

## ACCURACY OF DRAFT SURVEY PROCESS AND AFFECTING FACTORS

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### ABSTRACT

*The ship's method of determining the amount of cargo loaded is by means of draft surveys taken before and after the loading is carried out. In simple terms, the increase in displacement after loading, adjusted for any change in weights such as ballast, equals the weight of cargo loaded.*

*The draft survey may be the method of measurement specified in the charter party for deciding the quantity of cargo carried, in which case one or several surveyors are likely to be employed to carry out the survey. In special cases, the surveyor will have the benefit of equipment and instruments not found on board a normal bulk carrier, but in most instances the ship's master or officer with careful attention to accuracy and procedure can obtain results quite as good as those of the surveyor but the draft survey faces many claims in case the cargoes are received in shortage. (Yusuf, 2011)*

*Marine shipping industry fields faced significant technology development, integrated navigation bridge systems/electronic charts /ballasting system, etc. But still the draft survey is conducted by traditional ways have done years ago. New technologies are available in the market but nothing recommended from legal authorities to adopt it so all parties stick to the old- fashioned draft survey process.*

*The aim of this paper is to introduce new methods proposed by other parties for the calculation to overcome the discrepancy in measured of loaded and discharge cargoes and develop the vessels and port facilities without causing an increase or shortage to the exact amount.*

**KEYWORDS:** *Industry Fields, Accuracy and Procedure, Survey Process*

### INTRODUCTION

The reason of the draft survey is to keep the less or more cargo at one port to be loaded or discharged and it implies watching that shipper's figures are right, and it finishes the accounts cycle between the shippers, charterers, carriers, beneficiaries, customs, and surveyors.

All the past gatherings sit tight for the last draft survey figures to issue the Bill of Lading (B/L) and finish all the narrative procedure of cargo transfer from door to door. The solid business connection dispatch appeared among the above gatherings and the draft study demonstrates that concerned parties can't rely upon the draft survey figure as a last figure on the grounds that the draft overview relies upon variable factors on its calculation which proposes it as a prescribed figure as

opposed to definite one. The performing of the draft survey isn't a correct science much relies upon the climate conditions at the time, the swell, the precision of the draft marks and the accuracy taken in completing the required estimations. In any case, the exactness of a draft survey which has been appropriately performed is by and large viewed as being up to pretty much 0.5 % of the last figure. (Yusuf, 2011)

In some cases, the precision of Draft Survey is a central issue. Tragically, the parties concerned would be in question concerning the weight came about by Draft Survey, as they have been depending upon the specified scales for a long time. Bulk cargoes are ordinarily delivered under B/L which incorporate wording, for example, said to weigh or said to be or weight, measure, marks, numbers, quality, amount, substance, and esteem obscure.

On the other hand and conditions, the bill of lading does not have proof of the amount stated to have been shipped. Here and there the bulk carrier loads bundles/parcels for same cargo for various five representatives. In such case, the draft survey is of extraordinary importance to isolate the B/L figures be that as it may, if there is a deficiency, a trouble is looked in issuing the B/L.

The methodology used in this research paper depends on descriptive analysis by showing the figures used to declare the cargo shortage and regions are affected by draft survey calculations. The statistics curves used to show the incidents and which cargoes were affected in final calculations to determine its weights. Sources and data information are collected from official governmental websites, articles and some opinions given by the researchers.

### **Factors Affecting Draft Survey**

The United Nation draft survey code can be strongly recommended for the clarity and detail with which it describes good procedures, and for the well-designed survey forms. For the commencement of survey, it requires the following conditions: Vessel afloat, No cargo being worked, No ballast, fuel, fresh water, etc., being pumped or run, No hatch covers being opened or closed, No spares or stores being shipped or landed, All ballast tanks full or empty, Ship upright, Little or no tide or current running, Seas not unduly rough, Temperature difference between sea water and ship's decks not excessive.

Practically, not all these recommendations are applied before or even through the draft survey and sure it will affect the calculation process dealing with a false shortage or even an excess in cargo figures.

Sometimes it will be found that the results obtained from a draft survey are unexpected which is related to the ships constant may be found to be much larger than the normal for that ship, especially in old age ships or a negative constant may be calculated. The ship's figure for the tonnage of cargo lifted may differ from the shore figure by an unusually large amount. If there is regular follow up of calculations in a certain time base between ship and shore to compare figures at each stage of the calculation, then calculation errors are minimized. Since the discrepancy may be the result of a mistake in the draft readings or soundings, these should be rechecked, if still possible.

