

The Estimation of Vietnam National Demand for Marine Oil Spill Response Using Hypothetical Outflow from Oil Tanker

유조선 가상유출량을 이용한 베트남 해양기름유출 대응 요구량 산정

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Key Words : Vietnam national demand, Oil spill response capability, Marine oil spill response, Hypothetical outflow from oil tanker

1. Introduction

Vietnam is located in the tropical monsoon area, is the coastal and oil production country with more than 3,444 km of shoreline, thousands of islands, rivers and canals. The frequency of exploration and production of oil and gas activities and the amount of oil and petroleum products transported by vessels that enter and depart from Vietnamese ports and refineries are increasing, resulting in the big risk of oil spill around Vietnam. However, it is not known how much the amount of oil spill response demand should be. Oil spill response demand plays supposedly a vital role in setting up national response capability to marine oil spill incident in Vietnam. This study aims to estimate national marine oil spill response demand on water in Vietnam.

2. Oil transportation and offshore activities

Province	Port area	Oil Tanker (DWT)	Max oil discharge
Quảng Ninh	Cái Lân Oil Port	40,000	6,000
Hải Phòng	Hải Phòng, PITS, Đình Vũ	20,000	3,000
Thái Bình	Vien Hai Gas Field	-	-
Khánh Hòa	SPM Nghi Sơn	300,000	45,000
Đuyên Hải	Độc Oil Port	30,000	4,500
Hà Tĩnh	Vương Áng Total Storage Oil	18,000	2,700
Quảng Bình	Giảng River Oil Port	1,000	150
Điện Biên Phủ	Tham Ái Oil Port	2,000	300
Đà Nẵng	Mỹ Khê Oil Port	30,000	4,500
Quảng Ngãi	SPM Dung Quat	150,000	22,500
Bình Định	Quy Nhơn Oil Port	100,000	15,000
Phước Yên	Vương Cơ Port	10,000	1,500
Khánh Hòa	Van Phong Port	150,000	22,500
By Bin-Vang Tin, Dong Nai	Nha Trang Oil Port	10,000	1,500
	Cái Mép Oil Port	50,000	7,500
	PVC Port	50,000	7,500
	Long Sơn Port	30,000	4,500
	PITS Port	10,000	1,500
	Phu Mỹ Electric Co. Oil Port	10,000	1,500
	K2 Oil Port	7,000	1,050
	99 Oil and gas fields (Kong Do, Rang Dong, Hong Ngoc, Lan Tay, Su Tu, Doi, Dai Hung, Chi Lam, Ba Vi, Vietphong001) †	300,000	45,000
Hồ Chí Minh city	Nha Hè Oil Port	20,000	3,000
	Quy Nhơn Oil Port	25,000	3,750
	Sai Gon Petro Oil Port	25,000	3,750
	Cái Lân Oil Refinery	32,000	4,800
Cần Thơ	Cần Thơ Oil and Gas Port	5,000	750
Cà Mau	Sông Đốc Oil Field*	120,000	18,000

2. Oil transportation and offshore activities

3. Criteria of the developed countries for oil spill recovery capacity

3.1 Criterion of USA for oil recovery capacity

USA (Ref. 33 CFR Part 155 Appendix B & Subpart D)

- Target vessel: Regional Maximum oil tanker
- Maximum amount of oil discharge: Depending the amount of cargo on board
- Oil response demand on water: different according to type of oil and region

Oil Group	Nearshore/inland/ Great Lakes			Offshore			Open ocean		
	Natural Dispersion	Recovered Floating oil	% Oil on shore	Natural Dispersion	Recovered Floating oil	% Oil on shore	Natural Dispersion	Recovered Floating oil	% Oil on shore
I Non-persistent oils	80	20	10	95	[5]*	/	/	/	/
II Light crudes	50	50	30	75	25	5	100	10	/
III Medium crudes and fuels	30	50	50	60	40	20	75	20	[5]*
IV Heavy crudes/residual fuels	10	50	70	50	40	30	50	20	[30]*

* Included in table for continuity; no planning required.
Note: Percentage may not sum to 100%; reflects enhanced on-water recovery capacity

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3. Criteria of the developed countries for oil spill recovery capacity

3.2 Criterion of CANADA for oil recovery capacity

CANADA (Ref. CCG, 1995a; 1995b; CCG 1996)

