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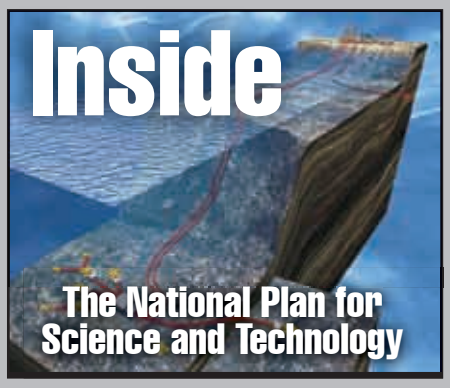

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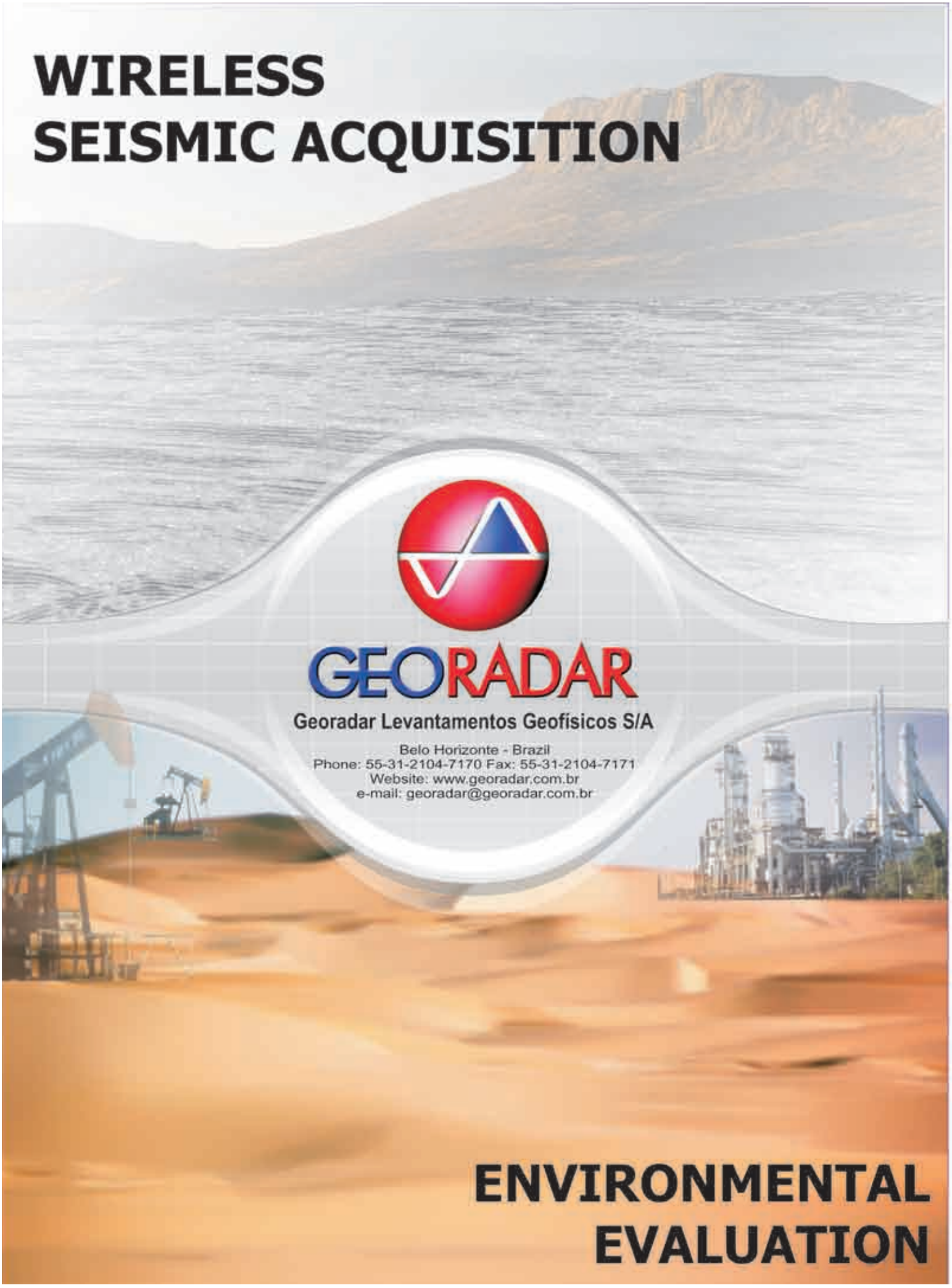

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ENVIRONMENTAL EVALUATION

2007 – Issue 4

Saudi Arabia Oil & Gas

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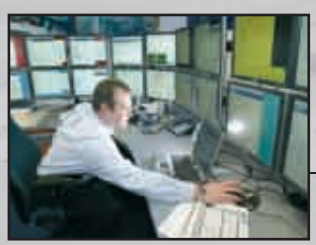

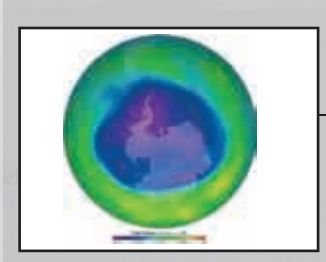

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3rd OPEC Summit & Oil Exhibition starts

RIYADH, November 13th , 2007 - The 3rd OPEC Summit was hosted in Riyadh this month by Saudi Arabia. The event was preceded by the International Oil Exhibition, which was well attended by both National and International Oil Companies. The Exhibition was arranged by the OPEC Summit Organizing Committee, and was held at the King Faisal Hall at the Intercontinental Hotel. This was followed by a Ministerial Symposium for the governments of OPEC member countries. EPRasheed's CEO and Founder Wajid Rasheed was invited to the summit as part of the international press team that were afforded a behind the scenes look at Saudi Aramco's current and future operations. Saudi Arabia Oil and Gas has an extended feature on the Summit and Saudi Aramco's operations in the February 2008 Issue.

Exhibitors included national oil companies of OPEC member nations such as SONANGOL, NIOC Group of companies, Sonatrach, Saudi Aramco, Kuwait Petroleum Company and major international oil companies such as ExxonMobil, Chevron, Nippon Oil and Shell, along with business and cultural exhibitions from OPEC member nations.

The cultural exhibitions are another mechanism through which cultural exchange and understanding is being promoted among OPEC states.

Additionally, the Ministerial Symposium brought together OPEC ministers, influential OPEC and industry leaders and some of the world's leading industry analysts to discuss global oil and gas markets, the future of oil in the global energy mix, energy and the environment, energy for sustainable development and the key role OPEC plays in the global economy.

Among the prominent industry leaders and analysts confirmed for participation in the symposium are: Abdullah ibn Hamad Al-Attiyah, Deputy Prime Minister and Minister of Energy and Industry, Qatar; Dr. Hussain Al-Shahristani, Minister of Oil, Iraq; Gholamhossein Nozari, acting Minister of Petroleum, Islamic Republic of Iran; Abdalla Salem El-Badri, OPEC Secretary General; Dr. Daniel Howard Yergin, chairman, Cambridge Energy Research Associates (CERA); and Dr. John Vernon Mitchell, Royal Institute for International Affairs, U.K.

Extending the ideals of cultural exchange, the OPEC Summit Organizing Committee has invited prominent journalists and opinion leaders from around the world to tour strategic areas within Saudi Arabia, visit premier industrial facilities and talk with CEOs and other corporate executives. The tours will precede the Third OPEC Summit.

OPEC was created in 1960 and has emerged as one of the world's most reliable and important energy providers. OPEC members supply about 40 percent of the world's oil, and have proven reserves totaling about 80 percent of the world's oil.

OPEC's mission is to stabilize global oil markets in a way that serves the interests of petroleum producers and petroleum consumers alike and benefits the global economy.

OPEC's 12 member states are Algeria, Angola, Indonesia, Islamic Republic of Iran, Iraq, Kuwait, Socialist People's Libyan Arab Jamahiriya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela. Its headquarters are in Vienna.

Advance Petroleum Services Limited Purchases Petrolube from Saudi Aramco and Mobil Investments

Dhahran, November 12, 2007 - Advance Petroleum Services Limited (APSL) announced today it had purchased 100 percent of the shares in the Saudi Arabian Lubricating Oil Company (Petrolube), a lubricant blending and marketing company, from Saudi Aramco and Mobil Investments S.A., an affiliate of ExxonMobil.

Petrolube had been a joint venture between Saudi Aramco, which owned 71 percent of Petrolube's shares, and Mobil Investments, which owned the remaining 29 percent of the company.

Petrolube was founded in 1968 and operates lubricant blending facilities in Riyadh and Jubail. Gulf International Bank BSC advised Saudi Aramco and Mobil Investments on the transaction.

Mr. Adil Tubayyeb, Desmond Carr and Engineer Hussain Dabbagh during and after the signing

New System Puts Rotating Gear Through Paces

By Stephen L. Brundage

DHAHRAN, October 31, 2007 - In the field, bad vibrations in rotating equipment can lead to shutdowns as engineers seek the source of the problem. Now, engineers can figure out how to minimize these vibrations by using the Consulting Services' Rotordynamic Test Lab in Dhahran's Research and Development Center.

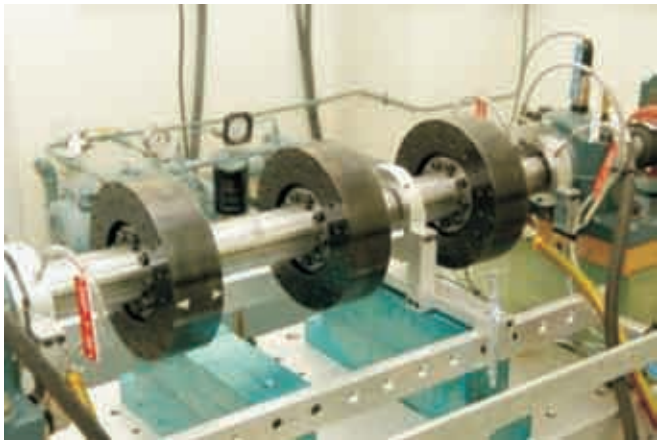
Designed and custom-made to suit the specific needs of Saudi Aramco, it was installed and commissioned in late 2006 by personnel from Consulting Services Department (CSD), Mechanical Services Shops Department and Ras Tanura Terminal Department.

The test shaft is driven by a variable-speed motor. A generator at the other end can be used to apply a load to the shaft to simulate field conditions for a variety of rotary equipment applications.

Along the test bench, sensors enable technicians to gather information relevant to the problem under investigation. Data is fed into a computer control console that monitors the equipment and provides shutdown in case of an emergency.

Dynamic Analysis Unit members Yousif Al-Sahood (on short-term assignment), Fathi Al-Salem, Khaleel Al-Hussain, Joveth Abutas and Ghaib Al-Motairi examine the Rotordynamic Test System at the Research and Development Center in Dhahran. The equipment was tailor-made for Saudi Aramco and designed by Spectraquest Inc. with substantial input from the Consulting Services Department. It is the only one of its kind in the Middle East. (Photos by Abu Abdul Aziz Studio)

The flexibility of setup means it can be adapted to multiple configurations, allowing engineers to reproduce and investigate complex problems in a safe and controlled laboratory environment.



Consulting Services' Rotordynamic Test Lab is a first for the Middle East and enables controlled simulation of a wide variety of rotating-machinery vibration problems

The system offers several benefits for the company, from training technicians to assessing and developing new technologies, products and diagnostic techniques through Applied Research Programs.

CSD employees Irvin Redmond, Khaleel M. Hussain and Joveth P. Abutas began the initiative and say the system will provide Consulting Services with a real opportunity to enhance the quality of the department's vital technical support to the field. CSD is enthusiastic about the new lab and already has a full research schedule drawn up.

If initial successes are any indication, the future looks bright for Saudi Aramco's promotion of innovation in the field of dynamic analysis.

