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Summer 2018

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DIVING
right into the job

2

Pioneers in Plants

Women at Ras Tanura Refinery and Terminals are paving the way for talented female engineers, scientists, inspectors, geologists, and IT specialists to take up positions in the front lines of Saudi Aramco's facilities.

Land Affairs: Mission Critical

The Land Affairs Department is entrusted with ensuring access to land where the company can explore for, and develop, the Kingdom's rich oil and gas resources. With a wide range of duties, such as reviewing exploration well site plans against public records, and detecting and removing any encroachments, Land Affairs plays a critical role.

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About the cover:
Metab Y. Otaif, a diver with the Marine Department's Underwater Inspection and Repair Unit, signals that he is ready to take the plunge into the Arabian Gulf.

أرامكو السعودية
saudi aramco

PIONEERS IN PLANTS

BY Scott Baldauf

PHOTOS BY Mohammed AlShaikh

RAS TANURA SEES FIRST WAVE OF FEMALE EMPLOYEES AT FACILITIES

Not too long ago, a visitor to a Saudi Aramco refinery or production facility would have found themselves in a man's world. Every employee — from the front-line technicians to the most senior manager — would have been a male.

But Saudi Aramco, with our talented young workforce and a commitment to fostering meaningful careers for both men and women, has made dramatic strides in recent years to draw on what some have called the company's greatest untapped resource — female employees.

During a recent safety review at the Ras Tanura Refinery (RTR), senior executives were pleased to see that two of the engineers making presentations to management were women whose work takes them into the refinery on a daily basis.

Numbering nine in total at RTR and Terminals — with even more women working in the RT labs — these women may be pioneers of a sort, but they are not alone. At a growing number of facilities and in a growing number of admin areas, women are finding their place in the front lines of the company's core businesses of Upstream and Downstream, working as mechanical, chemical, and petroleum engineers; chemists, lab scientists, and safety inspectors; and geologists, geophysicists, and IT specialists. Their supervisors all agree on one thing: Each one of these women is well prepared for the work, highly motivated, and their example will be transformative for the company, paving the way for other talented women to take their place out in the field.

"I was very impressed to see the capabilities of the women at Ras Tanura," Abdullah O. Al-Baiz, vice president of Engineering Services, said after an Executive Management Safety Review. "It's good to see women get the opportunities to work in our facilities and plants."

Moothy Alelaiwy, shown here consulting with Abdulrahman Al-Harbi in Ras Tanura (RT), said her time working for RT Operations Engineering has been challenging, but rewarding. "When I came to RT, the Facilities Planning Department management told me that operations is very challenging and you have to be tough," she said. "I was able to prove myself in this tough environment, which made people supportive and helpful. This also supported building my communication skills in such a tough environment."

To be sure, the oil and gas industry worldwide lags behind other industries, such as manufacturing and information technology, in adapting to the influx of technologically savvy female employees. According to a 2017 report by the World Petroleum Council and Boston Consulting Group, women represent only one-fifth of all jobs in the oil and gas industry. In addition, they are far more likely to be funneled into office or business support positions (50%) rather than technical or field positions (15%).

CHANGING TIMES

Yahya A. Abushal, then acting general manager at RTR, said: "Saudi Aramco has always demonstrated a leading role in creating career opportunities for both men and women. Throughout time, women have reached executive level positions, which is empowering to the generations ahead. Today we are reaping the benefits of the gender diversity decisions that were made in the past decade.

"As a Kingdom, the benefit we gain is that we are starting to tap into the talent of the other half of society, who are now able to participate in more parts of the economy," Abushal added.

"In RTR specifically, you will proudly witness the presence of female professionals' leadership and contributions across all disciplines. The journey of their personal and career growth is unmatched through the wealth of learning and expertise within our operations. For the company, these women are becoming role models for those who will follow them. The future is absolutely bright and promising ahead for all."

Saudi Aramco, much like the Kingdom, is going through significant changes, especially when it comes to gender diversity, specifically in the core business area of the company, said Lamah F. Al Khayyal, acting administrator for Saudi Aramco's Women in Development and Diversity.

With the increasing number of female students graduating from science, technology, engineering, and math (STEM) disciplines and majoring in STEM fields, more opportunities are becoming available to young Saudi women, said Al Khayyal.

"Organizations are becoming more aware of the diverse talent hiring pool, resulting in more female candidates being included. Saudi Aramco management is recognizing the potential of such talented females and are further working on paving the road for their success in the core business area," she said.

Currently, women still comprise a relatively small percentage of the workforce and even a smaller percentage in chief position holder positions, Al Khayyal said. But this is now growing, and with the new opportunities allowing females to gain hands-on experiences in some field positions, more leadership roles will open up in the near future for those who gain the needed experience and can rightfully compete for positions.

There are unique initiatives that are being introduced by various organizations, such as Upstream, Downstream, and Technical Services, to support the development of females across the company.

"Our goal is not to simply increase the number of women in the company," said Al Khayyal. "Our objective is to provide women the opportunity to venture into technical fields and build their skills and qualifications to create a more diverse workforce for Saudi Aramco."

ENGINEERING SUPPORT

On any given day, you will find Maria G. Alfaraj — a secondee from the Inspection Department — inside RTR, checking on equipment and working with operations and maintenance engineers to find solutions that will keep the plant running safely and efficiently. Like her male colleagues in the RTR Engineering Support Division, she came to her

The reality is that there are so many opportunities for young employees at Saudi Aramco. But you have to take the first step. If you don't show interest, you're not going to get it.

— Sara F. Soleja

job well prepared, with a degree in mechanical engineering and business administration. And like them, she has been entrusted with significant responsibilities.

"My colleagues in the plants are welcoming and supportive," Alfaraj said. "They're always willing to share ideas and challenge me and my ideas."

Ultimately, she believes that participating in field work at the refinery is a way of contributing to the company's success in one of its core businesses — refining.

"The refining business remains one of Saudi Aramco's core businesses. Wherever we work in the company, somehow we are all related to the refining business chain. It's gratifying to contribute in the field and to create value for the company with solutions that help our business succeed," said Alfaraj.

Her supervisor, Farooq Khan, calls Alfaraj one of his team's top performers, and he said performance on the job has been the best way to overcome potential "gender-based" skepticism from other organizations within RTR. "Technically, we make no distinction in engineering between men and women. All we need are the skills and professionalism," said Khan.

Alaa S. Alahmed, a mechanical engineer in RTR, said working inside the refinery every day is one of the greatest experiences to apply her knowledge and widen her skills working alongside colleagues on some of the company's biggest projects, such as the Integrated Manufacturing Operations Management System. She added that diversity is important in all life perspectives, culture, and thoughts — not just in engineering.

"If you're passionate about something, your fingerprint will be a definite difference," said Alahmed. "Theory and hands-on experience go hand in hand; they complement and complete each other."

Feras A. Anazi, supervisor of Alahmed's unit in Engineering Support, said he has been "very impressed with the quality of the female engineers we have had — Alaa and Maria, and Reema A. Aldhaneem before them. They add a lot of value to our workforce. Alaa was able to perform optimally in a male-dominated environment with confidence. She is passionate about engineering, and that has given her the courage to overcome a lot of her challenges working in the refinery. Also, Alaa is very excited to deliver presentations to a large group of people — and she does it very effectively."

OPERATIONS ENGINEERING

Sara F. Soleja said that when she joined RT Operations Engineering, she requested to be sent to the field because "refining is a core business for Saudi Aramco." In her field assignment with the refinery's planning group, Soleja uses optimization software to operate the refinery at the most economical and efficient level, responding to the constantly changing global demand for certain refined products.

"The reality is that there are so many opportunities for young employees at Saudi Aramco," she said. "But you have to take the first step. If you don't show interest, you're not going to get it."

Moothy A. Alelaiwy, a secondee from the Facilities Planning Department, said she had only one concern when she joined RT Operations Engineering — she wasn't busy enough. Her supervisor, Rebal O. Ismail, told her, "OK, brace yourself," before he put her in charge of planning for the entire refinery, communicating on a daily basis with the company's Oil Supply Planning and Scheduling Department in Dhahran to ensure the refinery meets customer demand.

Ismail, who supervises both Soleja and Alelaiwy, said Saudi Vision 2030, with its support for female employment, is "helping a lot; it's changing the culture. Once people get used to women working in the plants, it won't be such a shock anymore."

Zainab Al-Mohsen, who is currently working at the RT tank farm, said management has always encouraged her to advance her knowledge of the refinery process, and when the opportunity came to take an assignment inside the refinery, she took it.

Like her male colleagues in the RTR Engineering Support Division, Maria Alfaraj came to her job well prepared with an engineering degree and a desire to be a part of the team that contributes to the company's success in one of its core businesses. "It's gratifying to contribute in the field and to create value for the company with solutions that help our business succeed," she said.

RT LABORATORIES

Supporting every organization at the refinery complex are the RT labs, where lab scientists and chemists test samples all along the refining process to ensure safety and to assure the company's customers that the finished products (diesel, kerosene, gasoline, etc.) measure up to Saudi Aramco's strict standards.

Deimah A. Esmail, a veteran lab scientist with seven years of experience, analyzes water samples to ensure that any water that is discharged back to the sea is completely free of hydrocarbons. Her supervisor, Nasser M. Ahmary, said she was a critical contributor in updating systems and methods at the RT lab, and training her colleagues on lab equipment.

"Our work is very critical for the refinery," Esmail said. "The results are urgently needed, and if there is any delay, it affects the process. But this is a great place to start out your career. It's like college, and you learn a lot here."

Asma Y. Alfahad, a chemist at RT labs, said attention to detail is a vital part of her work with gas chromatography equipment. Before she even turns on a single piece of equipment, she inspects each instrument and changes any part of the instrument to avoid failure. By doing so, she is not only protecting the company's reputation for quality products, but she is also ensuring safety in the lab for herself and her colleagues.

"It has been an adjustment to work here, but I thank God that everything I learned in university, I am applying here," she said.

