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Press-release

Attracting New Technologies into Drilling in Turkmenistan

The Program of Development of Turkmenistan's Oil and Gas Complex, developed by sector specialists and approved by President of Turkmenistan Saparmurat Turkmenbashi, calls for raising by 2005 production of oil with condensate and gas to 28 million tons and 85 billion cu m, respectively, and increasing production further by 2010 to 48 million tons of oil with condensate and 120 billion cu m of gas.

The growth projection for hydrocarbons production in the country is supported by high estimates of Turkmenistan's hydrocarbons potential. For instance, as of early 2001, current geological hydrocarbons resources, including Turkmenistan's sector of the Caspian Sea, were estimated at 43.21 billion tons of reference fuel. Of these, recoverable reserves stood at 28.38 billion tons.

To date, only 24% of Turkmenistan's hydrocarbons resources have been developed (production + explored reserves), which bodes well for further increases in explored hydrocarbons reserves, provided that exploration and prospecting are organized and carried out effectively.

To ensure that this is indeed the case, in the first years after the country became an independent state, Turkmenistan has embarked on a course of introducing most modern equipment and technologies into geological exploration (geophysical and drilling works).

Especially effective have been high-precision technologies and equipment introduced into geological exploration, such as 3D seismic survey technology and vertical seismic profiling equipment that provides the capability to obtain precise data relating to speed parameters of individual formations, essential in ensuring a more accurate interpretation of seismic surveys results. 3D shooting helped update data on the deep structure of the Altyn Asyr territory on the right bank of river Amu Darya, work is currently under way to study deep horizons and to update data pertaining to oil and gas pools discovered earlier in southeastern Turkmenistan in the Prekhazarian zone and in the Gogerehdag-Ekerem zone.

Year in and year out, Turkmenistan has been increasing the volume of both production and exploration deep drilling. Over the past five years, the volume of production drilling increased 2.6 times, while exploration drilling gained 2.2 times.

A special priority in the course of deep drilling is assigned to tapping deep Miocene and Mesozoic deposits in the west of the country, and pre-Jurassic deposits in central and eastern Turkmenistan, that have not been studied before.

Onshore deep drilling in Turkmenistan

is carried out by drilling enterprises within the State Concerns Turkmenneft and Turkmengeology, and the State Corporation Turkmengeologiya. Drilling is performed on prospective onshore territories in Turkmenistan, such as promising oil- and gas-bearing areas in northern and southern Prigarabogaz, Pribalkan, Gogerehdag-Ekerem, and Aladag-Misriyan elevation zones, and prospects in the Central Garagum, Deryalyk-Dovdan, Turkmenabad, Murgab, Badkhyz-Garabil and Unguz oil- and gas-bearing regions, and in other areas.

Over the past years, priority in production drilling was given to controlled directional drilling and horizontal borehole wells completion with a view to enhancing the productivity of production wells.

This year, works were launched under a special program to develop deep deposits (occurring at depths ranging between 5,500 and 7,000 meters), including Miocene and Mesozoic deposits in western Turkmenistan, that are expected to harbor the bulk of that region's hydrocarbons resources. Specialists' projections indicate that by 2005, around half of all oil and gas produced by the State Concern Turkmenneft will be recovered from deep horizons.

Drilling of wells in Turkmenistan has a certain specificity due to the following factors:

- anomalously low formation pressure in depleted upper reservoirs at fields currently explored for resources in deep formations,
- anomalously high formation pressure in excess of 1,000 atms, and high temperatures in prospective Jurassic subsalt deposits in eastern Turkmenistan, and in the lower transverse section of deposits studied in southeastern Turkmenistan,
- high concentrations of aggressive components, such as hydrogen sulfide and carbon dioxide in production,
- substantial thickness (1,000 m and above) of saliferous evaporite deposits that contain lentils of high-pressure brine, as well as tight "free-flowing" strata.

In these conditions, the efficiency of hole-making and well-completion operations is contingent on availability of modern equipment and technologies, such as high-strength drilling bits ensuring high rates of drilling; high-quality drilling fluids with a variety of physical and chemical properties, ensuring a high efficiency of drilling under different geological conditions; high-strength drilling and casing pipes, and well-blowout preventor equipment and flowheads; modern core-recovery equipment that provides the capability of drilling with virtually continuous core recovery of up to

90% and above; measurement of data obtained in the course of certain field geophysical surveys during drilling, rendering roundtrip operations unnecessary; modern technologies allowing testing during drilling, etc.

In production drilling, the principal technical goal was to develop downhole arrangements ensuring higher oil recovery rates:

- multiple-hole wells,
- wells with horizontal wellbores,
- wells with two strings of tubing for producing two or more horizons.

Operations of this type are designed and partially implemented at the multi-layer Korpedzhe, Goturdepe, Barsagelmes and South Gamyshlydzha fields in western Turkmenistan, and can also be used to develop carbonaceous upper Jurassic deposits in eastern Turkmenistan whenever gas pools occur in poor-porous variations of collectors that do not produce high flow rates during development.

Opportunities for employing modern foreign technologies and equipment in Turkmenistan's oil and gas sector are explored at annual conferences, roundtables, seminars and presentations. Of the numerous offers made by international companies, proposals that correspond to local geological conditions to a maximum extent are selected and introduced into production.

