Analysis on the Cost Control of Container Liner Shipping Companies under the Global Sulphur Limit Directive

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Abstract. With the increasing attention of the international community to the ecological environment, shipping companies should take environmental protection into account while pursuing economic interests. The introduction of "Global Sulphur Limit Directive" shows that the shipping industry attaches great importance to environmental protection. However this directive also brings many challenges to shipping companies. This paper is about the cost control of container liner shipping companies under the "Global Sulphur Limit Directive". It analyzes the inevitability of sulphur emission control in container liner shipping companies under the "Global sulphur limit Directive", lists the existing approaches of sulphur emission control of container liner shipping companies and analyzes the impact of this directive on container liner shipping companies. Finally, based on the main challenge—the rise of operating cost, some suggestions are given in this paper.

1. Introduction
"Global Sulphur Limit Directive" advocates green shipping in order to reduce the harm of shipping activities to the environment. Sulphur emission control will be beneficial to the environment protection as well as to the elimination of excess capacity of shipping industry. However, the implementation of the "Global Sulphur Limit Directive" also brings new challenges to the shipping industry and the container liner shipping companies show obvious discomfort. Whether container liner shipping companies are willing or not, the internal and external requirements of the shipping industry make sulphur emission control a reality they have to accept.

2. The inevitability of sulphur emission control in container liner shipping companies

2.1. Compulsory requirement of international conventions
In 1997, IMO adopted the MARPOL Convention and established the global sulphur limit target. After that the 2005 MARPOL Convention (Annex VI) clearly proposes the need for monitoring and inspecting the sulphur content of marine fuel oil of all seagoing vessels (excluding military vessels) sailing in sulphur emission control areas(SECA). In October 2016, the 70th meeting of IMO's Marine Environmental Protection Committee strongly promoted the relevant mandatory standards for reducing nitrogen and sulphur emissions, among which the mandatory standards related to sulphur emission control were passed, and the global sulphur emission ceiling of 0.5% of marine fuel will be enforced from January 1, 2020[1]. Some shipping powers, such as Greece, called on IMO and its member states to consider delaying the enforcement of “Global Sulphur Limit Directive” until appropriate solutions were found. However IMO believes that it is not feasible to postpone this directive either in procedure or in law. Therefore, it is inevitable and urgent to control sulphur...
emission in shipping industry. As an important part of the shipping industry, no matter whether the container liner shipping companies are willing or not, the sulphur emission control of ships is a reality that must be accepted.

| Restricted scope | Sulphur emission ceiling (m/m) | Time of enforcement |
|------------------|-------------------------------|---------------------|
| Outside the SECA | ≤4.5% | Before January 1, 2012 |
|                  | ≤3.5% | January 1, 2012 and later |
|                  | ≤0.5% | January 1, 2020 and later |
| Within the SECA  | ≤1.5% | Before July 1, 2010 |
|                  | ≤1.0% | July 1, 2010 and later |
|                  | ≤0.1% | January 1, 2015 and later |

2.2. Financing requirement of financial industry for shipping companies

the Rocky Mountain Institute, the Global Maritime Forum and UCL Energy Institute launched the “Poseidon Principles” and 11 major global shipping financing banks, including Citibank, Societe Generale and DNB ASA signed it on June 18, 2019. According to the “Poseidon Principles”, these banks will take environmental protection as the priority for new shipping loans in the future. From the "Poseidon Principles", it can be seen that on the one hand, the banking industry has realized the trend of green shipping, and has made itself adjust its investment portfolio and reduce risks by inclining to the environment-friendly seagoing ships when issuing new loans. On the other hand, from the perspective of shipping companies, the proposal also means that they must take the road of green shipping if they want to obtain relevant financing. The shipping industry is a capital intensive industry. The shipping market has been hovering at a low level for many years and its green transformation mainly depends on financial support to some extent. The main financing channels of shipping companies include bank loans, bonds, public equity and private equity. According to the financing proportion, bank loan is the most important channel of shipping financing. From 2007 to 2017, bank loan accounted for 75% of the total ship financing[2]. Therefore, in the future, if shipping companies want to get financial support, they must really implement green shipping measures.

3. Existing sulphur emission control approaches of container liner shipping companies

3.1. Use of low-sulphur fuel oils

The most direct and convenient way for the existing ships is undoubtedly to use low-sulphur fuel oils to achieve the purpose of sulphur emission control because it does not need to invest a lot of money to convert the ships and the shipping companies can adapt to the emission requirements in a short time. Maersk Group has also signed a joint agreement with Koole terminals, which will allow Maersk Group to produce low-sulphur fuel oils at Koole's Botlek refinery in Rotterdam port.