Zainab A. Al-Mohsen, an RT lab scientist currently assigned to a field position at the RT tank farm, said her management and supervisors have always encouraged her to advance her knowledge of the refinery process, and when the opportunity came to take an assignment inside the refinery, monitoring the final products produced at the refinery, she took it.

If she had a chance to advise a young woman who was thinking of working inside a refinery, Al-Mohsen said she would tell her the following: "Do not allow people to tell you that you cannot do something because you are female. Tell me I need to develop myself and my understanding, but it has nothing to do with gender. Studies show that women are able to do the most difficult jobs that a man can do. It is your choice."

When Sara F. Soleja joined RT Operations Engineering, she requested to be sent to the field, because "refining is a core business for Saudi Aramco." In her field assignment, Soleja uses optimization software designed to operate the refinery at the most economical and efficient level, responding to the constantly changing global demand for certain refined products.

LAND AFFAIRS

MISSION CRITICAL

Safeguarding company land assets KINGDOMWIDE

By Scott Baldauf

To support Land Affairs representatives in reaching proper compensation for private land near Riyadh, a team of surveyors from the Geomatics Services Division set up a Trimble surveying system to mark out the land with incredible accuracy. The Trimble uses real-time kinematic, a satellite navigation technique, which gives the surveyors the ability to survey land with a margin of error of just one millimeter. (By comparison, standard GPS devices or smartphone location services have a margin of error of 10 meters.) *Photo by Ahmad El Itani*

As Adel A. Alqulaiti and Majed A. Al-Subaie park their company vehicle on the side of a skid road near the Khursaniyah Gas Plant, their eyes confirm what satellite and aerial photographs had warned them about.

Trained and experienced land representatives with Saudi Aramco's Land Affairs Department (LAD), Alqulaiti and Al-Subaie use an iPad with Geographic Information System (GIS) software to verify that a pair of ring-fenced compounds full of workshops, storage sheds, and construction equipment have been built just a few meters away from a gas pipeline that is currently under construction. Maps and aerial photos accessed on their iPad confirm this land is reserved by the government for Saudi Aramco.

The presence of a non-Aramco compound so close to a pipeline is not only an illegal encroachment — it is potentially dangerous and a violation of Saudi law. The next step, Alqulaiti and Al-Subaie conclude, will be to work with local government authorities to have this compound removed.

It is all in a day's work for employees of the LAD — the organization entrusted with ensuring access to land where the company can explore for, and develop, the Kingdom's rich oil and gas resources. With a wide range of duties such as reviewing exploration well site plans against public records, securing land through government reservations and private purchase, and detecting and removing encroachments, Land Affairs plays a critical role in maintaining the company's position as the world's leading supplier of energy.

The seven years of Umar S. Abdullatif's tenure as LAD manager have been busy. LAD's responsibilities have grown as the company's own massive expansion of operations have expanded. From roughly 80,000 square kilometers (sq. km) in 2011, the company's reservations have expanded to about 260,000 sq. km in 2017. To manage the workload, LAD's workforce has had to grow as well, from 41 in 2011 to 75 now — 11 of whom are female employees.

"Land Affairs Department's mission statement, which is at the center of what we do, is to safeguard company land assets across the entire Kingdom of Saudi Arabia," Abdullatif said. "This allows the company's business lines to operate effectively

and without delay for the benefit of the Kingdom's economy."

Being in charge of guaranteeing the company's access to critical lands requires LAD to maintain a focus on customer needs, Abdullatif said.

"Through our dedicated team of professionals and consultants, LAD is always available to respond to Saudi Aramco proponents' needs and requests in a timely manner."

Land Affairs representatives Adel A. Alqulaiti (right) and Majed A. Al-Subaie use an iPad with GIS software to verify that a pair of ring-fenced compounds are encroaching on land that has been reserved by the government. *Photo by Hasan AlMubarak*

Customer focus

LAD deals with a number of internal and external stakeholders. Within the company, LAD works heavily with Exploration, Petroleum, and Pipelines to delineate areas of hydrocarbon potential proactively to reserve lands, and therefore, minimize conflicts. LAD also works with Law on land claims and Loss Prevention to ensure buffers are there to safeguard the public and the company's facilities. LAD also works with Government Affairs to resolve land encroachments and high-profile issues where land needs intercede. LAD works with the Project Management Office Department when responding to land-use permits (LUPs) and surveying lands.

Outside the company, the department works with the Ministry of Energy, Industry and Mineral Resources, in addition to regional emirates, encroachment removal committees, the Ministry of Municipal and Rural Affairs, and the Bureau of Experts.

The demand for LAD services continue to increase. In 2010, LAD addressed 2,205 incoming letters for non-company land requests and reviewed 661 LUP review cases, and 123 well locations. In 2017, Land Affairs addressed 4,300 incoming letters for non-company land requests, and reviewed more than 3,400 LUP review cases and more than 600 well locations.

Azeb M. Al-Qahtani, manager of the Production and Facilities Development (P&FDD), said he considers LAD to be a key partner.

"P&FDD and Land Affairs are working hand-in-hand on a continuous basis to address all land issues and support Saudi Aramco field developments, maintain potential and other projects to avail the required lands in a timely and cost-effective manner, and resolve land issues prior to the commencement of the project's critical phases," Al-Qahtani said. "From simple land inquiries to official high-level government committees, our colleagues in LAD represent the

Umar Abdullatif (center) discusses a map with Azeb M. Al-Qahtani, manager of Production and Facilities Development (right) and Abdelhameed O. Al-Medani, Land Affairs consultant, at the Land Visualization Center in Dhahran — a facility with special "change detection" capabilities to detect possible encroachment on land reserved for the company and its facilities. *Photo by Saleh Al-Shabeeb*

Mohsin A. Al-Tuwaijri, a Land Affairs representative, meets with government officials at the Eastern Province Amanah (infrastructure authority) to discuss Saudi Aramco's land reservations and future projects. *Photo by Musleh Khathami*

company needs and requirements to ensure protecting the company's interest and our future oil and gas field development."

Technology

With 260,000 sq. km of land (larger than the area of the U.K.) to protect and monitor, Land Affairs makes use of a wide range of technology, including:

- SAP Land Management System: This fully digitized system (integrated with the LUP and e-Zajil systems) allows land representatives to administer land records, examine all case documents, create maps and input spatial information for land requests, automatically identify land conflicts, and then prepare and send the company's response.
- GIS and remote sensing: GIS is designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. Remote sensing is the science and technology of obtaining data by a satellite or aircraft-based sensor technologies to detect and classify objects on Earth. LAD uses a combination of these technologies to make informed decisions about land requests.
- Change Detection: This solution gathers satellite imagery and compares the images from two consecutive years — or quarters in some areas — to detect changes in land use, including potential land encroachments.
- GIS Mobile Solution: Once a potential encroachment is identified, Land Affairs representatives utilize an iPad with customized software to better inspect potential encroachments by utilizing GIS technology, updating maps in the field, collecting data, and updating the SAP Land Management database with the land request information.

The people

While technology is a key enabler, the secret to LAD's success rests in its people. As the company's operations grow, so does LAD's workload, and to meet the company's needs, LAD created a plan to ensure the development of a competent workforce. This included the recruitment and development of staff members with legal backgrounds to address complex land claim issues in addition to continually developing business and legal writing skills. LAD also benefits from professionals with diverse education and experience in the areas of GIS, remote sensing, and business administration. LAD representatives participate in a top four-level certification program from the International Right-of-Way Association (IRWA). More than 40 of LAD's land reps have completed IRWA certification.

Advocacy

As a key support organization that interacts daily with the public and with the government, Land Affairs representatives serve as advocates on the company's behalf. In conference rooms, seasoned Land Affairs representatives such as Mohsin A. Al-Tuwaijri engage with a variety of government agencies through dedicated committees established to review land issues. In these committees, LAD representatives put forward the company's interests and demonstrate their vital importance to the national economy.

Umar S. Abdullatif (second from right) studies a map with members of his Land Affairs team at the Land Visualization Center in Dhahran. *Photo by Saleh Al-Shabeeb*

Not surprisingly, LAD representatives in the field find themselves acting as advocates on behalf of the company, especially whenever there is an opportunity to meet with the public. During a recent field visit to the district of Namar, southwest of Riyadh, Abdullah M. Al-Amri and Abdulrahman S. Al-Shamrani met with a local businessman to discuss proper compensation for a piece of land owned by the businessman but reserved for Saudi Aramco by the government.

Working with a team from the Geomatics Services Division, Al-Amri and Al-Shamrani clarify just how much land the businessman owns, as surveyors set up a Trimble surveying system to mark out the land with incredible accuracy. The Trimble uses real-time kinematic, a satellite navigation technique used to enhance the precision of position data that gives the surveyors the ability to survey land with a margin of error of just one millimeter. (By comparison, standard GPS devices or smartphone location services have a margin of error of up to 10 meters.)

Al-Amri and Al-Shamrani meet up with the landowner and walk to each of the four corners of his land, each of the corners marked by a length of rebar pounded into the ground. The surveyors do their work, and the landowner signs an agreement to meet with a local government committee for land issues and with LAD representatives to arrive at a fair compensation for his land.

Geographical reach

To ensure that Land Affairs reps are able to respond quickly and provide service throughout the Kingdom, Land Affairs has been organized into four divisions according to professional function. These four divisions are as follows:

- Land Rights Division and Reservation Affairs Division: The primary function of these two divisions is to secure lands for future operations. This can be achieved through a land reservation request filed with the government, or by an acquisition or an easement. The two divisions also review all private land requests (title deed and town plan requests) to ensure minimal conflict with the company's land and operations.

Land Affairs representatives Abdullah M. Al-Amri (center) and Abdulrahman S. Al-Shamrani (right) meet with Faisal T. Al-Otaibi from the Project Management Office Department as a surveying crew conducts a survey near Riyadh. *Photo by Ahmad El Itani*

"Land Affairs Department's mission statement, which is at the center of what we do, is to safeguard company land assets across the entire Kingdom of Saudi Arabia. This allows the company's business lines to operate effectively and without delay for the benefit of the Kingdom's economy."