CEOs Gather for Last Leg of Hawiyah NGL Project

HAWIYAH, October 31, 2007 - The giant Hawiyah Natural Gas Liquids Recovery Plant (HNRP) Project is on track for completion, and to get all the key players on board for the final push, Saudi Aramco and contractor CEOs met Oct. 23-24.

The CEOs focused on the road to timely completion of the project, which is now nearly 90 percent done. Project team members and contractors reaffirmed their commitment to place the plant in service on time without compromising quality or safety.

The project is one component in the capacity expansion that the Kingdom and the company are taking on to meet the growing petrochemical industry demands of the nation and the world. At the peak of construction, 14,000 workers swarmed the site, and 65 million work hours have gone into the project.

One of the company's strategic imperatives is boosting the Saudi economy, so more than 60 percent of the material and services were procured through in-Kingdom sources, including 100,000 tons of pipe. Major vessels, including a de-ethanizer and a debutanizer, also were fabricated in-Kingdom.

Saudi Aramco and contractor executives gather for a group photo at the Hawiyah Natural Gas Liquids Recovery Plant project site after a CEO meeting there, which focused on the final push to completion

Hawiyah NGL Recovery Plant viewed after dark

On the first day of the CEO gathering, the company hosted a dinner at the construction site, followed by demonstrations of Saudi culture. HNRP team members staged a play about Saudization, reflecting its strategic significance to Saudi Aramco and to the Kingdom's economy.

All day Oct. 24, the heads of the main contractors met with company executives to review the status of the project and make plans for a timely start-up.

Khalid A. Al-Falih, executive vice president of Operations, representing president and CEO Abdallah S. Jum'ah, was joined by executives, general managers and department managers. Mohammad A. Hammad, manager of the Hawiyah NGL Recovery Projects Department, presented an update on the project and discussed accomplishments, safety, quality control, contractor Saudization and remaining challenges.

After welcoming remarks by Mohammad A. Al-Juwair, general manager of Southern Area Project Management, the contractor representatives presented the status of their portion of the work, and then CEOs discussed everything from construction progress and resource constraints to schedules.

Al-Falih closed by noting that the plant is a highly visible project of utmost importance to Saudi Aramco and Saudi Arabia. It will deliver the necessary feedstock for further diversification of the Kingdom's downstream industries, he said.

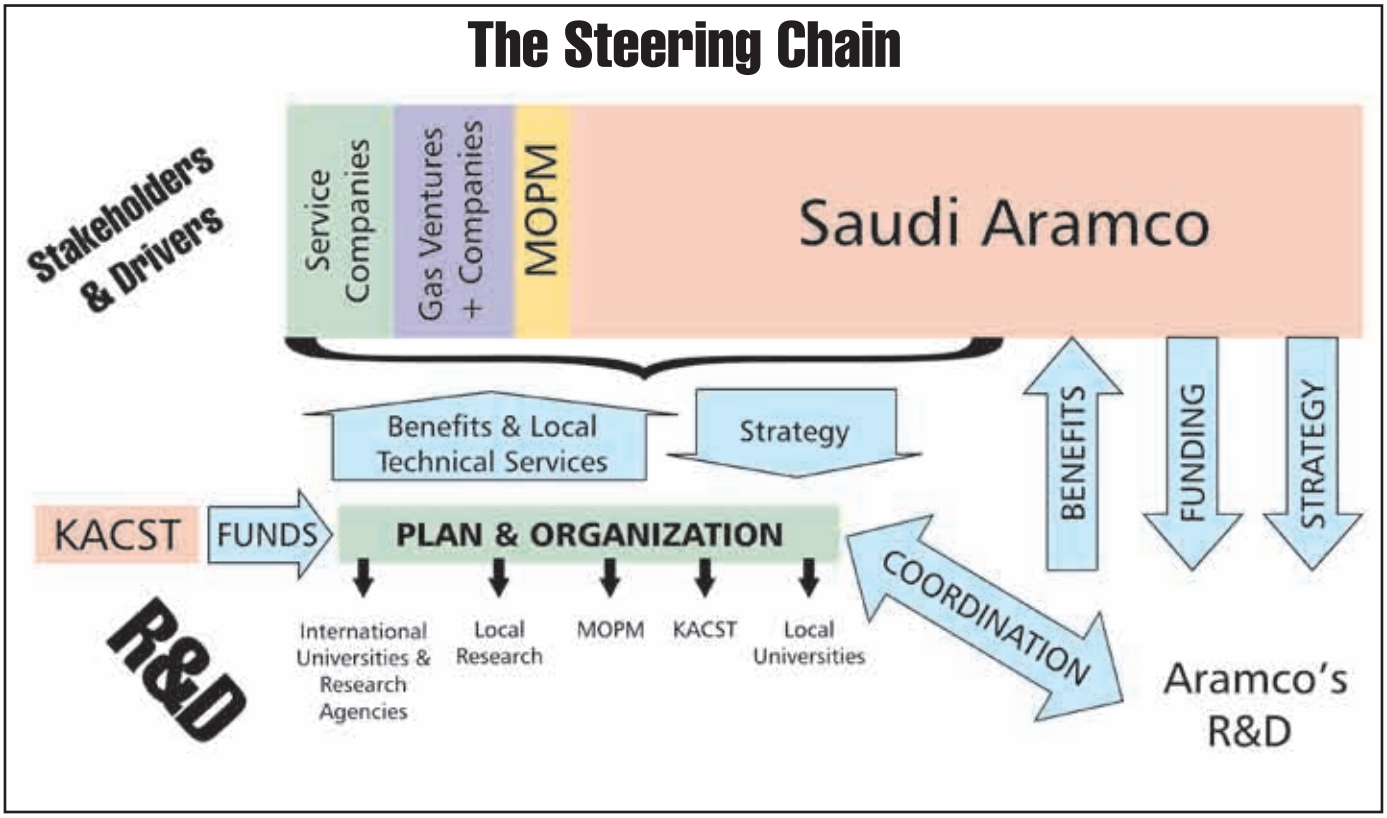
The National Pla and Technology

By Tariq AlKhalifah

Strategy has become a cool catchphrase expressing thought, organization, and foresight, but in our case it has meant being open and inclusive: hearing ideas from everybody in the industry.

Our strategy building project started about 8 months ago as the approval for a national plan for science and technology was given and a budget of about seven billion Saudi Riyals (SR) was allocated for the first five years of the 20 year plan with King AbdulAziz City of Science and technology (KACST) serving as managers of the plan. This total budget covers many disciplines and several different programs; however, at its heart is a list of 11 strategic and advanced technologies. Oil and Natural Gas comes second only to water technologies on the list, which emphasizes the importance of the petroleum industry to the Saudi Economy.

Consequently, we started a project April 2007 to build a strategic plan for the development and localization of Oil and natural Gas Exploration and Production technologies. The strategy relies heavily on the input and direction provided by our key stakeholders that include Saudi Aramco, Ministry of Petroleum and Mineral Resources (MoPM), the Gas Ventures, IOCs and service companies within upstream Oil and Gas. The relation of the stakeholders, specifically Aramco, to the plan and to other efforts on the matter is explained clearly in the diagram below.



A diagram depicting the food chain used in developing this strategic plan and its relation to Aramco's own effort in developing its strategies

an for Science

The National Strategy for Oil and Natural Gas Exploration and Production Technologies

At an early stage we recognized the importance of openness and broad participation. This fact encouraged us to build a website for the plan in which information is provided and participation is possible.

We also began by forming the Strategy Plan team with representation from Aramco, the Ministry and the Universities. The team was responsible for steering the effort and helping developing the plan. The team has met six times to date with full day meetings in which issues ranging from strategy to workshop to the proper path were discussed and is in constant email communication.

The website address is: http://www.ognpksa.org

The team includes:

- Tariq AlKhalifah - (KACST) - Director
- Abdulrahman Al Quraishi - (KACST) - Assistant Director
- Abdulaziz AlKaabi - (Saudi Aramco) - Member
- Saleh Almulhim - (Saudi Aramco) - Member
- Iessa Mahfis - (MoPM, Eastern Branch) - Member
- Majed badah - (MoPM, Eastern Branch) - Member
- Abdulaziz AlMajed - (KFUPM) - Member
- Abdulaziz ibn Laboun - (King Saud University) - Member
- Emad AlHomadhi - (King Saud University) - Member
- Hassan Naji - (KAU) - Member
- Mahmoud Al Osaimi - (MOPM) - Member
- Abdullah AlSabti - (KACST) - Project Manager
- Emad AlMushaqigh - (KACST) - Team Secretary

Where KSU stands for King Saud University, KFUPM stands for King Fahad University for Petroleum and Minerals, KAU stands for King AbdulAziz University and MoMP stands for the Ministry of Petroleum and mineral resources.

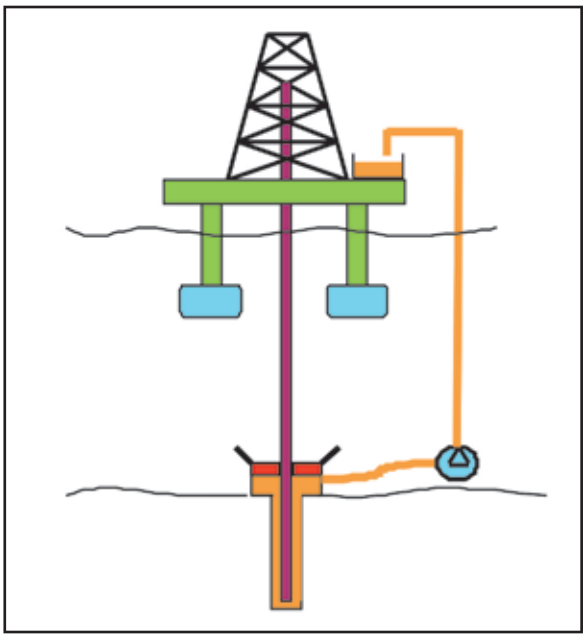
Although the strategy is developed concentrating on a goal year of 2025, which is influenced by Aramco's strategic target year, we needed to develop a vision for the next 100 years and establish directions close to where we want to be by the end of the century.

We started the strategy development process by reviewing the experiences of other technology mature countries chief among them is Norway and Canada. We evaluated the current status of technologies and professionals in the Kingdom and we hired SRI international to benchmark worldwide institutions in upstream oil and Gas.

We then distributed a questionnaire for SWOT analysis requesting information on the weaknesses, strengths, threats and opportunities to a large number of professionals in the Kingdom. This was followed by our first workshop in June 2007 dedicated to SWOT analysis and the development of our strategies. We invited the head of the Norwegian Oil and Gas technology strategy (OG21) to the workshop to enlighten us on their experience. Attendance exceeded 40 people representing practically all companies, research institutes and Universities working in the Upstream Oil and Gas in Saudi Arabia.

The long term view

Although the strategy is developed concentrating on a goal year of 2025, which is influenced by Aramco's strategic target year, we needed to develop a vision for the next 100 years and establish directions close to where we want to be by the end of the century. The vision is given by the chart below, which does not reflect exact numbers by any means, only possible trends. The chart's main message is that without the added value of enhanced recovery, new discoveries, Natural Gas and the supporting industry, value from Oil and Gas is bound to diminish. New technologies supporting these potential added values are needed to sustain growth. This includes supporting the refining and petrochemical industries as we expect that Saudi Arabia will dominate Oil resources down the road. Refining and Petrochemical is covered



by a similar strategy developed also by our colleagues in the petrochemical institute at KACST. Their main stakeholders are SABIC as well as Aramco.

Strategic components

The components of a strategy for an organization or a program or a project includes a vision, mission, values, strategic objectives, and in our case strategic technology targets. These are the headers that guide us as we outline the detail of achieving the strategy through strategic initiatives and scope of work, or in other words a plan. Here we outline the components of our strategy as follows:

Vision

Achieving the technical competence and superiority to find and produce all (every drop of) Oil and Natural Gas resources in the Kingdom's territories.

Pictures from the first Workshop

Mission

Creating an effective research and development environment for oil and natural gas exploration and production technologies through:

• Building an R&D infrastructure with qualified professionals.

