IMO-EU Joint Project: Capacity Building for Climate Mitigation in the Maritime Shipping Industry

Maritime Technology Cooperation Centre for Asia (MTCC-ASIA)

Pilot Project of Ship Fuel Oil Consumption Data Collection and Reporting

Final Report

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Host of MTCC-Asia

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Executive summary

The pilot project of ship fuel oil consumption data collection and reporting is one of the most important components enshrined in the IMO-EU Joint Project: Capacity Building for Climate Mitigation in the Maritime Shipping Industry. The main contents including in this report are overall purpose and guiding principles of implementing this pilot project, 6-step procedure of project implementation, real ship data collection and analysis, equipment inventory and examples of visibility activities.

In order to legally and effectively achieve the overall purpose of this pilot project, MTCC-Asia utilizes the 6-step implementation procedure, i.e. seminar, system development, data collection, data analysis, guideline and video development and E-reporting establishment.

The total 93,904 of sets of ship fuel consumption data has been successfully collected from 15 demonstration ships (5 container ships, 5 bulk carriers and 5 oil tankers, respectively) by MTCC-Asia. Through the data analysis, it is statistically indicated that the containership is largest oil consumer followed by the oil tanker and the bulk carrier because the containership consumes respectively 35.3% and 130.0% more fuel oil per nautical mile than the bulk carrier and the oil tanker, respectively, and also consumes respectively 88.6% and 333.8% more fuel oil per hour underway than the bulk carrier and the oil tanker. In terms of EEOI, the containership is $2.1 \times 10^{-6}$ (t/TEU·nm) while EEOI of the bulk carrier is $2.2 \times 10^{-6}$ (t/t·nm), which indicates that the containership consumes more fuel and produces more CO₂ compared to the bulk carrier.

All of the outputs including the guideline (printed and electronic versions), quick guidance (printed and electronic versions), video, E-reporting system and a USB stick which stores all of these outputs are assembled by MTCC-Asia as a package and delivered to seafarers on board in order to share the outputs of this project with the shipping industry as much as possible.
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1. Implementation of pilot project

1.1 Overall purpose of implementing the pilot project

The overall purpose of implementing this pilot project determined by MTCC-Asia is to:

- promote the awareness of implementing the IMO mandatory requirements on ship fuel oil consumption data collection in the shipping industry;
- support the region to effectively implement the IMO mandatory requirements on ship fuel oil consumption data collection through dissemination of knowledge and best practice;
- demonstrate the general situation of the given ship type fuel oil consumption;
- validate the availability and reliability of the collection method on ship fuel oil consumption data instead of emphasizing the quantity of ship fuel oil consumption data collection and ship number that the data is collected from; and
- facilitate the ships to effectively implement the mandatory requirements on ship fuel oil consumption data collection and reporting.

1.2 Procedure of implementing the pilot project

In order to legally and effectively achieve the overall purpose of this pilot project, as approved by the IMO PCU, MTCC-Asia utilizes the 6-step procedure which is wholly described with each step's purpose in Figure 1.2-1. The implementation of each step is explained in details from Section 1.2.1 to 1.2.6.
1.2.1 Seminar

(1) General information of three seminars
In order to propagate the IMO’s mandatory requirements on ship fuel oil consumption data collection and to seek the intelligent and physical support from the shipping industry and maritime administration, MTCC-Asia has held three seminars related to ship fuel oil consumption data collection and reporting in June 2017, April 2018, March 2019 in Shanghai, respectively. All seminars were participated by 56 experts and professionals from maritime administrations and the shipping industry. The regulatory requirements, overall purpose of the pilot project, significant importance, existing practices and progress, difficulties and challenges encountered and forthcoming plan with regards to ship fuel oil consumption data collection were fully exchanged and deeply discussed.

