

Conference Focuses on Technologies Key to Russia's Future

John Donnelly, *JPT* Editor

The need for new technical advances and solutions to take the Russian oil and gas sector to the next level highlighted panel and technical sessions at the second SPE Russian Oil and Gas Technical Conference and Exhibition, held in late October in Moscow. Russia has made significant strides in boosting production since the late 1990s and has played a significant role in helping meet global oil demand this decade. Much of this growth has come from the application of drilling and downhole technologies. But with many of the country's mature fields declining, a new wave of technological solutions is needed to maintain Russia's status as one of the largest oil and gas producers and exporters in the world.

The conference—under the theme “Technology for Today and Tomorrow”—brought together managers, technical specialists, and scientists to discuss case studies and technical solutions specific to the Russian/Caspian region as well as outside the region. Included in the panel and technical sessions were reviews of new frontiers, such as the extreme Arctic and ultradeepwater; the redevelopment of mature fields; developing and producing deep and complex reservoirs; and the need to attract and develop technical talent. The conference featured 20 technical sessions and four panel sessions, and the exhibited area featured 111 companies.

The opening plenary session provided a sweeping view of the state of the Russian industry. It was chaired by Iskander Diyashev, Chairman and Chief Technology Officer of IRDC, and featured panelists Thane Gustafson, Senior Director, Russian and Caspian Research, for Cambridge Energy Research Associates; Yury Podturkin, General Director of the State Commission of Reserves; and Anatoliy Brekhuntsov, General Director of SibNAC.



Graifer

Professor Valery Graifer, Chairman of the Board of Directors for JSC Lukoil, delivered the opening keynote address. He noted that significant changes have occurred in the Russian oil and gas sector since the first SPE Russian oil conference 2 years ago. There have been significant new finds, major new transportation

structures under development, and progress in developing output in the Arctic region. Oil and gas exports have also provided “tremendous benefit” to the country, he said.

The recent drop in commodity prices and global financial upheaval are putting pressure on both the oil sector and the Russian economy, he said. In addition, the state is requiring that oil and gas companies, such as Gazprom, take an

expanded role in the power sector. There is still a great need for technical advancement in Russia, Graifer said, particularly in enhanced oil recovery. Some of the technical challenges facing the Russian industry may require nontraditional approaches and applications of technology, which underscores the need for adequate advanced technical training. He singled out Schlumberger's new training center in the country as a “remarkable training center” and a good example of cooperation between Russia and the oil service sector.

Gustafson spoke of the Russian “oil miracle” that occurred beginning in about 1994 and continuing through last year. In particular, there has been a dramatic rise in output since 1998—increasing annually at double-digit rates from 2000 to 2004—with western Siberia continuing to play a major role in Russian oil output. During that rise, a handful of new fields began producing more and hundreds of fields posted slower decline rates, he said. “The secret was pumps, fracs, and floods,” Gustafson said, noting the role that technology and its application played in the progress.

Hydrofracturing was applied on a “massive scale” in the country from 1999 to 2007 with Gazprom, TNK-BP, and Rosneft the leaders. The technology was actually invented in Russia but this was the first time it had been applied on such a large scale. That application was instrumental in Russia's production increase this decade but its impact is beginning to slow. The production decline in the country is widespread, with Rosneft the only company posting higher output in the first half of 2008 vs. the first half of 2007, he said. “It is time [for the Russian oil industry] to retool, regroup, and reinvent itself and apply the new generation of technologies,” Gustafson said.

The structure of the country's tax code is proving to be a problem for the oil and gas industry and will become more noticeable to the government now that commodity prices are falling, he said. The tax code is regressive and is focused on revenues and production rather than a company's profit. “The code needs adjustment,” he said. Russia's marginal tax rate takes over 90% at prices about USD 25/bbl. “This has canceled out many of the gains companies would have enjoyed from higher prices the past few years,” he said.

But there now is a “lively discussion” taking place between the government and oil firms and the Russian export tariff may be adjusted, which will help companies' cash flow. The export tax helps keep domestic fuel prices down so any change in its structure will be politically sensitive, Gustafson said. “It is a complex issue with repercussions for the domestic economy aggravating the inflation rate,” he said.

