team has also filed patents covering several of the processes and technologies.



configurations in search of the most favorable combinations for implementation in the demonstration vehicle. The program focused on existing market fuels, but also examined several promising future fuel formulations.

The Peugeot 308 demonstration vehicle is equipped with a production 1.6-liter turbocharged engine. The AFRC team added a second fuel tank and fuel delivery system to the vehicle to accommodate the dual fuel arrangement. The vehicle used a RON 71 gasoline in combination with ethanol as the high octane fuel.

This fuel combination reduced the tailpipe CO₂ emissions by 4% with respect to a European pump gasoline (RON 95). The total well-to-wheel CO₂ emissions benefit of the system, including the fuel manufacturing, is estimated to be 13%.

The team undertook further certification studies to demonstrate that the vehicle complied with the Euro 6.2 emissions legislation for carbon monoxide, unburned hydrocarbons and nitrogen oxides. The Saudi Aramco researchers estimate that a further 15% reduction in the tank-to-wheel CO₂ emissions can be achieved by combining the OoD system with other engine

Over the last four years, in-house engine testing in Dhahran and Paris has evaluated a broad range of fuels and engine combinations. This has included four different oil-derived fuels in combination with five different high octane fuels (MTBE, ETBE, methanol, anhydrous ethanol, and hydrous ethanol).

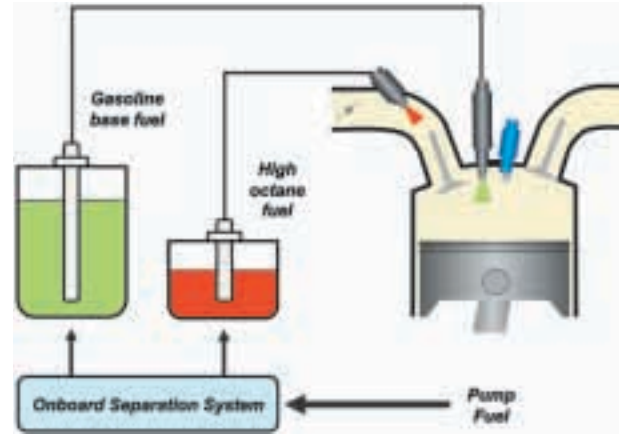
technologies, such as cooled exhaust gas recirculation.

Ammar A. Al-Nahwi, manager at the Research and Development Center (R&DC) in Dhahran said, “Octane-on-Demand is an opportunity to improve fuel efficiency by making the most effective use of the available fuel octane quality. This could also have implications for the refining industry, since it may reduce the amount of energy required to manufacture fuels in the future.”

Al-Nahwi visited the facility for the demonstration and was also invited for a test drive. “Our researchers have not only shown that this technology can provide environmental benefits,

The PP200 Pilot Plant facility located in Saudi Aramco’s R&DC in Dhahran. This facility has been used to examine the feasibility of separating today’s market fuels into two different fuels onboard the vehicle.





Clockwise from top left: The Octane-on-Demand demonstration vehicle was tested to ensure the vehicle complied with the Euro 6.2 emissions standards for carbon monoxide, unburned hydrocarbons and nitrogen oxides; The Octane-on-Demand demonstration vehicle is equipped with two tanks that require refueling with different fuels. Saudi Aramco’s researchers in Paris

and Dhahran are currently working on the next phase of the project, which involves developing an onboard fuel separation system. This system will be capable of producing the two fuels onboard the vehicle using today’s market fuels. A second fuel delivery system was added to the production Peugeot 308 passenger vehicle as part of the Octane-on-Demand system modifications.

but also that it can successfully be integrated into a real vehicle. This has been made possible by AFRC working in collaboration with our strategic partners,” he said.

Amer A. Amer, chief technologist of Fuel Technology at R&DC, believes that if the benefits of OoD are realized on a larger scale, then this technology could bring about a considerable reduction in transport-related greenhouse gas emissions.

