Analysis and Prediction of the Supply and Demand of China's Petroleum Products

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Abstract. In the face of the changes in the operation of international crude oil prices caused by externality market factors such as the continuous fluctuation of international oil prices and the steady recovery of domestic oil product sales, this paper first analyzes the oil product market environment, and then introduces the completion of major indicators in the eastern region of PetroChina. The supply and demand situation of China's petroleum product oil was analyzed and predicted from both supply and demand levels. After analyzing the current market situation and comparing predictions, it can be seen that oil refining and sales enterprises must actively and pragmatically respond, closely connect with various measures such as sea and land transportation capacity, grasp the market situation, and jointly promote the maximization of overall benefits in the refined oil industry chain.

Keywords: Petroleum, Finished oil, Requirements, Forecast

1 INTRODUCTION

As China's economic development enters the New Normal, coupled with the transformation and upgrading of industrial structure, resource and environmental constraints, and the rapid development of alternative fuels, the growth rate of domestic refined oil demand will slow down[1-2]. For large state-owned enterprises such as China National Petroleum Corporation (CNPC), they need to enhance their core competitiveness and explore and practice the high-quality development path of CNPC through practical actions. Under the strong impact of the pandemic in the 21st century, the external environment has become more complex, and the century long changes have accelerated their evolution. Although it has become more difficult, the future is still foreseeable[3-4]. From the national level, influenced by the national carbon emission and carbon neutrality policies, as a traditional high emission industry, the oil industry will accelerate its transformation and development[5]. With the rapid development of alternative energy sources such as electricity and hydrogen, private large-scale refining and chemical integrated projects have been put into operation, and the supply and demand of refined oil products will continue to be more prominent.

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At the same time, in the new situation of slowing oil consumption, it is of great significance to adapt to the changes in demand in the future refined oil market, ensure the balance of supply and demand in the domestic refined oil market, and protect environmental resources in the process of highlighting supply-demand contradictions, the rise of alternative energy, and the transformation of economic development mode. As a finished oil logistics enterprise, the Northeast Sales D Branch of China National Petroleum Corporation (CNPC) is still weak in utilizing innovative thinking to enhance its service guarantee ability and reduce operating costs. Therefore, in order to continue to do a good job in organizing the production and sales of finished oil in the eastern region of CNPC and ensure the smooth operation of the industrial chain of finished oil production and operation, we are conducting a prediction and analysis of the operating situation in February 2023 and the production demand situation in March 2023, which can provide certain reference for other operating enterprises within the refined oil sales industry.

2 Market Environment Analysis

2.1 Review of the Finished Oil Market

In 2022, the prevention and control of COVID-19 epidemic will run through the social life of the whole year, the driving force of refined oil consumption will change, the seasonal consumption law will be broken, and the consumption will hit the largest decline in history. The overall supply and demand of finished oil products are still in a surplus situation, but there is still a periodic mismatch between supply and demand, and diesel supply is tight in autumn and winter. New energy vehicles have entered an accelerated development stage, and the substitution of electric power for gasoline has grown rapidly. Liquefied natural gas (LNG) is still the main alternative energy source for vehicles[6].

The consumption of refined oil in China in 2022 was 326 million tons, a decrease of 7% compared to the previous year, marking the largest decline in history. The consumption of gasoline, kerosene, and diesel was 138 million tons, 18.25 million tons, and 169 million tons, respectively, with growth rates of -11.2%, -32.5%, and 0.9% compared to the previous year. The consumption diesel to gasoline ratio is 1.22, the highest since 2017[7]. After the outbreak of the COVID-19 epidemic, the consumption of gasoline and aviation kerosene has always been negatively affected. The consumption law formed for many years in the domestic market has been broken, the travel peak on holidays has disappeared repeatedly, and the peak consumption season of gasoline and aviation kerosene is weak. Diesel, supported by the release of high-quality coal production capacity, exhibits a more vigorous characteristic during peak production and electricity consumption periods. The monthly consumption and growth rate changes of refined oil products in 2022 are shown in Figure 1.

