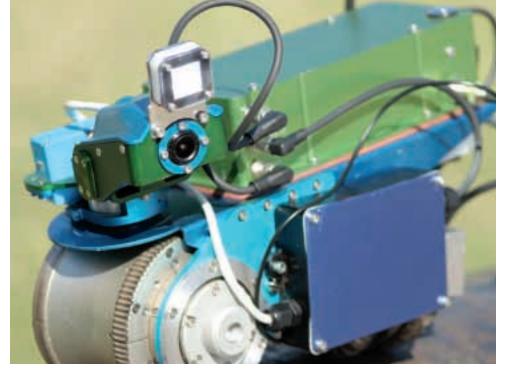
# dimensions international



2

# Made in Saudi Arabia: Innovative robots enhance operational efficiency

How Saudi Aramco is revolutionizing its inspection capabilities with cutting-edge robotic technologies.





# Marine Department transforms offshore transportation service

Saudi Aramco's commitment to innovative solutions continues with a new Sea Bus transportation service that delivers rig crews, critical equipment and supplies to some of the world's largest offshore oil fields.



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

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

Saudi Aramco's *Dimensions International* is published periodically for the affiliates, customers and employees of the Saudi Arabian Oil Company (Saudi Aramco).

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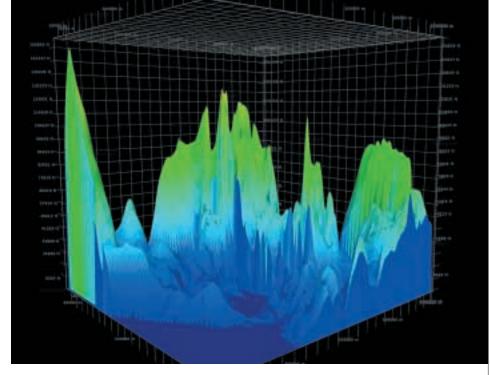
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# TeraPowers: The next big leap in reservoir simulation

Reservoir simulation takes a great leap forward with TeraPOWERS, enabling microscopic searches for new oil and gas fields.





# Al-Janadriyah festival

Sample Saudi Arabia's unique heritage, culture and cuisine at the famed Al-Janadriyah festival.

# departments

abbrev. 26 worldview Back Cover

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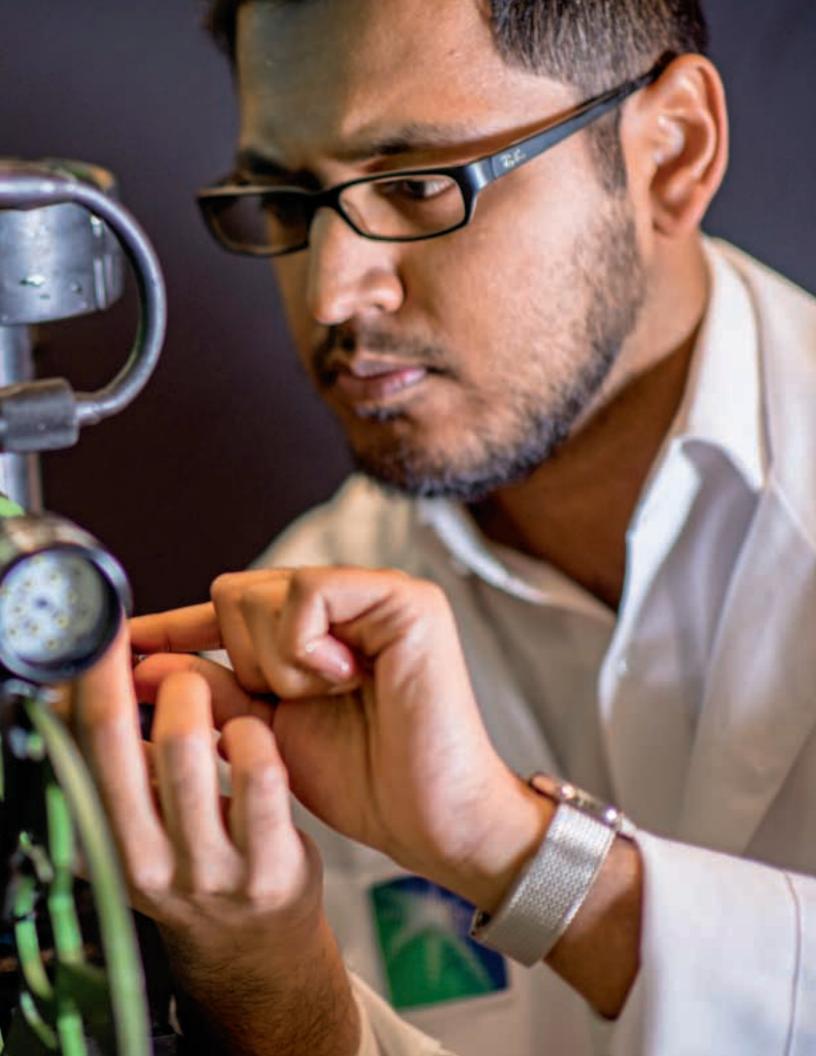
## About the cover:

The appliance of science: Saudi Aramco's Shallow Water Inspection Monitoring Robot (SWIM-R™) demonstrates the company's ever-advancing technology reach.











The Oil and Gas Network Integrity (OGNI) division at Saudi Aramco's Research and Development Center (R&DC) conducts cutting-edge research leading to rapid technology development and commercialization of intelligent systems that support the company's operations and aid in its asset integrity monitoring. These technologies address existing and anticipated operational challenges, which are key to achieving operational and cost efficiency while supporting the company's global position as a reliable producer of oil and gas. The OGNI division's main objective is to reduce the annual cost of corrosion by focusing its effort in three mainstreams: the modeling and prediction of where the corrosion is occurring, the detection and sensing of corrosion, and ultimately the mitigation and prevention of corrosion.

