



## **Loss Prevention Circular KISHPNI-LP-11-2021** ***(Ship To Ship transfer safety)***

### **► Introduction:**

Ship to ship (STS) transfer is the term primarily applied to the transfer of crude oil, petroleum products, liquid bulk chemicals and liquefied gas between sea-going tankers. There is also an increasing reliance on dry bulk cargo transfers between ships, but these are not specifically considered here.

The STS operation can be undertaken at sea, with either both vessels underway or one ship mooring alongside another at anchor. Operations are sometimes carried out in port, under the jurisdiction of a port or harbour authority, with one ship secured to a shore installation and one or more vessels mooring alongside.

STS oil cargo transfers involving oil tankers of 150 gross tonnage and above have been regulated on a statutory basis since the implementation of MARPOL, Annex I, Chapter 8 (Regulations 40 to 42), which entered into force on 1 January, 2011. These ships are required to carry an STS operations plan, which has been approved by their respective flag administration.

There is no such requirement under MARPOL Annex II for chemical cargoes. However, the International Safety Management Code (ISM) provides for all types of vessels to have on board procedures for key operations such as STS transfers. In this way, the ISM provides a link for chemical and LPG/LNG cargoes carriers to the STS transfer operations regulated under MARPOL Annex I.

The STS operations plan (the Plan) for each operation should be developed, taking into account the information detailed in the best practice guidelines for STS operations identified by such bodies as the International Maritime Organization (IMO), etc. These include:

- The IMO Manual on Oil Pollution, Section I, Prevention, 2011 Edition (IMO Manual); and
- The OCIMF Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases, First Edition, 2013 (the Guide)
- ISGOTT (International Safety Guide for Oil Tankers and Terminals), 6th Edition 2020
- The Tanker Safety Guide – Chemicals (fifth edition 2020 awaited)
- Mooring Equipment Guidelines (MEG4) Fourth Edition 2018
- The Ship Inspection Report (SIRE) Programme Vessel Inspection Questionnaires for Oil Tankers, Combination Carriers, Shuttle Tankers, Chemical Tankers and Gas Tankers, Seventh Edition (VIQ 7) and Chemical Distribution Institute (CDI) with their relevant sections and provisions.

The Guide sets out operational requirements for all types of tanker vessels. The additional considerations involving chemical tankers with MARPOL Annex II cargoes are outlined in Appendix B, while those for liquefied petroleum gas cargoes are in Appendix C.

The STS Operations Plan is required to be in the working language of the ship and may also be incorporated into an existing Safety Management System (SMS).

According to Regulation 41, Paragraph 3 of MARPOL Annex I Chapter 8 "*Any oil tanker subject to this chapter and engaged in STS operations shall comply with its STS operations Plan.*".

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► **Ship-to-ship transfer while underway or at anchor:**

The following guidance has been prepared by reference to the IMO Manual and the Guide. It is not applicable to transfers associated with fixed or floating platforms, nor does it apply to STS operations necessary for securing the safety of a ship, life at sea or the environment. The reporting requirements may not apply to bunkering operations.

**1-Person in charge:**

An STS transfer operation should be under the advisory control of one individual. Under MARPOL Annex I for oil cargoes, the role falls to the Person in Overall Advisory Control (POAC). In the case of MARPOL Annex II and LNG/LPG cargoes, the role falls to the STS Superintendent (STSSI). The roles could be performed either by the master of one of the involved vessels, typically of the mother (or constant heading) ship or an STS superintendent (or mooring master) from an STS service provider.

The appointment of the Person in Overall Advisory Control (POAC) or STS Superintendent (STSSI) should be a requirement of the STS operations plan.

The administration, cargo owners, tanker's operators or charterers should agree and designate the POAC/STSSI. The POAC/STSSI should be qualified to perform all relevant duties relating to ship-handling and cargo operations, taking into consideration the qualifications detailed in **Chapters 1.6 and 1.7** of the Guide and/or **Paragraph No. 6.2.1.2** of the IMO Manual.

In the event that an STS service provider is utilised, they should be requested to provide documentary evidence of the intended POAC/STSSIs qualifications, experience and medical fitness.

It is worth considering two POAC/STSSIs to ensure continuous 24 hour supervision, if applicable.

The appointment of a POAC/STSSI does not in any way relieve the ships' masters of any of their duties, requirements or responsibilities.

**2-STS transfer area:**

The STS transfer area should be carefully assessed for risks and chosen for a safe operation, in coordination with the appropriate authorities. In selecting the area, the following considerations should be taken into account: sea room, traffic density, water depth and the availability of a safe anchorage. A more detailed account of the factors to be considered when selecting an area for STS transfer may be found at **Paragraphs Nos. 2.3 and 2.4** of the Guide and **Paragraph No. 6.2.2.1** of the IMO Manual.

