



Research Paper

Patent analysis of Coal coking and its deep processing in The United Kingdom

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ABSTRACT: Based on the patent data of The UK, this paper analyzes the technical development status of coal coking and its deep processing in foreign countries, so as to provide reference and reference for the development of China's coal coking and its deep processing industry.

Key words: Britain; Coal coking; Deep processing; Patent analysis

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I. INTRODUCTION

Coal coking and its deep processing industry in China, after decades of development, has begun to take shape, ammonia in the coal coking, coal, coal and coal to methanol and so on the scale of production of the coal coking products are first in the world, but due to the relatively backward industrial structure, combined with traditional coal coking products is in a state of supply exceeds demand, overcapacity, lead to less competitive. The coking and deep processing industries of major foreign countries started earlier and developed at a high level. They have advantages in many key technical fields and industrial structure, etc., and there are many places for China to learn and use for reference.

In creative industry intellectual property public service platform, in deep processing of coking coal and its retrieval subject, constructing search expression, retrieved patent 40449, on the subject, in which, in addition to China, Japan, Britain, the United States, South Korea and Germany this five countries in 20102 patent applications account for 46.9% of total global patent applications, the visible in the five countries abroad coal coking and its development in the field of deep processing technology, the best is the most representative. Based on the patent data of The UK, this paper analyzes the technical development of coal coking and its deep processing in foreign countries, and provides reference for the development of China's coal coking and its deep processing industry.

II. OVERVIEW OF GLOBAL PATENT APPLICATIONS

2.1 Global ranking of Patent Applications

By analyzing the number of patent applications of the main applicants in the field of coal coking and its deep processing technology in the world, this paper aims to provide some directional guidance for the development and patent technology layout of China's coal coking and its deep processing industry on the basis of understanding the development status and development level of the field of coal coking and its deep processing technology in the world.

As you can see, in the field of coal coking and its deep processing technology, the development of better countries mainly in China, Japan, Britain, the United States, Germany, South Korea, and Russia and other countries give priority to, among them, China accounted for 23.1% of total global patent applications and the world in coal coking and its deep processing technology patent applications in the field of the first place, China as a major power coal resources, in the field of coal coking and its deep processing technology has its own unique advantages. Second, Japan ranks the second with 6,805 patent applications. As a country with extremely poor energy resources, Japan gives full play to its talent and technological advantages, and walks out a development path with Japanese characteristics in the field of coal coking and its deep processing technology. There is much to learn and learn from Japan. In addition, the United Kingdom, as the original country of coal industry, ranks the third in the world with 4,996 patent applications. The United States, Germany, South Korea,

Russia and other countries also play an important role in the field of coal coking and deep processing technology based on their respective advantages.

2.2 Analysis of global annual patent application

To analyze the global patent annual filings, can understand the world coal coking and its deep processing technology in the field of patent annual application status, which reflects the global coal coking and its deep processing industry of the development of each year, and overall grasp the development trend of the world coal coking and its deep processing industry, further reflects the change trend of global patent filings in years to come.

Can be seen from the figure 1, from 1991-2004, 14 years, coal coking and its average annual global patent applications in the field of deep processing technology has been floating around in 530, 2001 and 2002 the two years a more obvious increase in patent filings, break through 600, and then fell, overall before that in 2004, the global coal coking and its deep processing of patent applications have been maintained a relatively stable level. In 2005, the number of patent applications reached a record high of 743. After 2004, the world's coal coking and deep processing industry developed rapidly and ushered in a period of rapid growth. By 2013, the number of patent applications reached the peak of 1916. From the perspective of global patent application trend, in the following years, the number of patent applications in the field of coal coking and its deep processing technology will still remain high, but due to the impact of the global steel and coal market, the growth rate of patent applications will slow down in the next few years.

