Slow Steaming: Economic and Legal Impacts

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CONTENTS

PREFACE ..................................................................................................................................... 5

INTRODUCTION.......................................................................................................................... 7

CHAPTER 1: DEFINITION OF CHARTER ......................................................................................... 9

  CHAPTER 1.1 Types of Charter .................................................................................................. 10

CHAPTER 2: CHARTER PARTIES AS CONTRACT OF CARRIAGE .............................................. 14

  CHAPTER 2.1: Definition of Charter Parties ........................................................................... 17

  CHAPTER 2.2 Types of Charter Parties ................................................................................. 19

CHAPTER 3: THE CASE OF OFF-HIRE ......................................................................................... 22

  CHAPTER 3.1 Deduction from Hire ....................................................................................... 26

CHAPTER 4: SLOW STEAMING ................................................................................................. 29

  Case study ............................................................................................................................ 33

  CHAPTER 4.1 Legal Impacts of Slow Steaming ................................................................. 36

  CHAPTER 4.1.1: BIMCO Slow Steaming Clauses ................................................................. 39

  CHAPTER 4.2 Economic Impacts of Slow Steaming ..................................................... 47

  CHAPTER 4.3 Technical Impacts of Slow Steaming ................................................... 51

  CHAPTER 4.4: Environmental Impacts ............................................................................ 60

CONCLUSIONS ......................................................................................................................... 65

APPENDIX .................................................................................................................................. 70

BIBLIOGRAPHY ......................................................................................................................... 76
TABLE OF FIGURES

Figure 1: Marine Bunker Fuel Spot Prices USD per tonne ............................................ 29
Figure 2: Fuel Consumption by Container Ship Size and Speed ................................. 30
Figure 3: Correlation between container ship speed and engine load (percentage) ...... 55
Figure 4: Correlation between ship speed, required engine power and fuel consumption ........................................................................................................... 56
Figure 5: Annual CO₂ (million MT) emissions from vessels (2010 and 2015 Volume) 65

TABLE OF TABLES

Table 1: Main Advantages of slow steaming as perceived by the respondents 57
Table 2: Fuel Saving achieved using specific solutions (percentages) 57
Table 3: Number of respondents currently considering engine upgrade kits to further increase reliability and savings from slow steaming (percentages). Respondents were able to give more than one answer. 58
Table 4: Assessments of potential reductions of CO₂ emissions from shipping by using known technology and practices. 63
Table 5: CO₂ emissions (Mt) with no lay-up of container ships and when slow steaming is not applied in 2010-2013 66
Table 6: CO₂ emissions (Mt) with 10% lay-up of container ships and when slow steaming is not applied in 2010-2013 67
Table 7: Maximum possible speed reduction when no retrofit measures are taken 67
TABLE OF GRAPHS

Graph 1: Emissions of CO₂ from shipping compared to global total emissions for 2007

........................................................................................................................................ 65
The charter is a necessary act in the shipping industry in order to transfer cargo from one destination to another around the world. The charter is validated by a charter party. The charter parties can be divided into four categories: time charter, voyage charter, bareboat and contract of affreightment. The most common types of charter are the voyage charter and time charter. The differences between these types of charter are related to characteristics and function.

In the second chapter, there is also a division regarding the terms of the charter parties according to English Law. In addition, there are some extra divisions regarding the standard forms of charter parties in each category. For example, in voyage charter two of the most common are GENCON and BALTIMORE- regarding bulk carriers- and ASBATANKVOY in the tanker segment. On the contrary, the most common time charter parties in the bulk carriers segment are NYPE and BALTIME and in the tanker market BPTIME and SHELLTIME.

In the third part of this paper, there is analysis of the case of off-hire, which refers to the time charter. The vessel will be off-hire in the event of delay unless caused by breach of contract on the part of the charterer. There is a distinction between the types of standard off-hire clauses, which can be categorized as ‘period clause’ and ‘net loss of time clause’. Furthermore, there are three cases under which the charterer is entitled to deduct hire: 1) deduction expressly permitted by the charter party; 2) deduction in respect of off-hire events; 3) deduction by way of equitable set-off.

The fourth part of this thesis analyses slow steaming, the phenomenon of a common practice these years due to the increased bunker prices and the global economic crisis. Slow steaming is the practice of cutting the vessel’s speed in order to save fuels.

One of the main purposes of this paper is to provide an analysis of the impacts of slow steaming on economic, environmental, technical and legal fields. In relation to the economic impacts, slow steaming has a significant benefit as it contributes to absorption of excess tonnage and to cutting down on fuel consumption and bunker bills.
Moreover, there are impacts from slow steaming to the cargo owners as the time of transportation will increase due to the reduction in vessel speed.

Regarding the legal impacts of slow steaming, there are BIMCO clauses for both time charter and voyage charter. On the voyage charter there is an extra “Virtual Arrival” which is very important as it concerns port congestion and waiting time.

**KEYWORDS**

Slow steaming, Vessel speed, Fuel cost.
INTRODUCTION

With the term seaborne trade we mean the provision of transport services by sea from one place to another around the world. People, who are involved in the seaborne trade can be ranged in categories according to their activities and their role. Dr Martin Stopford mentions that “the shipping market is a group of people—ship owners, brokers, shipbuilders and bankers—who together carry out the transport of more than 3000 million tons of cargo by sea annually and who may see shipping as much more than just a business”.¹

In addition to this, Dr. Martin Stopford made a fundamental “division regarding the two most important segments in the shipping industry: bulk shipping and liner shipping”. “The bulk shipping industry specializes in the transport of large cargo parcels (iron ore, bauxite). On the other hand, the liner shipping industry specializes in the transport of small cargo parcels (containers). In both, there are different types of ships, capacity and economic policy.”

The shipping industry is highly affected by changes in the global economic and political environment. This has been proved, over the years, by the circularity of the sector. In addition, the regulations, the volatility in financial markets, the global financial crisis, oil prices as well as environmental concerns have added to the challenging business environment and the people who are involved in the shipping industry are tested every day. In such a challenging environment, ship owners need to make a decision on the type of the ship, the type of charter, the capacity and the trade patterns. That is the reason why ship owners need to carefully consider all of the above parameters.

In recent years, the financial crisis has particularly affected the shipping industry—with a notable example the rapidly rising oil prices. As a result, ship owners have serious problems and they have to find ways to deal with the extremely high prices; one of these ways is the slow steaming method.

Nevertheless, it is very important to examine the effects that slow steaming has on the mechanical equipment of the ship and the size of wear that is caused. Besides this, the slow steaming method has legal aspects, as there is a BIMCO clause regarding slow steaming on voyage charter and time charter which have to be taken into consideration.
CHAPTER 1: DEFINITION OF CHARTER

The need for a charter commences from the moment that charterer has the intention to transport a large parcel of cargo to a planned destination, agreed upon with the buyer and at a specific time. As far as the shipping company is concerned, the most important activity is the currency of a charter because it is the source of profit for the shipping company. The aim of the shipping company is the currency of a charter for a long period of time, with freight rates which are close or up to the current rates in the market and these rates are defined by the supply and demand of maritime services. This currency can be validated by the charter party. Charter party is defined as a specific contract by which the owner of a ship lets the whole or principal part to another person for conveyance of goods on a particular voyage to one or more places or until the expiration of a specified time.

It is generally acknowledged that, the ship owners prefer to hire a ship rather than own one because of the risk that they need to assess in relation to financial losses and replacement of the fleet with new and modern ships. More specifically, there is a ship owner with a vessel available for hire and a charterer or shipper who has a volume of cargo to transport from one location to another. Furthermore, there is a broker who acts as intermediary between the ship owner and the charterer and there is a Baltic Exchange where the brokers can meet and ships and cargoes can be “matched up.”

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3 http://scholarship.law.marquette.edu/cgi/viewcontent.cgi?article=2917&context=mulr
CHAPTER 1.1 Types of Charter

The charters can be divided into four categories:

1. **Voyage Charter**: In this type of contract, the ship owner has the obligation to carry a cargo from the loading port to the discharging port for a fee. This fee, called freight, is usually assessed per ton of cargo carried or as a lump sum of the complete voyage. Moreover, the ship owner pays for almost everything (operating costs, voyage costs, capital costs, cargo handling costs) with the exception of the loading and discharging costs, which are covered by both ship owner and the charterer according to the charter party. In cases where the charter party has a F.I.O (Free In and Out) term, the charterer is levied with the loading and discharging costs.

The freight for the safety and delivery of the cargo is paid by the charterers to the owner.

**Operating Costs**: This category includes all the running costs of the vessel. These are:

- Wages
- Sickness Costs
- Transport Costs
- Costs for supplies and provisions, lubricants and spares
- Insurance for Hull and Machinery, War Risk and P&I Club
- Maintenance and Repair Costs
- Administrative Costs

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**Voyage Costs:** This category includes the variable costs regarding the voyage.

These are:

- Bunkers
- Port charges including pilotage, tugs, light dues, canal dues and anchorage dues.

**Capital Costs:** In this category is placed the cost of capital such as loan repayments for acquisition of vessel.

**Cargo Handling Costs:** This category includes the Loading, Discharging, Stowage costs.\(^9\)

Moreover, the charterer will also pay the owner in the event of delays in loading and discharging of the vessel. If these delays exceed the permitted laytime\(^{10}\), the charterer will pay demurrage to the ship owner as set in the charter party. However, if the ship completes its operation on time, which is the laytime, the ship owner will pay despatch to the charterer as set in charter party. The rate of demurrage or despatch will be given in dollars per day, as agreed upon the charter party.

In addition, in case of non-payment of or demurrage to the ship owner there are two “remedies”: the lien on cargo and the lien on sub-freights. A lien is exercised by one party retaining possession of another party’s property pending payment of sums due from that party.

A lien on cargo is a right to detain the cargo pending payment and a lien on sub-freights a right to intercept sub-freights due to the charterer from its sub-charterer.\(^{11}\)

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\(^{10}\) Laytime is defined as the period of time agreed between the parties in a voyage charter for loading or discharging of cargo.

2. **Time Charter:** Time Charter is defined as the type of charter in which the ship owner hires out his vessel to the charterer for a specified period of time, which could be anything from the time taken to complete a single voyage (time charter trip) or for a period of months or years (period time charter).  

More specifically, a time charter trip is similar to a voyage charter as in both cases the vessel carries out a specific voyage, except that in the former, the ship owner will be paid per day of the vessel travelling (hire) instead of freight per ton of cargo as is the case in voyage charter.

Period Time Charter is the typical time charter in which the vessel is chartered for a period of time and travels around a specific geographical area or globally. The period of time could range from a few days to years.

In time charter, the hire payments are made per calendar months in advance. Hire will start to run when the vessel is delivered to charterers and will cease when the vessel is redelivered. The place and the time of these operations are determined by the charterer. However, the payment of hire could be on a lump sum basis. In this type of charter, the ship owner pays for the Operating and Capital Costs of the vessel and the charterer pays for the Voyage Expenses and Cargo Handling Costs for the vessel.

3. **Bareboat Charter:** Technically, bareboat charter is not a contract of carriage but a lease contract as the ship owner hands over the vessel for a very long period of time. Thereby, the charterer has possession not ownership of the vessel as well as management, operation, control, manning, employment, insurance, navigation and maintenance. However, the charterer cannot sell or mortgage the vessel.

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The bareboat charter is suitable for those who want to invest in a vessel without having the responsibility of its commercial and technical operation as well as for those who are experts in ship operation and who do not want the necessary capital cost for the acquisition of the vessel.  

4. **Contract of Affreightment:** Contract of Affreightment is “a shipping contract for the transportation of a certain amount of cargo” of a certain period of time and at nominated ports. This type of contract is a new type of cargo transportation contract in which the cargo quantities are large, homogenous and of specific type. Furthermore, over this period of time a number of shipments and voyages are agreed upon.  