### **The Factors Depending on Sea Conditions and Vague Draft Marks**

Regularly, the draft perusing ought to be led under a quiet sea condition and it's better to stop if the wave is more than 0.5 meters high. In this circumstance, there is a major danger of loading with less cargo under the B/L. The master must report such issue to owner/P&I Club., stop the draft survey if will not cause demurrage, issue the letter of

protest and arrange skilled surveyor at discharging ports. (Isbester, 1993)

If a ship is anchoring for a long time, on serve or an old ship is lacking maintenance, the fullmight be covered by the fouling and the draft mark is too vague to read.

### The Factors Depending On Ships Hydrostatic Data

Figure 1 shown the incorrect hydrostatic information or draft marks: Investigations carried out in specially performed draft surveys have indicated that there can be significant errors in the determination of displacement due to typographical errors or arithmetical errors in the ship's hydrostatic tables especially in the vessels that built in Chinese dry docking the hydrostatic data table ,especially for the signs of LCF(Longitudinal Centre of Flotation) and the distance for forward and aft draft mark correction information's included by (-) signs that's meaning the surveyor should put in mind that this signs should change to (+) signs. This could be improved if the tables furnished to the surveyor bore an approval stamp by the flagging government or the classification society. A number of years careless re-painting of draft marks, especially if they have not been permanently marked on the hull, can cause erroneous readings.(Isbester,1993) Ships hydrostatic data must be corrected, when the water is not salt water or density, not 1025.

Use of approximate methods for corrections: The mathematical methods used to correct for the drafts, trim and/or hull deflections, if these conditions exist, are approximations because of limitations of time, expense, and the work site. However, if the same methods are correctly and uniformly employed in all surveys, the resultant error in the exact cargo weight will be minimal

Incorrect tank calibrations: This is normally ascertained after a number of draft surveys when a constant error may appear, classification societies may issue the special calibration certificates for each compartment of the vessel.

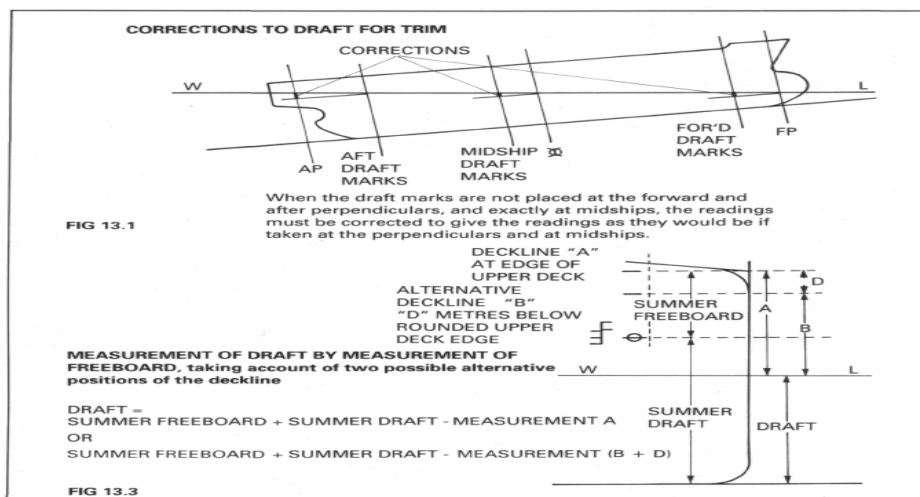


Figure 1: Corrections to Draft for Trim (Isbester, 2010)

### The Factors Depending On the Ships Tanks (Constant)

Mud and/or scale in ballast tanks: The quantity of mud and/or scale will increase over a period of years. It is very difficult to quantify. The effect on ballast calculations can be minimized unless there are reasons to the contrary by leaving a measurable quantity of water in the ballast tank instead of pumping it dry.

The calculation would then utilize a distinction in known water amounts instead of expecting that a tank is totally unfilled along these lines the mistake would be bound to the thickness differential of the mud and the counterweight water. Routinely extensive mass transporters touch base at emptying ports with a slight trim by the head because of consuming fuel from the toward the back found fuel tanks amid long ocean sections or change of the thickness between the last port and the flow port. Since by and large the sounding channels are found toward the back just, dry soundings of counterweight tanks do then not really imply that no water is available, since any water will gather in the fore end. At the point when the counterweight tables are in this manner entered with zero sounding and the head trim, extensive amounts of leftover weight water are found. Once more, this water does not really need to be available. Subsequently, when one expects exhaust or classified amounts, both might not be right (Wolfram, 2010).

