

Experimental Study on the Performance of Diesel Engine using Cylinder Diesel Test Bed to Reduce Combustion Impact

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Abstract

Since the introduction of the "One Belt and One Road" initiative, more and more countries have joined the "One Belt and One Road" of the energy and technology cooperation. At present, the global economy and energy transformation are facing multiple challenges. The energy and resource endowments of countries are relatively uneven, and their technological innovation capabilities are relatively lagging. This has strengthened the overall construction of the "One Belt and One Road" economic belt, accelerated the energy and technology cooperation among the countries and regions along the "One Belt and One Road" economic belt, built a new path for the "One Belt and One Road" multilateral energy and technology cooperation, and developed energy and technology cooperation between China and the five Central Asian countries. China's multilateral organizations, has improved the legal system for energy and technology cooperation, coped with the new geo-economic pattern of China and the five Central Asian countries, and opened up a new situation in energy and technology cooperation.

Keywords

"One Belt and One Road" economic belt; five Central Asian countries; energy cooperation; technological innovation.

1. Introduction

The energy and technology cooperation between China and the five Central Asian countries is an important part of the "One Belt, One Road" strategy. It has significant complementarities in advancing the economic development of China and the five Central Asian countries and plays an important role in promoting the economic development of China and the five Central Asian countries. The role, the five Central Asian countries are located in the linking zone, is between the Asian continent and the European continent. In the economic development of the Eurasian continent, they are an "economic depression zone", which promotes the economic development of China and the five Central Asian countries. Axis, thus further changes the economic map of the entire Eurasian continent.

The five Central Asian countries in a narrow sense include the Asian countries as Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan and Tajikistan. The five Central Asian countries are rich in oil and gas reserves, ranking third in the world, second only to the Middle East and Russia, have become a major energy supply base in the world. According to statistical data, the proved oil reserves of the five Central Asian countries have exceeded 10 billion tons, accounting for about 2.5% of the world's total proven oil reserves. Compared with oil storage, natural gas storage in the five Central Asian countries is more abundant. The proven natural gas storage in the five Central Asian countries exceeds 20 trillion cubic meters, accounting for approximately 10%. Therefore, it has given full play to the energy endowment advantages of the five Central Asian countries, enhanced the technological innovation capability, accelerated the development of the energy industry, and further promoted the energy and technology

cooperation between China and the five Central Asian countries to create a "One Belt and One Road" economic belt, and bring about the mutual benefit of the national economy and the win-win situation of cooperation.

2. Opportunities and Challenges for Energy and Technology Cooperation between China and the Five Central Asian Countries

2.1. Opportunities for Energy and Technology Cooperation between China and the Five Central Asian Countries

On May 23, 2017, the 25th anniversary of the establishment of diplomatic relations between China and the five countries in Central Asia, one week after the successful closing of the China's "One Belt and One Road" International Cooperation Summit Forum The Energy Forum was successfully held in Astana, the capital of Kazakhstan. The five Central Asian countries participated in the meeting with eight countries including China and Russia, and realized the alignment of the energy and technology cooperation strategy between China and the five Central Asian countries in the context of the "One Belt and One Road" initiative. Provided strong financial and technical support for the five Central Asian countries, and vigorously promoted the energy and technology cooperation between China and the five Central Asian countries into an unprecedented period of strategic opportunities.

2.1.1. Proposal and Implementation of China's "One Belt and One Road" Initiative

President Xi Jinping put forward the concept of the "One Belt and One Road", expressing China's desire to actively participate in foreign cooperation. China's economic development has been growing and accumulating over the past 30 years, and it has already had the initiative to implement the "One Belt and One Road" initiative and drive along the route. All countries have the common prosperity to achieve a win-win situation. The construction of the "One Belt and One Road" has brought opportunities for energy cooperation in the "China-Central Asia-West Asia Economic Corridor". China's strong financial, human and technological advantages will inject fresh vitality into the energy and economic development of the five Central Asian countries.

2.1.2. The Five Central Asian Countries Connect with China's "One Belt and One Road"

As a major energy-consuming country in China, the five Central Asian countries are rich in oil and natural gas energy. Therefore, China and the five Central Asian countries have very close energy and technology cooperation, which also embodies the economic cooperation between China and the five Central Asian countries. Today, China and the five Central Asian countries have begun to take shape in energy and technology cooperation. China has become the largest energy and technology cooperation partner of Kazakhstan and Turkmenistan, and the second largest energy and technology cooperation partner of Uzbekistan and Kyrgyzstan. At the same time, It is also the third largest energy and technology partner of Tajikistan. It escorts the safety of my country's energy supply, promotes the economic development of countries along the "One Belt and One Road", and consolidates the friendship and harmony of neighboring countries.

