

Prospects of Using the New Technologies in Oil and Gas Industry of Kazakhstan

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Abstract

In this review, prospects of using the new technologies in oil and gas industry of Kazakhstan are presented. The new technologies for solving of oil recovery of problem, transporting and oil refining depth considered.

The Republic of Kazakhstan is one of the great oil producers in the world. Present day, according to the supply of hydrocarbon raw materials, the country takes 13-th place in the world, but some facts say that

Kazakhstan will take 6-7 places in near future [1]. The level of oil recovery in 1991 was 26 mln tons, in 1998 decreased in to 15 mln tons a year, and in 1998 the level increased in to 26,5 mln tons a year again (see Fig.1).

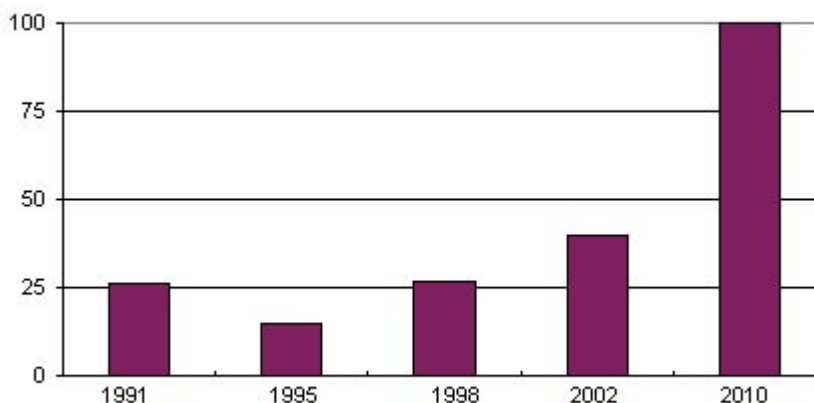


Fig.1. Volume of oil recovery, mln tons

In 1999 Kazakhstan broadly celebrated the 100-th jubilee of its oil and gas industries. A century ago in April No7 gave the first gusher in Karachungul place, Zhyloi region, in Atyrau, at the depth of 40 meters with the daily debit of 22-25 tons. The bore hole belonged to the Petersburg commercial company, to E.Grumb-Grzhimailo, Leman and Deppelmayer.

The industrial oil extraction was launched in 1911. In 1998 26,5 mln tons of raw material have been produced. It is expected that the oil extraction volume will be tripled owing to oil field.

A large portion of oil is exported. The output of all 3 oil refinery plants in Kazakhstan (Atyrau, Pavlodar and Shymkent) does not exceed 18 mln tons of oil per year. There is a problem regarding the increase in oil refining depth, directed to morovement the produced product quality and their assortment expansion. No plant produces any lubricating oils.

The new technologies and many investments are required to solve these problem.

The western regions have been considered to be perspective for oil and gas extraction (Atyrau, Mangistay, Aktjubinsk, Uralsk), at present the Southern oil field are being exploited, the perspectives to the East, North

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and Central Kazakhstan are determined. However the oil of XXI century is in the Caspian.

The consortium «KazakhstanCaspishelf» was established in order to make a detailed exploring and to conduct a geophysical study of Caspian shelf of the Kazakhstan sector. Alongside with the Kazakhstan companies, the big, well-known companies as AGIP, BRITISH PETROLEUM/STATOIL, BRITISH GAS, MOBIL, SHELL, TOTAL became the members of the consortium.

A wide scale work on study of geological construction and determination perspectives of oil and gas content in the Kazakhstan sector of the Caspian sea was held by the consortium. 218 mln dollars were invested for this part of work. 500 mln dollars were invested for the infrastructure development. About 26 thousand long linear kilometer seismological facts became known. Tons of oil and gas perspective structures were revealed. This gave an opportunity to begin exploration drilling.

The close mutual understanding between Pricaspian countries such as Russia and Kazakhstan, Azerbaijan, Turkmenistan and Iran is necessary for effective using of the Caspian wealth. Unfortunately the status of the Caspian sea has not been defined yet.

Kazakhstan, Nursultan Nasarbáyev says, considers the sea surface and its bioresources to be a common property, but herewith upholds the sectional dividing of the sea ground and its bowels. The above mentioned principle was the basis of the agreement signed by the Caspian states in July, 1998.

Exploitation of the Northern Caspian ground will be launched at the end of June 1999 (East Kashagan, in 80 km from Atyrau). The work will be carried out by the Offshore Kazakhstan International Company, which shareholders are Italian «Agip», English «British Gas», «British Petroleum», French «Total», Japanese «Intex», American «Mobil» and «Phillips Petroleum» and Dutch «Shell».

