ECG Academy

Thesis

SECA IMPACT ON SHORTSEA SHIPPING

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Abbreviations

SECA – Sulphur emission control area
MARPOL – The International Convention for the Prevention of Pollution from Ships
SMA – Swedish Maritime Administration
HH – High and heavy
LNG – Liquefied Natural Gas
BAF – Bunker Adjustment Factor
OEM – Original Equipment Manufacturer
LSP – Logistics Service Partner
ACEA – Automobile Manufacturers Organisation
NM – Nautical miles
KN – Knots
EPA – The United States Environmental Protection Agency
SOx – Sulphur Oxide
NOx – Nitric Oxide
Glossary

High and Heavy – Rolling cargo such as machines for mining and construction

Sulphur Dioxide (SOx) – part of emissions from bunker fuel burned by ships

Short Sea Shipping – vessels trading within shorter distances in a specific region (in this Thesis Europe)

Deep Sea Shipping – vessels trading cross continents (Europe to US for example)

Scrubbers – Technology that reduces the sulphur emissions on vessel

LNG – Liquid Natural Gas can be used as propulsion for vessels and is viewed upon as very environmentally friendly compared to other bunker fuels.
1. Introduction

The environment policy before 2008 was a very hot topic amongst national leaders and politicians on the global scene. After the Lehman crisis hit in September 2008 environmental legislation has been suffering severely. As the financial crisis was a reality, the world changed it focus after one of the deepest financial crisis since the crash on Wall Street in 1929. After 2008 companies struggled to survive in the new economic climate and many banks were made bankrupt whilst others were bailed out by their governments. Many people, especially in the Western World, lost their jobs, their savings and in some events their homes as they had to reduce their current living standards.

During the crisis however, the environmental challenges have not disappeared, but instead they have been lurking in the dark and they are growing in size. The effects of an increased scale of global warming will have an enormous impact on food production and especially the 3rd world will be heavily affected. Clean energy vs. dirty energy is another challenge which is spurred by a rapid population growth where China and the Chinese middle class is a big concern.

Some measures have been done and in the transport segment the main focus has been on sulphur emissions. As an attempt to reduce the emissions, the Sulphur Emission Control Areas (will be referred to as SECA in this Thesis) was enforced in May 2005 and is defined in MARPOL annex VI. The first areas to be covered by this was the Baltic Sea and parts of the Californian coast. The North Sea was later added and enforced 2007.
The idea behind this is to reduce sulphur in the bunker fuel and before July 2010 the limit for sulphur was 1.5%. After 2010 the limit was reduced to 1% which will last until 2015, before the next sulphur level will come to force with only 0.1% sulphur limit in fuel. For the rest of the world there is a plan to reduce sulphur limits to 0.5% by 2020, however this depends on fuel supply, so the global limit has been further stretched to come into force latest in 2025.

The effects for Automobile transport will be enormous for the industry especially the shipping companies as the bunker cost is the most significant costs in the daily operations. With further refined fuel with only 0.1% the cost for bunkers will grow more and the current fleets need to make drastic changes in their propulsion systems and/or propulsion types to be able to cope with the new regulations. In turn these costs must be transferred to other stakeholders such as ports, OEM’s and consumers in order to split these additional expenses. The shipping companies themselves also have to make choices for what type of strategy to follow in the new operating climate.
and what type of technology they want to invest in. This in turn can also provide advantages towards their competitors or they can be a disadvantage.

This thesis will focus on the theoretical impact the SECA will have for the short sea shipping companies and the main focus will be on the shipping lines operating in the Baltic and North Sea. The coming challenges this industry faces will result in a further cost increase, to an already struggling industry, which will limit the competitiveness of short sea shipping vs. for example land transport. New investments in propulsion system will be required to cope with the new legislation and I will discuss who is most likely to take this cost.

I will focus on various stakeholders within the short sea shipping industry of Automobile logistics with a main focus on the shipping companies and the measures that are needed to meet the requirements starting 2015. Other stakeholders such as OEM’s, Ports and land based LSP’s will also be touched upon.

In chapter 2.2 I will look closer to the risks and opportunities related to technology and innovation and how those two can create advantages for certain companies who dare take the first step by using new technology.