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Technology Applications

Four high-powered technical experts representing operators, service companies, and the Russian government discussed the recent improvements that technology has made in the Russian oil sector and what role it must play in the future during the second plenary session of the conference. A packed auditorium heard comments from moderator Maurice Dijols, President of Schlumberger Russia; Mars Khasanov, Director for Science, Rosneft; Mikolai Lisovski, Chairman of the Central Committee of Field Development Planning for the Ministry of Natural Resources; Richard Herbert, Executive Vice President of Technology for TNK-BP; and Douglas Meikle, Vice President, Europe-Eurasia, Halliburton.

Russia is facing the same problems the oil and gas industry is facing worldwide and needs similar technical solutions, said Khasanov, representing one of the largest Russian operators in the country. Those challenges include deteriorating reserves quality, declining reserves, rising need for unconventional hydrocarbons, material cost increases, and a deficit of skilled personnel. Russia's need for technology is even more acute because only 35% of 50 key technologies used today are being applied in Russia, he said.

Rosneft has established a "system of innovation" in an attempt to identify technical needs and speed technology adoption. The program includes developing new technologies or deciding to outsource, knowledge-management best practices, and professional training of staff. Work groups have been established in the areas of pilot project realization, technology customization, and technology selection. As a result of this program, 34 new technologies were tested between 2006 and 2008 and five new technologies implemented. Technical improvements have been made in the areas of spectrum velocity analysis, electrical submersible pump well monitoring, integrated modeling, and reservoir simulation, Khasanov said.

TNK-BP's Herbert said his company, which was formed in 2003, saw rapid production growth in its first 3 years primarily through the application of hydraulic fracturing, but output has flattened out since. He outlined three major phases of the company's technology evolution in Russia. From 2003–04, it focused on well work, especially fracturing and pump optimization, and saw output growth of about 15%. "This was part of the brownfield renaissance in Russia," he said.

From 2005–07, the technology focus was on increased reservoir understanding, as well as on sidetracks and horizontal wells, waterflooding, and acquiring 3D-seismic data. Output during this time grew by 2.8%. Now the company is focused on improved waterflooding, gas utilization, improved well work and drilling, and greenfield development, such as in eastern Siberia. TNK-BP will continue to use technologies available in the market rather than developing its own research and development in the short term, he said.

Herbert drew three lessons learned from the company's experience the past 5 years.

- Success has been based on the application of appropriate and available technologies.
- A "technology stream" was created to develop focused programs, testing and proving a technology's value before implementation.

- The impact of a given technology, such as fracturing, declines over time so there is a need to refresh technology applications.

Halliburton's Meikle acknowledged that the next trillion barrels of oil the industry develops and produces will be harder to find, in more complex and smaller fields, in more deeply buried reservoirs, heavier in gravity, more costly, and with less experienced personnel. In addition, great producing regions such as Mexico, the UK, and Norway are experiencing declining production. Without the increase in Russian output this decade, the world would be sorely short of oil, he said.

Russian will remain a "fit for purpose" market for technology, Meikle said. Three trends are apparent, he added: incremental production from fracturing is declining, horizontal and directional wells have increased well productivity through the drill bit, and well construction is moving toward directional drilling.

Focus on Shtokman

The promise and challenge of developing the world-class Shtokman gas field were outlined by Herve Madeo, First Deputy Chief Executive Officer of Shtokman Development, during a topical luncheon on the second day of the conference.

One of the world's largest offshore gas projects, Shtokman is estimated to hold as much as 3.8 trillion cubic meters of gas and 37 million tons of gas condensate. But it will be immensely challenging to develop because it lies deep within the Arctic Circle, 330 meters below the surface of the Barents Sea. Developing a field in such harsh climatic conditions is unprecedented.

Operator Gazprom is getting assistance from Total and StatoilHydro in the project. Shtokman Development was incorporated earlier this year with Gazprom owning 51%, Total 25%, and StatoilHydro 24%. Under completion of phase one of the three-phase project, Total and StatoilHydro will turn their shares over to Gazprom.

