

Seeking New Developments Under "Sulfur" Emission Restrictions

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Abstract

The 2020 IMO Sulphur Restriction Order has been officially implemented for some time, and the ensuing effects are constantly emerging. In the initial stage of the implementation of the sulfur restriction order, the large price difference between high and low sulfur oils affected the operating costs of the "low sulfur oil pie" shipping companies. The price gap between high and low sulfur oils is constantly narrowing, and this effect is also being mitigated. However, despite this, as the epidemic has passed and shipping activities have increased, the demand for low-sulfur oil will still rise, thereby boosting prices.

Keywords

Sulphur Restriction Order; Desulfurization tower; Shipping business.

1. Introduction

Taken together, there are currently three main options for different shipowners to cope with their own fleet conditions. They are to use low-sulfur fuel oil that meets IMO standards; add desulfurization devices to ships; and use LNG and other clean energy as ship fuel. However, no one can make up for the huge gap caused by the sulfur restriction order in a short period of time. How to fundamentally solve the problem of ship's fuel oil has become an urgent matter for the shipping industry.

2. How Sulphur Restriction Order Affects Shipping Market

2.1 Affecting compliant fuel prices

Firstly, the sulfur restriction order directly affects the price of compliant fuel. At the beginning of this year, due to a large short-term shortage of low-sulfur oil supply, the difference between high and low-sulfur oil prices remained basically above US \$ 200 / ton. It is predicted that the global marine fuel consumption will be nearly 200 million tons in 2020, of which the demand for low-sulfur oil is about 135 million tons, and the supply gap for low-sulfur oil is about 40%. By the end of 2019, the price of low-sulfur heavy oil continued to climb, and the price of MGO continued to rise. Among them, the price difference between low sulfur oil, MGO and high sulfur oil has been rising. At the beginning of February this year, the price difference remained at a range of 200-300 US dollars per ton. The price difference between Fujaira MGO and high sulfur oil (IFO380) once exceeded 400 US dollars per ton. The price of Singapore Port Low Sulfur Oil (VLSFO) once exceeded MGO. With the decline in global marine fuel demand, the price difference between high and low sulfur oil has gradually declined since the end of February. Currently, it is basically maintained at 110-150 US dollars / ton.