2.1.3. Turbulent Regional Security Requires China and the Five Central Asian Countries to Work Together

Since the United States "returned to the Asia-Pacific", the security situation in the regions surrounding my country and the five Central Asian countries has become increasingly optimistic. The willingness of China and the five Central Asian countries to develop scientific and technological cooperation is constantly increasing. The five Central Asian countries are important neighboring areas around the west of China. In the long run, the Gulf region has become China's energy importing place. The continuous unrest of the five Central Asian

countries has made China's energy security seriously threatened. After the five countries of Central Asia became independent, the first economic development strategy won the development of the energy economy, with China as the key direction for diversified energy exports, and better use of the rich oil and gas energy resources of the five Central Asian countries. The situation during the Soviet Union created a single export route.

2.2. Challenges of Energy and Technology Cooperation between China and the Five Central Asian Countries

Energy, as a relatively special commodity, has never been limited to pure economic relations in its production, sales, and circulation. It is also subject to international and domestic political relations and political situations, regional economic cooperation capabilities, and social influences in many aspects. The rich oil and gas resources, the special geographical location, the proposal of the "One Belt and One Road" strategic thinking and the concept of energy and technology cooperation have brought unparalleled advantages to the energy and technology cooperation between China and the five countries in Central Asia, and made China and Central Asia The energy and technology cooperation among the five countries faces huge challenges.

The five Central Asian countries headed by Kazakhstan and Turkmenistan, although oil and natural gas are extremely rich in energy, are subject to capital and technical conditions, so their development and utilization of oil and natural gas have to rely on the settlement of international oil companies. As a result, Central Asia has become an important area for the competition of energy resources and geopolitical competition among the world's major powers. The differences in energy consumption structure, foreign energy strategy, and energy security perspectives of various countries are also fully realized in this regional energy and technology cooperation.

3. Current Situation and Causes of Energy Science and Technology Cooperation between China and Five Central Asian Countries

3.1. Current Status of Oil and Gas Energy and Technology Cooperation between China and Five Central Asian Countries

3.1.1. Energy and Technology Cooperation Project

The energy and technology cooperation projects between China and the five Central Asian countries mainly include petroleum energy cooperation projects, natural gas energy cooperation projects, and coal and power energy cooperation projects. The petroleum energy cooperation project is the earliest, and the largest number of energy science and technology cooperation between my country and the five Central Asian countries. In the cooperation between China and the five Central Asian countries, energy and technology cooperation occupies a pivotal position, and in the energy and technology cooperation between China and the five Central Asian countries, China mainly imports primary energy from the five Central Asian countries. However, China's energy products, exported to the five Central Asian countries, are mainly energy processing and manufacturing products.

The five Central Asian countries are extremely important producers of oil and gas energy in the world. They are also extremely important exporters of oil and gas energy. 70% of the crude oil output of the five Central Asian countries is used for export. In 2018, the total bilateral energy imports and exports of China and the five Central Asian countries totaled 41.7 billion US dollars. Among them, imports were 19.101 billion US dollars and exports were 22.6 billion US dollars, as shown in Table 1.

Table 1. Total value of imports and exports of China and the five Central Asian countries in 2018

| Country Total | value of imports and exports (100 million USD) | Exports (100 million USD) | Imports (100 million USD) |
|---------------|---|------------------------------|------------------------------|
| Kazakhstan | 198.78 | 113.52 | 85.27 |
| Uzbekistan | 62.69 | 39.45 | 23.24 |
| Kyrgyzstan | 56.11 | 55.57 | 0.54 |
| Turkmenistan | 84.36 | 3.17 | 81.19 |
| Tajikistan | 15.06 | 14.29 | 0.77 |

Data source: "China Energy Statistical Yearbook"

3.1.2. Scientific and Technological Cooperation in the Exploration and Mining Industry

Although China's oil and gas energy resources are among the highest in the world, more than 80% of China's proven oil and gas energy reserves belong to terrestrial oil-bearing basins, with relatively poor accumulation conditions. Most oil and gas energy resources are of low abundance and low Permeable lithological formation. Most of the oil regions in Central Kazakhstan and the surrounding areas of the Caspian Sea in the five Central Asian countries belong to the typical marine oil and gas accumulation areas, and Kazakhstan's Aktobe Oilfield, South Turgay Oilfield and Tajikistan and the energy resources of Kyrgyzstan's oil regions all belong to terrestrial reservoirs. China's marine and terrestrial exploration technologies are the only ones in the world. Therefore, China and the five countries of Central Asia have inherent advantages in oil and gas exploration energy and technology cooperation.

