

Case Study From



Refining Sector in Kazakhstan¹

Kazakhstan produced about 828,000 b/d and exported more than 631,000 b/d of oil in 2001. The country used to be one of the major refining centers in the Soviet Union and still has about 400,000 b/d refining capacity. But, it imported refined products although domestic demand was only 130,000 b/d. Despite an 18-20% increase in production and exports in 2000, domestic refineries operated at only 30% capacity. Production of products dropped by 28% from 1998 to 1999. In December 1999, a regulation limited crude exports to secure feedstock for domestic refineries. In August 2000, a decree essentially forced companies to provide 25% of monthly output as guaranteed feedstock to

domestic refineries. Further measures, including legislation, to strengthen state control over the oil market may be introduced. The government also imposed a temporary ban on fuel oil exports to ensure sufficient volumes to meet domestic requirements for the heating season (until March 1, 2002). A similar ban was also imposed in 1999. What are the reasons for this paradoxical situation that damages Kazakh economy?

- *Are the existing refineries too old and cannot be upgraded, making their outputs incompatible with domestic needs?*
- *Are imports cheaper? Or, are export options for products limited?*
- *Is it lack of private capital that hampers profitability of these refineries? Or, is it just that crude oil exports are more profitable?*
- *What strategy should Kazakhstan pursue?*

Background

Kazakhstan, with 16 million people and a land area of one million square miles, is one of the most sparsely populated countries. GNP per capita was \$1,260 in 2000. Kazakhstan has a



vast area of arable land, but the share of agriculture in GDP is only 10% while the industrial sector (mostly developing the country's rich oil, gas and other resources) accounts for 30%. The economy is still closely linked with the other economies of the Former Soviet Union (FSU). However, since independence in 1991, trade has been redirected toward markets outside the FSU. Exports to Russia fell from 52% in 1987 to 26% in 1999. About

40% of Kazakhstan's imports come from Russia.

The country's economy contracted by 11% in 1992, 15.6% in 1993, 18.8% in 1994, and 8.9% in 1995. Devastating inflation struck the country and the rate exceeded 2000% in

¹ This case study was prepared using publicly available information.

1993, and 1,000% in 1994. During these transition years, employment fell sharply. In 1993, with international assistance from bilateral and multilateral donors, Kazakhstan began a comprehensive reform program aimed at moving toward a market economy. By end-1997, majority shares of virtually all eligible small- and medium-scale enterprises had been sold; share packages in most enterprises for mass privatization had been offered; and all but a few of 2,000 state and collective farms had been privatized. Management contracts have been let for many of the largest industrial firms, and many oil, gas, and mineral reserves were awarded to foreign investors. Also, the government began a major Pension Reform Program in 1998 that will strengthen the financial and securities markets.

The stabilization and liberalization efforts helped move the economy from hyperinflation to single digit inflation (3%) in 1998. By 2001, the registered unemployment rate declined to 3.3%, although the unofficial rate is estimated to be much higher (12-13%). The first positive growth after the break-up occurred in 1996. The economy continued to grow every year since then with the exception of 1998.

Energy Profile

The energy sector is central to the Kazak economy. Kazakhstan's oil production in 2001 reached 39.7 million tons (MT) a year (828,000 b/d). Domestic consumption in Kazakhstan has dropped sharply from 21.4 MT a year (430,000 b/d) in 1990 to 7.7 MT a year (155,000 b/d) in 2001. The country is also a net exporter of natural gas and coal.