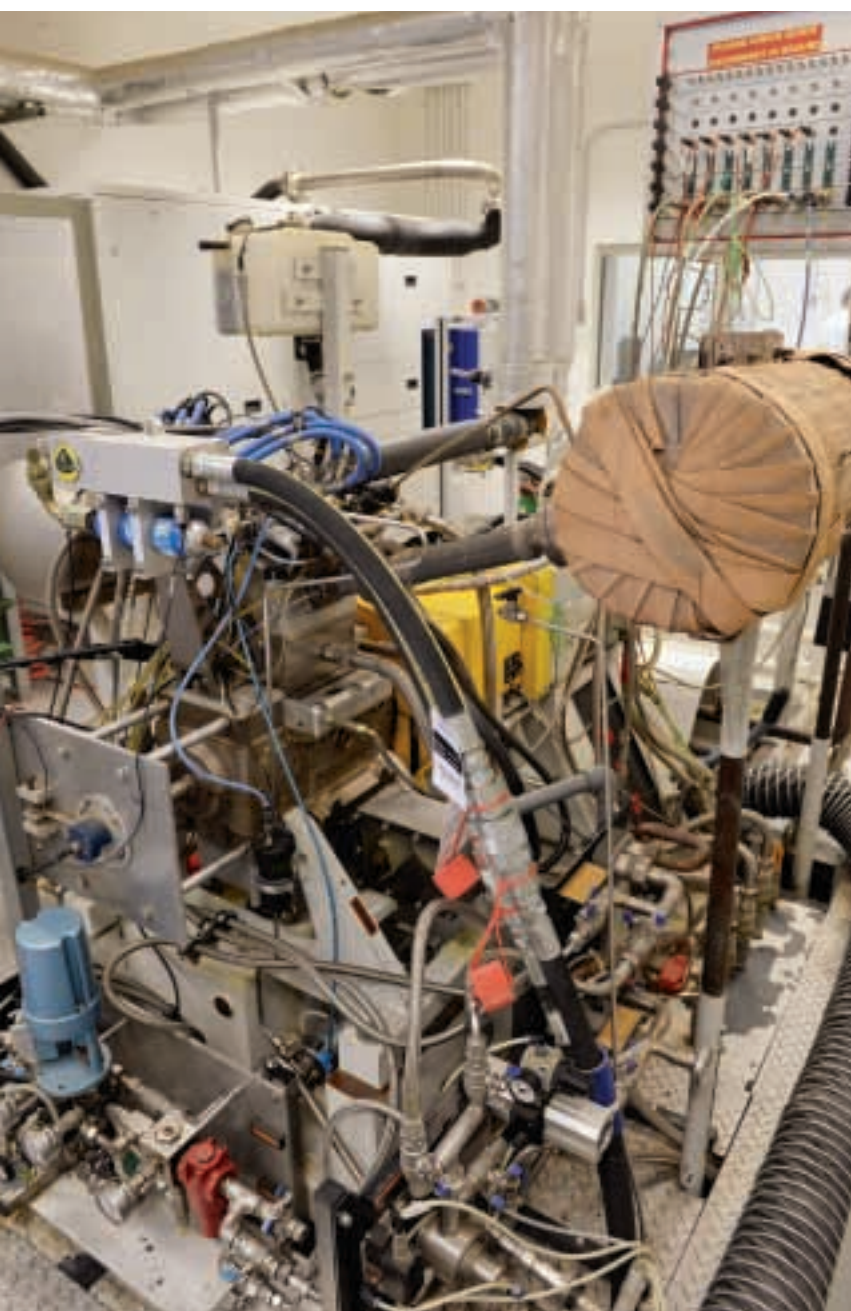
“Internal combustion engines will continue to play a major role in the transport sector for the foreseeable future,” said Amer. “Continuing to improve the efficiency of this well-established platform is one of the best pathways to achieve meaningful reductions in greenhouse gas emissions, while still meeting the world’s growing demand for mobility. The energy industry can, and should, play a more active role in partnering with automakers to address these challenges.”

The technical programs executed by AFRC are fully integrated within the Global Research Team for Fuel Technology, which has a unique approach as the

only fully global team from Saudi Aramco’s R&DC, based in Dhahran, the AFRC in Paris, and the Aramco Research Center in Detroit.

The main purpose behind positioning the teams across three continents is to provide global alignment and enhance innovation by engaging with regional knowledge hubs. Saudi Aramco’s research in the field of fuel efficiency is part of its commitment to a

The second phase of the project is now examining the feasibility of several promising onboard fuel separation technologies. These would enable the two fuels to be prepared onboard the vehicle using today’s market fuels. Considerable progress has already been made on the separation front, including patents and experimental engine testing results.



Left: A second fuel tank was added to the production Peugeot 308 passenger vehicle as part of the Octane-on-Demand system modifications. **Bottom:** The preliminary assessment of the Octane-on-Demand concept was undertaken using the single-cylinder engine testing facility in Dhahran.

cleaner environment, as demonstrated in the leading role the company took in the Oil and Gas Climate Initiative.

These technologies also have the opportunity to provide social and environmental benefits in a rapidly changing energy landscape. “In addressing the climate challenge, we see efficiency as a key element in reducing greenhouse gas emissions, particularly within the transport sector,” says Ahmad O. Al-Khowaiter, chief technology officer at Saudi Aramco. “Technologies such as Octane-on-Demand and its sister program, Gasoline Compression Ignition, both offer strong prospects in this area.”

For Calendini, this is only the start, with other exciting projects already underway in the research center.

“At this time, we have a car that uses two separate tanks that must be replenished with two different fuels,” he says. “The next phase of the project is examining the feasibility of several systems that can separate a market fuel into two fuels with different octane quality onboard the vehicle.”

This technology deployment pathway would enable OoD to be fully implemented using today’s market fuels and vehicle refueling infrastructure.

Saudi Aramco’s most recent research programs have been executed to better understand the value and benefits of this onboard separation technology. Preliminary testing of this exciting concept in Dhahran has already shown that further reductions in fuel consumption and CO₂ emissions are possible.

This approach has proven more appealing with the automakers who have visited Dhahran with interest in co-developing the technology for future vehicle programs. The team has also filed several patents covering the processes and technologies.

Inaugurated in May 2013, AFRC was established as part of a 10-year partnership program with IFPEN. The center is located at the IFPEN complex in Rueil-Malmaison, Paris, and allows Saudi Aramco to capitalize on IFPEN’s established facilities and resources.

In addition to the OoD vehicle demonstrator, the AFRC team is also jointly developing other oil-based, engine fuel technology solutions with several European automakers and technology providers. This includes strategic transport analysis and technology positioning studies.