UMAR S. ABDULLATIF,
manager of the
Land Affairs Department

- Land Protection Division: This division's main function is to ensure minimal interruption to critical company operations by proactively discouraging unauthorized land and working with Saudi Aramco proponents and government agencies to remove existing land encroachments in a timely manner.
- Geospatial and System Support Division: In addition to managing and supporting LAD's IT systems, the division utilizes technology — GIS and satellite imagery — to review LUPs and well locations, as well as provide cartography services to other LAD divisions and advisory services to Saudi Aramco organizations for optimal land allocation and pipeline routing.

The future

With an expanding portfolio of activities — in all business lines — the role of Land Affairs is the same that it has always been: To ensure the company's success.

The company's challenges may become more complex, as we enter new regions of the Kingdom and launch entirely new business activities. But Land Affairs is adapting to the changes, introducing new technologies to detect potential conflicts, and ensuring that all LAD employees have the skills to advocate the company's position and resolve land conflicts, while protecting critical relationships with the public and the government.

DIVING *right into the job*

Attention to detail is crucial for members of Saudi Aramco's Marine Department Underwater Inspection and Repair Unit

BY

Jamsheed M. Din

PHOTOS BY

Mohammed AlShaikh
and Moayed Al Qattan

Sitting before a wide array of switches, dials, regulators, gauges and screens, Sultan Al Ahmadi's eyes are a flurry of activity as they focus in on the many numbers and valves before him.

He flicks a switch and adjusts a dial. He has to be precise. Any complacency or lack of attention to detail could prove fatal.

Al Ahmadi is on board the *Zamil Six*. Around 20 feet away, Abdullah F. Al Amiri feels the effects of Al Ahmadi's actions. Al Amiri is sitting patiently inside a LARS — a metal cage measuring 6 feet by 3 feet, as it stands perilously close to the edge.

The meshed cage that surrounds him is attached to a winch that will soon shift into gear and lower both the cage and occupant into the Arabian Gulf waters below.

Donning a diving helmet that weighs approximately 15 kilograms, Al Amiri's every move is tracked by a camera and two-way communication system that is part of his essential headgear. It's Al Ahmadi who is keeping a close eye on the whole proceedings, communicating directly via radio.

"How much bailout pressure?" asks Al Ahmadi, referring to Al Amiri's emergency

When Saudi Aramco divers Abdallah F. Al Amri (left) and Ibrahim F. Al Khaldi are underwater, their every move is tracked by a camera and a two-way communication system that is part of their essential headgear.

Mustafa K. Karan examines a decompression chamber that is used in case of any emergency that requires a diver to be pulled from the water at speed. The diver is then placed in the chamber, allowing his body to decompress — a crucial procedure if a diver is in danger.

supply of air. "190 bar, bailout checks complete, ready for main gas," is the response.

Al Amiri is a Saudi Aramco diver. As part of the Marine Department's Underwater Inspection and Repair Unit (UIRU), his working world is subsea, among the marine and plant life of the Arabian Gulf. Today he is performing an underwater inspection of the *Zamil Six*. Along with fellow divers, their job is to inspect, repair, and maintain the integrity of company offshore assets, including barges, vessels, platforms, and pipelines.

His wingman on this job is Al Ahmadi, a diving supervisor who is responsible for the pre-dive safety checks and the dive and diver in general, from the time he leaves the surface to completing his decompression and reaching the surface again. Before Al Amiri, or any diver for that matter, submerges, the diving supervisor must give the green light.

The UIRU serves as Saudi Aramco's eyes, ears and indeed hands, beneath the sea. Divers, equipped with a sniper's vision, are dispatched to carry out detailed work in an environment that was not created for human interaction.

"The team amazes me," says Marine Department manager Mohammad A. Sultan. "They are always ready, no matter what it takes, to get the job done."

The UIRU is a testament to Saudi Aramco's efforts to ensure that its operations are optimal, efficient, and above all, safe — no matter the environment.

Mohammad A. Sultan

THE BRAIN

At the Tanajib pier, a heavy burst of rain sends workers dashing for cover. It's been raining intermittently throughout the night. And like a perfectly tuned orchestra, waves follow the cue of the rainfall by flowing and thrusting themselves upon the hulls of docked vessels.

At the nearby administrative and maintenance buildings, employees enjoy the splendid

downpour from the comfort of their offices.

At his desk, Petros Kogiamis is busy. His phone rings constantly. "Hello, diving" he answers. Another customer is on the line. UIRU services are in big demand and Kogiamis is the focal point. On any given day he can receive between 20 to 40 job requests, which are officially received through the Marine Department's Marine Operations Management (MOM) system. Rain or shine, the calls keep coming.

"We receive the orders, evaluate, and then decide which vessel will do the job," says Kogiamis.

The jobs vary in their requirements and complexity. To respond appropriately, at the unit's disposal are five vessels that are able to operate in varying water depths — two shallow water vessels that operate in waters from 2½ to 15 meters; two diving support vessels that operate in waters ranging from 15 to 50 meters; and one saturation diving vessel that can operate in water depths ranging from 30 to 300 meters. Each of the vessels also has portable diving equipment that can be utilized onboard purpose-built zodiacs. This allows the unit to reach extreme shallow areas up to the shoreline if need be.

Kogiamis's 32 years of diving experience mean the subsea is almost his second home. There's not much he hasn't seen in the world of professional diving. It's this experience that makes him a perfect fit for his role. In the hot seat, he assesses which vessels are available for the required jobs, in addition to dispatching instructions to divers and receiving operational updates. It's no surprise, then, that despite its inconspicuous appearance, his cubicle is known as "the brain."

"I communicate with our colleagues on the vessels," he notes. "From here we can see and monitor everything in real time and we know exactly where the vessels are and what dive jobs they are working on. It's a 24-hour operation — it doesn't stop."

> "The team amazes me. They are always ready, no matter what it takes, to get the job done."
>
> —**Marine Department manager Mohammad A. Sultan**

An ounce of prevention is worth a pound of cure, the old adage goes. Each year, the unit runs a proactive campaign to inspect 650 kilometers of subsea pipelines in addition to 72 platforms — helping to prolong the life cycle of the assets.

"By carrying out inspections we can spot any potential issues before they happen and intervene," notes Kogiamis. "The subsea environment has many challenges, so keeping a close eye on things is crucially important."

One of the vessels Kogiamis tracks is the *Mermaid Asiana*. On first appearances, there is nothing seemingly unusual about the vessel. Certainly, the elevated helicopter deck that stands

The dive helmet weighs close to 15 kilograms and is fitted with a camera and audio system that allows for communication with the dive vessel.

The *Mermaid Asiana*

- **PURPOSE-BUILT**
  Saturation diving support vessel
- Divers able to descend to **300 M**
- Features **12-MAN** saturated diving system
- Divers remain in saturation chamber for between **6-8 WEEKS** at a time

Saturation chamber

- The saturation chamber within the *Mermaid Asiana* allows divers to dive for **LONGER** periods, allowing for **GREATER** efficiency in operations

Diving bell

Diving bell receives gases via umbilical cord and is connected to vessel by

LIFT WIRE

Divers exit to the required depth through a

DIVING BELL

Once complete,

DIVERS RE-ENTER THE BELL to be hoisted back to the vessel where they re-enter the saturation chamber

Divers

Saturation divers dive for around

8 HOURS

per day, spending the remaining time inside the saturation chamber on the vessel

DIVERS in the Underwater Inspection and Repair Unit work on repairing and inspecting company assets subsea in the Arabian Gulf

at the front of the vessel is eye-catching — but far from uncommon on large vessels.

But it's below deck, deep into the core of the purpose-built saturation diving support vessel, where on a daily basis, an operation that grapples with the laws of nature takes place.

The Underwater Inspection and Repair Unit falls under the Marine Department in the Industrial Services admin area, presided over by vice president Abdulhakim A. Al-Gouhi.

SATURATED

Yaqub Al Omoud says goodbye to his wife and six children. They won't be seeing him for at least six weeks.

From the city of al-Hasa, the 34-year-old diver makes the journey by road and then air to Tanajib. Once at the pier, he will board the *Mermaid Asiana*. Psychologically, Al Omoud must be prepared for what awaits him. For the next six to eight weeks this vessel will be his home.