For example, the use of Belgium-manufactured Security DBS core extractors in wells drilled at the Bereketli and Yashyldepe fields on the right bank of river Amu Darya raised core recovery to 84% and above. Based on this rate of core recovery, field operators will be able to conduct more detailed studies of reservoir properties of pay zones, and increase estimates of reserves in reservoirs and deposits. Canadian HPI-HERLAND RIG-700C mobile drilling rigs are effectively operated in the Tagtabazar submountain region. Operators are also introducing J-70 drilling rigs manufactured in China, drilling bits supplied by Cameron, Baker Hughes and Halliburton, sidetracking technology developed by Russia's Oil and Gas Technology Engineering (Krasnodar), equipment for controlled directional and horizontal drilling produced by plant "Potential", a Kharkov-based manufacturer in Ukraine. High-technology equipment supplied by Bentech (Germany) and many other manufacturers is being introduced at fields in western Turkmenistan.

In future, Turkmenistan will unswervingly continue to pursue its policy of introducing the most modern equipment and technologies into geological exploration. ■



Turkmenistan's Sector of the Caspian Sea: Potential for Investors

The Caspian Sea, the world's largest land-locked watermass, harbors unique natural resources and colossal hydrocarbons reserves, which make it one of the richest oil- and gas-bearing basins in the world. In order to develop hydrocarbon resources in Turkmenistan's sector of the Caspian Sea, the Government of Turkmenistan intends to attract on a broad scale foreign companies that possess substantial experience of offshore oil and gas exploration and production, and capabilities of employing modern technologies and equipment.

Opportunities of attracting foreign oil companies into developing the hydrocarbons potential of Turkmenistan's sector of the Caspian Sea were highlighted in the interview granted by Khoshgeldy Kurbanovich Babayev, Chairman of the State Enterprise for the Issues of the Caspian Sea under the President of Turkmenistan.

Correspondent: Esteemed Khoshgeldy Kurbanovich, a substantial hydrocarbons potential of Turkmenistan's sector of the Caspian Sea, that contains 32 identified oil and gas prospects offered to foreign investors for explorations and development, appears attractive to quite a few oil and gas companies. Could you comment on the most recent accomplishments in that sphere?

Kh. Babayev: Indeed, around half of Turkmenistan's oil reserves and some 25% of natural gas reserves are located in the Caspian Sea region. Geological exploration performed jointly by Turkmen and foreign specialists, interpretation and analysis of all available data for Turkmenistan's sector of the Caspian Sea, as well as selection of variables used to estimate reserves in prospective oil- and gas-bearing horizons at depths ranging between 2,000 and 7,000 meters, suggest that the hydrocarbons potential of Turkmenistan's sector stands at 11 billion tons of oil and 5.5 trillion cubic meters of gas, not counting in the contract territories Block 1 and Cheleken.

Recently, foreign companies operating blocks there on PSA terms have achieved impressive results. In late June, company Dragon Oil, that works on the Cheleken block, brought on-stream a production well that flowed around 400 tons (2,892 barrels) of oil per day. Last August, company Petronas Charigali, working on Block-1, drilled the fourth exploration well at the Makhtumkuli field (formerly Eastern Livanov) that flowed 1,937 tons (over 14,000) barrels of oil daily, and 539,000 cubic meters (in excess of 19 million cubic feet) of gas per day. These discoveries are yet another proof that Turkmenistan's sector of the Caspian Sea is indeed a highly promising area.

Correspondent: How many foreign companies have shown interest in licensed offshore blocks in Turkmenistan's sector of the Caspian Sea to date?

Kh. Babayev: At this licensing stage, over 20 international oil and gas companies have shown interest in offshore blocks. These companies have purchased geological, geophysical and technical data, and are currently studying the territory of Turkmenistan's sector of the Caspian Sea.

More than 10 companies have officially submitted their proposals for obtaining licenses and for signing production-sharing agreements. The Working Group of the Authorized Organ for the Use of Hydrocarbon Resources under the President of Turkmenistan is currently engaged in negotiations with four foreign oil companies on signing production-sharing agreements and issuance of licenses.

Correspondent: How well are proposed offshore blocks explored and geological specificities of Turkmenistan's sector studied, and what has been the scope of offshore exploration drilling?

Kh. Babayev: Over the entire period of prospecting and exploration in Turkmenistan's sector of the Caspian Sea, 2D seismic profiles exceeded 77,300 line kilometers (maturity of data averages 1 line kilometer per one square kilometer).

Between 1996 and 2000, several foreign companies took part in the exploration effort, including Geco (Western Atlas) that used modern technologies and equipment to shoot in excess of 16,000 kilometers of seismic profiles, and for the first time ever studied the shallow portion of Turkmenistan's sec-

tor of the Caspian Sea in areas with sea depths below 10 meters. The company carried on its studies all the way to the coast and tied its research into deep wells positioning.

Over 113 wells have been drilled to date in Turkmenistan's sector of the Caspian Sea, with drilling volume standing at around 445,000 meters. Ten oil and gas deposits have been discovered as a result of exploration works, some of these deposits are currently being developed; prospective oil- and gas-bearing zones have been identified and classified in terms of their potential, and a new geological model of Turkmenistan's sector of the Caspian Sea and adjacent areas has been developed.

Prospects of discovering new oil and gas deposits in Turkmenistan's sector of the Caspian Sea are associated with Pliocene oil- and gas-bearing complex in the offshore South Caspian depression, and Mesozoic-Paleozoic deposits in the slopes of the Medium Caspian Garabagazgol dome elevations.

It should be noted that new substantial liquid and gaseous hydrocarbons reserves may still be discovered in Turkmenistan's sector, since over 80% of oil, gas and condensate resources are associated with deposits located at depths in excess of 3 kilometers, and in new zones of oil and gas accumulations that have not been sufficiently studied.