The main interest of this contract is the cargo, which the ship owner is obliged to carry using vessels of his choice. In the event of the ship getting lost, there is no cancellation of the contract but the ship owner has the obligation to replace it in order for the transportation to be continued. The freight is calculated based on the amount of cargo that is carried and is paid in advance or is post-paid, depending on the contract.  

In this type of charter, the ship owner is obliged to pay for Operating costs, Voyage costs, Capital costs and Cargo Handling costs. On the other hand, the charterer may have to pay the loading and discharging costs depending on the terms of Contract of Affreightment and the voyage charter parties.

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CHAPTER 2: CHARTER PARTIES AS CONTRACT OF CARRIAGE

When the contract of carriage is the charter party, its terms set the rights and obligations of the involved parties. The Law that is applied for this agreement is the Law as defined on the charter party. In most cases, the English Law- often called Common Law- is agreed upon and applied and determines the relation between charterer and owner, which is based on jurisprudence. However, the frustration of the charter party caused by delay or impossibility of performance because of an unforeseen event is no fault of either of the involved parties.21

According to the English Common Law, the terms of a charter party are categorized as follows:

Express and Implied Terms

Express terms are terms that have been specifically mentioned and agreed by both parties at the time the contract is made. They can either be oral or written and standard forms of charter parties or rider are agreed on.

However, sometimes a term which has not been mentioned by either party will nonetheless be “included” in the contract, often because without that term the contract does not make any commercial sense. These terms are called implied terms, they concern matters of high importance and this is the reason why the breach of these terms brings about important sanctions.22

22 http://www.tutor2u.net/law/notes/contract-express-implied-terms.html
At this point, we have to note that express term supersedes an implied term because the former is considered to express the intentions of involved parties. The most important implied terms of English Law are the terms regarding seaworthiness, due dispatch and proper route. 23

**Representations**

The terms which concern the presentations that take place during the negotiations and the promises that involved parties give, are called representations. In the event of misrepresentation the intention or not of the involved party must be examined. If the misrepresentation is made intentionally and as a result the other party was influenced to sign the charter party, the latter has the right to repudiate the charter party.

Otherwise, the involved party, who gave these particulars, has the obligation to indemnify the other party, unless he proves that he had reasons to believe until the moment that the charter party signed, that the particulars that he gave were true.

Representations could be the particulars of ship (name, year of built) that are described by owner and the particulars of cargo (weight, type) that are described by charterer. 24

**Conditions**

In the event of the one involved party breaching the terms, conditions are the terms which give the right to the other party to be released from performance of his further obligation under the contract, claiming damages for any loss he has suffered. Moreover, the innocent party can, if he prefers, to maintain the contract in existence and content himself with proceeding for damages in respect of loss. 25 Examples of conditions are geographical area of the ship at the time of signing of the charter party, nationality of the ship, class status from the classification society and expected date when the ship is ready for loading. 26

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26 Personal notes from University of the Aegean, Chios, on Marine Insurance.
Warranties

Warranties are the terms, whose breach from one of the involved party doesn’t give the right to the other party to be released from his further obligations, but gives only the right to sue for damages. Examples of warranties are fuel, redelivery and speed of the ship.

Innominate terms

Innominate or Intermediate Terms refers to terms which can be broken with serious consequences, in which case the term will act as a condition or it can be broken with minus consequences, in which case the term will act as a warranty.

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28 Personal notes from the University of the Aegean, Department of Shipping, Trade and Transport, in the course Marine Insurance.
29 [http://www.lawmentor.co.uk/glossary/I/innominate-term/](http://www.lawmentor.co.uk/glossary/I/innominate-term/)
CHAPTER 2.1: Definition of Charter Parties

According to Dr Martin Stopford, charter party is a contract setting out the terms on which the shipper contracts for the transportation of his cargo or the charterer contracts for the hire of a ship.\(^{30}\) The terms of a charter party are negotiable and are defined by supply and demand.\(^{31}\) Moreover, according to S.Zarkos, the word charter party comes from the Medieval Latin word “carta partita”, which means a divided document into two, whereby the same data is written in both and is carried by the two involved parties.\(^{32}\)

Since the end of 19th century, it has been common practice for the involved parties to choose standard forms of charter parties as the basis of their agreements.

In these forms, additional clauses (riders) were attached to cover the requirements of each charter and modify or delete the terms of standard form of charter party in order for the initial and additional terms to be the same.\(^{33}\)

The aim of the standard forms of charter parties is to standardize a number of clauses which are used in different types of trades. Thereby, involved parties have the obligation to complete some data in charter party (e.g ports, cargo, freight) and not create a charter party from the beginning, which will be time-consuming.\(^{34}\)

Therefore, the standard forms of charter parties are very important because they save time during the stage of the negotiations, as the main terms are already known and the involved parties only need to focus on key points such as setting the freight and demurrage. In this way the possibility of an onerous term being accepted because of unawareness or misunderstanding is limited.

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\(^{30}\) Martin Stopford, Maritime Economics, (1996), pg 22.
\(^{32}\) Zarkos S., Shipping Practice and the Related Law, (Ναυτιλιακή Πρακτική και Σχετικόν Δίκαιον) (1973), pg 76.
Furthermore, due to the wide international use of standard forms of charter parties, uniformity in the implementation of the law and his interpretation from the court applies. Most of the standard forms of charter parties have been executed by international committees which represent both the interests of the ship owner and the charterer.³⁵

CHAPTER 2.2 Types of Charter Parties

Under a voyage charter, a ship owner undertakes to carry specified goods on one or several voyages and the charterer is obliged to pay the freight, which is calculated according to the quantity of cargo. Some of the oldest standard forms of voyage charter party, such as the Baltic and International Maritime Conference Uniform General Charter (the GENCON), the Baltimore Berth Grain Charter Party (the BALTIMORE FORM C), the Chamber of Shipping River Plate Charter Party (the CENTROCON) and the Americanised Welsh Coal Charter Party (the AMWELSH) are still in use.36

- **The Americanized Welsh Coal Charter (the AMWELSH)** is the oldest of the above mentioned charter parties and was adopted in 1953 by the Chamber of Shipping Welsh Coal Charter of 1896. More specifically, the AMWELSH 93 is used for the shipment of coals from U.S ports to all destination ports and most commonly for the shipment of petroleum coke from the U.S Gulf and Western ports to worldwide destination ports. Moreover, the AMWELSH 93 is approved by BIMCO and ASBA.

- **The Chamber of Shipping River Plate Charter Party (the CENTROCON)** was adopted in 1914 and amended in 1950 and 1974. More specifically, the CENTROCON 1914 is approved by the Chamber of Shipping of the United Kingdom and is used for shipments of grain from the River Plate to all parts of world.37

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The Baltimore Berth Grain Charter Party (the BALTIMORE FORM C) was designated for the shipment of grain from North American ports to Europe and was adopted in 1913.38

The Baltic and International Maritime Conference Uniform General Charter (the GENCON) is a commonly used form for the general purpose of a voyage charter party. It was first revised in 1922 and then in 1976.39

So far as tanker voyage charter parties are concerned, the oldest standard form is the ASBATANK VOY charter party (former EXXONVOY 69) which was adopted in 1942 and revised in 1950. Furthermore, other forms of standard forms of voyage charter parties which are used by the major oil companies and others in oil trade are the SHELL VOY3, BP VOY, INTERTANKO VOY 1971.40

The standard forms of time charter parties are the following:

- **BALTIME**, which was originally issued in 1909 and amended in 1911, 1912, 1920, 1939 and 1950. It is a general purpose time charter party which is regarded as “owner’s charter party” and is produced by BIMCO.41
- **LINERTIME**, which was issued in 1968, is used for “chartering-in” liner tonnage and is produced by BIMCO. **42**
- **NEW YORK PRODUCE EXCHANGE (NYPE)** which was published for the first time in 1913, amended in 1921, 1931, 1946 and its revision was in 1993, approved by ASBA. It is another general purpose form and it is regarded as “charterer’s charter party”.43

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38 http://www.unzco.com/forms/ocean.htm#Maritime
In the tanker market, the major oil-trading companies have designed their charter parties in the following manner:

- **BPTIME,**
- **SHELLTIME,**
- **MOBILTIME**
- **INTERTANKTIME,** which is created by INTERTANKO\(^{44}\).

INTERTANKO is a forum where the industry meets, policies are discussed and statements are created. It is a valuable source of first-hand information, opinions and guidance which stand for safe transport, cleaner seas and free competition.\(^{45}\)


\(^{45}\) [https://www.intertanko.com/About-Us/](https://www.intertanko.com/About-Us/)
CHAPTER 3: THE CASE OF OFF-HIRE

In time charter parties, the charterers’ primary obligation is to pay hire continuously throughout the charter period.46 “A charter party might provide that the vessel would remain on hire except during delay caused by a breach of contract on the part of the owner. Otherwise, it might provide that the vessel should be off-hire in the event of delay unless caused by breach of contract on the part of the charterer”.47 There are various off-hire clauses in many different types of charter parties, with the outcome of a case depending on the exact words of the particular clause and the amendments that this clause has undergone. Furthermore, these clauses may have different events and periods by which the charterers’ hire ceases to be paid. “A charter party may have mini off-hire clauses such as speed deficiency, which can cause inconsistencies and contradictions if these have no reference in the main off-hire clauses”.48

The charterer has the right to place the vessel off-hire when the ship for any reason is not ready to render its services to charterers and the charterers don’t pay the hire due to the fact that time was lost.

However, the off-hire clause operates on certain specified events, independently of any breach of contract by the owners or the charterers.49 Standard forms of time charter parties usually provide for either the hire to cease completely or for the pro rata to be reduced to the degree of inefficiency in certain specified events.50 Thus, it is for the charterers to establish facts that come within the terms of that clause in order to be excluded from paying the hire.51 On the other hand, the operation of that clause is unaffected by exceptions or force majeure clauses in the charter party.52

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There is authority for suggesting that the clause will not operate where the specified event results from a breach of contract by the charterer; in such an event, even if the vessel did go off-hire, the owner could probably include the loss of hire in his claim for damages for breach.

As an example of the most commonly used NYPE 97 form, Clause 15- which regards off-hire events- states the following:

“That in the event of the loss of time from deficiency of men or stores, fire, breakdown or damages to hull, machinery or equipment, grounding, detention by average accidents to ship or cargo, dry docking for the purpose of examination or painting bottom, or by any other cause preventing the full working of the vessel, the payment of hire shall cease for the time thereby lost; and if upon the voyage the speed be reduced by defect in or breakdown of any part of her hull, machinery or equipment, the time so lost, and the cost of any extra fuel consumed in consequence thereof, and all extra expenses shall be deducted from the hire.”

The types of standard off-hire clauses can be categorized as ‘period clause’ and ‘net loss of time clause’. The ‘period clause, which creates a link between the specified events that trigger suspension of hire and the start and end of that period.

Thus, while this clause can be activated with any of the specified events, it would cease when the vessel is restored to a fully efficient state and able to provide the service immediately required of it.

However, “the restoration of partial efficiency of the vessel is generally insufficient to satisfy this requirement”. In addition, “this clause is difficult in application as the occurrence of the specified events is readily ascertainable”.

However, under the above clause, if damage prevents the working of the vessel for more than twenty-four hours, the hire ceases from the beginning of the period and not from the end of the twenty-four hours.

On the contrary, the intention of ‘net loss of time clause’ is to allow to charterers the net overall time lost because of the occurrence of one of the specified events. Furthermore, it provides that hire is not payable for the time lost on the occurrence of one of the specified events but only if the time is lost as a result. Lord Denning pointed out that “in the event of a breakdown of one of the cranes, the hire will not cease in case that the remaining cranes were able to do and did the work required and no time was lost”.