Fossil Fuel Reserves, Production and Consumption in Kazakhstan (2001)

	Proved Reserves	Production	Consumption
Oil	1.1 billion t. (8 billion b.)	39.7 MT/yr (828,000 b/d)	7.7 MT/yr (155,000 b/d)
Natural Gas	1.9 tcm (65 tcf)	10.7 bcm/yr (1.1 bcf/d)	10.1 bcm/yr (1.0 bcf/d)
Coal	38 billion short tons	82 million short tons	67 million short tons

Sources: Energy Information Administration, BP World Energy

Kazakhstan oil output is expected to increase significantly, especially if the Kashagan field proves to be another Tengiz (with potential recoverable reserves of 10 billion barrels). Some estimates for crude oil reserves in Kazakhstan are much higher than the estimates provided in the table above. For example, EIA reports a range of 10 to 17.6 billion barrels. With the completion of CPC pipeline, export options are increasing. Kazakhstan also started negotiations to join the Baku-Tbilisi-Ceyhan project in order to give it an alternate export route for its oil. Export of 350,000 bbl/d of oil annually through Russia's pipeline system of under a 15-year oil transit agreement will also increase the export amounts. Thus, by 2005, Kazakhstan may be able to produce 60 MT/yr (1.2 million b/d) and export more than 45 MT/yr (1.0 million b/d).

National power consumption has declined annually since 1990, with 2000 demand (48.3 terawatt-hours) little more than half of 1990 levels, primarily because of a drop in industrial electricity demand after the collapse of the Soviet Union. Although Kazakhstan currently generates enough electricity to meet most of its demand, the separation of networks has resulted in Kazakhstan becoming both an exporter and importer of electricity in accordance with regional needs. Kazakhstan has 17,450 MW of generation capacity (87% thermal, 13% hydro). In 1999, 87% of electricity was generated by thermal plants and the rest was generated by hydroelectric plants.

Privatization of the Hydrocarbon Sector

In July of 1995, President Nazarbaev issued a decree outlining rules for foreign companies wishing to invest in the country's energy resources. Before this decree, three entities held authority over the industry: 1) The Ministry of Oil & Gas (MOG) regulated oil and gas production and refining; 2) The Ministry of Geology & Preservation of Underground Resources regulated development of mineral resources; 3) State company Kazakhstanneftegaz, through various state owned operating units, engaged in oil and gas exploration, development, production, transportation, and refining.

The Kazakhstan transaction model was created to serve as a basis of negotiations with foreign oil and gas companies. The model has two key elements: 1) a joint venture (JV) between one or more designated Kazakhstan parties and a foreign oil company; and 2) an exploration and production contract between the JV and the government of Kazakhstan. The two-step procedure promises profitability to attract foreign oil company investments, while maintaining the country's control over resource development. It reserves for the central government the ownership of resources, but allows owners of hydrocarbons as determined by contract the right to dispose of production as they see fit. The form of contracts to be allowed includes JV, service, and production sharing agreements (PSAs).

Regardless of these changes, bureaucracy and legislative changes frustrate the international companies operating in the country. For example, due to a disagreement Kazakh government and TengizChevrOil (consortium developing Tengiz field) regarding some funding issues, the consortium was suspending a major portion of its financing. The conflict was later resolved. In addition, Kazakh President issued a decree that guarantees contracts with foreign investors remain in force regardless of changes in the legislation. However, that applies only to the new contracts, leaving the existing contracts in the danger of similar actions again.

In March 1997, the MOG was dissolved and a new organization, KazakhOil, was established to take over the state's interests in the petroleum sector. KazakhOil took control of the country's privatization efforts in the oil and gas sector, previously responsibility of the State Property Committee. This restructuring resulted in the divestiture of part of their equity interest in sector entities to foreign strategic investors through management contracts and partial ownership of the enterprise. President Nazarbayev signed amendments to existing oil and gas legislation on August 11, 1999 to give KazakhOil enhanced powers and responsibilities including the right to monitor foreign oil companies' activities although it may be their competitor. In February 2002, KazakhOil and the national oil and gas transportation firm TransNefteGaz were merged into a new national oil and gas company – Kazmunaigaz. Kazmunaigaz is now charged with ensuring a single state policy on using the country's mineral resources.

By the end of 1997, substantial equity ownership in two of the three Kazakh refineries and most of the large state oil companies had been transferred to foreign operators. In mid-1998, Kazakhstan transferred public stakes in its production and refining companies to KazakhOil in preparation for a possible privatization. However, the Kazakhstan Anti-Monopoly Committee (KAC) ruled that KazakhOil must at least divest itself of its export subsidiaries Munai-Impex and KazakhOil-Kommerts.