Ballast water tanks density during discharging the ballast tanks in loading port the density of tanks it is not the same since may be the vessels de-ballasting the tanks before arrival the loading Port that's cause different density in the tanks.

Measured the sounding pipes for the tanks: In case it by gauges or sounding tape it cause errors in the reading especially if the sounding pipes is in wet conditions, the sounding pipe is blocked at the certain point of height less than the height mentioned in sounding pipe plan. It is usually caused by ship's crew to minimize the ballast quantity measured and compensate it by cargo. In another case, the sounding tape does not touch the water tank well as per shown in figure 2.

### Draught and Tanks Gauges

Draught and tanks gauges may be very helpful as a check, but should never replace the reading of draughts using the fixed draught marks on the ship's hull.

### Squat

While measures the draught, when there is a strong current running and there are water depths of less than twice the draught of the vessel, the draught readings may be misleading, the report should include reference to Possible Squat Effects.

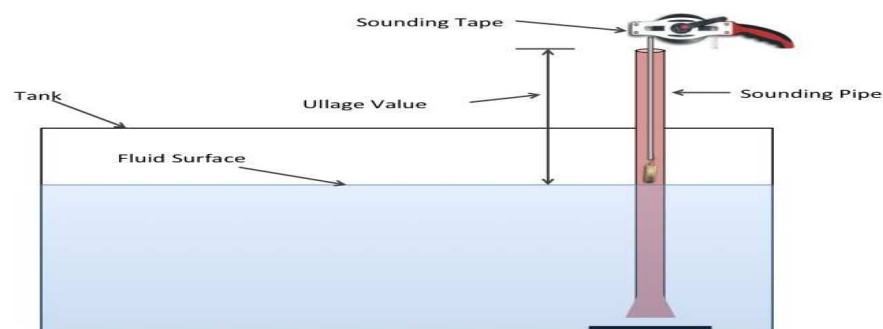


Figure 2: Sounding Pipe Wet

### The Factors Depending on Ships Construction Arrangement

#### Bottom Shell Growth

Marine growth on the bottom of the ship, especially if dry docking is delayed or if there is a failure in the anti-fouling paint, adds weight to the ship. But, because this weight should not change between the start and finish surveys,

it has no effect on the calculation of the cargo weight, unless the vessel is docked for a long period or the antifouling paint deteriorates. (strange, 2010)

### **Anchors and Chains**

The anchors may be in the housed position, where they contribute to the lightship, or they may have been used in the mooring of the ship. The loss of weight due to its removal is weight taken from the light displacement that amount should, therefore, be added to the quantity of cargo. There should be information available on board to enable the surveyor to establish or calculate the weight of the missing anchor and cable. (House,2015)

**Tunnel space/duct keel** that cannot be sounded: in some vessel, it contains a hidden tank on the ship and it is not mentioned in the tanks diagram sheet that delivered by the ship it uses to increase and decrease the draft reading and it is out from the hand of the surveyor.

### **The Factors Depending on Safe Port and Quay Characteristics**

**Water disturbance:** Normally due to wind, swell, current, quay finders location sometimes prevent the observations to reading the draft, seaside draft marks needs especially boats to take the accurate reading or passing traffics. An accurate reading of the draft requires the use of a draft reading tube.

**Variations in seawater density:** If a loaded vessel has a small under -keel clearance, the seawater may hold mud/sediment in suspension, or chemicals in solution could affect its density. This may be apparent from the bottom layer sample

### **Squat Effect**

When a vessel is moored in a tidal stream or a fast flowing current, in shallow water, it will squat in the water, its draft will increase. There appears to be no effect at current speeds below 2.5 knots. (Isbester, 1993)

### **The Factors Depending on Ships Gears Movement and Liquid Transfer**

**Moving and transfer the ships gears and liquid transfer:** the drafts reading forward and aft change during the movement of the ships gears although it is on deck or engine.

In another case transfer of the fresh water or fuel from the tank to tank. These factors help to obtain uncorrected drafts reading.