In addition, a comparison of the ‘net loss of time’ and ‘period’ clauses would be useful in order to better understand these clauses. We have a vessel which has a breakdown and is towed to discharge the cargo. The planned voyage is to sail from A on 01.01.12 and discharge to C on 11.01.12 and as a result the voyage calculated as 10 days. The actual voyage that the vessel did due to the breakdown was the below:

The vessel sailed from A on 01.01.12, after 3 days it arrived at B on 08.01.12, where it was towed and finally arrived at C after 8 days to discharge on 16.01.12.

‘Period off-hire’ is the actual time taken to perform tow from B to C, which is 8 days.

‘Net loss of time’ is the actual time from A to C (15 days), minus the time that it would have taken (ie.10 days) if there had been no breakdown, which was 5 days.

It would be essential to mention that in many off-hire cases the clauses are activated after a period of twenty-four to forty-eight hours has elapsed from the occurrence of the specified event. Once the clause operates, all time lost will count, including the twenty-four to forty-eight hours.

63 Texacotime 2, Clause 9, provides that ‘hire shall cease to be due or payable from the commencement of such loss of time’, J.F Wilson, Carriage of Goods by Sea, (1993), Second Edition, pg 107.
The charterer should fulfil all the obligations that he has under the charter during the off-hire period; for example, to pay for all bunkers\(^6^4\) or payment of crew for the overtime or other port services, unless the event that put the vessel off-hire was itself caused by the ship owner’s breach of contract.\(^6^5\)

‘The off-hire clause does not necessarily exhaust the charterer’s remedies regarding the events which operate the clause’.\(^6^6\) Should the off-hire event constitute a breach of contract by the owner, or some act or neglect not covered by the exceptions, the charterers may be entitled to have a claim for damages in addition to their right to suspend payment of hire.\(^6^7\)

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\(^6^4\) *Arild v. Hovrani* [1923] 2 K.B. 141.
CHAPTER 3.1 Deduction from Hire

It will be of vital importance to the charterer to be able to deduct claims from the hire rather than to have to pay the hire in full and seek to recover its claims from the owner. A charterer may be entitled to an overall adjustment of hire for a variety of reasons including: inter alia\(^68\) advances for disbursement made on the ship owner’s behalf under Lines 65, 66 of the NYPE 46 form, which state that it “shall be deducted from hire”\(^69\), allowances for speed deficiency or other failure of the vessel to meet charter specifications; or compensation for damage to cargo.\(^70\)

It is not stated so clearly that a deduction is permitted for off-hire period with respect to off-hire claims under Lines 97, 99 of Clause 15 of the NYPE 46 form, which states that “the payment of hire shall cease for the time thereby lost”.

However, it is a commonly accepted practice that a hire paid for a past period of off-hire be deducted from the next monthly hire payment.\(^71\)

In addition, the Baltim Clause 11 (A) states that “no hire (is) to be paid with respect to any time lost thereby lost...any hire paid in advance (is) to be adjusted accordingly”, by which off-hire could be deducted from a subsequent hire payment.\(^72\) Moreover, the cost of fuel used for domestic consumption may also be deducted from hire.\(^73\)

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\(^{68}\) Inter alia is a latin word for among other things.
\(^{71}\) The Lutetian [1982] 2 Lloyd’s Rep. 140, pg 149.
The charterer can make deduction from hire in three events:

1. **Deductions expressly permitted by the charter party**

   As mentioned above, the charterers may make deductions from hire if these are expressly permitted by the charter party. For example, under Lines 99 to 101 of the NYPE 46 form, the charterers are entitled to deduct hire in respect of time lost, fuel consumed and expenses incurred as a result of a reduction in speed caused by a defect in a breakdown of the ship’s hull, machinery or equipment.\(^74\)

2. **Deductions in respect of off-hire events**

   In some charters there are express provisions that allow charterers to make deductions from future payments of hire, for disbursements made on the owner’s behalf or for periods of off-hire.\(^75\) In the event of a disputed claim\(^76\), some charters do not allow deductions, while some others suspend the obligation to pay instalments of hire which fall due at a time, when the vessel is off-hire.\(^77\) However, since hire is payable in advance, it has been accepted that advance hire (which is) overpaid in respect of an off-hire period may be deducted from a subsequent hire payment.\(^78\)

3. **Deductions by way of equitable set-off**

   A right of set-off arises when a claimant’s claim for payment in respect of services rendered and a defendant’s cross-claim for defective performance of those services are so closely linked that the defendant is deprived of the benefit of the contract. Thus, the charterer may deduct from hire for a claim for damages in respect of a period during which the owners have, in breach of charter, deprived the charterers of the use of the ship in whole or in part.\(^79\)

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\(^74\) Judgment of Donaldson J., in *Seven Seas v. Atlantic* [1975] 2 Lloyd’s Rep. 188.

\(^75\) For example Shelltime 4, clause 9; Texacotime 2, Clause 7; Intertanktime 80, Clause 3.

\(^76\) Fonashatime, Clause 16.


"... it is not every cross-claim which can be deducted. It is only cross-claims that arise out of the same transaction or are closely connected with it. And it is only cross-claims which go directly to impeach the plaintiff's demands, that is, so closely connected with his demands that it would be manifestly unjust to allow him to enforce payment without taking into account the cross-claim ..." 80

It is not yet exactly clear which types of claim fall within this concept, but breach of the charter speed warranty has been considered as this, 81 because there was a failure in loading a full cargo by the owners 82 and such claims in respect of damage to cargo may not be deducted. 83

80 The Nanfri [1978] 2 Lloyd’s Rep. 132 at 140
CHAPTER 4: SLOW STEAMING

The recession began in 2008 and had a significant impact on the shipping industry. However, apart from that, the shipping industry has had to cope with the global financial crisis in 2009, the slump in demand, freight rates and rates for chartering the giant bulk carriers. Moreover, the oversupply of ships, which was a legacy from the boom times\textsuperscript{84}, the price war among the operators of container lines and the high bunker prices are additional problems the industry has had to deal with.

Figure 1: Marine Bunker Fuel Spot Prices USD per tonne

![Figure 1: Marine Bunker Fuel Spot Prices USD per tonne](http://www.cee.ntu.edu.sg/NewsnEvents/EPres/Documents/Sem30Sep14/Slowsteaming%20-%20NTU%202014.pdf)

More specifically, a recent report from Clarkson Research Services underlines that the price of a five year old Capesize (type of a bulk carrier vessel with capacity more than 80,000 dwt) has dropped by about 80% and the price for large oil tankers by more than 60%.

\textsuperscript{84} Boom times are the period in which the shipping market flourished.
The container shipping companies are facing serious problems as well, since their profits from $7 billion in 2010 turned to losses of about $5 billion one year later. All of the above put the involved parties—ship managers, ship owners, brokers, charterers—under a lot of pressure and the result became noticeable by cancellation of already booked orders, delaying of new building vessels and laying up of vessels.85

The solution to the high cost of fuel and carbon emissions has been the adoption of “slow steaming”, which means a reduction of speed from 20 knots to 17 knots.86

**Figure 2: Fuel Consumption by Container Ship Size and Speed**

![Graph showing fuel consumption by container ship size and speed](image)


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Slow steaming is not a new phenomenon; it was used for the first time in 1970 during the first oil crisis as a measure to reduce fuel costs. Maersk Line was the first container liner that introduced the practice in 2009-2010, won an award in 2009 and was named as Sustainable Shipping Operator of The Year for challenging the shipping industry and bringing about significant reductions in energy consumption and emissions.\(^87\)

The larger container ship “Emma Maersk” can save 4000 metric tons of fuel oil on a Europe-Singapore voyage by Slow Steaming and at a typical $600-700 per tonne, with this figure amounting to $2.4-2.8 million in fuel savings on a typical one way voyage. Maersk’s Tripple E Class of ships was designated for slow steaming, with special designated hulls for lower speeds and actually has less powerful engines than its predecessors.\(^88\)

Since 2008, this practice has been further extended more broadly, and not only to container shipping, and has brought widespread benefits to shipping companies. These benefits have resulted from lower fuel consumption and higher freight rates due to better balance between supply and demand. Moreover, another major reason that this method is accepted is because fuel usage costs constitute approximately 50% to 70% of a ship’s total operating expense and with variable fuel prices representing an unpredictable expenditure to maritime companies.\(^89\) However, despite the now widespread use of slow steaming, it is a controversial issue as it is uncertain whether slow steaming is used solely during these adverse economic conditions or whether it constitutes a general strategy to save costs.

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87 http://www.between-us.com/388/maersk-line-wins-award-for-super.htm
89 http://www2.emersonprocess.com/siteadmincenter/PM%20Micro%20Motion%20Documents/MFM-BRO-MC-001406.pdf
“In today’s market, it is very important that we ship owners utilize our existing fleet in the best possible way from an energy and environmental perspective and carefully investigate the potential for improvement, both technological and operational”, says Erik Hånell, President & CEO of Stena Bulk.  

However, there are several levels of slow steaming which are categorized as follows:

1) **“Slow steaming”** for reductions of about 15% regarding to the normal operating speed.
2) **“Extra slow steaming”** for reductions of about 25% regarding to the normal operating speed.
3) **“Super slow steaming”** for even higher reductions in operating speed.  

For example, Running a 10,000 TEU containership at 18-20 knots instead of the optimal cruising speed of 20-25 knots, can deliver daily savings of 175 tonnes of bunkers. Moreover, super-slow steaming at 15-18 knots improves the picture even further, saving an additional 100 tonnes per day.  

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91 Information from the Shipping Company that I had my summer internship in.

92 M.Wackett, Drewry warns of more slow steaming and void sailings as carriers absorb capacity, (2014), on [www.loadstar.co.uk](http://www.loadstar.co.uk)
Case study

Between October 2006 and December 2007 the owners, Bulk Shipping Union S.A, had chartered their vessel “Pearl Sea” bulk carrier to the charterers, “Clipper Bulk Shipping Ltd, under the terms of an amended NYPE time charter for 9 to 12 months for a series of voyages. The owners claimed $624,276.77 in respect of the unpaid hire due. In response, the charterers claimed to be entitled to withhold hire for underperformance contending the below according to law firm Stone Chambers, which wrote an analysis of the decision:

a) The vessel had failed to proceed with utmost dispatch in breach of clause 8.

b) The charterers were entitled to deduct for time lost due to slow steaming under the first part of the Off-hire Clause, Clause 15 93, which was amended from the standard Off-Hire Clause.

The charterers and the owners fell into dispute and this dispute, in accordance with the charter party, was referred to the Arbitration in London. The Arbitrators held that the charterers are entitled to withhold $118,974.69 by reason of slow steaming of the vessel, both by reason of the failure to proceed with utmost dispatch and the fact that it fell within the first part of Clause 15. Moreover, the charterers was obliged to pay to the owners $505,302.08 of the withheld funds.

In order to assess if the vessel had proceeded with due dispatch obligation under Clause 8 and if there had been a net loss of time under Clause 15, the Tribunal made a comparison between the vessel’s actual speed and the warranted speed. Therefore, Tribunal held that there had been a breach of Clause 8 and a net loss of time under Clause 15.

93 ...that in the event of the loss of time from deficiency, sickness, strike, accident or default of Master Officers or crew, or deficiency of men or stores, fire, breakdown or damages to hull, machinery or equipment, grounding, detention by average accidents to ship or cargo, dry docking for the purpose of examination or painting the bottom, or by any other cause preventing the full use of the vessel to the Charterers, the payment of hire shall cease for the time thereby lost...
In addition, the Arbitrators found that there were three possible reasons why the vessel had not reached the warranted speed. It might have been due to mechanical or technical problems; due to meteorological or oceanographic phenomenon and due to crew’s failure to prosecute with utmost dispatch.

The Arbitrators rejected the first two and Popplewell underlined that the arbitrators found that:

...the rpm at which the vessel’s engine had been set was less than that at which the engine was capable, during the three relevant voyages, and that was what caused the vessel to fail to achieve the speed set out in the performance warranty, a speed of which the vessel was capable throughout the period of service, including the three voyages in question.