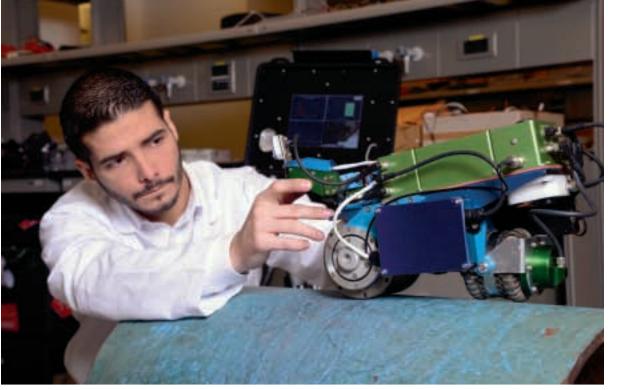
Within the division, the Intelligent Systems Team serves as the brainchild working on inspection technology solutions tailored to meet the needs of Saudi Aramco operating facilities. The diverse team of 10, seven of which are King Abdullah University of Science and Technology (KAUST) graduates, represent 10 different countries. Most of the team studied mechatronics and controls, be it under mechanical, electrical, or electronics engineering with a focus on robotics, instrumentation and similar domains.

The team focuses on projects that include the development of devices, processes and prediction software applicable to

asset integrity, including in collaboration with key academic and industrial partners.

Currently, the team is based at the Research Park in KAUST, taking advantage of their proximity to collaborate with the robotics, intelligent systems and control (RISC) lab at KAUST utilizing the facilities such as the central workshops and prototyping labs.

For the last five years, focusing primarily on robotics, the team has developed and deployed three unique technologies that support their commitment to rapid technology development that serves the sensing and monitoring program.







# Saudi Aramco Inspection Robot (SAIR)

The Saudi Aramco Inspection Robot (SAIR) is a robotic magnetic crawler capable of conducting visual inspection, ultrasonic thickness gauging and gas sensing on high and otherwise hard-to-reach steel surfaces. SAIR reduces potential hazards, inspection times and costs associated with the erection of single spherical tank scaffolding used for inspection activities.

The robot is selfcontained, wirelessly operated, and offers market-leading levels of maneuverability and dexterity while moving on steel surfaces within a wide range of curvatures.

A new company was created in the Kingdom through a venture investment and a licensing agreement for the commercial deployment of the SAIR technology.

Currently, there are

Left, top: Pablo Carrasco, an engineer on the Intelligent **Systems Team adjusts** the camera of the SAIR during a lab test on a pipe section. Left, middle: Marine Department manager Mohammad A. Al Sultan uses virtual reality goggles to watch video footage of the Shallow Water Inspection and Monitoring Robot (SWIM-R™) field test as Fadl Abdellatif explains the technology. Left, bottom: SWIM-R during the field test at Ras Tanura west pier conducting visual inspection and ultrasonic thickness measurement for a pipeline in shallow water. Right: Fadl Abdellatif controls SWIM-R during the field test in Ras Tanura while Chad Grahame monitors the robot's performance. Below: Sahejad Patel and Fadl Abdellatif conduct maintenance on SWIM-R.

three SAIR units housed in the lab at KAUST, two of which will be handed over to a commercial partner in 2017.

Ten inventions are filed and two granted patents resulted from the creation of SAIR.

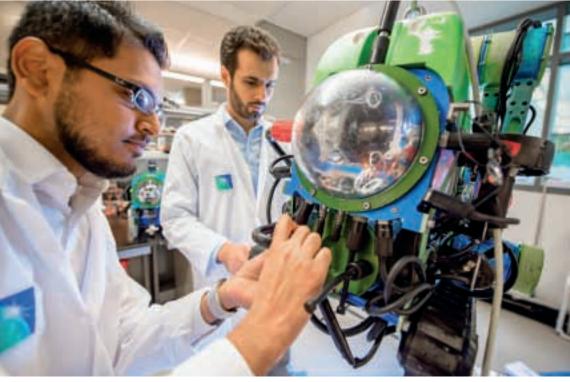
# Shallow Water Inspection and Monitoring Robot (SWIM-R™)

The shallow water inspection and monitoring robot (SWIM-R<sup>TM</sup>) is a robotic system with integrated inspection technologies that can be remotely operated in shallow waters to enhance pipeline inspection speed, efficiency and safety.

The groundbreaking technology is the type of innovation that is key to tackling the significant challenges that Saudi Aramco faces within its wider business. In particular, the inspection of pipelines in shallow waters has previously been problematic as current inspection procedures are performed by divers who are connected to a support ship or a diving support vessel (DSV) using an umbilical cord. This cord is used to supply air as well as a means of communication to the diver and relays a live camera video signal. By using SWIM-R and thereby eliminating the use of divers, the inspection process becomes much safer and much faster.

It is also particularly difficult, and sometimes impossible, to navigate a DSV in shallow waters due to the risk of impact





with the seabed or underwater obstacles. Therefore, alternative methods are used for shallow water pipeline inspection, including the usage of an inflatable boat. These methods are extremely slow as compared to inspection in deeper waters. SWIM-R enables the inspection of these shallow water pipelines safely and efficiently while drastically reducing the associated time and cost of shallow water inspections.

SWIM-R was designed, developed and field tested in less than two years, allowing for its deployment five months ahead of schedule, and was recently the recipient of a Saudi Aramco Excellence Award for advancing the company's, and the Kingdom's, position as a leader in innovative technologies. The creation of SWIM-R resulted in 12 inventions and seven filed patents.





Robotic Dust Mitigation (RDM)

Solar power is a cost-effective, sustainable, renewable and reliable source of energy.

Dust accumulation on solar panels can have a severe and detrimental effect on the productivity of solar arrays. A dust storm can lead to a 40% reduction in efficiency of solar panels, and accumulation of dust can lead to an efficiency reduction of 2% per week or more. To maximize the profitability and productivity of a solar power plant, it is necessary to reduce accumulated dust and debris.

The Intelligent Systems Team created the Robotic Dust Mitigation (RDM) technology, a low-cost technology to mitigate the negative impact of dust on solar panel produc-

Left: SWIM-R's robotic arm being tested using the remote control in the lab. **Below:** The Robotic Dust Mitigation Technology was deployed for 6 months as part of the field validation of the technology.

tivity. After two years of research and prototype testing, the solution offered by the technology is a robotic, dry cleaning technology that is fully automated to run on schedule or on command. The technology is now ready to help the company and the Kingdom realize the full profitability potential of automated dust cleaning technology for large-scale deployment of solar power in the region.