(2) Guiding principles of implementing the pilot project
The ensuing views exchanged on the seminars were formulated by MTCC-Asia as the guiding principles of implementing the pilot project:

Figure 1.2-1 6-step procedure of implementing the pilot project
The method used for ship fuel oil consumption data collection and reporting shall be able to reduce seafarer’s operational burden and/or company’s administrative burden as much as possible under the condition of the compliance with the IMO’s mandatory requirements;

The preferred method used for ship fuel oil consumption data collection and reporting shall be a system which is able to automatically collect the data on board, transmit the data from on board to on shore and produce the aggregated data on shore in accordance with the IMO’s mandatory requirements;

The system used in the pilot project shall be independently operated to avoid the unpredicted interruption to the existing system used on board;

The demonstration ships selected shall be typically representative, considering the factors such as ship type, ship size, ship age, ship voyage, automation of facility and equipment available on board; and

Ship fuel oil consumption data collected by the pilot project shall be kept anonymized and by no means can these data be published or reproduced without the written permission from the ship-owner in advance.

In addition, MTCC-Asia has also signed the support statements with three shipping stakeholders who are willing to provide the demonstration ships to support the pilot project. Section 1.3 introduces details regarding the demonstration ships.

1.2.2 System development

Based upon the guiding principles above-mentioned in Section 1.2.1, a system for ship fuel oil consumption data collection and reporting has been successfully designed, developed and put into operation by MTCC-Asia.

(1) System function

This system is able to offer the following main functions:

- To present ship’s static particulars, at least including:
  - ship name
  - IMO number
  - ship type
  - gross tonnage (GT)
  - net tonnage (NT)
  - deadweight tonnage (DWT)
  - power output (rated power) of main and auxiliary engines (kW)
  - EEDI (if applicable)
  - ice class (if applicable)
To provide the interface for automatically or manually inputting the ship’s dynamic information regarding the ship fuel oil consumption data collection and reporting, at least including the information of:

- reporting date and time
- departure port
- destination port
- navigational status of underway
- hours of underway
- speed over ground in knot
- fuel oil consumption in metric tonnes of main engine, auxiliary engine and boiler
- fuel oil type
- methods used for collecting fuel oil consumption data (method using BDNs, method using flow meters, or method using bunker fuel oil tank monitoring)
- distance travelled (over ground) in nautical mile

To store the data collected on shore and on board.

To transmit the data collected from on board to on shore in real time through the specific communication equipment independent of the existing system used on board.

To automatically aggregate data and produce the annual table in accordance with the Appendix 2 of SAMPLE OF THE COLLECTED DATA SUMMARIES in the 2017 Guidelines for Administration verification of ship fuel oil consumption data (resolution MEPC.292(71)).

To automatically aggregate data and produce the annual table in accordance with the Appendix IX of Information to be submitted to the IMO Ship Fuel Oil Consumption Database in the Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships, adopted by resolution MEPC.278(70).

Therefore, the logical functions of the system for ship fuel oil consumption data collection and reporting can be summarized as four aspects: data input, data storage, data transmission, data processing and illustrated in Figure 1.2.2-1.
Figure 1.2.2-1 Logical functions of the system for ship fuel oil consumption data collection

(2) System component
Following the logical functions of the system for ship fuel oil consumption data collection determined by MTCC-Asia, this entire system is divided into three physical components: onboard application component, data transmission component and onshore application component, see Figure 1.2.2-2.

Figure 1.2.2-2 Physical components the system for ship fuel oil consumption data collection

Onboard application component provides the user-friendly interface and enables operators to automatically or manually input the ship’s dynamic information regarding the ship fuel oil consumption data collection and reporting and store the data collected on board each ship. Figure 1.2.2-3 shows a snapshot of onboard application component (which is named as ShipFuelforSeafarers Tool). Figure 1.2.2-4 and Figure 1.2.2-5 respectively show the flow meter and the server installed on board container ships of this pilot project.
Figure 1.2.2-3 Snapshot of onboard application component

Figure 1.2.2-4 Flow meter installed in engine room of container ships
Data transmission component is to transmit the data collected from on board to on shore in real time. In order to ensure the system can be independently operated to avoid the unpredicted interruption to the existing system used on board and meanwhile the data can be transmitted in a reliable and efficient manner, MTCC-Asia selects the INMARSAT, BeiDou Navigation Satellite System (BDS) and Internet as the communication media between ship and shore for the ship fuel consumption data collection. In November 2014 the BDS has gained recognition from IMO. In comparison with other Global Navigation Satellite System, the BDS integrates navigation and short message communication capabilities. The BDS is currently able to provide the stable service within the Asia and Pacific region and it will be extended to the global by 2020 according to its development strategy. The obvious advantage by using the BDS for the ship fuel consumption data collection is that the ship can benefit from the independent communication channel, lower communication fee and simple installation of onboard terminal.