Regarding the net loss of time under Clause 15, the owners argued that slow steaming could not fall within the first part of Clause 15 because reduction in speed was exclusively referred to in the second part of the clause. Thus, the second part of the clause is “the only part governing any claims in respect of reduction in speed” and this was not the case, because Tribunal did not find any defect in or breakdown of the vessel’s hull, machinery or equipment. Popplewell J described the first part of clause 15 as a "net loss of time clause, and is apposite to extend to periods of partial interruption of the service in the sense of events interfering with the full working of the vessel sufficient to delay the service". 94

The owners appealed to the High Court and argued that the Arbitrators had been in error by converting a performance warranty (in Clause 29)95 into a continuous warranty. Popplewell J interpreted the words "during period of suspended hire" in clause 15 as referring to the "period of time lost by reason of the delay in the performance of the service" and accordingly he found no error in the decision of the Tribunal in this respect96 which had reached the conclusion:

95 The Clause 29 of the charter party contained a speed warranty about 13 knots (in ballast and laden) which applied only to the delivery of the vessel. Furthermore, the voyages had to be performed with “utmost dispatch”.
...not only on the basis of a failure to reach the warranted speed on each of the three voyages, but also on the basis that, on the evidence before it in relation to this vessel and the conditions which this vessel encountered, there was no other realistic explanation for a vessel which was capable of achieving the warranted speed at the moment she was delivered into the charter party failing to achieve that speed on the subsequent voyages. This is a legitimate process of reasoning and one which involves no error of law.

As a result of the slow steaming method, BIMCO has developed standard form slow steaming clauses for time charter parties and voyage charter parties. Both clauses provide owners with an express recognition that slow steaming in accordance with orders (if these are given by charterers or owners) will not lead to a breach of the utmost dispatch obligation. Furthermore, these clauses provide owners with a charterer’s obligation to ensure that the terms of Bill of Lading allow the slow steaming and that charterers will indemnify owners for liabilities, that may be arise from claims, for breach of the obligation to proceed with utmost dispatch.
CHAPTER 4.1 Legal Impacts of Slow Steaming

Slow steaming has been a common practice since 2008 as a result of reduced freight and increased bunker prices. Apart from the technical and economic impacts of this practice that are discussed in previous chapters, there are considerable legal issues with regard to slow steaming. Most notably these issues are related to the implied charter party obligation of due despatch and deviation for delay under bills of lading. However, there is an obvious conflict between an obligation to slow steam and an obligation to proceed with utmost despatch under the Bill of Lading. Utmost despatch means the most direct route at the fastest speed.

More specifically, under a voyage charter party, Common law implies an obligation to proceed with reasonable dispatch in the absence of an express provision to the contrary, and a breach of this obligation will entitle the charterer to claim damages caused thereby.97 Thus, the general rule is that the ship owner bears the risk of such delay, unless covered by an exception clause.98

“Additionally, it must be highlighted that delay occurring when performing the approach or the carrying voyage can amount to a deviation”... (If this deviation is) great and intentionally committed, particularly if a specific route has been agreed by the parties... (then it is unjustified).”

However, deviation is justified under Common Law for saving life at sea or communicating with a ship in distress, as the distress may involve danger to life.99 The Hague-Visby Rules extend this to somewhat to allow deviation to save life or property at sea.

Some deviations that are almost certain to be considered as unjustified are the following:

- A vessel calling at a port or place for the purposes of major repairs, dry-docking or major surveys which are not necessary for the contracted voyage.

- A vessel slow steams or stops short of the contracted place of discharge in order to exercise a lien on cargo and the contract of carriage does not contain an express liberty clause permitting it to do so.

- A vessel departs either geographically or otherwise from the contracted voyage such that there is a greater advantage to owners and a correspondingly greater disadvantage or risk to others.

- Slow steaming, eco-steaming etc. in order to conserve fuel (where the contract of carriage does not contain an express liberty clause permitting it to do so).

If the ship makes an unreasonable/unjustified deviation, the ability to rely on exclusions and exceptions as set out, for example in Hague-Visby Rules and as a result the benefit of the P&I cover for any liabilities that arise from the deviation may be lost. A deviation can therefore incur significant liabilities both under the charter party and the bills of lading.

Many charter parties include certain liberty clauses but they tend to be limited in scope. Some liberty clauses (such as GENCON) allow bunkering but others expressly exclude bunkering from the liberty to deviate (such as Shellvoy6). Liberty clauses should be treated with caution. Liberty clauses are usually held to be construed and read in such a way that any ambiguity will be construed against the party seeking to avail himself of the clause i.e. the owners. Even a wide liberty clause has been held to be a liberty only to proceed and stay at ports which are in the course of the voyage in a business sense.

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100 [http://www.skuld.com/topics/legal/pi/deviation--justified-or-allowed-and-implications-for-the-pi-cover--slow-steaming/](http://www.skuld.com/topics/legal/pi/deviation--justified-or-allowed-and-implications-for-the-pi-cover--slow-steaming/)

On the other hand, under a time charter party, the charterers may give the owners instructions to slow steam. The main legal issues related to slow steaming in this case relate to the ship owners’ obligations to follow the charterers’ slow steaming instructions, whilst at the same time ensuring the safety of the vessel, crew and cargo and also taking into account their obligations towards third parties, such as bill of lading holders.

In addition, the ship owner is deemed to be under an implied obligation to proceed with “utmost dispatch”\(^ {102}\). Breach of this obligation will entitle the charterer to claim damages\(^ {103}\) although the ship owner can be exempted if he is able to show that the delay was caused by an event covered by an exception clause.\(^ {104}\) Furthermore, the owner of the vessel warrants that his ship is capable of performing at “about” a certain speed in good weather and on specified fuel consumption.\(^ {105}\) Moreover, slow steaming could be related at some point to underperformance\(^ {106}\) or with over-consumption.\(^ {107}\)

From a legal aspect, slow steaming is in fact a deviation. This means that if an owner wishes to slow steam his vessel, he should make sure that charterers and bill of lading holders are made aware of this.

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106 Underperformance is the condition in which the vessel doesn’t comply with the agreed speed upon the charter party. In this case, the charterer is entitled to claim for underperformance.
107 Overconsumption is the condition in which the vessel consumes higher levels of fuels than the agreed upon the charter party.
CHAPTER 4.1.1: BIMCO Slow Steaming Clauses

BIMCO seeks to respond to an increased demand by many owners and operators in the industry, who faced with ever higher bunker prices in an already depressed market, need urgently to implement measures to save fuel and thus reduce costs. This was the reason why, BIMCO initiated a project to develop slow steaming clauses for use both for voyage and time charter parties in January 2010.

According to BIMCO, the purpose of this project has been to develop a suitable charter party provision that deals with the technical and legal aspects of a slow steaming regime. Quoting BIMCO’s words, the Slow Steaming Clause is aimed at “striking a fair balance between the charterers wish to control the speed of the vessel by giving express instructions and the owners’ concerns about the consequences of complying with such instructions”.108

A version for voyage charter parties has now been developed and was adopted by BIMCO in April 2012.109 A clause for time charter parties was adopted by BIMCO’s Documentary Committee and published by Special Circular on 7 December 2011. With these slow steaming clauses throughout 2011 and 2014, has solved a series of legal problems in relation to slow steaming, but leading shipping attorneys warn that the clauses do not mean a "card blanche"110 for slow speed sailing.

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108 https://www.bimco.org/~/media/Chartering/Special_Circulars/SC2011_07.ashx
109 https://www.bimco.org/~/media/Chartering/Special_Circulars/SC2012_05.ashx
110 Permission to do something in a way you choose to do it.
BIMCO SLOW STEAMING CLAUSES FOR VOYAGE CHARTER PARTIES

Under a voyage charter party, the legal aspects of slow steaming relate primarily to the owners’ entitlement to order the vessel to slow steam and the charterers have no entitlement. Furthermore, it is related to the owner’s obligation towards third parties such as holders of Bill of Lading, while taking into account the safety of the vessel, crew and cargo. BIMCO published the clause which was designed to apply to voyage charters in July 2012 and is applicable in the liner, tanker and dry bulk trades.

According to the terms of voyage charter party, only the owners can order the vessel to slow steam and this is clarified also in the Clause. However, the Clause does not provide the owners with a “carte blanche” to slow steam their vessel. The vessel’s speed can be reduced within the prescribed limits indicated in sub-clause (a) as a minimum speed. The minimum speed should be agreed by the owners and the charterers at the time of concluding the charter party.

Due to the fact that under the voyage charter party, the owners are responsible for providing and paying for the bunkers, the Clause does not provide for claims by the charterers against the owners that the vessel’s speed has not been adjusted to best minimize fuel consumption.

Finally, the sub-clause (d) is designated to avoid arguments regarding the fact that the vessel cannot proceed at speed below the minimum speed stated in sub-clause (a).

The Slow Steaming Clause for Voyage Charter Parties is a simple mechanism by which an owner can reduce fuel consumption on a voyage, without being in breach of due despatch obligations. In contrast, the Virtual Arrival Clause for Voyage Charter Parties provides the charterers with a mechanism to request an adjustment of the vessel’s speed so that it arrives at a particular destination at a predetermined time.

The contractually agreement to adjust vessel’s speed in order to meet a specified time of arrival can bring economic benefits to the parties.

111https://www.bimco.org/Chartering/Clauses_and_Documents/Clauses/Slow_Steaming_Clause_for_Voyage_CP.asp
Virtual arrival permits the adjustment of speed en route that absorbs additional waiting time instead of proceeding full speed to a discharge port and waiting to an anchor for an available berth. This means less emissions and savings in fuel costs for the owners and less demurrage costs for the charterers. It is also a means by which port congestion can be effectively managed as with the Virtual Arrival Scheme currently operated by the port of Newcastle in New South Wales, Australia.\textsuperscript{112}

The purpose of the clause is that the commercial benefits that accrue from the mutually agreed virtual arrival are shared between the owner and the charterer through reduced fuel consumption (and consequently emissions) and less waiting time at ports (demurrage bills).\textsuperscript{113} Like the slow steaming clauses, any reduction in the vessel’s speed, with charterers’ agreement, should not be considered a breach of owners’ due dispatch obligations\textsuperscript{114} and should therefore not cause an unjustified deviation. However, unlike slow steaming, Virtual Arrival needs to be embraced by all stakeholders concerned with the voyage, such as shippers, receivers, port authorities and terminal operators, in order to be successful.

More specifically, the “Virtual Arrival Clause” permits charterers to request the owners to adjust the speed of the vessel under a voyage charter to arrive at a loading or discharging port at an agreed date and time.\textsuperscript{115} In other words, the clause is designed to assist ship owners, charterers and ports to come to a logical agreement regarding sailing speed and arrival time to avoid port congestion.

\textsuperscript{112} https://www.bimco.org/~media/Chartering/Special_Circulars/SC2013_09.ashx
\textsuperscript{113} https://www.bimco.org/news/2013/10/04_virtual_arrival_clause.aspx
\textsuperscript{114} https://www.bimco.org/news/2013/10/04_virtual_arrival_clause.aspx
\textsuperscript{115} https://www.bimco.org/news/2013/10/04_virtual_arrival_clause.aspx
The procedure of “Virtual Arrival” is the following.\textsuperscript{116}

\begin{itemize}
\item[a)] The charterer identifies the delay at the discharge port
\item[b)] The cargo receiver or charterer may then suggest to undertake virtual arrival
\item[c)] A weather analysis provider acceptable to all parties is engaged to do the calculation
\item[d)] All parties agree
\item[e)] The master slows down the vessel
\item[f)] Once the voyage is completed, savings are calculated.
\end{itemize}

The Virtual Arrival Clause gives the charterers the right to request an adjustment of the vessel’s speed contrary to the normal position under a voyage charter party, but the owners can refuse such instructions on reasonable grounds, for example if the speed adjustment would compromise the safety of the crew and the vessel.\textsuperscript{117}

In addition, as it is stated in sub-clause (b), any additional time used on the sea voyage is compensated to the owners at a percentage of demurrage rates. If the parties cannot agree a rate to apply, then a rate of fifty per cent (50\%) of the demurrage rate will take effect. The discount should reflect the owners’ savings in bunker costs that will accrue from sailing at a reduced speed. The amount of extra time used on the sea voyage should be agreed by the parties. If the parties cannot agree an independent third party (“Expert”) should be appointed to calculate the amount of extra time.