To deliver on these objectives, new fuel formulations and methodologies will be jointly developed and demonstrated on real vehicles. IFPEN, a leader in its field that also receives Saudi Aramco sponsored students, brings with it a strong background in engine fuel matching and for its part, Saudi Aramco brings its knowledge of fuel production and industrial networks.

The physical creation of AFRC on the campus of IFPEN has also brought counterparts closer together, and

ARFC is one of three centers in Saudi Aramco's global fuel research network. Together with the Aramco Research Center Detroit, and the Research and Development Center in Dhahran, the teams focus on next-generation fuel and engine systems. The centers serve as a platform to innovate, develop, and showcase low carbon footprint transport technologies that will promote the development and adoption of sustainable and cost-effective transport solutions. The centers also enable Saudi Aramco researchers to more closely engage with U.S. and European automakers, and technology developers.

Right: The Aramco Research Center in Detroit focuses on demonstrating fuel efficient and affordable engine fuel technologies to enable widespread deployment. The state-of-the-art facility is equipped with vehicle technology integration capabilities, and is in close proximity to various leading automotive companies and key transport stakeholders. This provides Aramco's researchers with access to leading industry partners, research organizations and academia. **Bottom:** Inaugurated in May 2013, AFRC was established as part of a 10-year partnership program with IFPEN. The center is located at the IFPEN complex in Rueil-Malmaison, Paris, and allows Saudi Aramco to capitalize on IFPEN's established facilities and resources.

is considered a major step for future collaboration on a broader range of topics.

"The OoD technology demonstration is the first major accomplishment of the fuel research collaboration between Saudi Aramco and IFPEN," said IFPEN president Didier Houssin.

In addition, Saudi Aramco can now capitalize on this strategic position within an established automotive ecosystem, with world-class facilities, experienced scientists, and industrial links to various European automakers to deliver promising technologies such as OoD to the market. 🌐





Seizing
opportunities,
collaborating
with

CHINA

China
Development
Forum lays
groundwork
for alignment

By Paul Zhang

Seizing opportunities through collaboration will create synergies to further strengthen the long-standing relationship between Saudi Arabia and China, Saudi Aramco president and CEO Amin Nasser told the China Development Forum (CDF) 2017 in Beijing.

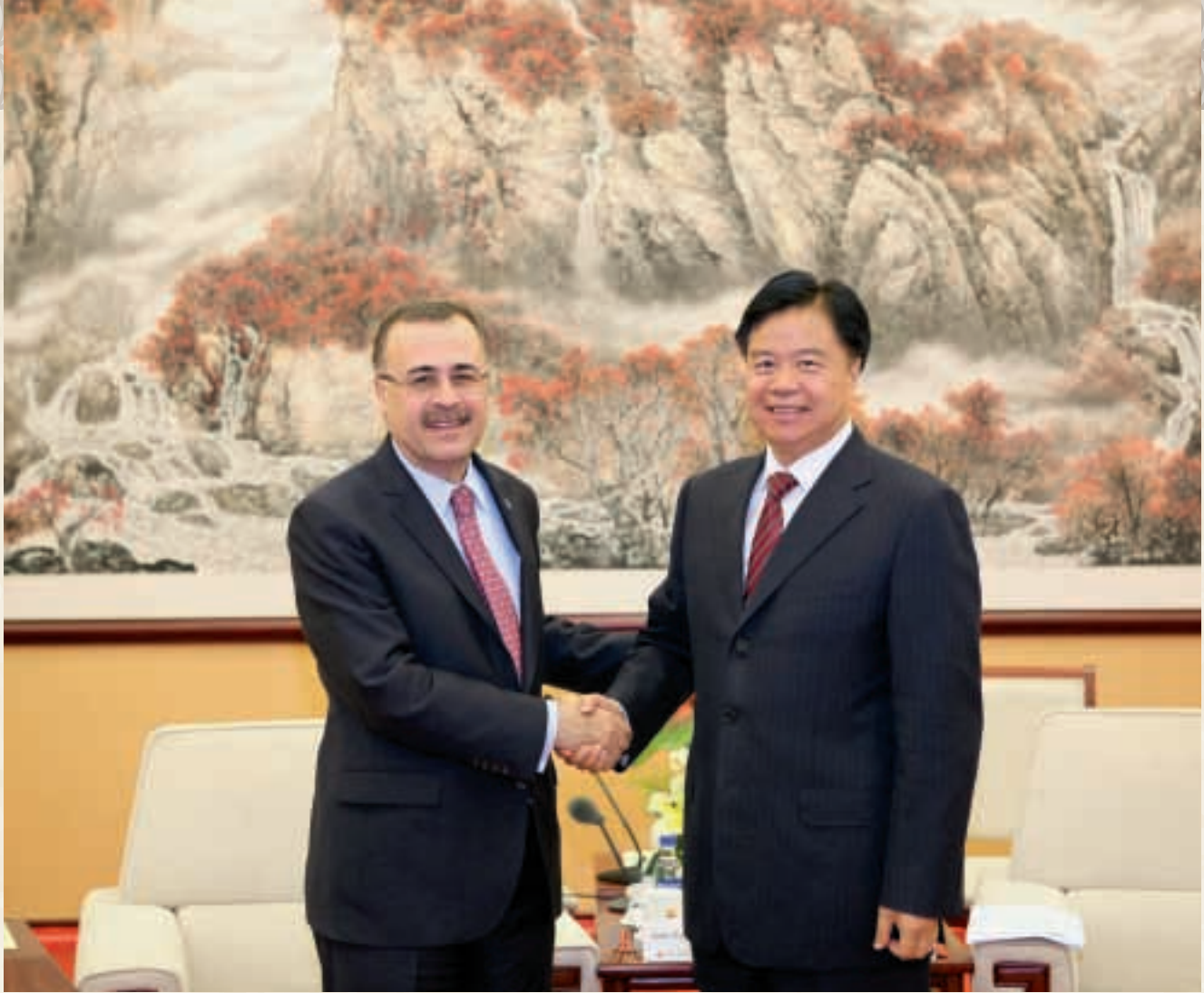
Nasser was addressing distinguished delegates from leading companies, international organizations and academia from around the world. This year's CDF took place just after the historic state visit to China by the Custodian of the Two Holy Mosques, King Salman ibn 'Abd Al-'Aziz Al-Sa'ud.