3.1.3. Scientific and Technological Cooperation in Pipeline Transportation

China is a country with high coal production but poor oil and gas. Under the strategic background of the "One Belt and One Road" initiative, global economic integration is also evolving. Countries are looking for ways to enrich the country and strengthen the people. Energy and technology cooperation is becoming closer. From the perspective of geographic location, China and the five Central Asian countries are adjacent countries. The great advantage of pipeline transportation has greatly promoted the energy and technology cooperation between China and the five Central Asian countries.

The natural gas pipeline project between China and the five Central Asian countries is a cross-border energy artery. Current events have promoted energy and technology cooperation and economic development in countries along the "One Belt and One Road". The natural gas pipelines of the five Central Asian countries have connected China with the five Central Asian countries and other Asia-Pacific countries, which has effectively promoted the construction and development of the "One Belt and One Road" economic belt. The natural gas pipeline transportation capacity of China and the five Central Asian countries is increasing every year. It has developed into the largest natural gas transportation pipeline system in the five Central Asian countries. The crude oil pipeline between China and Kazakhstan is China's first cross-border onshore crude oil pipeline, and it is also an overseas crude oil pipeline that directly leads to the final energy consumption market in Kazakhstan. It is the theme of the "One Belt and One Road" economic energy cooperation.

3.2. The Causes of Energy and Technology Cooperation between China and the Five Central Asian Countries

China's energy import demand continues to rise year by year, making the energy export markets of the five Central Asian countries wider. Kazakhstan, Kyrgyzstan, and Tajikistan are the three countries in Central Asia that border China, and the four countries are adjacent to each other. The unique geographical advantages have made China and the five Central Asian countries increasingly prosperous in energy science and technology cooperation; China's advanced exploration and mining energy technologies and the rich energy resources, unique to the five Central Asian countries, have made the "One Belt and One Road" background. National energy complementarity continues to increase.

3.2.1. The Rise of China's Energy Dependence

China's total energy production is among the best in the world, but due to the rapid growth of energy demand, China's energy supply gap is also expanding. Therefore, China must continue to increase oil and gas import investment and construction, and continue to promote the diversification of oil and gas imports, so as to make up for the gap in China's energy supply, guarantee energy security, and gradually establish a global energy and technology cooperation system, as shown in

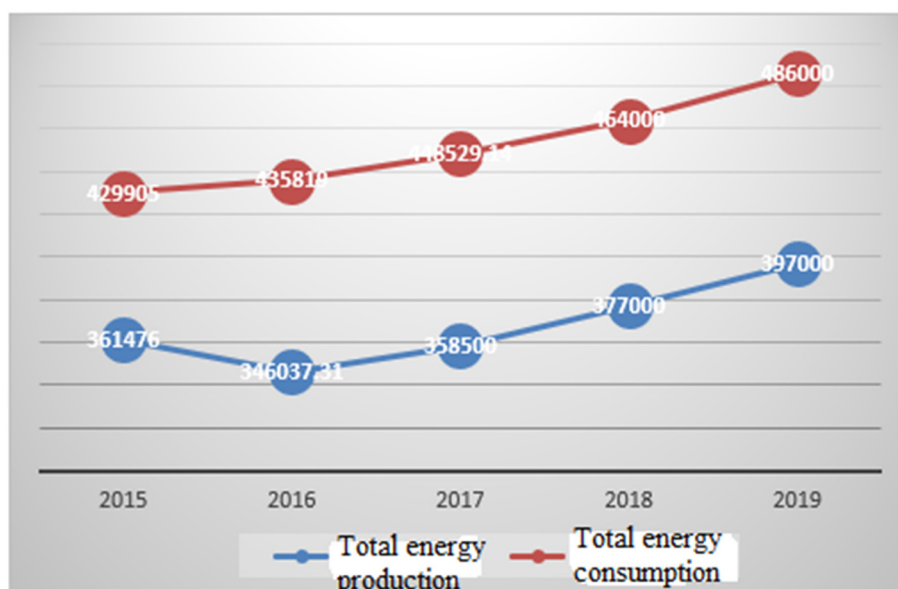


Figure 1. Broken line chart of China's total energy production and consumption
 Source: "China Statistical Yearbook"