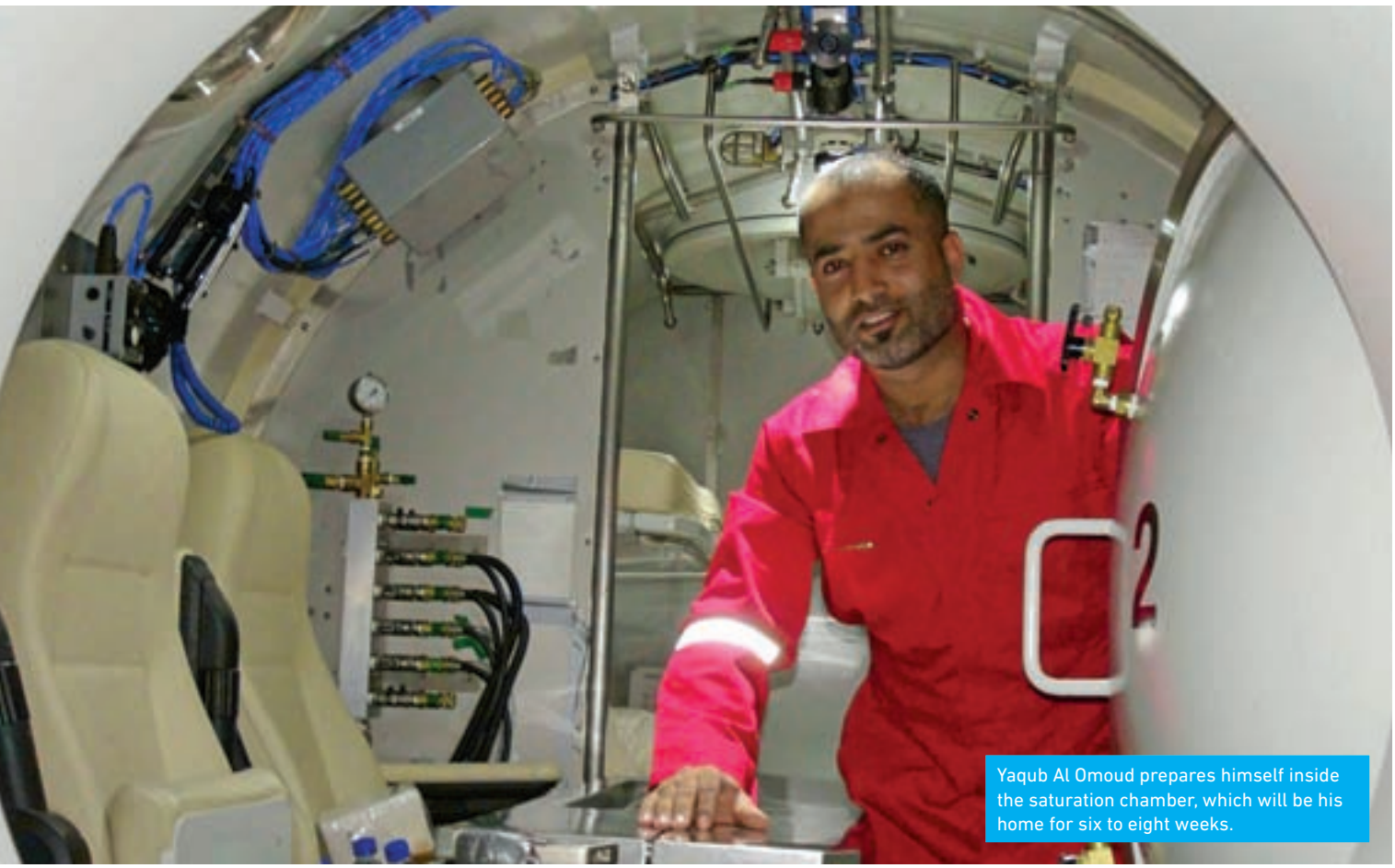
But Al Omoud won't be sleeping below deck in a cabin. Nor will Al Omoud be found working on the deck or in the control room.

For up to eight hours per day Al Omoud will be underwater, inspecting and repairing Saudi Aramco assets. For the remaining 16 hours he will be in a saturation chamber — a high-pressure habitat that he shares with up to six other divers. This is the pinnacle of diving.

Having just arrived at the *Mermaid Asiana*, he readies himself before entering the chamber. He has his books, electrical devices, and other essentials. The medic on board the vessel carries out the mandatory pre-saturation medical check — Al Omoud is good to go.

The saturation chamber is technology's answer to the dilemma of being able to dispatch divers to depths of 100 meters, and more, at an instant's notice and for prolonged periods of time, possibly for up to eight continuous hours.

The saturation unit is pressurized to almost the same depth



Yaqub Al Omoud prepares himself inside the saturation chamber, which will be his home for six to eight weeks.

Khalifa I. Dossary mans the controls in the diver control room aboard the *Zamil Six*.

level at which the divers will be working subsea. Inspecting company assets at such depths for long periods of time means that saturation divers need to stay in the water longer and deeper than conventional commercial divers.

Regular commercial divers will work for around 20 to 90 minutes in shallower water depths up to 50 meters, then take around 40 minutes to resurface due to the necessary decompression stops along the way. If divers resurface too quickly they can suffer decompression sickness, which is the result of having breathed gas that is at a higher pressure than the surface pressure. This happens when divers remain subsea for long periods at greater depth, without ascending gradually and making the decompression stops needed to slowly reduce the excess pressure of inert gases dissolved in the body.

In the saturation unit Al Omoud and other divers will breathe a mixture of gases, including oxygen and helium. Once the body is saturated it means the diver can be deployed from the saturation unit into the water, and more importantly, he can come straight back without the need for decompression stops.

Saturation divers are therefore able to work at greater depths for longer periods of time.

"One of the biggest advantages of having a vessel like the *Mermaid* and its saturation divers is that they can be dispatched at a moment's notice to deep depths — we don't have to worry about the divers being saturated or getting decompressed on their return," notes superintendent of Marine Offshore Operations, Turki M. Shihri.

Turki M. Shihri

"This means we save time and money, but more importantly, it means we are always ready to deal with any situation."

Al Omoud will be saturated in the same chamber where he sleeps and rests. To get to the seafloor he will exit his

pressure chamber through an airlock and enter a diving bell. The diving bell is then lowered to the seabed, or required working depth, and Al Omoud is released to work.

Once finished, Al Omoud, or any other saturation diver, will re-enter the bell, which is then hoisted back to the vessel.

All the time, his world does not go beyond the subsea area and the saturation chamber.

Saturation diving is all about depth and time. However, even operating in shallow waters can throw up the most challenging of scenarios. But even in this instance, UIRU was to prove, that through ingenuity and technology, no challenge is unsurpassable.

Khaldoun I. Bukhari

A SHALLOW PROBLEM

Connected to an umbilical cord, a diver submerges to begin a shallow water inspection of a Saudi Aramco asset.

The umbilical cord resembles a thick yellow rope, and serves as the conduit for a supply of diving gases. It also contains reinforced wires allowing radio communication with the diver as well as providing light to the diver and a camera feed back to the surface dive panel.

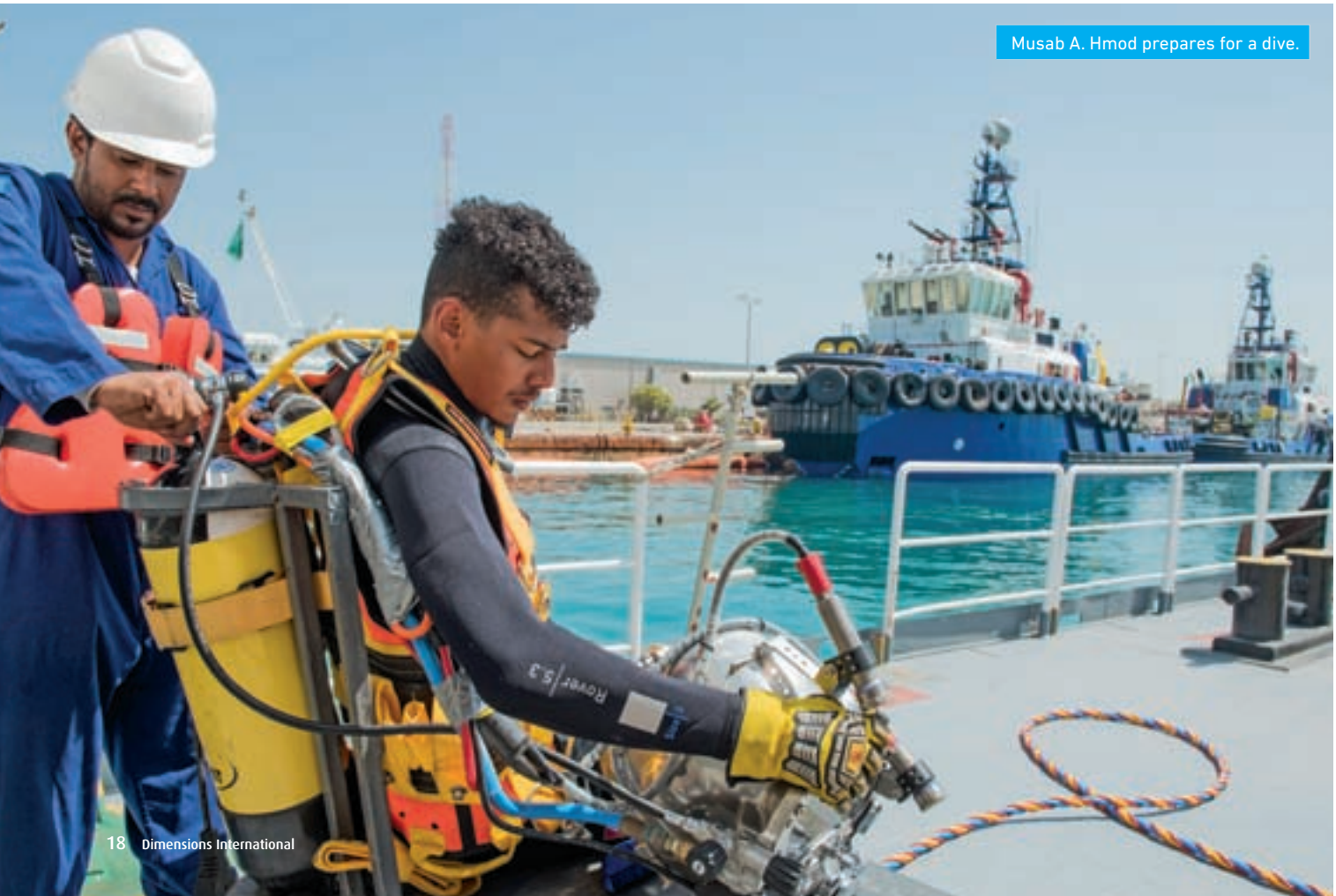
The cord is connected to a shallow water inspection vessel. However, it must operate carefully, a host of potential problems await — not least the risk of impact with the sea bed or underwater obstacles in the shallow waters. It's risky business.

Necessity is the mother of invention, and the UIRU turned to the company's Research and Development Center's Intelligent Systems Lab for assistance. How could they inspect assets in shallow waters and avoid the potential hazards to the support vessels?

Seven engineers based within the Oil and Gas Network Integrity Division were assigned to work with three members of the Marine Department, and in less than two years they successfully developed the Shallow Water Inspection and Monitoring Robot (SWIM-R).