Nasser said the close association between the two countries could be further augmented with a host of new business and economic opportunities ranging from energy collaboration, knowledge and technology transfer, as well as innovation-driven industries, benefiting both countries and beyond.

AN IDEAL PLATFORM FOR PROSPEROUS TRADE

Highlighting various opportunities for mutual growth, he told ministers, officials, and industry leaders that Saudi Arabia provides China's defining strategic economic initiatives with an ideal platform for prosperous trade between the Middle East and Asia, providing a vital trade link to other regions surrounding the two.

"This year's CDF, in particular, has greater significance for Saudi Aramco, taking place only days after the historic state visit of the Custodian of the Two Holy Mosques, King Salman ibn 'Abd Al-'Aziz Al-Sa'ud, to China," said



Nasser in his speech at CDF's Session III, which featured the theme "Made in China 2025 and Structural Reforms."

"As President Xi (Jinping) and King Salman agreed during the state visit that both our countries should deepen cooperation in the energy sector, Saudi Aramco stands ready for opportunities to invest and to collaborate, and for opportunities that would bring our two nations even

closer together," Nasser said. "Let us seize them and advance the transformation process for our two countries, and indeed, the world.

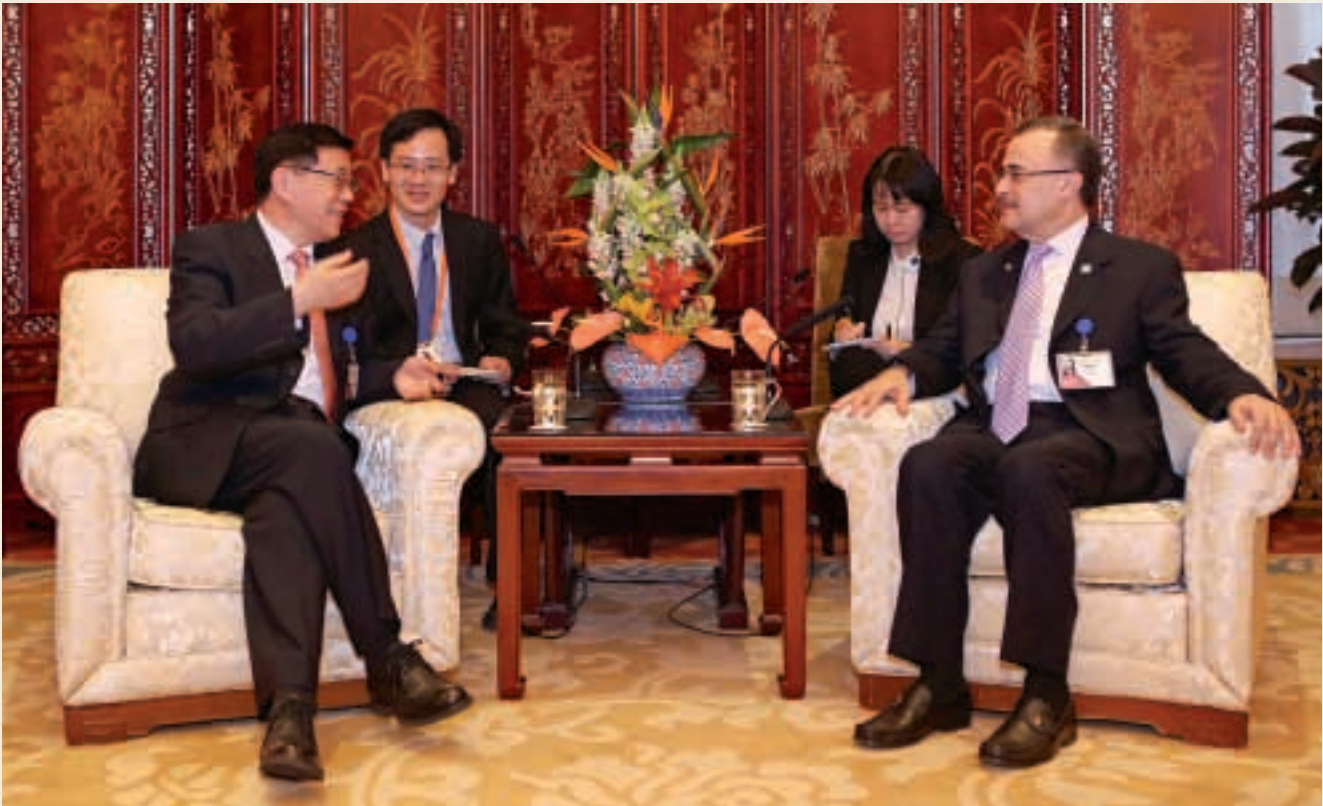
"We in Saudi Arabia have been closely following China's three defining strategic economic initiatives — 'Go Global,' 'Belt and Road,' and 'Made in China 2025.' That interest has only intensified with last year's launch of