Correspondent: Massive investments are needed for a comprehensive development of offshore projects in Turkmenistan; should calculations suggest the expediency of merging offshore blocks, does Turkmenistan's legislation allow it?

Kh. Babayev: In line with the program of offshore blocks licensing, they are to be licensed through direct negotiations with interested foreign compa-



nies. Blocks can be merged both prior to negotiations and after negotiations.

Prior to negotiations, blocks can be merged on the following principles. An interested company or a consortium of companies can apply to the Competent Organ for the Use of Hydrocarbon Resources under the President of Turkmenistan (provided such an application complies with provisions of Article 12 of Turkmenistan's Law on Hydrocarbons Resources) for a license for one or several offshore blocks. Whether or not a company (or a consortium of companies) will be granted the right to develop several offshore blocks will be decided by the sides through negotiations.

Several blocks, developed by contractors, may be merged for the purpose of joint development and operation, i.e. after appropriate agreements have been concluded, based on the provisions of Article 29 of Turkmenistan's Law on Hydrocarbon Resources. The Law and a production-sharing agreement may provide both for "voluntary joint development" and "mandatory joint development."

Under a *voluntary* joint development clause, contractors independently may sign an Agreement for Joint Development of a field, and submit it for consideration to the Authorized Organ.

Under a *mandatory* development clause, the Authorized Organ may make it binding on several contractors to enter into an agreement among themselves to develop a field jointly.

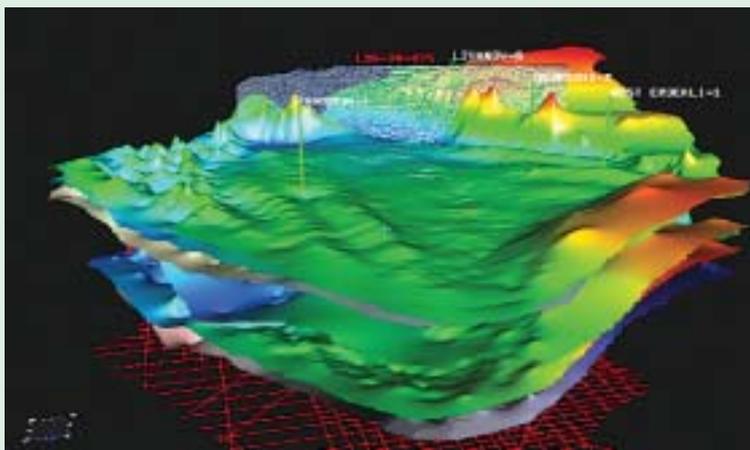
Under these scenarios, blocks are merged only for the purpose of their simultaneous development; nevertheless, production-sharing agreement signed by the Authorized Organ with each respective contractor will retain in effect separately.

Correspondent: Are there blocks challenged by Azerbaijan in terms of jurisdiction, among licensed offshore blocks?

Kh. Babayev: Turkmenistan, proceeding from a principled and consistent position, favors an early resolution of the issue of the international legal status of the Caspian Sea, that should take into account new political realities and interests of all Caspian Sea states. Turkmenistan has always displayed, and is now displaying, reserve in practical actions in the Caspian Sea until its new legal status is determined; Turkmenistan has respected and is respecting now the positions of all Caspian nations.

However, Azerbaijan has taken the liberty of making moves that run counter to interests of other Caspian nations. Reiterating the importance, among other things, of reaching an agreement on a fair division of the sea, the Azeri side nevertheless unilaterally announced, ignoring the opinion and sovereign rights of other countries, its priority rights to several deposits and prospective structures in the Caspian Sea.

I could mention such deposits as Osman (the name Azerbaijan uses is Chyrag) and Omar (the name Azerbaijan uses is Azeri); while Osman is



Major horizons: 3D Image

partially located in Turkmenistan's sector of the Caspian Sea, all of Omar is part of the Turkmen offshore block III in Turkmenistan's sector of the Caspian Sea.

Ignoring Turkmenistan's suggestions that unilateral oil and gas works be suspended until the status of the Caspian Sea is resolved, Azerbaijan is pushing ahead with work in zones whose jurisdiction so far has not been determined.

Among other things, Azerbaijan signed an exploration and development contract for the Abikh block that includes such prospects as Araz, Alov and Sharg (names of blocks used by Azerbaijan), where the latter structure, called Altyn Asyr, is located in Turkmenistan's sector and is part of the offshore block 24.

We are confident that we shall be able to resolve territorial claims that we are confronted with at present.

Correspondent: Esteemed Khoshgeldy Kurbanovich, could you elaborate on opportunities and long-term plans for transporting oil produced in Turkmenistan's sector of the Caspian Sea?

Kh. Babayev: At present, foreign oil companies operating in Turkmenistan on production-sharing agreements freely ship for export their share of produced oil in tankers across the Caspian Sea in following main directions:

- To the Iranian port of Neka (then via Iran to the Persian Gulf, on swap deals; oil is then transported to European and Asian countries);

- Via Baku and Makhachkala (then by rail or existing pipelines) to Black Sea ports;

- Via Astrakhan and Volga-Don Canal to Black Sea ports;

- In addition, oil can be delivered via Russia by rail to port Ventspils on the Baltic coast, and on to northern Europe.

Also, options for building an export oil pipeline from Kazakhstan via

Turkmenistan and Iran to the Persian Gulf, running close to the Caspian shore, is being considered for the long term.

Correspondent: What are port infrastructure capacities for oil and refined products transshipment in place in ports now? Are there plans for expansion?