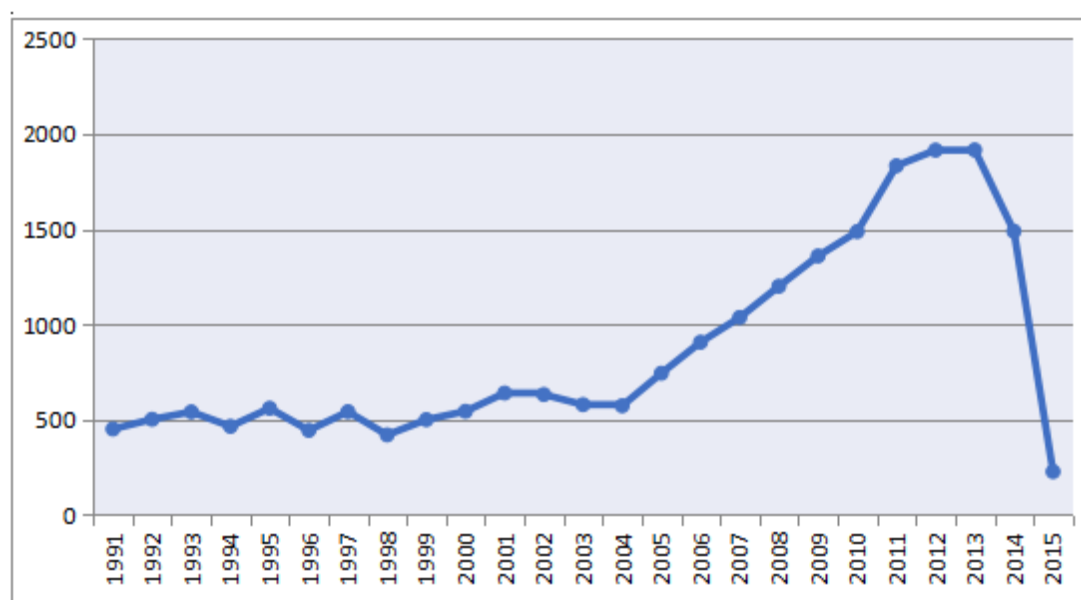


Figure 1 Annual global patent applications

III. ANALYSIS OF UK PATENTS

3.1 Annual patent application in the UK

Britain is the first country in the world to start coal coking and its deep processing, and also the first country to implement modern patent system. As can be seen from Figure 2, the coal coking and its deep processing industry in The UK started earlier, with the first patent application filed in 1867. The early development of the coal coking and its deep processing industry in the UK has a significant historical background. But early filings were relatively low, and the growth was modest.

The number of patent applications for coking and deep processing also peaked in Britain in 1927. In the mid-19th century, mankind entered the "Electric Age" with the beginning of the second Industrial Revolution. The internal combustion engine fueled by gas and gasoline was born one after another. The invention of internal combustion engine promoted the development of petroleum extraction industry and the production of petroleum coking industry. The use of oil has partially replaced coal. The development of the British coking industry began to slow down. At this time the British conservative ideas in the field of science and technology is more serious, stick to the existing scientific and technological achievements, many new inventions to promote met with resistance (such as the light is delayed due to the gas industry monopoly power of resisting shall promote), so in Britain during the second industrial revolution coal coking and its deep processing patent filings dropped than before.

Britain in the 20th century experienced a complex mix of internal and external changes. As can be seen from the figure, the number of patent applications for coal coking technology in the UK during this period has been decreasing, especially in recent years, due to the low international coal price and the decline of ore quality, and stricter environmental regulations will lead to the closure of old coal-fired power stations. As a result, the coal coking industry in Britain has also fallen into the trough in recent years.

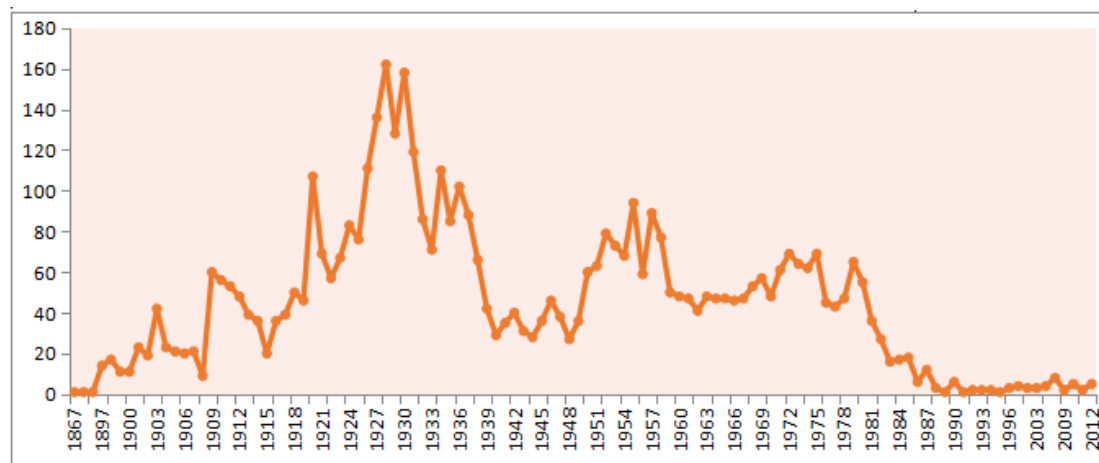


FIG. 2 Distribution of annual Patent applications in the UK (1867-2012)