Onshore application component is the central part of the entire system. Besides storing the data collected from all demonstration ships, it is able to automatically produce the annual table as required by the 2017 Guidelines for Administration verification of ship fuel oil consumption data (resolution MEPC.292(71)) and the Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships, adopted by resolution MEPC.278(70). Figure 1.2.2-6 shows a snapshot of onshore application component (which is named as E-System of Voluntary Ship Fuel Consumption Data Collection and Reporting).
The equipment used in this pilot project includes software and hardware. The inventory of those equipment and their pictures are listed in Table 1.2.2.1 as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onboard application component</td>
<td><img src="image" alt="Onboard application component" /></td>
</tr>
<tr>
<td>Onshore application component</td>
<td><img src="image" alt="Onshore application component" /></td>
</tr>
<tr>
<td>Item</td>
<td>Image</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>BeiDou message combination terminal</td>
<td><img src="image1" alt="Image" /></td>
</tr>
<tr>
<td>BeiDou message SIM card</td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>BeiDou message terminal holder</td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td>BeiDou message terminal hoop</td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>BeiDou message terminal antenna cable</td>
<td><img src="image5" alt="Image" /></td>
</tr>
<tr>
<td>Item</td>
<td>Image</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>BeiDou message terminal USB cable</td>
<td><img src="image1" alt="Image" /></td>
</tr>
<tr>
<td>BeiDou message terminal power adapter</td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>Monitor of onboard application system</td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td>Case of onboard application system</td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>Operator manual</td>
<td><img src="image5" alt="Image" /></td>
</tr>
</tbody>
</table>
1.2.3 Data collection

93,904 sets of ship fuel oil consumption data in total has been successfully collected from 15 demonstration ships by MTCC-Asia after installing the system developed on board. The detailed information of data collected for each demonstration ship is presented in Section 2 Data collection.

1.2.4 Data analysis

Obtaining and storing the ship fuel consumption data is not the end of this pilot project. MTCC-Asia believes that the most important intent underlying this pilot project is by analyzing the data collected to demonstrate the general situation of the given ship type fuel oil consumption and to validate the availability and reliability of the collection method on ship fuel oil consumption data. The detailed result of data analysis for this pilot project is presented in Section 3 Data analysis.

1.2.5 Guideline and video development

MTCC-Asia developed and published the Guidelines on Fuel Oil Consumption Data Collection and Reporting and its corresponding quick guidance and video which presents the know-what and know-how on ship fuel oil consumption data collection and distributed those to the ships. The details of the guideline, quick guidance and video are included in Section 4 Guideline and video development.

1.2.6 E-reporting establishment

The final step of this pilot project implemented by MTCC-Asia is the establishment of a voluntary E-reporting system on ship fuel oil consumption data collection and reporting, which are distributed to ships to encourage more ships join this system and further to facilitate the shipping industry to effectively enforce the requirement. The contents related to this step are included in Section 5 E-reporting establishment.

1.3 Demonstration ships

Following the guiding principles that the demonstration ships selected shall be typically representative, considering the factors such as ship type, ship size, ship age, ship voyage, automation of facility and equipment on board, MTCC-Asia has successfully chosen 15 sea-going vessels, 5 container ships, 5 bulk carriers and 5 oil tankers as the demonstration ships of this pilot project under the generous support from three stakeholders.