Kh. Babayev: Expansion and modernization of port infrastructure capacities is one of our priorities. Oil and refined products are currently shipped for export via the Turkmenbashi port, and Aladzha and Ekerem terminals.

The Turkmenbashi port has the capacity of transshipping refined products only; it can handle 3 million tons of petroleum products per year. Two oil piers there are to be reconstructed, a third pier will be built; as a result, refined products transshipment will grow to 5 million tons per year. Oil is shipped for export from terminals in Aladzha (throughput capacity of 2.4 million tons per year) and Ekerem (1.2 million tons). The former has the capability of servicing 5,000-DWT tankers, while the latter can handle tankers of up to 7 DWT. A pier, recently reconstructed at the Ekerem terminal, has the capability of pouring oil into two tankers simultaneously. An international tender has been announced for constructing a new oil pier with throughput capacity of 2 million tons per year.

Turkmenistan also has plans to create its own tanker fleet. The first Turkmen tanker was built last year. With its own tanker fleet at its disposal, Turkmenistan will be able to cut costs involved in foreign freight that annually run up to around 4 million tons of oil and refined products. ■



LPG Plant in Nayip

Liquefied gas is a new export product in Turkmenistan that in 2001 produced 111,200 tons of LPG. Plans for 2002 call for raising production to 245,200 tons. Liquefied gas is currently produced in Turkmenistan by three plants.

The first gas liquefaction unit (UPSG-1) was commissioned at the Nayip gas fields in June 1998. Equipment supply, contract supervision and start-up works were performed by TECHNOFRIGO DELL'ORTO SpA (Italy), while units of the State Concern Turkmenneftegazstroy were responsible for construction and installation.

An annual design capacity of UPSG-1 is 1.0 billion cu m of processed gas, 15,000 tons of LPG, and 15,000 tons of gas condensate. Since it was brought on-stream, UPSG-1 has performed in a stable way producing at its rated capacity.



A two-stage process used by UPSG-1 yields a propane-butane mixture and gasoline as its end-products. During stage one, gas is dewatered by TEG in a glycol dehydrator at temperatures of up to -10°C . Stage two involves dehydration by molecular sieve filters at temperatures of up to -20°C . Then gas is fed into a cold exchanger where deep refrigeration occurs and gas is expanded in a turbine expansion engine to -85°C . The next stage is low temperature separation that produces liquid products. Finally, deethanization and production of end-products, i.e. propane-butane and gasoline, occur at the last stage.

Output of UPSG-1 Nayip meets the requirements of the TDS 20448 -90 certificate of quality for the following fractions:

- sum total of methane - not specified.
- sum total of propane - up to 60%.
- sum total of butane - up to 40%.
- liquid residuum, percent by volume - up to 1%.

It was no accident that the Nayip group of fields was chosen for building

the second LPG plant. Reserves in the fields making up this group (Nayip, North Nayip, South Nayip, Bovrideshik, Kerpichli, North Balguuy, Balguuy, Gazlydepe, the Dervez group of fields, Babarap, Kerven and other fields) harbor sufficient reserves to provide feedstock for the plants for another 50 years.

Construction of a new gas liquefaction unit is currently being completed there. The unit will have a daily gas processing capacity of 9.0 million cu m, an annual LPG production capacity of 65,000 tons, and an annual gas condensate production capacity of 65,000 tons.

UPSG -2 will employ the following process: Following initial separation, gas will be fed to dewatering and treatment filter, then to a molecular sieve filter. At the next stage, gas will be fed through a mechanical filter into a cold exchanger, refrigerated in a turbine expansion engine, and after low-temperature separation will be deethanized and propane-butane and liquid fractions will

be produced. The quality of production will be identical to that of LPG produced by UPSG-1. The design of UPSG-2 envisages two trains, each processing 4.5 million cu m of gas per day.

The new plant is being built pursuant to Decree of the President of Turkmenistan № 4956, dated 27 October 2000, under a contract signed with Canada's Thermo Design Engineering that will construct the facility on turn-key terms. The US\$25-million plant is to be commissioned in December 2002. The project is financed by the State Concern Turkmengaz.

Three additional tanks with combined storage capacity of 600 tons are being installed with a view to extending the throughput capacity of the Gaz-Achak filling point located 50 km from the field, that will accept, store and ship liquefied gas. Thus, all necessary arrangements have been made to handle additional production: a storage plant and existing capacities at a rail tank car and a tank truck loading racks have been prepared. In addition, a new 159 mm products pipeline currently under construction will link the field with the loading point.

The other two LPG units are operated in the city of Turkmenbashi (its annual capacity is up to 10,000 tons per year), and at the Turkmenbashi oil refinery. The latter unit, currently producing 220,000 tons per year, will increase annual production to 345,000 tons per year once its design capacity is reached.

LPG produced by these plants is handed over to the State Trading Corporation Turkmenneftegaz, which ships production by rail and automobile transport for export and on Turkmenistan's domestic market. Virtually the entire volume of LPG slated for export is to be subsequently exported through open auctions. Iran and Afghanistan have so far been the principal consumers of liquefied gas. ■



*UPSG-2 construction:
general view*



High-Technology Operations Are the Future of Geological Exploration

Right Bank of River Amu Darya: 3D Seismics Carried Out Jointly with CGG at Altyn Asyr Block to Appraise Hydrocarbons Reserves.

Turkmenistan annually makes up for extracted hydrocarbons by increasing its explored reserves. Further increase in oil and gas production in Turkmenistan is contingent on availability of sufficient explored reserves of hydrocarbons and a higher efficiency of exploration at newly discovered deposits.