Oil and gas infrastructure

Refineries in Kazakhstan are struggling to overcome their legacy of outdated technology from the Soviet era. Prior to the break-up of Soviet Union, these refineries were part of a broader regional network, planned and built mostly to satisfy the economic needs of the Soviet Union and not the particular domestic or industrial needs of Kazakhstan.

As a result, today, Kazakhstan's refining configuration is not suited to its internal needs. The 104,000 b/d Atyrau refinery is the only refinery that can process domestic oil produced in the region. Pavlodar refinery does not have connections to the most prolific producing region of the country and depends on Russian oil. In 1999, 74% of refinery throughput was Russian oil. Shymkent refinery currently uses oil from Kazakh fields at Kumkol, Aktyubinsk, and Makatinsk, but utilization is only 60% because it is unable to process other oils.

The plants are outdated and not maintained well. They were constructed with Soviet design and manufacturing processes and the latest western technologies were not available before 1991. According to the World Bank, their secondary oil processing capacities was on average 31% in 1991. They have limited capacities for converting bottom-of-the-barrel into light products. They largely rely on catalytic reforming and hydrotreating processes rather than catalytic cracking, hydrocracking, and thermal operations. The share of heavy fuel oil in refinery output is on average 35-40%. Gasoline quality is well below European standards. The products are high in sulfur and unprofitable in export markets.

Another result of Soviet planning is the lack of infrastructure for Kazakhstan's domestic gas resources. The country has estimated 2 trillion cubic meters (tcm) of gas reserves (~70 tcf), 96% of which are located in the east, but development of gas in Kazakhstan as a part of the Soviet Union was limited. Domestic markets in the south are forced to rely on exports from Uzbekistan.

In 1995, Oil & Gas Minister Balgimbaev identified seven projects to establish the independence of Kazakh oil industry: 1) Construction of a refinery at Mangystau at a cost of \$1.5 billion; 2) Rehabilitation of Uzen oil field to produce 7.5 MT/yr (150,000 b/d); 3) Expansion of Zhanazhol gas processing plant near Aktyubinsk with an initial outlay of \$200 million; 4) Upgrade of Atyrau refinery - \$1.2 billion project that should enable Kazakhstan to refine about 6 MT/yr (120,000 b/d) of its own oil and to produce 1.9 MT/yr (38,000 b/d) of light petroleum products; 5) Construction of a catalytic refining unit at Shymkent's 6.25 MT/yr (125,000 b/d) refinery at a cost of \$120 million to add 1 MT/yr (20,000 b/d) of light products capacity; 6) Construction of a western Kazakhstan-Kumkol oil pipeline with a \$1 billion project that would enable Kazakhstan to refine its own crude oil at Shymkent and at the 162,000 b/d refinery at Pavlodar; and 7) Development of Kumkol field and construction of a propane-butane plant to supply gas to Kyzylorda, Zhezkazgan, and southern Kazakhstan.

Refining Sector

Kazakhstan has three refineries with a total capacity of 20.2 MT/yr (400,000 b/d). The Pavlodar (in northeast Kazakhstan) and Shymkentnefteorsinez (SHNOS; in south central Kazakhstan) refineries each have a capacity of 7.5 MT/yr (150,000 b/d). They were built to process crude from Western Siberia, delivered via the Omsk-Pavlodar-Shymkent-Chardzou pipeline. The oldest refinery is located in Atyrau (5.2 MT/yr, or 104,000 b/d) in western Kazakhstan, close to Tengiz. This is the only refinery in Kazakhstan designed to use local crudes (see table at the end for detailed characteristics).

Atyrau

Oil extraction in the western part of Kazakhstan is rising, but refinery output is declining. Crude oil is supplied to the Atyrau refinery from three major producing areas with increasing output: 1) Tengiz and 2) Emba deposits – by a 530-mm (20-inch) pipeline; 3) the deposits located west of Atyrau – by 426-mm (17-inch) pipeline. The pipelines are 26.2, 27.3 and 26 km long (16.2, 17 and 16.2 miles), respectively.