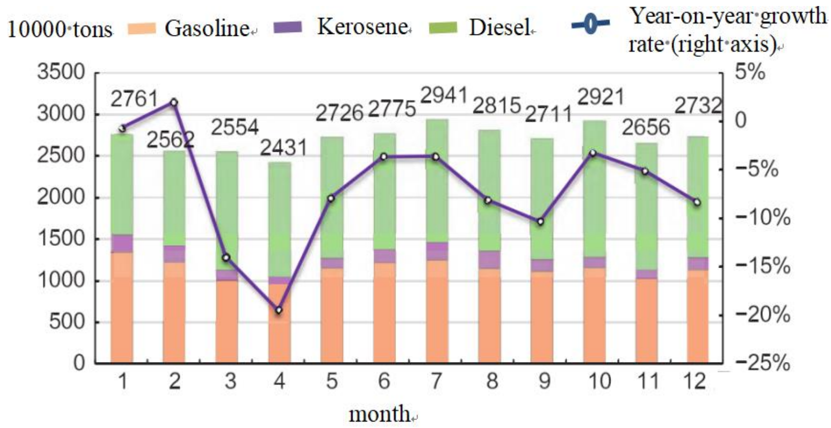

Fig. 1. Monthly Consumption and Growth Rate of Finished Oil Products in 2022

In 2022, various alternative energy sources will replace approximately 65.14 million tons of conventional gasoline and diesel, an increase of 0.8% compared to the previous year. The increase mainly comes from electric power, hydrogen energy, and coal based liquid fuels, while the decrease mainly comes from natural gas and LPG used in vehicles. The scale and proportion of alternative fuels in China in 2022 are shown in Figure 2.

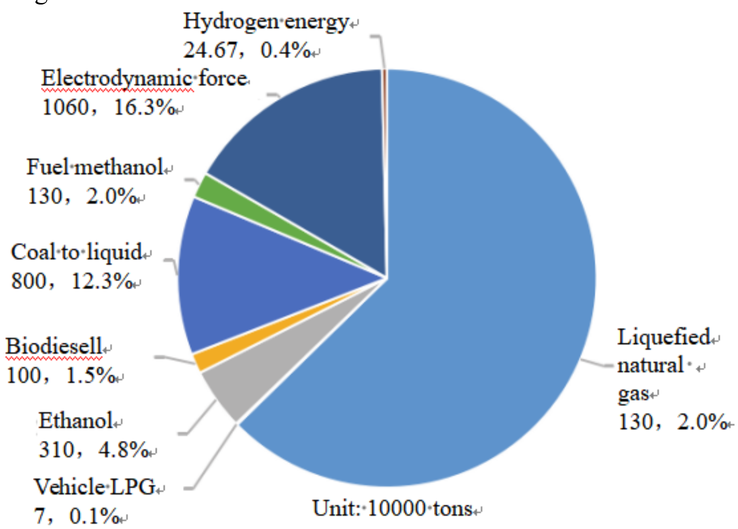

Fig. 2. The scale and proportion of alternative fuels for automotive gasoline and diesel in China in 2022

2.2 International crude oil price trend

Throughout 2022, due to the combined influence of multiple international and domestic factors, China's domestic oil consumption experienced a year-on-year decline for the first time. The degree of external dependence of oil and crude oil also decreased, and the consumption of finished oil throughout 2022 also showed a significant decline trend. According to the data from the China Petroleum Corporation Economic and Technological Research Institute, it can be seen that in the entire year of 2022, the total apparent oil consumption in China was 719 million tons, a year-on-year decrease of 0.6%. This is the first negative growth in apparent oil consumption in nearly 30 years; However, from the perspective of market terminal consumption, China's apparent oil consumption for the entire year of 2022 was 692 million tons, a year-on-year decrease of 4.4% and a decrease of 0.6% compared to the same period in 2019. Based on the perspective of consumption structure, China's oil consumption in 2022 showed specific characteristics of "fuel decrease and raw material increase". The consumption of finished oil decreased significantly by 7.7% year-on-year, while the growth of chemical oil still remained at 6.4%.