The area on the right bank of river Amu Darya is a highly promising territory that harbors rich gas reserves, and probably significant oil reserves in upper Jurassic carbonaceous deposits. The Altyn Asyr block is located in the Yashyldepe oil- and gas-bearing district of the Turkmenabat oil- and gas-bearing region in the Pirguyy-Yanguyy gas accumulation zone. The block includes the Bereketli, Pirguyy, Yanguyy, North Yanguyy, Chashguyy and Sandykly fields, densely located next to well-known large deposits: the Samandepa gas condensate and Kokdumalak (Yashyldepe) oil/gas condensate fields. This block was chosen for surveys employing the boundary point method in a 3D modification because its subsalt carbonaceous complex, that included numerous plays with complicated structures, produced commercial gas influx rates from appraisal wells at the Altyn Asyr block of 1.5-2 million cu m per day. Based on the results of surveys carried out on the block and outside its boundaries, resources on the right bank of river Amu Darya were estimated at over 1.7 trillion cu m of gas. Reserves of the Altyn Asyr block are currently updated by deep exploration drilling and well testing.

3D seismic surveys were performed by the Lebap geophysical party, a unit of the State Concern Turkmengeologiya, between 1999 and 2000. The Lebap geophysical party employed modern sophisticated equipment supplied by Sercel: a SN 388 seismic acquisition system and 27-ton Merz vibrators. Since 3D seismic surveys at the Altyn Asyr block, performed jointly with company CGG, were carried out on flat terrain, they produced data of sufficient quality.

The aim of the surveys was to develop models of carbonaceous reservoirs, update the geometry of reservoirs identified earlier, evaluate net volume of traps and formations, fluid saturation, reserves density, choose an optimal pattern of appraisal, exploration and pilot (development test) wells, to calculate gas reserves and resources, as well as associated components, for a subse-

quent development of a pilot field development project.

In late 2001, Ashgabat methodical party, unit of the State Concern Turkmengeologiya, completed processing and interpretation of seismic and well log surveys data. The party used CGG's software for processing, and GeoQwest Schlumberger's software for interpretation of data. The GeoVector Plus software package was used in data processing performed jointly with CGG's specialists. Even though the software package ensured an acceptable quality of data processing, according to specialists, procedures offered by the software suite were not up to the complexity of data at hand.

Results of 3D seismics were used in a report that evaluated and calculated hydrocarbons reserves in the above fields and other prospective areas, and appraised maturity of geological and geophysical data as of 1 July 2001. Available results of 3D seismics will help substantially cut the volume of costly drilling in the course of subsequent exploration of reserves.

As a result of geological exploration for gas (2D and 3D seismic surveys and exploration drilling), the State Concerns Turkmengeologiya and Turkmengaz were able to study deep structures of the Bereketli, Pirguyy, North Yanguyy (Yeribai), Yedili, Chashguyy, Yanguyy and Sandykly gas condensate fields. In addition, a number of new plays on the Altyn Asyr block were prepared for drilling.

All identified reservoirs occur in subsalt upper Jurassic carbonaceous Callovian-Oxford complexes. They are mostly of a massive formation type, are complicated by faults, and have lithologic-structural barriers.

Natural gas in pay horizons was classified as sulphurous-carbonate-hydrocarbon gas containing condensate, ethane, propane, butane in commercial volumes.

A comprehensive interpretation of 3D seismic surveys provided detailed data on the structure of the Bereketli, Pirguyy, Sandykly fields and on the Yanguyy group of fields, data pertaining to including tectonic properties, structural planes correlation of various lithologic-stratigraphic surfaces, geometric parameters of gas reservoirs and caps, hydrocarbons traps' limits, allowing to esti-

mate the net volume of collectors and to develop a 3D model of the reservoirs.

A series of structure maps of the top and bottom of the pay horizon, i.e. of the Callovian-Oxford reservoir, was developed, and pool limits (gas-water contact), distribution of net reservoir thickness and net gas-saturated thickness, porosity and gas saturation were defined.

Based on the results of surveys and studies, drilling of confirmation, exploration and prospect wells was recommended. Significantly, drilling of confirmation wells was recommended in the course of pilot development. One accomplishment of works that were performed was mapping of the internal structure of the carbonaceous reservoir (maps of areal convergence of facies were developed for the first time), which will contribute to an optimal arrangement of wells.

3D seismics provide the capability to evaluate the commercial potential of fields and to combine preparation of fields for development and their pilot development. A small number of wells drilled during pilot development can serve to update earlier hydrocarbons reserves counts, and to launch a full-scale development. This will substantially shorten the timeframe of bringing fields on stream, and help cut hydrocarbons prospecting and exploration costs.

Turkmenistan intends to continue to introduce modern equipment and technologies into prospecting and exploration, giving priority to highly effective methods of 3D seismics. ■





Cooperation with Ukraine: Oil and Gas Projects



**CS Iylanly construction:
compressor shop GPA-C-16**

Ukraine is one of Turkmenistan's major economic partners. Mutual interests of the two states are determined, first and foremost, by historical production and technological ties in oil and gas production, transportation and processing of hydrocarbon resources produced by the fuel and energy complex. Both Ukraine and Turkmenistan have a stake in maintaining and advancing these ties on a mutually beneficial basis.

Ukrainian engineers began working in Turkmenistan in the late 1970s - early 1980s. Deliveries of Turkmen gas, partially paid for by Ukraine's involvement in investment projects in Turkmenistan's oil and gas sector, play an important role in this cooperation.