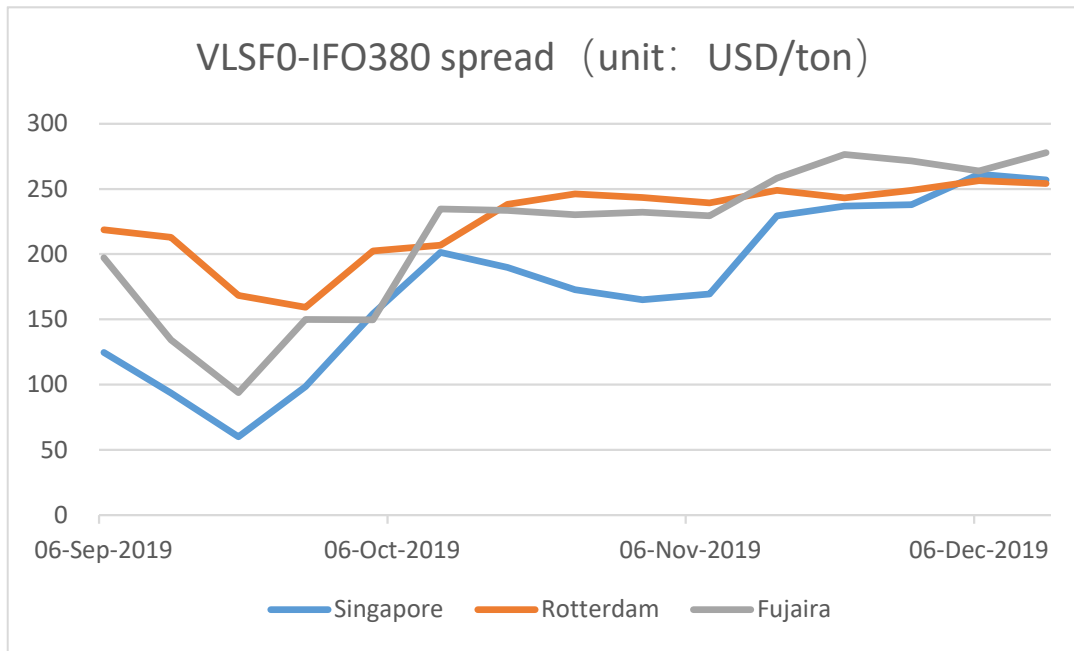


Figure 1. VLSF0-IFO380 spread

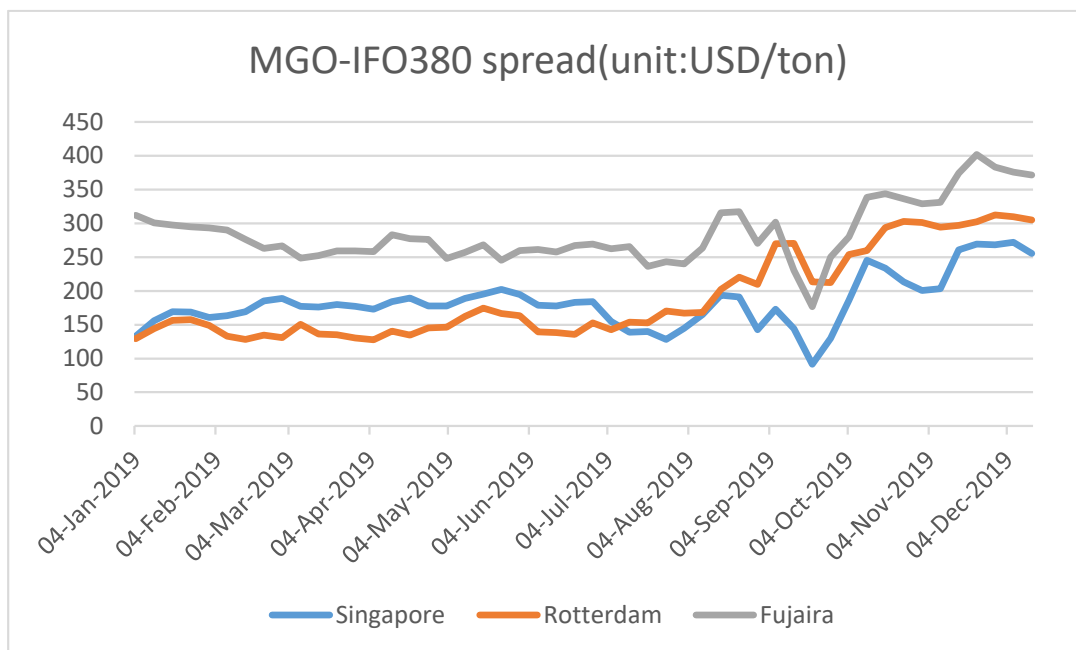


Figure 2 . MGO-IFO380 spread

2.2 The number of ships with desulfurization towers increased rapidly

Secondly, the number of ships installing desulfurization towers has increased rapidly, and large ships have become the main force for installation. In 2019, the cost of installing desulfurization towers has dropped significantly by 2 million to 3 million US dollars, and the unit price has dropped to 3 million to 5 million US dollars. Installing desulfurization towers has become an attractive option for liner companies. [1]

The data shows that as of January 18, 2020, the capacity of container ships with desulfurization towers installed worldwide accounted for 10.7%, exceeding 10% for the first time, totaling 2,475,500 TEU. Among them, the capacity of modified desulfurization towers reached 19.156 million TEUs, accounting for 77.4% of the capacity of installed desulfurization towers, becoming the current mainstream choice. At the same time, the capacity of the desulfurization tower is being modified at

the dock to reach 7.6300 million TEU, although it has decreased compared with December 2019, but the overall remains at a high level, accounting for 3.2% of the global total capacity

In fact, since June 2019, the number of container ships with docking desulfurization towers in the world has been rising all the way, simultaneously pushing the global fleet's idle capacity to a new high in two years. [2] As of January 2020, 376 container ships have chosen to install desulfurization towers, of which 68 new desulfurization towers have been installed, 222 desulfurization towers have been refitted, and 86 are being converted.

Among the ship types with installed desulfurization towers, the shipping capacity of container ships above 125,000 TEU accounts for more than 60%, and the ship types below 2999TEU have the largest number of installed ships, accounting for 37%.