3.2.2. The Five Central Asian Countries have Considerable Energy Reserves and Great Development Potential

The Central Asian region is known as the "energy base of the 21st century." Kazakhstan is the largest country among the five Central Asian countries. Kazakhstan's energy is mainly distributed around the Caspian Sea, with oil and natural gas as the main energy sources, and its storage capacity is extremely rich. The storage capacity of oil along the Caspian Sea can reach 10 billion tons, and the storage capacity of natural gas is as high as 11600 trillion cubic meters. Uzbekistan's energy resources are mainly three types of oil, natural gas and coal. The proven storage of oil is 5.3 billion tons and there are more than 160 oil producing areas; the proven storage of natural gas is more than 5 trillion cubic meters, which is listed as one of the top ten mining countries in the world. Kyrgyzstan is an important coal-producing country in the world, with good coal quality and high reserves. It is mainly concentrated in the Tianshan area in the

north and south. The coal storage capacity can reach 29 billion tons, known as the "Central Asian coal bucket". Turkmenistan has oil and natural gas distributed throughout the country, and oil storage is second only to Kazakhstan. The proved storage of natural gas is more than 20 trillion cubic meters, ranking first in the five Central Asian countries, accounting for the world's total storage. One quarter of Tajikistan's energy resources are mainly coal. At present, the total proven storage of coal is about 3 billion tons, and there are more than 35 deposits. The storage of oil and natural gas is also very rich. The total proven storage of oil is 120 million. Tons of the total proven storage of natural gas is 880 billion cubic meters.

4. Summary

The "One Belt and One Road" economic belt can promote the economic development of China and the five Central Asian countries. The energy and technology cooperation between China and the five Central Asian countries has strong complementarity and isomorphism, and also has a good cooperation foundation and conditions. The background of the "One Belt and One Road", promotes the economic development of the countries along the route and achieves the goal of mutual benefit and win-win for both countries.

4.1. The Initial Stage of Energy and Technology Cooperation between China and the Five Central Asian Countries

In the early stages of the implementation of the "One Belt and One Road" economic belt strategy, energy and technology cooperation between China and the five Central Asian countries have made full use of existing advantages and conditions to consolidate existing cooperation achievements. The energy cooperation is mainly oil and natural gas, energy and technology cooperation. The scope of the scope should be extended around the core business of the entire oil and gas industry chain, and the cooperation of the entire industry chain should be carried out through the exploration, development, storage, transportation and refining of oil and gas.

4.2. The Promotion Phase of Energy and Technology Cooperation between China and the Five Central Asian Countries

With the advancement of the "One Belt and One Road" economic belt strategy, the energy and technology cooperation between China and the five Central Asian countries should be further strengthened, and the oil and gas "cake" should be enlarged to deepen further the cooperation field of oil and natural gas energy resources, the cooperation of diversified oil and gas energy resources, to explore better the innovation of oil and gas energy and technology, find new fields of energy and technology and the scope of energy and technology cooperation, and constantly explore new energy resource cooperation models and codes of cooperation.

4.3. The Strengthening Phase of Energy and Technology Cooperation between China and the Five Central Asian Countries

With the strengthening and consolidation of the "One Belt and One Road" economic belt strategy, the energy and technology cooperation between China and the five Central Asian countries is different from the past extensive exploration and production and simple energy and technology cooperation. Promoting the economic modernization of participating countries is essential. While energy and technology cooperation meets the interests of both parties, it also pays more attention to the safety, efficiency and quality of energy, in order to pursue the sharing and complementation of energy exploration, development and utilization technologies.

4.4. Optimization Phase of Energy Science and Technology Cooperation between China and Five Central Asian Countries

With the adjustment and continuous improvement of the "One Belt and One Road" economic belt strategy, China and the five central Asian countries have expanded the cooperation field of energy science and technology, and constantly optimized the cooperation mode of energy science and technology. With energy as the breakthrough point of China and the five central Asian countries energy technology cooperation will play the role of "leader", comprehensive, and so did the "area" the other areas of economic comprehensive cooperation of countries along the economic belt, "One Belt And One Road" economic belt not only reflects the economic strategy, at the same time, the leading role of more cultural strategy, energy science and technology cooperation penetration in China and all aspects of the five central Asian countries, mutual confluence, promoting common development, and become a Chinese version of "area" realistic vision.

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