**3-Notification to authorities:**

Tankers subject to MARPOL Annex I Chapter 8, which plan STS operations within the territorial sea, or the exclusive economic zone (EEZ) of a party (i.e. signatory state) to the present MARPOL Convention are required to notify the relevant coastal state authority not less than 48 hours in advance of the scheduled STS operation. The notification shall comprise the information contained at **Paragraphs No. 2.2** of the Guide and **Paragraph No. 6.2.3.1** of the IMO Manual.

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For STS operations involving other cargoes, the operators should check with local regulators to determine the level of approval required.

Where, in an exceptional case, STS operations are to take place within 48 hours, the oil tanker shall notify the coastal state authority at the earliest opportunity.

The responsibility for the notification to the coastal state authority rests with the masters of the tankers involved in the STS operation.

The masters should also ensure that they have a copy of any acknowledgment from the coastal state authority to carry out the STS operation.

When STS transfers are undertaken in international waters, a navigational warning (securité) should be broadcast to all ships, advising other traffic in the area of the names of the oil tankers; area and nature of operations; time and expected duration; and request a wide berth.

#### **4-Equipment:**

Prior to the commencement of the STS operation, the masters of the two tankers should exchange information regarding the availability, readiness and compatibility of the equipment to be used in the operation. This should include the two ships themselves, having regard to their design and characteristics.

The tanker(s) should be provided with fenders, both primary and secondary. The former should ideally be floating pneumatic type complying with ISO 17357. The secondary can be foam filled type, light in weight and more easily hauled well above the water in positions with limited access to lifting gear. The fenders can be secured to either vessel, although landing on an unprotected section of the hull is less likely if the fenders are appropriately secured to the manoeuvring ship.

When smaller vessels (chemical tankers) of similar size are engaged, the accommodation superstructures will likely extend to the ships' sides (not only the bridge wings). Fenders may need to be considered to protect the superstructures from contact during the operation as a result of rolling and listing of one or both of the vessels.

The master of the tanker to which the fenders are to be secured should request copies of the certificates demonstrating that the primary fenders have been tested in accordance with industry best practice, which is at intervals not exceeding two years. Secondary fenders do not require testing because they are not fitted with safety valves.

The cargo hoses employed in the STS operation should be specially designed and constructed for the product being handled and the purpose for which they are being used. One of the main issues with the thermoplastic and rubber hoses is that they may not be compatible with certain cargoes. They may not have the required resistance, particularly for some petroleum products and chemicals. Suitability of hoses will need to be verified prior to the transfer. Details of relevant standards are contained in **Paragraphs No. 9.2** of the Guide. A visual inspection of the hoses should be carried out before they are connected to the manifolds to determine that they are free of any damage and in good order.

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A common issue with STS hoses is their support. Often there is inadequate provision for proper support saddles to comply with the minimum bend radius of the cargo hoses. This can particularly be the case where the vessels are not large and use smaller fenders. The smaller fenders do not allow for sufficient distance between the vessels for compliance with the minimum bending radius of the cargo hoses. Hose strings should be of sufficient length to avoid overstressing and chaffing throughout the cargo transfer, taking into account changes in relative freeboard and ship movement. The OCIMF paper Specification Guidance for Dock Hoses (August 2006) gives additional guidance.

The cargo flow rates are also important. If the supplied hoses do not come with a maximum permitted flow rate, reference should be made to the above OCIMF paper and the STS guide for max flow rates. Different cargoes having different densities should also be handled at lower rates for safety reasons and to avoid delamination of the inner surface of the thermoplastic hoses.

Periodic pressure testing and inspection of the hoses by a third party approved by the maker should be also sought as information prior to the STS. The periodic test and inspection are mentioned in the OCIMF paper for dock hoses. The hoses should carry the appropriate markings and the commensurate certification should be made available.

Another issue for flammable, hazardous or gaseous cargoes is venting to the atmosphere by the receiving vessel. Due regard must be given to vapour dispersion and avoiding the buildup of gas concentrations around the accommodation of both vessels.

With inerted cargoes, there may be requirement for vapour balancing hoses to be connected between the inert gas lines of the two ships. Specific operational requirements will need to be developed between ships using vapour balancing, to ensure that liquid transfer start and constant rates are maintained within the capability of the gas lines. Such transfers should only be undertaken between inerted ships and the recommendations contained in ISGOTT Section 7.1.6.4 should be followed.

With some toxic chemical cargoes specified in the IMO Codes, vapour return is mandatory and STS operations involving such cargoes will be dependent upon the provision of the correct vapour return equipment,

#### **5-Mooring equipment:**

It is important that ships involved in STS operations are equipped with good quality mooring lines, efficient winches, well placed and sufficiently strong closed fairleads (chocks), bollards and other associated mooring equipment. All mooring equipment should be in good order and free of defects.