5 container ships are serving the cross-continental trade between Asia and Europe, representing the newly-built ships with the average gross tonnage 122,321, length overall 336 meters, service speed 23 knots and age of 3.8 years. Compared to other types of demonstration ships, these container ships have a relatively high automatic facility and equipment installed on board. For instance, the flowmeters and the corresponding electronic supportive system are installed on these 5 container ships, which in principle provides the alternative to collect ship fuel consumption data with more frequent and accurate.
5 oil tankers represent the moderately-built ships serving the voyage within the Asian region with the average gross tonnage 635,88, length overall 234 meters, service speed 14.6 knots and age of 9 years.

And 5 bulk carriers are relatively old ships, averagely aged in 20.2 years and engaging on the coastal voyage at present. The average gross tonnage 439,71, length overall 229 meters and service speed 14.2 knots. Both oil tankers and bulk carriers are lack of electronic facility and equipment for recording ship fuel oil consumption data on board, which signifies that ship fuel consumption data can be collected in a manual and daily manner.

2. Data collection

2.1 Container ship

With regard to this pilot project, the total 91,353 sets of data related to ship fuel oil consumption have been successfully collected from 5 demonstration container ships when they are underway. The general information of data collection for 5 demonstration container ships is shown in Table 2.1.1-1. The number of data collected is not evenly distributed within 5 container ships due to the difference of data collection duration and the availability of ship.

<table>
<thead>
<tr>
<th>No.</th>
<th>Ship</th>
<th>Start date</th>
<th>End date</th>
<th>Data number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Container ship A</td>
<td>2017/9/14 0:00</td>
<td>2018/12/24 0:45</td>
<td>37206</td>
</tr>
<tr>
<td>2</td>
<td>Container ship B</td>
<td>2018/5/22 0:00</td>
<td>2019/4/23 16:30</td>
<td>6379</td>
</tr>
<tr>
<td>3</td>
<td>Container ship C</td>
<td>2017/6/7 0:00</td>
<td>2019/5/7 21:00</td>
<td>25073</td>
</tr>
<tr>
<td>4</td>
<td>Container ship D</td>
<td>2018/1/3 0:00</td>
<td>2019/1/6 14:00</td>
<td>12750</td>
</tr>
<tr>
<td>5</td>
<td>Container ship E</td>
<td>2017/7/28 0:00</td>
<td>2017/12/18 0:45</td>
<td>9945</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total</strong></td>
<td></td>
<td></td>
<td><strong>91353</strong></td>
</tr>
</tbody>
</table>

Each set of data includes data and time, status, hours travelled, distance travelled, speed, fuel consumption of main engine, fuel type of main engine, fuel consumption of auxiliary engine, fuel type of auxiliary engine, fuel consumption of boiler and fuel type of boiler. As the flowmeters and their supportive electronic system are installed and working in normal conditions on 5 container ships board, the data collected on these ships board can be with more frequent (every 15 minutes) and more accurate in an automatic manner compared to the data collected from below oil tankers and bulk carriers. Figure 2.1-1 shows the example of dataset collected on container ships by using flowmeters.
Due to uncertain reasons, data of auxiliary engine and boiler collected by the flow meter became irregular and is quite less compared to main engine, which would be ignorable in this report.

Thus based on the annual data, the aggregated data table can be automatically produced in accordance with regulation 22A and appendix IX of MARPOL Annex VI. Figure 2.1-2 shows the part of aggregated data table of a container ship.

![Figure 2.1-2 Example of aggregated data table of a containership](image)

**2.2 Bulk carrier**

The total 1,218 sets of data related to ship fuel oil consumption have been successfully collected from 5 demonstration bulk carriers when they are underway. The general information of data collection for 5 demonstration bulk carriers is shown in Table 2.2-1.
Likewise, each set of data includes data and time, status, hours travelled, distance travelled, speed, fuel consumption of main engine, fuel type of main engine, fuel consumption of auxiliary engine, fuel type of auxiliary engine, fuel consumption of boiler and fuel type of boiler. As the flowmeters and their supportive electronic system are not installed on 5 bulk carriers board, the data collected on these ships board can only be collected by seafarers after they use bunker fuel oil tank monitoring on board in daily interval and transmitted from ship to shore via the system developed by MTCC-Asia. Figure 2.2-1 shows the example of dataset collected on bulk carriers by bunker fuel oil tank monitoring on board.