3.2. Installation of scrubbers

The technology of installing scrubbers to ships has been relatively mature at present and the cost of installing scrubbers in 2019 has dropped significantly, the unit price has dropped to 3-5 million US dollars. The installation of scrubbers is becoming the most attractive option for container liner shipping companies. 327 vessels have been or will be equipped with scrubbers around the world by December 2019. Among them, Mediterranean Shipping Company has become the liner shipping company with the largest number of scrubbers installation, with 51 ships having installed or about to install scrubbers and the transportation capacity has reached 665812TEU[3].
3.3. Use of nonpetroleum-based fuels
In terms of environmental protection, clean energy is the best choice. Compared with heavy fuel oil or marine diesel oil, the CO2 emission of LNG can be reduced by about 10% -15%. The emission of NOx and SOx is very small, less than one tenth of the former, which fully conforms to the upper limit of sulphur content (not higher than 0.5%) specified by IMO. By the end of 2019, there are only 8 LNG powered container ships with capacity of 16000 TEU, accounting for 5% of the 172 LNG powered ships around the world. Most of the ships using LNG power are LNG transport ships and passenger ships. CMA CGM Group is the most active liner shipping company to use LNG power to deal with sulphur emission control. It is expected that 20 LNG powered container ships will be put into operation by 2022[3].

4. Impact of “Global sulphur limit directive” on the operation of container liner shipping companies

4.1. Advantages

4.1.1. Promoting environment protection
“Global sulphur limit directive” makes container ships more environmentally friendly during transportation. Every year, more than 80% of the world's total cargo volume is transported by sea, and 20% of the seaborne volume is transported by container ships. In 2019, the number of global container ships will exceed 5000 ships. Among the three main ship types, the container ship has higher power, which causes serious environmental pollution. The air pollution of large container ships cannot be ignored. According to the research, in 2019 container ships with the capacity of 12000-14999TEU have increased by 7.8%, and the capacity of 15000+TEU ships have increased by 23%. The implementation of the sulphur limit directive will greatly promote environmental protection, control the sulphur emissions of container ships during transportation and be conducive to the sustainable development of the container liner shipping industry.

4.1.2. Eliminating the excess capacity to promote the high-quality development of the container liner shipping industry
2020 global sulphur limit is essentially a reshuffle of shipping industry. First of all, the implementation of the directive will inevitably lead to a substantial rise in the operating cost of liner shipping companies, which is hard for small liner shipping companies to bear and the concentration of liner shipping industry will be further improved. The international shipping market, especially the long-distance shipping market will be monopolized by large liner shipping companies. The small liner shipping companies will have to move to the regional market or withdraw from the market. Companies with poor management will also be eliminated and washed out. In addition, the global economic growth continues to slow down in recent years, trade frictions are repeated and the growth rate of international commodity trade continues to decline. However in the meantime, the liner shipping companies' pursuit of large-scale ships has resulted in excess capacity of container ships. The implementation of the “Global sulphur limit directive” is a good opportunity to eliminate the excess capacity. The "low standard ships" in the liner transportation market will be eliminated. To some extent, the implementation of “Global sulphur limit directive” is a great opportunity to promote the high-quality development of the shipping industry.

4.2. Challenges

4.2.1. Uncertainty of sulphur emission control approaches
Each liner shipping company adopts different sulphur emission control approaches according to its actual situation. However, the three existing sulphur emission control approaches are still faced with certain uncertainty. For example, the quality and safety of low-sulphur fuel oils should be considered.
Because of the insufficient supply of low-sulphur fuel oils in the short term, "blending oil" with sulphur content less than 0.5% will become the main source of fuel supply. However "blending oil" is difficult to meet the standard in flash point, stability, compatibility and other aspects and has potential safety hazards. There are also disputes on the installation of scrubbers mainly because installing scrubbers may discharge the original air pollution source into the sea. In addition, this approach still needs to use high-sulphur oils. The price of high-sulphur oils fluctuates greatly and the market trend of oil price in the future is not very clear. Finally if LNG and other clean energy are used as ship fuel, the ship will face high cost of conversion. For the newbuilding LNG powered container ships, the construction cost is also high. According to the relevant data from CMA CGA, the cost of 20,000 TEU LNG powered ship is about 160 million US dollars, while that of 22,000 TEU general container ship is about 140 million US dollars. In addition, the fuel tank of LNG powered container ship takes up a large space which will sacrifice a certain cargo space. At the same time, because of insufficient port facilities, not all ports can be used to refuel ships. At present, only Rotterdam, Singapore, Zhoushan port have perfect port facilities.