### **Cargo Claim**

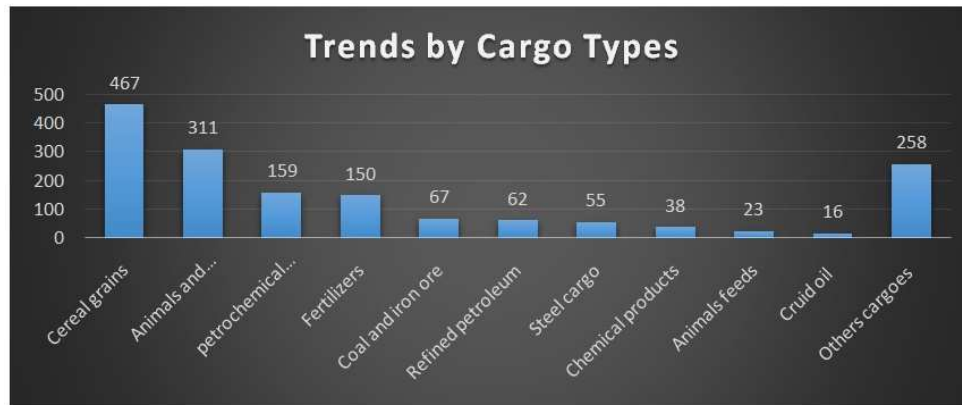
Within the category of cargo claims handled, cargo shortage claims occur at the discharging port. For bulk carriers and tankers, as well as for general cargo and container vessels, a shortage claim arises where there is a discrepancy between the quantity of cargo noted on the B/L and the quantity discharged.

In the case of cargo such as cereal grains, coal, and mineral ores for which the quantity of cargo on the B/L is shown by weight, the quantity measured at the loading port and the quantity measured at the discharging port is compared, and any cargo shortage beyond the Trade Allowance (generally 0.5% of the quantity on the B/L) generally becomes the subject of a Cargo Claim. In particular, with cereal grain cargo for which the quantity noted on the B/L is determined by the Shore Figure at the loading port, cargo claims due to an alleged shortage exceeding the Trade Allowance 0.5% are very

common. While also dependent on the point in time at which the shore figure is taken. (stokoe,2015).

### Trends by Cargo Type

Figure 3 summarizes trends in cargo shortage by cargo type. Considering cargo and vessel type together with the trends for types of cargo are therefore similar to the trends for vessel type as described above, with cargo losses concentrated on the container, bulk, and chemical cargo.



**Figure 3: Cargo Shortage by Cargo Type**

**Source: P&I club, 2016**

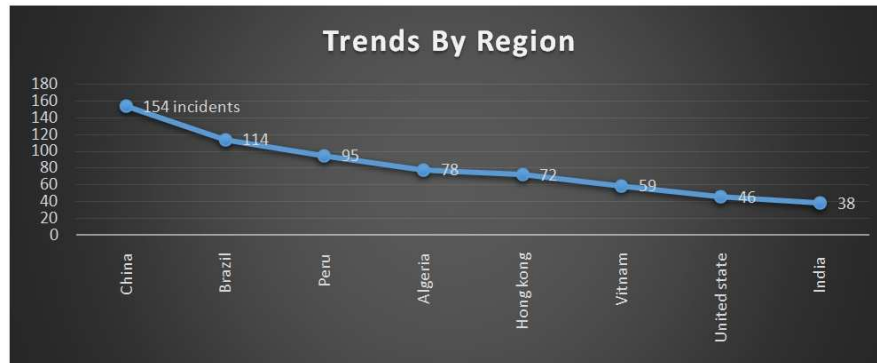
The above figure shown that the Bill of lading is a figure that is liable to shortage and increase since it is under the threats of the draft survey calculation. The draft survey depends on variable factors that's it is difficult to monitor and observe by same data for more person at the same time and it is a way for dispute and arbitration. The ports and the ships lose more time to fix the satisfactory B/L figures.

The shore figure should be the main figure taken in documentary issue. The conveyor belt and shooters should be updated to measure the cargo weight by using the cargo pile and cargo stowage factor (Durham, 1982).

### Trend by Region of Incidents

Figure 4 shows rejoin of shortage for bulk carriers. The location of the incidents is generally the discharging port. Almost all cargo shortages on container vessels occurred at transit ports (Singapore, South Africa). At these transit ports, the terminals, rather than the consignees, suspect container cargo shortages as described above and conduct investigations accordingly.

On the other hand, incidents involving bulk carriers are predominant in China, South America Brazil, Peru, and Algeria in North Africa. In China, in particular, statistical data shows that many cargo shortages occur not only in tankers but in bulk carriers. It is common to find that cargo quantity reports from the shippers at the loading port differ from the quantity onboard the vessel.