Above: Saudi Aramco president and CEO meets with Wang Yilin, chairman of CNPC. Below: Amin Nasser, left, greets the staff at Aramco Asia headquarters in Beijing. The stop was one of many important meetings on his agenda during his recent visit to China.





Left: Amin Nasser, Saudi Aramco president and CEO, greets Li Keqiang, Premier of the State Council of the People's Republic of China, at the China Development Forum. Below: Saudi Aramco president and CEO meets with Li Wei, president (minister) of the Development Research Center.



Saudi Vision 2030 and the parallels it has with all three. As a result, enormous opportunities are opening up for our countries and companies to seize,” he added.

THREE AREAS FOR SYNERGY

Nasser outlined three areas that could emerge from this dynamic synergy between both countries that would benefit companies across a broad spectrum of industries. The first opportunity concerns enhancing two-way investment flows between the two countries, which would help with

both China’s “Go Global” and “Belt and Road,” as well as Vision 2030.

“Chinese companies can benefit from the Kingdom’s strategic location on the Maritime Silk Road by establishing manufacturing, logistical, and R&D bases — especially on the West Coast of Saudi Arabia. From there, they can easily access large markets in the wider Middle East and North Africa region, all the way up to Europe, and they can also easily access the Kingdom’s vast energy resources and supply of petrochemicals,” he said. “Equally, with the



Speaking at the CEO Dialog during the China Development Forum, Amin Nasser notes that when combined with carbon capture, utilization, and storage, Saudi Arabia could convert its vast oil and gas resources into clean hydrogen-based mobility and power, while China could convert its vast coal resources into clean hydrogen-based electricity.

right opportunities, we would like to further strengthen our oil supply relationship and multiply our investments in China, particularly in the downstream.”

The second area is aligned with the Paris Agreement. It is anticipated that hydrocarbons will still be meeting a significant portion of the world’s primary energy demand even a quarter of a century from now, and all sources of energy would be needed.

“However, we must deal with carbon emissions in line with the Paris Agreement on climate change. This is where hydrogen and carbon capture utilization and storage could be game changers for Saudi Arabia and China,” he said.

Nasser explained that although hydrogen mostly comes from gas, it could also increasingly come from oil and coal. “If carbon capture, utilization, and storage — and hydrocarbons — can be made to work together, then green hydrogen is within our reach,” he said.

This would revolutionize future mobility, as hydrogen-based fuel cell vehicles are not far behind electric vehicles.

Hydrogen-based fuel cells also have the power to revolutionize electric power generation.

In panel remarks, Nasser said that when combined with carbon capture, utilization, and storage, Saudi Arabia could convert its vast oil and gas resources into clean hydrogen-based mobility and power, while China could convert its vast coal resources into clean hydrogen-based electricity.

The third area involves “noncombustible” uses of oil to create a variety of new materials.

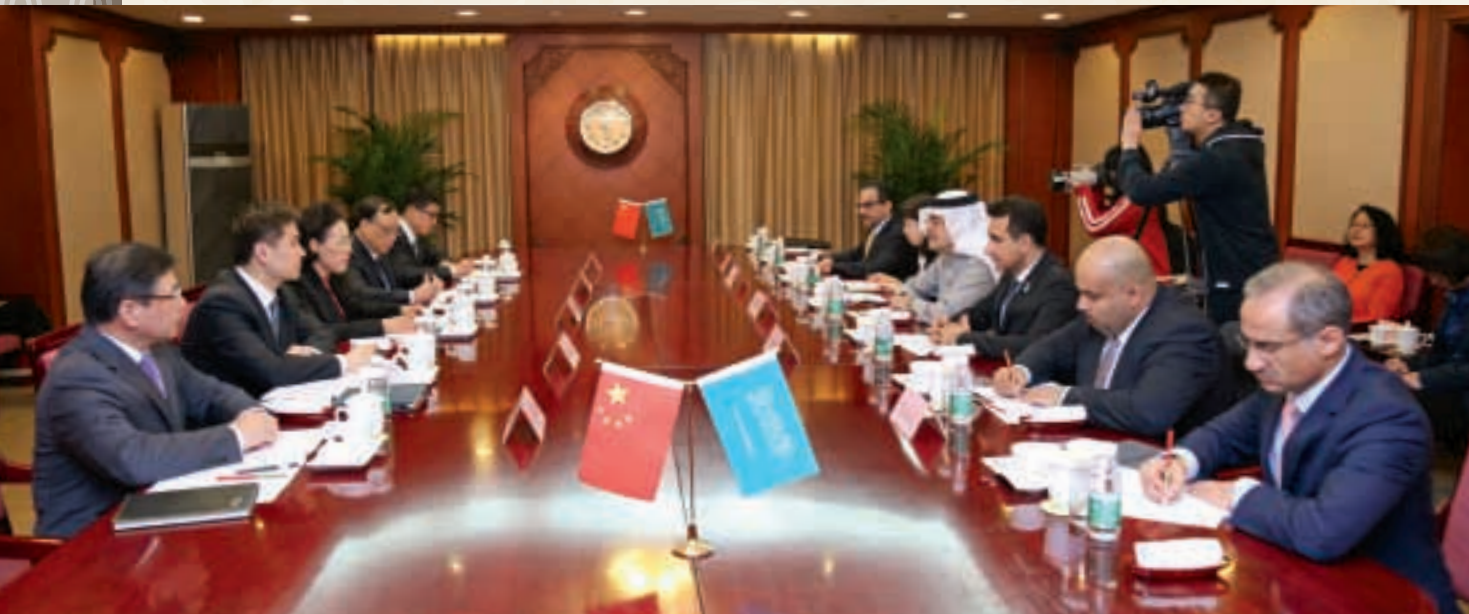
Saudi Aramco’s crude-to-chemicals initiative — which looks to directly convert crude into petrochemicals, eliminating the entire refining step of the process — could change the competitive dynamics of petrochemical feedstocks and assist in developing advanced new materials, as well as enable new uses.