• Drafting policies and procedures and activating the cooperation and collaboration venues between research institutes including universities and the private sector.

• Localization and development of Oil and Natural Gas Exploration and Production technologies to solve problems, improve Quality, and reduce cost.

Values

• Openness: Open and shared information environment

• Cooperation: Exchange information and ideas through cooperative work

• Humbleness: Recognizing that what you have always requires improvement

• Truth: Delivering accurate and precise information

• Dedication: To follow tasks to the end

• Competition: the kind that promotes the work spirit and enthusiasm

Strategic Objectives

Our objectives are directed to obtain the technologies and methodologies capable of achieving these strategic goals by 2025.

1. Improved data availability, openness, visualization and access for research.
- The availability of all acquired geological, geophysical and Petroleum info digitally with instant access.

2. Improved human resources quality, quantity and education.
- Increase in local Ph.D. holders in E&P disciplines by 1000% (or 1000).

3. Improved oil recovery and proven reserves.
- Increase oil in place to 900 billion barrels and obtain a recovery rate of 70% by 2025 (Aramco objective).

4. Reduced cost of exploring and production.
- Reduce the cost of a onshore barrel by 20% and an offshore barrel by 50%.

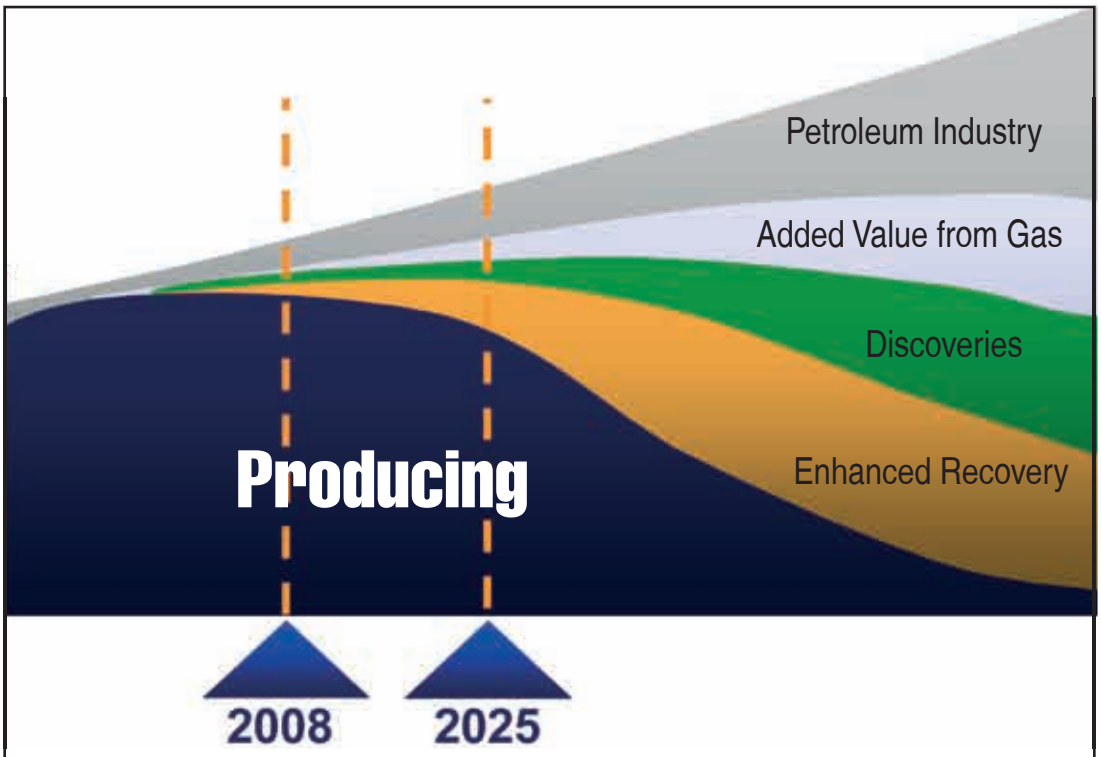
5. Efficient and improved oil and natural gas exploration and drilling.
- Cut the time needed for land acquisition and drilling by a 50%.

6. Reduced well pollution and emission.
- No harmful pollutants emission from Red Sea wells and reduced emission from onshore and gulf wells to a minimum.

7. Complete the geological information needed for Oil and Gas upstream R&D.
- Complete all missing Petroleum geology information.

8. Development and localization of technology services for Oil and Gas.
- The availability of at least 50% of the technology (i.e. software) services locally.

The performance objective numbers are described here for the purpose of measuring performance and evaluating projects in which we develop and localize technologies that can help us achieve these numbers. However, these numbers are not goals that we, or our partners in



A chart displaying future challenges as we try to insure that value from the Oil and Gas sector in Saudi Arabia continues to increase (courtesy of OG21 strategy)

the plan, intend to achieve or obligated to do so. The application of the technologies that meets these goals is at the discretion of the actual operators of the Oil and Gas industry in Saudi Arabia, or in other words our stakeholders.

Challenges

The following is a list of some challenges gathered through the questionnaire:

1. Education of young people on the importance of oil and gas technologies;

2. Higher sulfur content;

3. High-Water oil ratio;

4. Slow information gathering including survey and seismic acquisition in land;

5. Seismic acquisition in areas covered with sand and characterized with near surface complexities and multiples;

6. Reservoir characterization and monitoring;

7. Data sharing and availability;

8. Subsalt exploration and production;

9. Drilling in deep water and old and complicated formations;

10. Environmental technology and Zero emission;

11. Identification, mapping and understanding of source rocks and petroleum system in the region including the Red Sea;

12. Basement depth and mapping;

13. Unayzah formation heterogeneity;

14. Improved oil recovery;

15. Exploration in new frontier areas such as the Red Sea and Rub AlKhali;

16. Mapping the top of large reservoirs;

17. Detection and mapping of fractures in carbonate reservoirs;

18. Deep inter-well resistivity measurements;

19. In-situe wettability characterization;

20. The problem of condensate banking in Gas wells;

21. Oily water disposal;

22. Upstream waste management;

23. Water down hole and online separation;

24. Pore network modeling;

25. Well monitoring systems;

26. Well testing analysis in highly permeable layers;

27. Sand production from unconsolidated formations;

28. Dealing with reservoir characterized with high salinity and temperature.

Technology Targets

Our technology targets are driven by the challenges recognized in our analysis and the purpose of the targets is to organize technology target groups lead by the industry responsible for developing strategies for each targeted technology.

An advanced and integrated database with high end visualization and communication tools for Oil and Gas information

- Development of data storage, compression, and monitoring capabilities (i.e. Database);

- Capabilities in data format upgrade and adaptation to our needs (i.e. new data formats);

Development of analysis, visualization, and integration tools (i.e. user interface);

- Improved data accessibility through better communication and structure (i.e. internet access);

- Advancements in data openness and sharing systems (i.e. access regulations).

Completion of the petroleum geological information

- Mapping, modeling, and describing the Sedimentary basement (i.e. improved Gravity interpretation);

- Better understanding and characterization of the petroleum systems including the source rock (i.e. Seismic data interpretation);

- Improved description of important and complicated formations including Onaiyza formation (i.e. improved well information);

- Improved Fault and fracture description and direction in Carbonate formations (i.e. azimuthal anisotropy);

- Completion of the geological maps and their integration and coherency (i.e. Remote sensing interpretation).

Enhanced oil recovery

- Improved injection and production systems in carbonate reservoir;

- Determine the proper enhance recovery methods for existing reservoirs;

- Reduce water-oil ratio.

Reservoir modeling, monitoring and management

- Improved reservoir modeling and simulation (i.e. Parallel simulation), modeling and simulation tools;

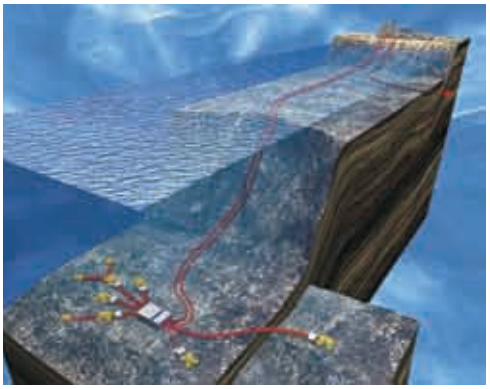
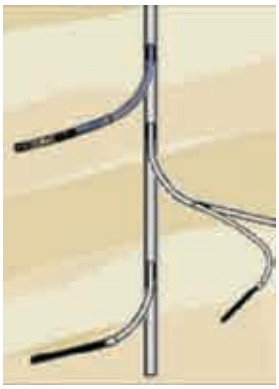
- Enhanced reservoir monitoring and attributes extraction (i.e. 4-D seismics, Deep diagnostics and sensing);

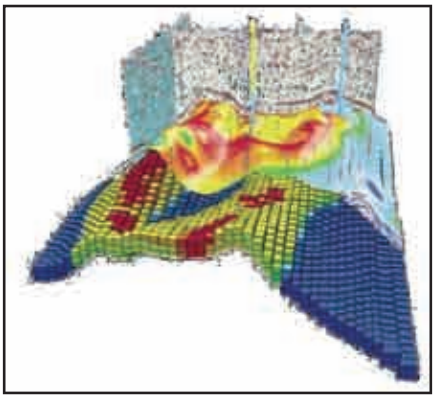
- Enhancements in Real-time and remote monitoring of changes in giant reservoirs (i.e. Passive seismic, Nanotechnology, wireless technology);

- Improved information and attribute integration for reservoir simulation (i.e. well-seismic integration), modeling and simulation input data;

- Fracture and fault detection and mapping in Carbonate reservoir (i.e. azimuth anisotropy).





Improved Oil and Gas exploration and success rates especially in the Rub AlKhali and Red Sea

- Improved efficiency and Quality of Land acquisition (i.e. Land streamers);

- Solving near surface seismic problems (i.e. Datuming and inversion);

- Solving seismic multiple related problems (i.e. Full waveform inversion);

- Improved seismic imaging (i.e. Prestack depth migration);

- Development of unconventional methods for exploration and data integration (i.e. remote sensing).

Oil and Natural Gas Production

- Solving the problem of Gas condensate in producing wells;

- Oil and gas reservoir stimulation;

- Production free of pollutants.

Improved drilling operations (quality and efficiency)

- Reduce drilling cost and drilling completion through developing efficient drilling systems (i.e. New cutting methods and drilling fluids);

- Complete drilling and consequences monitoring systems (i.e. Drilling sensors and advanced drilling components);

- Improved drilling in deep water and through formations in old and hard layers (i.e. Ultra Extended reach drilling);

- Improved drilling in high temperature, high pressure and high productivity formations.

Protecting the environment

- Improved monitoring systems and methods for emission from wells (i.e. water real-time sensors);

- Enhanced production standards to avoid emission;

- Improved Carbon dioxide capture, and sequestration

- Production and injection related hazard assessment (i.e. passive seismic, InSAR).

Strategic Initiatives

Although the strategy is developed concentrating on the next 20 years or a goal year of 2025, which is influenced by Aramco's strategic target year, we needed to develop a vision for the next 100 years and establish directions close to where we want to be by the end of the century.

The Strategic Initiatives include a broad range of factors from financial issues such as capital allocation, R&D such as HR and locations, cooperation between industry, universities, research centres and local technology providers.

Conclusion

This has been truly a joint effort with companies like Saudi Aramco, SRAK, LUKSAR and others contributing heavily in shaping the strategy. The strategy will be followed by a plan to implement it and achieve the stated objectives. The plan will detail spending and project priorities as well as a structure for Quality control.

EP in Rub

It is the marine organisms of eastern Saudi Arabia's ancient sea that, settling to the bottom over millions of years, eventually became trapped subterranean deposits of oil and natural gas. Gas deposits, specifically gas and condensates existing independently of oil reservoirs (non-associated), are what the South Rub AlKhali Co. Ltd. (SRAK) has been exploring for in The Empty Quarter since 2004.