Gazprom plans initial production of 23.7 billion cubic meters of gas a year with first pipeline deliveries in 2013. Annual output could eventually quadruple initial production. The field was discovered in 1988 but the field was not developed because of the harsh Arctic conditions. Gazprom drilled the first appraisal well in 2006. The field is expected to be a major supplier of gas to Europe and the US through liquefied natural gas (LNG) and by pipeline.

Among the challenges the project faces are working around the vast icebergs in the region, supplying the personnel and equipment, working in freezing winds and 6 months a year in darkness, and working around a delicate ecosystem. Forecasts are for gas from the field being supplied to Europe by 2013 and the LNG plant going onstream a year after that. Plans are to triple output after the initial 7 years of production. The second phase of the project will begin in 2016 and the third phase in 2020, with each phase bringing on an additional 23 billion cubic meters of gas.

Shtokman will require three of the largest platforms in the world, ice-resistant and capable of withstanding 25 meter waves. Three seabed pipelines will carry the gas to shore to terminals in Teriberka in the Murmansk region, where the LNG plant will be located.

Innovation Highlights Technical Program

The technical program of the conference focused on innovation and applicability to existing technical challenges, as well as the potential economic efficiency of the use of proposed innovations for subsoil users. Conference organizers, under the leadership of Conference Chairperson Adil Mukhitov of Schlumberger, chose 168 oral and knowledge-sharing presentations from the more than 689 abstracts that were submitted for the event. The papers include authors from more than 65 companies, representing 26 countries around the world.

Among the technical papers presented at this year's conference were:

- "The Evolution of Hydraulic Fracturing in Russia" by authors from Halliburton and Rosneft, which traces the growth of arguably the most significant technology affecting the country's upstream sector. Before the mid-1990s, the main goal of hydraulic fracturing operations in Russia was preventing near wellbore damage. Because of Russian oil production practices at the time, it became apparent that the hydraulic fracturing technology combined with drilling horizontal wells increased production and was therefore beneficial to the Russian economy.

Hydraulic fracturing application can be divided into three categories: skin-bypass treatments in the 1990s, production-



Mukhitov

enhancement treatments for specific reservoir conditions from the late 1990s to the present, and optimization of production-enhancement treatments to address multizone completions and horizontal-well fracturing from 2003 to the present and likely into the future. Multizone stimulation and horizontal-well fracturing—partially after sidetracking existing

nonusable well stock—will be a key to Russia reaching its future production targets.

- "Main Tendencies of the Sweep Efficiency Improvement Evolution in Russia" by authors from Schlumberger and the Russian State Reserves Committee analyzed the sweep efficiency enhancement technologies that have been applied in Russia. The most common sweep efficiency enhancement techniques are sidetracking, nonstationary flooding, and flow-diverting technologies based on chemical injection. Hydraulic fracturing can also be used to improve sweep efficiency by treatment. The paper presented several case histories of these treatment techniques and identified development trends for the future.

1. Flow-diverting technologies based on different agents used in injection wells, infill drilling, and nonstationary flooding have been the chief sweep efficiency enhancement

Students Showcase Talent at Regional Paper Contest

The Third Regional Student Paper Contest was held during the Russian Oil and Gas Technical Conference and Exhibition. This was the first contest held in the region since the formation of the new Russian and Caspian Region of SPE, and 13 out of the 18 registered SPE student chapters from the region were represented. Also new this year was the division of contestants into three categories—undergraduate, master's, and PhD—because of the large response to the call for abstracts.