That could positively have an impact with new materials as part of the 10 focus areas of Made in China 2025.

CDF is China’s most preeminent platform for dialog

“Saudi Aramco stands ready for opportunities to invest and to collaborate, and for opportunities that would bring our two nations even closer together. Let us seize them and advance the transformation process for our two countries, and indeed, the world.”

— Amin Nasser, Saudi Aramco president and CEO



between China’s senior leadership and representatives from global leading businesses, international organizations, and scholars from home and abroad. This is the forum’s 18th session since its debut in 2000.

The theme of the CDF this year — “China and the World: Economic Transformation through Structural Reforms” — addresses key topical issues concerning China and the world in a time of global uncertainties, including

the economy and industry, international relations, public policy, sustainable development, health and welfare, finance, and technology and innovation.

MOUS AND BILATERAL MEETINGS

Apart from speaking at the CDF, Nasser’s agenda in Beijing also involved the signing of two Memorandums of Understanding (MoUs) between Saudi Aramco and China

Above: Saudi Aramco president and CEO meets with Huang Dunhua, vice chairman of state-owned Assets Supervisions and Administration Commission of the State Council. Below: Saudi Aramco president and CEO meets with Wang Yupu, chairman of Sinopec.





Saudi Aramco president and CEO meets with Wang Jianlin, chairman of the Wanda Group.

North Industries Corporation (Norinco Group) and Aerosun Corporation at the Saudi-Chinese Investment Forum.

The MoU with Norinco enables further strategic cooperation and downstream investment opportunities in China, which include the development of a refinery and chemical facilities.

The MoU with Aerosun involves the manufacturing of reinforced thermoplastic (RTP) pipe, as well as research and development.

Several bilateral meetings were held with leaders of key Chinese entities. They included Li Wei, president (minister) of the Development Research Center; Wang Yupu, chairman of Sinopec; Wang Jianlin, chairman of the Wanda Group; Huang Danhua, vice chairman of state-owned Assets Supervision and Administration Commission of the State Council; Wang Yilin, chairman of CNPC; and He Jiuchang, Yanchang Petroleum Group chairman.

Nasser also attended a CEO dialog organized by the China Petroleum and Chemical Industry Federation.

ROADS OF ARABIA EXHIBITION

Another highlight of the visit was attending the closing ceremony of the Roads of Arabia exhibition, which was presided over by the Custodian of the Two Holy Mosques and Chinese President Xi Jinping. The exhibition, which

was on its Asian tour, was launched last December with China as the first location, sponsored by Saudi Aramco.

The groundbreaking Roads of Arabia exhibit debuted in November 2012 in Washington, D.C., and has made several stops at major cities outside of the Kingdom. Featuring hundreds of objects on display highlighting Arabia's vibrant cultural and commercial connections with civilizations and countries across time and distance, Roads of Arabia has brought the treasures and artifacts of the Kingdom's past to new audiences.

KING ABDULAZIZ PUBLIC LIBRARY

Nasser also attended the inauguration by King Salman of the King Abdulaziz Public Library branch at Peking University, where the Custodian of the Two Holy Mosques was also conferred an honorary doctorate by the university.

The library's role is to motivate cultural communication between the Arab world and China, as well as to provide a conducive platform for researchers. The library is expected to further enhance bilateral relations and strengthen the bridge of cultural and social ties between the two nations.

Saudi Aramco played a key role in the library construction in terms of its interior, furniture, decoration, and landscaping. It also arranged for the delivery and placement for the first group of about 25,000 books. ☺

“Chinese companies can benefit from the Kingdom’s strategic location on the Maritime Silk Road by establishing manufacturing, logistical, and R&D bases — especially on the West Coast of Saudi Arabia.”

— Amin Nasser, Saudi Aramco president and CEO



abbrev.