Thus based on the annual data, the aggregated data table can be automatically produced in accordance with regulation 22A and appendix IX of MARPOL Annex VI. Figure 2.2-2 shows the part of aggregated data table of a bulk carrier.
The total 1,375 sets of data related to ship fuel oil consumption have been successfully collected from 5 demonstration oil tankers when they are underway. The general information of data collection for 5 demonstration oil tankers is shown in Table 2.3-1.

Table 2.3-1 General information of data collection for 5 oil tankers

<table>
<thead>
<tr>
<th>No.</th>
<th>Ship</th>
<th>Start date</th>
<th>End date</th>
<th>Data number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oil tanker A</td>
<td>2017/5/5 0:00</td>
<td>2018/5/4 0:00</td>
<td>220</td>
</tr>
<tr>
<td>2</td>
<td>Oil tanker B</td>
<td>2017/5/5 0:00</td>
<td>2018/5/5 0:00</td>
<td>296</td>
</tr>
<tr>
<td>3</td>
<td>Oil tanker E</td>
<td>2017/5/2 12:00</td>
<td>2018/5/2 12:00</td>
<td>213</td>
</tr>
<tr>
<td>4</td>
<td>Oil tanker D</td>
<td>2017/5/5 0:00</td>
<td>2018/5/9 0:00</td>
<td>321</td>
</tr>
<tr>
<td>5</td>
<td>Oil tanker E</td>
<td>2017/5/5 0:00</td>
<td>2018/5/9 0:00</td>
<td>283</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td></td>
<td></td>
<td>1333</td>
</tr>
</tbody>
</table>

Likewise, each set of data includes data and time, status, hours travelled, distance travelled, speed, fuel consumption of main engine, fuel type of main engine, fuel consumption of auxiliary engine, fuel type of auxiliary engine, fuel consumption of boiler and fuel type of boiler. As the flowmeters and their supportive electronic system are not installed on 5 oil tankers board, the data collected on these ships board can only be collected by seafarers after they use bunker fuel oil tank monitoring on board in daily interval and transmitted from ship to shore via the system developed by MTCC-Asia. Figure 2.3-1 shows the example of dataset collected on oil tankers by bunker fuel oil tank monitoring on board.
Thus based on the annual data, the aggregated data table can be automatically produced in accordance with regulation 22A and appendix IX of MARPOL Annex VI. Figure 2.3-2 shows the part of aggregated data table of an oil tanker.

3. Data analysis

3.1 Comparison of speed and unit fuel oil consumption per nautical mile

Figure 3.1-1 indicates the comparison of speed and unit fuel oil consumption per nautical mile for containership, bulk carrier and oil tanker. Compared to bulk carrier and oil tanker, containership clearly consumes the largest amount of fuel oil and produces the largest amount of CO\textsubscript{2} per nautical mile due to its fastest average speed of 15 kn and the highest portion of underway status. Due to the fact that the average speed of oil tanker is faster than bulk carriers, the oil tanker consumes more amounts of fuel oil and produces more amounts of CO\textsubscript{2} per nautical mile than bulk carrier. In a word, in terms of fuel oil consumption per nautical mile or production of CO\textsubscript{2} per nautical mile, containership is the largest consumer, followed by oil tanker. And the bulk carrier is the least. Specifically, the containership
consumes respectively 35.3% and 130.0% more fuel oil per nautical mile than the bulk carrier and the oil tanker, and the therefore emits more amounts of CO$_2$ in the same proportions.