Sixteen students competed in the undergraduate division, presenting their work on a variety of technical topics from seismic to reservoir simulation. Winners were selected based on the technical content and individual presentation skills by a panel of three judges. The judges, Dinara Salyamova, Andrey Gladkov, and Mike Mayorov (with afternoon substitute Anastasia Tsibik), challenged each presenter with questions designed to evaluate their knowledge on the subject of their presentation. First place went to Dmitry N. Kuravskiy representing Gubkin University in Moscow, whose presentation "Methods of Making Fine-dispersed Gas-water Mixtures and Calculation Parameters Dispersion Device to Obtain DWGM with Optimum Data" described his research on devices for creating gas in water dispersions for injection. Second-place winner Alexander V. Zhonin of Ufa State Aviation University presented "Diagnosis of Unstable ESP Operation." Third place was awarded to Alena Vinogradova of Tyumen State University, who presented "Classification of Type of Reservoir Using Method of Hydraulic Flow Units." In the master's division, four

competitors impressed the panel of three judges, Sergey Kolbikov, Evgeyniy Kovalevskiy, and Valery Chkuaseli, with their depth of research and presentation quality. The first-place winner was Ksenia (Kulakova) Antipova from Samara State Technical University, with her presentation "Paradoxical Phenomena in Deep Waters," which used special core analyses to explain secondary deposition in primary porosity. Second-place honors went to Maxim Fayzullin of Tomsk Polytechnic University presenting "Methodology for Determining Permeability in the Lower Jurassic Formations."

The PhD division was judged by the same panel as the master's division. Four contestants presented original material commensurate with their level of education. First place went to Maria Belyanushkina of Russian State Geological Prospecting University for her presentation on "Application of Complex Clustering Algorithms for Calculating and Determining Facies from Seismic Data," describing her unique calculation method for facies mapping from seismic data. Second place went to Alexander Y. Petrov of Moscow Institute of Physics and Technology, who presented "Application of Horizontal Drilling Technology in Western Siberia."

First-place winners will receive an all-expenses paid trip to represent the region at the 2009 International SPE Student Paper Contest, which will be held during the SPE Annual Technical Conference and Exhibition in October 2009 in New Orleans, Louisiana. Contributions from the event's sponsors, ExxonMobil and PetroAlliance, allowed students from all over the region to participate in the contest.

techniques used. Recently, horizontal wells have been used more often for field development.

2. Sidetracking and horizontal drilling have distinctive advantages compared with other techniques in sweep efficiency enhancement, the authors say.

• “The Unique Experience of Odoptu-more Field Development—A New Stage in Russian Offshore Projects” by authors from RN-SakhalinNIPImorneft and RN-Sakhalinmorneftegaz examined the unique experience of Odoptu-more (Northern Dome) field development by Rosneft. The field is located 5 to 7 km from the shore of Sakhalin Island under the Sea of Okhotsk. Onshore extended-reach wells with horizontal section are drilled in severe arctic conditions. The successful experience of extended-reach drilling gained by Rosneft since 1998 was adopted in 2003 by Exxon Neftegaz, the Sakhalin-1 project consortium operator. Among the authors’ conclusions were that:

1. Horizontal well patterns taking into consideration subsurface features will provide maximum recovery of the field’s hydrocarbon reserves and will allow an increase in the recovery factor.

2. Experience gained during the Odoptu (Northern Dome) field development by extended-reach-well drilling with horizontal offset up to 7 km, has indicated high efficiency of similar technologies used during the development of neighboring fields, located offshore in the Sea of Okhotsk.

3. Proactive geosteering technology was favorable to the increase of the effective wellbore length four times and to doubling the sweep efficiency, taking into account the highly complicated field geology.

• “Well Productivity and Oil Recovery Enhancement in East and West Siberian Fields as a Result of Inflow Control Technology and Application” by authors from Rosneft and Baker Hughes noted the operational risks and challenges in oil production because of the highly diverse reservoir properties of Siberian fields. The majority of the operator’s east and west Siberian fields include heterogeneous sandstones with low to high permeability, complicated geological and stratigraphic cross-sections, and an active bottom water aquifer. In some areas, a gas cap is one of the drive mechanisms.