Broken down by Turkmen customer corporations, data below characterize various joint projects.

Projects of State Concern Turkmenneftegaz

The main partner of State Corporation Turkmenneftegaz is the M.V. Frunze Machine Building Scientific-Production Association (SMNPO) based in the city of Sumy. From 1984, its specialists designed, built and commissioned a number of gas transport infrastructure facilities (see Table).

Construction is currently under way of the second 80,000-kW line compressor station Iylanly. Built on turn-key terms, the new stations will have more than

ed by yearend 2003. Last year Ukrainian specialists also revamped the automation system at the Kirpichli booster compressor station at a cost of \$2.7 million (contractor - OOO Ukrainian Gas Technologies).

Projects of State Trade Corporation Turkmenneftegaz

The main partner of the State Trade Corporation Turkmenneftegaz is subsidiary SU-7 of closed joint stock company Ukgazprombud that has been operating in Turkmenistan since 1995.

Payments for works completed at all projects are made by gas deliveries to Ukraine.

The following gas transport infrastructure facilities are currently under construction: a linking gas pipeline that includes a section crossing river Amu Darya (16 km), electric and chemical protection system at the gas pipeline Tedzhen-Ashgabat-Biuzmein (TAB) with a power transmission line (90 km), reconstruction of compressor station Belek involving replacement and installation of new 8.3 billion cu m-per-year



**Dust collector,
gascleaning unit of CS Iylanly**

double the capacity of the old Iylanly compressor station. The station, that will cost over \$88 million to build, is to be commissioned in February 2003.

In addition, under a construction contract signed in 2001, design work has been almost completed for building a new 80,000-kW line compressor station Deryalyk. Construction works under the \$90-million contract are to be complet-

**Table 1. CHARACTERISTICS OF COMPRESSOR
AND BOOSTER COMPRESSOR STATIONS**

Station	Unit Type	Number of Units	Year Commissioned
CS Pustynnaya	GPA-Ts-6.3	21	1982
	GPA-Ts-16	3	1982
BCS Shatlyk	GPA-Ts-6.3	7	1984
	GPA-Ts-6.3	7	1986-1987
SC Deryalyk	GPA-Ts-6.3	14	1983-1984
CS Iylanly	GPA-Ts-6.3	6	1984
BCS Kipichli	GPA-Ts-6.3	8	1986-1988
BCS Uch-Adzhi	GPA-Ts-6.3	4	1992
BCS Dovletabad	GPA-Ts-6.3	4	1999



Our Partners



Gas pipeline crossing Garabogaz-Gol

compressor units, and a section of the gas pipeline crossing the Karabogaz strait (1.6 km). These projects will cost a total of around \$33 million to complete. Table 2 contains more detailed data relating to the above projects.

In 1997-2001, company Ukgazprombud constructed facilities worth around \$66 million (see Table 3).

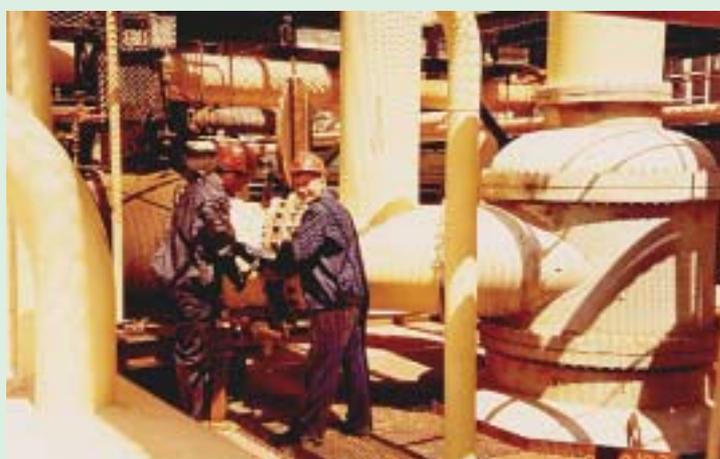
Projects of State Concern

Turkmenneft

The main partners of the State Concern Turkmenneft are the M.V. Frunze SMNPO and company ATF

Facility	Construction Framework	Cost, US\$
1. Linking gas pipeline, with river Amu Darya crossing	2001-2002	\$15 million
2. Electric and chemical protection system at TAB gas pipeline, with power transmission line	2002-2002	\$1.751 million
3. Reconstruction of CS Belek	2002-2003	\$7.415 million
4. Karabogaz strait gas pipeline crossing	2002-2003	\$8.671 million

Ukgazstroy. In addition, closed joint stock company (ZAO) Engineering Company working at the Gotur-depe field, building a new gas lift compressor station (contractor - the M.V. Frunze SMNPO)



CS "Serdar" - preparation for commissioning

Ekomatneftegaz, and closed joint stock company Ukgipro-bud also work on several facilities.

Ukrainian specialists are currently

and reconstructing an old compressor station (phase IV) (the contractor, ZAO Ukgipro-bud, is paid in hard currency). The new gas lift compressor station will have a daily capacity of 12 million cu m, including a daily gas lift capacity of 5.5 million cu m, and will daily deliver 6.5 million cu m of gas to the Central Asia-Center trunk line. As a result of reconstruction involving an overhaul of nine gas-compressor units, cooling system, modernization of the automation system etc., the old Goturdepe compressor station will become more reliable.

