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Quality of seawater at seaports of southeast area and Mekong delta in Vietnam

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Abstract. Water quality of seaport is the question of interest for the sustainable development of Vietnam's seaport system, particularly the port is located on the rivers before flowing into the sea. This article assesses the current state of the system to collect and treat waste water generated in the operation of ports and water quality of seaports in the Southeast area and the Mekong River Delta, as the basis for proposed environmental protection solutions accordance with development plan of Vietnam's seaport system.

1. Introduction

Seaports in the South East region and Mekong Delta (DBSCL) are two major group seaport (group 5 and group 6) belonging to Vietnam seaport system. Port throughput is forecasted to be 306 million ton for group 5 and 156 million ton for group 6 by 2020; in 2030 is 650 million ton for group 5 and 300 million ton for group 6. The number of passengers passing through the port is forecasted to be 544 million passengers for group 5 and 70 million passengers for group 6 by 2020; in 2030 is 1339 million passengers for group 5 and 116 million passengers for group 6 [1]. With the planning of seaport system development the assessment of the current status of the seaport environment is necessary to forecast the quality of the seaport environment and propose measures to protect the environment, in accordance with the development plan of VN seaport system.

2. Method of research

To make this report, the following analysis have been used:

- Method of inquire and survey.
- Method of sampling, analysis.
- Method of data aggregation.
- Comparative method.

3. The results and discussion

3.1. Current status of wastewater collection and treatment system in operation of seaports in the Southeast region and Mekong Delta.

Wastewater from the ship



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At most seaports in the country, there is no system for receiving liquid waste, ballast water from ships. Although it is required to develop appropriate facilities for receiving waste at ports, as provided in the MARPOL convention 73/78 and Circular 50/2012/TT-BGTVT regulating reception management and treating liquid waste with oil from ships at VN seaports [4]. This is also a common situation in many of Convention member countries of developing countries, including VN. The cause of the existence is due to lack of proper attention from competent authorities and investors, there is no proper financial mechanism and legal sanctions. On the other hand, the MARPOL convention 73/78 does not yet have uniform guidelines for standards for waste receiving equipment. In the fact in VN today, oil tankers taking oil, especially crude oil in the oil export region are still floating, there is no regulation on ballast water exchange position for ships at seaports.

At some seaports in the country, the collection of oil-contaminated wastewater from ships has been carried out by a number of private units. However, the control of the transfer of contaminated wastewater has not been tight, so amount of wastewater collected at VN seaports is still very small compared to the clearance demand of the ships entering the port.

Wastes water generated on the port

a. Industrial waste water.

Industrial wastewater in seaport areas arises mainly from the process of repairing and maintain equipment and machinery of the port. The waste composition in the waste water is mainly oil and suspended substances. Only some large ports such as Sai Gon port...there is a system to collect and treat this type of waste water, while small port and local port are not treated and discharged with other types of water other water. As a result, the survey of the current state of collection and treatment to industrial waste water in some seaports is shown in table 1.

Table 1. Current status of industrial waste water collection and treatment at a number of seaports in 2015.

Ordinal	Port name	Yes/ No	Capacity m3/ day and night	Private system or combined with processing	Processing method
1	Tan Thuan port	Yes	3	Private	Grease separation + physicochemistry
2	Tan Thuan II port	Yes	3	Private	Grease separation + physicochemistry
3	Ben Nghe Port	No	-	-	-
4	Tan Cang- Cat Lai port	Yes	5	Private	Grease separation + physicochemistry
5	Binh Duong port	No	-	-	-
6	Dong Nai port	No	-	-	-
7	SP-PSA port	Yes	10	Private	Grease separation
8	Cai Mep international port	Yes	300	Combined	Grease separation, flocculation and biology
9	Can Tho port	No	-	-	-

b. Domestic waste water.

At all survey seaports, domestic waste water of port official and employees is preliminarily treated through septic tank system. However, wastewater after septic tank system has not reached the environmental standards of domestic waste water. Only a few seaports of domestic waste water will continue to be treated to the level of environmental standards before being discharged into the environment such as Tan Thuan port, SP-PSA port, Cai Mep international port.

As a result, the survey of the current status of domestic waste water treatment at some seaports is shown in table 2.