The device is able to conduct visual inspections, marine life cleaning, ultrasonic thickness readings, and cathodic protection voltage measurements in shallow waters.

Divers can now operate the vehicle remotely from onboard



Musab A. Hmod prepares for a dive.

The *Mermaid Asiana* is a saturation diving vessel and is used for operations that are in depths of 30 to 300 meters.

the dive vessels.

"This was a great leap," notes URIU head Khaldoun I. Bukhari. "It is a very effective way to carry out our operations in shallow waters and is a great example of collaboration between different departments."

One of the operators of SWIM-R is 28-year-old Shadi S. Negaimshi. He serves as a trainee Diving supervisor, and also operates the technology from above the surface in a diving support vessel.

"This was a breakthrough technology that was developed specifically for our operations," he notes. "Obviously, it gives me great pride to be part of its deployment — it shows that the company is always looking at innovative ways to tackle operational challenges."

Negaimshi is no stranger to serving the interests of the Kingdom — in fact he's quite a pro. It was in 2008, when the eyes of the world were on Beijing, that he first stepped forward and represented Saudi Arabia at the Olympics as a freestyle swimmer.

Four years later he joined UIRU as a diver. "Water is my passion — I am doing something I love," he says with a brimming smile.

Having received extensive training in the unit, Negaimshi is all too aware of the trust now placed on him.

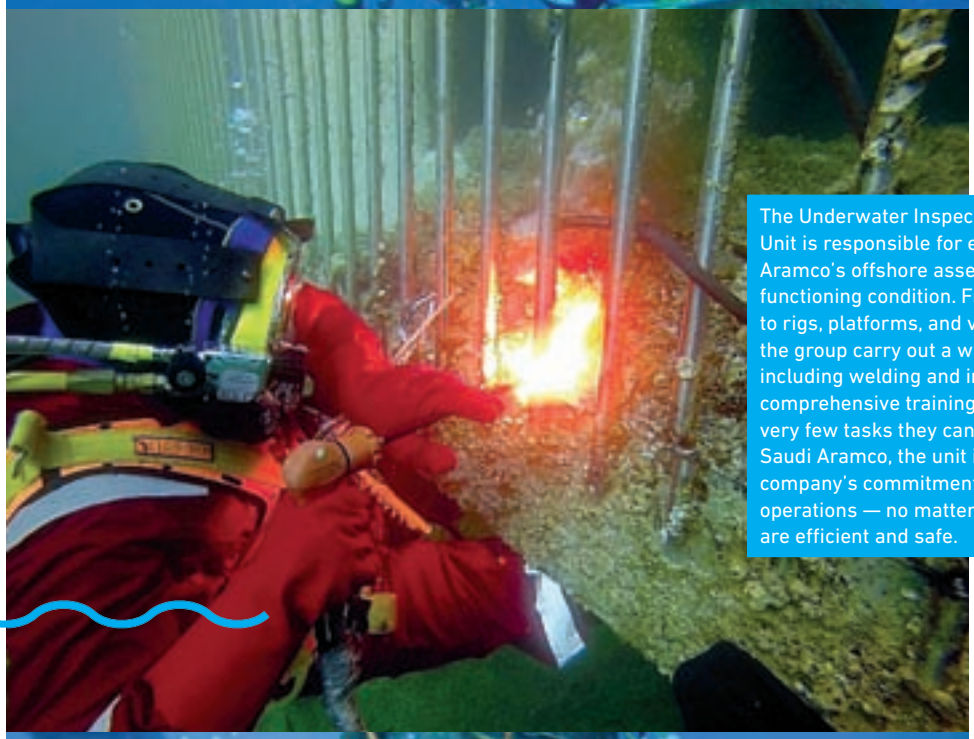
"The company has invested in me and it comes with a responsibility — we must give 100% all of the time and always be looking at ways in which we can improve our operations."

Eyad T. Al Hajji was the first Saudi diver to join the Underwater Inspection and Repair Unit.

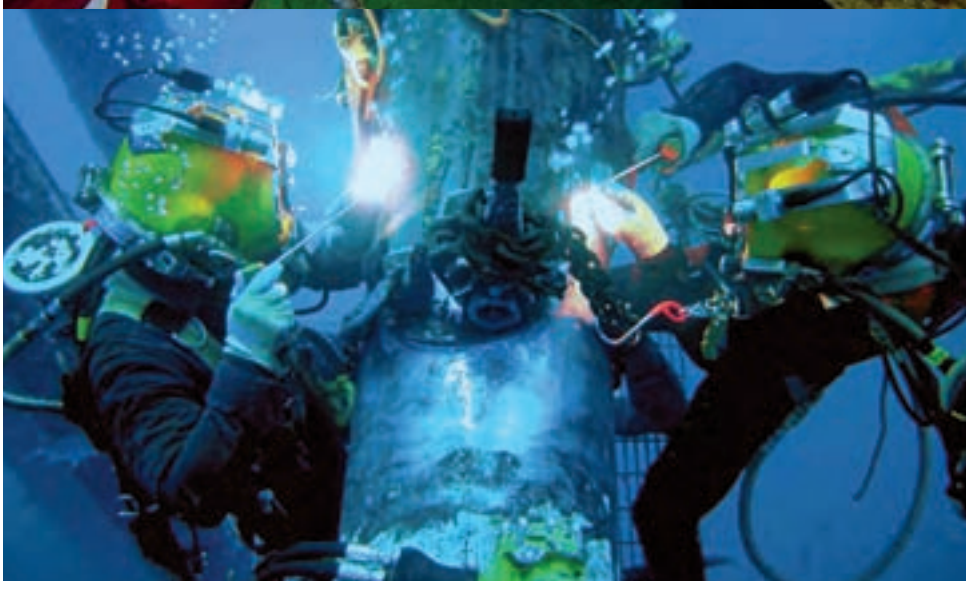
'NEW CHALLENGES'

"There is a special relationship between me and the water," says Eyad T. Al Hajji, with a look of contemplation.

The 40-year-old diver



The Underwater Inspection and Repair Unit is responsible for ensuring Saudi Aramco's offshore assets are kept in optimal functioning condition. From subsea pipelines to rigs, platforms, and vessels, the divers in the group carry out a wide array of duties, including welding and inspections. Their comprehensive training means there are very few tasks they cannot handle. For Saudi Aramco, the unit is a testament to the company's commitment to ensuring all of its operations — no matter the environment — are efficient and safe.



from al-Khobar is rarely at his seat. As a diving supervisor he is busy either overseeing dive operations on vessels, or in his office at the Tanajib pier ensuring tasks run smoothly. In the world of Saudi Aramco marine operations, Al Hajji is a pioneer. When he joined Saudi Aramco's diving operations in 2006 there were no other Saudis on the team. He would be the first — and a sign of things to come.

Not exactly the career path his professors at King Faisal University expected him to follow.

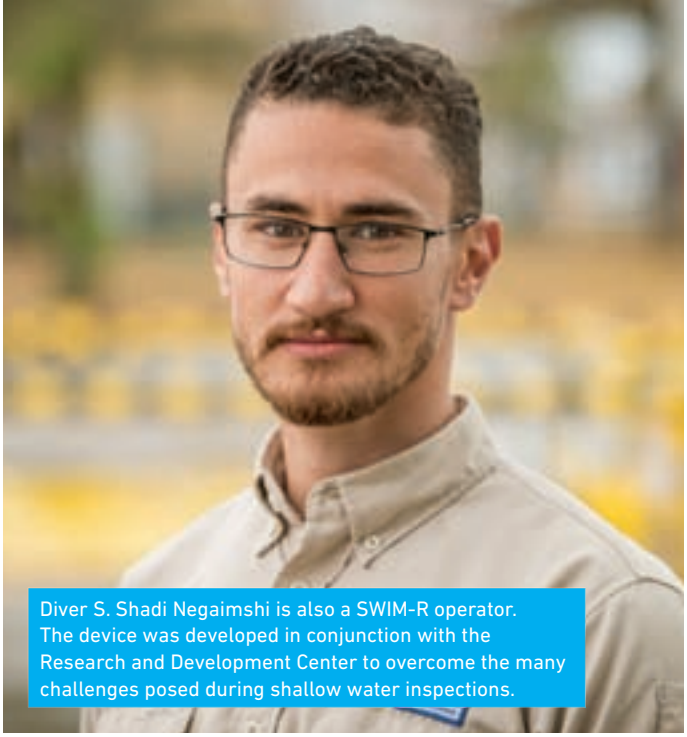
"I graduated with a degree in English Literature," he reminisces. "I was not interested in becoming a teacher though — I wanted to do something that didn't have a daily routine."

Al Hajji, already an established swimmer by the time he graduated, followed his instincts and decided to take his affinity with the water to another level.

He spotted an advertisement from a contractor company requiring divers — he was hooked. Successfully recruited, extensive diver training in the United Kingdom soon followed. Contracts with Saudi Aramco exposed Al Hajji's skills to UIRU and they wasted no time in recruiting him.

"I knew the job with Saudi Aramco would be exciting," he explains. "It would present me with new challenges and I was ready to take them on. It was a source of immense pride for me to be the first Saudi diver for the company."

A period of intense training was arranged that included a diving medic course and a program in Nondestructive Testing/Subsea Inspection — crucial skills for Al Hajji's line of work with the company.



Diver S. Shadi Negaimshi is also a SWIM-R operator. The device was developed in conjunction with the Research and Development Center to overcome the many challenges posed during shallow water inspections.

"I always love to dive — you never know what you are going to face. That's the beauty of this job. You are operating in an environment that is alien to human life — it's not natural for humans to be under the water.

"Sometimes I would ask myself while subsurface — 'what am I doing here?' But this environment brings out the best in human ingenuity."

Despite his relatively young age, Al-Hajji is now considered a mentor in the unit. Younger Saudi blood is now stepping forward, carrying the torch first lit by the "pioneer."