However, in 1998, the refinery processed 2.7 MT (54,000 b/d) of crude, or 52% of capacity. In 1999, this figure dropped to 1.9 MT (38,000 b/d), or 37% of design capacity. In 2000, the refinery processed around 2.2 MT of crude (48,000 b/d), or 59% of design capacity.

Atyrau is the oldest and simplest of the country's refineries. KazMunaiGas holds 89% of its shares. The refinery requires \$450 million to obtain a catalytic cracker, which will allow it to process 90,000 b/d. In 2000, Japanese Bank for International Cooperation approved financing for the upgrade, which Marubeni will undertake. The refinery revamp would boost the production of light products to 80% of capacity. In particular, gasoline production is expected to double to one MT/yr.

Pavlodar

Pavlodar, with a capacity of 7.5 MT a year (or 150,000 b/d), is technically-equipped for processing western Siberian crude and is not linked by pipeline to western Kazakhstan. In 1999, Russia supplied only 721,200 tons (14,400 b/d) of oil to Kazakhstan. As a result, the Pavlodar refinery, with the best processing facilities among the three plants (catalytic cracking, thermal operations, etc.), has been running at 9% of design capacity. Pavlodar has been crippled by competition from Russia's Omsk refinery, located 350 km (218 miles) to the north. Deliveries of crude to Pavlodar plummeted after the Omsk refinery expanded its capacity to 30 MT/yr (600,000 b/d).

The country explored alternative arrangements to get oil. The Kazakh government reached an agreement with Russian oil giant Lukoil on the shipment of 130,000 tons (950,000 barrels) of oil to the Pavlodar refinery, which allowed the refinery to operate at full steam throughout December 1999. In 2000, swap deals were arranged for the Pavlodar refinery to receive 2 MT (14.5 million barrels) of Russian oil. The refinery also received small amounts of crude oil from Kumkol field in Kyzylorda oblast.

The refinery is partially privatized. Mangystaumunaygas holds a 51% stake in the refinery. The remaining 49% stays under the state control.

Shymkent Refinery (HOP OJSC)

Hurricane Oil Products Open Joint Stock Company (HOP OJSC), earlier known as SHymkentNefteOrgSintez OJSC, was formed to operate Shymkent refinery in 1993. HOP OJSC was designed to process Western Siberian oil as 80% of its feedstock. The increase of pipeline supplies from the Kumkol deposit compensates the lack of Russian oil. Today, the refinery relies largely on oil from fields operated by Canada's Hurricane Hydrocarbons Ltd. and Russia's Lukoil (Kumkol). It also has access to rail deliveries from Uzbekistan and from the Chinese National Petroleum Corp.'s Aktyubinsk fields in the west.

HOP OJSC processed 3.4 MT (68,000 b/d) of oil (42% of capacity) in 1999, producing diesel, gasoline, kerosene and fuel oil. HOP OJSC supplies about 65% of the refined products used in the southern regions of Kazakhstan. Close to 50% of output is consumed in Almaty. In 2000, it started the construction of a catalytic cracking complex, which will increase its output of light oil products from 65% to 85% of its output slate.

Hurricane sent an offer to HOP OJSC shareholders to purchase the refinery's remaining outstanding shares. At present, Hurricane controls 88.37% of the refinery's shares after purchasing most of HOP OJSC in early 2000. The merger, along with high oil prices, has dramatically improved Hurricane's fortunes. HOP OJSC processed 70% of Hurricane's oil and sold it as refined products, primarily on the domestic market in Kazakhstan. The remaining 30%, accounting for more than 770,000 barrels, were exported by rail to ports on the Black Sea.