Reproduced from Saudi Aramco Dimensions Magazine

The Rub

This is an archetypal sand desert that seems haunted by its own vastness, its own austere beauty. It is one of the largest continuous sand deserts, encompassing 582,750 square kilometers (225,000 square miles) of the Arabian Peninsula. SRAK, an incorporated joint venture company operating on behalf of its three shareholders (Shell with 40 percent and Total and Saudi Aramco each holding 30 percent), inaugurated its first well in July 2006. The drilling rig is a fragile appearing metal latticework frame 65 meters (213 feet) tall, which seems tiny and insubstantial amid the hugeness of the desert.

According to the terms of the Upstream Project Agreement with the Saudi Arabian government, signed during ceremonies in Riyadh on November 15th 2003, the newly formed company had only five years to explore the geology of an area equivalent in size to the United Kingdom. One thing was clear. To do so in any comprehensive manner would be an impossible feat. In addition, the contract stipulated that seven wells were to be drilled during that time.

In a perfect world, drilling engineers know ahead of time how deep they need to drill and what types of rocks they will encounter at various depths. The problem for SRAK drilling engineers was the lack of geological data on their contract area in the southern Rub AlKhali Basin.

SRAK drilling manager Koen Bracquene is a man long accustomed to the realities of the imperfect world of exploration and drilling. "Based on very preliminary geological data, you make your conceptual design calculations for different situations, and worst case scenarios in particular," he said. "From there, you start looking for a drilling unit and your long delivery equipment — the pipes, the valves and the flanges to put on the wellhead. Because of the specific requirements and the prevailing market conditions, that process typically takes about a year."

A year, plus a minimum of two years before SRAK generated data would reveal the most promising site for a well. Before SRAK could even hope to get its first well started, three of the five years were already gone. Under that timeline the math wasn't adding up.

Bracquene and his team got to work making the most accurate drilling plan they could, along with contingencies to cover as many geological uncertainties as possible. The last thing they wanted was to start drilling a well only to find that they didn't have bits of the correct hardness or pipe of the correct specifications to complete the well to

AlKhali

the required depth. That could delay progress for a year they could ill afford to lose.

Every day became a race for information. Over the years, 20 test wells had been drilled within the SRAK contract area. Imagine 20 straws sunk randomly into the ground across the whole of Scotland, and you begin to understand not only the scale but also the limitations of any information the geologists might obtain. Furthermore, only five of the wells were drilled to a depth at which gas might reside. Analysis of core and cutting samples from those wells would provide the first few pieces of the puzzle, albeit not the prized edge pieces. A little more information was gleaned from a Saudi Aramco airborne magnetic survey done in the early 2000s that overlapped into the northern edge of SRAK acreage. The Saudi Geological Survey also had some magnetic data that SRAK acquired. After integrating all of the well and seismic data at their disposal, a hazy picture began to form and obvious questions arose. How do you acquire enough geological data to exactly pinpoint the seven best well sites in a 210,000-square-kilometer area? How do you engineer and drill seven wells in five years when you don't have the information you need and when materials for each one could take a year to manufacture and get on site? How do you accomplish all of this in one of the most remote deserts on the planet and one of the last places on earth to be explored, where the climate is severe and there are no roads?

Depending on your perspective, this could either be an absolutely appalling prospect or a dream come true. For SRAK CEO Patrick Allman-Ward, it was both.

"It is very rare in the world these days that you get an opportunity to explore a basin pretty well from scratch and to turn a blank piece of paper into a portfolio of prospects," he said. "Most geologists spend their lives re-mapping prospects that other people have already mapped. In this project we are putting new prospects on the map that have never been seen before. That, of course, is very exciting."

He also knew that time and technology had fortuitously conjoined at this moment to give this venture its best chance for success. There had been tentative attempts to unlock the secrets of the Rub AlKhali before, of course. With a few exceptions in the north, most had been defeated by the combination of extreme conditions and distances.

To do it right, Allman-Ward knew he would have to take advantage of every new technological advancement. He would have to assemble teams of people who knew how to turn challenges into opportunities. To prevent mutiny en masse, he would need to make the desert camps as comfortable as possible. Environmental impact studies would need to be undertaken. Health, safety and environment (HSE) standards would have to be implemented and strictly adhered to. And exploration efforts would have to be coordinated with government agencies interested in the preservation of any archaeological sites that might be discovered. Allman-Ward and SRAK had one chance to bend to their will the collective forces that would result in success. There would be no cutting corners. They would do it right.

SRAK CEO Patrick Allman-Ward reveals why he thinks this area has such large hydrocarbon reservoirs compared to other places around the world.

"It always puzzled me a little bit as to why Saudi Arabia was so uniquely blessed with such an abundance of hydrocarbons. I think for most geologists and seismic interpreters who are familiar with mature areas of exploration, if you find a new prospect it will typically be a prospect of a few square kilometers. One of the exciting things about the acreage we are exploring is that we are mapping for the first time some very large structures indeed, with an aerial extent of hundreds of square kilometers in some cases. I think one of the keys to the large prospects found here is that the Arabian platform, which is the name for the plate on which Saudi Arabia sits, has actually been very stable over geological time.

"Part of the regional geological work we have done has established that the Arabian plate came together from a series of smaller plates between the Pre-Cambrian and Cambrian period. So we're talking 600–800 million years ago when the Saudi Arabian plate was welded together in its present form. Since then the plate has gone up and down relative to sea level, and has experienced a

series of flooding and erosion events. When sea flooded over the top of the plate, it created accommodation space for sediments to be deposited either in the form of clastic sediments or carbonate sediments. These provided the source rocks, the reservoirs and the seals. And when the sea retreated, the sediments were exposed and eroded. But in fact, the overall internal structural deformation in the Arabian plate has been relatively minor. It has remained largely undisturbed. Yet all around the edges of the Arabian plate, a whole series of plate tectonic mountain-building events has occurred.

The consequence was some subtle re-activation of structures within the Arabian plate as a result of these far-field stresses.

"Subtle changes mean the structures are very large because they haven't been fragmented and broken up into tiny pieces. The Saudi Arabian plate seems to be full of these very large structures, because it has not been subjected to intense tectonic events. It has been subjected to relatively mild far-field events that have subtly remobilized faults and fractures and created the structures that we currently see. And then, of course, you have two world-class source rocks; some people say more than two, which also help to fill these very nice structures with hydrocarbons."

Data exploration

Meanwhile, SRAK geologists were trying to decide how to quickly acquire the most useful seismic data in their massive contract area.

"Our strategy was to try and find a means by which we could implement a focused exploration program, centered during the first two-and-a-half years on finding the hot spots in outer contract area," said Allman-Ward. "Ultimately, that meant applying every geological trick that we had in order to zoom in and focus on the pieces of acreage that we needed to expend time and effort in."

To accomplish this they used a methodology called play-based exploration. In play-based exploration, you step back and look at the terrain in a holistic way instead of just trying to map prospects or structures. You take into account the natural history of the terrain and how it evolved through time in terms of its structural evolution and the deposition of sediments and source rocks. Then you evaluate how those source rocks have matured through time and at what point hydrocarbons may have been expelled out of those source rocks and to where they might have migrated.

"We have a large number of structures we are mapping and discovering in this area," Allman-Ward explained. "But then the question becomes: Which are the good ones and which are the bad ones? You have to prioritize the prospects for drilling, and that's the process of de-risking."

Knowing that they had one chance to coax a grudging desert into revealing its mysteries, a serious multi-pronged exploration program ensued. SRAK used unconventional technologies such as low-frequency (acoustic) seismic surveying and magneto tellurics, as well as conventionally acquired seismic data from vibroseis trucks and satellite imagery. And in its effort to locate the contract area's elusive hydrocarbon deposits, SRAK would eventually conduct what would become the largest high-resolution airborne gravity survey in the world.

An educated guess

After more than two years of exploring, surveying and mapping their contract area, SRAK narrowed in on where to drill their first well. Frustratingly, even with all the data at their disposal, the site selection was little more than an educated best guess. Why?

"In some areas of the world (the Gulf of Mexico, Nigeria, the Far East, etc.), you get a strong indication of whether you have hydrocarbons from the seismic data," Allman-Ward stressed. "We don't have that luxury. In all of our areas, the rocks are old as opposed to being very young. Old rocks don't respond in the same way to the presence of hydrocarbons and therefore don't show up on the seismic data directly."

When dealing with an entity such as the Rub AlKhali, the people of SRAK will tell you that they don't expect things to be easy. Instead, they shore up their positive attitudes and make contingency plans. In this case, the first well would be considered a true blind test. From there they would do something geologists call de-risking.

"We have a large number of structures we are mapping and discovering in this area," Allman-Ward explained. "But then the question becomes: Which are the good ones and which are the bad ones? You have to prioritize the prospects for drilling, and that's the process of de-risking."

For a while, though, it looked like SRAK wasn't going to meet its tight timeframe. All the equipment that Bracquene had ordered over a year ago was now being

delivered at the SRAK storage yard in al-Khobar. There was just one small problem: As the five-year clock continued to count down, Saudi Aramco had recently embarked on a major expansion of its exploration program, and the suitable drilling rigs, well construction and evaluation services throughout the Kingdom were being used.

Not ones to be discouraged easily, representatives from SRAK had launched an area-wide search and had found a suitable rig in Dubai. All they had to do now was have it trucked nearly 2,000 kilometers through the desert to the well site. Also, for the over-desert trek they would need specially rated trucks. That was fine. They were even willing to build basic roads where none existed.

SRAK officials said that results from Isharat-1 have been very encouraging and have shown that the venture's geological model for the region is gratifyingly accurate.

But those plans could get reshuffled at a moment's notice, depending on what additional data comes to light. The men of SRAK understand the sarab, the mirage, because they live in a realm where images are constantly shimmering in the heat of scrutiny and wavering in and out of focus. But that's part of the challenge.

SRAK hopes to spud another exploration well — Al-Mirtan — in early March 2007. But, gas or no gas, SRAK is gathering critical information with which to recalibrate their ever-changing model of the Southern Rub AlKhali Basin. They've already moved the location of their second well when new information was analyzed. That decision resulted in an additional 200 kilometers of road that needed to be built and completed in three months. Work at that well site is now under way and plans are being updated for the third well and beyond.

But those plans could get reshuffled at a moment's notice, depending on what additional data comes to light. The men of SRAK understand the sarab, the mirage, because they live in a realm where images are constantly shimmering in the heat of scrutiny and wavering in and out of focus. But that's part of the challenge. And they wouldn't be in this business if they didn't welcome a challenge.

Investing in People

With recovery from carbonate reservoirs becoming an increasingly important portion of the world's production, the industry looks to advancing training and development opportunities in the Middle East to ensure the most efficient and effective exploitation strategies.

By Ali Hariki, Training Center Manager, Schlumberger

A well-trained workforce benefits every aspect of the oil and gas industry. Employees who have been carefully trained perform their tasks more efficiently, with greater safety for themselves and their co-workers and with greater personal satisfaction. But it was not always so. For many years training was performed as an apprenticeship, with new workers being placed alongside more experienced workers. They were expected to "pick up" the skills of the job simply by observing and helping the senior employee. The approach was a recipe for mediocrity. Workers learned bad habits from their mentors along with good, but lacked the experience and insight to know the difference. Since the training was based on experience, there were huge differences between the skill levels of trainees as result of the opportunities they had to develop experience during their training. Workers were forced to train on the equipment they had, whatever its age or condition, so they did not learn about the latest technology.

As recently as 40 years ago, engineers were given a new spiral notebook and a pencil and told to write down everything—that would be their training manual. They were told to go to the supply store and buy a hard hat and a pair of steel-toed boots—that was their safety briefing. Thus equipped, they were sent out into the field. Training was simply a case of "survival of the fittest."

A formidable challenge

Today, training has developed into a science. It permeates every aspect of a company and touches every employee from the newest recruit to the corporate office. Top managers recognize the value and the necessity of training, and have invested considerable time and money to make it as effective as possible. Because of training's impact on safety, efficiency and job performance, employees are required to receive specific instruction and be certified at certain skill levels as a pre-requisite for promotion, or even before they are permitted to perform certain tasks.