Based on the continuous growth of domestic crude oil production, the dependence of China's oil and crude oil consumption on external factors has both decreased throughout 2022. Among them, China's dependence on external sources for crude oil was 71.2% compared to 2021, a decrease of 0.73 percentage points year-on-year. There has been a downward trend in 2021 and 2022 for two consecutive years; The degree of dependence on external sources of oil was 71.5%, a year-on-year decrease of 0.96 percentage points.

2.3 Review of the Finished Oil Market

Since February 2023, international oil prices have first fallen and then risen[8]. Since early April 2023, both crude oil and finished oil inventories in the United States have increased to their highest levels since June 2021. At the same time, OPEC+(OPEC and non OPEC producing countries) has maintained their current production policies unchanged, and various factors have led to a downward pressure on oil prices; Subsequently, the gradual recovery of Chinese demand boosted consumer sentiment in the market, the main export terminals in Türkiye were forced to close after the earthquake, leading to a shortage of supply, and Russia's production reduction plan for March 2023 and other factors supported the rise of oil prices. In April 2023, the average prices of Brent and WTI were 83.54 and 76.86 US dollars per barrel, respectively, a decrease of 0.37 and 1.3 US dollars per barrel compared to the previous month.The detailed price trend is shown in Figure 3.

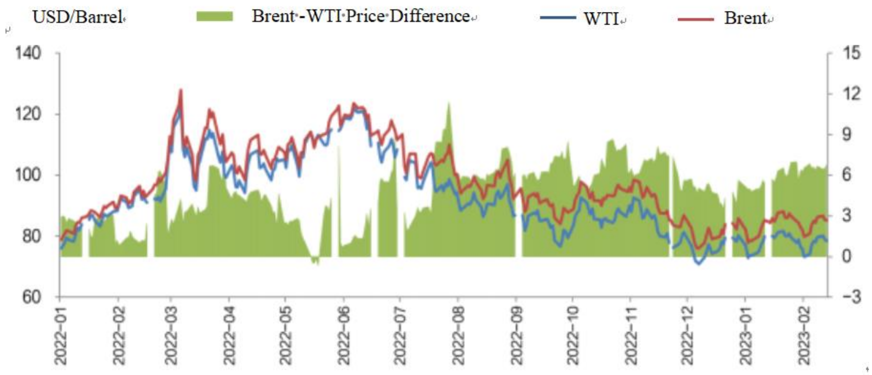

Fig. 3. International Oil Price Trends

2.4 Domestic supply and demand situation of refined oil products

Since February 2023, with the continuous stability of the national epidemic and the situation being fully controllable, after the end of the Spring Festival holiday, all industrial and commercial economic activities in various parts of the country have been on the right track. The resumption of work and production index of various domestic enterprises and organizations has increased by 27.8% month on month, which is 5.2% higher than the same period in 2022[9]. Based on the choice of transportation mode, the residents' choice of road travel index has increased by 22% year-on-year; The index of residents choosing air travel has increased by 13% year-on-year; The multi-modal freight logistics index increased by 21% month on month. Based on the statistical indicators and parameters of the demand side of refined oil products, it can be seen that the relevant oil industry system as a whole shows the basic characteristics of "slow roads, strong aviation, and rebound in freight logistics".

In February 2023, with the growth of gasoline and aviation coal consumption during the Spring Festival and the expectation of further increase in refined oil consumption, refineries under the two major groups of China Petroleum and Sinopec generally increased their operating loads, driving a significant increase in crude oil processing volume. In February 2023, the crude oil processing volume of the two major groups, PetroChina and Sinopec, was 33.7 million tons, with a daily processing load of 1.2036 million tons, an increase of 4.95% month on month and 2.74 percentage points year-on-year. In terms of local refining, in April 2023, due to multiple factors such as the continuous recovery of downstream demand in the industrial chain, the continuous improvement of the refined oil market, and the significant increase and widening of refining profits, some refineries have continuously increased their production and processing capacity. However, there are still a few refineries that have experienced a decrease in production due to secondary device inspection and maintenance. For example, in February 2023, Shandong Refinery maintained its atmospheric and vacuum operating rate at 67.8%, a slight increase of 0.6 percentage points compared to the previous month and a year-on-year increase of 7 percentage points.