In order to avoid the owners being in breach of their obligation to proceed with due despatch under the charter party and other contracts of carriage, the Sub-clause (c) clarifies that the exercise to reduce speed in accordance with the Clause will not constitute a breach of such obligations. The master should exercise due diligence in order to comply with the charterers’ instructions.

\textsuperscript{116} \url{http://www.maritimecenter.dk/public/dokumenter/EMUC/Konferencer/2014/Blue%20Business/Christos%20Kontovas.pdf}

\textsuperscript{117} \url{https://www.bimco.org/-/media/Chartering/Special_Circulars/SC2013_09.ashx}
In the end, sub-clause (d) aims to protect the owners from claims by third parties such as bills of lading holders arising out of delays. The charterers are required to ensure that bills of lading and other cargo documents issued by the owners provide that compliance with the Clause will not constitute a breach of contracts of carriage with third parties. Finally, the charterers undertake to indemnify the owners against liabilities that may arise under contracts of carriage with third parties.

**BIMCO SLOW STEAMING CLAUSE FOR TIME CHARTER PARTIES**

Under a time charter party, legal aspects of slow steaming relate to the owners’ obligations to follow the charterers slow steaming instructions while taking into account the safety of the vessel, crew cargo and obligations to third parties such as holders of Bill of Lading. After long discussions about slow steaming, BIMCO published the clause for Time Charter Parties in December 2011 and is suitable for the liner, tanker and dry bulk trades.

More specifically, this clause was developed with the aim of balancing Charterers’ wish to control the speed of the vessel by giving express instructions, and Owners’ concerns about the consequences of complying with such instructions.

The technical aspects of the Clause have been dealt with and clarified by engineers who have given BIMCO guidance regarding the potential limitations of marine engines and other related equipment and generally the effects on marine engines of slow steaming. Two types of slow steaming are stated in the Clause depending on the parties needs: “Slow Steaming” down to a level which would not require the owners to make any modifications to the engine (essentially the cut-off point for the engine auxiliary blowers) and an “Ultra Slow Steaming” option for cases where owners and charterers agree that the ship can slow steam to a greater degree.

The latter will only apply if the parties have expressly agreed to it by deleting the former, which will otherwise apply by default.

118 [https://www.bimco.org/Chartering/Clauses_and_Documents/Clauses/Slow_Steaming_Clause.aspx](https://www.bimco.org/Chartering/Clauses_and_Documents/Clauses/Slow_Steaming_Clause.aspx)
In addition, as it stated in sub-clause (a) the charterers are entitled to submit instructions
to the Master to reduce speed or RPM or to adjust the speed in order to meet a specified
time of arrival at a certain destination. The reference to ‘specified time of arrival’
should merely be seen as an indication of the owners’ intention to do what they can to
adjust the speed in order to meet the specified time of arrival, if possible. The owners do
not warrant that they will be able to arrive at this point in time. When the charterers
wish to adjust the speed of the vessel, they are required to submit their slow steaming
instructions to the Master in writing. The purpose of this is avoiding misunderstandings
in the event of a dispute. It should be noted that speed reductions are always subject to
what has been agreed regarding ‘slow steaming’ or ‘ultra slow steaming’; the safety of
the vessel, crew and cargo and protection of the marine environment; and
recommendations from manufacturers’/designers’ of the engine(s) and other related
equipment. Finally, in order to protect owners from unforeseen expenses with regards
to modifications, the sub-clause (a) states that the Master is not obliged to comply with
any additional recommendations and requirements issued by manufacturers and/or
designers subsequent to the date of the charter party (or the date when this clause was
incorporated if, for instance, the clause is agreed and incorporated at a later stage).

The sub-clause (b) refers to situations not only where the charterers may want a fixed
reduction in speed, but also where they want the vessel to adjust speed during the
passage to arrive at a specified time. The purpose of this is that owners will be able to
agree to a charterers’ request to reduce the speed of the vessel to below any of the
warranted charter party speeds without being in breach of other charter party provisions
by doing so.

Sub-clause (b) (iii) emphasises that the safety of the vessel, crew and cargo are
paramount and therefore the vessel is at liberty to increase speed at any time to avoid a
particular hazard, at the Master’s discretion.

Sub-clause (c) explains in greater detail what the owners should take into consideration
to minimise fuel consumption for the purposes of sub-clause (b).
Sub-clause (e) emphasises that compliance with charterers’ instructions in terms of slow steaming will not constitute a breach of any obligation that the owner may have under the charter party or contracts of carriage to proceed with due despatch.

The last section of the Clause (which does not apply to liner services) requires charterers to incorporate into all bills of lading issued by or on behalf of owners a provision whereby owners are exonerated from claims for deviation by delay. This is to cover late or delayed arrival as a result of charterers’ orders to reduce speed.

**Calculation of Speed and Consumption Claim**

There are two methods for calculation of speed and consumption claim. The first method of calculation is to take the vessel’s average good weather performance and apply that to the period under review.

**Example**

The charter party description is “about 15 knots on 20 mt IFO in good weather conditions”.

<table>
<thead>
<tr>
<th></th>
<th>Good weather</th>
<th>Bad weather</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance sailed</td>
<td>3000 miles</td>
<td>1500 miles</td>
<td>4500 miles</td>
</tr>
<tr>
<td>Time taken</td>
<td>215 hours</td>
<td>145.33 hours</td>
<td>360.33 hours</td>
</tr>
<tr>
<td>Fuel consumed</td>
<td>195 mt</td>
<td>105 mt</td>
<td>300 mt</td>
</tr>
</tbody>
</table>
**Speed Claim**

Vessel sailed good weather distance of 3000 miles, in 215 hours with 13.95 knots.

If the vessel had maintained the average good weather speed of 13.95 knots over total distance of 4500 miles, the time will be \( 322.58 \text{ hours or days} = \frac{322.58}{24} \rightarrow \text{days} = 13.44 \).

If the vessel had maintained the average good weather speed of 14.5 knots, for distance of 4500 miles the time will be: \( t = \frac{4500}{14.5} \rightarrow t = 310.34 \text{ hours or } \frac{310.34}{24} = 12.93 \text{ days} \).

Charterers can claim for 13.44 days - 12.93 days = 0.51 days.

**Consumption Claim**

Vessel consumed 195 mt in good weather conditions in 215 hours or days = \( 215/24 \rightarrow \text{days} = 8.958 \). So, the consumption per day will be: cons = \( \frac{195}{8.958} = 0.021768 \times 1000 \rightarrow \text{consumption per day} = 21.768 \text{ mt} \).

If the consumption of the vessel per day is 21.768 mt per day for a voyage of 13.44 days, the total consumption will be 21.768 \times 13.44 = 292.59 mt.

If the agreed upon the charter party consumption is 20 mt per day for a voyage of 12.93 days then the total consumption will be 20 \times 12.93 = 258.60 mt.

Charterers can claim for 292.59 - 258.60 = 33.99 mt.
CHAPTER 4.2 Economic Impacts of Slow Steaming

While one of the most common reasons for slow steaming is to reduce air emissions and bring about a more environmentally-friendly operation, more underlying causes are to absorb excess tonnage and to cut down on fuel consumption and bunker bills. Additionally, if a vessel can arrive at a load or discharge port with reduced waiting time, this may improve port safety and minimize the time in port. As a matter of fact, slow steaming is quite a complex issue, affected by more factors and with impact broader than most people generally realize, according to Ma Shuo, a professor of maritime economics and policy at World Maritime University (WMU) in Sweden. He adds that, “slow steaming is affected by interplay of six forces or factors”. But basically the most important and dominating factor is freight rate,” Ma told the audience at the lecture. “This means that when freight rates are high, speed has to be high.” Furthermore, as container supply chain and liner shipping analyst Drewry pointed out, given the intense competition any sustained reduction in fuel prices will result in lower annual contract freight rates.

“Apart from freight rate, the other five factors are bunker cost, ship cost, cargo cost, interest rate and environmental cost” as Ma points out. Regarding bunker costs, as bunker prices have increased considerably in recent years, slow steaming has become more appealing to carriers. At $500 per ton fuel prices, carriers can save 5–7% on costs, which might represent $250,000 on one voyage and $15–$20 million annually for one Asia-Europe lane. Given thin profit margins in the industry, carriers infer that slow steaming is becoming the new norm.

Slow steaming also enables carriers to absorb excess fleet capacity during periods of slack demand. Throughout 2009 and 2010, ocean carriers took delivery of vessels ordered before the economic downturn.

119 http://theloadstar.co.uk/drewry-warns-shippers-expect-slow-steaming-blanked-sailings/
121 http://www.palgrave-journals.com/mel/journal/v15/n2/full/mel20132a.html
Since slower vessel speeds reduce capacity on a service string, carriers can deploy excess vessels to the string to maintain capacity under slow steaming rather than ‘laying up’ $100+ million dollar ships. For instance, it is estimated that super slow steaming could absorb 4% of the available fleet.\textsuperscript{123}

The carriers need to update their trade routes if they want to maintain a weekly service for a certain trade route and maybe they will need to add vessels on their fleet. A study by Rotterdam's Erasmus University found that ocean carriers can achieve fuel savings of up to $67 million through slow steaming—with $6 million more saved if ships are slowed to 15 knots. Also, the added inventory costs shippers accrue when goods are on the water total nearly $170 million, based on price-per-hour waiting time.

Since 2009, slow steaming has helped reduce carriers’ fuel bills and absorb excess capacity. Alphaliner estimates that some 1.2 million TEU of container capacity is currently absorbed by carriers’ extra-slow steaming and super-slow steaming initiatives.\textsuperscript{124}

The figure has remained relatively stable in the past 18 months at 7% of the fleet as fuel prices decreased at around $600 per metric ton, it says. Alphaliner concedes that an increase in service speeds of up to four knots will result in higher fuel consumption but says that it would be offset by lower vessel costs (capital costs or charter hire) as ships are removed from rotation. It adds that the cost savings would be higher for shorter routes.\textsuperscript{125} The National Industrial Transportation League said “carriers appear to have retained the economic benefit of slow steaming for themselves.”\textsuperscript{126}

On the other hand, there are significant economic impacts from slow steaming to cargo owners. More specifically, cargo owners have to understand that the time of transportation will be increased by reducing the vessel speed. Longer transit time will increase shippers’ costs because they need more inventory to feed this longer supply chain. Longer ocean transit times can also impact shippers' cash flow, as the time from production to sale is extended.

\textsuperscript{123} Information from the Shipping Company that I had my summer internship in.
\textsuperscript{124} http://www.tradewindsnews.com/weekly/347260/Expert-reaction-split-on-impact-of-lower-bunker-prices
\textsuperscript{125} http://www.tradewindsnews.com/weekly/347260/Expert-reaction-split-on-impact-of-lower-bunker-prices
\textsuperscript{126} http://www.charlestonbusiness.com/news/39324-shippers
Still, shipping line customers may be able to use slow steaming to their advantage because of the one great benefit it does produce: reliability.\textsuperscript{127} Increased reliability also allows shippers to reduce the inventory they hold in the destination country—counteracting the increased inventory levels needed for slow steaming.