More than 30 sets of downhole equipment have been purchased for the Vankor project. It was initially expected that the open hole would be drilled with a 143 mm drill bit, hence 101.6 mm outside diameter (OD) openhole completion equipment was purchased for installation. However, to increase designed well productivity re-engineering of the drilling plan means 152.4 mm holes with a dogleg from 2° to 6° per 30 meter build angle can now be drilled. Because of the larger open hole, 30 sets of 114.3 mm OD openhole equipment were purchased for installation. Based on the success of the Komsomolskoe and Vankor developments, the operator intends to install further completions using the technology in the east Siberian and Sakhalin fields.

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New Russian-Language Publication Debuts

Timed with the 2008 SPE Russian Oil and Gas Technical Conference and Exhibition was the debut of SPE's first non-English language publication. *SPE Review—Russian/Caspian* was sent electronically in October to more than 5,000 oil and gas professionals working in Russia, primarily non-SPE members.

The first 20-page issue featured interviews with SPE members—including Phil Poettman, SPE's first Distinguished Member from Russia; a full-length technical paper; a report from a recent gas condensate workshop; a preview of the Russian oil conference; details of SPE's history in Russia; an event calendar; and a listing of SPE section activities in the region.

The publication is the most recent example of SPE's growth in Russia. SPE's first section was established in 1992 and an SPE office opened in Moscow in 2007. Professional membership in the country has grown to 746, with 488 of those members classified as young professionals under the age of 36. In addition, there are 251 student members spread across 13 student chapters at universities. In 2006, young members of the Moscow Section established a Young Professionals program, the first of its kind in Russia.

SPE Review—Russian/Caspian will be sent electronically every other month and subsequent issues will generally follow the first issue's format. Those interested in more information about the new publication should contact SPE's Moscow office at +7 495 748 3588 or crocionova@spe.org.

The Children of Oilmen

On display in the exhibit area of the conference was artwork from children whose parents work in the Russian oil and gas sector. The display featured winners of a nationwide contest titled, "We are the Children of Oilmen." Organizers said this is the first time such a national contest highlighting parents who work in the Russian oil and gas industry has been held.

Prize winners under the age of 16 were allowed to attend the exhibition. The main goal of the contest is to attract young people to a career in the petroleum industry as well as to maintain family traditions. Categories in the contest included the themes of:

- I am Proud of My Family
- The Image of an Oilman
- Profession Dynasty
- Oil Symbols
- My Future Profession
- Russia—an Oil Power

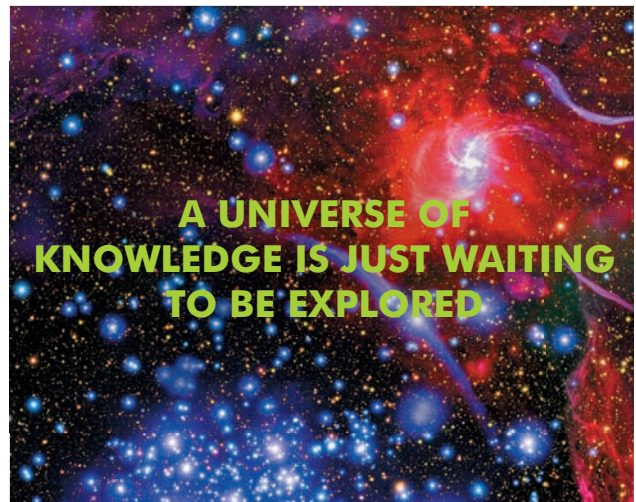
The best works in the contest will participate in the nationwide "Images of Science 2008" contest and will be displayed for a year at various Russian and international scientific and technical conferences and forums. The contest is being run by "Mir Nauki" (World of Science), a nonprofit partnership for science and technology promotion.



One of the winners of the Children of Oilmen contest.

Other highlights of this year's event included a Young Professionals Workshop chaired by 2005 SPE President Giovanni Paccaloni. Students from top universities in Moscow and four young professionals gave presentations on one of four values: learning, innovation, excellence, and social responsibility. An award for the best presentation was given out during the closing ceremony. In addition, a student paper contest featuring graduate and undergraduate students took place.

The next SPE Russian Oil and Gas Technical Conference and Exhibition is scheduled for October 2010 in Moscow. **JPT**



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