Additionally, key research conducted during the course of the project has demonstrated that dry cleaning of solar panels using the patented technology does not negatively affect the functionality of the solar panels, resulting in two highimpact journal publications that will help the solar industry to become more efficient and effective in arid regions, such as Saudi Arabia.

Prior to this research,

solar panels were being cleaned using manual labor, which is expensive, uses significant amounts of water, and can result in damage to the panels.

The technology was demonstrated to maintain greater than 99% performance, resulting in increased power generation of at least 1% over weekly washing with distilled water and labor — meaning that there is a direct increase in solar power plant production of 1% by switching from current practice to robotic dust mitigation technologies, and the operating cost decreases as well.

RDM resulted in four patents filed, and the technology is being licensed and commercialized by a local company.



# A safe, reliable and innovative solution for offshore crew passenger transfer

By EAMONN J. HOUSTON
Photos by MOHAMMED AL SHAIKH/MPD

It's fast, it's cost-effective, and it has revolutionized the delivery of rig crews working on some of the world's biggest offshore oil fields.

The new Sea Bus service introduced last year by Saudi Aramco's Marine Department at Tanajib marks yet another major initiative undertaken as part of an ongoing marine business transformation.

The new offshore transportation services, which tie in with the department's efforts to continuously upgrade services, follow the successful implementation of the Marine Offshore Floating Hub at Tanajib.

The Sea Bus service operating out of Tanajib Pier ticks just about every box in Saudi Aramco's framework for Operational Excellence. Launched in early 2016, the service uses dedicated Fast Crew Supply Vessels (FCSVs) and have exceeded all expectations.

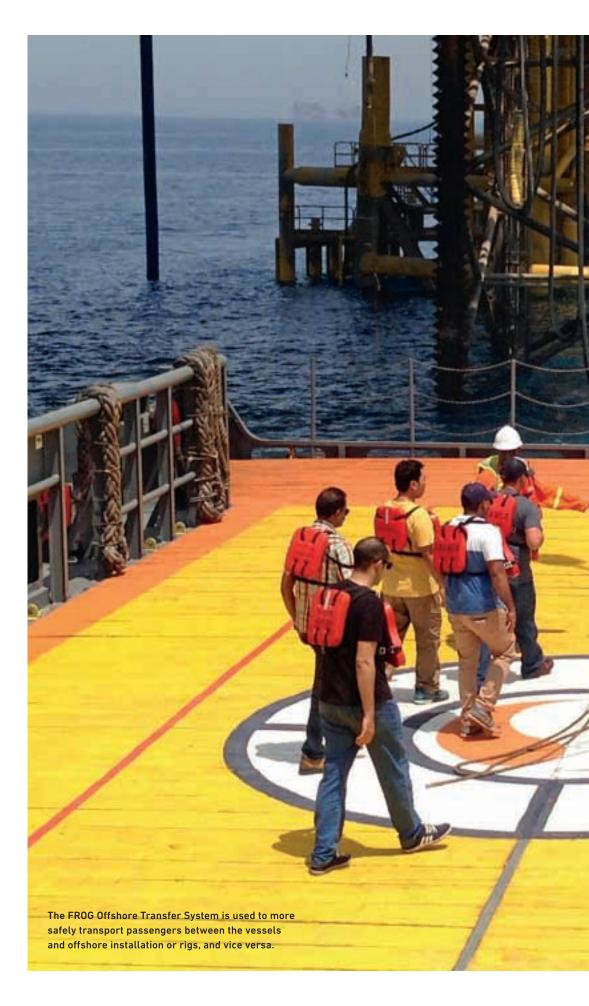


he need for the Sea Bus service resulted from the increasing numbers of offshore oil drilling rigs, which raised the demand on Aviation to transfer additional rig crews and critical equipment to and from rigs. Crew transfers were previously conducted by helicopter, with the new service taking a considerable load off of Aviation while also reducing transportation costs.

Among the many benefits of the new program are the cancellation of the procurement of 14 conventional crew boats; a reduction of the load on the rotary wing (helicopter) fleet, thereby resulting in an extended maintenance window availability for helicopters; and a reduction of greenhouse gas emissions due to the reduced number of required vessels.

It is estimated that the program will result in a cost avoidance of about \$40 million annually by eliminating the need for the 14 additional vessels as well as the resulting reduction in flights.

After inception of the program in February 2016, more than 45,000 passengers were safely transported from the Tanajib Marine Facility by year-end 2016, with approximately 55,000 passengers per annum expected to be transferred in subsequent years.





# Young Saudi talent plays a key role

Young Saudi talent is playing a key role in the wider transformation of Marine Logistics operations, particularly the Sea Bus service.

"The operation is dynamic in nature. Priorities can shift quickly from normal operations to emergencies or urgent passenger and cargo requests. We have to be adaptable and flexible to tailor our plans.

"Of course, teamwork plays a big role, and we are proud of the way our team interacts on a daily basis. We have to be a team and support each other.

"We hand over to our colleagues and make sure we are planning, monitoring, and delivering Marine Sea Bus services to the satisfaction of our customers."

# ABDULAZIZ M. AL-SOMALI.

Marine Logistics senior planner, age 30

"I have been working with Marine Logistics for over a year and since the beginning of this project.

"The dispatch group is split into two sections, the dispatching of the vessels and the new Sea Bus service. As a dispatcher, the main duties are to monitor the movement of vessels and to keep the dashboard updated.

"We contact a senior planner to inform him about any urgent passenger or cargo requests, and he will plan for it instantaneously.

"We are taking over from Aviation the responsibility for more than 50% of rig crew changes at the Manifa, Marjan, Zuluf, and Safaniyah oil fields. We have a dispatch every day at 8 a.m."

# IBRAHIM H. AL BAROI.

Marine Sea Bus dispatcher/coordinator/shipper, age 21

"After we receive the request for urgent materials, we arrange forklifts, loaders, and the transportation that we need to deliver the cargo from its area to the receiving station.

"It is a very challenging operation, and we have to verify and double-check everything to ensure that all passengers are checked in and dispatched to the relevant FCSVs. We ensure that they arrive at their destinations safe and sound. All of this involves a lot of communication between Drilling and Workover, Aviation, and the FCSVs. There is really no margin for error, so teamwork is very important in our jobs. I have gained a lot of experience."

