

# OIL & GAS OF TURKMENISTAN



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# **Welcoming address**

**Dear Ladies and Gentlemen,**

**The Ministry of Oil and Gas Industry and Mineral Resources of Turkmenistan welcomes readers of the first issue of "The Oil and Gas of Turkmenistan" quarterly.**

This is the start-up issue of a series of publications devoted to Turkmen oil and gas industry. This new edition will provide coverage of the achievements and main development guidelines of the industry. We also plan to inform the international business community of the Turkmen national policy priorities to draw in foreign partners that possess new technologies and equipment in the sphere of geological survey work, development and construction of offshore and onshore fields, and service work. The publication will offer opportunities to exchange experience with international companies successfully operating in Turkmenistan and outline prospects for cooperation with potential partners.

Information offered for your attention will be conducive to development of mutually beneficial cooperation and successful expansion of international partnership relations in the oil and gas industry of Turkmenistan. ■

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# Press-release

## ***Roundtable to Explore the Impact of New Technologies, Equipment, and Services in Turkmenistan's Energy Sector***

### ***Officials, Key Decision-Makers to Discuss Prospects for the Oil and Gas Sector***

**ASHGABAT/MOSCOW.** March 26, 2002 -- A roundtable on Oil and Gas Sector: Business Opportunities in Modern Technologies, Equipment, and Services, featuring Turkmenistan government officials, will be held in Ashgabat, May 28-29, 2002. The Roundtable, held under the patronage of the Ministry of Oil and Gas Industry and Mineral Resources, is organized by RPI, Inc., an official consultant to the ministry.

Roundtable participants will provide detailed information on the status of, prospects for, and priorities regarding introducing modern technologies, equipment, and field services to Turkmenistan's oil and gas complex. In addition, the Roundtable will offer an opportunity to exchange views, establish and consolidate business contacts, and identify the most effective forms of cooperation among Turkmenistan and foreign companies, financial institutions, and other interested parties.

Speakers at the forum will include Yolly Gurbanmuradov, Deputy Chairman of the Cabinet of Ministers of Turkmenistan; Kurbannazar Nazarov, Minister of Oil and Gas Industry and Mineral Resources of Turkmenistan; and Khoshgeldy Babayev, Chairman of the State Enterprise for Issues Related to the Caspian Sea, as well as the heads of State Concerns Turkmenneft, Turkmengaz, and Turkmenneftegaz-

stroy, State Corporation Turkmengeologiya, State Trade Corporation Turkmenneftegaz, and top executives from other government agencies.

Foreign participants invited to the Roundtable include representatives of government agencies from Turkmenistan's partner countries, and officials from international companies with experience in working with Turkmenistan or that are interested in advancing business cooperation.

The Roundtable is designed to provide insight into Turkmenistan's oil and gas complex and into attracting international partners in the oil and gas industry to implement modern technologies in prospecting, exploring, and drilling on prospective blocks and deposits in the Turkmen sector of the Caspian Sea and onshore. Roundtable participants will also address numerous other topics, including hydrocarbons development and production, oil and gas recovery enhancement, stimulation of oil and gas extraction, supplying drilling platforms, permanent offshore platforms, semi-submersibles, vessels, and pipe-laying ships, construction of new gas treatment and processing capacities, and development of gas chemistry, fertilizers production and gas-fired power generation.

Drawing on their analyses of the technological state of the industry,

Turkmenistan's fuel and energy complex officials will review the potential for implementing modern oil and gas technologies, services and equipment, planned volumes of investments, and development prospects for the equipment and field services market.

A comprehensive technological renovation of the sector is viewed as a major factor in the successful implementation of the oil and gas industry development strategy proposed by President of Turkmenistan Saparmurat Turkmenbashi. The strategy calls for production to increase to 28 million tons of oil and 85 billion cubic meters of gas by 2005, and to 48 million tons of oil and 120 billion cubic meters of gas by 2010, an impressive increase from the 2001 totals of 8 million tons of oil and 51.3 billion cubic meters of gas.

The Roundtable is the first in a series of joint events that the Ministry of Oil and Gas Industry and Mineral Resources of Turkmenistan and RPI, Inc. plan for 2002. The Ministry and RPI, Inc. will hold an annual conference and exhibition entitled Potential of Turkmenistan's Oil and Gas Sector and Introduction of Modern Technologies, and prepare and distribute a number of special publications featuring the current status of and development prospects for the oil and gas industry in this hydrocarbons-rich country. ■



# NEW REGULATIONS FOR TRADING PRODUCTS OF THE FUEL AND ENERGY COMPLEX

Assisted by all concerned Turkmen ministries and agencies, a new mineral power sources export bidding and sale procedure was elaborated to execute the resolution of the President of Turkmenistan dated December 31, 2001, and also to improve oil and petroleum products sales bidding procedures.

In accordance with this new procedure, a Supervisory Authority was established to include representatives from the Government, National commodity exchange, National customs, and Tax Service, representatives of the

buyer and product manufacturer, a broker and other members and government authorities concerned.

After the volume of mineral power resources and price formation considerations related to them are approved, a bid is made. The auction is held on a weekly basis. Three days prior to the auction, commodity exchange quotation as well as the place and time of the auction are made public by mass media in the press.

The geopolitical situation of Turkmenistan and its steady economic

development play a significant role in attracting to our market leading oil traders. Mineral power resources realized through the auctions of the National commodity exchange make it possible to maintain an open-door policy. The democratic nature of the auctions, specifically the equality of all competitive participants (brokers), is conducive to choosing the best available quotation.

The text of the document is given below in full. ■

## REGULATIONS ON CONTRACTING AND PERFORMING CONTRACTS FOR SALE OF THE PRODUCTS OF FUEL AND ENERGY COMPLEX TO FOREIGN MARKETS

### I. GENERAL

1. These regulations were worked out in compliance with the laws of Turkmenistan and regulate procedures of selling through auction crude oil, petroleum products, natural gas, electric energy, and other products produced by the enterprises of fuel and energy complex of Turkmenistan (further referred as products).

These regulations do not apply to other types of products sold through Turkmenistan National commodity exchange. In case of conflict between these regulations and valid exchange trading procedures related to regulating sale of crude oil, petroleum products, natural gas, electric energy and other products of fuel and energy complex, these regulations shall prevail.

2. Product bidding lists made up by the sellers and approved by the Supervisory Council which is formed by the Cabinet of Ministers of Turkmenistan shall be offered to the auction held once a week on Wednesday.

3. State trading corporation "Turkmenneftegas" shall act as the seller of the products of fuel and energy complex of Turkmenistan.

4. Volumes, terms of delivery, and basic prices related to the products offered at the auction shall be specified by the seller and approved by the Cabinet of Ministers of Turkmenistan. The seller shall specify volumes and terms of delivery based on monthly production balance forecasts and residential consumption figures. Basic export prices and payment currency shall be specified on the basis of world prices for similar products of the fuel and energy complex and taking into account applicable price adjustments for transportation, insurance, and product quality.

The seller's obligation is to submit auction bids promptly and completely and to perform terms and conditions of the contract concluded based on the auction results.

5. At least 7 days before the auction, the seller shall submit the bids to the Turkmenistan National commodity exchange stating type of the products offered for the auction, volume, terms of delivery, and basic export prices approved by the Cabinet of Ministers of Turkmenistan.

Within 10 days of the month following the auction month, the seller shall submit to the Cabinet of Ministers of Turkmenistan and Turkmenistan National commodity exchange information on the progress of the contracts concluded based on the results of the last and the previous auctions.

6. The buyers at the auctions can be legal entities, including foreign legal entities, that have the right to trade at the Turkmenistan National commodity exchange. A buyer may participate in the auction in person or by proxy through its representative.

### II. AUCTION PROCEDURES

7. Auctions are organized and held by the Supervisory Council that shall include representatives from the Government, Turkmenistan National commodity exchange, National customs, tax service, law enforcement authorities, representatives of the seller and product manufacturer, a broker and other members with participation of government agencies concerned.

A Government representative who shall chair the Supervisory Council may invite experts in various fields of knowledge. All members of the Supervisory Council perform their jobs without any compensation. Expenses related to invitation of experts may be included in the cost of the products.

Work schedule of the Supervisory Council shall be determined on a collective basis.

8. Auctions shall be held in a form of verbal competition (open auction). In case especially big lots of products are involved, auction procedures may be specified by resolution of the Supervisory Council.

9. Supervisory Council shall have organized weekly auctions. A complete list of the products to be sold shall be notified to buyers through mass media or communicated otherwise at least one week prior to the auction, stating exact volume and lower price limit of the products for sale. Other information related to the products for sale can be publicly known subject to the resolution of the Supervisory Council.

10. The seller of the products (or its authorized representatives) shall sign an agreement with the Supervisory Council. Product sale bids for the auction to be filled by the seller shall be the integral part of such agreement. The bids made out for each trading lot separately shall contain all basic information related to such trading lot: location, ways of transportation available, quantity per grade (type, brand, etc.), commodity pattern, production mode, initial value, mode of payment, term of delivery and other information that in the opinion of the seller may promote a more advantageous deal.

11. Based on the sale bids, the Supervisory Council shall prepare a catalogue to contain full information on all trading lots offered for the auction and also addresses, settlement accounts, and names of the sellers for the buyers to make deposits to their accounts.

12. Supervisory Council shall announce the time and place of the auction in the press and special reference editions. Forms and means to announce the auction shall depend on the volume and quality of the produce sold and type of auction procedures. In case foreign buyers need to be invited to the auction, notices of the auction may be given in foreign press as well.