«Tengizshevroil» is regarded to be model example of using Caspian wealth rationally. Official strategy of «Tengizshevroil» is to become the most efficacious oil company in the world. The practice has shown that on the factors of using the technologies, on economic factors and also on social problems «Tengizshevroil» occupies dominating position. For instance, in 1998 the Republic of Kazakhstan received 452 mln dollars in different directions and enterprise salary fund was 30 mln dollars (with average salary being 625 dollars per a month) [2].

Thus, the social problems in «oil» regions are solved

effectively. The results of the census conducted in 1999 may prove it: nowadays 14 mln 950 thousand people live in Kazakhstan (in 1989-16 mln 1999 thousand p.). Increase in population is observed in the «oil» areas-in Atyrau is 4%, in Kysylorda - 4%, in the Southern Kazakhstan-9%.

In 1993, i. e. its first year of working, «Tengizshevroil» extracted 30 000 barrels of oil a day, in 1998-190 000 barrels. According to the project, the extraction volume will be brought to 500 000 barrels or 16 mln tons per year. The Caspian pipe-line will be launched by that time. Exploitation cost on mining one ton of oil have been brought from 130 dollars to 20. These facts show that «Tengizshevroil» becomes the main section of a new Caspian oil branch.

One of the deterrent factors in increasing of oil mining volume is the unsolved problem of oil transport to the world market. It is known that not only economic, but also geopolitical factors play a significant role in solving of this problem. Among all the supposed oil transporting routes the Caspian pipe line, connecting Tengiz with the Russian port Novorossiisk has a great significance; pipe line is to start working in June 2001. Designed capacity of the pipe line is 27 mln tons of oil per year.

At the same time, technical problems concerning the increase in Kazakhstan oil transporting volume of existing systems are solved. For instance, for Atyrau-Samara system Kazakhstan quota has increased by 4 mln t oil per year from 1999. Delivery of Kazakh oil by different means of transport through Iran and Georgia is going on.

A certain portion of oil and gas is refined in the oil and gas stations.

Atyrau oil refining plant built and put into operation in severe years of the War II is the most important one in Kazakhstan oil refinery industry. In 1945 plant output was about 800 thousand tons oil per year. At present the output up 5 mln tons per year.

Now it is a jointstock company. It produces petrol of 4-brands — AI-76, AI-80, AI-91, AI-93 and aircraft kerosene, diesel oil, stove fuel, salve, coke oil, roasted coke and others.

The depth of oil refining is 59,9%. Measures on a sharp increasing of refining depth and on the plant reconstruction are being taken. The plant has a large intellectual potential. The workers are skilled in modern technology, but the plant needs investments for its wide introduction.

The Pavlodar and Shymkent oil refining plants are considered to be more up to date. They were built for

refining of oil mixtures of Western Siberian oil field. For this purpose the powerful oil pipeline Omsk—Pavlodar—Shymkent—Fergana—Chardzhou was built. After the collapse of the USSR the supply of the above mentioned plants with raw material become a problem. The plants were transferred to the possession of unknown foreign companies. But this attempt ended unsuccessfully.

The output of 3 plants is 18 mln tons of oil per year. Though more than 26 mln tons of oil are extracted in the country, owing to various subjective and objective reasons the plants are not supplied with enough raw materials. Owing to low refining depth and inferior quality of produced oil products the industry of our country faces many difficulties.

None of the above mentioned plants produces lubricating oil and oilchemistry products. The country demands in these products are satisfied owing to import. The country will face a big problem concerning the using of new technologies, assortment expansion of the product and investment volume increase.

Joint-ventures. The strategic direction of oil and gas branch development is a wide using of new technologies and investments. The setting up of the joint-ventures to big foreign companies is the right way of above mentioned issues setting. One of the foreign investors, who was going to run his business in Kazakhstan said: «we come here not to possess part of your country but to become a part of your country».

Many joint ventures, such as «Tengizshevroil», «Kumkol-LUKoil» (with Russia), «Kazakhturk-munai» etc. are the bright examples of it.

JV «Kumkol-LUKoil», established in 1995, got 5 billion tenge from oilproduct sale last year. With the assistance of Russian scientists the automatized sections in the field of drilling, mining, transportation of highlyparaffin oil are worked out. Also the salt- paraffin accumulation and oil equipment corrosion control are worked out [3].