![Graph](image)

**Figure 3.1-1 Comparison of speed and unit fuel oil consumption per nautical mile**

### 3.2 Comparison of speed and unit fuel oil consumption per hour

Figure 3.2-1 indicates the comparison of speed and unit fuel oil consumption per hour underway for containership, bulk carrier and oil tanker. Compared to bulk carrier and oil tanker, containership clearly consumes the largest amount of fuel oil or produces the largest amount of CO$_2$ per hour due to its fastest average speed of 15kn. Due to the fact that the average speed of oil tanker is faster than bulk carriers, the oil tanker consumes more amounts of fuel oil or produces more amounts of CO$_2$ per hour underway than bulk carrier. In a word, in terms of fuel oil consumption per hour underway or production of CO$_2$ per hour underway, containership is the largest consumer, followed by oil tanker. And the bulk carrier is the least. Specifically, the containership consumes respectively 88.6% and 333.8% more fuel oil per hour underway than the bulk carrier and the oil tanker, and therefore emits more amounts of CO$_2$ in the same proportions.
3.3 Comparison of EEOIs

EEOI of each ship is able be calculated based on total fuel oil consumption in ton, total distance travelled in nautical mile and total loading cargo capacity (in TEU for containership and in ton for bulk carrier) during the data collection period. Figure 3.3-1 shows EEOIs of 5 containerships and 5 bulk carriers, respectively. On an average, EEOI of containerships is $25.1 \times 10^{-6}$ (t/TEU·nm) while EEOI of bulk carriers is $21.2 \times 10^{-6}$ (t/ton·nm). Therefore, the containerships have higher EEOI than bulk carriers, which indicates that containerships consume more fuel and produce more CO$_2$ compared to bulk carriers.
3.4 Observation from method of data collection used by MTCC-Asia

From the practices of this pilot project, it is well shown that the method used by MTCC-Asia, i.e. collect data by seafarers through bunker fuel oil tank monitoring on board, transmit data through satellite communication system and produce aggregated data through electronic means is a reliable method that can be suggested to be used in ship fuel oil consumption data collection and reporting in accordance with the IMO requirements.

For ships which the flowmeters and their supportive electronic system are installed and working in normal conditions on board, the data collected on these ships board can be with more frequent and more accurate in an automatic manner.

For ships which the flowmeters and their supportive electronic system are not installed on board, the data collected on these ships board can only be collected by seafarers after they use bunker fuel oil tank monitoring on board in daily interval and transmitted from ship to shore via the system developed by MTCC-Asia. But the information type included in the ship regular daily report is not exactly same with the data type required by the Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships, adopted by resolution MEPC.278(70), causing some data required to be absent. Information type included in the regular ship daily report is varied depending on the company requirements, normally including distance travelled, average speed, fuel consumption of every kind of engine, fresh water consumption, draft fore and aft, etc. But if a ship in one day suffer different navigational status, i.e. sea passage, harbor passage and mooring/anchor status, it is not possible to find the information from some daily report to confirm the distance travelled, average speed, fuel consumption of every kind of engine for each navigational status. In particular, the method used for ship fuel oil consumption collection is not included in the ship daily report. That is if ship daily data is not stored or collected in a format in accordance with the IMO Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships, some type of data maybe will be difficult to be completely recovered when the annual aggregated data is required to be provided. Therefore, it is quite necessary to train the ship seafarers or company operators to familiarize the type of data that should be collected in accordance with the IMO Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships. To avoid the difficulty of the data recovery when the annual aggregated data is required to be provided, it is recommended that for ship which the data collection is based on manual input, the ship’s regular daily report should be adjusted so that the data scope included in the daily report should at least cover the data type required by the IMO Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships.

4. Guideline and video development

4.1 Purpose of developing guideline

The contributions made towards the mission of reducing GHG emissions from ships rely not only on the marine regulators, maritime administrators and ship managers, but also on
seafarers. As the front-line operator of a ship, MTCC-Asia is fully aware that each seafarer can play a direct and significant role in limiting or reducing GHG emissions from ships. Therefore, to facilitate readers, in particular seafarers, this guidelines publication is written in a user-friendly language through the avoidance of complex terminology and formula as far as possible and is widely disseminated to ships through visiting ships by MTCC-Asia, its branch office, pilot and shipping company when ships call at ports.