3.2 Analysis of UK patent applicants

As can be seen from Figure 3, the Koppers Company (Cobers) has the highest number of applications. On company's global headquarters in Pittsburgh, is the world famous engaged in deep processing of coal tar in a multinational company, the world's first coal tar processing and marketing ability, leading products for the soft asphalt, hard asphalt, industrial naphthalene, carbon black oil, wash oil, crude phenol, solvent oil and other related products, is also the world's largest carbon coking products manufacturers, suppliers, in the field of oil processing and coking coal tar has a wide range of technology and management experience. And with the Chinese related enterprises especially Tangshan iron and steel in the tar deep processing downstream industry extension field to maintain a close cooperative relationship. I.farbennindustrie (French company) had the second highest number of applications. Fabre is an interest group formed by a number of companies, initially consisting of three German coking, pharmaceutical and dye companies. This approach to business cooperation avoided vicious competition between companies and shared technological achievements, similar to the prevailing trusts in the United States at the time. Third, Simon Carves, based in Manchester, United Kingdom, is an all-purpose engineering firm with all the necessary engineering skills and licensed to provide engineering services to clients through alliances with patentees.

In addition, bergwerksverband GMBH, Carl Still, ESSO Research and Engineering Company, Standard Oil Development Company, Didier Aktiengesellschaft, Woodall-Duckham (1920) Limited, Imperial Chemical Industries Limited, MetallgesellschaftAktiengesellschaft, The Barrett Company, and Ernest West also have a large proportion of patent applications in the field of coal coking and its deep processing technology in the UK, and they also play an important role in promoting the development of coal coking and its deep processing industry in the UK, and are important components of the coal coking and its deep processing industry in the UK.

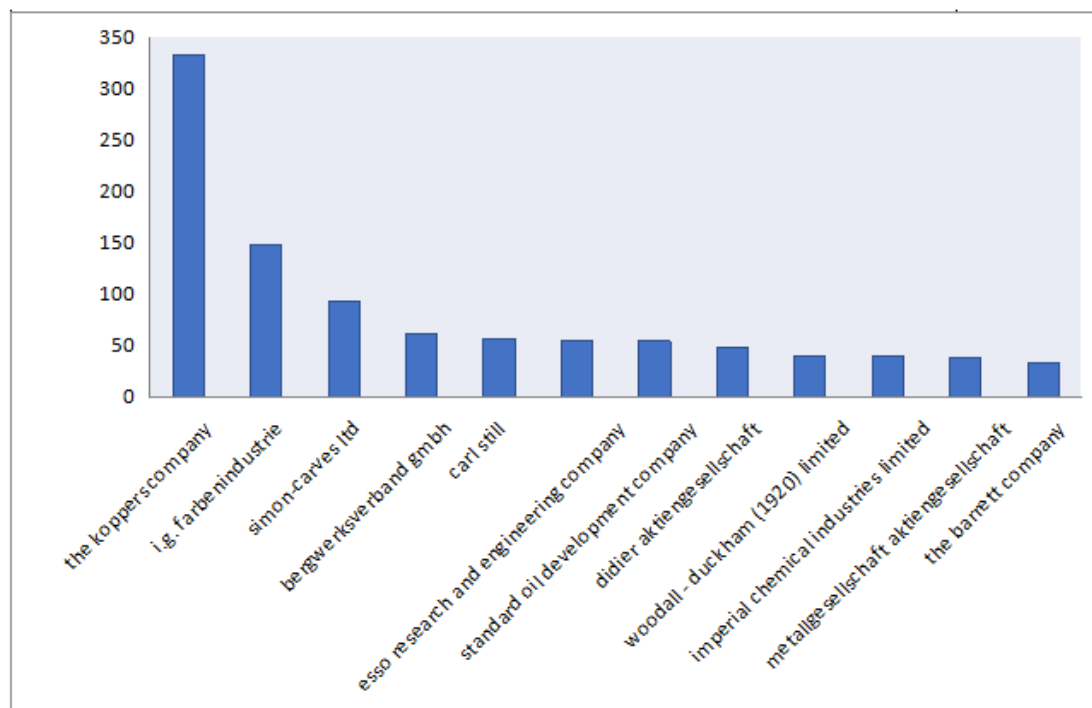


Figure 3 Ranking of UK patent Applicants (Top 10)