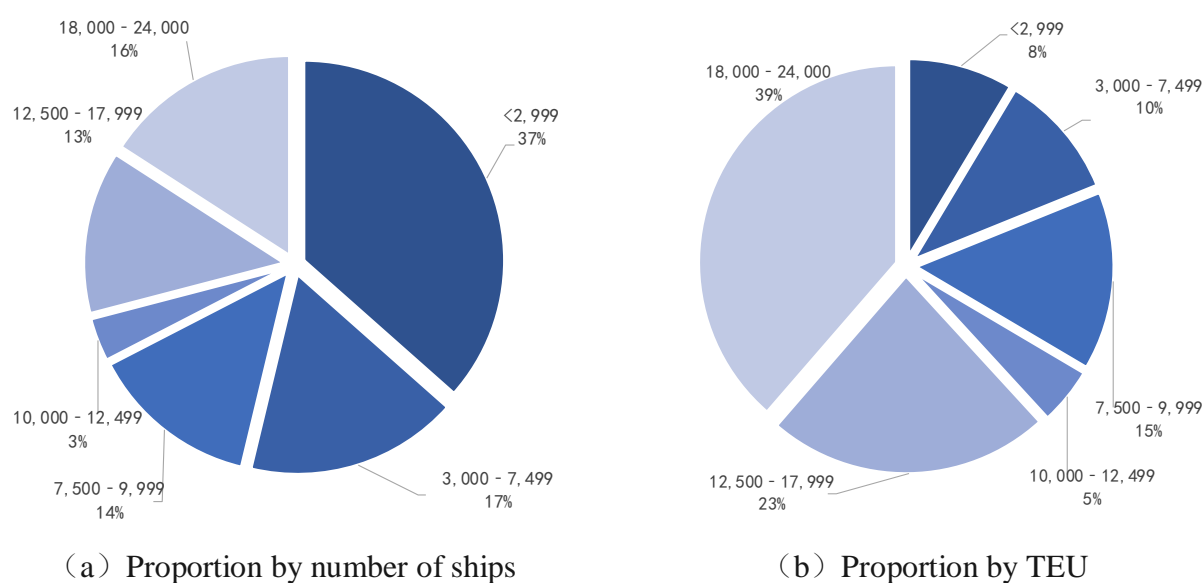


Figure. 3 Proportion of ship types among ships with installed desulfurization tower

At the same time, sulfur restrictions have accelerated the replacement of ships, the amount of ship dismantling has rebounded sharply, and the price of ship recycling has fallen rapidly. In 2019, 96 container ships with a cumulative capacity of 186,300 TEU entered the dismantling market worldwide, and the volume of ship dismantling rebounded significantly, a significant increase of 82.0% year-on-year.

As of December 27, 2019, the annual average value of container shipbreaking prices was 418 \$ / ldt, a year-on-year decrease of 9.6%, with a maximum value of 415 \$ / ldt and a minimum value of 370 \$ / ldt.

2.3 LNG and other new energy power ships accelerate development

Not only that, due to limited sulfur orders, LNG and other new energy power ships are accelerating development, and refueling with compliant fuel is the mainstream choice. [3]As of the end of 2019, a total of 8 LNG-powered container ships with a total of 16,000 TEUs were in operation worldwide, accounting for 5% of the 172 LNG-powered ships. The majority of LNG-powered ship types are LNG transport ships and passenger ships, and LNG-powered container ships It accounts for only 0.1% of the global container fleet's total capacity.

With the advancement of the green development trend of the shipping industry, it is expected that 22 LNG-powered container ships will be delivered for use in 2020, and the operation volume of LNG-powered container ships will increase significantly. The most active liner company that chose to use LNG power to respond to sulfur restrictions is the CMA ship. It is expected that by 2022, it will have 20 LNG-powered container ships in operation.

Overall, in response to the implementation of the sulfur restriction order, the choice of installing desulfurization towers and LNG power is still a minority. Especially when the price difference

between high and low sulfur oils is shrinking, refueling with compliant fuel has become the mainstream choice for shipping companies.

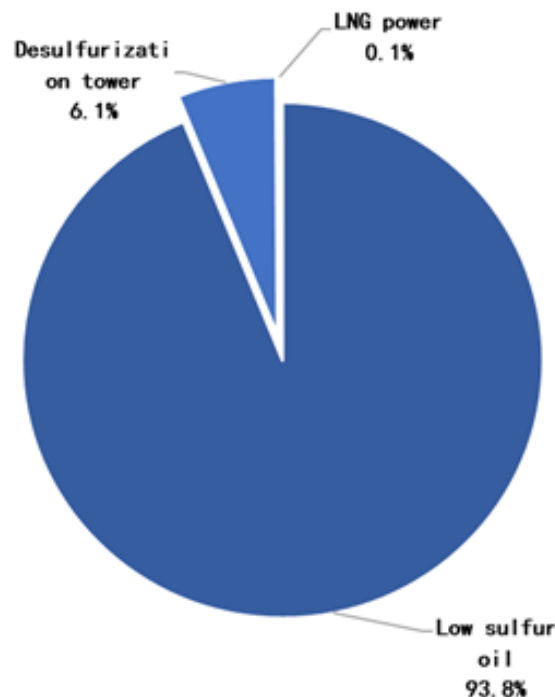


Figure 4. Proportion of three ways for container shipping industry to respond to sulfur restriction orders (by TEU)