**Figure 4: Region of Incidents of Cargo Shortage**

Source: P&I club, 2016

### Case Studies for Cargo Shortage and Claims

#### Case 1: Bulk Carrier Clash

##### Fact

The Clash, a bulker, is fixed for a voyage to carry a cargo of fertilizer in bulk from China to India. According to the draught survey at the load port, and the bill of lading issued, total cargo loaded is 78,400mt. The results of the joint discharge survey, which is undertaken by the Master, receivers, and port- appointed surveyor are as follows:

- The amount of cargo discharged according to the ship's final draught survey is 78,420mt.
- The amount of cargo discharged according to shore-side figures is 78,065mt.

Therefore, an apparent cargo shortage of 335MT (equivalent to 0.4%) if you checked the shore-side figures.

##### Defense and the Court Actions

The Clash subsequently receives a cargo shortage claim in the amount of \$100,000 from cargo interests. In its defense, ship's interests contend that the claim is a paper shortage, as opposed to an actual/real shortage.

#### Case 2: Guangzhou Green Oil vs BOC (Bank of Chinese Insurance)

##### Fact

The plaintiff Guangzhou Green Oil was the buyer and receiver of a cargo of Argentina Soybeans. The defendant BOC Insurance was the marine cargo insurer of the shipment.

When the cargo arrived at Guangzhou, the quantity discharged was only 65,636 MT according to CIQ (China Inspection and Quarantine) weight certificate the bill of lading recorded that 65,930 MT's cargo had been loaded on board. At the port of loading, the moisture rate of the cargo was 11.57% according to the FOSFA (The Federation of Oils, Seeds, and Fats Associations) approved surveyor. At Huangpu, the moisture rate was 10.7% according to the CIQ quality test. The cargo receiver claim shortage of 294 MT against the insurer under the cargo insurance policy. However, the insurer refused the claim, and the case was lodged in front of Guangzhou Maritime Court.

## **Defense and the Court Actions**

The cargo insurer raised two defenses, i.e. 0.5% inaccuracy defense and moisture evaporation defense. However, both defenses were refused by Guangzhou Maritime Court and Guangdong Higher Court.

The courts' reasoning can be summarized as follows. Regarding the finding of facts with respect to the shortage, the courts held that although inaccuracy of measurement always exists and is unavoidable, the quantity evidenced by CIQ Weight Certificate shall be held at the "true quantity discharged" subject to that the CIQ has carried out the survey as per the regulation.

If we analyze the introduced case studies, we will find that draft survey figures are often short in figures comparing to the shore figures and that causing claims to be issued.

## **Proposed New Technologies Ro Overcome Discrepancy in Measured Weights of Loaded and Discharged Cargoes Digital Measurement System for Ship Draft Survey**

The Draft survey is calculated depending on image acquisition unit via a high definition camera extended to the shipboard from the main deck. The draft marks are computerized and will detect the draft water line by means of the color image for clear reading.

### **A Dynamic Voltage Compensation Method**

Can be used for improving the weighing accuracy of cargoes amount inside the cargo holds. This can be done through computerized sensors placed in each cargo hold corner to measure the cargo pile height and convert it to volume. In addition, these sensors will help in calculating the cargo weight through the input stowage factors.

## **CONCLUSIONS**

Cargo shortage problems frequently happen at the discharging port when the cargo amount has been measured utilizing ship figures at load ports. Measures to avoid such inconvenience can and ought to be taken at the stacking port.

Not exclusively ought to the arranged and loaded amounts of cargo be looked at previously, then after the fact stacking, however a willful draft review ought to be done with each stacking grouping as per the stacking technique. Sometimes, since the stacked and released amounts are controlled by the shore amount, the draft survey may not be completed. Nonetheless, it is essential to complete to do as such, particularly if a cargo shortage claim is expected, a joint review which incorporates the freight interests and the charterers if at all conceivable is suggested.

Regardless of whether the discharged amount is dictated by draft survey or shore figure, if there is a disparity between the shore figure and the vessel's figure, it is imperative to set up a Statement of Fact and issue a Letter of Protest, and send duplicates to each one of those concerned, previous departure and immediately, independent of regardless of whether you have gotten a notice or claim around then. I suggested that we should have another approach to help the draft study assume that we trust for the draft overview as a prescribed figure as it were.

The innovation ought to enter the transportation world in load computation particularly in ships outline, the ships ought to be worked in a unit to ascertain the volume of every cargo holds, tanks measured by various electronic ways, draft checking and seawater density.



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