TWO OF A KIND

As admin clerks with the Marine Technical Services Department, Musab A. Hmod and Metab Y. Otaif would find themselves at the heart of supporting the department's operations.

The pair both attended the Industrial Training Center in Dhahran and joined their new organization together.

One morning, like hundreds of others across their department, they received what seemed to be a regular email. Yet it turned out to be the beginning of a new and exciting journey — one they would once again carry out together.

"I opened the email and it was a request from the department for anyone interested in becoming a diver to come forward," remembers Otaif.

He immediately consulted with his close friend and colleague Hmod, who to no surprise, was also excited at the prospect of becoming a diver.

"I saw this as my chance to go offshore," Hmod recalls. "I wanted to work offshore — I am in love with the sea."

Hmod and Otaif were part of a drive to internally recruit divers to join UIRU. But they would have to prove themselves under immense physical and psychological challenges to qualify.

"We have an internal recruitment process — it's rigorous and we only recruit the very best," notes Bukhari.

"The physical aspect is just one part. Of course they have to be physically fit, but the mindset has to be there — it takes something special to become a diver in the unit."

Not wasting any time, Hmod and Otaif replied to the request and were selected for interviews. After passing medical and physical tests they were the only two selected from nine to join the unit.

A comprehensive training program would now kick in. The friends, who were now colleagues, joined a three-month orientation on board Saudi Aramco vessels. They would observe diving operations, safety procedures, and the uses of the decompression chamber.

This was followed by an intense 90-day underwater diving training program in Saldanha Bay in South Africa.

Each day, the pair would train in diving operations from 10 a.m. to 5 p.m. They would be given basic seaman training and would see their physical fitness skyrocket.

"When I began I could swim 300 meters in 10 minutes," said Hmod. "I then got my time down to eight minutes, and then down to six minutes."

"We pushed each other to complete the course," says Otaif, referencing the close relationship he had forged with Hmod. "We had taken every step together. He was like my twin."

After successfully graduating from the course, the pair rejoined the unit as fully qualified divers.

> "The physical aspect is just one part. Of course they have to be physically fit, but the mindset has to be there — it takes something special to become a diver in the unit."
>
> —**Khaldoun I. Bukhari**,
> *head of the Underwater Inspection and Repair Unit*

Like others in the UIRU, Hmod and Otaif work five days continuously and then have two days off. This may sound like a regular work schedule — not quite. Their five working days are often spent aboard vessels on the Arabian Gulf, where they work, eat and sleep.

And yet when Hmod goes home for the weekend, he still finds himself wearing a helmet and safety outfit.

"I have two Harley Davidsons, and I go for long rides from Dammam to al-Hasa. I like movement, I don't like staying still," he says enthusiastically.

For Otaibi, days off are a little more relaxed, preferring to spend time with friends.

At the beginning of their careers, the world is their oyster.

"In five years' time I would like to be a diving medic and dive supervisor," says Hmod ambitiously. "I would also like to be a saturation diver."

Al Omoud, already a saturation diver, has some simple advice.

"Take no shortcuts — learn the right way early."

Simple words that carry a world of meaning, succinctly defining the Saudi Aramco way.

Initiative launched to plant 1 million trees Kingdomwide by 2025

By Jeffrey A. McCoshen

Under the patronage of HRH Governor of the Eastern Province Prince Saud ibn Nayef ibn 'Abd Al-'Aziz Al Sa'ud, Saudi Aramco recently launched an ambitious environmental stewardship initiative to plant 1 million trees native to Saudi Arabia throughout the Kingdom by 2025.

A PLEDGE TO THE KINGDOM
A PLEDGE TO THE ENVIRONMENT

HRH Prince Saud ibn Nayef ibn 'Abd Al-'Aziz Al Sa'ud is joined by Amin Nasser and Ahmed S. Aleyadah, along with a number of governmental and Saudi Aramco officials, as they plant and water *Acacia*, *Zizphus Spina-christi*, and *Tamarix* trees at the launch of the "Saudi Aramco Environmental Initiative for Planting One Million Trees" ceremony in Dhahran. The environmental stewardship efforts are aligned with Saudi Vision 2030. *Photo by Musleh Khathami*

The "Saudi Aramco Environmental Initiative for Planting One Million Trees" follows the company's successful project of planting 2 million mangrove trees along the shores of the Arabian Gulf coast, which was completed in 2017, and is in keeping with Saudi Aramco's ongoing effort toward nurturing the Kingdom's biodiversity. These environmental stewardship efforts are also aligned with Saudi Vision 2030, as well as the United Nations conventions on conserving biodiversity.

"Sowing the Seeds" for Future Generations

The project launch was highlighted by the inauguration of


Acacia Tortilis

the 500,000 square meter Aramco Eco-Park by the Governor. It is anticipated that the establishment of the eco-park will make a significant contribution to the quality of life in the area while enhancing biodiversity and "sowing the seeds" for future generations.

The recent ceremony included the signing of a Memorandum of Understanding (MoU) between Saudi Aramco and the Ministry of Environment, Water, and Agriculture to enhance coordination and activate procedures and measures necessary to maintain the ecosystem, natural vegetation, and in support of forestation. Ahmed S. Aleyadah, Deputy Minister, and Nasser A. Al-Nafisee, then Saudi Aramco vice president of Corporate Affairs, officially signed the MoU.

The ceremony concluded with the dignitaries planting three trees native to Saudi Arabia to kickoff the project.

A short film about Saudi Aramco's environmental efforts in general, and the new initiative in particular, was also presented during the ceremony. Mohammed S. Al Khulaify, an engineer with the Abqaiq Plants Operations Department, delivered a presentation on the initiative, addressing the company's objectives, strategies, and experience in using polymer technology to irrigate trees.

An Environmental Example to Follow

Saudi Aramco president and CEO Amin Nasser thanked HRH for his "participation and patronage," telling attendees of the project launch at the Aramco Eco-Park that the company "always strives to be a model in preserving the environment, and this initiative is a scientific and practical model in promoting the ecological balance to safeguard the natural environment for the benefit of future generations of the Kingdom."

The Kingdom, said Nasser, is home to many unique environments that require intensive protection. Nasser noted a few essential elements that are key to the initiative.

The trees that will be planted require minimal irrigation, and the water used on the project will be reclaimed wastewater, leaving the Kingdom's precious groundwater sources untouched.

In addition, said Nasser, technology and innovation will be used to reduce the required irrigation water by up to 70%.

"We are looking forward to creating a vegetation cover to reduce the effects of sandstorms and absorb 20,000 metric tons of carbon dioxide per year," said Nasser.

The initiative will yield more than 20 million kilograms of carbon sequestration per year while also increasing shade and evapotranspiration, making the local areas cooler.

The beautification of Saudi Arabia's landscape, said Nasser, is an added benefit to the project.

Combatting Desertification

Planting the native trees in strategic locations throughout the Kingdom will help to combat desertification, which essentially involves the movement of sand caused by loss of vegetation. Desertification happens due to several factors, including excessive harvesting of firewood, off-road driving, overgrazing, ineffective farming practices, and extended drought. It is considered one of the largest threats to sustainable development in the world today.

Trees, shrubs, and other plants play a vital role in stabilizing sand. Not only do tree roots help bind the sand together, but the plants themselves help to slow down the movement of wind over the landscape. Losing a large number of trees in desert areas can allow the wind to pick up loose sand and blow it into the air, creating large amounts of dust particles, which can lead to sandstorms.

Native Plants and Trees

The Saudi Aramco initiative will utilize 26 species of native trees in harmony with the nature of Saudi Arabia. The native trees to be planted are adaptive to the challenges of surviving in the Kingdom's environment, which includes low rainfall and highly saline soil and water.

Environmental experts have indicated that as much as 33% of all native plants and animals in the Kingdom are vulnerable to extinction, and one of the most important methods of restoring biodiversity is to plant native trees and bushes. These plants help to attract and enhance the survival rate of native animals.

Additionally, the native plants are considered culturally relevant to Saudi Arabia as the ancient Bedouin used many of the more than 2,500 species for food, medicine, cosmetics, and art, for thousands of years, so the initiative is also helping to preserve this unique cultural heritage.

The native plants require less water than so-called "exotic" plant species, and the water that will be used for irrigation will be reclaimed wastewater. No groundwater will be used, thereby helping sustain the Kingdom's precious groundwater resources.


Acacia Gerrardii

Water Saving Technology

In line with existing Saudi Aramco best irrigation practices, the company will continue to explore the most appropriate water saving technologies for use in the initiative. One such technology is the use of polymers, which have been used in


Ziziphus Nummularia


Prosopis Koelziana

semi-arid areas to help reduce the amount of irrigation water required.

The polymers are inserted into the soil near each plant to absorb and retain large amounts of water. The nearby plants are then able to tap into the stored water within the polymers. The feasibility and suitability of this, and other water saving technologies, will be investigated over the course of this initiative.

Other benefits of the initiative include increasing surface and renewable water table levels by reducing temperatures, and the absorption of carbon dioxide to help decrease pollution.

Other Examples of Commitment

The initiative represents another significant Saudi Aramco contribution toward enhancing sustainability, ecological balance, and biodiversity. In the past five years alone, the company has undertaken numerous large-scale biodiversity initiatives, including:

- Creation of a 637 km^2 fenced protected area at Shaybah to preserve over 200 species of native and migratory animals and plants
- Reintroduction of the Arabian oryx, Arabian sand gazelle, and ostrich to the Shaybah Wildlife Sanctuary after they had been extinct in the region for decades
- Planting of 2 million mangrove trees along the Arabian Gulf coast
- Protection and restoration of internationally significant wetlands west of Abqaiq
- Construction of a mangrove eco-park at Tarut Bay
- Mapping of the distribution and abundance of every bird species in Saudi Arabia
- Production of the *Marine Atlas of the Western Arabian Gulf*
- Production of the *Field Guide to the Biodiversity of Dhahran*
- Conducting comprehensive biodiversity surveys at numerous Saudi Aramco facilities around the Kingdom, including in Abha, Abqaiq, Bahra, Dhahran, East-West Pipelines, Haradh, Khurais, Khursaniyah, Medina, Midyan, Safaniyah, Tanajib, and ‘Udhailiyah, among others.