# AHMAD ALHARBI.

Marine Sea Bus dispatcher/coordinator/shipper, age 21

"It is now four years since I joined Marine Logistics, and I am proud that I have participated from the beginning of the Sea Bus project.

"I continuously monitor vessels' movements in the field. I update the Marine dashboard, and I make sure that each vessel arrives and is dispatched from Tanajib in a timely manner.

"I also do passenger check-in and checkout, and I do the passenger manifest for the FCSVs. I also communicate with FCSVs using marine very high frequency radio.

"There is a lot of responsibility and a lot of teamwork. We make sure that we all work together and work for our customers to achieve our mission of providing reliable, safe, and costeffective, integrated marine solutions."

### SULTAN M. AL-OAHTANI.

Marine Sea Bus dispatcher, age 24









# Capabilities of the FCSVs >

There are currently two FCSVs that are being utilized for the Sea Bus Service — Alya McCall and Seacor Leopard.

The Alya McCall features a waterjet-propelled monohull design with a top speed of 38 knots, a capacity for 100 passengers, and 327 m<sup>2</sup> of deck space for cargo. The passenger area has large LCD screens, DVD, WiFi and stabilized satellite television that works anytime on the move.

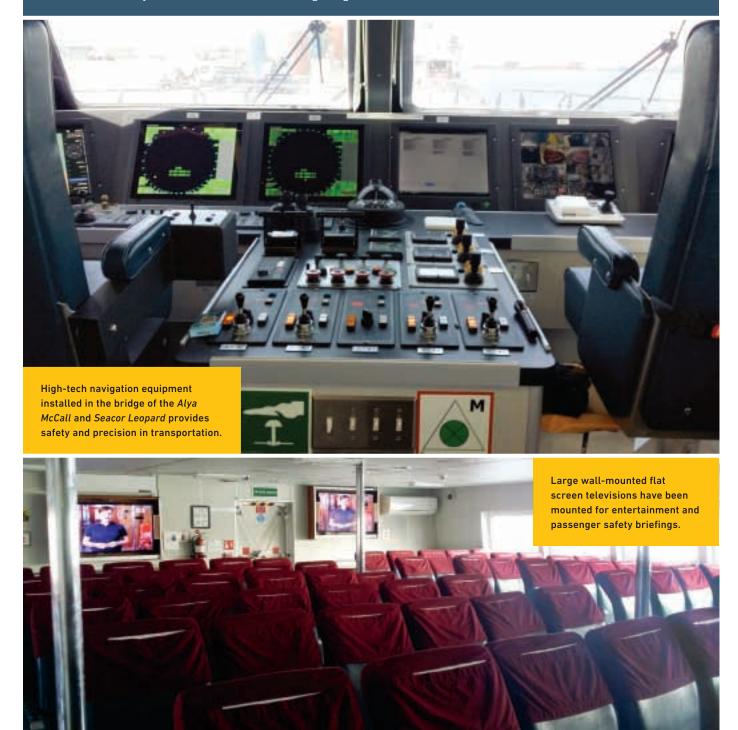
The vessel has a ride-stabilization system to enhance passenger comfort and is fitted with a DP2 dynamic position system for accurate station keeping alongside rigs.

Additional safety features include FiFi-1 firefighting

capability and standby certification (survivor craft).

The Seacor Leopard is a waterjet-propelled catamaran design with a top speed of 42 knots, capacity for 135 passengers, and 260 m² of deck space for cargo. It has a VIP and conference area refreshment center, large LCD screens, DVD, WiFi, and stabilized satellite television.

The vessel has high-tech equipment installed on the bridge for navigating safely at high speeds. The vessel has a ride-stabilization system to enhance passenger comfort and is fitted with a DP3 dynamic positioning system for excellent station keeping alongside rigs. Additional safety features include standby safety certification.





Emergency express cargo and critical equipment transfers are also performed on a daily basis to avoid costly rig shutdowns during well control issues and ensure safe and reliable operations.

The service, which covers the Safaniyah, Manifa, Zuluf, and Marjan oil fields, is an ongoing initiative of the Marine Department's Logistics Transformation Model that will eventually be rolled out to cover all offshore passenger and equipment transfers. All offshore passenger transfers are centralized at a single point of control, thereby maximizing deployment and availability of the service.

The service's expansion will eventually include even more offshore customers, such as Northern Area Oil Operations, Terminal Operations, Northern Area Gas Operations, and also the Marine Department's own vessels and barges.

# The Sea Bus Dispatch Office

The Dispatch Office is within the newly designed Marine Logistics building at the Tanajib Pier. The office consists of a booking desk and a fully air-conditioned seating area that has a capacity for a sufficient number of passengers.

The seating area boasts several large wall-mounted flat screen televisions for entertainment and passenger safety briefings.

Bookings are automated through the Aviation Department's flight booking system, where the Marine and Aviation departments work closely to ensure all eventualities are covered.

Two shuttle schedules are currently in operation. There is a morning schedule for offshore rig crew changes and an afternoon schedule for on-demand requests, including transfer of passengers from Tanajib to all rigs, field transfers, and cargo transfers.

The initiative serves as an example of the close collaboration between Marine, Aviation, Transportation and Equipment Services, and Drilling and Workover to ensure the safe, efficient, and reliable transfer of crews working offshore. The success of this innovative Sea Bus service resulted in the team from the Marine Department being recognized at the 2017 Saudi Aramco Excellence Awards.



# FROG Offshore Transfer System brings rig crew safety to the fore

An example of Saudi Aramco's commitment to our corporate safety values, the FROG offshore transfer system was introduced in April 2016 to improve safe transfer of passengers to and from the rigs.

Basically, the FROG system is a crane transfer capsule that allows for rapid and safe movement of personnel between the FCSVs and the offshore installation or rig, and vice versa.

The system has been in service offshore for 20 years, and there are now 800 devices in operation worldwide with over a million passenger transfers taking place each year. The FROG system has revolutionized the way the industry conducts personnel transfers.

The Marine Department is currently using the FROG-XT6 capsule that protects passengers from falling, collisions, and heavy landings. It has a medevac stretcher for the evacuation of an injured person and is buoyant and self-righting in water. It also has seats fitted with quick release three-point harnesses

to restrain passengers, and a spring suspension system to cushion landings.