13. The notices shall specify time, volume, and starting price for each lot of products offered for auction and also where one can get more detailed ▶



information on all trading lots, terms and conditions of sale, and persons to be addressed to have additional information on the products for sale.

14. The seller shall specify the starting price of the products to be further confirmed by the Supervisory Council.

15. Seller of the products may fix initial cash deposit separately for each trading lot as a performance guarantee by the buyer. Later, the deposit will be netted in payment for the purchased produce or remitted to the participants of the auction who failed to make a purchase (with certain portion of the deposit to be withheld). A buyer willing to participate in the auction shall make a deposit to the settlement (or any other) account of the seller in respect of all chosen trading lots.

16. A buyer willing to participate in the auction shall submit personally or by proxy an application on each trading lot to the Supervisory Council. Such application shall be submitted at least two days before the auction.

The application shall specify the following:

- consent to purchase the products in compliance with the sale terms and conditions;

- the price offered in respect of each trading lot planned to be purchased, stating such price in words (any corrections and erasures in the prices shall be validated);

- full name of the legal entity submitting the application, its address, and bank particulars;

- a copy of the deposit payment instruction shall be enclosed with the application.

17. Applications of the buyers shall be filed in a separate log subject to the established procedure; thereafter, a list of participants in the auction shall be published one day before the auction.

18. Information on deposit payment shall be filed in the log of deposits made in respect of trading lots offered for the auction.

### **III. GENERAL REQUIREMENTS APPLICABLE TO AUCTION PROCEDURES**

19. At any auction, minutes shall be kept to fix all resolutions of the Supervisory Council in connection with any circumstances that take place during the auction.

20. Auction shall be held uninterrupted until its end. If required, the Chairman of the Supervisory Council shall announce an intermission before all persons present, stating the time to resume the auction and make an entry in the minutes to this effect.

21. Offering or removal of trading lots previously offered for the auction and not listed in the catalogue can be done by the Supervisory Council subject to the presentations of the seller on the auction day if it is required to reassess the lots due to their damage (loss, deterioration, etc.) or in case it is required to use certain lots in case of emergency, subject to the resolution of the Cabinet of Ministers of Turkmenistan. Subject to a written application of the seller or its proxy, any trading lot submitted to the auction can be removed therefrom in case of no proper competition.

22. Auction shall open if more than two persons willing to participate there-in are present.

23. An auction shall be held for each trading lot separately in the order it is listed in the catalogue.

### **IV. FILLING OUT DOCUMENTS BASED ON AUCTION RESULTS**

24. Final auction results shall be fixed in the auction register, to be the integral part of the minutes of the auction.

25. Upon termination of the auction, the deposit log, trading list, minutes of the auction, and auction register shall be signed by all members of the Supervisory Council. The Chairman of the Supervisory Council shall announce final results of the auction.

26. After auction results are announced, auction winners shall within a week conclude the product sale-purchase contract with the seller in compliance with the rules of the Turkmenistan National commodity exchange.

### **V. PAYMENTS AND AUCTION OPERATIONS PROCESSING**

27. Within 15 days of the contract, the buyer shall remit the funds to the seller's accounts specified in the contract and obtain from the seller the products, subject to the terms and conditions of the contract.

In case, within the above period, the invoice is not paid or the buyer does not obtain the products through its fault, the auction results shall be null and void and the buyer shall not be entitled to attend auctions for one year. Initial cash deposit shall be not be refunded to such buyer.

### **VI. LIABILITIES OF THE PARTIES**

28. Any claims of the seller, buyer of the products, and the Supervisory Council shall be considered subject to the procedures envisaged by the laws of Turkmenistan.

29. The seller shall deliver the products in question in compliance with the delivery terms stipulated by the contract.

30. The buyer shall pick up the products under the contract in the volumes specified therein.

### **VII. RECORDS AND REPORTING**

31. Under clause II of these regulations, the sellers and the Turkmenistan National commodity exchange shall submit to the Cabinet of Ministers of Turkmenistan the following reports and information:

- within 10 days of the month before the month in which the auction is to be held - monthly exchange bids stating commodity description and quality characteristics of the products to be exported, volumes and delivery terms as well as basic prices and payment currency (seller);

- within 10 days of the month in which the auction is to be held - consolidated report on the auctions to sell for export the products of fuel and energy complex (Turkmenistan National commodity exchange);

- within 10 days of the month following the month in which the auction is held - report on performance of the contracts concluded based on the results of the last and before last auctions (seller).

Additionally, before 10 days of each month:

State customs of Turkmenistan shall submit to the Cabinet of Ministers of Turkmenistan a report on the actual export shipment of the products of the fuel and energy complex itemized per types, contracts, and payment currency.

National Foundation for oil and gas industry and mineral resources development of Turkmenistan shall submit to the Cabinet of Ministers of Turkmenistan a report on cash revenues from export sale of the products of fuel and energy complex itemized per type of product, contracts, and currency of revenues.

Reporting forms shall be prescribed by the department of oil and gas industry of the Cabinet of Ministers of Turkmenistan and approved by the supervising Vice Chairman of the Cabinet of Ministers of Turkmenistan.

Turkmenistan National commodity exchange and the seller shall exchange information as stipulated by these regulations and as agreed between them.

32. Department of oil and gas industry of the Cabinet of Ministers of Turkmenistan shall collect, summarize, and analyze the reporting data submitted by the seller, Turkmenistan National commodity exchange, National Foundation for oil and gas industry and mineral resources development of Turkmenistan and State customs as well as other information pertaining to execution of these regulations.

33. Consolidated reporting and analysis results shall be submitted by the department of oil and gas industry to the supervising Vice Chairman of the Cabinet of Ministers of Turkmenistan, who shall regularly inform the President of Turkmenistan on the progress of execution of these regulations.



# Turkmenistan Oil and Gas in 2001-2002

**Kurbannazar Nazarov**  
*Minister of Oil, Gas and Mineral Resources of Turkmenistan*



In 2001, we obtained good results in all scopes of oil and gas industry: exploration and production, developing new fields and enhancing recovery in the old ones, modernizing gas infrastructure. Increasing investments in the national O&G complex resulted in large measure from the growing inflow of national resources.

### Prospecting and Exploration

Oil and gas prospecting and exploration in the territory of Turkmenistan are carried out by the state corporation Turkmengeologiya, which performs seismic studies and deep drilling over the entire territory of the country; exploration drilling for oil and gas is performed by state concerns Turkmenneft (which operates in Western Turkmenistan) and Turkmengaz (which works in the eastern part of the country). In 2001, the volume of 2D seismic studies stood at around 3,500 running km, while 3D seismic surveys covered more than 340 running km. Ten prospective oil and gas structures were prepared for deep drilling. Drilling of exploration and development wells amounted to 225,000 m, 57 wells were completed. The combined hydrocarbon reserves increase exceeded 50 million tons of oil equivalent.

Prospecting and exploration performed in 2001 accomplished the following:

- Wells at the Yashildepin group produced the first commercial discharge of gas with condensate. A high condensate content of 200-300 g/cu m, observed here for the first time in eastern Turkmenistan, is an encouraging criterion for launching prospecting for liquid hydrocarbons accumulations on the right bank of river Amudarya.

- A new field, named Nebitlije, flowing commercial volumes of oil (in the Gegerendag-Ekerem zone in western Turkmenistan) was discovered.

- Very substantial gas discharges were obtained at the Yankui, Chashgui, Bereketli, Pirguyi, Yashildepe tracts on the right bank of river Amudarya.

Obtained progress was greatly due to the purchase of \$35-million worth

of new drilling rigs and equipment. In November 2001, the president of Turkmenistan signed the Program for Expanding Geophysical Works for the Period of up to 2002, aimed at enhancing the scope of geological prospecting. The program calls for the allocation of over \$56 million to purchase modern instruments and equipment, including equipment for deep drilling.

### Oil Production

In 2001, oil production with condensate in Turkmenistan totaled 8019.3 thousand tons, registering a 12% increase over the preceding year. The respective shares of oil producers in the total oil production are as follows:

- State concern Turkmenneft — 7300.3 thousand tons;

- The share of the consortium and foreign companies under the PSA — 307.6 thousand tons;

- State concern Turkmengaz — 175.1 thousand tons;

- State concern Turkmengeologiya — 3.2 thousand tons;

- Yashildepe field — 233.1 thousand tons.

State concern Turkmenneft's own production (without its share under the PSA) totaled 6821.6 thousand tons, registering a year-on-year growth of 13.7%.

Thirty-two new oil wells were brought onstream; over 600 wells were overhauled, producing an additional 835,000 tons; 213 inactive wells were brought back onstream, accounting for an extra 323,500 tons of crude; 47 wells were switched to lifting and 36 to high-pressure gas lift production.

### Gas Production

Gas production in Turkmenistan in 2001 totaled 51.3 billion cu m. (109% growth over 2000). Export of gas in 2001 reached 37.34 billion cu m (111.2% increase). Turkmenistan's development program for 2002 calls for raising gas production to 70.8 billion cu m.

The major gas producer in Turkmenistan is the state concern

Turkmengaz, accounting for 85% of the entire Turkmen gas production. In 2001, Turkmengaz shipped for export 31.95 billion cu m. State concern Turkmenneft extracted a total of 7.7 billion cu m of gas, shipping 5.4 billion cu m for export.