Only fairleads of the enclosed type (chocks) should be used to ensure effective control of the mooring lines as the freeboards of the two ships changes during cargo transfer. Lines that lead downwards at the start of cargo transfer may lead upwards towards the end.

Ships equipped with steel wire or high modulus synthetic fibre mooring lines should fit rope tails to provide elasticity and to permit cutting away in the event of emergency. Tails should be at least 11 metres long and have a dry breaking strength of at least 25% greater, or 37% greater if polyamide (nylon), than that of the lines to which they are attached.

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For the elasticity to be effective and really work, the rope tail should be deployed so that it remains between the two vessels. Otherwise, if it passes through the chocks, only part of the tail will effectively provide elasticity which will be significantly reduced, and the tail will be exposed to chafing at the chock. Additional wire tails should therefore be considered for vessels primarily equipped with mooring wires and rope tails, to make a system of wire-rope tail-wire tail. The wire tail passes through the chock of the other vessel and is secured to the bit. This protects the rope tail and allows for its full functionality to be used – elasticity and optimal strength.

Protectors from chafing should be considered for modulus ropes or mooring ropes at the chocks. This will usually be an obligation of the vessel deploying the relevant lines.

A prime consideration in mooring during STS operations is to provide bitts and fairleads for all mooring lines without the possibility of the ropes chafing against each other, the ships involved or the fendering arrangements.

Detailed advice on mooring equipment can be found in **Paragraph No.9.3** of the IMO Manual.

#### **6-Contingency planning and emergency procedures:**

In light of the risk of accident and the potential scale of the consequences, the organisers of an STS operation are required to develop contingency plans for dealing with emergencies. Before committing to an STS operation, the parties involved should undertake a risk assessment covering operational hazards and the means by which they are managed. The output from the risk assessment should be used to develop risk mitigation measures and contingency plans covering all possible emergencies and providing for a comprehensive response, including notification of relevant authorities.

Tankers will have in place their generic risk assessment through their Safety Management Systems (SMS) to cover STS operations. However, a specific risk assessment and contingency plan, which are local to the area of the scheduled STS operation, should be made or requested from the STS service provider.

Pre-STs training and familiarisation drills organised either on each ship individually or together with both vessels are important.

Particular reference should be focused on regional notifications and additional resources available in the area, which could be mobilised in the event of an emergency.

#### **7-Preparation for STS operations:**

Prior to the commencement of any STS operation, a joint plan of operation (JPO) should be developed to ensure that all parties involved, including the STS service provider, are in alignment with regard to how the operation is to be conducted. The masters of both tankers and the STS superintendent, if appointed, should make preparations before commencement of the operation, as detailed in **Section No. 5** of the Guide and **Paragraphs No. 6.4.1 to 6.4.4** of the IMO Manual.

Communications with the master of the other oil tanker should be established at an early stage to coordinate the rendezvous and the method and system of approach, mooring and disengaging.

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When the preparation of either oil tanker has been completed, the other vessel should be so informed. The operation may proceed only when both oil tankers have confirmed their readiness.

Each master should ensure that they are familiar with the STS operations Plan.

The completion of all checklists, examples of which are set out in the Appendices to the Guide, should be undertaken as appropriate prior to each stage of the operation. Once each checklist has been completed, each ship should confirm with the other that all items have been checked and found to be correct.

### **8-Records of compliance:**

Records of all STS cargo operations are to be noted in the STS Operation Plan (for Annex I cargoes), Oil Record Book or Cargo Record Book, as appropriate, (as well as any additional records and checklists required by the STS operation Plan and ISGOTT) and retained on board for a period of at least three years. The records shall be made available for inspection to a coastal state authority i.e. Port State Control upon request.

### **9-Liability risks:**

Various risks are evident when engaging in STS operations, such as the physical safety of the two ships involved, protection of shipboard personnel and the risk of pollution. Risks are also associated with the cargo, in particular shortage claims, given the potential difficulties of ullaging at sea. Further issues might arise from cargo quality and contamination. Such risks can be mitigated by employing the services of petroleum inspectors and pollution prevention advisors/supervisors to monitor, document and sample the cargo operations.

Particular care also needs to be taken in the event of some chemical cargoes such as those with a propensity to polymerize (styrene monomer). Such cargoes may contain an inhibitor, which may have been dosed with the intention of only a single voyage. Transshipment of such cargoes may mean that they are on board longer than intended when originally shipped. This may mean that the life of the inhibitor expires before reaching the destination, which can have disastrous results. Careful checks should be made of the validity of the inhibitor and that it is topped up and properly certified, if required. When considering compliance with MARPOL Annex I Chapter 8, further risks arise as follows:

- A tanker conducting an STS operation without notifying the coastal state authority could be in breach of MARPOL and her ISM Safety Management System (SMS).
- Vessels that conduct an STS operation without appointing a suitably qualified POAC will be in breach of their STS operations Plan and their SMS.
- Conducting an STS operation without verification of the appropriate certificates and test dates of the equipment to be used could be a breach of MARPOL and the vessel SMS.
- For non-compliance with her STS operations Plan, the vessel might also face a liability covering a period of three years.