4.2.2. Increase in operating cost
No matter what kind of sulphur emission control approach is taken by liner shipping companies, the result will be a rise of operating cost. In general, LNG powered ships are only small proportion of the world container fleet, which is expected to remain a small proportion of the fleet in the next few years, so it will not have any great impact on the shipping industry. The installation of scrubbers allows the carrier to continue to use heavy fuel oils, but the cost of converting ships is expensive. Most container liner shipping companies still use low-sulphur fuel oils. Hapag Lloyd believes that if the cost difference between high-sulphur fuel oils and low-sulphur fuel oils is $250 per ton, it means there will be 1 billion US dollar increase of its annual cost. Maersk estimates that the company will spend about 2 billion US dollars a year once the sulphur limit directive comes into effect; CMA CGM thinks it will pay about 1.5 billion US dollars. According to the research, the global shipping industry's fuel oil cost will increase 40-60 billion US dollars per year if two thirds of the global ships use low-sulphur fuel oils.

5. Cost control measures of container liner shipping companies under “Global sulphur limit directive”
In order to cope with the cost increase caused by the sulphur limit directive, liner shipping companies choose to transfer the additional cost by imposing BAF (Bunker Adjustment Factor) on shippers. However, this measure is not fully accepted by shippers. The main reason is that the shipper believes that the BAF levied by liner shipping companies is not transparent. According to a survey from Drewry, 76% of shippers said they did not receive clarification or information from shipping service providers on how they intend to respond to potential cost increases. Even if Maersk issued a detailed press release in 2018 on how to calculate fuel charges, it was still accused by shippers of blatant profiteering. Therefore it is not advisable for the container liner shipping companies to pass on the increased cost to shippers completely, which is a passive approach. Container liner shipping companies should take positive measures to control costs through internal operational optimization.

5.1. Route optimization and appropriate reduction of the number of base ports
In order to cope with the increasing cost, container liner shipping companies can adopt some traditional methods to control the cost. Liner shipping companies can optimize the existing routes, readjust the layout of the global route network and form a multi-level backbone and branch network. Through route optimization, liner shipping companies will reduce the number of base ports, thus it will reduce the expenses of ports and fuel costs. At the same time, liner shipping companies can work closely with feeder companies to distribute and transfer goods through feeder transportation.
5.2. Slow steaming to reduce cost
Slow steaming is the traditional way to control the cost of liner industry, which is still one of the effective methods to cope with "Global sulphur limit directive ". The choice of slow steaming is based on the low expectation of world economic and trade development. There are many unstable factors in the global economic recovery. In addition, trade frictions between China and the United States still exist and the demand for maritime transport will not grow rapidly. At the same time, the trend of large-scale container ships is obvious. The idle capacity of the global fleet is high and the excess capacity still exists. Slow steaming can digest part of the excess capacity and above all it can reduce the fuel consumption greatly. The relationship between speed and fuel consumption is cubic. That is to say, if the speed is reduced by 2%, the fuel consumption will be reduced by 8%. Rather than impose BAF, reducing the speed of navigation and controlling the fuel cost to keep the freight rate at a low level is more acceptable for shippers.

5.3. Investing in intelligent and environmentally friendly ships
Container liner shipping companies should timely eliminate older ships and invest in more intelligent and environmentally friendly ships. Intelligent ships generally use green energy or new energy such as electric power, which greatly reduces the pollution of ships. Apart from that, intelligent ships have higher thermal efficiency and it means more money can be saved. Take a 10 000 TEU container ship for example, every 1g of fuel consumption reduction means saving 200 000 US dollars per year. For container liner shipping companies, the investment in the early stage will be converted into the income in the later stage.

5.4. Extending marine logistics chain
In addition to the traditional measures to reduce the cost, container liner shipping companies should shift their attention from the sea to the land. Container liner shipping companies can extend marine logistics chain. Those companies can make up for the loss in the shipping segment through gaining more profits from other segments[3]. The supply chain integration initiated by liner shipping companies can not only achieve the purpose of cost transfer, but also solve the most complex transportation link-marine transport. It is beneficial for liner shipping companies to control the whole logistics, to improve the service quality and speed up the delivery of cargo.

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