3 Completion status of main indicators in the eastern region

3.1 Sales

From the specific domestic sales volume of PetroChina, the sales of finished oil in February 2023 reached 8.023 million tons, a year-on-year increase of 15.9%. Among them, gasoline completed 3.378 million tons, a year-on-year decrease of 5.3%, diesel completed 3.862 million tons, a year-on-year increase of 42.8%, and aviation coal completed 783000 tons, a year-on-year increase of 19.5%. The sales volume in the eastern region (the resource distribution area of eastern refining and chemical enterprises) reached 4.433 million tons, a year-on-year increase of 16.1%. Among them, gasoline completed 1.916 million tons, a year-on-year decrease of 4.6%, diesel completed 2.191 million tons, a year-on-year increase of 44.7%, and aviation coal completed 326000 tons, a year-on-year increase of 9.8%. Among them, the sales growth of gasoline and diesel in Northeast China is particularly significant, with sales growth of 38.1% in Heilongjiang region, 27.7% in Inner Mongolia region, and 19.4% and 10.4% respectively in Liaoning and Jilin regions.

3.2 Production and delivery completion status

In February 2023, the Eastern Refinery completed 8.007 million tons of crude oil processing, an increase of 1.17 million tons year-on-year; Production completed 4.524 million tons, an increase of 425000 tons year-on-year (gasoline increased by 24000 tons, diesel increased by 238000 tons, and aviation coal increased by 163000 tons). From the perspective of the entire month of February, although the rapid increase in market demand since the Spring Festival has made it difficult to ensure resource supply, with the full cooperation of refining and chemical enterprises, the active production of component gasoline and aviation coal has effectively ensured the increase in demand brought about by increased travel. At the same time, by promoting the reduction of low pour point diesel fuel depots and the seasonal change of diesel varieties, the stable supply of spring plowing oil has been timely ensured.

3.3 Configuration completion and inventory status

In February 2023, Northeast Company transferred to provincial and regional companies and completed 3.74 million tons of special user configuration plans, an increase of 223000 tons year-on-year. Among them, the Northeast region completed 1.212 million tons of configuration, which was on par with the same period, the East China region completed 857000 tons of configuration, an increase of 126000 tons year-on-year, the South China region completed 706000 tons of configuration, an increase of 50000 tons year-on-year, and the North China region completed 448000 tons, which was on par with the same period.

As of the end of February 2023, the inventory of gasoline and diesel in eastern refining and sales enterprises reached 5.485 million tons (2.627 million tons of gasoline and 2.858 million tons of diesel), a decrease of 156000 tons compared to the beginning of the month (181000 tons of gasoline increased compared to the beginning of the month, and 337000 tons of diesel decreased compared to the beginning of the month). In order to meet the demand growth brought about by the market recovery, the current inventory of gasoline, diesel and oil depots of regional companies has dropped to a historically low level.

4 Market supply and demand forecast

4.1 Macroeconomic trend prediction

In 2023, China's macroeconomic growth will resume. In terms of fixed assets investment, infrastructure and manufacturing industries maintained rapid growth and continued to play a major driving role. The drag of real estate on the economy has weakened, and the annual growth rate of fixed assets investment is expected to increase to 6%. In terms of consumption, offline consumption is rapidly recovering, the employment situation is constantly improving, and the growth rate of household income is expected to increase. The total retail sales of consumer goods are expected to stop declining and rebound, with a growth rate expected to reach 5.5%[10]. In terms of exports, the international economic growth rate has slowed down, foreign demand is facing a decline, and the overseas supply chain is gradually recovering to support the upward trend of exports. The substitution effect in the surrounding areas continues to strengthen, and under the comprehensive impact, the export growth rate is expected to decrease to 3%. In 2023, China's macro economy showed a recovery growth trend on a low base basis, with an expected GDP growth rate of over 5.6%, a significant increase compared to 2022.