3. Companies have very different attitudes towards installing desulfurization towers

3.1 Low-sulfur oil pie represented by Maersk

Admirers of the low-sulfur oil program represented by Maersk believe that sulfides should be removed from the refinery. Maersk Group's oil trading company has signed a joint agreement with KOOLE Terminals, which will allow Maersk Group's production at the Koole's Botlek refinery in Rotterdam Marine low sulfur oil required by the "Sulfur Restriction Order". Low sulfur oil can solve the problem of sulfide emissions from the source, but it faces many challenges such as increased operating costs and daily maintenance management of ships. [4] Since 2019, the price difference between low-sulfur oil, MGO and high-sulfur oil has been increasing, and the current price difference is more than 200 US dollars / ton. In the short term, there is a risk of insufficient supply of low-sulfur oil. Therefore, "harmonic oil" with a sulfur content of less than 0.5% will become the main source of compliant fuel oil supply, but "harmonic oil" is difficult to ensure compliance with other standards in terms of flash point, stability and compatibility, and there are hidden safety risks, and "Harmonized oil" is not widely used in the market, so it is impossible to accurately judge the relevant characteristics and parameters. Low sulfur oil supply and demand prospects and safety performance will directly affect the choice of the majority of shipping companies.

3.2 Desulfurization towers represented by MSC

Mediterranean Shipping Company has become a leading carrier in desulfurization equipment. So far, there are more than 300 ships that have or will be equipped with desulfurization equipment worldwide. Among them, Mediterranean Shipping was the first to equip 51 ships, followed by Evergreen Marine to install 43 ships. [5] Grimaldi Shipping, an Italian private shipping company, has become the liner company with the highest proportion of desulfurization tower installation capacity, accounting for 45.6%.

Table 1. Statistics of the installation of desulfurization towers of major liner companies as of December 2019

	company	Number of ships installed (Ship)	%	Ship capacity installed (TEU)	%
1	MSC	51	9.0%	665812	17.7%
2	Evergreen	43	21.5%	330538	26.0%
3	CMA CGM	25	5.0%	273450	10.2%
4	Maersk	22	3.1%	282623	6.7%
5	HMM	14	22.2%	93726	24.2%
6	PIL	10	8.3%	57038	14.5%
7	Hapag Lloyd	8	3.4%	106160	6.2%
8	COSCO	6	1.3%	34473	1.2%
9	Grimaldi Shipping	5	13.2%	19045	45.6%
10	Matson	5	20.8%	10784	25.1%

At present, the technology for installing desulfurization towers is relatively mature. The cost of installing desulfurization towers in 2019 has also dropped significantly, and the unit price has dropped to 3-5 million US dollars. Installing desulfurization towers is gradually becoming the most attractive option for liner companies. However, the installation of desulfurization towers has also been controversial, mainly because the desulfurization towers may discharge the original source of air pollution into the ocean, and did not solve the source problem of sulfide pollution.

3.3 LNG power system represented by CMA CGM

The pioneering CMA ship has ordered nine 22,000TEU container ships equipped with LNG systems as early as 2017. By 2022 CMA ship is expected to have 20 LNG-powered container ships in operation.