Further on I will make an evaluation where I will use calculations to show an example of the cost increase with investing in the different technologies. Based on this I will evaluate the options and will summarize my findings in the conclusions chapter.
2. SECA IMPACT ON SHORT SEA SHIPPING

2.1 Shipping Lines – Car Carriers

Short sea shipping becomes the immediate loser after the 2015 SECA legislation comes into force. After the crisis demand for new vehicles was reduced dramatically and the shipping companies needed to reduce their tonnage in the market in order to match demand. Growth in new vehicle sales in Western Europe was temporarily spurred by scrapping incentives made by the governments, especially in Germany. After the incentive period car sales fell back again and have not recovered much
since. Ongoing problems in Europe such as the unemployment, with Spain’s 25% as a good example, makes the future uncertain.

Russian trade saw a huge increase in foreign new car sales up until the crisis in 2008. The volumes fell steeper than any other of the big economies in Europe, however despite this, the volumes improved again the following years and as you can see from the below graph there has been tremendous increase in car demand after 2010. Pre-crisis sales levels was reached in 2012 of almost 3 million cars whilst in 2013 sales are expected to flatten out.

Figure 2.1.2 Annual Russian Car Sales 2006 - 2012

(Source: IHS Global Insight)

For a shipping company, trading in the Baltic with volumes for Russian, Finnish and other Baltic states is characterized by one way traffic, as there is limited return cargo to Western Europe and onwards. With that in mind rate needs to be reflected to cover all bunker cost both directions which already compromise the margins.

The shipping company’s risk profile will vary between the different players in the European market. Some companies have spread its risk between different countries and areas within Europe through various service lines. With a diverse fleet, planning the tonnage in the various markets will be of vital importance in order to have the
best tonnage in place for the different volumes, e.g. size of the vessels, Ice class, bunker consumption and speed. Investments in current tonnage and new tonnage will need to be carefully assessed. In the below illustration photo showing the various decks for car’s and high and heavy. The latter type of cargo can be very fluctuant as it’s normally, within Europe, sold on the spot market. Other countries with high imports of machinery can also be very seasonal such as Russian imports of agriculture machinery which is quite high 1st half of the year, then volumes reduce in the 2nd half before winter starts.

Figure 2.1.3: Car Carrier Illustration

(Source: RayCarCarriers)

Using the above as an example it has very good capacity for HH cargo, although it’s a Deep Sea vessel, however if this vessel would be trading 2nd half of the year from north-western Europe to Russia space would not be fully utilized as it would be in the 1st half of the year. Also, considering the point mentioned earlier in this chapter with limited return cargo it would be very difficult to reach profit margins. Thus, having a balanced fleet will be vital but the vessels in the fleet also should be further balanced to meet a tougher operating climate.

The bunker adjustment factor can be an efficient tool to cope with higher bunker prices. Using this tool, shipping companies can insure themselves to fluctuations in
oil price but it can also justify the operating expenses towards the OEM’s and spot customers.

After the crisis when world growth was limited, several container shipping companies introduce slow speeding to elevate demand. This was later on adopted by other shipping segments including the Car Carrier Industry. The challenge for the car carrier with operating on low speed is to meet the OEM lead time requirements detailed in the different contracts. This further exemplifies the need for more dialogue and cooperation between OEM and LSP down on an operating level.

2.1.2 OEM Dilemma’s

For OEM’s planning their future vehicle flows within the SECA areas will be met with tough negotiations on the rates with the LSP’s on the sea transport. One plausible outcome for LSP’s is to bake the additional bunker expenses into current BAF schemes (as mentioned in previous chapter). These normally vary between the different OEM’s as they sometimes have their own formulas to calculate on and it is normally evaluated on a monthly or quarterly basis.

Figure 2.1.4 Daimler Plant

Most likely certain flows will be transferred to however if this trend will be a reality the risk of congestion and longer transit times can be a likely factor to keep vehicle flows on sea. For Russia, already poor infrastructure like roads in the Baltic region can further provide an argument to keep flows by sea.

(source: Deutsche Welle)
Shift of factory locations to more strategic areas will also be an alternative, however the investment cost will be quite significant and certain factories produce for various markets, thus strategic plant locations could possibly provide limited positive effects. Coming back to the Russian example, Russia has had a boom in new vehicles (see figure 2.1.2) since 2010, whilst western European markets have been lagging behind. In the current European economic situation many OEM’s look to the east for selling their various models, however in time the European economy is expected to shrug off parts of the crisis and vehicle sales can be expected to rise in years to come.

2.1.3 Port’s

Ports are in a similar position as the car carrier companies as they both face a potential huge volume drop. The need for innovation on the port side in terms of efficient operations with a focus time and cost alongside demand from the shipping industry to offer extra services on bunker supply which also will require investment costs. This will also put pressure on ports outside the SECA areas because innovations spurring from SECA ports will most likely give them a competitive advantage, for example to lowered cost pr. unit handled.