Also, this year Ukrainian specialists will complete operation works at a complex gas treatment plant at the Korpudzhe field and at measuring station Chalayuk (on the border with Iran). The project (contractor - ZAO Engineering Company Ekomatneftegaz) was aimed at accomplishing the following goals: to stabilize gas deliveries from the Korpudzhe field and to enhance the quality and reliability of natural gas delivery to the Islamic Republic of Iran via the Korpudzhe-Kord Kuy export gas pipeline. In addition to operation works, the project involved training of personnel, upgrading of software and developing systems operating manuals, as well

Project	Year Commissioned	Cost US\$	Project Description
1. Kazandzhik-Kyzylarbat gas pipeline	1997	\$21.96 million	90 km in length
2. Compressor station Kaka - phase I	1999	\$23.2 million	Capacity - 18,900 kW (three gas-compressor units). Capacity of each unit - 10.5 million cu m/day
3. Compressor station Kaka - phase II: linking gas pipeline on the MAB-TAB route	2001	\$20.8 million	50 km in length. (Mayskoye-Ashgabat-Biuzmein and Tendzhen-Ashgabat-Biuzmein)



Our Partners



**BCS "Barsagelmes":
adjustment works for compressors start-up**

as routine maintenance at the measuring station. More detailed data relating to these projects are shown in Table 4.

In 2000-2001, Turkmenneft's partners implemented several projects to raise oil production and associated petroleum gas utilization at the Goturdepe and Barsagelmes fields. Specifically, works at the Barsagelmes field involved reconstruction of compressor station Serdar (with a daily capacity of 8 million cu m of gas), including its system of gathering, transportation and supply of gas lift gas. Since the facility was commissioned in 2001 (contractor - the M.V. Frunze SMNPO), a combined gas lift oil production at the field has exceeded 2.6 million tons.

Phases I, II and III of compressor station Goturdepe reconstruction on turn-key terms were completed at the Goturdepe field (contractor - ATF Ukrkazstroy). The compressor is used to supply gas lift gas to oil wells produced at that field. Ten gas-compressor units were replaced, and a 53-km gas pipeline to Dzhebel-CAC-3 point was construct-

ed as part of the associated petroleum gas utilization program. Completion of these works enhanced reliability and operation stability of the compressor station, ensured an uninterrupted operation of gas lift wells and created capabilities for associated petroleum gas utilization of gas pipeline was commissioned in 2001.

Three block and unit gas lift compressor stations were also designed and built at the Goturdepe and Barsagelmes fields (contractor - the M.V. Frunze SMNPO) that are used to operate deep wells, drilled to red beds, by providing high-pressure gas lift of up to 120 atms. With the block and unit compressor stations on-stream, daily oil production from deep wells at the Goturdepe field increased to over 1,141.4 tons. A total of 901,554 tons of oil have been recovered at the field since the CSs were commissioned in 2001, while daily oil production at the Barsagelmes field increased to over 405.8 tons after the block and unit gas lift compressor stations were brought on stream. More detailed data relating to completed projects are shown in Table 5.

Pursuant to the Treaty of Economic Cooperation for 2001-2010 signed between Turkmenistan and Ukraine, and Agreement on Delivery of Turkmen Natural Gas in 2002-2006 and on Principles Governing Mutual Payment for Delivered Gas, the two sides are engaged in negotiations on cooperation in several areas, including geological

Table 4. CURRENT JOINT PROJECTS

Facility	Construction Timeframe	Cost in US\$
1. Construction of gas lift compressor station Goturdepe	2001-2004	\$120 million
2. Reconstruction of CS Goturdepe - phase IV	2002 -2003	\$12.846 million
3. Construction of power plant at Korpedzhe complex gas treatment plant	2002 -2003	\$0.67 million
4. Management and operation of process facilities at Korpedzhe complex gas treatment plant and Chalayuk measuring station	2001-2002	\$3.235 million

Table 5. COMPLETED JOINT PROJECTS

Facility	Year Commissioned	Cost in US\$	Form of Payment
1. Reconstruction of CS Serdar	2001	\$68.792 million	Payment in gas delivery
2. Design, reconstruction phases I and II on turn-key terms, CS Goturdepe	2000-2001	\$17.897 million	Payment in gas delivery
3. Reconstruction phase III, CS Goturdepe, and construction of CS Goturdepe-CAC-3 (Dzhebel) gas pipeline	2001	\$8 million	Payment in hard currency
4. Design and construction of three block and unit gas lift compressor stations at the Goturdepe and Barsagelmes fields	2001	\$8.626 million	Payment in hard currency



**Assembling
new gas pumping aggregate**



HALLIBURTON Presentation

On 23-24 July 2002, company HALLIBURTON held a presentation for Turkmenistan's oil and gas sector personnel. The Turkmen side was represented by over 150 geological exploration and oil and gas production specialists from the State Concerns Turkmengeaz and Turkmenneft, the State Corporation Turkmengeologiya, the Ministry of Oil and Gas Industry and Mineral Resources, and the Cabinet of Ministers of Turkmenistan.

HALLIBURTON's William Duncan, Manager, Business Development Caspian Region, presented an overview of company operations. Other presentations were made as well: by V. Makarov, technical specialist for the Caspian region, on enhanced oil recovery technologies and techniques; by M. Abazlov, authorized business development specialist, on cementing technologies; by D. Slevin, manager for wells completion in Eurasia, on well development and completion products and services; by T. Kalay, representative of HALLIBURTON LANDMARK, on LANDMARK's areas of operations; by A. Uskembayev, operations supervisor, on use of drilling fluids; by I. Mitchell, on drilling services provided by HALLIBURTON's division company Sperre Sun b Securite DBS; by E. Shibalov, geophysics engineer involved in well logging and perforation, on well logging and perforation techniques. E. R. Clark, HALLIBURTON KBR Eurasia's sales manager, made a final presentation "Capabilities and Scope of Services Provided to Customers Involved in Onshore and Offshore Drilling."