Figure 1 - Tomorrow's workers - where will they get the training they need to perform the work we need?

The combination of business growth and attrition as older employees reach retirement age has put a strain on the entire industry. For example, between 2004 and 2006 Schlumberger has recruited more than 13,000 technical staff with university degrees out of a total headcount growth of 20,000. In the last two years more than 6,000 engineers have been recruited from over 200 universities in 80 countries. The cumulative training load for these engineers and specialists is expected to exceed 440,000 training days in 2007. In our industry, every company is challenged to get more done with less staff. Expectations are also changing as organizations are faced with more complex challenges such as increasing recovery from carbonate reservoirs. Technology plays a big role in making operations less labor-intensive, but it is clear that training must be made more efficient (Fig. 1).

e is Good Business

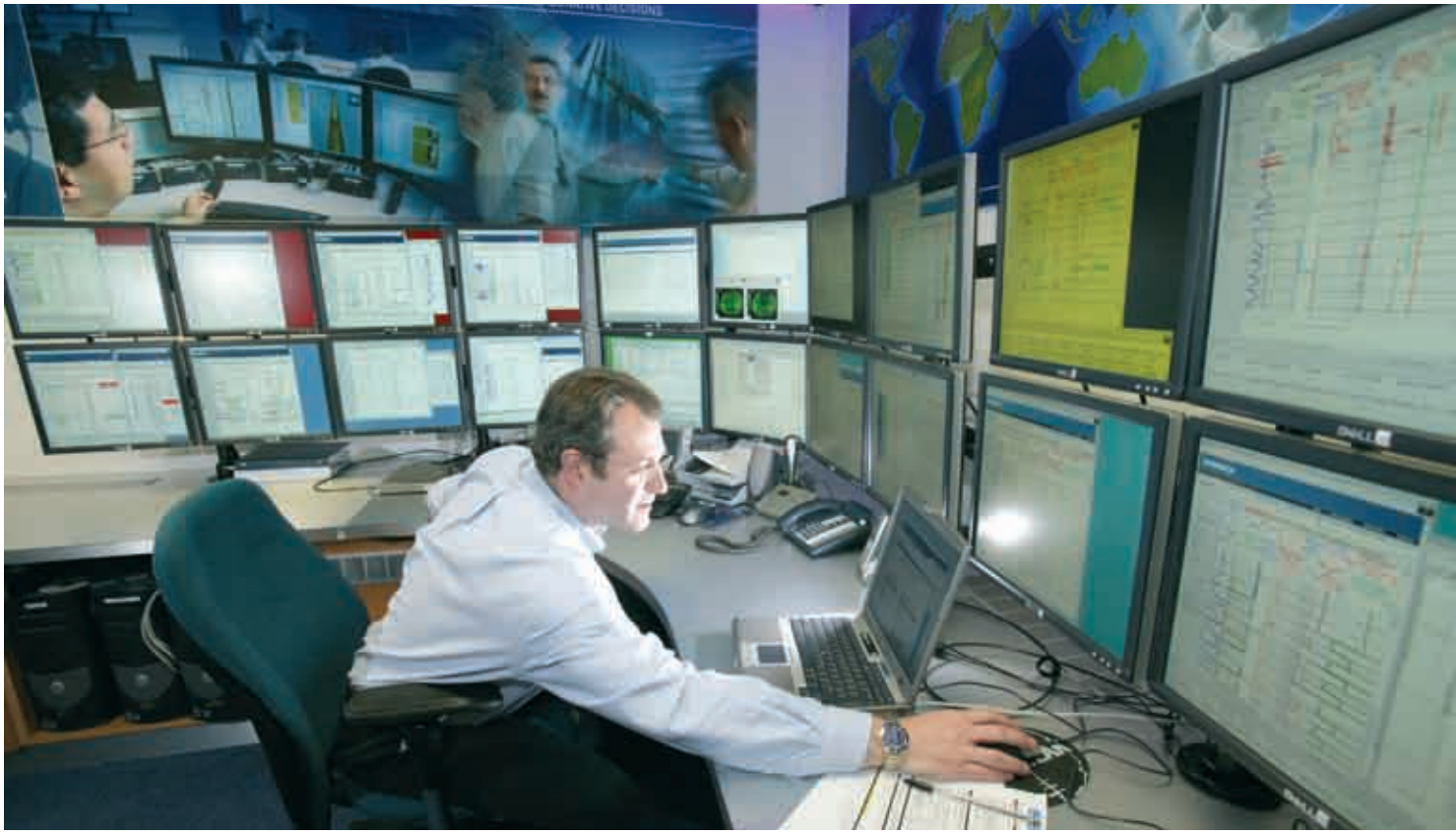


Figure 2 - The global network of OSCs - students learn from experts in a controlled environment.

A fundamental approach is to define training in terms of educational objectives that describe in minimum terms what the student is expected to be able to do following successful completion of the training, as well as the expected time-frame. Resources including manuals, training problems and bibliographies are included, and all are combined into a development program consisting of periods of formal classroom and practical study interspersed with practical on-the-job training. Both the student and the trainer/manager know what is expected, so the program is self-motivating.

In the past, busy managers working in the industry have complained, "I know that training is important, but I can't spare any people right now to send them away to a training class." Asked to share their own experience by teaching a class, they scoffed, "Impossible! I have no time." Even these scenarios, which seem to be prevalent today, have a solution. Technology is supplying new ways to train employees that is highly efficient and effective, but requires a much reduced investment of time. Some companies are making interactive distance-learning classes available on the Internet so employees can learn theoretical subjects at their home base during spare time, and at their own pace. This allows them to make maximum effective use of their time when they do go away to a training class. With the basic theory well-understood, students can develop the important practical skills and passion for the job efficiently, and with greater success ratios. In addition certain training can be outsourced to nearby universities or commercial skills training centers.

Is experience the best teacher?

Many people are of the opinion that practical skills and experience cannot be taught, they must be experienced. To a certain extent this is true, but in the past it was virtually impossible to expose everyone to every possible job experience in a reasonable time and at an affordable cost. Schlumberger is using its global network of Operation Support Centers (OSC) to speed up the process (Fig. 2). OSCs allow concentration of company and customer

Figure 3 - The new Schlumberger Carbonate Research Center in Dhahran focuses world-class expertise on Middle East challenges.

expertise to effectively manage remote operations from drilling to production. More than 45 centers strategically located throughout the world aggregate operational data in real-time and convert it into practical information from which decisions can be made and immediately implemented.

What better place to expose trainees—both those of the oil company and the service company—to a broad base of experience in a safe manner and in a tightly-condensed time frame? Working closely with experts in a controlled environment, trainees get to observe, study and be involved with a wide variety of real-world scenarios and challenges as well as follow the decision-making process as it is enacted. More experienced experts can work from an OSC remotely monitoring and supporting operations on well sites. This allows junior engineers to gain practical experience under the active guidance of a senior mentor.

A few forward-thinking companies are discovering the benefits of opening their formal training to students from outside their companies. For example, a key skill that must be learned by Schlumberger engineers as well as oil and gas company engineers and geoscientists is well log interpretation. Why not open the interpretation classes to everyone, Schlumberger thought. By integrating log interpretation classes, two major benefits were realized: Schlumberger engineers developed a much clearer understanding of the challenges and needs of their customers, and the customers came away knowing that they had received training equal to that of the very engineers they would be working with in the field. Both groups learned valuable insights that would help them communicate and perform their jobs more effectively. Integrated training has been expanded to cover many additional oilfield subjects.

Recognizing that every employee is an important member of the team, managers are working with training and human resources experts to formalize the entire employment experience from recruitment through promotion. Each position is a node on a structured development plan so employees who have the desire and drive can rise to the level of their competence. Career paths have been developed for field specialists as well as for engineers, geoscientists, technicians, sales and marketing professionals and managers. Compensation plans have been broadened to recognize the value of each employee's contribution and compensate them accordingly.

Closer to home

Over the past decade there has been a marked decline in the number of graduates showing an interest in careers in the oil industry. It is therefore becoming increasingly difficult to recruit talented science graduates to address and solve the industry's complex problems. By working with universities it is hoped that interest will be regenerated in the careers in the oil and gas industry. In the Middle East, Schlumberger has enriched the quality and scope of its training because of affiliations with universities such as King Fahd University of Petroleum and Minerals (KFUPM) in Dhahran and Texas A&M University in Qatar.

The new Schlumberger Center for Carbonate Research (SDCR) has been located in Dhahran's King Abdullah Science Park to promote closer interaction between research scientists from Schlumberger, experts from KFUPM, the King Abdul City for Science and Technology, as well as regional oil companies and other institutions (Fig. 3). The opportunities for interaction are many and varied, from internships awarded to deserving students to scheduled lectures by company experts as well as learned academics.

SDCR is entirely dedicated to carbonate research. This is remarkable as in the past little research was conducted on carbonates in comparison to sandstone formations. Although, theoretically well defined, in practice carbonates remained poorly characterized. With the high demand for oil, carbonates are now a significant part of oilfield activities. The research center provides unique training and expertise to local people providing them with the means to tackle the challenges that carbonates present. This has come at a time when operators are looking towards carbonate reservoirs, most of which lie in the Middle East. The Middle East has 62% of the world's proven conventional oil reserves, and on average, 70% of these reserves are in carbonate reservoirs (BP Statistical Review 2006).

Figure 4 - The recently opened Regional Training Center in Abu Dhabi, UAE provides practical training for workers destined for jobs in the Middle East and Asia.

SDCR is located on the world's largest known carbonate reservoir. This allows Schlumberger engineers and clients to field test new technologies just a few kilometers away from the center. Due to the immense and individual challenges presented by carbonate reservoirs, solutions are developed in collaboration with the local customers and universities.

Bringing scientific principles to a practical level, Schlumberger launched a new Regional Training Center in Abu Dhabi (Fig. 4) earlier this year. The opening of the center recognizes the industry-wide requirements for quality training to bring new recruits up to speed more quickly, and to develop new skills for existing staff from various companies. The center boasts state-of-the-art classrooms, workshops, laboratories and field technical equipment providing training in cementing, stimulation, well logging, artificial lift technology and directional drilling. In fact, the center provides training for all of the company segments.

What's next?

The Middle East also benefits from the collaborative training environment offered by the Network of Excellence in Training (NExT), which was established in 2000 as a consortium of Heriot-Watt University in Scotland, Texas A&M University, The University of Oklahoma, and Schlumberger Oilfield Services. NExT has developed unique, advanced, project-based training and competency assessment services for oil and gas industry organizations, and is deeply embedded within the training infrastructure serving the Middle East.

The organization can provide anything from specific seminars and short courses on almost any petroleum industry-related subject to a complete 11-month collaborative NExT Subsurface Integration Program (NSIP), where industry students are trained and mentored using state-of-the art technology and techniques to develop a solution to a real problem that will deliver significant economic impact for the sponsoring asset team. Inclusion of this business problem, which could address any stage of the asset's life cycle, is key to the NSIP, and the training is immediately applied to achieve the business goals of the asset.

Courses taught include the geosciences as well as reservoir engineering and formation evaluation, and a wide range of relevant exploration and production technologies. Participants learn to integrate disciplines to solve problems in such a way that economic benefits to the asset are optimized. The NExT curriculum is overseen by a governing board from the founding universities, and is generally intended to fill gaps in the universities' degree programs and available industry training. NExT courses are open to anyone, not just Schlumberger clients or employees.

Tomorrow's Solutions

In the modern petroleum industry, training is as thoroughly integrated into daily life as eating and sleeping. Based on the belief that one is never too old to learn, appropriate training is offered at all levels. The programs in place and ongoing in the Middle East are some of the newest and most comprehensive available anywhere. This is a fitting accomplishment given the region's position as leading energy supplier to the world.