Deputy Minister Ahmed S. Aleyadah and Nasser A. Al-Nafisee, then Saudi Aramco vice president of Corporate Affairs, sign a Memorandum of Understanding to enhance coordination and activate procedures and measures necessary to maintain the ecosystem, natural vegetation, and in support of forestation. Watching from behind are HRH Prince Saud ibn Nayef ibn ‘Abd Al-‘Aziz Al Sa’ud, Governor of the Eastern Province; Amin Nasser, president and CEO of Saudi Aramco; and Mohammed Y. Al Qahtani, Saudi Aramco senior vice president of Upstream. *Photo by Moayed Al-Qattan*

Native trees to be planted in the "One Million Trees" initiative

Saudi Aramco will plant 26 species of native trees, shrubs, and plants that naturally occur in each local area to grow and flourish, including the following:

Ziziphus Nummularia

A shrub that has adapted to desert climate that grows up to 2 meters in height. The plant has evergreen leaves and flowers in the form of clusters resembling a tent. The fruits of the tree are similar to apples.

With its wedge-shaped roots, leathery leaves, resistance to drought, and high salinity tolerance, *Ziziphus Nummularia* has adapted well to desert conditions.

Acacia Ehrenbergiana

A long thorny desert plant that is widely spread in the Arabian Peninsula. With its purple red to grey branches, *Acacia Ehrenbergiana* can be found in valleys, solid land, flood canals, and waterways. They usually grow in groups and mix with other types of trees.

This kind of tree is the best drought-tolerant plant among the *Acacia* species. They can be gradually deprived of water after the first year of being planted.

Acacia Tortilis

Acacia Tortilis has a leveled summit. It is a desert tree that grows in Africa and the Kingdom of Saudi Arabia, as it can resist the harsh conditions of the desert. It has a triangular shape with a round top, disorganized branches, and has smooth leaves and fruits. It grows in valleys, stretching sands, and low lands.

The flowers of *Acacia Tortilis* are yellowish white and aromatic. The fruits of the tree are similar to twisted horns forming a tight-knit ring. *Acacia Tortilis* is an evergreen tree with small leaves and sharp thorns at its base.

Acacia Gerrardii

This tree can grow as high as 10 meters and has an opened or rounded top. The bark of the trunk is brown or dark grey and has a rough surface. The branches are yellow or yellowish brown.

This kind of tree is widespread in the central region, particularly in Rawdat Khuraym and at-Tanhat.

Prosopis Koelziana

A tall shrub about 12 meters high, its branches are white, grey, or brown, containing shining whiteness. It has short irregular thorns. This kind of tree grows in three locations in the Eastern Province — one location is in the area of Thaj in Wadi al-Miyah; another is in al-Wannan, south of As-Sarrar, where the trees are overgrazed, and a third is in al-Marah town, north of al-Hasa.

This kind of tree is also planted for shade and decoration in some villages in al-Hasa.

Tamarix Aphylla

This tree is native to areas with a Mediterranean climate, stretching from North Africa to Southeast Asia. This kind of tree, which can grow as high as 15 meters, is found in all parts of the Kingdom.

It is fast-growing, and used as a windbreak and field markers. It can endure salt and frost, and thrives near waterways.

Salvadora Persica

This tree with many branches grows to more than 8 meters in height and can be found in deserts from the Atlantic Ocean to the Red Sea, the Arabian Peninsula, India, and Africa. *Salvadora Persica* is an evergreen tree with fine lines on its soft, dangling, cylinder-shaped branches.

This tree grows in various climate conditions. It has a special status for Muslims, as it one of the best sources for *siwak*, a natural toothbrush fashioned from a twig.


Acacia Ehrenbergiana


Salvadora Persica


Tamarix Aphylla

abbrev.

Saudi Aramco news in brief

Ashraf AlTahini (center) accepts two Hart Energy Meritorious Engineering Awards for new Aramco technologies and programs from Hart Energy's Russ Lass and Peggy Williams.

Aramco technology and R&D take center stage at OTC

HOUSTON, TEXAS, USA — The 50th annual Offshore Technology Conference (OTC) in Houston brought together innovators seeking to push the boundaries of offshore oil and gas exploration.

During the conference, researchers from Aramco's EXPEC Advanced Research Center (EXPEC ARC) were honored with two prestigious meritorious engineering awards from Hart Energy, a leading energy publisher.

The first award recognized Saudi Aramco's contribution to health, safety, and the environment with its "CO_2 EOR and Sequestration Project with a Comprehensive Monitoring Program." Carbon capture and sequestration is the process of capturing waste carbon dioxide (CO_2) from large sources such as power plants, storing it, and depositing it underground where it will not re-enter the atmosphere.

The second award was for DrillCam, an integrated real-time system for imaging and predicting ahead of the drill bit and around the well. According to Mustafa N. Al-Ali, chief technologist of the Geology Technology Research Team at EXPEC ARC, it uses multi-physics measurements — both downhole and on the surface — to produce a real-time image surrounding the drill bit similar to what the doctor sees while operating an ultrasound.

Agreement to commercialize robotic inspection technology

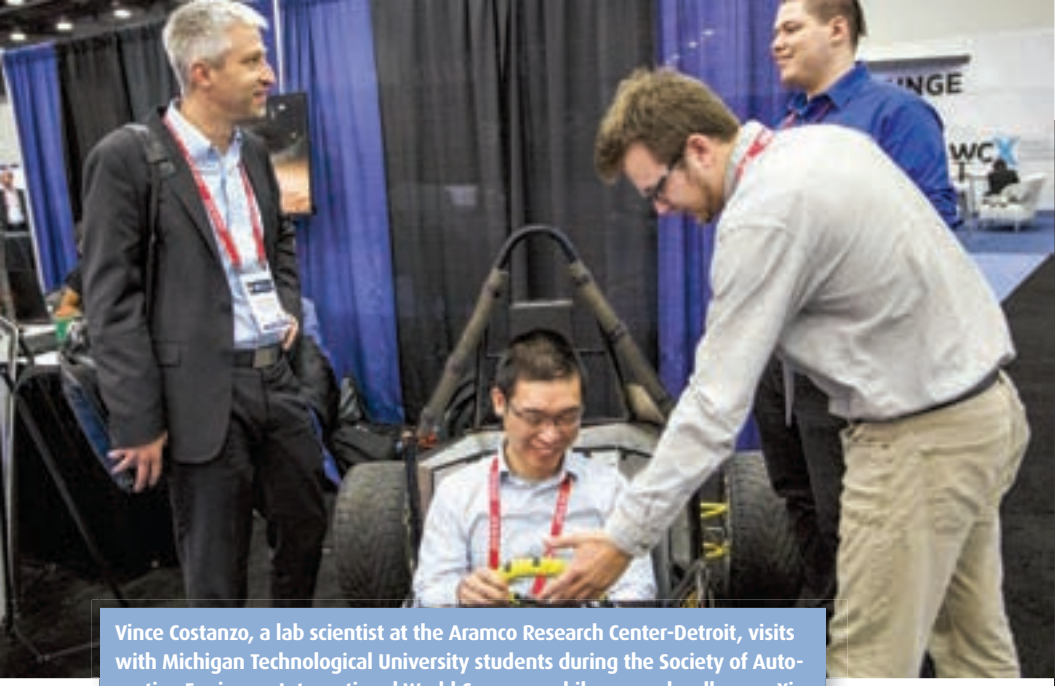
HOUSTON, TEXAS, USA — One of the highlights of the Offshore Technology Conference was the Shallow Water Inspection and Monitoring Robot (SWIM-R), a technology developed in-house by Saudi Aramco. Showcased during the event to demonstrate how the remote-operated vehicle (ROV) can be operated wirelessly in shallow waters up to 10 meters deep, SWIM-R enhances pipeline inspection speed and efficiency while minimizing safety hazards.

Saudi Aramco is working with the Research Products Development Company — which is in turn collaborating with Teledyne, a leading manufacturer of inspection ROVs — to commercialize SWIM-R.

A first success under this new agreement is the awarding of a development contract, which will integrate a unique sensor design developed by Saudi Aramco into an ROV.

The integrated sensor can perform ultrasonic thickness readings and cathodic protection voltage measurements at a single touchdown, thereby reducing inspection costs for shallow

Mike Read, president of Teledyne Marine (left), and Abdulmohsen Almajnouni, CEO of the Research Products Development Company (RPDC), sign an agreement for technical collaboration to commercialize custom inspection remotely operated underwater vehicles for Saudi Aramco. Standing from left are Mishal Al-Harbi, RPDC vice president for Strategy and Planning; Ashraf AlTahini, ASC director of Research and Development; Muteb A. Muteb, King Abdulaziz City for Science and Technology vice president of Innovation and Industrial; and Saif A. Al-Saif, Saudi Aramco's head of Technology Commercialization, Technology Strategy, and Planning.



Vince Costanzo, a lab scientist at the Aramco Research Center-Detroit, visits with Michigan Technological University students during the Society of Automotive Engineers International World Congress while research colleague Xin Yu (seated) checks out a vehicle on display.

water pipelines, minimizing inspection safety hazards, and enabling the inspection of hard-to-reach sections.

Aramco researchers participate in Society of Automotive Engineers International World Congress

DETROIT, MI, USA — In April, staff members from the Aramco Research Center-Detroit and Dhahran participated in the Society of Automotive Engineers International World Congress and Exhibition in Detroit. Their contributions to the technical sessions illustrated Aramco's advances with engine and fuels research and technology.

This was the fifth year for Aramco to join the automotive industry's leading technical conference.

Aramco debuted a Ford F-150 prototype truck projected to achieve 37 miles per gallon using gasoline compression ignition technology earlier this year in Detroit at the North American International Auto Show, and it was positively received by both industry and the consumer.

