IMO: liner shipping companies

Speed has always been an important factor in maritime operations. In times where the shipping market is in a depression, many maritime operations operate in ‘slow-steaming’ mode in which they have lower speeds, a positive side-effect of this is that it also lowers polluting emissions. (EEA, 2013)

However, if this is not true, then liners will concentrate on increasing their profits and not consider the environmental factors. Moreover, IMO cannot force liners to reduce CO2 emissions without taking into consideration their economic situation. Finally, with the slow steaming strategy, how can liners reduce the amount of CO2 emissions to the maximum level while minimizing their operating costs? Regarding these issues, during the past ten years, there have been many discussions on air pollution, including GHG emissions, within international shipping. The Organization for Economic Cooperation and Development (OECD) investigated the amount of GHG emissions targeting the representative transportation modes such as road, rail, and ocean (OECD 2009).

IMO established the fuel-based exhaust gas emission factors using long-accumulated data and forecasted the potential amount of CO2 emissions in the shipping industry based on a single vessel through the prediction of the annual growth of fleets in each shipping market (ICS 2009). Moreover, numerous studies attempted to estimate the amount of GHG emissions in shipping and other relevant industries (Corbett and Koehler 2003; Faber et al. 2010; Hoffman, Eide, and Endresen 2012; Kontovasa and Psaraftis b 2011, Rightship 2013). When it comes to the impact of slow steaming on liner shipping, Notteboom and Vernimmen (2008) argued that slow steaming has a strong correlation with fuel consumption, and Ronen (2011) derived the positive relationship between the slow steaming and the operating costs on a loop. Cariou and Cheaitou (2012) argued for the sustainability of slow steaming in the short term from the economic and environmental viewpoints. Eide et al. (2011) analyzed the costs for reducing CO2 emissions in the shipping industry. Woo and Moon (2012) built a simulation model using system dynamics to analyze the relationship between voyage speed and operating costs, and argued that slow steaming is not always helpful in reducing the operating costs on a loop. Nevertheless, there still remains an unexplained answer in relation to the basic questions raised at the beginning.

Most previous studies have confirmed that slow steaming is an effective and efficient operating strategy for liners to reduce GHG emissions and thus their operating costs. However, this led the authors to reexamine the impacts of slow steaming on the amount of CO2 emissions and the operating costs from different perspectives and to set out three objectives: (1) to simulate the relationship between voyage speed and the amount of CO2 emissions in terms of the elasticity and evaluate any changes in the amount of CO2 emissions by considering the current average voyage speed on major routes; (2) to see that the reduction in voyage speed always contributes in reducing the operating costs of shipping lines; and (3) to find the optimal voyage speed as a solution in maximizing the reduction of CO2 emissions at the lowest operating cost in order to satisfy IMO’s reduction target.(027)

The main outcomes of the simulation can be summarized as follows. Firstly, slow steaming is helpful in reducing the amount of CO2 emissions, whereas it is not always useful to reduce the

operating costs. As the voyage speed decreases, more CO2 emissions can be reduced. However, the operating cost can be reduced only within the range between 25 and 13.6 knots by slow steaming, and it can be minimized at 18.6 knots. Secondly, the enlargement of vessel size on a loop is helpful to reduce the amount of CO2 emissions at all different voyage speeds. However, this influences the operating costs and the cost-energy efficiency (CEEI index) negatively. Thirdly, when considering the current average voyage speed (15-17 knots), it can be evaluated that more than 90% of CO2 emissions have been reduced already on the Asia-Europe route based on the results of the simulation. Finally, three strategic voyage speeds were derived by simulation, with the optimal voyage speed being 17.4 knots. At the optimal voyage speed, liners can maximize the reduction of CO2 emissions at the lowest operating cost, thus satisfying the political target of IMO.

Based on the aforementioned results, some conclusions can be made. Firstly, from the viewpoint of liners, it is required to improve their operating strategies by considering the optimal voyage speed (17.4 knots) and the strategic range of voyage speed (22-14 knots) to secure the economic and political advantages of slow steaming. Secondly, even though nowadays liners focus on two strategies, that is, slow steaming and the enlargement of vessel size, to enjoy the slow steaming effects and the economies of vessel size at the same time, it is required to select one of two strategies based on their own strategic goals. This is because there is a negative correlation between both strategies. Hence, if liners target a goal on the reduction of operating costs, they need to control their voyage speed by considering the strategic range of the voyage speed and the optimal voyage speed by maintaining the employed vessel size. Thirdly, it is necessary to devise a method for improving their service quality. The increased transit time by slow steaming may cause an increase in a customer’s in-transit inventory costs, and this would have a negative effect on the operation of the whole integrated supply chain. In this sense, Daily Maersk is a good example where the disadvantage of slow steaming is compensated for, that is, long transit time.

On the other hand, from the viewpoint of IMO, it is necessary to improve the relevant environmental policies in the liner shipping industry. It is estimated that a great deal of CO2 emissions, which exceeded the reduction target of IMO, have been reduced already by slow steaming in liner shipping based on the results of simulation. Moreover, when considering other relevant regulations of IMO for the reduction of carbon emissions, it is expected that CO2 emissions could be further reduced in liner shipping. In this sense, it is necessary to establish another measure that can reflect the amount of CO2 emissions and the economic situations of liners at the same time. Moreover, it is necessary to improve the direction of environmental policies to support liner shipping companies that have reduced the amount of CO2 emissions by slow steaming by utilizing market-based instruments such as carbon tax, emissions trading, and cap-and-trade all at the same time. In this sense, the CEEI, with EEOI, is expected to play an important role in controlling the amount of CO2 emissions by considering the economic situation of liners.