With a view to raising production, in 2001 gas producers completed and brought onstream 45 gas wells at the Garashsyzlygyn 10 yyllygy (or "10 years of Independence", previously Beshgyzyl), Yelguyiy, Dovletabad, Malay-Chartak, Korpeje, Konegala and other fields.

- Field construction at the Garashsyzlygyn 10 yyllygy field was fully completed, and the field was brought onstream in June 2001. Its annual design production capacity is 5 billion cu m. Gas is pumped from 18 wells via a newly built 90.2-km pipeline to the Uchadji complex gas treatment plant and further to a trunk gas pipeline. Annual treatment capacity of the plant is 5 billion cu m.

Field construction was completed at the Yelguyiy field, which was linked to the Garashsyzlygyn 10 yyllygy-Uchadji pipeline.

Production at the Korpeje gas field reached its design capacity. The field is the main source for the supply base delivering gas to the Korpeje (Turkmenistan)-KurtKui (Iran) pipeline. Gas field construction continues at the Gasylydepe and Balguy fields, where combined annual production is expected to total 1.5 billion cu m of gas.

With a view to increasing export shipments of gas, capacities of the following enterprises currently onstream are to be upgraded by way of:

- completing the construction of a new 18.9 MgW section of the GPA-C-6,3 compressor station at the Naiyp field;

- construction of an additional separation line at the natural gas treatment plant-5 at the Dovletabad-2 field.

The goal of maintaining a stable level of natural gas production will be accomplished by the construction of 21 gas wells that will be brought



onstream, and reconstruction of the gas-collecting system at the Vostochny and Western Shatlyk fields.

## Gas Infrastructure

In addition, major gas infrastructure upgrade and construction projects have been completed. Specifically, at the Dovletabad 15 field a gas treatment and compression plant was commissioned; a measurement point, operated on the cost-accounting principle, was installed at the Deryalyk compressor station; the remote control system (Supervisory Control And Data Acquisition) at the Turkmenistan (Deryalyk)-Europe pipeline (formerly called Central Asia - Center IV pipeline system) was upgraded; a 20-billion-cu-m-per-year gas desulfurization and treatment units was installed at blocks GS-2 of the Dovletabad field. An automated control system for compressor units was installed and commissioned at the liquefaction plant and repressuring station at the Naiyp field. Following the reconstruction of the Serdar compressor station, 8 million cu m/d gaslift gathering and transport systems were constructed to handle gas produced by oil wells operated by state concern Turkmenneft. Compressor station Goturdepe and a gas pipeline, linking the compressor station with the Turkmenistan (Bekdash)-Europe gas trunk pipeline (formerly called Central Asia - Center III system), were reconstructed.

With a view to upgrading gas treatment processes, glycol dehydration plants at the GS-2 blocks and gas pretreatment units at the Dovletabad field are to be reconstructed.

Automated control and operation system is to be installed at the repressuring station Naiyp. Work at these facilities began in 2001, and is to be completed in the current year.

Work aimed at raising the throughput of the Turkmenistan (Deryalyk)-Europe gas pipeline continues at the Garagum and Iylanly compressor stations, as well as at the 165.7-km bypass gas line of the Turkmenistan (Deryalyk)-Europe gas pipeline system. These measures are to increase export gas quality, leveling it to world trade requirements.

## LPG

Liquefied gas is a new export product for Turkmenistan. In 2001, LPG production reached 111,200 tons. Production target for 2002 is 245,200 tons.

At present, liquefied gas is produced in Turkmenistan by three LPG plants. Production by the LPG plant at the Turkmenbashi refinery (commissioned in 2001), currently standing at 18,000 tons per year, will increase to 345,000 tons when the plant starts

operating at its design capacity. Another plant, installed in 1998 at the Naiyp field, has an annual capacity of 15,000 tons, while the output of the third plant operated in the city of Turkmenbashi equals 10,000 tons per year.

One more LPG plant slated for construction at the Naiyp field, under a contract signed with Canada's Thermo Design Engineering, will process 9 million cu m/d (50,000 tons per year) of natural gas. The project is currently in its design stage. Turkmenistan also has announced a tender for the design of two LPG plants in western Turkmenistan with a combined production capacity of 200,000 tons per year (100,000 tons each, to be installed at the Goturdepe and Korpedje fields). By boosting its LPG production, Turkmenistan will be in a position to expand its market share in LPG sale markets.

## Investments

Investments into Turkmenistan's oil and gas sector in 2001 totaled nearly \$800 million (without PSAs), with Turkmenistan's own-to-borrowed funds ratio being 74/26 (46/54 in 2000). Over 49% of all investments financed work performed with the participation of international contractors. Almost all equipment was supplied for investment projects of reconstruction and modernization of existing and construction of new facilities. More than 15% of total investments financed the purchase of equipment beyond the budgets of construction projects, and these purchases did not include purchased drilling rigs and drilling equipment. The year 2001 saw the commissioning of fixed assets worth \$606 million.

With investments in the priority sectors of the oil and gas industry expected to double in 2002 compared to the period under review, the oil and gas sector's own money will make up the bulk of investments (53%). Foreign investments will be channeled into top-priority projects envisioning the introduction of state-of-the-art technologies and equipment.

**In the gas sector**, an international consortium of Marubeni, JGC (Japan) and Linde (Germany) began to design a gas processing complex in Gazodjak which will annually produce 200,000 tons of polyethylene. The project will be financed by foreign loans. The AFSK Group (Israel) will upgrade the automated control system at blocks GS-2 of the Dovletabad field.

**In the oil sector**, foreign loans will be raised to resume electric bottom-hole drilling and to build up the potential of controlled directional and horizontal wells drilling (joint stock company Potensial, Russia), as well as to set up a digital trunking communi-

cation network based on the Tetrapol technology (Siemens, Germany).

In oil refining, foreign loans will finance reconstruction of the Seidy refinery (\$5 million).

In 2002, Turkmenistan's oil and gas sector will invest its own financial resources into field construction at the South Gamyshlydja, Keymir and Akpatlavuk oil fields and into bringing these fields onstream, and fund the construction of a high-pressure gas pipeline linking the Akpatlavuk and Keymir fields. Works under the E&P investment project at the Nebitlidje, Shatut and Gerchek fields will continue.

Over \$1.261 billion worth of facilities are to be commissioned in 2002. In addition, more than \$265 million of investments in exploration and development of oil deposits have been earmarked by foreign companies operating as PSA partners of Turkmenistan - Petronas Charigali (Malaysia), Dragon Oil (UAE), Burren Energy (UK), Mitro International (Austria).

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Investment policy of Turkmenistan is based on the principle: "hydrocarbon bonanza is the foundation of the future development of the country". It means that revenues obtained in sales of gas, oil, and petroleum products are re-invested in all sectors of the Turkmenistan economy, and first of all, in the O&G complex. Understanding that the use of newest world technologies, equipment, and expertise is a must for quick development, Turkmenistan creates a business climate favorable for attracting foreign manufacturers with a long-term interest in cooperating with our country. ■



# Modernization of Gas Infrastructure of Turkmenistan

**\$180 M third stage of the project completed**

(CONTINUED ON PAGE 32)



This February, a gas preparation and compression installation with 20 billion cu. m. annual design capacity was put into operation in Dovletabat, the country's biggest gas field. This installation will provide for cleaning and dehydration of gas, bringing its quality to world standards. Within the same project, a new metering center at the "Deryalyk" compressor station (90 MW capacity) at the Turkmen-Uzbek border was constructed on a turnkey basis. Dispatcher control and data collection system (SCADA) was reconstructed on the pipeline network Turkmenistan (Deryalyk) - Europe used to supply Turkmen gas into the Russian system. The main gas pipeline between Dovletabat and Deryalyk was reconstructed. Construction of compressor station and gas cooling installation at Dovletabat field was completed. Generally, this project significantly increases reliability of export supply throughout the entire process chain, beginning with raw material delivery, its preparation and its transportation via main pipeline, and ending with registering its volume at the metering stations at the country's border.

The field's reserves, which produce about 1.5 trillion cu. m. of gas, now make it possible to export up to 100 billion cu. m. of natural gas annually. As the president of Turkmenistan put it at the installation start-up ceremony, the problem of raw material to fill gas pipeline projects to export gas to Pakistan and Turkey has been finally resolved.

Today, Dovletabat field provides for 80 per cent of national natural gas export supply. Additionally, up to 70 K tons of gas condensate can be supplied

from here annually. In fact, the field has reserves of sulfur-free and sulfurous gas and is conventionally divided into two fields - Dovletabat-15 and Dovletabat-45. Gas produced at Dovletabat-15 field is collected at Dovletabat head structure, where it is further treated at low-temperature separator units and after-pressure compressors. A new gas compression installation has the capacity of about 54 million cu. m. of gas per day

in terms of gas compression and dehydration and perfectly matches production rate of Dovletabat-15 field.

From the field, the gas is supplied under computer monitoring via three 1,420-mm lines to the sale place at the Turkmen-Uzbek border. This 750-km route has five compressor stations and is terminated at a metering station at CS Deryalyk, accounting for the entire volume of the gas exported into the international pipeline Turkmenistan (Deryalyk) - Europe. This pipeline takes Turkmen gas to the CIS markets and further to Europe.

Dresser Rand, Marfi-Trench Corp., Daniel (USA) and AFSK (Israel) have supplied and assembled the main equipment for this project. Czech experts from CKD Praga Diz, one of the subcontractors, constructed the after-pressure installation, a chilling station, and a series of ancillary facilities of the complex. The most advanced compressor machinery was used. Three compressor units (29 million cu. m. of compressed air daily each) bring the pressure of producing

formations of the field to designated process regime. There is a possibility envisaged to include this new complex into a common process scheme with the already operating compressor station.