«Kuatamlonmunai» was established in 1994 for exploitation of Konys and Bektas oil field in Ksylvorda region (near oil field Kumkol). Only in 1997 the construction of the village for 61 persons has been finished. The access road with the length 53 km, has been. The test drilling of 10 holes was ended. In future these holes will give 13 thousand barrels a day. The construction of 4 star hotel for 54 place in Ksylvorda is going on.

Not only new technologies but scientific debates, seminars and conferences on vital scientific-technical

problems are being introduced by the foreign companies, firms and big departments.

Scientific seminar on sequence stratigraphy held in Almaty by the American association of oil geologists, American oil company ARCO in common with the scientific-engineering center «Neft», Engineering academy under the support of Ministry of oil and gas industry, National academy of sciences, Ministries of geology and natural resource protection was a great event. Specialists in the field oil industry, the heads of oil and gas enterprises took part in the seminar. Many of them change their opinion about oil and gas content of the regions of Kazakhstan [4].

The privatization of oil and gas complex enterprises has begun. The new owners are supposed to invest 3 billion dollars in 5 years as investments into oil mining enterprises.

Privatized oil and gas companies will make a contribution to increase effectiveness of the branches by using the new technologies and equipment.

Private company ANAKO (Atyrau joint stock company) which constitutors are representatives of Kazakhstan (president Sagat Tugelbaev) was the first to use in Atyrau, in the oil field Kyrykmylytk:

- new underground pumps for oil mining - screw pumps of Austrian production;
- diesel-generator units Katerpillar for their own power stations;
- wind energyunits for electrochemical protection of oil pipe line;
- water freshening on the deposit by diaphragm water freshness from water bore-holes.

Present day the company-operator, gained tender on managing, is working at the oil field. The oil workers first put it into practice in Kazakhstan.

The oil gas potential development program includes the ecological problems, i. e. biosphere protection.

Caspian oil is under extreme conditions. For instance, Tengiz oil is at 850 atmosphere pressure under 120-150 °C, sulphurous gases content to 25 %. To expose such a bed is equal to expose a powder red. There was a surge on 37-th bore-hole in Tengize: air got heated to 180 °C, the earth to 410 °C, radius impact was 350 km. The sulphureous gas content exceeded 20 MPC at 45 km distance (maximum possible concentration).

Above mentioned consortium «Kazakhstan-caspi-shelf» gave a whole picture of the ecological condition of the Caspian sea. The new environment protection methods and technologies of extracting, drilling, prepa-

ration, transporting and refining of oil with anomalous properties are being worked out by scientists and specialists.

New technologies are offered and put in industry by scientists of Kazakhstan for the solution of problems connected with efficient using of diesel fuel purification of high sulfurous oil from harmful sulfurous and metal containing compositions. The new non-organic coating for oil gas equipment and aqueduct protection are developed, the problems connected with ecological control of oil contamination are solved. Scientific engineering center (SIC) "Neft" of Engineer academy of RK developed the project, realization of which will allow to develop the methods and instructions for normalization of harmful blowouts of petroleum refineries, to determine the normalizing costs of stable condensate and the norm of natural saleable oil decrease.

Contamination of environment by ecologically-harmful components of used-up petroleum products is a great problem. About 6 mln tons of petroleum products get into biosphere every year, more than 50 % of which are the used-up lubricant. It is necessary to put in the new technologies of regeneration, the collection of used-up petroleum products, taking of economical steps, stimulating the ecologically-pure methods of used-up oils utilization. One of the perspective methods is the method of regeneration and purification of used-up petroleum product mixtures, developed by Kazakh State National University (Yu. Zaykin, R. Zaykina) based on using of high-energy electron or gamma-quantum beams. The using of new technology will allow getting motor fuel mixtures, purified from tars and washing materials, without using of chemical reagents [5].

The Government of Kazakhstan pays a great attention and solves successfully up-to date problems connected with organization of modern productive infrastructure of oil gas sector in economy. The organization of industrial — drinking water supply both in oil reprocessing and output regions plays the main role. The more difficult problem of water supply takes place in the South Kazakhstan regions due to necessity of surface and stratal water with high mineralization and great concentration of corrosive and toxic components using. It is the cause of low operating and ecological serviceability of industrial - drinking water supply systems. One of the perspective methods of serviceability increase in anti - corrosive reprocessing of water by inhibitors, among which non -organical polymeric phosphates are effective

and for their production there is the powerful raw material and industrial base in Kazakhstan — phosphorites of Karatau and phosphater plants of Taraz and Shevchenko. It is necessary to point out that due to functional dependency of properties on polyphosphater composition it is possible to get the matters which are effective both in drinking water supply systems in low mineral water and industry water supply (in systems of seam pressure support, with use of stratal and gray water) using the same technological line.