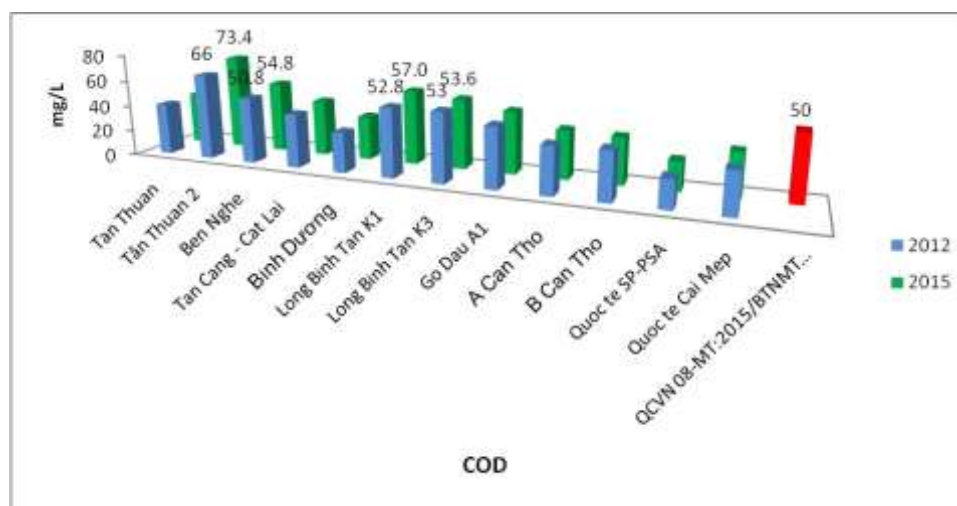
Table 2. Results and survey of current status of domestic waste water treatment at a number of seaports in 2015.

Ordinal	Port name	Waste water treatment works	Capacity m ³ / day and night	Private system or combined with processing	Processing method
1	Tan Thuan port	Yes	70	Private	Physicochemistry + microbiology
2	Tan Thuan II port	Yes	30	Private	Physicochemistry + microbiology
3	Ben Nghe port	Sump	-	-	-
4	Tan Cang- Cat Lai port	Yes	30	Private	Physicochemistry + microbiology
5	Binh Duong port	Sump	-	-	-
6	Dong Nai port	Sump	-	-	-
7	SP-PSA port	Yes	60	Private	Microorganism
8	Cai Mep international port	Yes	300	Combined	Grease separation, flocculation and biology
9	Can Tho port	Sump	-	-	-

c. Overflow rain water

All seaports have a system to collect storm water runoff on the wharf area and wharf area, rainwater collection system has been open-lined concrete of sealed box with collection gates. Overflow rainwater is deposited to separate oil and mechanical residues through gas pits and then discharge into receiving sources.

3.2 Current status of environmental quality of seaports in the Southeast region and Mekong Delta – COD and BOD content

**Figure 1.** COD content graph at some port in the South East region and MeKong Delta.

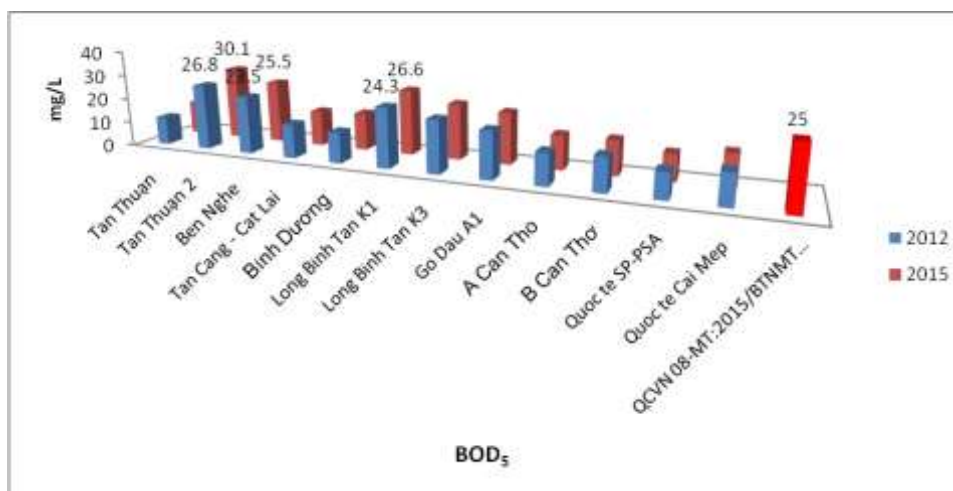


Figure 2. BOD5 content graph at some ports in the South East region and Mekong Delta.

The results show that: COD ranges from 21.5mg/l to 73.4mg/l, BOD5 fluctuates in the range of 10.3 mg /l to 30.1 mg/l. The results are compared with the national technical standards for surface water QCVN 08- MT: 2015 / BTNMT because water samples are taken at the ports located on the rivers before merging into the sea. In which, 4/12 ports have COD measurement position and 3/12 berths with BOD5 measurement position exceed permitted limit according to QCVN 08- MT: 2015/BTNMT (column B2).