# Another step toward Operational Excellence

The Marine Department's Sea Bus initiative is another stepchange in the way Saudi Aramco manages offshore oil and gas operations. The latest technologies and equipment have been procured to provide safe, reliable, and efficient offshore transfer services.

The initiative is an outstanding example of how the Operational Excellence "Plan/Do/Check/Adjust" approach has been effectively implemented to achieve cost savings for the company.

The service is successfully managed by a dedicated team of young Saudi dispatchers — a crucial cog in the company's future. The experience of managing this safety critical aspect of offshore personnel transfer will better equip these future leaders for the challenges that they may one day face.  $\oplus$ 

# THE NEXT BIG LEAP IN RESERVOIR SIMULATION

**by HEATHER EBENCE** 

The Exploration and Petroleum Engineering Center – Advanced Research Center (EXPEC ARC) TeraPOWERS Technology Team, under the leadership of Saudi Aramco Fellow Dr. Ali H. Dogru, achieved a major breakthrough with the industry's first one trillion cell oil migration to reservoir simulation run on October 28, 2016.



audi Aramco's cornerstone technology, the Parallel Oil, Gas and Water Enhanced Reservoir Simulator (POWERS deployed in 2000) has taken its next evolutionary step from mega-cell to giga-cell (GigaPOW-ERS — achieved in 2010) and now to tera-cell (TeraPOWERS of 2016) simulation capability.

"This is the world's first trillion cell run as well as a major breakthrough for the global scientific community. Using trillions of cells in a subsurface flow simulation environment was a





Left: Dr. Ali Dogru in discussion with the young scientists of the TeraPOWERS team: Dr. Abdulrahman Al Mana, Dr. Tameem Al Mana and Dr. Ahmad Youbi. Right: TeraPOWERS team discussion, clockwise from top: Larry Fung, Dr. Abdulrahman Al Mana, Shouhong Du, Florian Mannuss, Dr. Thomas Byer and Dr. Ali Dogru.

long-awaited dream for the global petroleum industry and scientific community," said Dogru.

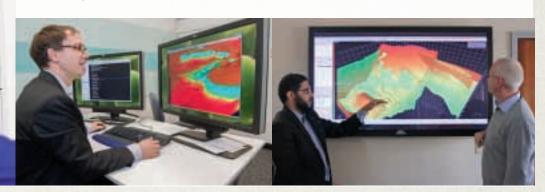
"We simulated an oil migration problem in the Kingdom from the source rock to the trap with millions of years of history in 10 hours using one trillion active computational cells. This achievement opens the door for us to simulate the Saudi Arabian peninsula in its entirety, from source rock to reservoir, as one model, at reservoir simulation grid resolution. This means that we will be able to examine the peninsula under the microscope for new oil and gas fields."

# SHAHEEN II AND COLLABORATION

The breakthrough was achieved using the King Abdullah University of Science and Technology (KAUST) Shaheen II super computer. EXPEC ARC has supported and collaborated on a range of upstream research programs at KAUST over the years. Scientists used 150,000 cores — approximately 75% of the entire computer.

Since the computing power requirements are so enormous for computational modeling technology development, KAUST provides EXPEC ARC access to

Opposite: Dr. Ali Dogru discussing the results of TeraPOWERS Oil Migration with team members Florian Mannuss, Dr. Binghuai Lin, Shouhong Du and Dr. Ahmad Youbi. Below left: Florian Mannuss studying his in-house developed visualizer. Below right: Dr. Tameem Al Mana and Dr. Guido Port examining a simulation of hydrocarbon movements.



WITH THIS MAJOR BREAKTHROUGH, SAUDI ARAMCO IS TAKING A BIG LEAP TOWARD THE GOAL OF IMPLEMENTING A BASIN SIMULATOR, WHICH WILL PROVIDE A MORE COMPLETE PICTURE OF OUR AS-SETS, ALLOWING THE COMPANY TO BECOME AN EVEN MORE EFFI-CIENT STEWARD OF THE KINGDOM'S HYDROCAR-BON RESOURCES.

> Mohammed Y. Al Qahtani, SENIOR VICE PRESIDENT OF UPSTREAM

GIGAPOWERS HAS PROUFN FXTRFMFIY UALUABLE IN PROVIDING A HIGH-IMPACT RETURN ON INVESTMENT FOR RESERVOIR MANAGE-MENT AND EXPLORATION.

> — Nasir K. Al Naimi, VICE PRESIDENT OF PETROLEUM ENGINEERING AND DEVELOPMENT



Left: Dr. Thomas Byer studying the simulator code and results. Right: Dr. Abdulrahman Al Mana checking simulator performance.

the Shaheen II on an arranged basis. During these special requests, KAUST contributes super computer run time as well as the specialized personnel for system support to ensure the runs go smoothly.

"We could not have achieved this incredible milestone without the expertise and resources from KAUST, which provided superb support," said lead TeraPOWERS developer Larry S.K. Fung, who was a founding member of the original POWERS and instrumental in the KAUST partnership.

"Working on GigaPOWERS over the years, and now TeraPOWERS, has been such an exciting experience. We are driving the industry's leading state-of-the-art technology and working on one of the largest magnitude of clusters in the industry to deliver a most powerful solution."

# EXPEC ARC AND MODELING

The simulation of the flow of fluids in the subsurface through and around the reservoir structure requires vast computational power. The more reservoir engineers know about what is going on in and around the reservoirs, the more effectively they can place wells and manage production of hydrocarbons to optimize resources. Since the giant reservoirs of Saudi Arabia are among the biggest in the world, the company requires extremely powerful modeling and simulation capability to understand the mysteries of the underground.

No such capability existed in the industry, so EXPEC ARC embarked upon the arduous journey of pioneering its own in-house technology solution in

Left: Dr. Binhuai Lin coding TeraPOWERS. Right: The TeraPOWERS team: Shouhong Du, Florian Mannuss, Guido Port, Sarah Seddon, Isabella Inzoli, Abdulrahman Al Mana, Ali Dogru, Tameem Al Mana, Larry Fung, Ahmad Youbi, James Tan and Thomas Byer.





Left: Dr. Dogru discussing the simulator equations with the team. Right: Dr. Isabella Inzoli and Dr. Abdulrahman Al Mana examining the fluid movements predicted by the simulator.