Ports situated close to the SECA border could potentially be more attractive for shipping companies if it provides a cost benefit for the latter. In the below illustration I use the example of port of Southampton and Bristol (Portbury).
The distance between Southampton and Bristol is 395 nm. Trading ex. ports like Zeebrugge and Bremerhaven doesn’t necessarily provide large amount of bunker sailings, looking at the whole voyage distance as the former is 192 nm and latter 456 nm away from Southampton. However if we compare ex. St. Petersburg the distance is 1.630 nm then the extra trip to Bristol would equal approx. 24% longer voyage.

To give an example:

1. Vessel A consume 30 tons a day operating on 14 knots
2. St. Petersburg to Southampton would take approx. 4.85 days vs. 5.9 days St. Petersburg – Bristol (1.984 nm)
3. For Southampton the vessel would consume 146 tons of fuel and 177 tons for Portbury.
4. Using current price of LSFO of approx. 690$ this equals total bunker expenses by 100,740$ for Southampton option and 122,130$ for Portbury.
5. 395 nm will equal 35 tons of fuel
A deep sea carrier with cargo coming from e.g. the United States will have a clear advantage of avoiding Southampton as switch to LSFO from HSFO will not be necessary. Initially this would seem a plausible scenario for how shipping companies would try to negotiate on export/import ports towards the OEM in order to reduce the transport costs. And short sea shipping companies could potentially then be pressured to shift ports accordingly.

Another plausible trend will be that ports favored in South of Europe will experience increased transshipment flows ex Asia such as Port of Barcelona, Marseille and Koper, as well as Turkish ports. This in turn will also give a further boost to land transport onwards to final destination of the volumes.

2.1.4 Consumer’s

Consumers in for example Scandinavian states could experience a further increase of buying cars. The main imports of new cars to Finland is by sea due to geographical restrictions. As OEM’s and LSP’s will strive to cope with the coming cost increases on the transport side, parts of this will inevitably be transferred onto finish consumers.

From an OEM point of view, the Scandinavian countries with low population compared to other European ones, sales potential is considerably less. In that sense OEM’s could possibly down prioritize these markets with their launch of new models, which will affect the consumer.
2.1.5 Land transport

Figure 2.1.6 Car Carrier Truck

(Source: Illustration photo, Auto-Transports Blogspot)

As previously mentioned, land transport, trucks and rail, will potentially get more volumes shifted to land as this option will provide a more cost effective solution. As mentioned in previous chapter, a likely shift for volumes to southern European ports will provide additional land based capacity required.

There will be a risk of congestion on certain trade routes for the trucking services and this in turn would benefit the sea transport side as OEM’s would try to balance their volumes in their logistics chain. The impacts of modal shift will put pressure on shipping companies to further seek alternatives to improve cost efficiency and a further focus on innovation will be necessary to reduce the possible negative impact.

Land transport companies is constantly focusing on innovation and also lobbying towards EU through organizations such as the ECG to promote their industry by challenging restrictions on size and weights allowed for trucks in the various EU member states.
2.1.6 Environment/Socioeconomic effects

The aim with the new Environmental legislation is to increase the health benefits as it will reduce for example asthma symptoms according to the United states Environmental Protection Agency (EPA). EPA further analyzed that the reduction of sulphur emissions from vessels will reduce the number of premature deaths by 79% (EPA, 2012). In terms of money the socioeconomic benefits will as a result provide between 2-6 Billion Euros (SMA, 2009)

Figure 2.1.7 Pollution from Vessel

(Source: Illustration photo, Bellona)

Another effect can be seen in the labor market in Europe as some shifts in employment from the shipping sector to the land transport sector, rail and truck, is expected (EU, 2011). But also the need for investment in innovative solutions will further generate new jobs according to the European Commission report (EU, 2011).
2.2 Analysis of technology

Investment in technology and ship design will be required for the shipping companies to comply with the new SECA regulations. Choosing the right technology will be of crucial importance as the various alternatives could provide competitive advantages towards other shipping lines and it can also provide cost efficiency in the long run to avoid a shift from sea to land.

As part of ECG Module III the long term benefits of innovation was discussed in various groups and the main factors that benefits companies that came out of the discussion was:

1. Competition
2. Cost-competitive
3. Survival

Investment costs will be high and for the companies who have no newbuildings in the pipeline will be too late to have delivery by January 2015, thus the most likely alternatives will be using scrubber technology.