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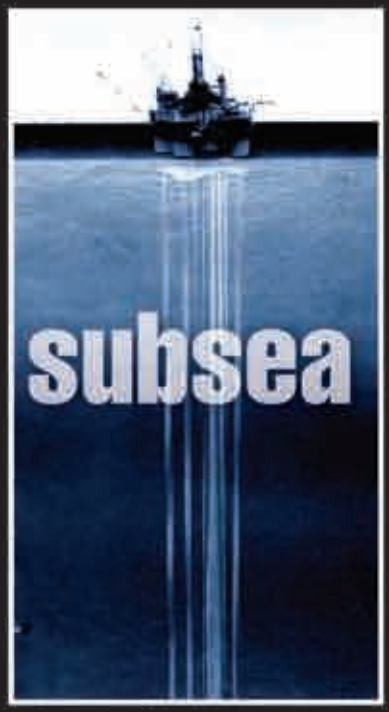

subsea

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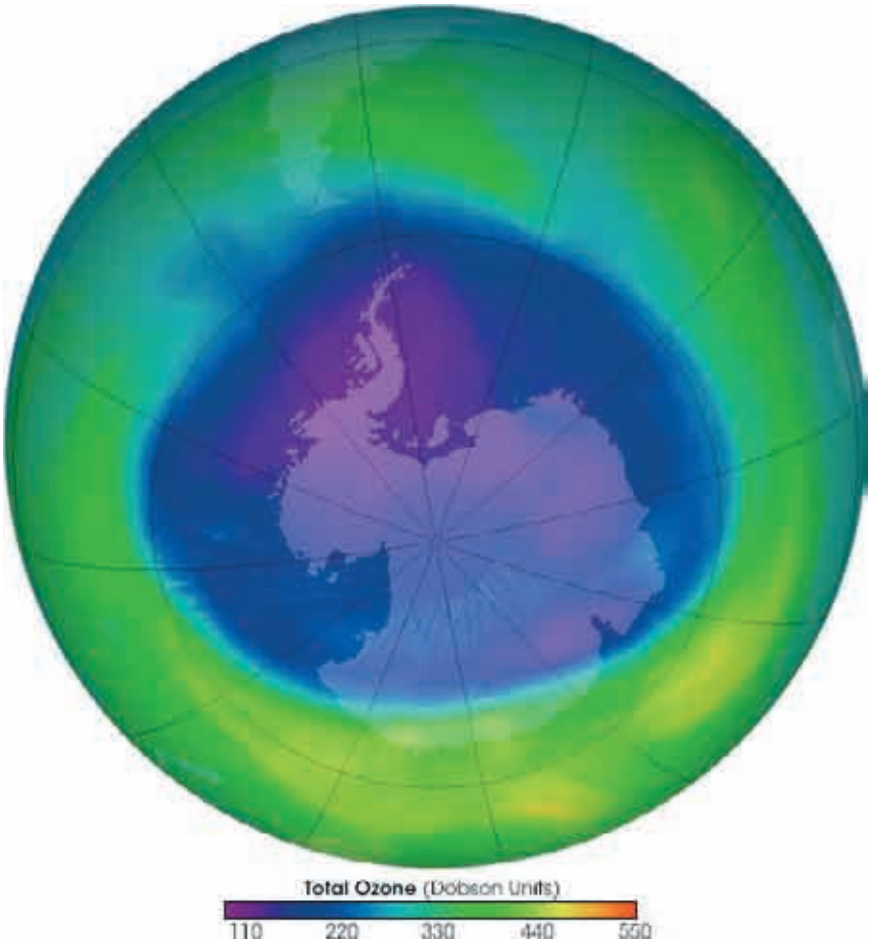
The Big Melt

As part of a double feature, ttnrg (Sister Magazine to Saudi Arabia Oil and Gas) looks at Global Warming and Climate Change. This issue covers the climate reduction and an exclusive interview with Dr. Andrew Spencer of the Scott Polar Research Institute, Cambridge University, England on the role of polar ice-caps in the environment.



By Wajid Rasheed

Since the 18th Century and it's accompanying rapid industrialization, volumes of CO_2 have been increasing (See Global Warming Issue 3). CO_2 has the greatest effect of greenhouse gases and projections show that emissions will continue to grow. For CO_2 emissions to stabilize at 'safe' levels there would have to be a major reduction in emissions complemented by new energy technologies that do not produce CO_2 at all. However, more than 80% of today's energy demands are met by fossil fuels, which makes it even more challenging.

Tracking Temperatures

Scientists keep track of global temperatures by registering air and sea temperatures. According to US environmental body figures, the global average temperature of the air at the Earth's surface has warmed between 0.3 and 0.6°C (about 0.5 and 1°F) since the late nineteenth century, while atmospheric temperature has risen 0.6°C (1.1°F), and sea level has risen several inches.

Scientists have also started tracking changes in the polar ice-caps. Since, starting in 1999, researchers working

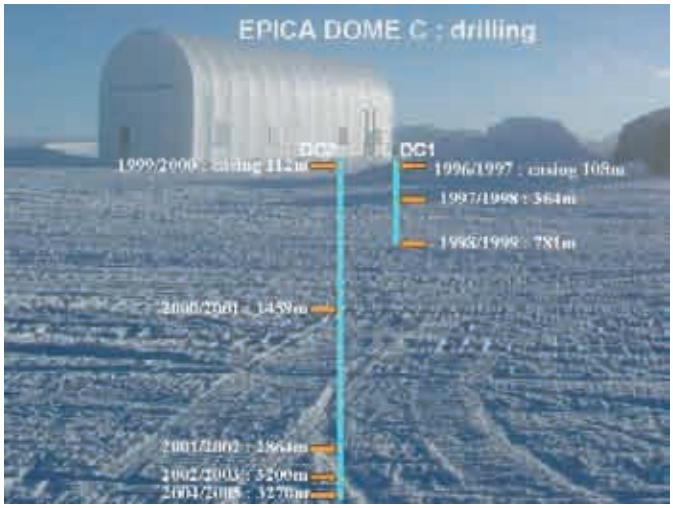
with the European Project for Ice Coring in Antarctica (EPICA) have drilled over 3,000m into the Dome C ice, which corresponds to a geological time-line dating back nearly a million years. Over time, solids and fluids are trapped in the ice, and these provide insight into the atmospheric mixture of gases present across the timeline.

Researchers have found that CO_2 is now about 30% higher than at any time, and methane 130% higher than at any time; and the rates of increase are absolutely exceptional: for CO_2, 200 times faster than at any time in the last 650,000 years.

Antarctic Climate Record

EPICA aims to fully document the Antarctic's climatic record of the Antarctic and to compare this with Greenland's record. To do this, scientists have employed drilling facilities to drill cores through the ice-caps. Currently, further cores are needed to cover extreme time scales with one at a site of higher annual snowfall to provide a detailed record of events over the last glacial cycle, and the other in a region of low snow accumulation.

Taken together the two cores are expected to shed light on the following key questions not answered by the results from either the Greenland cores, or the earlier Vostok drilling in Antarctica.



1. Are the rapid climatic changes of the last ice age cycle global events, or are they restricted largely to part of the Northern Hemisphere, where it is possible that geographic conditions favour them?

2. Are these rapid changes unique to the last glacial cycle or did they occur in previous cycles as well?

3. Is the relatively warm stable climatic period of the last 10,000 years an exception for the last 500,000 years?

Ice drill programmes have the twin goals of identifying changes in past climate and in atmospheric chemistry. One of the main ways of identifying climate change is to determine the proportions of oxygen and hydrogen 2 isotopes at different levels of the core through their presence in water.

Equally important is the reconstruction of past atmospheric chemistry, including aerosols and water soluble gases, in addition to the composition of atmospheric gases trapped in bubbles within the ice. A variety of techniques is used here, including continuous flow analysis to measure H_2O_2, NH_4, and HCHO. Sodium, calcium and sulfate levels are also measured, as these provide information, respectively, on past atmospheric concentrations of sea salt (Na), soil dust (Ca), and secondary aerosols derived from sulphur, including marine biogenic and volcanic emissions.

All these measurements would be of little value, however, without accurate dating of the ice cores. For the last 50 ka this is relatively straightforward, as detailed information has already been obtained from Central Greenland cores and from a core obtained in the western Antarctic deep Byrd ice. Dating of the new cores can then be performed by matching acidic sulphur signals against volcanic horizons identified within the Byrd core. To extend the dating back to 250,000 years other techniques are needed, and include ice-flow modelling controlled by matching features in the new cores (eg. changes in atmospheric gas isotopic and chemical composition) with corresponding features in the ice cores from Vostok and central Greenland as well as with the ocean sediment records.

Montreal Climate Conference

The United Nations Climate Change Conference closed with the adoption of more than forty decisions that will strengthen global efforts to fight climate change. Reflecting on the success of Montreal 2005, the Conference President, Canadian Environment Minister Stéphane Dion said: "Key decisions have been made in several areas. The Kyoto Protocol has been switched on, a dialogue about the future action has begun, parties have moved forward work on adaptation and advanced the implementation of the regular work programme of the Convention and of the Protocol."

Richard Kinley, acting head of the United Nations Climate Change Secretariat said: "This has been one of the most productive UN Climate Change Conferences ever. Our success in implementing the Kyoto Protocol, improving the Convention and Kyoto, and innovating for tomorrow led to an agreement on a variety of issues. This plan sets the course for future action on climate change."

Key decisions were made that outline the path to future international action on climate change. Under the Kyoto Protocol, the process for future commitments beyond 2012 got underway. A new working group was established to discuss future commitments for developed countries for the period after 2012.

In Montreal, developed countries committed themselves to fund the operation of the clean development mechanism with over USD 13 million in 2006-2007. The process for methodologies under the clean development mechanism (CDM) was simplified and its governing body strengthened.

In addition to this, the second Kyoto mechanism - Joint Implementation - was launched.

Its governing body was set up. Joint Implementation allows developed countries to invest in other developed countries, in particular central and eastern European transition economies, and thereby earn carbon allowances which they can use to meet their emission reduction commitments.

A major break-through was the agreement on the compliance regime for the Kyoto Protocol. This decision is key to ensure that the Parties to the Protocol have a clear accountability regime in meeting their emission reductions targets.

Technology was at the centre of discussion on efforts to reduce emissions and adapt to climate impacts. Countries agreed on further steps on promoting the development and transfer of technologies. One technology that raised particular interest was carbon capture and storage - a technology that involves storing carbon underground. It is estimated to have the potential of reducing the costs of mitigation by up to 30% . Parties agreed to move forward with deeper analysis of this technology.

Dr Andrew Spencer talks exclusively to Saudi Arabia Oil & Gas about the role of polar ice-caps in maintaining the global climate equilibrium.

Q: Saudi Arabia Oil & Gas - *What changes have the Ice Caps seen in the last 50 (fifty) years?*

A: Dr Spencer - The Antarctic & Greenland ice sheets are thinning near to the coast due to accelerating glaciers and increased melting, respectively. Both are thickening inland due to increased snowfall. Overall, both ie sheets are close to balance, i.e. the snowfall gains are comparable to the coastal losses.

Q: Saudi Arabia Oil & Gas - *How is this affecting the earth's climate, the natural environment, the habitats of wildlife and on sea levels?*

A: Dr Spencer - The only real effect is sea level rise. At present, the best estimate is that Antarctica & Greenland combined contribute 0.2 mm per year of the 1.8 mm per year global sea level rise. Some people are looking into whether accelerated melting of Greenland might freshen the North Atlantic ocean enough to divert the gulf stream and cool northern Europe, but this is still a hypothetical argument.

Q: Saudi Arabia Oil & Gas - *What does the Polar research institute do?*

A: Dr Spencer - A mixture of polar research on physical glaciology and humanities. There is also a musuem, and the world's premier polar library.

Q: Saudi Arabia Oil & Gas - *Have any trends regarding Polar Ice Caps been identified?*

A: Dr Spencer - A couple of regions stand out. The West Antarctic ice sheet is losing ice mass because the glaciers are flowing too quickly, most likely due to warm ocean waters at their termini. Arctic sea ice area and volume have both decreased over the past 50 years or so.

