

# Noise from moored ships: NEPTUNES measurement protocol

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## Summary

*The NEPTUNES (Noise Exploration Program To Understand Noise Emitted by Seagoing ships) project is about mitigating the noise impact from moored ships around sea ports. This project is a combined effort from eleven ports around the world. Next to legislation and information, this project aims to reduce the annoyance caused by ship noise by pricing noisy ships as an aspect of port fees. This requires a noise measurement protocol that specifies how, and which sources must be measured under representative circumstances. In addition to sound power levels, this measurement protocol will also gather information on possible hindrance aspects like tonality, low frequency and fluctuating noise. This paper will give information on the background and the status of this measurement protocol.*

## 1. Introduction

The NEPTUNES project [1] was initiated by the Port of Rotterdam and aims to get more insight into the ship-generated noise problems in ports collaborating in this NEPTUNES project. The project researches what type of ships and sources are the cause of annoyance perceived by residents living close to the port. Advancing the science of measuring and quantifying the ship-generated noise is part of the project as well as to identify the problems with legislation, regulations or policies if legislation etc. is available. The project also aims to find ways to mitigate annoyance. The acronym NEPTUNES stands for Noise Exploration Program To Understand Noise Emitted by Seagoing ships. Within the NEPTUNES project, eighteen ports collaborate. The ports are mainly situated in Europe.

Two ports are situated in Oceania and one port in North-America. Besides the project plan, the project should deliver the next deliverables:

1. Questionnaire
2. Measurement protocol
3. Best Practice Guide
4. Roadmap Implementation

This paper deals with the measurement protocol.

## 2. Noise from moored ships

In many ports noise from moored ships is an issue. Sailing ships tend to make more noise but pass by in less than a minute. A larger ship will stay moored for over 24 hours. During measurements we have learned that the sound power levels from ships like tankers, containers, general cargo and roll on roll off (RoRo) ships vary from 95 up till 125 dB(A) [2].

This means that reaching a 50 dB(A) level at a nearby house, the distance from ship with a sound power of 120 dB(A) to the nearest house should be over a 1000 meter. Often this distance cannot be reached. The effect in some ports is that every tenth ship calling on the port causes a complaint.

No regulated noise measurement protocol was found during our worldwide investigations on this subject.

### 3. Noise sources



figure 1: funnel and machine house ventilation grids

The main sources of a moored ship are the funnel and the ventilation grids from the machine house, often driven by a fan.

The auxiliary engines are often large with a capacity of over 4 MVA, enough energy for about 600 houses, based on an averaged European power consumption.

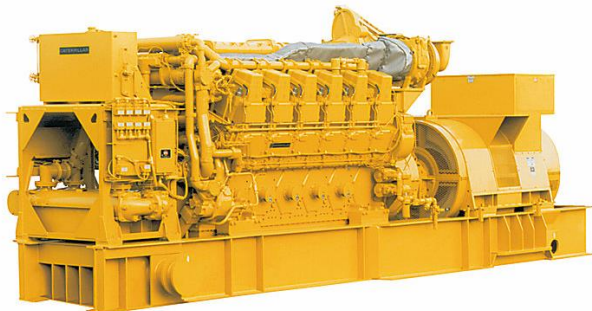


Figure 2: 4 MVA diesel auxiliary engine (picture from [www.cat.com](http://www.cat.com))

Where the funnel is an omnidirectional source, the grids are often not, being part of a building, see figure 1.

In ports these engines do not run on full power, normally at a 20 to 30% of their full capacity. Full capacity is used when bow thrusters run while maneuvering.

Next to these sources mentioned above, that can be found on any ship, reefers (cooled containers), pumps on deck, ventilation of decks and traffic on ramps from RoRo ships, have their influence.

### 4. Regulations

Ships must apply to the rules of the International Maritime Organisation (IMO). In the IMO

regulations (resolution A.468(XII), Code on noise levels on board ships, [3]) also noise is considered, but only for the crew

and on listening posts like the bridge with a noise limit of 70 dB(A). This is often not sufficient to set limits to the noise production of ships. In some ports, moored ships are part of the total noise production of the port and must respect certain noise limits. But in most ports, noise from moored ships is not restricted. So, no mitigating measures can be enforced.

### 5. Incentive

To give the moored ships an incentive to reduce noise, an option is to incorporate the noise produced by the ship in port dues. When many ports over the world share this incentive, this will hopefully reduce the noise production.

Another incentive could be that freight owners want their goods to be transported in a green way.

If noise is incorporated in a part of an environmental index for shipping, next to issues like exhaust gasses, underwater noise, waste water, etc., owners can make a choice.

To incorporate noise, the noise from a moored ship must be measured in a prescribed way, independent of location and meteorological circumstances.

Because the NEPTUNES project is about reducing noise impact, also the spectrum (tonal or low frequency noise) and intermitting noise will be evaluated.

### 6. Measurement protocol

These measuring instructions [4] have been developed to ensure that the measurements are carried out in a comparable manner in different ports by different persons. Apart from guidance on the measurements, the measuring instructions will inform about what needs to be documented during measurements and what meteorological situations should be avoided.

The setup of the measurement protocol is like an ISO standard with definitions, standards used, measuring equipment (class 1), measuring conditions (meteo, background noise), etc.

During measurements the operational circumstances must be constant. The main parameter to be monitored in this respect is the power generated for the electric equipment running on board.

The involved ports will take care of performing measurements according to the measurement protocol. This will consist of measurements on about five moored ships from each type described above.

Based on this information, the measurement protocol will be final adjusted.

## **9. Conclusions**

As part of the repression of annoyance from moored ships, a measurement protocol is established. This protocol is tested around the world on different type of ships. The results can be used as part of an incentive to lower port dues for silent ships.

## **Acknowledgements**

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## **References**

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[www.imo.org/blast/blastDataHelper.asp?data\\_id=22286&filename=A468\(12\).pdf](http://www.imo.org/blast/blastDataHelper.asp?data_id=22286&filename=A468(12).pdf)
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