1994 with just a small team of scientists. The team grew over the years and achieved the million cell simulation milestone in 2000. With the greater number of cells in the reservoir models, greater detail is provided of the reservoirs.

A giant field like Ghawar (the largest in the world) was not able to be simulated in its entirety with sufficient resolution until GigaPOWERS came along. Suddenly, reservoir engineers could understand connectivity among the various reservoirs and improve the management of the field.

"GigaPOWERS has proven extremely valuable in providing a high-impact return on investment for Reservoir Management and Exploration," said Nasir K. Al Naimi, vice president of Petroleum Engineering and Development. "To be able to model the physics of hydrocarbon reservoirs, from their original generation to their final production, and from the tiny pore-scale all the way to the giant field-scale and even to basin scale used to seem impossible. The TeraPOWERS team is a leading example of the pioneering minds at EXPEC ARC that fuel the dreams and deliver the technologies of tomorrow."

> Shouhong Du in discussion with Dr. Ahmad Youbi.

# THE MISSION OF TERAPOWERS

The mission of TeraPOWERS is twofold: To help increase discovery and recovery. TeraPOWERS will catapult the company much further in reservoir management optimization in visualizing not only all the fields, but what is happening between them, in one enormous model of the Saudi Arabian basin in its entirety.

"With this major breakthrough, Saudi Aramco is taking a big leap toward the goal of implementing a basin simulator, which will provide a more complete picture of our assets, allowing the company to become an even more efficient steward of the Kingdom's hydrocarbon resources," said Mohammed Y. Al Qahtani, senior vice president of Upstream. "It is also a demonstration of the top talent our company has for managing our oil and gas assets, with great inventive and 



THIS IS THE WORLD'S FIRST TRILLION CELL RUN AS WELL AS A MAJOR BREAKTHROUGH FOR THE GLOBAL SCIEN-TIFIC COMMUNITY, US-ING TRILLIONS OF CELLS IN A SUBSURFACE FLOW SIMULATION ENVIRON-MENT WAS A LONG-AWAITED DREAM FOR THE GLOBAL PETROLEUM INDUSTRY AND SCIEN-TIFIC COMMUNITY.

- Dr. Ali H. Dogru







The Saudi Aramco Employees Association (SAEA) embodies a diverse group of employees and dependents from a wide array of countries and cultures, working and living together in the generous and hospitable environment that is Saudi Aramco.

To celebrate this diversity and to promote cross-cultural understanding, the Dhahran chapter of SAEA — in collaboration with Government Affairs in Riyadh - recently organized a trip to the annual Al-Janadriyah Festival in Riyadh. More than 130 employees and dependents were flown into the Kingdom's capital, giving them an opportunity to experience firsthand Saudi heritage and culture.

# The national festival for heritage and culture

Under the patronage of the Custodian of the Two Holy

Mosques, King Salman ibn 'Abd Al-'Aziz Al-Sa'ud, the 31st session of the National Festival for Heritage and Culture (Al-Janadriyah Festival) was inaugurated on Feb. 1. Organized by the National Guard, it continued through the middle of the month.

The festival area, covering an astounding 1.5 km<sup>2</sup>, included culture, customs, food, folklore, dances, costumes, and craftsmanship that are characteristic to each region or province of Saudi Arabia.

The provinces represented with pavilions at Al-Janadriyah were Jazan, Asir, Ha'il, Najran, Tabuk, Taif, Makkah, Medina, Riyadh, Al Baha, Qassim, and the Eastern Province. Neighboring countries of Egypt — the featured country this year — Oman, Bahrain, Kuwait, and the United Arab Emirates also participated in the festival with their respective pavilions.



Above: The skyline of the venue symbolizes the coexistence of the old and new in the country. Left: 1 Handicrafts particular to each region were displayed at the festival. 🕡 Working on Egyptian inlaid table art. 🚯 A camel show. 🕼 Traditional costumes on display. ҕ Traditional weaved baskets and swords on display.

The festival also imparts information on Saudi Arabia's ministries and governmental organizations, social projects, and nonprofit organizations. Representatives from the Ministry of Education, Saudi Tourism and National Heritage Commission, and the UNHCR United Nations High Commission for Refugees were also present.

# A tour of the Al-Janadriyah festival

The Makkah Al-Mukarramah and the Medina Al-Munawara pavilions were very popular with the crowds where oldfashioned houses, picturesque alleys, and typical Hijazi sougs symbolized the spirit of the respective provinces. The group had an opportunity to witness the Ardah dance, which originates from the Najd area and the Mizmar dance, which

comes from the Hijaz region. Camel shows, horseback riding, sword dancing, and poetry recitals were some of the other activities at the festival. Festival-goers experienced music (Egyptian Oud), craftsmanship (inlaid table work), and rich history at the Egyptian pavilion.

We tried the traditional food of Hail — matazeez and margoug — made with flattened pieces of wheat and cooked with spices, meat, and vegetables. We also witnessed Hail hospitality in the date and coffee ceremony.

Faisal A. Arab, organizer of the SAEA trip, says: "Al-Janadriyah is the best place to sample regional food and really taste the best of what Saudi Arabia has to offer. It is also nice to support some of the local artists and home-based businesses."

The skyline of the festival venue was dotted by forts of varying styles and sizes, the flag of Saudi Arabia, and para-



Above: The Aradah dance is the folkloric dance of Saudi Arabia. It differs slightly from region to region and often uses swords and canes to demonstrate a tribe's fighting strength. Right: 1 Guests admire paintings and displayed artwork. 2 Artisan showcasing his skills.

gliders flying over the site. This imagery symbolizes the coexistence of the old and new in the country. People come wearing traditional dresses, while others are dressed in modern attire. Traditional food coexists alongside fast-food chains and food trucks.

A Saudi Aramco dependent, Farida Cicek, tells us about her experience at the Al-Janadriyah festival.

"I particularly enjoyed mingling with the locals and sampling regional foods. The full-scale model houses were fascinating with their artifacts. The guides were friendly and eager to explain the displays.

"And of course, the animals — seeing the camels, falcons, and mules close-up is always wonderful. Overall, the atmosphere of the festival was unique, and we had the opportunity to practice speaking a little bit of Arabic too!"