Q: Saudi Arabia Oil & Gas - *What are the predicted consequences of current trends?*

A: Dr Spencer - There are theoretical arguments that say any retreat of West Antarctica would have to be an accelerating process. If these are correct (still not confirmed), the retreat we see today could accelerate sea level rise, and there is enough ice in West Antarctica to raise sea levels by 5 metres.

Arctic sea ice cover plays two important roles, it reflects incoming solar radiation and it removes freshwater from the north Atlantic ocean. If it decreases, or disappears, the Earth could warm and Arctic oceans could freshen.

OGEP 2008

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Organizers

The Saudi Meeting on Oil and Natural Gas Exploration and Production Technologies

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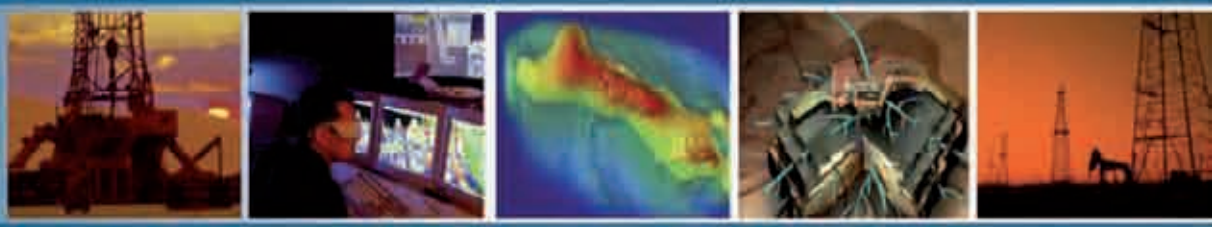

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OGEP 2008 Program

Welcome Message

On behalf of the organizing and scientific committees, I am honored to welcome you all to the *Saudi Scientific Meeting on Oil and Gas Exploration and Production Technologies (OGEP 2008)* to be held in Riyadh, our dear capital, from January 6th-8th, 2008. The event will be held under the auspices of the *Minister of Petroleum and Mineral Resources His Excellency Ali Naimi.*

OGEP's 2008 theme is *"Towards Local Research & Development"* which reflects the importance of upstream research & technologies in helping the Kingdom and the Oil industry respond to unprecedented global demand for energy. Saudi Arabia has initiated several upstream development programs to increase its maximum sustainable daily production capacity to 12.5 million barrels of crude oil by 2012. This coupled with the startup of major upstream drilling activities by the international oil companies exploring for non-associated gas, presents challenges that can only be overcome with focused minds and leading edge technologies through sustained investments in local research and development (R&D). OGEP provides a great opportunity for industry professionals, academics, and researchers to meet and share views, expertise and knowledge, and to promote the latest industry research and technology.

The technical program was very carefully selected to reflect the new technologies being developed and implemented in the industry. The program includes 14 technical sessions with more than 27 Keynote and Invited Speeches delivered by top experts/world-authorities in their respected areas. In addition, the program contains more than 50 oral presentations, 30 poster presentations and an one day field trip to nearby geological outcrops. Furthermore, the program also contains the following three high level panel discussions:

Dr. Sami Al-Neaim, the Chairman of the Scientific Committee

- *The National Plan to Develop and Localize Petroleum & Gas Technologies*
- *Saudi Arabian Upstream Research & Development Challenges*
- *Local Content of Oil & Gas Technologies*

I would like to sincerely thank all the keynote/invited speakers, authors, presenters, panelists, and sessions chairmen for their invaluable time and effort accepting our invitation to participate in this important technical event. Special thanks to the supervisory and technical committees members, without whom we could not have developed such a program. I am delighted to welcome every one of you, including our dear in-kingdom and out-of-kingdom delegates for their interest and participation in this event.

DAY 1: Sunday Ja

8:30 - 10:00 am

Opening Ceremony (Central Hall): H.E. the Minster of Petroleum and Minerals Speech & Exhibition Tour

10:15 - 12:15 pm

Session 1 (Hall A): Hydrocarbon Exploration in Frontier Areas:

Session Chairmen:

Dr. Abdulaziz Al Laboun, KSU

Mr. Mike Koch, General Manager Exploration, Chevron International Exploration and Production, Chevron

	Title	Author (s)	Title & Affiliation
Keynote Speech	Of Elephants and Lions - Skill and Serendipity in Hydrocarbon Exploration	Walter Voggenreiter	Evaluation Manager, SRAK
Oral Presentation	Facies and Stratigraphy of the Dibsiyah and Sanamah Members of the Wajid Sandstone in Southwest Saudi Arabia	Jean Loup Rubino, et.al	Total, SRAK, Saudi Aramco, Shell
Oral Presentation	Integrated Hydrocarbon Charge Modeling of the South Rub AlKhali Basin	Andrew Bell	Shell
Oral Presentation	Formation Evaluation through wireline in hostile conditions of Ubaylah-2 well, Rub AlKhali, Saudi Arabia	J Vicens and M. Hassan	Schlumberger & EniRepSa
Oral Presentation	Paleozoic Tectono-Stratigraphic Framework of Saudi Arabia	Abdulaziz Laboun	KSU
Alternate & Poster Presentation	Integrated Geology and Geophysical Evaluation to Constrain Glacial Paleo-Topography, Sarah and Qasim Formations in the South Rub AlKhali Basin	Geoff Pike	SRAK

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10:15 - 12:15 pm
Session 2 (Hall B): Drilling Technologies

Session Chairmen:
Mr. Omar Husaini, Saudi Aramco
Dr. Abdulaziz Al-Majid, KFUPM

	Title	Author (s)	Title & Affiliation
Keynote Speech	Growing Global Demand….Drilling Perspective	Zuhair Al-Hussain	Executive Director, Drilling & Workover, Saudi Aramco
Keynote Speech	How Do We Choose the Right Technology	David Payne	Vice President Drilling & Completions Chevron Global Upstream
Invited Speech	Advancement and Economic Benefit of Directional Deep-Reading and Geo-steering Technology	Michael Bittar	Technology Fellow, Halliburton
Oral Presentation	Ensuring 8 ½" hole in reservoir for deep gas wells: the Lean Profile Solution	Antonio Radossi	EniRepsa Gas Ltd.
Oral Presentation	A New Development Re-entry Solution Using Expandable and Rotary Steerable Drilling	Khalifa M. Al-Amri	Saudi Aramco
Alternate & Poster Presentation	FORMLock TORXS – Linear Drilling Technology. A Robust Liner System for Liner Drilling and Ream down Applications	Rustom K. Mody, et. al.	Baker Hughes Inc. (Division – Baker Oil Tools)
Alternate & Poster Presentation	Development of New Retarder Systems to Mitigate Differential Cement	Mohammad Al-Arfaj	Saudi Aramco

DAY 1: Sunday Ja

10:15 - 12:15 pm
Poster Session number 1 (Exploration Technologies: See Poster's 1 Table below)

12:15 - 1:30 pm
Lunch and Prayer Break

1:30 - 3:30 pm
Session 3 (Hall A): Non-conventional Exploration Methods

Session Chairmen:
Dr. Abdumohsin Al-Dulaijan, SRAK
Dr. Mike Wilt, Schlumberger

	Title	Author (s)	Title & Affiliation
Keynote Speech	New Exploration Challenges and Technologies: Back to the Future	Dirk Smit	Head of Exploration Research and Innovation in Shell International and Exploration and Production Shell
Invited Speech	Seismic Spectroscopy using amplified 3C geophones	Pieter Van Mastrigt	Head of Seismic Processing, SRAK
Invited Speech	Deep Hydrocarbon Exploration using Electromagnetic Methods	Don Watts	Western Geo-system, Schlumberger
Oral Presentation	Trial of Low Frequency technology for deep gas exploration in a frontier area	Rob Habiger et. al.	Spectraseis Technologies, Switzerland
Oral Presentation	Tilt-Depth Method : A Simple Depth Estimation Method Using First Order Magnetic Derivatives	Ahmad Salem et. al.	GETECH, Japan
Alternate & Poster Presentation	Two and Half-Dimensional Gravity Modeling to Delineate the Structures of the Western Abu Gharadig Basin, Western Desert, Egypt	Ahmed A. El-Khafeef	Egyptian Petroleum Research Institute (EPRI), Egypt

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1:30 - 3:30 pm
Session 4 (Hall B): Enhanced Oil Recovery

Session Chairmen:
Dr. Ali Meshari, Saudi Aramco
Dr. Mohammed Amro, KSU

	Title	Author (s)	Title & Affiliation
Keynote Speech	Enhanced Oil Recovery's Role in Reserve Growth	Larry Lake	Chairman PE Department, University of Texas, Austin
Invited Speech	Enhanced Oil Recovery for Improving Production Efficiency and Recovery in Existing Fields	Dr. Ganesh Thakur	Global Advisor – Reservoir Management & Chevron Fellow
Oral Presentation	Steam Flood Piloting the Wafra Field Eocene Reservoir in the Partitioned Neutral Zone Between Saudi Arabia and Kuwait	Degenhardt, et. al.	Saudi Arabian Chevron
Oral Presentation	Experimental Investigation of Co2 Miscible Flooding in an Oil Reservoir in Saudi Arabia	Habib Menouar, et. al.	KFUPM
Oral Presentation	The New Technology of Oil and Gas Production and Recovery Increase	Ikram Kerimov	Azerbaijan National Academy of Science
Alternate & Poster Presentation	Laboratory Investigation of CO_2 Miscible Flooding	Eissa Shokir et. al.	KSU, KACST
Alternate & Poster Presentation	Enhanced Oil Recovery Screening of PNZ Reservoirs	Ms. Carreras	Saudi Arabian Chevron/Chevron Energy Technology Company

3:30 - 4:00 pm
Prayer Break

4:00 - 5:30 pm
Panel Discussion I (Central Hall): The National Plan to Develop and Localize Petroleum & Gas Technologies
Moderator: Dr. Tariq AlKhalifah, KACST

DAY 2: Monday J

8:30 - 10:30 am
Session 5 (Hall A): Advances in Seismic Acquisition and Processing

Session Chairmen:
Dr. Khalid Rufaii, Saudi Aramco
Mr. Adel Al-Khelaiwi, SSGL

	Title	Author (s)	Title & Affiliation
Keynote Speech	Advances in Acquisition and Processing of Land Seismic Data	Oz Yilmaz	Chief Technology Officer, GeoTomo LLC
Invited Speech	Processing and Finite Difference Modeling Advances Applied to Land Seismic Designs	Fred Herkenhoff	Senior Geophysical Advisor and Chevron Fellow
Oral Presentation	An Example of High Productivity Single Vibrator 3D Acquisition	Jean-Jacques Postel	CGGVeritas Jean
Oral Presentation	Regularization and Interpolation of Sparse, Wide-azimuth Onshore and Ocean Bottom Seismic Data using a global 5-D interpolator	Gareth Williams	CGGVeritas
Oral Presentation	Evolution of Pre-Stack Multiple Suppression Based on Velocity Discrimination	Mahmoud Hedefa et. al.	Saudi Aramco
Alternate & Poster Presentation	Isharat -1 Multi Azimuth VSP	Pieter Van Mastrigt and Abdulmohsin Al-Dulaijan	SRAK

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8:30 - 10:30 am
Session 6 (Hall B): Advances in Reservoir Geo-mechanics & Hydraulic Fracturing