3.3 Analysis of IPC technology composition of British patent

3.3.1 Overall IPC distribution

It can be seen from Figure 4 that the patent applications for coal coking and its deep processing technology in the UK are mainly distributed in the top 10 subcategories of C10B, C10G, C07C, C01B, C10L, C10C, C10J, B01D, B01J and so on. Carbonization of C10B (carbon materials to produce gas, coke, tar or analogue) class of patent applications of 2422 pieces, accounted for about 48.5% of all patent applications, make up the British coal coking and its deep processing technology, the most important part of the coal coking technology in the basic products, research and development is also more emphasis on the part of the UK also suggests the use of basic product coal coking in energy use also accounts for a larger proportion. Secondly, C10G (hydrocarbon oil cracking; Preparation of liquid hydrocarbon mixtures, such as destructive hydrogenation, oligomerization, polymerization; Recovery of hydrocarbon oil from oil shale, oil deposits or oil and gas; Refinement of mixtures mainly containing hydrocarbons; Reforming of naphtha; Ground wax also occupies a large proportion in THE IPC technology composition, indicating that Britain pays more attention to the research and development and investment of deep processing technology in the field of coal coking. As a country earlier in the utilization of coal coking products, Britain's deep processing technology is relatively mature. In particular, the use of coal for environmental protection.

Meanwhile, C07C(acyclic or carbocyclic compounds), C01B(non-metallic elements; Its compound), C10L(fuel not included in other categories; Natural gas; Synthetic natural gas derived from methods not included in the C10G or C10K subclass; Liquefied petroleum gas; Use of additives in fuel or fire; Igniter), C10K (purification and modification of chemical compositions containing carbon monoxide combustible gases), C10J(production of producer gas, water gas, syngas or mixtures containing these gases from solid carbon materials; Carbonization of air or other gases), B01D (separation); Its related equipment is also one of the hot technical fields of coal coking and its deep processing; In addition C10C (tar; The processing of tar pitch) and B01J(chemical or physical methods such as catalysis, colloid chemistry) are also important components in the field of coal coking and its deep processing technology. The frenzied research and development activities carried out by British coal coking Company during the Second World War promoted the relatively perfect and mature development in the field of coal coking and its deep processing technology, which involved a wide range of fields and its technical strength should not be underestimated.

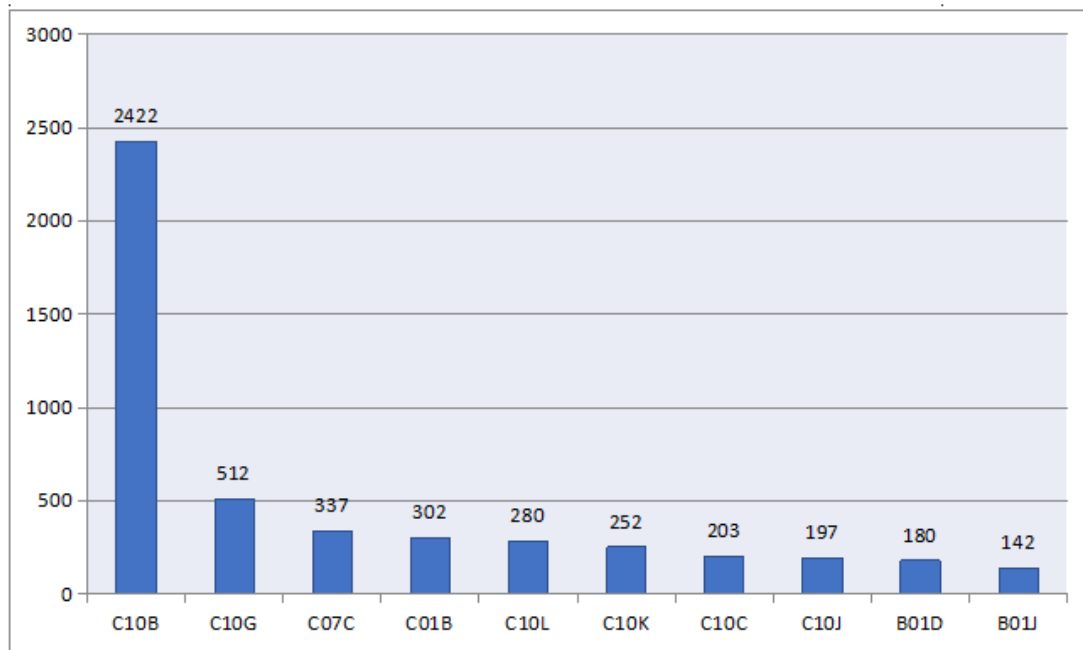


FIG. 4 Composition of IPC technology (small class) bar chart

3.3.2 Analysis of key Patents in the UK

In coal coking and its deep processing of patent technology involving 219 small under the class of 687 is analyzed, a larger group take 20 IPC classification number before the overall ranking, the number 20 IPC classification under the total consists of 3612 patent applications, accounted for 72% of all patents, shows the top 20 patent IPC classification represents is coal coking and its key technology in the field of deep processing technology.