TSS content

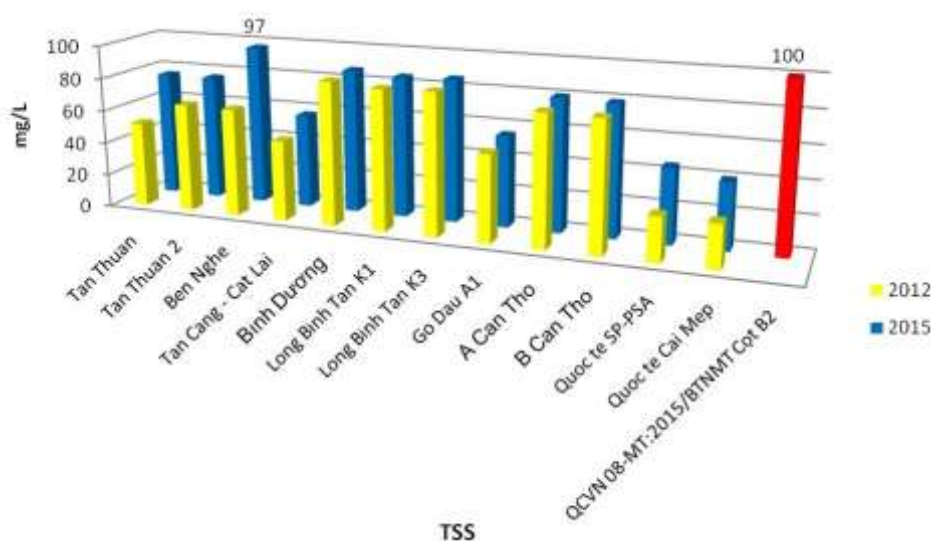


Figure 3. TSS content graph at some ports in the South East region and Mekong Delta.

The results showed that: TSS content ranged from 26 mg/l to 97 mg/l. In which no port with TSS measurement position exceeds the permitted limit according to National Technical Regulation on Surface Water QCVN 08-MT; 2015 / BTNMT (column B2).

N- NH4 concentration and grease

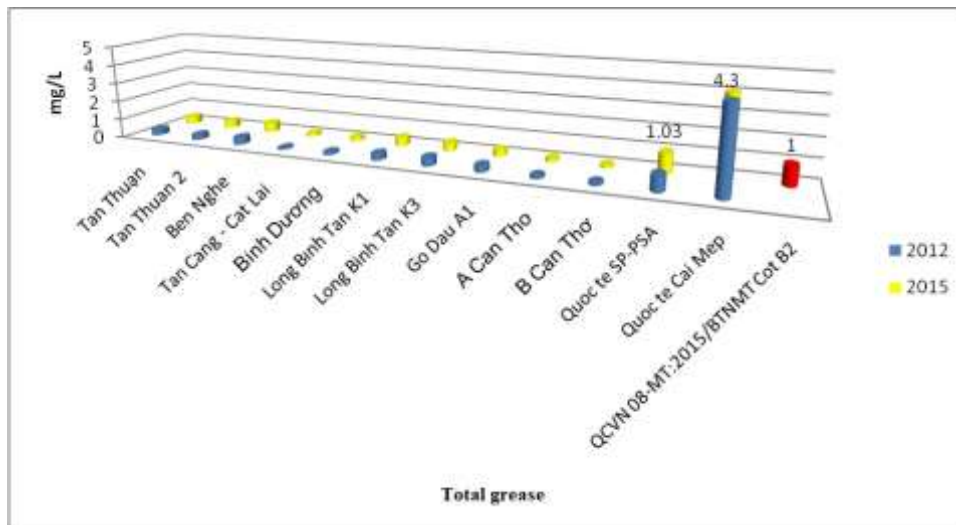


Figure 4. Concentration and grease graph at some port the South East region and Mekong Delta.