Saudi Aramco news in brief



Saudi Aramco researcher Wajdi Al Sadat envisions that his innovative system will integrate power generation sources with renewables to reduce CO₂ emissions.

Carbon capture idea may help change the world

ITHACA, NEW YORK, USA — Seeking an innovative way to capture carbon dioxide (CO₂) by using a new battery setup is the goal of Cornell University doctoral candidate and Saudi Aramco Wajdi Al Sadat, who gained special recognition from the prestigious journal, *Scientific American*, for his idea.

Describing the idea as “carbon-breathing batteries,” the magazine recently named his proposal as the first of “10 Ideas That Will Change the World.” One day, the batteries might outfit a power plant or automotive tail pipe — using CO₂ in the process instead

of producing it.

In a paper originally published in *Science Advances*, Al Sadat worked with Cornell professor Lynden Archer to demonstrate CO₂ capture using aluminum in the metal/oxygen electrochemical system of a battery,

deviating from the classical approach of carbon capture, and addressing the conversion of CO₂ in the same system.

Al Sadat notes that aluminum is the third most abundant element in the Earth’s crust, making it much cheaper than other metals, addressing the economical adoptability of the technology.

Al Sadat says he has constructed, tested and analyzed close to 800 batteries using the new system.

Saudi Aramco and McDermott International sign MoU for construction of offshore platforms

DHAHRAN, SAUDI ARABIA — Saudi Aramco recently signed a Memorandum of Understanding (MoU) with McDermott International Inc. (MDR) for the integrated engineering procurement, construction and installation (EPCI) of offshore platforms for McDermott’s growing Middle East market, and other regional oil and gas development markets at the King Salman International

Vice president of Saudi Aramco’s New Business Development, Ziad Al-Murshed, and executive vice president, chief financial officer at McDermott International Inc., Stuart Pines, sign a MoU to establish a project to provide engineering services, procurement, construction, and installation of integrated marine platforms. Amin Nasser, Saudi Aramco president and CEO, and David Dixon, president and CEO of McDermott International Inc., look on.





Huda M. Al-Ghpson accepts a Middle East Women Leaders Excellence Award at the 21st Global Women Leaders Conference in Dubai. Presenting her with the award is Afef Haddad, Country Program coordinator, deputy to the World Bank's Country director for Maghreb and Malta.

Complex for Maritime Industries and Services project.

The project is part of Saudi Aramco's plan to expand its local supply chain, which will improve the company's agility while driving additional economic and human capital development, as well new employment opportunities in the Kingdom in support of the goals of Saudi Vision 2030.

The selection of MDR was the result of a rigorous evaluation process, which followed extensive negotiations with several world-class companies in the offshore EPCI services field.

Huda M. Al-Ghpson recognized for leadership in regional and global development

DUBAI, UAE — The Datamatrix Group, in collaboration with the Middle East Excellence Awards Institute, honored Huda M. Al-Ghpson, executive director of Human Resources for Saudi Aramco, at the 21st Global Women Leaders Conference in Dubai.

The Middle East Women Leaders Excellence Award recognizes Al-Ghpson's distinct leadership role in regional and global development — making significant contributions to the industry and leading the way for the involvement and

participation of women in the workforce.

The first woman in the history of Saudi Aramco to assume the level of executive director, Al-Ghpson has been recognized as a catalyst for change, an innovator in the field of human resources, and a leader who has contributed to the development of the region's future.

Bone marrow transplants helping cancer patients at JHAH

DHAHRAN, SAUDI ARABIA — Earlier this year, Johns Hopkins Aramco Healthcare (JHAH) became the second Eastern Province hospital where bone marrow transplants are performed.

"This is an important milestone for the treatment we provide patients suffering from multiple myeloma, lymphoma and other cancers," said Dr. Nafisah Al-Faris, Oncology Institute chairwoman. "Bone marrow transplants, also known as hematopoietic stem cell transplants, allow us to give a higher dose of chemotherapy, which can improve the outcome."

Chemotherapy destroys stem cells that create the different types

of blood cells. These blood-forming stem cells are located in the bone marrow. Inserting healthy stem cells after chemotherapy allows for a person's body to regenerate blood cells that fight infection and keep the body functioning properly.

Describing a recent procedure, Dr. Ahmed I. Alsagheir, hematologist/oncologist, said: "We extracted bone marrow from the patient, gave him a high dose of chemo, and once the chemo left his body — within about 48 hours — we reintroduced the collected stem cells from their bone marrow. It takes 12 to 14 days for stem cells in the bone marrow to begin replicating."

The JHAH Bone Marrow Transplant Team includes, from left, Dr. Ahmed I. Alsagheir, hematologist/oncologist; Ali Alkhardawi, blood bank manager; Dr. Nafisah Al-Faris, Oncology Institute chairwoman; Bavani Puthankalam, charge nurse; and Fatimah Sharrahi, nurse.



Unique program embeds Saudi firefighters in U.S. departments

DHAHRAN, SAUDI ARABIA — A unique program to introduce Saudi Aramco firefighters to the American fire service culture and best practices for public safety is currently underway in the U.S.

Working with the International Association of Fire Chiefs (IAFC) and Aramco Training Services Co., Saudi Aramco's Fire Protection Department (FrPD) embedded several cohorts of its firefighters with urban fire departments in California and Oklahoma to perform the duties and activities of regular crew members and bring "lessons learned" back to Saudi Arabia.