Completion of the third stage does not mean that there is nothing else to do. As regards further improvements of the gas-preparation process, it is planned to reconstruct glycol dehydration installations at the head structure blocks (GS)-2 and gas pretreatment units of the Dovletabat field. In 2001, certain work was done at these facilities and their completion is expected this year.

Further work to modernize gas infrastructure in Turkmenistan includes construction of 165.7-km bypass gas pipelines Turkmenistan (Deryalyk) - Europe, line compressor stations Yilanly and Deryalyk, 80 MW each. Total value of the above facilities is \$396 million. In addition, in order to increase the throughput and operation reliability, a package of modernization and renovation work is envisaged and being realized at the Turkmen section of gas pipeline system Turkmenistan (Bekdash) - Europe in the West of Turkmenistan. In connection with this project, line compressor station Belek is being reconstructed. Other facilities are 70-km gas pipeline Khazar - CS Goturdepe to supply gas from operated offshore and onshore fields of Khazar to Turkmenistan (Bekdash) - Europe system and compressor station Goturdepe and new CS Corpedje to be designed and reconstructed. Total investments in this work will amount to about \$330 million.

## TRANS-AFGHAN GAS PIPELINE

This proposed 1,460-km pipeline can be constructed from Dovletabat in Turkmenistan via Kandagar in Afghanistan and further to Multan in Pakistan. The throughput of this gas pipeline would make 15 billion cu. m. of gas annually (700 cu. ft. of gas annually) and can be raised to 20 billion cu. m. Cost of construction may be as high as \$2 billion. It will require another \$500 million for the project if the gas pipeline is extended to India.

In the mid-1990s, a consortium run by American Unocal was formed to construct the pipeline. This consortium also included Delta (Saudi Arabia), Itochu (Japan), Inpex (Japan), Hyundai (South Korea), and Crescent

(Pakistan). The consortium even discussed ways to solve principal organizational issues and financing of the project named Centrgas, though the destabilized situation in Afghanistan interfered with the plans of the consortium.

In view of the latest positive developments in Afghanistan, there are grounds to suppose that the work on the project can be resumed.

Another component of this project envisaged construction of oil pipeline from Turkmenabat (Chardjou) in Turkmenistan via Afghanistan to the terminal in one of the Pakistan ports in the Arabian Sea. Projected daily throughput of this pipeline was 1 million barrels of oil.



# HIGH QUALITY AND BROAD RANGE OF PRODUCTS — NEW HORIZONS OF THE TURKMENBASHI OIL REFINERY

*From the very first days of Turkmenistan's independence, modernization and re-equipment of facilities were emphasized by the president of Turkmenistan as priority areas in the development of the nation's oil and gas complex. Answering questions of our correspondent, Guychmurad Esenov, director of Turkmenbashi Refinery, stressed that soon a day will come when a brand name "Turkmen Oil" appears on world markets.*



**Correspondent:** Dear Mr. Esenov, what is the production potential of Turkmenbashi refineries complex today and what transformation has it undergone since the country gained independence?

**Guychmurad Esenov:** The national program called Strategy of Socio-Economic Transformation in Turkmenistan for the Period of Up to 2010, proposed by President of Turkmenistan Saparmurat Turkmenbashi, unambiguously states that the scientific-technical policy pursued in the oil refining industry will aim at raising production of motor fuels through the introduction of advanced oil refinery yield processes, development and production of new-generation catalysts, high-octane and oxygen-containing additives, as well as through measures aimed at

enhancing environmental safety and reducing energy intensity.

Under the direct guidance of the head of state, extensive work has been carried out to attract into the sector the world's leading companies that possess both modern technologies and internationally recognized expertise in petrochemical production development. In the few years that have passed since the country became independent, international corporations, companies and firms, such as Technip (France/Germany), NINISC (Iran), JGC, Itochu, Nisse Ivai (Japan), Gama (Turkey), and Merhav (Israel), have pooled their efforts and built capacities that form a complex of enterprises which, as the president pertinently observed, though complementing each other, are state-of-the-art production facilities.

For over a year, the refinery has been successfully operating a hydrofining and reforming plant (CCR) producing automobile gasoline blending fuel. We launched production of high-octane gasoline, diesel fuel and liquefied petroleum gas at a millisecond catalytic cracking plant (MSCC), as well as lubricating oils and polypropylene production.

The scale of modernization currently under way at the refinery is apparent from the amount of foreign investments into the project, that to date have totaled US\$1.5 billion.

As a result of the successful implementation of the program, the Turkmenbashi refinery no longer produces leaded gasoline; instead, we launched large-scale production of unleaded AI-95 and AI-76 gasolines. The major indicator characterizing efficiency of oil feedstock utilization, i.e. the oil refinery yield, went up from 64% to 80%, which is rather a high index even by world standards.

Not only was the refinery able to boost lubricants production as a result

of modernization, it also widened the range and improved the quality of products.

Unleaded gasoline, aviation and power kerosene, heating fuel, liquefied petroleum gas, diesel fuel, lubricating oils, polypropylene, detergents - this is the basic range of products that the refinery produces at present.

The implementation of a comprehensive reconstruction and modernization program at the refinery has helped Turkmenistan improve its positions in the international sale markets: having fully met its requirement in a wide spectrum of high-quality petroleum products, the country is now emerging as their major producer.

**C:** From what you've said I see that drastic reconstruction and modernization of the plant constitutes its medium- and long-term strategy. What newest technological processes and solutions would you like to emphasize in the first place?

**G.E:** Let me first describe the characteristic features and new advanced capabilities of the continuous catalyst regeneration catalytic reforming plant (CCR)\*.

The plant that we operate represents the most recent upgraded modification of platforming technology. A special feature of the new plant is its modernized catalyst cases enhancing catalyst circulation, and the positioning of catalyst cases one above another. And of course, the most important new feature is the continuous catalyst revivifying unit. Operating continuously, the revivifier fully regenerates (restores) the catalyst, which is the key factor in ensuring C-5+ and hydrogen output at the beginning of the catalyst action cycle, and in further operation of the plant.

A new system of catalyst flow provides for minimal catalyst deteriora-



## Technologies of Success

tion and formation of catalyst fines. Catalyst abrasion in our case stands at less than 0.01% wt. of circulating catalyst.

The system effectively removes fines from circulating catalyst, thereby prolonging the period of continuous operation and extending the interrepair life to 3-4 years.

In the final analysis, the use of the system increases the output of 100-octane reformat and hydrogen and, more importantly, improves cost-effectiveness and enhances environmental safety.

**C: Indeed, introduction of these newest technological solutions helps to guarantee production of high-octane unleaded gasoline that meets appropriate international standards. And how the production of another type of motor fuel - namely, diesel oil - is going?**

**G.E.:** We supervise this issue constantly. To raise the quality of diesel fuel, we signed a contract with Technip Germany GmbH for design and construction of diesel hydrofining plant.

Addressing representatives of the companies that will be involved in the construction of the plant, Saparmurat Turkmenbashi stressed that Turkmen specialists and their foreign partners were able to anticipate the course of events. The point of departure of the project is the European Union standard that will become effective on January 1, 2005. The main requirement is to minimize as far as possible sulfur content in diesel fuel, which will



Lubing oil plant at Turkmenbashi refinery

ensure an efficient ecological background of consumption and contribute to a healthier environment in large cities.

Construction of the plant at the Turkmenbashi refinery will span 33 months, and by 2005 the plant will be producing 1.5 million tons of European-quality diesel fuel. I think I should also point to the fact that this contract was Turkmenistan's first based on the new European currency, the euro, which was used as the currency of the contract, worth 132 million euros.

**C: According to media reports, at the plant a millisecond catalytic cracking unit (MSCC) was commis-**

**sioned, representing newest technology even by world standards. Please tell us in more detail about it.**

**G.E.:** As a matter of fact, there is only one other site in the world where such plants are currently operated: Louisiana, USA. Functionally, the MSCC plant is subdivided into three units: the catalyst case-reviver where catalytic reactions and catalyst regeneration occur; the rectification unit and its main tower where fractionation of heavy liquid fractions occurs; and the gas fractionation unit where light products are separated into gases, liquefied hydrocarbon gases and gasoline, i.e. a classical catalytic crack-

### TURKMENBASHI COMBINED REFINERY: TODAY AND TOMORROW

Turkmenbashi Refinery, founded in 1943, is the leader of the oil processing sector in Turkmenistan.

According to the pre-investment feasibility study for refinery reconstruction accomplished in 1996 with participation of Israeli "Merkhav" company, modernization and reconstruction of the refinery are planned to be made in two stages. The first stage of modernization, which was completed in 2001 by the 10th Independence anniversary, targeted secure operation with production capacity of 6 M tons annually in terms of crude oil processing.

Foreign partners such as Technipe (France), Itochu, JGC, Chiyoda, Nichimen (Japan), Iran National Petroleum Engineering and Construction Company, Gama (Turkey) and others actively participated in reconstruction of Turkmenbashi combined refinery.

Reconstruction resulted in complete technical retooling of the refinery with modern energy and raw material saving equipment and technologies with minimum environmental pollution levels. New equipment and technologies make possible production to international standards. Depth of raw material processing increased to 80 per cent, yielding a product output increase. Production of new products like lubricating oil and polypropylene began.