4.2 International Crude Oil Market Forecast

As a response to Western oil price restrictions, Russia voluntarily reduced its oil production by 500000 barrels per day in March 2023. Subsequently, the United States announced that it would release strategic oil reserves again from April 2023 in response to Russia's production reduction. Russia may expand its crude oil production reduction efforts on the basis of the original plan; Meanwhile, 19 OPEC+production reduction countries have stated that they will continue to maintain the current "production control and price protection" policy, and it is expected that the international crude oil market supply will show a tight balance.

The United States will have planned maintenance of multiple refineries in March and April 2023, resulting in a decrease in crude oil demand; However, China's crude oil demand is expected to remain positive, and India's crude oil imports are expected to remain high, to some extent alleviating the pressure brought by the decline in US demand. In terms of oil prices, factors such as the recovery of China's oil demand, the increasing demand prospects of IEA and OPEC+, and Russia's proactive tightening of supply have provided support for oil prices. However, the Federal Reserve's expected increase in interest rate hikes is expected to increase, and the United States will release strategic oil reserves, limiting the space for oil prices to rise. In March 2023, international oil prices fluctuated and rose, with Brent's average price remaining at $85-89 per barrel; It is expected that after a phased pullback in April 2023, the Brent average price is expected to be between $82 and $86 per barrel.

4.3 Prediction of supply and demand in the refined oil market

Economic construction has once again become the focus of China's social development, and the state requires the steady recovery of economic operation at the beginning of the year. The repair of consumption will continue to drive the return of the growth momentum of refined oil products. In terms of gasoline, with the stable recovery of travel demand and the recovery of positive growth in gasoline vehicle sales, the gasoline consumption in March 2023 was 13 million tons, a year-on-year increase of 20.7%, with a daily average of 419000 tons, a decrease of 10000 tons/day compared to the previous month. In terms of diesel, infrastructure projects are expected to be fully carried out, driving the growth of oil consumption in industrial and mining production, construction, and logistics transportation. In March 2023, diesel consumption reached 14 million tons, a year-on-year increase of 2.2%, with an average daily consumption of 452000 tons, an increase of 31000 tons/day compared to the previous month. In terms of aviation coal, domestic route travel continues to recover, and international routes are steadily recovering. Driven by the dual engines of international and domestic routes, the consumption of aviation coal in March 2023 was 2.3 million tons, a year-on-year increase of 74%, with a daily average of 74000 tons/day and a month on month increase of 10000 tons/day.

In March 2023, some units of Zhenhai Refinery and Huizhou Refinery will be shut down for maintenance, which will affect the overall load to a certain extent. However, if other normally operating refineries slightly increase their capacity, the main refinery's operating load may be slightly reduced as the rise and fall offset each other. In terms of ground refining, from the end of February 2023 to March 2023, Shandong Zibo, Dongying, and Rizhao ground refineries have successively shut down for maintenance, and the operating rate of atmospheric and vacuum distillation in Shandong ground refineries will open a downward channel.

5 conclusion

Based on comprehensive analysis and judgment, driven by economic recovery, it is predicted that the overall demand for gasoline will stabilize in the coming months, but local resources will be tight; The overall demand for diesel and aviation coal is showing an upward trend. Based on the above situation prediction and comprehensive analysis, we will continue to make efforts in the following two aspects: the first is to switch to producing marketable products and expand sales volume. The second is to ensure the efficiency of resource stocking and alleviate the pressure of maritime operations. Therefore, in the face of the changes in the operation of international crude oil prices caused by externality market factors such as the constant fluctuation of international oil prices and the steady recovery of domestic refined oil sales, oil refining and marketing enterprises have made concerted efforts and actively responded to the changes. Through a number of measures such as timely conversion of scarce resources, full realization of sales expansion, close connection of sea and land transport capacity, they have firmly grasped the favorable situation of the market and realized the maximization of the overall interests of the industrial chain.

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