2.2.1 Scrubbers

Scrubber systems can be installed on existing vessels and they remove particulates from the vessel emissions, reducing SOx and NOx. Scrubbers can be categorized as part of a “push innovation”, as the SECA legislation was imposed on the member states, innovators threw themselves on the task and scrubbers is one of the outcomes.
Using the scrubber as an example in the Product life cycle for how this technology would be applied in the coming years. During the introduction phase the technology will be relatively new to the market and thus have a high cost which will be met with suspicion. During the growth phase normally this would be a cause due to a catalyst which in this case will be the introduction of the SECA limits.
During maturity this technology will have lower cost and applied by more companies before it is expected to decline and/or be withdrawn. This is because new technology is expected to appear in the market, or the solution will be more integrated in the new vessels that will be built in the next 10 years or so. In the graph I’ve also added another line which represents the renewal which can represent a new solution for more integration of this technology onto the vessel.

An estimated cost for a scrubber is 5 Million USD alone, and this is excluding dry-docking and installation costs. Scrubbers also is expected to increase the fuel consumption of a vessel by 1-3% (EU, 2011). The scrubber will also create additional various costs such as maintenance and cleaning.

Chapter 2.2.2 LNG

LNG has been a very hot topic in the debate for coping with environmental regulations for a number of reasons. Main advantage is the environmental benefits which can be viewed in table 2.2.5.

Figure 2.2.3 LNG Carrier

(Source: safety4sea)
The current challenge for LNG is the current infrastructure and the need for investments to further develop this in the ports and terminals within the SECA. LNG bunkering option is not available at the moment however several ports such as Rotterdam, Antwerp and Hamburg expect to have this in place within 2 to 3 years, and in the below figure is some of the projects of proposed new LNG distribution terminals (Veritas, 2012).

![Figure 2.2.4 – Proposed new LNG distribution terminals](image)

(Source: Veritas)

The main cost associated with LNG propulsion systems will be the installment of the new system and tanks. The actual cost will vary as it depends on several factors such as vessel size and its total tank capacity. Many shipping lines operating within Europe requires various types of tonnage depending on where they are trading, however a Publication from Det Norske Veritas expect the price will range from 10% to 25% of the total ship costs (Veritas, 2012). So assuming a newbuildings will cost 60 million EUR, the LNG system will equal about 6 MN EUR – 15 MN EUR.
Another factor worth mentioning is that the operating income running on LNG will also be less as the tanks take more space than current propulsion systems so vessels will experience a limited intake pr. voyage.

A paradox will be that if LNG will be chosen for main propulsion by the market, vessels trading into Russia for example will be faced with the paradox that high sulphur fuel is expected to be a surplus demand in Russia so the price will be very cheap.

Figure 2.2.5 SOx emission (Tonnes/year)

(Source: Veritas, 2010)

2.2.3 Cost Evaluation

To compare the various options I've created an example looking on 3 different propulsion options for the shipper:
1. MGO (no investment costs) 
2. LNG 
3. Scrubber

This example is meant to cast a glance of the possible costs related to each option in terms of running cost (fuel) and investment cost.

Bunker price assumption in this case is 960 USD/t for MGO, 690 USD/t for HSFO and 800 USD/t for LNG (full list of assumptions and calculations in Appendix 1). Investment cost for LNG systems is 10 million USD and 5 million USD for scrubber systems.

<table>
<thead>
<tr>
<th></th>
<th>Basic Ship</th>
<th>MGO only</th>
<th>LNG</th>
<th>Scrubber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total acquisition cost (MUSD/Ship)</td>
<td>60 000 000</td>
<td>60 000 000</td>
<td>70 000 000</td>
<td>65 000 000</td>
</tr>
<tr>
<td>Fuel+ Chemical costs</td>
<td>8 280 000</td>
<td>11 520 000</td>
<td>10 080 000</td>
<td>8 299 200</td>
</tr>
<tr>
<td>Capital cost</td>
<td>4 800 000</td>
<td>4 800 000</td>
<td>5,600 000</td>
<td>5 200 000</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td>785 000</td>
</tr>
<tr>
<td>Total cost pr year</td>
<td>13 080 000</td>
<td>16 320 000</td>
<td>15 680 000</td>
<td>14 284 200</td>
</tr>
</tbody>
</table>

(Source: Author, see appendix 1 for breakdown)

In the above calculation I have not made any assumptions on forecasting the various future bunker prices, although a fair assumption will be that the price for MGO will become more expensive in the coming years as it seems to be the favored bunker choice at the moment. This assumption is based on that due to restriction from companies to invest in new technology and with an aging fleet for example the investment costs will not be justified. Instead they can postpone the investment until the technology will lower in price.