PRIMARY AREAS OF RESPONSE	ON SHORE (%)	SHELTERED (%)	UNSHelterED (%)
	Holyrood	40	40
Come by Chance	40	40	20
Point Tupper	40	40	20
Halifax	40	30	30
Saint John	40	40	20
Sept-iles	40	40	20
Québec City	Tier	Maximum Quantity of oil spill (tonnes)	Mobilization Time (hour)
Montréal	1	150	6
Nanticoke	2	1,000	12
Sarnia	3	2,500	18
Vancouver	4	10,000	72

EDRC = T × 24 × E

3.5 Summary: Criteria of 4 countries for oil spill recovery capacity

Nation	USA (33CFR85, OPA90)	CANADA (CCG, 1995, 1996)	JAPAN (JCG, MDPC)	KOREA (KCG, NCP)
Target vessel	Regional Max oil carrier	Regional Max oil carrier	Regional Max oil carrier	Regional Max oil carrier
Max amount of oil discharge	All cargo on board	10,000 tons	23,000 kℓ	45,000 kℓ
Oil spill response on water	Diferent according type of oil and region	Different according region	23,000 kℓ	15,000 kℓ
Duration response	4-10 days	10 days	2-3 days	3 days
Hour per day	24h/day	24h/day	12h/day	8h/day

3. Criteria of the developed countries for oil spill recovery capacity

3.3 Criterion of JAPAN for oil recovery capacity

JAPAN (Ref. JCG, MDPC)

- Target vessel: Regional Maximum oil carrier (260,000 DWT)
- Maximum amount of oil discharge: 23,000 kℓ
- Oil response demand on water: 23,000 kℓ
- Duration cleanup: 2-3 days (12h/d)

WCD: 260,000 DWT of tanker incident spills 23,000 kℓ (crude oil) in the Tokyo Bay area

- Total response = 18,400 kℓ (3 days, 12h/d)
- Total amount response required (T)

$$T = 18,400 \div (3 \times 12) = 511 \text{ kℓ/hour}$$

4. Summary: the results of calculation for oil spill recovery capacities of 4 countries

Nation	USA	CANADA	JAPAN	KOREA
Total amount response required	15,625 tons/h* 6,250 tons/h	633 tons/h 1,267 tons/h	511 kℓ/h	16,632 kℓ/h 14,569 kℓ/h 1,894 kℓ/h

- According to the total amount of oil response required on water to be prepared to the worst case of discharge from the largest tanker incident in each country, it was shown that the total amount of oil response required on water was the highest in Korea, peaking 1,894 kℓ/h.
- Working time per day, mechanical efficiency, operating efficiency and mobilization are applied to estimation of oil recovery required in Korea.
- Therefore, the estimation method of Korea can be used as a useful method to set up the response demand of Vietnam in the future.

3. Criteria of the developed countries for oil spill recovery capacity

3.4 Criterion of KOREA for oil recovery capacity

KOREA (Ref. KCG)

- Target vessel: Regional Maximum oil carrier (300,000 DWT)
- Maximum amount of oil discharge: 45,000 kℓ
- Oil response demand on water: 15,000 kℓ
- Duration cleanup: 3 days (8 hours/day)

WCD: 300,000 DWT of tanker incident spills 45,000 kℓ (crude oil)

Total response = 15,000 kℓ (3 days, 8h/d)

- Lee Bong Gil, 2001: $NRC = T \times (3 \times 8) \times 0.2 \times 0.33 \times 0.65$ (1)
- KRISO; $NRC = T \times (3 \times 8) \times 0.2 \times 0.33 \times 0.70$ (2)
- 2010.01.01 $NRC = T \times (3 \times 8) \times 0.2 \times 0.33$ (3)

→ Total amount recovery required (T)

$$T = 15,000 \div (3 \times 8 \times 0.2 \times 0.33 \times 0.65) = 16,632 \text{ kℓ/hour}$$

$$T = 15,000 \div (3 \times 8 \times 0.2 \times 0.33 \times 0.70) = 14,569 \text{ kℓ/hour}$$

$$T = 15,000 \div (3 \times 8 \times 0.2 \times 0.33) = 1,894 \text{ kℓ/hour}$$