Challenges

Production of refined petroleum products in Kazakhstan dropped by 28% between 1998 and 1999 to 5,732,000 tons. In 2001, three refineries turned out 1.5 million tons of gasoline (including aviation fuel), 6% up from 2000 but still 80% of the 1998 level. Kerosene output fell by 69% to 0.7 million tons, diesel fuel totaled 2 million tons (80% of the 1998 level), and fuel oil production dropped to 2.3 million tons (70% of 1998 production). Production of oil coke, oil bitumen and other residues from oil processing decreased by 49% last year.

A gasoline deficit and increase in products prices were felt in almost all regions including Almaty, Pavlodar and Karaganda. Atyrau residents repeatedly experienced sharp rises in regional gasoline prices. In just one day, costs for 76-octane gasoline rose by 16.2%. The hike in prices did not quell demand, as fuel available at local stations was quickly sold out. Prices for products soared occasionally in South Kazakhstan oblast as well. Authorities were particularly concerned about the cost of diesel fuel, the price of which has reportedly risen from \$240 to \$300 per ton (\$33-41 per barrel).

In December 1999, Prime Minister Tokayev signed a regulation restricting oil exports from the republic in the year 2000 to 22 MT. Tokayev assigned the Ministry of Energy, Industry and Trade (MEIT) the task of creating a schedule for the year's exports and updating it monthly depending on the feedstock available to domestic refineries at the time. The customs committee under the ministry of revenues will enforce the restrictions. In August 2000, a decree essentially forced companies to provide 688,000 tons of oil, about a quarter of monthly output, as guaranteed feedstock to domestic refineries.

The MEIT calculated that Kazakhstan needs about 2,318,800 tons of mazut (fuel oil) for the time period between October 2000 and March 2001. According to the current production rates of 750,000 tons of oil per month, the republic's three oil refineries will produce a total of 250-260,000 tons of mazut per month, well short of the republic's monthly demand of 386,500 tons.

Refiners were not allowed to sell mazut abroad for the three-month period from September 25 to December 25. Meanwhile, world market prices for products have risen sharply and, for the first time in recent years, mazut price reached \$120 per ton (\$16 per barrel). The order is geared to ensure sufficient fuel supply for the nation's heat and power plants during the winter heating season. HOP OJSC officials told the press that the government ruling will force them to breach mazut export contracts, and may cost the state roughly \$7 million in tax revenue per month. Atyrau refinery president noted that his enterprise would not be able to identify demand on the domestic market for the mazut it could produce this autumn, and would cut its mazut production because of the regulation. He added that, technologically, the refinery could not cut mazut output without also cutting diesel fuel and gasoline production.

Also, the Kazakh government issued a decree that called for regulation of oil producers and refineries that "have a domineering position in the domestic market of oil and oil products." The decree, signed by Prime Minister Balgimbaev on September 18, amended an earlier August 16 decree that applied only to refineries with strong domestic sales. Earlier in 2000, Balgimbaev allowed the Agency for Regulation of Natural Monopolies and Protection of Competition, along with the MEIT, to institute price controls over Kazakhstan's three refineries. He later rescinded the resolution that permitted the price controls, then reinstated it with the August 16 decree, but applying it only to refineries that dominates domestic sales. In early 2002, a new draft law was designed to shift the burden of ensuing sacrifices to the refining industry, rather than the consumer or the government as the latter did not want to raise prices. Currently, the price of gasoline in Kazakhstan is about 35 Tenge for a liter of regular (80 octane) which would be around 88 cents/gallon.

Given these challenges, alternative refining strategies were also pursued. In the past, Kyzylorda-based oil producers were forced to use a pipeline owned by Hurricane Kumkol Munay to deliver feedstock to HOP OJSC. But, a new rail terminal allowed Kyzylorda oil companies to ship to a local mini refinery, reduce costs and increase profit. The new facility has the capacity to store and process up to one MT/yr. In the West Kazakhstan oblast, a gas condensate refinery plant, supplied by the nearby Karachaganak field, produced 28,000 tons of oil products in January 2000, consisting mostly of gasoline, mazut and diesel fuel. The plant reached 93% of its planned gas condensate processing capacity for the first time.