The projects were financed by a consortium of German banks, Eximbanks of Japan, Turkey, and Malaysia, Nichimen (Japan), COFAC system (France), and DUCROIX (Belgium). In fact, a new combined refinery was constructed to replace a technically outdated plant.

As to the magnitude, technical workmanship superiority, technological level, realization period and geography of participating parties, modernization of the Turkmenbashi combined refinery has no rivals throughout the FSU economic area.

#### COMPLETED RECONSTRUCTION PROJECTS:

1. Hydrocleaning and catalytic reforming with continuous catalyst regen-

eration (CCR) installation to refine 750,000 tons of oil annually and produce high octane gasoline (100 RON)

Work began in February 1997 and was completed in February 2000. As a result, Turkmenistan fully covers its demand in high octane automobile gasoline. Ecologically friendly clear gasoline AI-95 produced by the CCR installation fully replaced leaded automobile gasoline brands A-72, A-76 and AI-93 previously produced by the refinery.

#### 2. Millisecond Catalytic Cracking (MSCC) Installation

Due to special technology licensing provisions, the project was divided into two parts - MSCC project proper and GPU project - gasoline plant.

Functionally and technologically, the installation is divided into three sections: reactor-regenerator block that differs in principle from all previously existing reactors and, owing to this feature, secures 1.5 plus light oil products recovery, rectification block and gas fractionation section. MSCC installation can process 1.800 K tons of crude oil annually to produce 920 K tons of high octane gasoline, 345 K tons of liquefied gas, 255 K tons of diesel fuel and 280 K tons of boiler fuel.

Construction of the installation began in September 1997 and was completed in April 2001.

#### 3. Polypropylene production installation 90 K tons annual capacity

The project targeted more efficient utilization of the propane fraction produced by the MSCC installation and production of polypropylene, a product important and necessary for Turkmenistan's national economy, and also an increase in the export potential of the refinery. A process licensed by UOP (USA) is used to separate propane-butane fraction. Another UOP process is used to extract propylene from the propane fraction.

Polypropylene is produced based on "spheripol" technology supplied by Montella company. Flexibility is the salient feature of this technology. ▶



# Technologies of Success

ing process occurs. The definitive distinctive property of the plant which embodies a new technological development is the principle employed in the catalyst case process that offers a number of advantages over processes used before. For that reason, I would like to deal with this unit in greater detail.

In a simplified way, the unit operates as follows: regenerated catalyst (from the revivifier) is fed into the reaction zone in the catalyst case where the feeding curtain of the catalyst comes into contact with the feedstock in the upper portion of the catalyst case. The feedstock is fed into the catalyst case through a patented dispersing nozzle, and upon evaporation, which takes a fraction of a second, reacts in the flow's horizontal motion zone. After the reaction is completed, vapors are rapidly separated from the catalyst. Vapors from the catalyst case pass through a system of external cyclone separators that almost completely separate vapors from the catalyst. Vapors then are fed into the main tower. Steam-stripped in the lower portion of the tower, dead-catalyst is fed into the revivifier for regeneration.

What economic benefits does this unit offer? I'll cite just a few figures. While the output of light petroleum products yield from the same feedstock at our other plant stood at around 60%, including 30% of gasoline, the yield of the MSCC is over 50% of gasoline and a sum total of around 85% of light products. As was noted earlier, the operation of this plant enabled us to raise the oil refinery yield to 80%.

### **C: And how is the situation with production of lubes - this is so important for car owners?**

**G.E:** We particularly pride ourselves on having been able to launch lubricating oils production using Turkmen crude oil as feedstock. During the Soviet period, attempts to accomplish this goal spanned years, and still produced no results. Due to a high methane hydrocarbons and a low of multitiring aromatic hydrocarbons content, we were unable to ensure proper viscosity and temperature properties of lubricating oils' components. However, the problem was solved after several specialized European firms became involved in the research.

Joint efforts resulted in a new process that can be effectively employed to produce lubricating oils from Turkmen crude. Essentially, a novel feature of the process is the use of special methods in the preparation of the base for lubricating oils production, namely, the employment of vacuum redistillation to produce a number of main narrow cuts. It is these narrow cuts that are used as feedstock to produce base lubricants. Each cut separately passes three special treatment stages: selective treatment by furaldehyde, methyl-ethyl ketone-based dewaxing, and hydrofining under hydrogen pressure. Base oils thus produced are mixed in certain proportions, and additives required by the production process are added, the result being a range of lubricating oils for carburetor and diesel engines,

transmission and industrial lubricants that meet international standards.

The refinery has the capacity to annually produce 80,000 tons of such lubricating oils. We believe that the time is not far off when products bearing the brand name of "Turkmen Oil" will be offered in markets the world over.

### **C: Mr. Esenov, in addition to refining section your plant has a petrochemical one. What innovations do you plan to introduce in it?**

**G.E:** In addition to raising the output of motor fuels and lubricating oils, the comprehensive refinery development program calls for more rational utilization of refinery hydrocarbon gases.

Not only is the refinery increasing the output of liquefied gases for domestic consumption and for export, the gases are also used to produce polypropylene, an extremely valuable petrochemical product which is in very high demand in international markets.

Production facilities with annual design capacity of 90,000 tons of polypropylene employ the process developed by Italy's Basell. Three types of polypropylene, intended for use in the manufacture of sheet thermoplastics, polymer film, and fiber used in polymer fabric making, are slated for production during the initial period of operation. A novel feature of this production process is its unique deep feedstock treatment method, used to remove various detrimental metal impurities, and the principle of opera-

In the future, if required, shock resistant copolymer can be produced based on the spheripol process at any time by assembling additional gas phase copolymerization apparatus.

#### 4. Lubricating oil plant with 80 K tons annual capacity

A turnkey contract for the installation was awarded in 1996 to Mannesman KTI (Germany) that was eventually purchased by Technipe (France). The Edelianu (Germany) process is used to produce base oil. Today, mechanical construction of the installation is completed. Start-up and adjustment and performance tests are going on..

#### 5. Modernization of existing process installations

Emerol Ltd. (Ireland) accomplished reconstruction of the flare installation using absolutely new technology - gas liquid jet devices and automatic control system by Foxborough. As a result, complete gas condensate and gasoline fractions recovery was achieved and 80 per cent recovery of degassed gases.

The same company accomplished a project to modernize vacuum refining BT-1, using a promising technology of vacuum generation by hydrocirculating unit. Oil refining depth has been increased, yielding greater product output. Operation costs and power consumption were reduced (heat power [steam] saving of 8 t/hour was made). Now, sulfur and carbon contaminated discharge is limited, there is no 4 tons daily kiln gas decomposition products exhaust in the atmosphere, and 480 cu. m. daily circulation water supply to steam ejection pumps is excluded.

### **WORKS IN PROGRESS:**

1. Maschinen und Anlagenbau Grimma GmbH (Germany) is carrying out reconstruction of a catalytic reforming installation L35/11-300, using the most advanced technologies that have no analogues in the world oil refining practice.

2. After the modernization is completed, 220 K tons of butane-butylene fractions annually will be processed into liquefied gas with 70 per cent con-

version index, and light gasoil will be converted into diesel fuel to the amount of 300 K tons annually.

3. Emerol Ltd. (Ireland) is carrying out modernization work on retarded coking unit UZK-2 with 600 K tons annual capacity in terms of coke and electric demineralization unit ELOU AT-1, AT-2 and AT-3 with the total capacity of 4 M tons annually.

4. Chalyk Energy (Turkey) and Schneider Electric (France) are carrying on construction of a 126.4 MW gas turbine power plant for the combined refinery and substation to match.

5. Pars Energy (Islamic Republic of Iran) is constructing a terminal to store and sell liquefied gas with throughput capacity of 6 K tons annually.

### **SECOND STAGE OF RECONSTRUCTION OF THE REFINERY:**

1. In 2002, a turnkey contract was signed with Technip Germany GmbH (Germany) to construct diesel fuel hydrocleaning unit with 1,500 K tons annual capacity.

2. Tenders are open for construction of kerosene cleaning units with 600 K tons annual capacity and gasoline treatment units with 800 K tons annual capacity, for reconstruction of petroleum coke calcination unit UPNK-2 and modernization of atmospheric oil refining unit AT-4 with 3 M tons annual capacity.



## Technologies of Success

tion of loop catalyst case with circulating catalyst.

Under the initial operation arrangement, following the stripping of propane-propylene fractions used to produce propylene from gases obtained at the MSCC plant, the remaining portion of the butane-butylene fraction is used as a component in commercial liquefaction of gas supplied to the residential sector.

Since the butane-butylene fraction is a very valuable petrochemical feedstock, refinery specialists were given the task of finding ways to use the fraction in the production of alkylate, a high-octane gasoline component.

If anything, it would appear that this traditional oil refining process is not new: All it takes to accomplish the goal is to build an alkylation plant. However, refinery specialists took a different path that led to an ingenious solution. They proposed reconstruction of the catalytic reforming plant L-35-11/300 that had been shut down following the commissioning of the new CCR plant. Production equipment installed at L-35-11/300 is to be used for coker gas oils hydrofining to produce world-class quality diesel fuel, while the gasoline stabilization unit will be reconstructed with a view to giving it the capability to run the butane-butylene fraction alkylation process and produce alkylates with an octane number of at least 95.

This is an entirely new process that has no analogues anywhere else in the world; it is more advanced than other processes used the world over. The process is based on the use of new catalysts with a high degree of conversion (of at least 95%) at low temperatures of 50 - 80 C, with pressure maintained at approximately 16 at. Jointly with international firms, we are currently developing engineering documentation for the upcoming reconstruction of the plant.