As can be seen from Figure 5, the technology of coal coking and its deep processing in Britain is mainly in "door or enclosure of coke oven", "heating coke oven with combustible gas", "other carbonization or coking processes; The general characteristics of the distillation process ", "horizontal chamber of the coke oven", "including carbon monoxide gas purification", "coking furnace", "to heat carrier, including to be part of the processing of solid fuel combustion, direct heating to make solid carbon material carbonization", "made by solid carbon fuel combustible gas containing carbon monoxide" and "solid fuel", etc. Especially in the coke oven door or closed technology development is the best, has a great advantage. This shows that Britain's long-term technological development in coking furnace has been relatively mature, and it is a country that pays more attention to environmental protection and resource conservation. In addition, the technology related to "the discharge device of dry distillation gas", "the processing of tar", "the distillation of specific solid raw materials or special forms of solid raw materials" and the charging device are also key technologies in the field of coal coking and its deep processing in the UK. On the whole, the technology distribution of the UK in each large group is relatively balanced, indicating that the UK has more and more mature research in various aspects of coal coking and its deep processing technology, which is closely related to the early historical background of the UK.

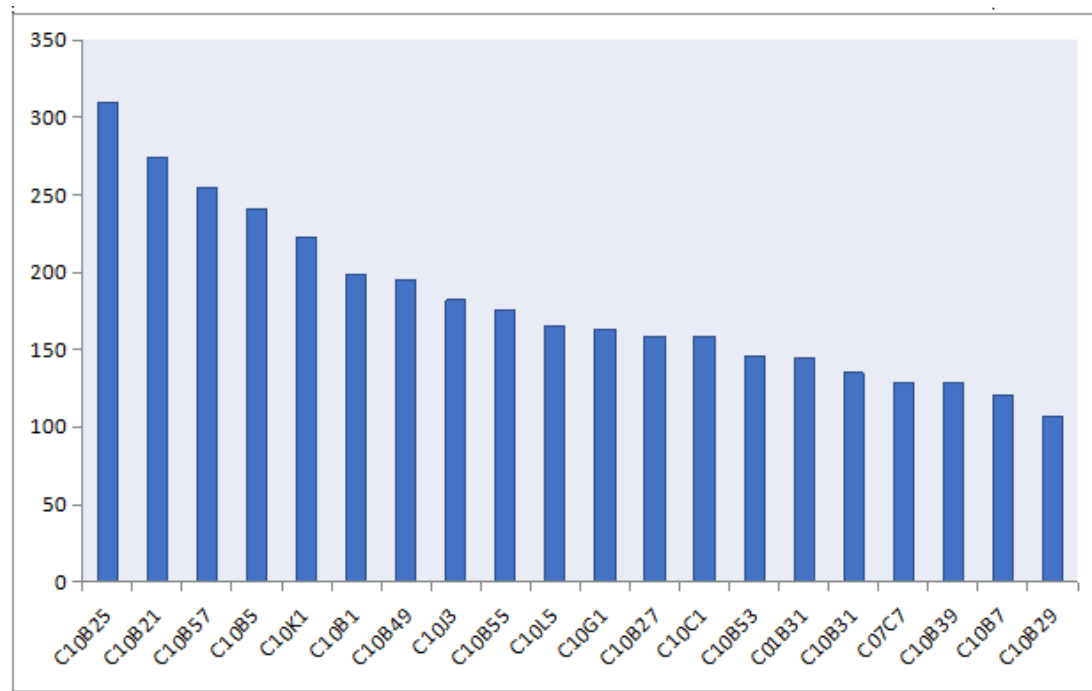


FIG. 5 Composition (large group) of IPC technology

IV. THE CONCLUSION

By analyzing the number of patent applications of major applicants in the field of coal coking and its deep processing technology as well as the British patents, we can see the basic trend of the development of coal coking and its deep processing technology in the world. Britain's coal coking and its deep processing industry has experienced several important stages, such as the initial stage, the overall development stage, the depression stage and the redevelopment stage.

Coking technology has been highly mature today, hot charged coking technology has been in the market promotion, but the British still coke production is realized by using traditional coking technology, the traditional coke oven chamber volume has more than 90 m³, carbide coking process do the environmental protection, efficiency, gas processing, in terms of coal with low volatile coal, coke yields rise accordingly. In terms of environmental protection and resource conservation, each country attaches great importance to it and has certain technical support accordingly.

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