Technologies and services provided in practical oil and gas operations, and experience in introducing modern technologies, were of a particular interest to Turkmen specialists as they are deemed to be very important in developing and strengthening the potential of the country's oil and gas sector. These technologies and experience will be thoroughly studied.

The second day of meetings between representatives of HALLIBURTON and specialists from ministries and agencies of Turkmenistan's oil and gas sector was devoted to discussions focusing on technical aspects. During a presentation, representatives of the company emphasized HALLIBURTON's willingness to cooperate with Turkmenistan's oil and gas sector.

Based on the results of the presentation, the Turkmen side decided to define lines of cooperation with the company in a more detailed way, which will subsequently provide the basis for further discussions and negotiations. ■

Third Well Brought On-Stream at Dzheitun Field

In late June 2002, Dragon Oil (Turkmenistan) Ltd. successfully brought on-stream the Dzheitun 22/103 (LAM 22/103) well under a production-sharing agreement for contract territory Cheleken in Turkmenistan's sector of the Caspian Sea. Dzheitun 22/103 is the third production well drilled under the Plan of Development of the Dzheitun (formerly LAM) Deposit. The well was tested and flowed 2,892 barrels of oil per day (around 400 tons).

A multipacker string for single-tubing string four-zones production was stripped into the controlled directional well. Oil is currently recovered from two horizons in the interval of 2,546-3,316 meters. Now that the new well has been brought on-stream, production at the field went up to approximately 2,000 barrels per day (around 1,600 tons). According to a long-term drilling program, a drilling rig that had been operated at the Dzheitun 22 (LAM 22) platform was moved to the site where the forth Dzheitun 22/104 (LAM 22/104) is being drilled. As of late August 2002, that well was drilled to 3,642 meters.

Commenting on these developments, Mr. Hussein Sultan, Chairman of Dragon Oil's Board of Directors, said: "We continue to control our costs quite stringently with a view to cutting them even further, and we have been able to reduce drilling costs. We are on our way to reaching the goal of raising oil production to 15,000 barrels of oil per day by yearend 2002." ■

Cooperation with Japan

On 19 August 2002, President of Turkmenistan Saparmurat Turkmenbashi Niyazov received Chairman of the Board of Japan's Itochu Corporation Mr. Minoru Murofusi, who also co-chairs the Turkmenistan-Japan Economic Cooperation Committee.

During the meeting, the sides noted that cooperation between Turkmenistan and its Japanese partners has been quite fruitful, and pointed to the intention of the sides to develop their partnership even further, which finds its manifestation in the willingness of Japanese companies to take part in a whole range of large-scale projects in Turkmenistan. One of these projects, according to Mr. Murofusi, is construction of the Turkmenistan-Afghanistan-Pakistan gas pipeline which Japanese businesses would like to join.

In his turn, the President of Turkmenistan expressed satisfaction over the status of economic relations with Japan's business circles, and praised Japanese equipment supplied to Turkmenistan. The Turkmen state has always given preference, and will continue to do so without any reservations, to advanced technologies and equipment. The head of the Turkmen state invited Itochu Corporation and other world-renowned leaders of Japan's business to take an active part in projects to build mobile liquefied gas plants to be constructed close to produced gas fields, that have a very short payback period, and offered cooperation in developing Turkmenistan's oil and gas sector and its infrastructure, as well as in building gas pipelines.

The most significant result of the meeting was the signing of an Agreement between the Government of Turkmenistan and Japan's Komatsu Ltd. and Itochu Corporation on long-term cooperation in supplies and maintenance of road-building machines in Turkmenistan. The Agreement calls for long-term cooperation between the Government of Turkmenistan and the Japanese side in implementing projects relating to construction of new and repair of existing oil and gas pipelines, oil and gas field construction, annual supply of up to 200 pipe-laying machines, bulldozers, loaders and other equipment manufactured by Komatsu, construction of top-class highways, and implementation of other priority projects listed in the National Strategy of Socio-Economic Transformations for a Period of up to 2010.

Representatives of the Japanese companies also stressed their willingness to take part in a project of capacity extension at the polypropylene plant operated at the Turkmenbashi oil refinery, and in a fundamental modernization of the Seidi oil refinery.

Based on the results of the meeting, the sides also decided to call the next regular session of the Economic Cooperation Committee, and to prepare for discussion questions relating to development of a reliable mechanism for pursuing mutual interests that consist in broadening bilateral cooperation and in making such cooperation more targeted. ■



Main Indexes of the Oil and Gas Complex

Indexes	unit of measurement	Actual production, 1st half of 2002 (expected)
Gross Production		
gas	m cu m	27,906.7
including export	m cu m	20405
oil (including gas condensate)	th t	4,270.2
including export	th t	1,109.5
Oil Refining	th t	2876
Production of All Types of Gasoline-total	th t	767
including:		
AI-93, AI-95 gasolines	th t	181
AI-72, AI-76 gasolines	th t	483
Diesel production	th t	684
including export	th t	374
Mazut production	th t	448
including export	th t	313
Liquefied gas production	th t	92
including export	th t	86.1
Natural Gas Processing		
- liquefied gas	th t	5.8
including export	th t	0.2
Exploration Drilling	th m	43.8
Production Drilling	th m	94.2
Capital Investments	bn manats	1,673.8

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Cover photo: Construction of second LPG plant at Nayip.