In addition to substantial economic benefits, the implementation of this

project will provide the foundation for setting the goal in the general plan of long-term development that we intend to draft, of raising oil refinery yield to around 95% and of achieving light petroleum products output of 80%.

### **C: And what do you do to increase ecological safety?**

**G.E:** Introduction of scientific and technological breakthroughs into production provided the foundation for both the construction and modernization of process installations, and for the drafting and implementation of environmental protection measures aimed at enhancing ecological safety.

First and foremost, it is noncompressor gas utilization.

It was first used at the flare facilities operated at the refinery in order to minimize the volume of gas disposed of in flares. A special feature of the new system is the use of unique hydrocirculating units system designed by Doctor of Technical Sciences V. G. Tsegelsky (Russia). For the purposes under review, the system was used for the first time at our refinery. The principle of operation is quite simple: Gases are drawn off by an ejector pump, with a low-value petroleum product serving as the operating fluid, heavy coker gas oil in our case. Expulsion from the ejector occurs under the pressure of 3.5-4 kg/sq cm, which is sufficient for gas separation and for feeding it into the refinery fuel system.

Employment of this system helps cut capital costs and saves resources, as trapped gas is fed into the fuel system, gasoline losses are reduced, and atmospheric emissions are minimized. Annual economic benefits generated by the installation of the new system at the flare facilities reconstructed by Emerol (Ireland) are estimated at over US\$1 million.

### **C: Mr. Esenov, to prevent failures**

**in the operation of the newest equipment, a pertinent infrastructure must surely be created, mustn't it?**

**G.E:** Yes, you are completely right. In parallel with modernization of process installations, the refinery is carrying out reconstruction of infrastructure facilities.

New electric power substations have been built in order to ensure the refinery's power self-sufficiency, as well as desalting plants, recooling towers, steam generators. The work continues.

Company Gent Oil completed construction of a powerful desalting plant and boiler units.

Calyk Enerdji (Turkey) launched construction of a gas turbine plant. With the complex of the gas turbine, desalting plant, and boiler units up and running, the refinery will be completely power self-sufficient. With these new facilities onstream, the Turkmenbashi power plant will become a standby source of power for the refinery. We have also installed an extensive network of interdepartment gas mains, built new pumping stations, storage tank facilities, a new product pipeline Refinery-UFR tank farm, and accommodation space for the personnel.

The first phase of refinery modernization is nearing its completion at this stage. Phase two of the reconstruction program envisions a further oil-refining capacity extension to 9 million tons per year, which implies that in order to maintain a high refinery yield while processing greater volumes of feedstock, we need to construct new primary oil distillation plants and to introduce a whole range of secondary processes, such as isomerization, hydrocracking, diesel fuel hydrofining, simultaneously proceeding, of course, with reconstruction of process installations in operation. ■

## MODERNIZATION OF GAS INFRASTRUCTURE OF TURKMENISTAN

(CONTINUED FROM PAGE 28)

Since the CIS countries, mainly Russia and Ukraine, traditionally are the sales market for Turkmen natural gas via a system of transcontinental main gas pipelines Turkmenistan (Deryalyk) - Europe, great attention is paid to technical maintenance of the Turkmen section of this gas pipeline system and the increase of its throughput. ■





# UNIT CUM SEPARATE OPERATION OF TWO AND MORE HORIZONS WITHIN ONE WELL AT CORPEDJE

## Recovery of hydrocarbons from low-permeable and problem reservoirs

In 2001 SC "Turkmenneft" introduced unit cum separate well operation technology, i.e. operation of two or more horizons within a well to increase production and reduce well construction costs.

A considerable portion of residual oil, both within old and newly discovered fields in Turkmenistan, is confined to low permeable and problem reservoirs of the Apsheron, Akchagyl and Low Red Rock. The salient feature about them is the building up of passive dissolved gas drive during operation. In connection with this, well production rates are relatively low and tend to decrease in the course of operation. In addition, holing and development of low red rock formations are associated with big expenses and complications due to the major depths at which they occur.

To cut expenses for development, drilling, and operation of the wells, concern "Turkmenneft" uses unit cum separate technology of operating two

horizons within one well (USO). This technology accelerates commissioning horizons to the active development phase and their unification with the basic one, saves finances and material to drill wells, and increases the current oil production rate.

In the last two years at Corpedje and South Gamyshlydja fields, USO started to be introduced to the following scheme "oil horizon - gas horizon", so that same well can be used to produce oil in the summer time and gas in winter in order to span peaks of its exports.

USO schemes have been realized directly assisted by Schlumberger company and with the down-the-hole equipment supplied by this company. "Sleekline" machinery and technology contributed much to boosting and simplifying work on USO scheme-operated wells.

The same technology is used also by "Dragon Oil" that works in the off-

shore contracted territory "Cheleken".

Today, the company, which is employing quite modern though proven reliable well drilling and completion methods, has completed and commissioned two wells and is drilling a third one. New wells were completed in several producing horizons, thus making possible unit cum separate operation of formations. All previously drilled wells were completed exclusively within one producing formation, entailing development limitations and also limiting well production rates and hydrocarbons recoverability.

It is clear that the multi-horizon well completion scheme employed by the company raises expectations for increased recoverable reserves and renders development more efficient and profitable. ■

## "SLEEKLINE" WTM UNIT (WIRE LINE )

WTM unit is a two-drum container type installation with a 72-h/p hydraulic motor, 110-220-V power generator and 200-atm manipulator pump to manipulate surface machinery, develop back pressure, and pump process fluid via lubricator.

This compact unit can be used either in mobile or stationary ground version, regardless of the conditions and services available at any field.

### Application

"Sleekline" operations are carried out during routine maintenance and commissioning of wells and in the course of various studies and regulation well production rate. No killing of the well and no heavy-duty equipment are required to use "Sleekline" equipment, which offers safe control over the status and operation of wells.

### Standard version of the unit:

Winch: wire 0.125" (3.17 mm);  
stranded wire line - 7/32" (5.5 mm).

Blowout preventer equipment 10,000-PSI WP(700 atm.): flange, adapter, preventer, lubricator and stuffing box seal, manometer to control well pressure.

Sleekline tool: set of tools to perform standard operations within 62 mm - 73 mm - 89 mm tubing and also various operations in case of an offshore version.

### Standard operations:

Standard operations include, but are not limited to, the following:

**Sampling:** bottom hole and tubing sampling tool is used.

**Identification of pipe shoe location:** tubing shoe locating tool is used. This can be necessary if tubing hanger length is not known or their number failed

to be identified correctly.

**Pipe gaging:** gages of different diameters are used to check inside diameter of pipes or identify location of equipment and devices installed in the well.

**Paraffin control:** tools are used to clean off paraffin and other accumulations in tubing.

**Valves trip:** valves are installed in landing nipples to isolate formation producing zones, in the event of major repairs of bottom hole equipment, to maintain and regulate formation pressure, to regulate well gas factor and also to pressure test the tubing to check for tightness.

**Schlumberger circulating devices:** are installed above packer to make possible circulation of liquid in the tubing and casing string-borehole annulus by means of opening these devices with a special tool.

**Gas lift equipment:** gas lift valves trip in tubing of various diameter, varying from 62 to 73 and 89 mm.

**Pressure and temperature study:** electronic manometers and thermometers are put inside the well to obtain data on pressure and temperature inside well during its operation

**Fishing job:** in complicated cases, stranded wire is used.

Fishing works on a well are carried out in the event any tool or wire (cable) is left in the borehole during any operation.

**Swabbing (stranded wire is used):** this operation is carried out to lower liquid level before perforating, commissioning well after drilling work, perforation, killing, hydrofrac and injection of any type to create drawdown by means of lowering column of liquid inside tubing and casing string-borehole annulus.

**Overhaul associated works:** flow string gaging, impression block generation during fishing operations to save time and expenses on overhaul and eliminate additional tubing running.



### CIS Leaders Summit

From February 28 to March 1, 2002, Almaty hosted a CIS leaders summit. Before the plenary session, Saparmurat Turkmenbashi had bilateral meetings with the presidents of Armenia, Belorussia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Uzbekistan, and the Ukraine. At the meetings, issues of bilateral cooperation in economic, cultural, and political spheres were discussed. The summit resulted in the Joint Declaration of the Presidents of the Republic of Kazakhstan, the Russian Federation, Turkmenistan and the republic of Uzbekistan on energy policy. For the purpose of developing resources potential, coordinating export and import and investment policies of their nations, maintaining energy security, and deepening long-term cooperation and the strategic partnership between gas companies of the said countries, the presidents think it is important to develop strategic cooperation in this sphere on a long-term basis. In the gas sphere, this involves maintaining reliable and stable natural gas supplies to world markets and national markets of the Commonwealth of Independent States and other European and Asian countries to satisfy their growing demand. To achieve these goals, the governments of the said countries will undertake necessary measures to provide favorable conditions for cooperation of gas companies and sign respective bilateral and multilateral agreements, and provide for realization of such agreements.

### China

The agreement on mutual understanding and basic principles of cooperation in the oil and gas sphere signed between the Government of Turkmenistan and China National Oil and Gas Corporation on July 6, 2000, aims at further developing cooperation between the parties in the sphere of oil and gas, economic integration through the use of advanced technologies to implement Turkmen oil and gas complex development projects based on mutual economic benefits and development of cooperation through the exchange of professional experience and also in the sphere of intensified oil production at operated fields.