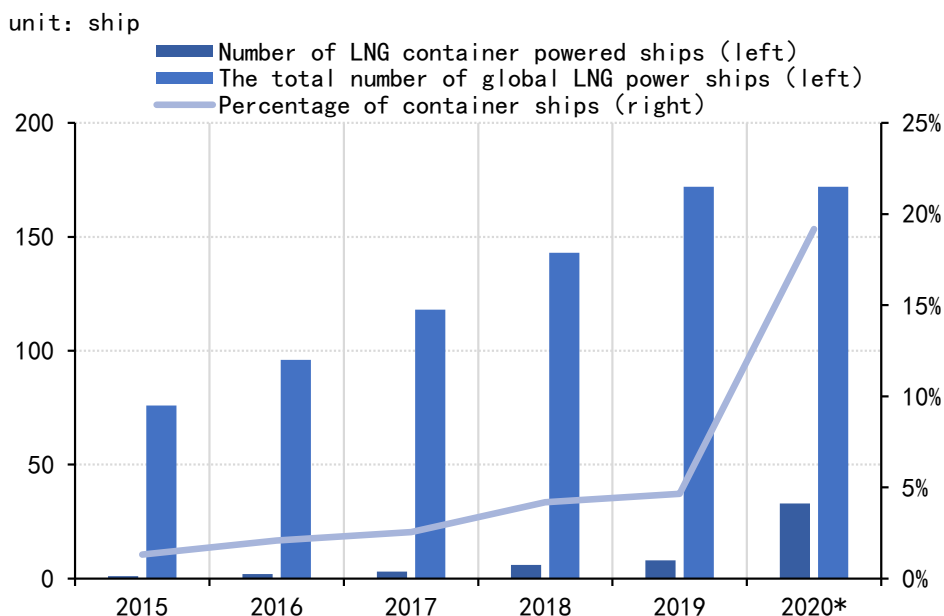


Figure 5. Number and proportion of LNG-powered container ships

Although the cost of LNG system ships is relatively high, compared with traditional fuel oil, the advantages of LNG as a marine ship fuel are mainly reflected in environmental protection. [6] When liquefied natural gas is burned, it will release less carbon dioxide, and there will be basically no emissions of nitrogen oxides, sulfur oxides, and particulate matter. Compared with heavy fuel oil or marine diesel, the carbon dioxide emissions of LNG can be reduced by about 10% to 15%. The NO_x and SO_x emissions are very small, less than one-tenth of the former, which is completely in line with IMO regulations. The upper limit of 0.5%.

Table 2. Statistics of the proportion of different marine fuel emissions

Emissions	HFO	MDO	LNG
SO _x	0.049	0.003	0.002
CO ₂	3.114	3.206	2.750
CH ₄	-	-	0.051
NO _x	0.093	0.087	0.008
PM	0.007	0.001	-

The controversy about the LNG system is not limited to the cost of ships. Ship owners are more concerned about the layout of LNG bunkering ports, LNG prices and navigation safety.

4. Companies with low desulfurization tower installation ratios may have profit risks

According to the calculation of fuel consumption per TEU in 2019 by the Shanghai International Shipping Research Center for a liner company ranked by the world's top five in a certain capacity, the current LSS (low sulfur oil surcharge) charged by most liner companies is difficult to completely offset the previous high and low sulfur oil price difference (Singapore amounted to US \$ 306 / ton).

However, due to the recent epidemic situation and the impact of international oil prices, the price difference between high and low sulfur oil has rapidly narrowed, even reaching US \$ 100 / ton. This is mainly due to the fact that due to the large-scale suspension of production and production of enterprises, the import and export of goods have decreased, resulting in the slowdown of shipping activities. However, it cannot be ignored that the epidemic itself will also have an impact on the resumption of the refinery. In addition, as the impact of the epidemic gradually dissipates and the backlog of goods shipped, the demand for low-sulfur fuel will also increase significantly.

If the median value of the current high-low sulfur oil price difference is 200 US dollars per ton, then ships with desulfurization towers can usually recover the installation cost within 1 to 2 years, and the cost recovery period for ultra-large container ships is even less than 1 year. [7] For ships that recover the installation cost of the desulfurization tower, the remaining time is equivalent to "making money in disguise." If the liner company that puts into operation routes also collects additional LSS, it is equivalent to "making money directly". Of course, the desulfurization tower also requires a certain maintenance cost. The specific amount is not yet known, but the overall cost should not be large. For liner companies with a relatively low desulfurization tower installation ratio, if the extra costs paid for fuel in 2020 cannot be transferred well, it may have a greater impact on the company's overall profitability.

The current desulfurization tower seems to have completed a status change from the initial "chemical plant" on board to the "banknote printing machine" on the ship. Ship companies with high desulfurization tower installation ratios seem to have better opportunities in the future to obtain better profit. [8] At the same time, the shipping companies that have regretted the low desulfurization tower installation ratio may have begun to take action, or will promote the arrival of a wave of

desulfurization tower installation peaks, which may push the average desulfurization tower conversion time to rise again.

The essence of the sulfur restriction order is a major reshuffle in the shipping industry. "Low-standard ships" and poorly managed enterprises will be eliminated and washed out. To some extent, the implementation of the sulfur limit order is to remove excess capacity at a time. Great opportunity to promote high-quality development of the shipping industry.

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