Shippers can hold less buffer stock because they can be sure new stock will arrive on time. For some companies this isn’t an issue, but it may cause problems for those that rely on an expedited cash flow process. For example, reducing the speed from 27 to 22 knots, the time for a voyage such as Asia-Europe will be increased 3-4 days.\textsuperscript{128}

Finally, there are serious impacts to the ship owners or ship managers as well. The ship owners or ship managers, who are obliged to the charterer by the contract to fulfil their requirements such as instructions relating to ship speed, may have additional concerns due to the possibility that they end up bearing the potentially consequential costs of slow steaming operations, whereas the carriers profit from the benefits. Moreover, reducing the speed will increase the time, which would affect the number of trips per year. By the increase in the number of trips per year, the total supplied capacity per year will decrease. This will have a negative effect on revenues if the demanded capacity is not distributed among the remaining ships.\textsuperscript{129}

Fuel savings could cause a significant reduction in cost, although marine fuels tend to burn more efficiently under high engine loads. Slow steaming without modification definitely requires the engine to operate outside the conditions for which it has been optimized.\textsuperscript{130} In addition, there are costs that will not exist if the vessel operates at normal speed, such as additional equipment and refitting of main engines.\textsuperscript{131} When a vessel continues engine operation at lower loads, this may cause extra fouling.\textsuperscript{132}

\textsuperscript{127} http://www.inboundlogistics.com/cms/article/is-slow-steaming-good-for-the-supply-chain/
\textsuperscript{128} http://www.inboundlogistics.com/cms/article/is-slow-steaming-good-for-the-supply-chain/
\textsuperscript{129} Information from the Shipping Company that I had my summer internship in.
\textsuperscript{130} http://www.steamshipmutual.com/pdf.html?id=576550&pdf=truc
\textsuperscript{131} http://www.fmc.gov/assets/1/Documents/RESPONSE%20EVERGREEN%20SHIPPING%20US%20FINAL%20NONCONFIDENTIALApr%205%20(2).doc.pdf
\textsuperscript{132} To encrust a ship’s hull with foreign matter such as barnacles.
Also, this will require the consultation from specific engine manufacturers for general advice and assistance with special modifications or enhanced maintenance programs. Although some engine manufacturers and vessel operators have more data regarding the effects of slow steaming, the long-term effects are not known yet.

For example it takes 30 days for a 300,000 dwt VLCC loaded in Middle East to sail to the US West Coast at 16.5 knots and consuming 98 tonnes per day. If the vessel reduces its speed by one knot, the fuel consumption reduction would be about 12 tonnes per day.

However, this will add 2 days to the voyage hence giving a net fuel saving of about 180 tonnes. Based on the latter and on an average cost of HFO of $650 per tonne, the saving due to fuel consumption will be about (180*650) $117,000 per day.\textsuperscript{133}

Another example according to Lee Kindberg, environmental director of Maersk North America, is: an 8000 TEU container ship travelling at 21 knots will burn 125mt fuel to go 500 nautical miles. The same ship will need just 80 mt of fuel to travel the same distance if the speed drops to 15 knots.\textsuperscript{134}

\begin{footnotesize}
\begin{itemize}
  \item [133] file:///C:/Users/Techspot/Downloads/SLOWSTEAMINGFUELEFFICIENCYANDTHEENVIRONMENTv6.pdf
\end{itemize}
\end{footnotesize}
CHAPTER 4.3 Technical Impacts of Slow Steaming

The greatest challenge in implementing slow steaming is the accurate monitoring of the vessel’s speed by the vessel and its regulator and whether the speed can be set as and when is required. Satellite Automatic Identification System (S-AIS), which is one of the basic requirements for all vessels to have, allows the vessel and the regulator to monitor the speed. In addition, another way to verify the vessel’s speed is the inspection in logbook entries when the vessel leaves one port and enters another one. However, a regulated speed that depends on ship’s size and type is preferable to a single speed for all vessels, because the latter would distort the competitive market between ships. Ship-specific speeds could be monitored based on self-reporting of verifiable data. Moreover, there are two ways to implement slow steaming: the implementation with engine modification and without it.

Slow Steaming with Engine Modifications

Currently an engine set up being offered by engine makers is to install a de-rated engine with an extra cylinder. This future proofing gives ship owners the option of up-rating the engine in the future in times when ship speed has a direct impact on a vessel’s charter rate.

- The possibility of slow steaming increases the pressure for options to be fitted on the exhaust tract such as exhaust gas economiser by-pass flaps, fixed water washing or easy access for water washing (and draining) of exhaust gas boiler.
- Design attention to sizing of engine shafting, propellers, auxiliary blowers, turbo charging and ancillary equipment.

135Automatic Identification System (AIS) is an automatic tracking system used on ships and vessels traffic services for identifying and locating vessels by electronically exchanging data with other nearby ships. S-AIS technology provides essential information for worldwide monitoring of any maritime mobile equipped with an AIS device. This means that SAT-AIS has become an essential component of worldwide maritime security. (http://www.sat-ais.org/what-is-sat-ais/)
136Information from the Shipping Company that I had my summer internship in.
137Lloyd’s Register, Marine Services, Container Ship Speed Matters, (September 2008).
Slow Steaming Without Engine Modifications

- For extreme low load operation (20% and below) there always has been the requirement to operate the engine intermittently at high load in order to increase the exhaust gas velocity to clean out the uptake of soot and also burn off any un burnt cylinder oil.

- Exhaust gas economiser gas fires. Cleanliness of the uptake is always an issue and vessels fitted with an economiser bypass flap will be better placed to keep the uptake clean and keep gas velocities at a maximum.

- Exhaust gas economiser water washing may need to be considered after extended periods of slow speed steaming to prevent boiler fouling.

- Auxiliary blower cut in / out level. Engine may be operating at levels close to the cut in /out point, which will govern the engine speed. Alternatively the blower can be manually switched on / off to prevent fluctuating conditions.

- Turbocharger fouling on the compressor and gas side may be an issue requiring either abrasive in service cleaning on the gas side (walnut shells) or water solvent cleaning on the compressor side.

- Air cooler cleanliness involving increased water solvent cleaning (this may involve both in-service washing and complete removal in port for putting into a solvent bath). Additionally, maintaining the air cooler temperature could also pose a problem on some (older) engines as the cooling water control valve may be operating outside its design conditions. This may result in manually squeezing the cooling water outlet valve on the air cooler in order to maintain the air inlet temperature in the 40 – 50°C range.

- Load dependant lubricators have proved to offer the greatest saving in slow speed operation as well, thus preventing the over lubrication of the cylinder which inevitably leads to piston ring sticking and unburnt oil lining the exhaust manifold. This can lead to a potentially dangerous situation if the engine speed is increased too quickly, resulting in uncontrolled burning and turbocharger over speed.
• For low load operation between 20 - 40% your vessel’s engine may be suitable for retrofitting a 'cylinder cut out system' (subject to vibration evaluations, auxiliary blower modifications etc). Cylinder cut out has the advantage of increasing the load on the remaining cylinders and thereby improving the combustion operating conditions in the operating units.

• Electronic engines have several different software operating modes. These may be varied to suit the operating conditions.

• De-rated engines. For the same bore of engine several different versions of rating and power output may be available. The original engine set up may not be suitable for the current operating conditions and in consultation with engine maker it may be possible to change the engine rating.138

There are different types of slow steaming that can be applied without engine modifications.

a) **Low RPM with auxiliary boiler cut off and auxiliary blower cut off**: Steam demand is handled 100% by exhaust boiler after optimizing usage of steam. Main engine turbocharger can cope up with the air demand and oil fired boiler is cut off.

b) **Low RPM with auxiliary boiler firing intermittently and auxiliary blower cut off**: Steam demand is handled mostly by exhaust boiler and the oil fired boiler assisting in between and firing intermittently. Main engine turbocharger can cope up with the air demand.

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138 Lloyd’s Register, Marine Services, Container Ship Speed Matters, (September 2008).
c) **Low RPM with auxiliary boiler firing frequently and auxiliary blower cut in and running:** As exhaust temperatures have fallen, steam demand is met by oil fired boiler firing frequently. Main engine turbochargers cannot cope due to less enthalpy of exhaust gas and the fact that the auxiliary blowers are running.\(^\text{139}\)

According to the Maximum Continuous Revolution (MCR), which is the rated or maximum continuous power of a diesel engine, slow steaming can be divided into four categories as follows:

1) **Reduced speed** where the range of main engine load is below the optimization point down approximately 60% of load. Optimization point is the point which is defined for the vessel and her engine to run, in this particular speed and MCR.

2) **Moderate slow steaming** where the range of main engine load is 40-60% of MCR. In this case, the auxiliary boiler is cut-off but the auxiliary blowers may cut-in periodically when approaching the lower point of this load range.

3) **Deep slow steaming** where the auxiliary blowers are in service and the auxiliary boiler may cut in and the load range is 20-25% of MCR.

4) **Ultra slow steaming** where the auxiliary boiler and auxiliary blowers are running and the load range is approximately 10% of MCR.\(^\text{140}\)

\(^{139}\)Marine Insight, The guide to Slow Steaming on Ships, (December 2012).

\(^{140}\)Przemysław Kowalak, Chief engineer's hands-on experience of slow steaming operation, Maritime University of Szczecin, Poland.
The easiest way to reduce cost is to reduce the ship’s speed. The ship’s speed is reduced by lowering the speed of engine and propeller. The power required by the main engine, however, correlates disproportionately with the ship’s speed as it seen in Figure 4 below.
The MAN DIESEL&TURBO Survey in 2012, revealed that fuel cost saving was the most important reason for introducing slow steaming. Apart from running at part-load, there are a number of other ways to further increase the financial return from slow steaming. These include the use of slide fuel-valves, turbocharger cut-out solutions, the upgrading of lubrication-oil systems, engine de-rating and propeller upgrading. Survey respondents that had adopted one or more of these measures declared themselves pleased with the results.

The table below divides the respondents in two categories, the Considerers who haven’t implemented engine retrofits and the Implementers who have implemented at least one of them.
Table 1: Main Advantages of slow steaming as perceived by the respondents

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Considerers [%]</th>
<th>Implementers [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel cost savings</td>
<td>93.7</td>
<td>94.7</td>
</tr>
<tr>
<td>Greater utilisation of existing capacity</td>
<td>22.5</td>
<td>34.2</td>
</tr>
<tr>
<td>Avoidance of idling costs</td>
<td>29.7</td>
<td>28.9</td>
</tr>
<tr>
<td>Schedule reliability</td>
<td>10.0</td>
<td>15.8</td>
</tr>
<tr>
<td>Service and maintenance savings</td>
<td>17.1</td>
<td>18.4</td>
</tr>
<tr>
<td>Lower emissions</td>
<td>36.0</td>
<td>42.1</td>
</tr>
</tbody>
</table>


Table 2: Fuel Saving achieved using specific solutions (percentages)

<table>
<thead>
<tr>
<th>Fuel savings</th>
<th>As expected</th>
<th>Higher than expected</th>
<th>Lower than expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine retrofit incl. slide fuel valves T/C cut-out</td>
<td>70.3</td>
<td>5.4</td>
<td>16.2</td>
</tr>
<tr>
<td>Derating &amp; propeller upgrade</td>
<td>87.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

In the table, 70.3 per cent of respondents reported that they had achieved fuel savings as expected by implementing slide fuel valve and/or turbocharger cut-out solutions. Only 16.2 per cent achieved lower than expected savings. The gains are even more pronounced when it comes to engine derating and/or propeller upgrades with 87.5 per cent reporting expected fuel savings.

Table 3: Number of respondents currently considering engine upgrade kits to further increase reliability and savings from slow steaming (percentages). Respondents were able to give more than one answer.