In view of the above, the parties have agreed to cooperate in studying the fields of West Turkmenistan and to work out a field development project aimed at increasing oil recovery (an agreement on Gumdag field development project has been signed). Another issue is the investment project by SC "Turkmenneft" related to prospecting and hydrocarbons pro-

duction in the lateral area of the Caspian Sea and the right bank of the Amudarya River. Other items of cooperation are feasibility study for a gas pipeline from East Turkmenistan to the China border, seismic survey, drilling, and field development works and supplies of oil equipment from China. All terms and conditions of the agreement are being implemented.

On January 25, an official Chinese delegation headed by Ismail Aimat, Member of the National Council of the PRC, visited Ashgabat and had meetings in the Parliament and with the Government of Turkmenistan to discuss the status and prospects of bilateral relations in the sphere of trade and economy. The negotiations focused on such issues as partnership relations in sericulture and oil and gas complex. Two contracts previously approved by resolutions of the President of Turkmenistan were signed: one is to provide services to increase oil recovery at "Gumdag" field and the second is to supply four drilling rigs for State concern "Turkmengas" at a total value of US\$52.4 million. Both contracts were concluded with the divisions of China National Oil and Gas Corporation that from 1997 have been successfully performing workover of the wells at oil fields in the West of Turkmenistan. Yet another agreement was signed to grant a 5 million yuan donation in aid from the Government of China to Turkmenistan. Trading authorities of both countries will specify the mechanism to use the above funds.

### Russia

During the working visit of the President of Turkmenistan to Moscow in January 2002, in negotiations that were held in an atmosphere of complete understanding and consent, the national leaders had a comprehensive exchange of opinions on matters of topical interest and prospects for developing Turkmen-Russian relations and on key regional and international problems of mutual interest.

The presidents confirmed their readiness to engage in comprehensive expansion and strengthening of equal and mutually beneficial cooperation in various spheres and made instructions for the preparation in the nearest future a draft of a treaty on friendship and cooperation between Turkmenistan and the Russian Federation. Specifically stressed was the importance of developing large-scale cooperation in the sphere of the oil and gas complex and energy resources transportation. A concrete step in this direction shall be the signing of the agreement between the Government of Turkmenistan and the

Government of the Russian Federation on cooperation in the gas industry that envisages supplies of natural gas from Turkmenistan to the Russian Federation on a long-term basis and realization of joint projects in this industry of national economy.

On April 24, 2002, in Ashgabat at the Caspian summit, Turkmen President Saparmurat Turkmenbashi and Russian President Vladimir Putin signed the treaty on friendship and cooperation between Turkmenistan and the Russian Federation. This document became a natural continuation of the 1992 treaty, though worked over with due consideration of new realities, and it demonstrates the endeavors of both friendly nations to expand and strengthen mutually beneficial partnership relations. It covers all sphere of cooperation, from economic to humanitarian. In compliance with Article 21 of the treaty, the parties are expanding cooperation in fuel and energy complexes - processing, transportation, and sale of hydrocarbon raw material, construction and reconstruction of oil and gas complex facilities and its infrastructure, rational utilization and further development of available pipeline systems, and also realization of new export pipeline facility projects.

### Ukraine

Representatives of oil and gas complexes of both countries are negotiating an agreement between Turkmenistan and the Ukraine on economic cooperation for the years 2001-2010 and an agreement on supply of Turkmen natural gas for the years 2002-2006 and the principles of settlements for gas supplied to the Ukraine. Within the framework of these negotiations, issues related to the opportunities for Turkmen-Ukrainian cooperation in oil and gas industry of Turkmenistan are being discussed. These involve geological and geophysical works on contracted territories of Turkmen offshore and onshore, acceptable forms, scope, and term for Ukrainian participation in development of oil and gas resources, deliveries of Ukrainian transportation, crane and tug boats and other specialized vessels to participate in development works at the Turkmen sector of the Caspian Sea, design work related to process facilities of the combined onshore drilling basis for drilling, construction and operation of offshore fields, construction at the Ukrainian enterprises of mobile and fixed drilling rigs to drill exploratory and development wells on the Turkmen Caspian shelf and other works.



## Afghanistan

From the first days of independence, Turkmenistan has made efforts to expand and strengthen cooperation with Afghanistan in various spheres and to establish trade and economic relations. Over this period, a series of joint projects in various branches of industry has been developed, although the main project remains the gas pipeline project to transport Turkmen natural gas to Pakistan. Turkmenistan and Afghanistan have outlined priorities of economic partnership relations. During a March visit to Turkmenistan by H. Karzai, Head of the Provisional Administration of Afghanistan, the first documents regarding Turkmen-Afghanistan cooperation were signed, namely an agreement on cooperation in the sphere of electric power engineering. Five US\$500-million contracts were signed for construction and reconstruction of electric power supply facilities in the territory of Afghanistan. Once these projects are completed, a solid foundation to realize strategic plans to develop regional energy market will be established. As stated in the Turkmen-Afghan inter-governmental agreement, one of the directions for partnership relations

will be realization of projects to secure sales of Turkmen electric energy to third countries in transit through Afghanistan. Thus, Turkmen-Afghan agreements reach beyond exclusively bilateral interests and become one of the important vectors of regional development in general.

## Zarubezhneft

In the first quarter of 2002, Ministry of Oil and Gas Industry and Mineral Resources of Turkmenistan, State concern "Turkmenneft" and State enterprise Russian Foreign Economic Association "Zarubezhneft" signed a protocol of intent to intensify production of hydrocarbons at Turkmen fields, with the aim of utilizing advanced technologies to intensify hydrocarbon production proposed by "Zarubezhneft". It is planned to accomplish at Turkmen oil fields joint testing, adaptation, and implementation of integrated oil recovery and hydrocarbon production intensification methods, and certain operations making up such methods.

## Ashgabat Caspian Summit

On April 23-24, 2002, on the initiative of the President of Turkmenistan, the first Caspian Summit was held, attended by the heads of the Governments of Russia, Iran, Azerbaijan, Kazakhstan, and Turkmenistan. It was a historic event that was held at a high organizational and political level. The presidents expressed their unanimous opinion that for the first time ever they have entered the road leading to concord. The summit had the effect that any and all issues of dispute were delineated and discussed, and what is more important, they were taken out of the conflict zone. A clear understanding was reached to solve any problems on a peaceful and constructive basis. Areas of consent were outlined and topics for further discussions were specified. So, a resolute and irrevocable step forward was made to reach a common goal - to settle the status of the Caspian Sea. ■



# New Technologies in PSAs of Turkmenistan

### **PSA Block I - operator Petronas Charigali (Turkmenistan)**

**Time- and cost-saving drilling equipment and technologies were used in 2001 for offshore exploration drilling (up to 4,800 m).**

**New technologies and equipment that were used comprised the following.**

Top Drive electric power unit used to rotate the drilling string instead of a rotary table makes it possible to have 30 meters drilling assembly instead of 10-meter-long drill pipes drilling. The unit provides rotation when pulling out the string. This is important when drilling long sections of open holes with minimum mud surplus to maintain the through hole. Top Drive electric unit makes it possible to pull the string by back rotation in problem clay and shale.

Use of hub-type preventers help reduce preventer's pulling-out time. Flange connection requires 20 bolts to screw, whereas only 4 bolts need to be screwed in case of hub-type connection.

Diamond drilling bits are used mainly to drill holes up to 17-1/2" in diameter. Generally, one bit is used to drill the entire section, thus offering time savings for the round trip job to replace the bit. The company, though, has encountered a hard-to-drill section within 12-1/4" hole. Diamond bits were continuously covered with the rock. Usage of rolling cutter bits for soft rock helped increase the drilling rate. As to the sections drilled with diamond drilling bits, the company optimizes drilling parameters such as BRPM (bit revolutions per minute), weight per bit, mud circulation velocity and pressure to increase drilling rate. As to hard but sandy rock, most efficient was 190-RPM mode with minimum per bit weight.

Logging tool is used for hole logging while drilling. This tool offers real-time data on the rock and hole path and better control over casing depth and time saving for pulling out job and electric logging. Above all, the most important thing about it is that this technique excludes the risk of sticking and emergency work to pull out the logging tool.

Hydroblock hammer was used to drive in special 30-inch surface casing string to the end. Usually, the top 20 meters of a hole are drilled with a 36-inch bit followed by driving in 30-inch surface string till the thrust end. This operation takes less than a day compared to two days or more to drill and cement 30-inch pipe.

Efficient shale shaker was used to remove cuttings from the drilling mud to secure efficient drilling job. KCL PHPA polymer glycol based drilling mud was used to drill 17-1/2" or smaller sections. This drilling mud is extremely efficient to check swelling of clay and shale rock.

### **PSA Nebitdag - operator Barren Resources Petroleum Limited**

**New technologies facilitating cost saving and oil production increase were used to develop Burun field.**

#### **Water injection:**

Barren launched a pilot water-injection project to pump water at 5,000 psig operating pressure to the depth exceeding 4,000 m. This is one of the deepest reservoirs in Turkmenistan to employ secondary operation methods.

#### **Gas lift:**

Gas compressor by Nuovo Pignone was purchased. Now it is being installed to consolidate gas lifting system throughout the field, especially for applications below 3,000 m. The company has been purchasing advanced gas lift equipment, including Weatherford McMurphy Maaco cable retrieved gas lift valves.