The scientists of Chemical sciences Institute named after A. B. Becturov (E. E. Ergozhin, U. Zh. Dzhusipbecov) have developed the technology of obtaining and approved in experimental - industry scale a number of phosphaters compositions which allow solving problems of corrosion and salt sediments in complex and also refusing from expensive import reagents using [6].

The exploration and exploitation of the most part of oil gas condensate Kazakhstan fields are connected with aggressive influence on pipelines, stratal water and oil equipment, containing the hydrogen sulfide, that leads to the loss of mechanical durability of metals as a result of its absorption by hydrogen. Whereas, phosphaters do not supply the protection of steel constructions from aggressive influence of hydrogen sulfides media the investigations on composition creation on base of polyphosphaters and organic composition have been begun by Institute of chemical sciences and Kazakh State National University.

The method and technology of reprocessing of high-viscosity oil with paraanomalous properties are developed in the Institute of Metallurgy and Beneficiation. The method includes predemetallizing and predesulfidizing in autoclaves at manganese-bearing materials presence. On the first stage the raw oil on the oil fields undergoes the hydrofining and hydrocracking on catalysts.

The hydrosulfur is trapped and reprocessed with elementary sulfur obtaining by claus-process with the aid of homemade titaniumoxide catalysts, by this the output of light fractions is supplied. Used-up catalyst are reprocessed with pure oxide vanadium obtained according to developed technology.

The pre-technical-economical calculations show the economical effect will be 200,0 mln tenge at 2,5 mln tons per year of heavy oil reprocessing.

The perspectives of development of modern petroleum producing industry are connected with intensification and deepening of processing both initial and

used-up materials. One of the non-traditional ways of petroleum product reprocessing including high productivity and quality of end products is the using of ionizing radiation energy. At mazut reprocessing by beams of high energy electrons, it may be obtained the gild of motor fuel to 80 %, including gasoline to 20 % and diesel fuel to 60 %.

It was shown on the example of heavy petroleum products reprocessing (mazut M-40 of Atyrau refinery plant, Karazhanbassk oil) with high sulphur concentration that the most part of transformed, at radiation, sulphur compositions are in heavy liquid fractions of radiation product basically, as oxidized compositions, while the concentration of sulphur changes a little in coked rests in comparison with initial product [7].

Analysis of oil resources balance, oil demand and supply in world market, combination of strategic goals and economic profits determines the ways of export pipelines from Kazakhstan. At present, delivery of Kazakhstan oil for world market is held by means of Uzen—Atyrau—Samara pipeline. The present pipeline system of Russia, taking into account its efficiency, may play the main role in oil export from Kazakhstan in the future. But it is not enough.

The Caspian pipeline connecting Tengis and Novorosiisk is the most important from all the future ways of oil transports, which is planned to be launched in June, 2001, with 27 mln tons per year project capacity.

The “KazTransOil” company is trying to make an agreement of oil transport through the system of trunk pipelines of “Transneft”, the pipelines of Ukraine, Byelorussia and Lithuania to increase the export opportunity it will allow to increase the quality of exported Kazakhstan oil. Among other project it may be noticed the exoneration of non-working branch of Tengiz—Aktau pipeline, that would allow to export 5 mln tons of oil.

The agreement about building of West Kazakhstan—Kumkol—China pipeline has been signed, The Caspian pipeline consortium had signed the contract with Russian-French consortium “Starstroy” on building of linear part of pipeline from frontier of RF with Kazakhstan to Novorosiisk. The technical questions connected with increase in quantity of Kazakhstan oil transport according to the existed systems are solved. For example, according to Atyrau-

Samara system the quote of Kazakhstan since 1999 has been increased by 4 mln tons per year with account of approach till 12—15 mln tons per year. The supply of Kazakhstan oil by different kinds of transports through Iran and Georgia is continued. The control of risk and strategy of insurance gets new impulse, that will allow petroleum and gas companies to get the safe base for developing economical market. We have to solve the problems connected with reforming of industrial structure, providing of scientific part of developments, creation of department system on organization of information-publishing and presentational centers and so on. The solution to these and other problems will allow to get over dragged out pause, to support achieved already in 90-th years standard of oil output, and even to increase it two-three times owing to huge hydrocarbon potential marine and ground fields of Kazakhstan.

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