<table>
<thead>
<tr>
<th>Engine Upgrade Measures</th>
<th>Considerers</th>
<th>Implementers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of slide fuel valves to prevent deposits</td>
<td>44.1</td>
<td>62.1</td>
</tr>
<tr>
<td>Turbocharger cut-out solutions for increased flexibility</td>
<td>18.9</td>
<td>10.8</td>
</tr>
<tr>
<td>Cylinder oil system optimisation to save lubricating oil and avoid the risk of scavenge fires</td>
<td>23.4</td>
<td>16.2</td>
</tr>
</tbody>
</table>


Another potential source of savings that is related to slow steaming is the opportunity to save expensive lubricating oil by adapting dosage to the engine load. Here, 23.4 per cent of Considerers and only 16.2 per cent of Implementers are seriously considering cylinder oil optimization as a means of saving costs and optimizing cylinder lubrication for low-load operation.

Owners will undoubtedly seek to invest in more fuel efficient vessels in the long-term as there is a commercial advantage. Moreover, owners seem to be more agreeable to retrofitting their vessels.
A barrier to this happening widely is the current split of incentives between owners and charterers, where the charterer of a retrofitted vessel stands to save on bunker costs, but the owner sees the capital investment as a risk, because he is not certain of gaining a share of the savings if charter rates do not increase.
CHAPTER 4.4: Environmental Impacts

In 1997, a new annex regarding the regulations for the prevention of air pollution from ships was added to MARPOL. The purpose of this annex was to minimize airborne emissions which contained in ships exhaust gas, including sulphur oxides (SO\textsubscript{x}) and nitrous oxides (NO\textsubscript{x}). MARPOL ANNEX VI came into force on 19 May 2005 and the Marine Environment Protection Committee (MEPC) agreed to revise MARPOL Annex VI with significantly enhanced emissions limits. The revised MARPOL ANNEX VI was adopted in October 2008 and entered into force on 1 July 2010.

The main changes to MARPOL Annex VI are an advancing reduction globally in emissions of SO\textsubscript{x}, NO\textsubscript{x} and the introduction of emissions control areas (ECAs) to reduce airborne emissions further in designated sea areas.

Under the International Convention for the Prevention of Pollution form ships (MARPOL) Annex VI (Regulations for the Prevention of Air Pollution from Ships), specifically under regulation 14 covers emissions of Sulphur Oxides (SO\textsubscript{x}) and particulate matter from ships. Currently, MARPOL Annex VI has 77 parties representing the 94.77% of world merchant shipping tonnage.

The Emission Control Areas (ECA) were established under MARPOL Annex VI for SO\textsubscript{x} and these are the following:

- Baltic Sea area
- North Sea area
- North American area (covering designated coastal areas off the United States and Canada)
- United States Caribbean Sea area (around Puerto Rico and the United States Virgin Islands).

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141 MARPOL: The International Convention for the Prevention of Pollution form ships
142 http://www.imo.org/MediaCentre/HotTopics/GHG/Documents/sulphur%20limits%20FAQ.pdf
However, outside the Emission Control Area the current limit for sulphur content of fuel oil is 3.50%, falling to 0.50% m/m on and after 1 January 2020. The 2020 date is subject to a review, to be completed by 2018, as to the availability of the required fuel oil. Depending on the outcome of the review, this date could be deferred to 1 January 2025.143

In 2011, IMO has adopted a number of mandatory instruments requiring new ships to meet higher standards of efficiency. The aim of these measures (EEDI/SEEMP) was to significantly reduce the amount of CO₂ emissions from international shipping and entered into force on 1 January 2013.

Energy Efficiency Design Index (EEDI) for new ships is the most important technical measure and its purpose is to promote the use of more energy efficient equipment and engines. EEDI requires new ships to meet a certain level of energy efficiency from the outset and calculates this efficiency, based on a complex formula which takes into account the ship’s emissions, its capacity and speed. The lower a ship’s EEDI, the more efficient it is. The required EEDI represents a minimum energy efficiency requirement for new ships depending on ship type and size.

The SEEMP is a practical measure to improve energy efficient of a ship in a cost-effective manner. Moreover, it provides a practical tool to formally capture processes by which a ship owner can seek to manage the environmental performance and improve efficiency aspects of their operations. The SEEMP encourages the ship owner, at each stage of the plan, to consider new technologies and practices when seeking to optimize ship performance. The shipping companies can use the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool.144

143 http://www.imo.org/MediaCentre/HotTopics/GHG/Documents/sulphur%20limits%20FAQ.pdf
144 http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Default.aspx
The calculation is based on an individual vessel’s fuel consumption and data on the achieved transport work (e.g. cargo mass, number of passengers carried, etc.). This index can be used to measure the ‘real’ efficiency of a ship in operation and to estimate the effects of any changes, such as hull and propeller cleaning, slow steaming, improved voyage planning, etc. Moreover, EEOI will change depending on how the vessel is operated and what abatement measures the owners/managers have retrofitted. 145

Many ships lately choose to reduce speed as a strategic choice. Reductions in speed are expensive because they affect directly the freight that a vessel can transport over a particular period of time and as a result the income of the vessel. In that case, the owner should use additional capacity in order to avoid losses. Although, it could be very profitable if the speed reduced when the freight rates are low and the fuel prices are high. 146

According to the IMO GHG Study 2008, there was an analysis for the approximate cost efficiency and maximum abatement potential for a speed reduction by 10% of all vessels (price of bunker fuel is US$500/tonne, interest rate 4%) and the general conclusion is that faster ships and larger ships demonstrate a better cost efficiency than smaller and slower ships.

A wide range of options for increasing the energy efficiency and reducing emissions by changing ship design and ship operation has been identified. An overall assessment of the potential of these options is shown in Table 4 to achieve a reduction of CO2 emissions. Since the primary gateway to reduction of CO2 emissions is the increase of energy efficiency, these reduction potentials generally apply to all emissions of exhaust gases from ships.

Table 4: Assessments of potential reductions of CO₂ emissions from shipping by using known technology and practices.

<table>
<thead>
<tr>
<th></th>
<th>Saving of CO₂/tonne-mile</th>
<th>Combined</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESIGN (New ships)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concept, speed and capability</td>
<td>2% to 50%†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hull and superstructure</td>
<td>2% to 20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power and propulsion systems</td>
<td>5% to 15%</td>
<td>10% to 50%†</td>
<td></td>
</tr>
<tr>
<td>Low-carbon fuels</td>
<td>5% to 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renewable energy</td>
<td>1% to 10%</td>
<td></td>
<td>25% to 75%†</td>
</tr>
<tr>
<td>Exhaust gas CO₂ reduction</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OPERATION (All ships)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet management, logistics &amp; incentives</td>
<td>5% to 50%†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voyage optimization</td>
<td>1% to 10%</td>
<td>10% to 50%†</td>
<td></td>
</tr>
<tr>
<td>Energy management</td>
<td>1% to 10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* CO₂ equivalent, based on the use of LNG.
† Reductions at this level would require reductions of operational speed.

Source: Second IMO GHG Study (2009)

The above practices for reduction of CO₂ emissions are divided into two categories; practices for new ships and practices for the existing ships. In the first category, there are five different solutions. The concept, speed and capability can save up to 50% of CO₂ per tonne-mile with reduction of operational speed while hull and superstructure can save 2%-20% of CO₂ per tonne-mile. In addition, power and propulsion systems can save 5%-15% of CO₂ per tonne-mile and if this practice is combined it can save 10%-50% of CO₂ per tonne-mile. It has to be mentioned that renewable energy can save 25%-75% if it is combined. Furthermore, regarding the second category fleet management, logistics and incentives can save up to 50% of CO₂ per tonne-mile with the reduction of operational speed. Voyage optimization and energy management can save the same percentages 1%-10% but if voyage optimization is combined it can save 10%-50% of CO₂ per tonne-mile.
There has been a lot of pressure on the shipping industry to reduce global CO$_2$ emissions by 3-4% as well as sulphur emissions from international shipping industry. This pressure increased with the IMO sulphur requirements. More specifically, ships trading in designated emissions control areas will have to use fuel oil on board with a sulphur content of no more than 0.10% from 1 January 2015, instead of 1.00% which was enforced until December 2014.

More specifically slow steaming also has significant environmental impacts, as a 10% reduction of fleet average speed results in a 19% reduction of CO$_2$ emissions. In addition, emissions of NOx, SOx and black carbon are reduced.

It is calculated that if we burn a ton of fossil fuel (heavy fuel oil, diesel or other) between 3.02 and 3.11 tons of CO$_2$ are generated depending on the fuel. In graph 1, it is clear that the share of global CO$_2$ emissions regarding international shipping is 2.7%.

149 http://www.martrans.org/documents/2012/Psaraftis20Posidonia.pdf
Graph 1: Emissions of CO₂ from shipping compared to global total emissions for 2007

Source: Second IMO GHG Study 2009

Figure 5: Annual CO₂ (million MT) emissions from vessels (2010 and 2015 Volume)

Source: http://www.palgrave-journals.com/mel/journal/v15/n2/full/mel20132a.html
For 2010 volume, slow steaming lowers annual CO₂ emissions by 2.03 million MTs from full speed. Extra slow steaming has a decrease of 3.37 million MTs from full speed. Finally, super slow steaming has the biggest reduction of 3.63 million MTs from full speed. According to the figure above, we conclude that the point of view regarding the implementation of extra slow steaming is enhanced.

As a matter of fact when ships slow down, more ships are needed to cover the same amount of transport work. On the contrary, when speed restrictions do not exist and the transport demand is low, ships tend to slow down.

In order to be determined the emissions reduction of slow steaming by a report that has made from seas at risk, there has to be taken into account the emissions when slow steaming is applied and when it is not applied. Firstly, in case the slow steaming is applied, it should be accounted a certain percentage for ships which are laid-up. After some assumptions that have been made and some figures that have been collected, this report, in order to measure the emissions with the absence of slow steaming, has ended up to the fact that it has to be two cases as follows.

Table 5: CO₂ emissions (Mt) with no lay-up of container ships and when slow steaming is not applied in 2010-2013

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tankers</td>
<td>227</td>
<td>239</td>
<td>254</td>
<td>264</td>
<td>273</td>
<td>285</td>
<td>-</td>
</tr>
<tr>
<td>Bulkers</td>
<td>166</td>
<td>181</td>
<td>195</td>
<td>208</td>
<td>222</td>
<td>233</td>
<td>-</td>
</tr>
<tr>
<td>Container ships</td>
<td>223</td>
<td>247</td>
<td>242</td>
<td>268</td>
<td>281</td>
<td>298</td>
<td>301</td>
</tr>
<tr>
<td>Total</td>
<td>617</td>
<td>666</td>
<td>691</td>
<td>739</td>
<td>776</td>
<td>816</td>
<td>301</td>
</tr>
</tbody>
</table>
Table 6: CO2 emissions (Mt) with 10% lay-up of container ships and when slow steaming is not applied in 2010-2013

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tankers</td>
<td>227</td>
<td>239</td>
<td>254</td>
<td>264</td>
<td>273</td>
<td>285</td>
<td>-</td>
</tr>
<tr>
<td>Bulkers</td>
<td>166</td>
<td>181</td>
<td>195</td>
<td>208</td>
<td>222</td>
<td>233</td>
<td>-</td>
</tr>
<tr>
<td>Container ships</td>
<td>223</td>
<td>247</td>
<td>242</td>
<td>248</td>
<td>261</td>
<td>276</td>
<td>281</td>
</tr>
<tr>
<td>Total</td>
<td>617</td>
<td>666</td>
<td>691</td>
<td>720</td>
<td>755</td>
<td>794</td>
<td>281</td>
</tr>
</tbody>
</table>

Furthermore, in order to be calculated the relationship between the actual speed of a ship, the maximum speed of a ship, and its engine load, a model has been estimated and after some extra assumptions, the following speed reductions turn out to be feasible in the period 2008-2013.