The researchers from Detroit work in collaboration with researchers from other locations within the company's global network, including Paris, at the Aramco Fuel Research Center located at IFP Energies nouvelles, and Dhahran.

Saudi-France CEO Forum leads to billions in commercial cooperation for company

PARIS, FRANCE — Saudi Aramco was a major focus at the Saudi-France CEO Forum in April, which was held in Paris to promote bilateral business and cooperation between the two countries.

The program includes a number of world-scale projects in which French businesses can play a major role by providing the strategic mix of technical capabilities and innovation to creating synergies, thereby benefiting both companies as well as the Kingdom.

Among the agreements signed were two with French energy major Total — one of which is to build a giant chemicals complex in Jubail, Saudi Arabia.

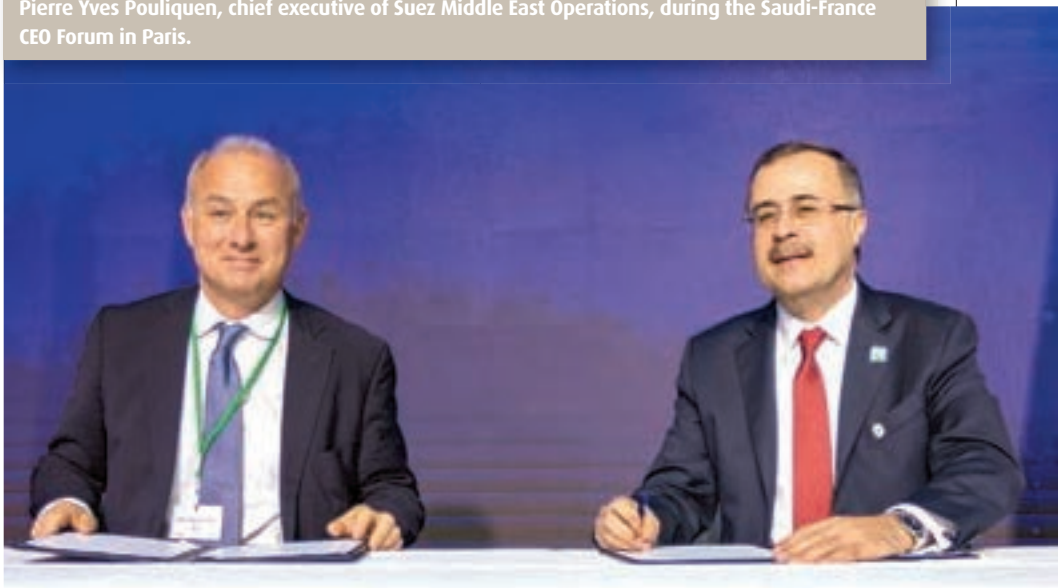
Signed on behalf of Total by CEO Patrick Pouyanné, the complex will be integrated downstream of the SATORP refinery — a joint venture between Saudi Aramco (62.5%) and Total (37.5%) in Jubail. The move is designed to fully exploit operational synergies.

The deal was one of several pursued by Saudi Aramco with French companies at the forum, which promotes bilateral business and cooperation between the two countries.

Aramco signs MoU for developing, building Indian mega-refinery

NEW DELHI, INDIA — In early April, Saudi Aramco signed a Memorandum of Understanding (MoU) with Ratnagiri

Amin Nasser, Saudi Aramco president and CEO, signs a Memorandum of Understanding alongside Pierre Yves Pouliquen, chief executive of Suez Middle East Operations, during the Saudi-France CEO Forum in Paris.



Refinery and Petrochemicals Ltd. — a consortium of Indian oil companies that includes the Indian Oil Corporation Ltd., Bharat Petroleum Corporation Ltd., and Hindustan Petroleum Corporation Ltd. — to jointly develop and build an integrated mega-refinery and chemicals complex at Ratnagiri in the state of Maharashtra.

"Investing in India is a key part of Saudi Aramco's global downstream strategy, and another milestone in our growing relationship with India," said Amin Nasser, Saudi Aramco president and CEO.

The strategic partnership brings together crude supply, resources, technologies, experience, and the expertise of these multiple oil companies with an established commercial presence around the world.

The refinery is expected to be capable of processing 1.2 million barrels of crude oil per day. It will produce a range of refined petroleum products, including gasoline and diesel, meeting BS-VI fuel efficiency norms. The refinery will also provide feedstock for the integrated chemicals complex, which is anticipated to be capable of producing approximately 18 million tons per annum of chemical production.

Amin Nasser, Saudi Aramco president and CEO, shakes the hand of Ashok Balasubramanian, CEO of Ratnagiri Refinery and Petrochemicals Ltd. following a MoU signing ceremony to jointly develop and build an integrated mega-refinery and chemicals complex at Ratnagiri in the state of Maharashtra.

Abubaker S. Saeed, Sarah F. Alsaif, and Sunil L. Kokal pose with their awards from the Abu Dhabi International Petroleum Exhibition and Conference.

EXPEC ARC wins three awards at ADIPEC

ABU DHABI, UAE — Saudi Aramco's EXPEC Advanced Research Center (EXPEC ARC) won three awards at the Abu Dhabi International Petroleum Exhibition and Conference (ADIPEC).

The awards recognize leading initiatives, projects, and technologies that have displayed excellence on a global scale. EXPEC ARC garnered first place in the categories of technological innovation, digital transformation, and personal achievement.

The world's slimmest, most compact hydraulic tractor project was awarded first place in the Best Technological Innovation and Research Project of the Year category. The hydraulic tractor enables engineers to inject stimulation chemicals deep into the extended reach wells — more stimulation means more oil production.

The Kingdom's first intelligent carbon dioxide (CO_2) enhanced oil recovery (EOR) and sequestration demonstration project was awarded first place in the Best Digital Transformation Project category. The demonstration project, led by EXPEC ARC's Reservoir Engineering Technology Division in collaboration with Petroleum Engineering and Development, Southern Area Oil Operations, and Hawiyah NGL Recovery Plant Department, tests the feasibility of sequestering CO_2 through EOR — a win-win approach and strategic project for the company.

Sarah F. Alsaif, a petroleum engineer with the EXPEC ARC Reservoir Engineering Technology Division, was awarded the Young ADIPEC Engineer Award. With a solid foundation in petroleum engineering, Alsaif's research area focuses on reservoir monitoring, reservoir simulation, and uncertainty quantification. She works on uncertainty quantification workflow development and deployment to interpret electromagnetic surveys for fluid saturation mapping involving reservoir modeling and simulation.

Saudi Aramco, PETRONAS form two new joint ventures in Malaysia

KUALA LUMPUR, MALAYSIA — In March, Petroliam Nasional Berhad (PETRONAS), the national oil company of Malaysia, and Saudi Aramco announced the formation of two joint ventures (JVs) for the Refinery and Petrochemical Integrated Development project.

Bringing together resources, technologies, experience, and expertise, the strategic alliance is a historic partnership between two of the largest and most successful national oil companies in the world.

Through this collaboration, Saudi Aramco will supply 50% of the refinery's crude feedstock requirements with the option of increasing to 70%. Meanwhile, natural gas, power, and other utilities will be supplied by PETRONAS and its affiliates. The parties will share in the rights to offtake the production of the JV on an equal basis.

The refinery, which has a capacity of 300,000 barrels of crude oil per day, will produce a range of refined petroleum products, including gasoline and diesel that meet Euro 5 fuel specifications. It will also provide feedstock for the integrated petrochemical complex, which is capable of producing 3.3 million tons per annum of petrochemical products.

Construction is nearing completion on the Refinery and Petrochemical Integrated Development project in southern Malaysia.

Amin Nasser speaks during a panel session at the U.K.-Saudi CEO Forum held in London.

The project is on track for refinery startup in the first quarter of 2019.

Saudi Aramco signs MoUs, agreements at U.K.-Saudi CEO Forum in London

LONDON, U.K. — In March, Saudi Aramco participated in the U.K.-Saudi CEO Forum held in London to promote bilateral business and cooperation between the two countries.

The Memorandums of Understanding (MoUs), which were signed by Saudi Aramco with Royal Dutch Shell, The Royal Institute of International Affairs (Chatham House), Imperial College, and The Welding Institute (TWI), reflect the company's close ties to the U.K. and the breadth of its strategic interests.

The MoU Saudi Aramco signed with Royal Dutch Shell agreed to jointly pursue international gas business opportunities, including upstream development, liquefaction projects, and other aspects of the gas value chain. The MoU reflects Saudi Aramco's strategy to expand its natural gas assets while acknowledging Royal Dutch Shell's strength in liquefied natural gas.

The MoU with The Royal Institute of International Affairs reflects a long-standing relationship and paves the way for further cooperation on assessing changes to the global and national energy markets and policies.

The MoU with Imperial College London will seek to establish joint projects targeting frontier technologies and developments in chemical engineering, petroleum and geoscience, mechanical engineering, and advanced materials.

The MoU with TWI sets out plans to establish the multiple stakeholder Nonmetallic Innovation Center at TWI alongside the National Structural Integrity Research Centre — a partnership with leading academic institutions, research centers, energy companies, and composite materials manufacturers.

Saudi Aramco

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worldview

Neuschwanstein Castle, Bavaria, Germany

Alaa A. Othman captured this colorful image of Neuschwanstein Castle in October 2017. Neuschwanstein is a 19th century palace built on a rugged hill above the village of Hohenschwangau near Füssen in southwest Bavaria, Germany. The palace was commissioned by Ludwig II of Bavaria as a retreat. Construction began in September 1869, and was mostly complete by 1886, when the king died. It was open to the public shortly after his death. More than 1.3 million people visit annually.

Othman used his Nikon D750 camera with other special tools for capturing the castle during this time of the year. He lives with his family in Dammam, Saudi Arabia, and works in Dhahran heading the East Region Portfolio Management division with the Domestic Joint Ventures Management Department. Othman has been with the company for 21 years.