First-timer Gihan Osman speaks highly of her experience at the Al-Janadriyah festival. "The festival was an extravaganza of extraordinary sights, tasty bites, and Saudi cultural delights," Osman said with a smile.

"The artisans from each area had a uniqueness that was not so apparent by a mere first look, or walk by. All in all, I was blown away by the size and grandeur of the festival. Never did get to hold a falcon, but oh well, next year!"

Last year, the festival welcomed five million visitors from Saudi Arabia and abroad.

# Connecting employees to the Kingdom

Past president and longstanding member of the Dhahran SAEA board, Mel Scott, said such outings organized by



SAEA connect expat employees to the Kingdom, and promote cross-cultural understanding between the guests and hosts of this country.

"As expats, we should be learning about the customs and cultures of the country that we reside in," said Scott.

"Additionally, we help build tourism in the country through our trips, for example, by hiring licensed local tour guides."

Echoing Scott, Merrell Foote, co-organizer of the trip and a regular volunteer at SAEA activities, said: "During the four years that I've lived in Saudi Arabia, it has been important for me to learn about my host country. I've traveled to different regions including Hail, Qassim, and the Empty Quarter. I am surprised by the Kingdom's rich variety of landscapes, architecture, cultural traditions, arts and crafts, and cuisine."

The SAEA is a 72-year-old, nonprofit, self-directed group that is sponsored by Saudi Aramco's Recreation Department. It is the largest self-directed group in the Dhahran community, with a membership of more than 7,000 employees and their dependents. The affairs of the Dhahran SAEA are handled by a board of directors — employees who volunteer their time to plan and organize SAEA trips and activities. Alongside employees, dependents offer their talents and time to help enrich and enliven the Saudi Aramco residential community.

SAEA promotes culture, entertainment, environment, theater, and sports by organizing recreational events (family fun, dinner events, theater plays, etc.) and educational trips (Al-Janadriyah Festival, Tabuk, Ha'il, Baha, and others) for its members.

# abbrev.

Saudi Aramco news in brief



mation Technology Academy, which is working to admit 700 information and communications technology students by the end of the third quarter of 2017. From left are Nabil K. Al Dabal, GM of Training and Development, Yousef A. Al Ulyan, executive director of IT, Ali S. AlSoma, ministerial advisor and secretary general to the MCIT, and Sulaiman A. Mirdad, deputy governor of the CITC. Photo by Ding/MPD

# Company, partners sign MoU to establish **National Information Technology Academy**

AL-KHOBAR, SAUDI ARABIA — Saudi Aramco, along with our strategic partners, recently signed a Memorandum of Understanding (MoU) to establish the National Information Technology Academy.

The MoU was signed by representatives from Saudi Aramco, the Ministry of Communications and Information Technology (MCIT), the Communications and Information Technology Commission (CITC), and the Technical and Vocational Training Corporation

(TVTC), with representatives from major information and communications technology (ICT) companies such as Oracle, IBM, Hewlett-Packard, Microsoft, Huawei, Wipro, SAP, Cisco, and Mobily in attendance. The signing ceremony was followed by a panel discussion, and then a guestion-and-answer session.

The academy's strategic objectives

are aligned with those of the Kingdom's Vision 2030 — developing the IT sector and a digital economy, increasing local workforce skills, equipping citizens with competencies that will meet the future needs of the labor market, and increasing female participation in the workforce.

The academy will invest in Saudi human capital by equipping young Saudis with market relevant ICT skills, bridging the skills gap, and developing a "job ready" talent pool. Its curriculum will focus on technical and professional skills, as well as address emerging technologies that are aligned with market needs where students are "trained to hire."

# **New compact** hydraulic tractor helps stimulate wells

DHAHRAN, SAUDI ARABIA — The **EXPEC Advanced Research Center** (EXPEC ARC) Production Technology Team has successfully completed the technology development of the world's slimmest, most compact hydraulic tractor, jointly developed with Western Well Tools.

The new technology was trial tested with the support of Northern Area Production Engineering and Well Services, and Northern Area Reservoir Management.

Successful yard and pull tests were



This new generation of slim, compact but strong tractors was recently trial tested with major success in Manifa field. This success represents a breakthrough with global implications in small diameter, extended reach wells (ERWs). The technology is cost-effective, as it is rigless.

The tractor is now the world's slimmest most compact coiled tubing tractor (2.125" outer diameter, 20 feet in length), and it's a key enabler for intervention in horizontal open hole ERWs that have small inner diameters.

ship with General Electric (GE), marked a new milestone in Saudi Aramco's plan toward realizing the 9.5 gigawatt (GW) national renewable energy target defined in Saudi Vision 2030.

For several years, Saudi Aramco has invested to develop high potential sites for wind energy in Saudi Arabia. Sites across the Kingdom have extraordinary wind resource potential and may generate some of the lowest cost electricity globally.

The Saudi Aramco-GE wind turbine demonstration project will power Saudi Aramco's facility in Turaif, providing

energy by blades 120 meters in diameter. The turbine's rotor tips reach 145 meters from the ground. The turbine blades are constructed from lightweight composite materials, resembling large aerodynamic glider wings.

The wind turbine project was developed by specialists from Saudi Aramco's Power Systems, with GE selected to design, supply, and construct the demonstration project.

# U.S. Chamber of **Commerce hosts Aramco business** forum

**WASHINGTON, D.C.** — The U.S. Chamber of Commerce hosted a business forum recently for U.S. companies to learn about opportunities to partner with Saudi Aramco and invest in the Kingdom. The forum comes at a pivotal time for the company as it supports the Kingdom's economic development plans with an emphasis on local manufacturing, workforce training and development, and more investment not only in the energy sector but across a variety of industries.

These are the basic principles at the heart of the company's localization

delivers the welcoming keynote address at the U.S.-Aramco Suppliers Forum in



Saudi Aramco, GE team up to supply renewable energy to the Kingdom with commissioning of first wind turbine in Turaif

TURAIF, SAUDI ARABIA — Saudi Aramco has marked the commissioning of the Kingdom's first wind energy turbine, providing electricity to its bulk plant facility in Turaif in northwestern Saudi Arabia.

The project, developed in partner-

electricity directly to the bulk plant. One wind turbine creates the equivalent of enough power to supply

250 homes, can displace 19,000 barrels of oil equivalent, and generate 2.75 MW, thereby reducing demand for electricity from the national grid.