The Kazakh government also explored opportunities in Ukraine. Ukraine's Kherson oil refinery has the capacity to refine 8 MT/yr, but is currently refining just 1 MT. Kazakhstan pursued using the spare capacity in this refinery depending on its transit quotas for crude oil through Russia. The republic is interested in utilizing Ukrainian refineries and export opportunities via Ukrainian pipelines to Europe. KazakhOil was awarded a license but Ukraine retracted the license because of non-compliance by KazakhOil.

Local refineries are managing to take in more crude by paying higher prices for crude from local producers, with the higher costs inevitably being passed on to consumers. The Chimkent refinery was paying US\$140/tonne (US\$19.1/b) for crude in mid-November, close to the average export price of US\$20.3/b in the first ten months of 2000 and well above what the government believes that local refineries should be paying. The result is that the Chimkent refinery was charging Tenge44-57/litre (31-40 US cents/litre) for petrol in late November, and the Atyrau refinery was charging Tenge40-55/litre. A major problem facing Kazakhstan's refineries is smuggled petrol from Russia and Uzbekistan.

So, Kazakhstan has overcapacity in the refining sector and that it may well be cheaper to import refined products than to produce them locally. The shortfall in local supplies caused by insufficient oil deliveries and exports of refined products has been made up with cheap imports from Russia. The amount, and cost, of refined products imports is surprisingly small. In the first ten months of 2000 Kazakhstan imported 27.1% of all its gasoline needs, a total of 389,900 tons of gasoline, up by 430% year on year. Kazakhstan imported 6.6% of its mazut supply, equal to 125,600 tons, down by 27.9% year on year. A total of 9.3% of diesel requirements were imported, 169,000 tons, a 300% increase. Put otherwise, Kazakhstan could be entirely self-sufficient in refined products and still not need around half of its current oil refining capacity.

Sources:

Kalyuzhnov, Andrei and Julia Nanay. Caspian area refineries struggle to overcome Soviet legacy, *The Oil & Gas Journal*, August 21, 2000.

Business Information Service for the Newly Independent States of the U.S. Department of Commerce, www.bisnis.doc.gov

The Oil & Gas Journal web site, ogj.pennnet.com

Refineries in Kazakhstan

Showing	Pavlodar	Shymkent	Atyrau
Capacity of primary oil refining, MT/yr	7.5	7.5	5.2
Year placed into operation	1978	1984	1945
Personnel	2,837	1,775	2,080
Capacity of main technological processes, MT/yr			
Primary refining	7.5	7.5	5.2
Catalytic cracking	2.0	*	-
Catalytic reforming	1.0	1.0	0.3
Hydrofining of fuels	2.6	2.6	-
Hydrofining of catalytic cracking feed	2.4	-	-
Vacuum distillation of fuel oil	4.0	4.0	1.5
Coking	0.6	0.6	0.7
Coke calcination	0.12	-	0.14
Production of bitumen	0.5	-	-
Production of sulfur	0.02	0.005	-
Degree of refining, %	80	68	56
Products			
- motor petrol ?-76	+	+	+
- motor petrol ?I-91, ?I-92	+	+	+
- motor petrol ?I-93	-	-	+
- aviation kerosene	+	+	**
Diesel fuel with a congelation temperature of 10-15°	+	+	+
- Diesel fuel with a congelation temperature of -30°	+	-	-
- furnace fuel oil: brand 100	+	+	+
brand 40	-	+	+
- liquefied gases (social consumption)	+	+	+
- white spirit (thinner for lacquers and paints)	-	-	+
- furnace fuel (social consumption)	+	-	+
- coke	+	***	+
- vacuum gas oil (fraction. 350-500°)	-	-	+
- sulfur	+	****	-
- bitumen (constructional, road-building, roofing)	+	-	-

Notes: * - the unit is being installed; ** - in 1995 experimental lots were received; *** - the unit for coke production has been installed, but not put into operation; **** - sulfur production is not operating because of its low content in the feed.