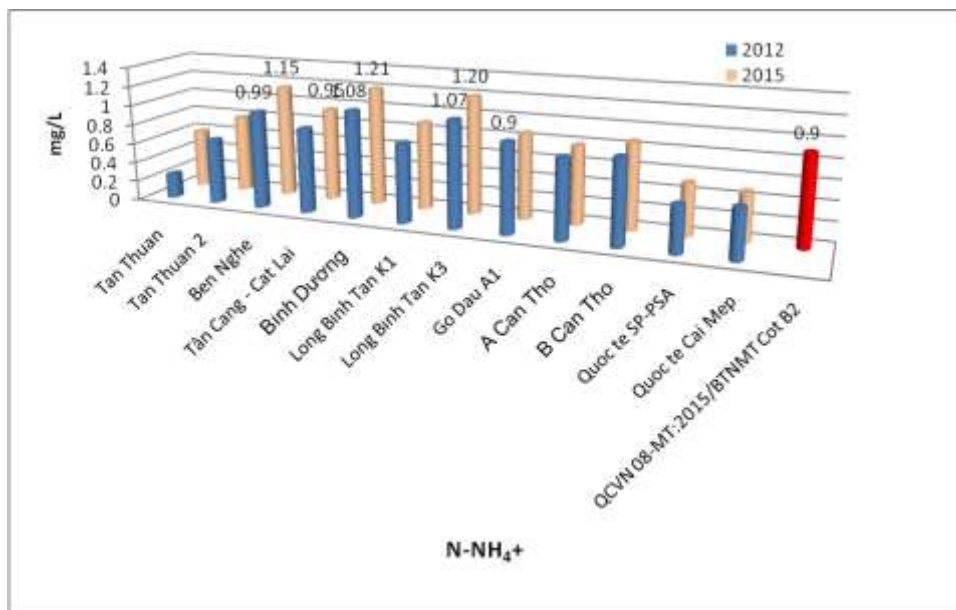


Figure 5. N-NH₄⁺ concentration graph at some ports in the South East region and Mekong Delta.

According to the surface water environment monitoring data at some ports in the South East region and the Mekong Delta, the following shows that: The concentration of N-NH₄⁺ fluctuates in the range of 0.25 mg/l to 1.21 mg/l, the concentration of grease fluctuates in the range of 0.1 mg/l to 4.3 mg/l. In which, there are 2/12 ports having N-NH₄⁺ measurement position exceeding the permitted limit, there are 7/12 ports with the concentration of grease exceeding the permitted standards according to the National Technical Regulation on Surface Water QCVN 08- MT: 2015 / BTNMT (column B2). Ports with high N-NH₄⁺ concentrations are Binh duong port and Long Binh Tan port K3, the ports with highest concentration of oil and grease are SP-PSA and Cai Mep international port

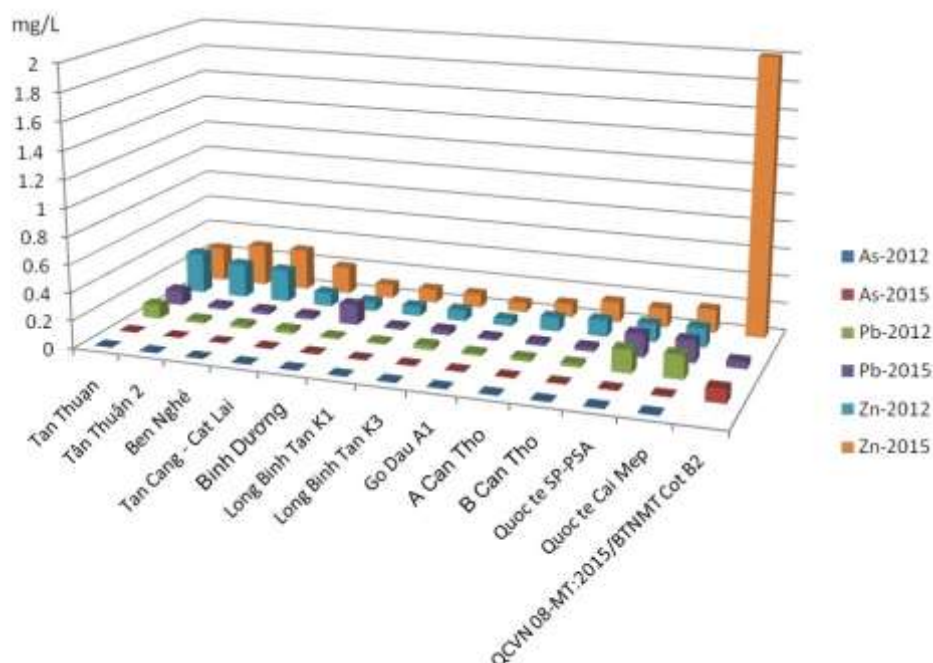


Figure 6. Concentration diagram of heavy metals in some ports in the Southeast and BSCL.

The results show that: The concentration of Pb ranges from 0.001 mg/l to 0.17 mg/l, the As concentration fluctuates in the range of 0.001 mg/l to 0.005 mg/l, the Zn concentration fluctuates in the range of 0.05 mg/l to 0.3 mg/l. In which, there are 2/12 ports having measurement positions Pb exceeding the permitted limit of SP-PSA port and Cai Mep international port, and no ports with As and Zn concentrations exceeding the permitted standards according to the technical standards. National Art of Surface Water QCVN 08-Mt: 2015 / BTNMT (column B2). Thus, the water quality of Thi Vai river has Pb metal pollution signs.

4. Conclusion

The development of seaport system inevitably affects the environment. Research results on the content of organic substances, grease, ammonium and Pb in some seaports in the South East region and the Mekong Delta exceed the permitted limits and tend to increase, indicating environment impacts increasingly, schools from domestic wastewater, stormwater runoff and oil-containing waste at seaports. To minimize such impacts, the construction of appropriate wastewater treatment systems and full and regular operation at seaports is necessary. In addition, it is necessary to have synchronous implementation measures in seaport planning to reduce pollution and sustainably develop Vietnam's seaport system.

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