#### **Well completion equipping:**

Contractor uses modern technologies - 2 1/8" deep charges by Schlumberger. The company uses equipment by the leader in well completion technologies manufacturer - AS1-X packers by TEAM (Houston). Barren works with Harbison-Fisher, the leader in the sphere of deep sucker-rod pumps to improve operation of deep sucker-rod pumps at the field.

The practices of employing more local specialists contributes to much better understanding of field peculiar-

ities. Besides, local labor performs the principal work instead of subcontractors, thus contributing to cutting expenses.

### **PSA Garashsyzyk-2 - operator Exxon Turkmenistan (Amudarya) Limited**

**New developments and methods contributing to improved data quality and cost reduction were used to complete 2D work at West Turkmenistan fields.**

ExxonMobil has developed HFVS (High Fidelity Vibroseismic Simulation) technology to collect and process seismic data. This new method may help improve data quality and cut expenses, especially for territories with considerable surface divergences such as limestone outcrops. Surface power signals from several vibrators are recorded separately to be used to identify the interval operator to retrieve reflection data from each of the vibrators as if they were recorded separately. Measuring output data for each vibrator and given non-linear distortions and communication errors are minimized, so small waves with minimum sin phase are obtained. Field data confirm that intervals between the signals taken from separate vibrators and recorded simultaneously are within 40-60 dB.

In case several vibrators are located at different elevations and in the surface environment, data quality is much improved when they are processed on a separate basis. In case conventional seismic survey signals from each vibrator are automatically combined, deviations in the near-surface zone significantly deteriorate resolution. With the HFVS method, statistical errors can be calculated for each vibrator prior to totalizing. Besides, HFVS usually offers higher coverage factor to have coherent noise reduced more efficiently. Given signal to noise level is favorable HFVS method may also improve efficiency through parallel recording of several shot points.

### **PSA Cheleken - operator Dragon Oil (Turkmenistan) Ltd.**

**Company's principal efforts are**



**aimed at increasing production and reducing specific production cost to secure production efficiency and profitability. Dragon Oil relies on well-completion methods that are modern and reliably tested by previous experience drilling.**

To date, the company has completed and put into operation two wells and spud in the third one. Small radius curve proved to be the optimum version for drilling above wells. Third well is expected to be completed within 100 days. This became possible due to minimizing equipment failure risks, correct bit selection, ad-lib drilling mud technology and equipment to check the cuttings. The first two wells were drilled to "S" pattern, whereas the third one is being drilled at 30° slant. Due to multi-layer structure of the pressure reservoir, the data produced by mud logging, especially by technical cable logging, are very important. Tool logging is used to identify pressure patterns and fluid structure. This information is important to have optimum completion of well-drilling job.

New wells were completed in several producing horizons, thus permitting unit cum individual operation of the beds. All previously drilled wells ended up exclusively in one producing horizon, thus considerably limiting development opportunities and well yield and hydrocarbons recoverability.

It is clear that the multi-horizon well-completion pattern employed by the company raises expectations for increased recoverable reserves and renders development more efficient and profitable.

The company will proceed with the drilling work program and plans to construct and modernize the entire field infrastructure, including onshore facilities and the filed product collection system. Partly, the plans were successfully accomplished in July 2001. Beside LAM-22 production platform, a new offshore platform was installed to host living premises. In due time, LAM-22 complex will be converted into the central offshore base to consolidate control and supervision over all production wells and offshore hydrotechnical structures.

### **PSA Khazar - operator SC Turkmenneft**

**New technologies contributing to cost reduction and oil production rate increase were employed for drilling work and operation of East Cheleken field.**

For the first time ever in Turkmenistan a comprehensive geophysical study by Schlumberger was completed at well 33 at the depth exceeding 4,600 meters, comprising running in geophysical tools on drilling pipes and TLC (tough logging conditions) system utilization. The following results were obtained by this geophysical study:

- for the first time ever, a considerable part of East Cheleken filed production section has been covered by modern geophysical complex making possible to correlate rated Schlumberger complex parameters with GS OGDD for all wells within south-east limb of East Cheleken;

- compensated neutron logging data and combination with wide-band sonic method give a detailed evaluation of the bed porosity index required for geological simulation;

- wide-band sonic method will help obtain mechanical properties rock appraisal required to optimize bit selection schedule and to design horizontal drilling;

- repeat formation testing (RFT) helped to identify the actual (initial bed) pressure within beds of members IX, 1Xa, 1X6 and within the top section of member X. Pressure data is required to have accomplished hydrodynamic simulation of the field;

- repeat formation testing (RFT) helped to obtain data on the nature of formation pressure gradient within the lower section of red rock and configuration of pressure values within high reservoir pressure anomaly (HRPA) zone and trace the stratigraphic confinement and depth HRP zone begins. Reservoir saturation tool (RST) testing employing neutron carbon-oxygen method was accomplished for the first time at some wells. Based on RST results and taking into consideration results obtained through previously accomplished conventional electro-metric study interval selection was made for reshooting and additional shooting work.

Geophysical study package included inspection of casing string technical condition and their bond with hydrated cement by means of CBL (cement bond log) and CET (cement evaluation tool) methods. Shooting was accomplished by perforators with highly efficient POWER ENTRJET-43 Schlumberger charges.

Newly developed drilling bits by Continental Industrial Supply and Baker Hughes will be used to drill wells by new drilling rigs in order to cut well construction period.

All drilled wells will have modern wellhead equipment. Casing heads and Christmas tree by ABB Vetco Grey, a leading world manufacturer, will be

used.

Well-maintenance program included utilization of flexible tubing for bottom-hole cleaning, high-performance perforation systems and appraisal of current oil saturation by modern GS methods, namely pulse neutron carbon-oxygen method.

When Continental Industrial Supply came on the scene, a program of existing well pool overhaul commenced assisted by overhaul heavy-duty pulling machine equipped with advanced drilling mud cleaning system and blowout preventer equipment. Combined job package included fishing operations, water shutoff, return to underlying formations, repair of casing strings, repair and replacement of casing heads and Christmas trees.

An important element of the workover job was the use of clean brines based on a mix of calcium chloride calcium bromide to kill the well and fine brine filtration system. Brines void of solid phase considerably reduce the risk of deteriorating reservoir properties of the formations.

Unique water-shutoff work was accomplished at well 2, that included use of flexible tubing unit. Use of flexible tubing unit and Sleek line cable unit made possible to accomplish the following works:

- complete cleaning of tubing off asphalt-resin-wax accumulation;

- retrieving lost alien items (at well bottom or in tubings);

- secure geophysical tools passage through the tubing (pulling out attachments for subsurface pressure gages);

- removal of sediments from well bottom (sand and baryte bridges and perforators' debris);

- cleaning of perforation openings by means of rotary side flushing;

- downhole rock sampling;

- placing and drilling out cement plugs below tubings without pulling out the latter.

Turkmen partner acting as operator contributes over 70 years of SC Turkmenneft's experience to the project, offering an opportunity to use the infrastructure, equipment, technology and the personnel of the national oil company to carry out project works.

In its turn, foreign investor Mitro International Ltd. provides for operational and flexible investment of the partners' respective shares and contributes international experience to secure technologies, supplies of requisite equipment and materials that are necessary to promote the project and employs its own expert assessment to guarantee efficiency of investment and use thereof to designated purposes. ■



## Oil and Gas Complex of Turkmenistan 2001-2002

Indices	Unit of measurement	Actual Results in 2001	Programm for 2002
<b>GROSS PRODUCTION</b>			
Gas	M m <sup>3</sup>	51,324.6	70,800
including export	M m <sup>3</sup>	37,339	56,500
Oil (including gas condensate)	K tons	8,019.7	13,500
including export	K tons	1,802.6	2,730
<b>OIL REFINING</b>			
including export	K tons	5,212.8	7,700
including export	K tons	2,854.9	5,056.8
Production of gasoline, all types, total	K tons	993.6	1,962
including			
Gasoline AI-93, AI-95	K tons	229.6	300
Gasoline A-76	K tons	764	1,158
Production of diesel fuel	K tons	1,475.3	2,067
including export	K tons	926.6	1,417.3
Production of fuel oil	K tons	1,303.7	2,093
including export	K tons	1,144	2,022.9
Production of LP 6	K tons	93.8	245.2
including export		85.5	238.5
<b>PROCESSING OF NATURAL GAS</b>			
LN 6	K tons	17.4	15
including export	K tons	9.1	1.98
<b>EXPLORATORY DRILLING</b>			
	K m	80	133
<b>DEVELOPMENT DRILLING</b>			
	K m	144.8	169
<b>CAPITAL INVESTMENT</b>			
	Bin manat	4,697.2	8,484.4



# Investments in oil and gas complex for the period of 2002-2010, US\$ billion

	Total	State concerns and corporations					Direct foreign investments
		Turkmenogas	Turkmenneft	Turkmengeologia	Turkmenneftegas*	Turkmenneftegasstroy	
TOTAL	45.7	3.6	4.9	0.6	2.1	0.12	34.4
including							
Own funds	8.5	2.9	3.8	0.6	1.1	0.12	
Borrowed funds	2.8	0.7	1.1		1.0		
Including foreign loans	2.4	0.6					
Direct investments	34.4						34.4

\* Out of the investment funds of STC "Turkmenneftegas" it is planned to invest in oil refineries as follows: TOR - \$0.549 billion, SOR - \$0.156 billion.

Investments for "Turkmentransgas" - \$0.140 billion.

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Cover photo: CCR hydraulic cleaning and catalytic reforming unit at  
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