



**Port de Barcelona**

# Instrumentation & Service Control of MARPOL I / MARPOL V

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**Port de Barcelona**



## INTRODUCTION

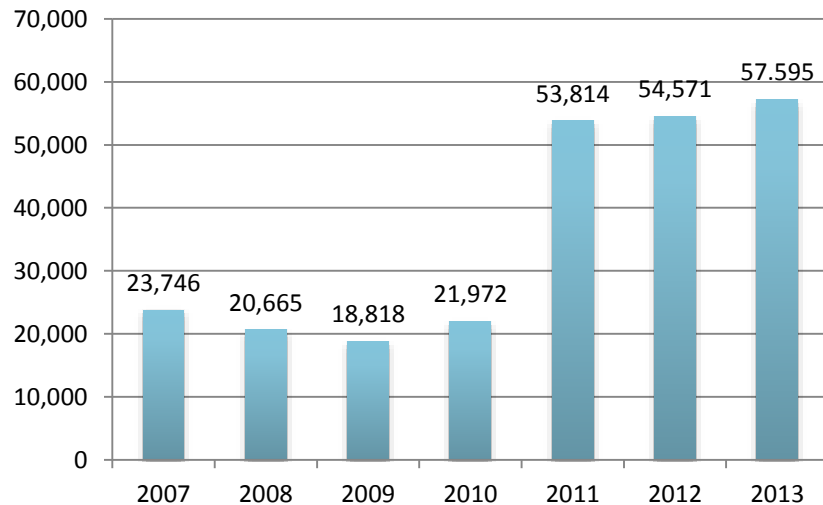
- Port Authorities - provide collection and treatment services of waste (Art. 63.3).
- Port of Barcelona - Annex I and V of the Marpol convention 73/78.
- Concessions to offer these services.
- Services billed by the operators measuring the volume of waste.
- Verify volumes given by the operator.
- Main goal: Analysis of possible alternatives to measure waste volumes.



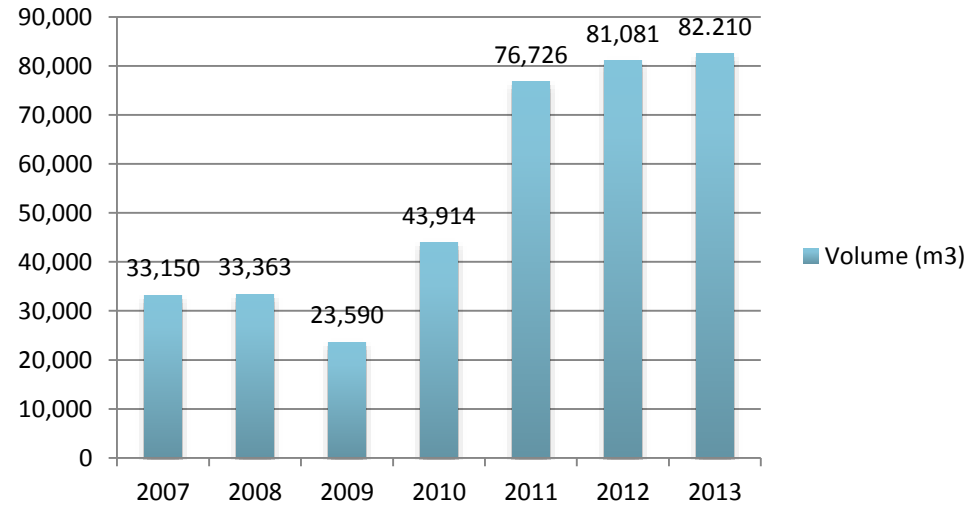
## INTRODUCTION

➤ According to the available data:

**MARPOL I (2007-2013)**



**MARPOL V (2007-2013)**





## WASTE COLLECTION

### MARPOL I

#### Collection with barge:

The waste collected is mixed inside the barge tank and delivered jointly to the homogenization tank at the treatment plant.



31%

#### Collection with truck:

12 trucks of 14 m<sup>3</sup> of capacity and 4 tankers of 29.100 L. Mostly individual operations, but also some joint.



69%

### MARPOL V

#### Collection with barge:

A very simple operation: crew members throw waste bags directly into the barge.



1%

#### Collection with open-box truck:

Container trucks of several volumes: 5, 8, 16 and 20 m<sup>3</sup>.



99%



## MEASUREMENT OF MARPOL I

### Marpol I with barge:



#### Mass flowmeter

Based on the controlled generation of Coriolis forces, capable of measuring fluid mixtures containing oils, lubricants, fuels, liquefied gases and solvents with a **accurate measurement**. It allows to **measure flow and density** at the same time.

### Marpol I with tank truck:

#### Weighing cell:

##### **Reliable measure.**

Must be completed with a **study of densities** depending on the type of vessel that allows developing a translation table of weights to volumes.



#### Radar probe:

- Measuring range up to 12 m
- Temperature range : -20 to + 80 ° C
- Pressure range: -1 to 6 bars
- Memory storage integrated
- Approved ATEX, IEC Ex, CSA, FM , NEPSI



## MEASUREMENT OF MARPOL V

- Most of the solid wastes ( MARPOL V) are collected by container trucks.
- 3 different possibilities of measurement:
  - Semi-direct system for measuring volume of waste that allows an estimation of the filling ratio of the waste container: **radar sensors**.
  - Indirect system to measure that allows a later translation to volumes of waste: **scales**.
  - A direct system that measures the volume of waste present on the box of the truck: **radiation**.



## MEASUREMENT OF MARPOL V

### Marpol V with container trucks:

#### Radar sensors:



#### STRENGTHS:

- The **difficulty** of operation and the maintenance costs are **reduced**, since the measurement is performed without contact.
- It is a very **reliable system**, due to there are no wear elements.
- The **accuracy** of the measurements is **high** and not dependent of external factors.
- Acquisition, installation and operational **costs** are relatively **low** compared to other options.

#### WEAKNESSES

- Equipment's reading indicates the maximum area occupied by the waste in the container. This implies that **the interstices of the container are not considered**.
- Any **superficial element** that stands **between the sensor** surface **and the container** can lead to **erroneous results**.





## MEASUREMENT OF MARPOL V

### Marpol V with container trucks:

Scale:



#### STRENGTHS:

- It is a type of measurement very **quick and effective** with immediate response.
- It is a very **reliable** system due to there are no wear elements.
- The **accuracy** of the measurement is **high** and not dependent on external factors.

#### WEAKNESSES:

- As a lecture of volume is **indirect** and introduces an **uncertainty** in the final result.
- Acquisition, installation and operational **costs are moderate** compared with the other options.



## MEASUREMENT OF MARPOL V

### Marpol V with container trucks:

Radiation:

STRENGTHS:	WEAKNESSES:
<ul style="list-style-type: none"><li>- It is a type of measurement very <b>quick and effective</b>.</li><li>- The <b>accuracy</b> of the measurement is <b>high</b> if it is determined that the system is suitable given the variability of the materials to be measured.</li></ul>	<ul style="list-style-type: none"><li>- There is <b>no guarantee of proper functioning</b>.</li><li>- Acquisition, installation and operational <b>costs</b> are <b>high</b> compared to other options.</li></ul>



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Thank you



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