Table 7: Maximum possible speed reduction when no retrofit measures are taken

<table>
<thead>
<tr>
<th>Year</th>
<th>Tanker</th>
<th>Bulkers</th>
<th>Container ships</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0-0.5%</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>2009</td>
<td>12%</td>
<td>17%</td>
<td>15-16%</td>
</tr>
<tr>
<td>2010</td>
<td>15-21%</td>
<td>17-27%</td>
<td>15-18%</td>
</tr>
<tr>
<td>2011</td>
<td>16-20%</td>
<td>17-29%</td>
<td>11-16%</td>
</tr>
<tr>
<td>2012</td>
<td>16-18%</td>
<td>17-28%</td>
<td>4-16%</td>
</tr>
<tr>
<td>2013 (for container only)</td>
<td>-</td>
<td>-</td>
<td>2-16%</td>
</tr>
</tbody>
</table>

In 2008 the potential for slow steaming is relatively low for all types of ships, but especially for tankers. From 2009-2012 there is a significant increase in the potential for slow steaming from 12% to 20% for tankers, 17% to 29% for bulkers and 4% to 16% for container ships.
CONCLUSIONS

The scope of this paper is to provide an analysis of the slow steaming method and its impacts on the economic, legal and environmental fields as nowadays this method has become a common practice by most shipping companies worldwide. This is the result of increased fuel prices, the global economic crisis and consequently the ups and downs on the freight rates due to the volatility of the shipping market. Historically, slow steaming was used in 1970 for the first time as a measure to reduce fuel costs and in 2009 and 2010 Maersk line was the first shipping company to introduce the slow steaming practice.

Moreover, another major reason that this method is accepted is because fuel usage costs constitute approximately 50% to 70% of a ship’s total operating expense and with variable fuel prices representing an unpredictable expenditure to maritime companies. However, despite the now widespread use of slow steaming, it is a controversial issue as it is uncertain whether slow steaming is used solely during these adverse economic conditions or whether it constitutes a general strategy to save costs.

Firstly, slow steaming has significant legal impacts and two of the most important legal terms are due dispatch and deviation. Because of the disputes that arise from these words, BIMCO published two clauses regarding slow steaming. There is a clause that is applied to voyage charter parties and another to time charter parties. With regard to voyage charter parties, there is an additional clause, the Virtual Arrival Clause, which permits charterers to request that the owners adjust the speed of the vessel under a voyage charter to arrive at a loading or discharging port at an agreed date and time.

From an economic aspect, slow steaming has a significant benefit as it contributes to absorption of excess tonnage and to cutting down on fuel consumption and bunker bills.

150 http://www2.emersonprocess.com/siteadmincenter/PM%20Micro%20Motion%20Documents/MFM-BRO-MC-001406.pdf
151 http://www2.emersonprocess.com/siteadmincenter/PM%20Micro%20Motion%20Documents/MFM-BRO-MC-001406.pdf
More specifically, Alphaliner estimates that some 1.2 million TEU of container capacity is currently absorbed by carriers’ extra-slow steaming and super-slow steaming initiatives. Moreover, there are impacts from slow steaming to the cargo owners as the time of transportation will increase due to the reduction in vessel speed. On the other hand, shippers can hold less buffer stock because they can be sure new stock will arrive on time.

Regarding the technical impacts of slow steaming, a division must be made between slow steaming with engine modification and without engine modification. Engine modifications are the engine retrofit solution such as: flexible turbocharger cut out system, slide fuel valves and engine de-rating or propeller upgrade.

Currently, an engine set up being offered by engine makers is to install a de-rated engine with an extra cylinder. This future proofing gives ship owners the option of up-rating the engine in the future in times when ship speed has a direct impact on a vessel’s charter rate. On the other hand, there are other solutions to avoid engine modifications.

Slow steaming also has significant environmental impacts, as a 10% reduction of fleet average speed results in a 19% reduction of CO₂ emissions. There has been a lot of pressure on the shipping industry to reduce the 3-4% of global CO₂ emissions from international shipping, as well as sulphur emissions. This pressure increased with the IMO sulphur requirements due to come into force in 2015 for Emission Control Areas.

Finally, slow steaming constitutes a common practise and it seems that it will continue to be implemented in ships due to the positive effects that it has.

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APPENDIX

BIMCO Slow Steaming Clauses for Voyage Charter Parties

The content of the clause is the following:

a) The Owners shall be entitled to give instructions to the Master to reduce speed or RPM (main engine Revolutions Per Minute) provided that the Vessel’s speed, basis good weather conditions, shall not fall below … knots.

b) Where the Vessel proceeds at a reduced speed pursuant to Sub-clause (a), this shall constitute compliance with, and there shall be no breach of, any obligation requiring the Vessel to proceed with utmost and/or due despatch (or any other such similar/equivalent expression).

c) The Charterers shall ensure that the terms of the bills of lading, waybills or other documents evidencing contracts of carriage issued by or on behalf of the Owners provide that the exercise by Owners of their rights under this Clause does not constitute a breach of the contract of carriage. The Charterers shall indemnify the Owners against all consequences and liabilities that may arise from bills of lading, waybills or other documents evidencing contracts of carriage being issued as presented to the extent that the terms of such bills of lading, waybills or other documents evidencing contracts of carriage impose on or result in the imposition of more onerous liabilities upon the Owners than those assumed by the Owners pursuant to this Clause.
d) This Clause shall be without prejudice to any other express or implied rights under this Charter party entitling the Vessel to proceed at speeds below the minimum speed stated in Sub-clause (a).\textsuperscript{154}

**BIMCO Virtual Arrival Clause for Voyage Charter Parties**

a) Notwithstanding any other clause in this Charter party entitling the Owners to slow steam, the Charterers shall be entitled to request the Owners in writing to instruct the Master to adjust the Vessel’s speed to meet a specified time of arrival at a particular destination, always subject to the Owners’ consent which shall not be unreasonably withheld and, in the case of an approach voyage, subject to agreeing an amended cancelling date. The Charterers shall not be entitled to request an adjustment of speed that exceeds the Vessel’s warranted speed. Any extra time used on a sea voyage as a direct consequence of the Vessel adjusting speed pursuant to the Charterers’ request shall be compensated by the Charterers to the Owners at a rate equal to ___% of the demurrage rate (if left blank then fifty per cent (50%) shall apply).

b) Such compensation shall be payable by the Charterers to the Owners prior to completion of final discharge. The extra time used shall be agreed by the parties, failing which an independent third party (an “Expert”) shall be appointed by mutual agreement. The Expert shall act as an expert and not as an arbitrator and his decision shall be final and binding upon the parties. The costs of such Expert shall be shared equally by the parties. In the absence of mutual agreement as to the identity of the Expert, each party shall appoint an independent Expert at their own expense to calculate the extra time; the average of the results of such calculations shall be binding.

\textsuperscript{154} https://www.bimco.org/Chartering/Clauses_and_Documents/Clauses/Slow_Steaming_Clause_for_Voyage_CP.asp
c) Such extra time shall be calculated on the basis of all relevant information including but not limited to weather data, wave and speed projections and other relevant technical or meteorological data.

d) Where the Vessel proceeds at a reduced speed pursuant to Sub-clause (a), then provided that the Master has exercised due diligence to comply with such instructions, this shall constitute compliance with, and there shall be no breach of, any obligation requiring the Vessel to proceed with utmost and/or due despatch (or any other such similar/equivalent expression).

e) The Charterers shall ensure that the terms of the bills of lading, waybills or other documents evidencing contracts of carriage issued by or on behalf of the Owners provide that compliance by Owners with this Clause does not constitute a breach of the contract of carriage. The Charterers shall indemnify the Owners against all consequences and liabilities that may arise from bills of lading, waybills or other documents evidencing contracts of carriage being issued as presented to the extent that the terms of such bills of lading, waybills or other documents evidencing contracts of carriage impose or result in the imposition of more onerous liabilities upon the Owners than those assumed by the Owners pursuant to this Clause.
BIMCO Slow Steaming Clauses for Time Charter Parties

(a) The Charterers may at their discretion provide, in writing to the Master, instructions
to reduce speed or RPM (main engine Revolutions per Minute) and/or instructions
to adjust the Vessel’s speed to meet a specified time of arrival at a particular
destination.

i. *Slow Steaming – Where the Charterers give instructions to the Master to adjust
the speed or RPM, the Master shall, subject always to the Master’s obligations in
respect of the safety of the Vessel, crew and cargo and the protection of the
marine environment, comply with such written instructions, provided that the
engine(s) continue(s) to operate above the cut-out point of the Vessel's engine(s)
auxiliary blower(s) and that such instructions will not result in the Vessel’s
engine(s) and/or equipment operating outside the manufacturers’/designers’
recommendations as published from time to time.

ii. *Ultra-Slow Steaming – Where the Charterers give instructions to the Master to
adjust the speed or RPM, regardless of whether this results in the engine(s)
operating above or below the cut-out point of the Vessel's engine(s) auxiliary
blower(s), the Master shall, subject always to the Master’s obligations in respect
of the safety of the Vessel, crew and cargo and the protection of the marine
environment, comply with such written instructions, provided that such
instructions will not result in the Vessel’s engine(s) and/or equipment operating
outside the manufacturers’/designers’ recommendations as published from time
to time. If the manufacturers’/designers’ recommendations issued subsequent to
the date of this Charter Party require additional physical modifications to the
engine or related equipment or require the purchase of additional spares or
equipment, the Master shall not be obliged to comply with these instructions.

* Sub-clauses (a)(i) and (a)(ii) are alternatives; delete whichever is not applicable. In the
absence of deletions, alternative (a)(i) shall apply.
(b) At all speeds the Owners shall exercise due diligence to ensure that the Vessel is operated in a manner which minimizes fuel consumption, always taking into account and subject to the following:

i. The Owners’ warranties under this Charter Party relating to the Vessel’s speed and consumption;

ii. The Charterers’ instructions as to the Vessel’s speed and/or RPM and/or specified time of arrival at a particular destination;

iii. The safety of the Vessel, crew and cargo and the protection of the marine environment; and

iv. The Owners’ obligations under any bills of lading, waybills or other documents evidencing contracts of carriage issued by them or on their behalf.

(c) For the purposes of Sub-clause (b), the Owners shall exercise due diligence to minimize fuel consumption:

i. When planning voyages, adjusting the Vessel’s trim and operating main engine(s) and auxiliary engine(s);

ii. By making optimal use of the Vessel’s navigation equipment and any additional aids provided by the Charterers, such as weather routing, voyage optimization and performance monitoring systems; and

iii. By directing the Master to report any data that the Charterers may reasonably request to further improve the energy efficiency of the Vessel.

(d) The Owners and the Charterers shall share any findings and best practices that they may have identified on potential improvements to the Vessel’s energy efficiency.
(e) **For the avoidance of doubt, where the Vessel proceeds at a reduced speed or with reduced RPM pursuant to Sub-clause (a), then provided that the Master has exercised due diligence to comply with such instructions, this shall constitute compliance with, and there shall be no breach of, any obligation requiring the Vessel to proceed with utmost and/or due despatch (or any other such similar/equivalent expression).

(f) **The Charterers shall ensure that the terms of the bills of lading, waybills or other documents evidencing contracts of carriage issued by or on behalf of the Owners provide that compliance by Owners with this Clause does not constitute a breach of the contract of carriage. The Charterers shall indemnify the Owners against all consequences and liabilities that may arise from bills of lading, waybills or other documents evidencing contracts of carriage being issued as presented to the extent that the terms of such bills of lading, waybills or other documents evidencing contracts of carriage impose or result in breach of the Owners’ obligation to proceed with due despatch or are to be held to be a deviation or the imposition of more onerous liabilities upon the Owners than those assumed by the Owners pursuant to this Clause. **Sub-clauses (e) and (f) are not applicable in the liner trade. 155

155 https://www.bimco.org/Chartering/Clauses_and_Documents/Clauses/Slow_Steaming_Clause.aspx
Alan A. Mocatta, Michael J. Mustill, Stewart C. Boyd, Scrutton on Charter Parties and Bills of Lading, (1984), Nineteenth Edition


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