In the event of a proper and locale specific risk assessment not being carried out, an effective, coordinated, response to an emergency situation might not be possible.

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### **10-Previous incidents / accidents:**

The most common incident to occur during STS operations is a contact/collision between the two ships while manoeuvring alongside each other, or upon departing. Collisions between the two ships typically occur for reasons which include the following:

- Incorrect approach angle between the manoeuvring vessel and constant heading (mother) ship.
- The manoeuvring ship approaching at excessive speed.
- Failure of one or both ships to appreciate meteorological and/or tidal conditions.
- The mother vessel underway not maintaining a constant heading and speed.
- The mother vessel at anchor failing to control excessive swinging and/or the manoeuvring ship failing to appreciate the swing.
- Miscommunication between the vessels during manoeuvring.
- Bridge wing to bridge wing touch for ships of similar length.

Engine failure of one of the tankers, particularly during mooring and un-mooring, can also result in a collision between the two ships. The failure of a ship's main engine to start at a crucial point has also been a common cause of accidents.

Failure of mooring lines can occur because the mooring equipment is in poor condition, insufficiently deployed or not properly deployed.

Excessive speed during mooring manoeuvres, extreme ship motion during the STS transfer operation and a poor mooring arrangement or management leading to chafing of the lines can also lead to mooring line failure. Mooring line failure can cause fatal injuries to crew members, as well as damage or failure of the cargo hose(s).

The integrity of the fenders can be compromised by the manoeuvring vessel landing too heavily on the mother tanker.

**Cargo pollution can arise from situations, which might include:**

- Failure of cargo hoses and/or mooring lines
- Deterioration of the weather conditions and/or sea state
- Damage to the cargo hose(s)
- Cargo overflow
- Machinery failure on one of the tankers
- Failure of pressure release valves, leading to tank over/under pressure
- Securing and/or disconnecting of cargo hoses in a seaway, and
- Cargo pump, valve or line failure on one of the tankers

The spillage of hydrocarbons or flammable chemicals can in turn lead to the increased risk of fire and/or explosion.

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A risk to the safety of the crew also exists in the form of gas accumulations because airflows around the decks of ships involved in STS operations are prone to eddies that prevent normal dissipation. In this regard, normal tanker safety precautions should be maintained during all cargo transfer operations.

### **11-Incident prevention:**

STS operations can be undertaken safely by adhering to the guidelines and procedures set out above. Further actions might also be considered, such as conducting an appropriate safety drill prior to the STS operation, e.g. emergency unmooring or SOPEP containment.

The bridge team should remain vigilant during the STS operation and not rely upon the POAC/STSSI (if such services are engaged).

It is also worth considering the employment of two POAC/STSSIs, particularly when the operation is expected to be protracted, to ensure 24 hour supervision and assistance.

In light of the hours of rest regulations applicable to seafarers under the STCW Convention, it is also worth considering the hours of rest taken by the POAC/STSSI before commencing the scheduled STS operation.

If STS operations are undertaken whilst underway, consideration also needs to be given to having sufficiently rested personnel on duty both on the bridge and on cargo watch. To this end additional personnel may be needed for extended or frequent operations. For vessels constantly engaged with STS operations, such as in the US Gulf, additional crew should be considered.

Given the ever-increasing diversity of crews, owners should consider providing an additional copy of the STS operations plan in the native language of the crew to ensure thorough comprehension of all concerned.

### **12-Bunkering:**

Bunkering operations are not covered by MARPOL, Annex I, Chapter 8 and are not considered as STS cargo transfer operations. However, most of the above factors can be applied to bunkering operations, particularly when the receiving vessel is at anchor. Many companies have appreciated the safety considerations and have adopted a number of points from the STS transfer checklists as part of their bunker transfer procedures and plans. With the ever more increasing LNG/LPG bunkering, the specifics of this type of bunker should be taken into consideration.

Further consideration should be given to bunkering Outside Port Limits (OPL). There are many reasons for vessel operators choosing such areas, including the avoidance of port dues and the ship could be facing arrest or an unwelcome inspection by Port State Control officers.

Bunkering OPL can be more hazardous than at a designated anchorage as the waters are typically less sheltered. In addition, in the event of an incident, it would be likely to take significantly longer to mobilize an emergency response.

Due regard should be paid to the stemming of gas oil in light of the lower flash point and the commensurate increased risk of explosion.

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