The GE 2.75-120 wind turbine has been delivered with a desert protection package specifically designed for the Kingdom's hot and harsh conditions. The tower stands 85 meters high, capturing



initiative, the In-Kingdom Total Value Add Program (IKTVA), which is designed to drive domestic value creation, develop a strong broad-based local contractor community, and maximize long-term economic growth and diversification to support a rapidly changing Saudi economy.

Addressing the 150 CEOs, vice presidents, owners, investors, and others who gathered for the event was Aramco Services Co. (ASC) president and CEO Basil Abul-Hamayel, who touched on topics such as Saudi Aramco's need for supplies, the benefits of partnering with Aramco, and the importance of IKTVA.

"In addition to becoming a supplier for Aramco, you have even more options to expand your business in Saudi Arabia and the broader Gulf region," he said.

# Patent power: EXPEC ARC researcher an innovation leader

DHAHRAN, SAUDI ARABIA — People are the most valuable asset in executing any strategy. Since researchers at the EXPEC Advanced Research Center (EXPEC ARC) are the driving force of the department, investing in their skill sets and work environment provides tremendous returns.

Their ingenuity and inventiveness that delivers solutions to Saudi Aramco Upstream technical challenges are transformed into intellectual property, which is

regularly recognized by the international industry in the form of patents and awards.

While receiving several granted patents a year is a major achievement for researchers, receiving nine granted patents for one researcher in a single year is unprecedented in the department.

Abdullah S. Al-Yami, a researcher with EXPEC ARC Drilling Technology, achieved that in 2016 for his leading work in the areas of wellbore isolation, drilling fluids, and expert systems.

Al-Yami is known for targeting practical research to address technical challenges in drilling operations. All of his patents were deployed in the field — a major achievement for any inventor.

# Saudi Aramco deploys innovative electrical submersible pumping system

DHAHRAN, SAUDI ARABIA — Saudi Aramco has announced the successful installation and functional test of the collaboratively developed Baker Hughes TransCoil rigless deployed electrical submersible pumping (ESP) system.

The TransCoil system is the first-in-in-

dustry high hydrogen sulfide, cable deployed ESP system and the first-in-industry vertical ESP cable hanger system. It is designed to bring wells on production faster with lower installation and replacement costs for ESPs. This is because the new system eliminates



the need for an expensive rig to replace the ESP. It is particularly advantageous in offshore wells where not only rig intervention costs are expensive, but also where limited rig availability can delay ESP replacement.

Conventional ESPs need workover rigs for deployment and their power cables are connected from the ESP bottom. In contrast, the new system is rapidly deployed with a coiled tubing (CT) unit into already installed production tubing, reducing deployment time from days to hours

The technology also features an inverted ESP system with the motor connected directly to the powered CT. By eliminating the traditional ESP power cable-to-motor connection, the technology further improves overall system reliability.

The combination of the power cable and the CT into a cohesive deployment string extends the operating range of the system to 12,000 feet and enhances reliability, compared to existing CT deployed ESPs that simply pull the power cable through the CT.

The nickel alloy outer jacket also provides corrosion protection in harsh environments.





Yuan Aijuan speaks on behalf of the children who had an opportunity to take part in the Aramco youth program "A Journey of Art," noting: "Although I don't understand what sketching means, I do know paint my hometown. I want to say a big thank you to you."

# Aramco Asia embraces art-loving kids in China's Guangxi

# NANNING, GUANGXI CHINA —

Aramco-Asia recently launched "Aramco Youth Program — A Journey of Art" for 40 local students of ethnic minorities from less fortunate families in China's Guangxi Zhuang Autonomous Region.

The project, which falls within the framework of Saudi Aramco's corporate social responsibility and the Asia Pacific Donation Program 2017, was kicked off through close cooperation with Aramco-Asia, China Daily and the China Youth Development Foundation (CYDF).

The inauguration ceremony that was held at Guangxi Arts University in the regional capital city of Nanning earlier this year attracted more than 100 participants.

The nine-day program is designed to

provide the kids with a fun-filled, art-customized atmosphere that allows them to embrace new learning opportunities. They are given the chance to enjoy sightseeing, outdoor painting, receive training through lectures, and engage in an art competition. The children also receive mentoring from professionals at Guangxi Arts University.

It is the second time that Aramco Asia has coordi-

nated with China Daily and CYDF to host the community program, which benefits children of ethnic minorities in China's underdeveloped southwest frontier.

# **Berri Gas Plant** receives Energy Globe **National Award**

BERRI, SAUDI ARABIA — The Berri Gas Plant (BGP) Department recently received the 2016 Energy Globe

National Award from the Austria International Committee. BGP won the national award for its energy conservation initiative of ethane liquefaction.

Presented by the Austria embassy ambassador in Riyadh, the Energy Globe Award is one of the most prestigious environmental awards in the world. It distinguishes projects regionally, nationally, and globally that conserve resources such as energy.

In April 2015, BGP developed a new liquefaction heat exchanger to keep its operations energy efficient, safe, and environmentally friendly. The plant successfully commissioned and started up the new exchanger at its ethane and NGL recovery plant.

The process integration has contributed effectively in saving electrical power and reducing maintenance and operations costs as BGP is able to operate only one heat exchanger instead of an entire ethane liquefaction system. In addition, the modifications raised the ethane liquefaction capacity by 25%. ⊕

Austrian Ambassador Gregor W. Koessler, Counselor Kurt Altmann, far left, present behalf of Saudi Aramco.



Saudi Aramco

dimensions

Public Relations Department C-11B, Room AN-1080 North Admin Building #175 Dhahran 31311, Saudi Arabia

# worldview



# Aurora Borcalis in Norway

Ala'a A. Othman captured this colorful image of the Aurora Borealis in January 2017. He was participating in a photography workshop with a group of professional photographers from different parts of the world in the Lofoten Islands, Norway. Lofoten is an archipelago in Norway. It is known for its dramatic scenery, with peaks like the Svolværgeita pinnacle jutting up into the sky. Cycle routes cover the islands, passing through fishing villages like Henningsvær, which has colorful buildings lining its waterways.

Othman used his Nikon D750 camera with other special tools for capturing the Aurora's 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 20 years.