From the calculation we can see the immediate winner is scrubber systems. Using scrubber systems an extra cost will incur for disposal of the filtered sulphur. This waste will go in a tank and will be treated with chemicals for then further disposal when vessel is in port. Using scrubbers to filter sulphur in HSFO, there is no need for bunkering with a refined product thus price pr. ton is expected to be cheap (see appendix 1 for assumptions).
Fuel and chemical costs for LNG will be lower than the MGO option, however the investment cost is quite high in comparison which will take longer time before it will be covered. This option will be most likely in the case of future newbuildings as applying such costs on a vessel (life expectancy generally set to 27 years) will not be profitable. LNG however still is viewed upon as the most environmental friendly propulsion type thus this type of technology will not disappear but keep innovating closer to the market requirements.

Also, as mentioned in previous chapter, the market needs to develop LNG infrastructure thus shipping companies will be reluctant to take the risk, bearing in mind the high investment costs, without the proper infrastructure in place.

X. Conclusions

Shipping companies will be facing the biggest challenges as the regulations will have a direct impact on their daily operating costs which will compromise their potential profit margins and survivability. To cope with the new regulations various propulsion options have been evaluated in this thesis and the most attractive choice as of now seems to be the scrubbing systems. Due to relative lower investment cost than LNG propulsion systems it will be more beneficial to invest on this type of technology on existing tonnage as LNG propulsion will be better for a newbuildings project due to higher investment cost. For the latter, the timing of adding LNG technology on vessels will not make sense if the infrastructure in LNG supply is not present in the market. Developments in the crude oil price will also be a factor and could be too uncertain for a company to purely base their decision on one or the other technology.

A further challenge for shipping companies is to maintain volumes on sea with the cost increase as a result from the SECA regulations, and closer cooperation and dialogue with the OEM’s to create visibility of these challenges they face will be very important. New BAF clauses between OEM and LSP will need to be renegotiated for contracts started or existing after 2015 taking the fuel cost hike into consideration. From the OEM side the new cost for transporting cars by sea will be evaluated to an expected lower cost by land and a modal shift is very likely to happen.
Shipping companies could, not only try to cooperate in the new environment with OEM’s, but also seek support from organizations such as the EU and try to promote the environmental friendly steps taken by the company and in return receive incentives and subsidies related to investment in new environmental friendly technology. New projects such as the Motorways of the Sea within the SECA region can also be an option to divert more volume from land to sea, as short sea shipping generally is viewed upon as more environmental friendly than land transport.

LSP’s within the truck and rail industry will most likely gain a competitive advantage over short sea shipping in terms of lower operating costs for certain markets within SECA. Main challenges for the trucking companies will be national legislation on truck size and weight. Congestion will also be of concern, and something that can result in shipping companies attracting more cargo by sea arguably.

Ports, along with the shipping segment, will also need to invest in their current terminals if vessels start utilizing various new technologies, such as sulphur sludge disposal from scrubbing technology and also potentially LNG distribution terminals. Shift to other ports outside SECA will pose a potential threat as trade flows from Asia for example could favor ports in southern Europe.

The main challenge for the Automobile logistics operating within the SECA will be to have a level playing field between the various stakeholders. Finding a balance within operating practices on sea and land will be a challenge for both segments. And the European Union and IMO needs to monitor and accommodate a level playing field with a focus on ensuring fair competition within the new operating environment.

The clear winner of the SECA regulation is neither of the above mentioned stakeholders, but you and me. Environmental policies are vital to reach a greener future for all, and amidst all the various countries and global stakeholders, someone needs to take that first step.

IMO and the SECA areas has taken the first step.
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Appendix 1 Propulsion Comparison Assumptions

Assumptions

Fuel cost
MGO 960 USD
HSFO (scrubber) 690 USD
LNG 800 USD

Investment (in MEUR)
Basic car carrier 60 M/USD
Scrubber 5 M/USD
LNG 10 M/USD
Rotations/year 30
HFO/MGO Consumption/rotation 400
LNG consumption/rotation 420
Interest rate 8%

Other costs
Scrubber maintenance cost/year 35000 EUR/year
Lube oil + chemical cost (scrubbers) 600000 EUR/year
Scrubber sludge disposal 150000 EUR/year
Word of honour statement

I declare that I have written the thesis with the title

SECA IMPACT ON SHORTSEA SHIPPING

on my own. Information from other sources or ideas from other persons are marked.

Oslo, 11.03.2013

__________________________
Torkell Stavdal