4.2 Contents of guideline

The guideline is finalized based on the observations obtained during the implementation of this pilot projects, comments of questionnaires from 15 demonstration ships and advices from IMO PCU experts. The contents of guideline are organized in five parts as follows:

- Chapter I presents the overall regulations developed and various actions conducted by IMO to enhance the energy efficiency and reduce GHG emissions from international shipping as a contribution to the global actions against climate change under the United Nations Framework Convention on Climate Change (UNFCCC).

- Chapter II provides the intent of and the mandatory requirements on the ship fuel consumption data collection and reporting.

- Chapter III introduces in detail principles, precautions and data submitted requirements of three data collection methods, i.e. method using bunker delivery notes (BDNs), method using fuel oil tanker monitoring on board and method using flow meters.

- Cases of ship fuel consumption data collection and reporting from container ship, bulk carrier and oil tanker are presented in Chapter IV.

- Operational guidance for users’ reference on a simplified software of ship fuel consumption data collection and reporting is demonstrated in Chapter V.

The guideline together with the corresponding quick guidance and video after approved by IMO PCU are disseminated to ships. Figure 4.2-1 and Figure 4.2-2 show the cover pages of guideline, quick guidance and video, respectively.
5. E-reporting establishment

5.1 Purpose of establishing E-reporting system

A demo software of ship fuel consumption data collection and reporting which is named as the E-system of Voluntary Ship Fuel Consumption Data Collection and Reporting is developed and disseminated to ships for the purpose of facilitating the shipping industry to have a better
understanding in effectively implementing ship fuel oil consumption data collection and reporting according to IMO requirements.

5.2 Functions of E-reporting system

The E-system consists of three parts, ShipInfo.hch, Data input.exe and Data aggregated.exe. The file of ShipInfo.hch is designed for inputting and storing the ship static data, see Figure 5.2-1. The Data input.exe is designed for manually inputting the dynamic data related to the ship fuel consumption data collection and reporting, see Figure 5.2-2. The Data aggregated.exe is used for searching the annual aggregated data, see Figure 5.2-3.

Once the completion of the data input and selection, click the button Confirm at the bottom right, then the ship dynamic data is sent to the onshore database if the radio communication network is available as well as stored locally at the same time.
After the completion of ship dynamic data input, the annual ship aggregated data can be automatically produced by using *Data aggregated.exe*, see Figure 5.2-3 and 5.2-4.

![Figure 5.2-3 Annual collected data summary submitted to flag state](image1)

![Figure 5.2-4 Annual aggregated data summary to IMO](image2)

6. Package of project output

In order to share the guidelines and other outputs of this project with the shipping industry as much as possible, MTCC-Asia assembles the guideline (printed and electronic versions),
quick guidance (printed and electronic versions), video, E-reporting system and a USB stick which stores all of these outputs as a package and delivered to seafarers on board through ship visiting, Shanghai Pilot Station, Ningbo Pilot station and shipping companies. Figure 6-1 shows the package of the project output is delivered to seafarers on board through visiting the ships by MTCC-Asia officials. Figure 6-2 shows the package of the project output is delivered to seafarers on board by pilots.

Figure 6-1 Package of project output delivered to seafarers on ship by MTCC-Asia

Figure 6-2 Package of project output delivered to seafarers on ship by pilots

As of the date submitting this report, the package of the project output was circulated to
2,329 vessels in total.

7. Examples of visibility activities

As per the Communication and visibility plan approved by the IMO PCU, MTCC-Asia has through social media, website, seminar, workshop, international meeting, equipment installed on board, onshore application system, ship visiting, E-learning course etc. disseminated the activities of the pilot project. The following figures show some examples of visibility activities of the pilot project.

Figure 7-1 Ship visit and seminar dissemination through Social media
Figure 7-2 Onboard installation dissemination on website

Figure 7-3 Pilot project dissemination on seminar

Figure 7-4 Pilot project dissemination on workshop
Figure 7-5 Pilot project dissemination on international meeting

Figure 7-6 Pilot project dissemination through equipment installed on board
Figure 7-7 Pilot project dissemination through onshore application system

Figure 7-8 Pilot project package dissemination on website

Figure 7-9 Pilot project dissemination through E-learning course