"Our department invests heavily in the development and training of our manpower to ensure constant improvement of personnel competency and readiness," says Mohammad A. Al-Aqeel, FrPD training chief.

"This program is the first-of-its-kind anywhere," says Laura Bell of the IAFC. "What makes it unique is that these Saudi firefighters are being operationally

Members of the Saudi Aramco Fire Protection Department are training in the U.S. in a first-of-its-kind program being offered in coordination with the International Association of Fire Chiefs and the Aramco Training Services Co.



During the week of the annual convention of the AAPG, Aramco geoscientists gathered to study core samples with scientists at the University of Texas Quantitative Clastics Laboratory in Houston.

embedded with departments. It's quite common for U.S. fire departments to have firefighters from abroad ride along with them, but they usually aren't equipped with uniforms and turnout gear, nor do they participate operationally as part of a structured program. We want them to gain an appreciation for the depth and breadth of our mission, especially in the aspect of community service."

Aramco participates in AAPG convention, 100th anniversary

HOUSTON, TEXAS, USA — The American Association of Petroleum Geologists (AAPG) annual convention in Houston marked a significant milestone for the organization — its 100th anniversary. Aramco participated in the conference, joining other global upstream leaders to honor AAPG's legacy and usher in a new era of success.

Throughout the four-day annual conference and exhibition, a team

of geoscientists, researchers and other Upstream professionals from Saudi Aramco and Aramco Services Co. contributed 17 presentations to the AAPG technical sessions, and more than 25 presentations in all throughout the event.

Additionally, we helped facilitate a major international student competition, hosted a group of company sponsored geoscience graduate students, and met with a number of industry professionals interested in careers with Aramco.

Aramco participated in several other activities during the week. A group of our geoscientists gathered to study core samples with scientists at the University of Texas Quantitative Clastics Laboratory in Houston, and Upstream researchers from Saudi Aramco and the Aramco Research Center-Houston met to discuss project highlights and opportunities for further collaboration.

Saudi Aramco's Anwar Al-Beiji recognized for distinguished service

HOUSTON, TEXAS, USA — Anwar Al-Beiji, geologist and team lead in the Saudi Aramco Exploration Resource Assessment Department, received an American Association of Petroleum

Geologists (AAPG) Distinguished Service award.

Al-Beajji accepted the award during the opening session of the 2017 AAPG Annual Convention and Exhibition in Houston. He was one of nine recipients receiving the award this year.

Al-Beajji has been a tireless volunteer and strong advocate for AAPG, joining the organization about 10 years ago. Passionate about AAPG's Imperial Barrel Awards (IBA) student competition, he served as the first IBA coordinator in the Middle East Region. Al-Beajji traveled extensively to universities throughout the region to speak to student groups and to lead efforts to establish AAPG student chapters there.

"I am deeply honored to receive this award," Al-Beajji said. "AAPG has so much to offer all of us working in the geosciences field. I saw the benefits early on, and wanted to share those with other young geoscientists in the Middle East. I truly feel that my career would not be complete unless I volunteered to give back to the geoscience community and help others along the way."

Anwar Al-Beajji receives an AAPG Distinguished Service Award during the convention's opening session. He is pictured with AAPG president Paul Britt, left, and Misfir AzZahrani, general manager of Saudi Aramco Prospect Portfolio Development.



Stimulating ambitions of Japanese youths the Aramco way

TOKYO, JAPAN — The 7th Saudi Aramco scholarship was recently awarded to three graduating students of Japan's Kanagawa Prefectural Yokohama Senior High School of Interna-

At YIS's school festival, AAJ senior marketing Ali Al Masoud's rich experience and knowledge in a wide range of topics drew the interest of students while providing a good test of their spoken Arabic. The students used the interaction to learn more about Arabic culture.

tional Studies (YIS).

YIS is the first public high school in Japan to have an Arabic language course, and Aramco Asia-Japan (AAJ) has been supporting the school by upgrading the equipment in classrooms and providing scholarships to eligible students annually.

The relationship between Aramco and YIS dates back to 2010, when AAJ approached YIS after learning about the school's Arabic course — a rarity for high schools in Japan. The initiative was based on the belief of then-principal Shinichi Hanyuda that Arabic is one of the official languages of the United Nations, spoken worldwide, and that a correct understanding of the Arabic/Islamic world is important for a global citizen.

To date, 167 students have taken the Arabic course at YIS, and though that number is relatively small compared with other languages, the students who take the Arabic course are enthusiastic and dedicated. 🌐



worldview



Malcapuya Island, Palawan, Philippines

Sharon McNeill captured this shot of the pristine beach on Malcapuya Island on a cruise to the Philippines in January 2017. After docking at the port city of Coron, in the district of Palawan, she then had to climb aboard a local catamaran for another two hour boat trip to reach this beautiful island. Palawan is renowned throughout the Philippines, and the world, as an area of outstanding natural beauty, and is a favorite among divers for its diverse underwater life.

McNeill used her Canon IXUS 180 point and shoot camera to take the shot. She works in the Corporate Business Ethics Office, which is part of the Compliance Department, in the Law Organization. McNeill has been with the company for 27 years.