Session Chairmen:
Dr. Musaed Al-Awad, KSU
Mr. Kirk Bartko, Saudi Aramco

	Title	Author (s)	Title & Affiliation
Keynote Speech	Advances in Reservoir Geomechanics	Younane Abousleiman	Professor & Director of the Poro-Mechanics Institute, University of Oklahoma
Invited Speech	Coupled modeling of stress-induced changes in rock permeability - bringing added realism to both short-term UBD management and long-term reservoir management	Brian Smart	Heriot-Watt University, UK
Oral Presentation	Insight into the Relationship between Wellbore Induced Stresses, Breakouts and in-situ Stresses	Ashraf AlTahini et. al.	Saudi Aramco
Oral Presentation	Effect of Combined In-situ Stresses and Heterogeneities on Relative Permeability of Reservoir Rock	Abdulrahman Al-Quraishi, et. al.	King Abdul Aziz City of Science & Technology
Oral Presentation	Fracturing Horizontal Wells: Fracture Mechanics and Reservoir Engineering	Hazim Abass et. al.	Saudi Aramco
Alternate & Poster Presentation	Evaluation of Mohr-Coulomb Failure Criterion Using Unconfined Compressive Strength	Musaed Al-Awad	KSU

10:30 - 10:45 am
Coffee Break

10:45 - 12:15 pm
Panel Discussion II (Central Hall): Saudi Arabian Upstream Research & Development Challenges
Moderator: Dr. Nabeel Al-Afaleq, Saudi Aramco
Panelists: To be announced

DAY 2: Monday J

10:45 - 12:15 pm
Poster Session number 2 (Drilling & Production Technologies: See Poster's 2 Table below)

12:15 - 1:30 pm
Lunch and Prayer Break

1:30 - 3:30 pm
Session 7 (Hall A): Advances in Seismic Imaging

Session Chairmen:
Dr. Abdullatif Al-Shuhail, KFUPM
Mr. Ashraf Khalil, SRAK

	Title	Author (s)	Title & Affiliation
Keynote Speech	The relationship between seismic acquisition and image quality: advantages of new technology in the field	Craig Beasley	Vice President, WesternGeco and Schlumberger Fellow, Schlumberger
Invited Speech	Multiple Elimination on Land Seismic Data – The Saudi Aramco Experience	Panos Kelamis	Chief Geophysicist, Saudi Aramco
Oral Presentation	Near Surface Solution using the Wave Equation	Saleh Al-Saleh	Saudi Aramco
Oral Presentation	Velocity model building in depth domain for Pore Pressure Prediction	Patrizia Cibin, et. al.	ENI E&P Div, Italy EniRepSa Gas LTD
Oral Presentation	Improving Seismic Processing for Deep Gas Exploration in the Rub AlKhali	Samir Alinaizi	EniRepSa Gas LTD
Alternate & Poster Presentation	Efficient High-Resolution Seismic data to Model Near-surface Complexities	Tariq AlKhalifah	KACST

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1:30 - 3:30 pm
Session 8 (Hall B): Advances in Reservoir Management

Session Chairmen:
Dr. Abdulrahman Al-Qurishi, KACST
Dr. Scott Meddaugh, Saudi Arabian Chevron/Chevron Energy Technology Company

	Title	Author (s)	Title & Affiliation
Keynote Speech	Meeting Future Challenges: The Role of Reservoir Management	Waleed Al-Mulhim	Manager, Reservoir Management, Saudi Aramco
Oral Presentation	Real time Reservoir Management from Data Acquisition Through Implementation	Saeed Al-Mubarak	Saudi Aramco
Oral Presentation	Reservoir Modeling of the Wafra First Eocene Reservoir, Partitioned Neutral Zone, Saudi Arabia and Kuwait	Meddaugh, et. al.	Saudi Arabian Chevron/ Chevron Energy Technology Company
Oral Presentation	Data Mining for Predicting Permeability in Carbonate formation Based on Support Vector Machines	Emad El-Sebakhy	KFUPM
Oral Presentation	The use of Advanced Computations to Optimize Oil Fields Development	Tony Pham, Fahad Al-Ajmi, et. al.	Saudi Aramco
Alternate & Poster Presentation	Advanced Technology and Innovative Solutions Drive Field Development in Saudi Arabia	Said Al-Malki	Saudi Aramco
Alternate & Poster Presentation	Characterizing Petroleum Fractions for Simulation	Hassan Naji	King Abdulaziz University

DAY 2: Monday J

3:30 - 4:00 pm
Coffee and Prayer Break

4:00 - 5:30 pm
Session 9 (Hall A): Advances in Stimulation & Formation Damage

Session Chairmen:
Dr. Muhammad Badri, Schlumberger
Dr. Hamoud Al-Anazi, Aramco

	Title	Author (s)	Title & Affiliation
Keynote Speech	Fracturing and Stimulation Technology Trends - A Global Approach Driven By Middle East Challenges	Steve Davies	Schlumberger
Oral Presentation	Complex Zonal Isolation with Improved Swelling Rubber Packers	Paul McElfresh	Baker Hughes
Oral Presentation	Long Term Evaluation of an Innovative Acid System for Fracture Stimulation of Carbonate Reservoirs	Ibrahim Al-Hakami	Saudi Aramco
Oral Presentation	Advanced Selective Stimulation Technique - First Multi Stage Acid Frac Completion in Saudi Aramco	Saeid Mustafa El-Shourbagi	Saudi Aramco
Oral Presentation	The Use of StageFrac New Technology to Complete and Stimulate Horizontal Wells: Field Case	Hassan Al-Hussain	Saudi Aramco
Alternate & Poster Presentation	Reservoir Protection in ESP Completions	Mohammad Athar Ali	Schlumberger
Alternate & Poster Presentation	Understanding Zonal Isolation Technology Advancement, Enables Operators to choose the correct Solution for Wellbore Completions	Amy Farrar	Baker Hughes

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4:00 - 5:30 pm
Session 10 (Hall B): Upstream Application of NANO Technology

Session Chairmen:
Dr. Mazen Kenj, Saudi Aramco
Dr. Nasr Al-Arify, KSU

	Title	Author (s)	Title & Affiliation
Keynote Speech	Application of Nanotechnology in Oil and Gas	Ramanan Krishnamoorti	Professor, University of Houston
Invited Speech	Innovations in Smart Materials for Subsurface Applications	John Ullo	Project Manager, Schlumberger
Invited Speech	The Road to Acquiring In-Reservoir Nanodevices	Mazen Y. Kanj	Petroleum Engineering Specialist Saudi Aramco

Day 3: Tuesday J

8:30 - 10:30 am
Session 11 (Hall A): Advances in Quantitative Seismic Interpretation

Session Chairmen:
Mr. John Garrity, Saudi Arabian Chevron
Mr. Saleh Al-Maglouth, Aramco

	Title	Author (s)	Title & Affiliation
Keynote Speech	Recent Advances in Quantitative Seismic Interpretation - The Link Between Seismic and Geomechanics	Tom Davis	Professor of Geophysics and Director of the Reservoir Characterization Project, Department of Geophysics, Colorado School of Mines
Oral Presentation	Deterministic and Geostatistical Inversion of 3D Seismic Data and Well-Logs: Applications to Carbonate Reservoirs, Partitioned Neutral Zone (PNZ), Saudi Arabia and Kuwait	Arturo Contreras et. al.	Saudi Arabian Chevron/Chevron Energy Technology Company
Oral Presentation	Fractures Detection and Characterization for the Jurassic Carbonate Reservoirs Using 3D P-wave Prestack Seismic Data in Saudi Arabia	AbdulFattah Al-Dajani	Saudi Aramco
Oral Presentation	Joint Inversion of Ground Penetrating Radar and Seismic Velocity Data in Sandy Sediments for Porosity and Water Saturation.	Abdullatif Al-Shuhail	KFUPM
Oral Presentation	Seeing the invisible: Predicting fluid paths with an innovative new seismic attribute	Khalid Al-Hawas and Saleh Al-Dossary	Saudi Aramco

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08:30 - 10:30 am
Session 12 (Hall B): Advances in Formation Evaluation & Well Testing

Session Chairmen:
Khalid A. Zainalabedin, Saudi Aramco
Mr. Raid BuKhamseen, LUKSAR

	Title	Author (s)	Title & Affiliation
Keynote Speech	Advances in LWD resistivity imaging in conductive mud	Marian Morys	Halliburton
Keynote Speech	Stretching the limits of existing technology	John Edwards	Schlumberger
Oral Presentation	Advanced Mud Logging Techniques as Formation Evaluation support	Mohamed Hassan	EniRepSa Gas Ltd. Eni E&P Div.
Oral Presentation	Magnetic Resonance Acquisition and Processing Improvements for Saudi Arabia	Steve Crary et. al.	Schlumberger Oilfield Services & Saudi Aramco
Oral Presentation	A Practical Approach to Determine Permeability from Wireline Measurements	Ahmed Al-Harbi et. al.	Saudi Aramco & Imperial College
Alternate & Poster Presentation	Detecting Fracture Porosity and Estimating Its Aperture Using the Dual Laterolog of Rudeis-Sidri Area, Gulf of Suez, Egypt	Mahmoud Ghorab and Tarek Shazly	Egyptian Petroleum Research Institute

10:30 - 10:45 am
Coffee Break

10:45 - 12:15 pm
Panel Discussion III (Central Hall): Oil & Gas Technologies: Local Content
Moderator: Yahya Shinawi, Director General, MINPET
Panelists: To be announced later

Day 3: Tuesday J

10:45 - 12:15 pm
Poster Session number 3 (Reservoir Technologies: See Poster's 3 Table below)

12:15 - 1:30 pm
Lunch and Prayer Break

1:30 - 3:30 pm
Session 13 (Hall A): Advances in Reservoir Deep Diagnostics

Session Chairmen:
Mr. Abdullah Al-Jof, MINPET
Mr. Saleh Ruwaili, Saudi Aramco

	Title	Author (s)	Title & Affiliation
Keynote Speech	Emerging Technologies for Fluid Movement Monitoring and Determining In-Situ Two-Phase Flow Properties and Recovery Efficiency	Fikri Kuchuk	Fellow and Chief Reservoir Engineer, Schlumberger
Invited Speech	Imaging Reservoirs using both Electric and Seismic Energy	Bill Daily	Multi-Phase Technologies, LLC
Oral Presentation	Deep Diagnostic Technologies for reservoir Surveillance and Saturation Monitoring; Saudi Aramco Perspective	Saleh B. AlRuwaili	Saudi Aramco
Oral Presentation	Crosswell Electromagnetic Tomography for Waterflood Monitoring in Saudi Aramco Field	Alberto F. Marsala	Saudi Aramco
Oral Presentation	Predicted Borehole Gravimeter Response in an Oil Reservoir under Water flood	Harold Pfutzner	Schlumberger
Alternate & Poster Presentation	Large Scale Reservoir Monitoring with Nonseismic Geophysics in Saudi Arabia	Michael Wilt	Schlumberger
Alternate & Poster Presentation	Emerging Geophysical Technologies for Reservoir Monitoring in Intelligent Fields	Shivaji Dasgupta	Saudi Aramco

January 8, 2008

1:30 - 3:30 pm
Session 14 (Hall B): New Generation of Smart Wells

Session Chairmen:
Mr. Drew Hembling, Saudi Aramco
Mr. Suresh Jaboc, WellDynamics

	Title	Author (s)	Title & Affiliation
Keynote Speech	Recovery and Economics, a shifting Paradox	Patrick Schorn	President Schlumberger Completions
Oral Presentation	Saudi Future Smart-Wells Design: A Game Changer in Oil Fields Operations	Abdullah Al-Qahtani	Saudi Aramco
Oral Presentation	First Commercial Deployment of an Expandable Monobore Liner Extension	Rustom Mody	Baker Hughes
Oral Presentation	Intelligent Completions Technology Offers Solutions to Optimize Production in Multi-Lateral Wells	Muhammad Shafiq	Schlumberger
Oral Presentation	Maximum Reservoir Contact Wells Equipped with Smart Well Technology: Optimization and Sustained Performance	Abdulatif Al-Omair	Saudi Aramco
Alternate & Poster Presentation	Case Histories of Improved Horizontal Well Cleanup and Sweep Efficiency with Nozzle Based Inflow Control Devices (ICD) in Sandstone and Carbonate Reservoirs	Ahmad Sunbul et. al.	Saudi Aramco
Alternate & Poster Presentation	Advanced Completions Offshore and Onshore	Stephen Dyer	Schlumberger

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