

## **ÉPREUVE 4**

**CONCOURS D'ÉLÈVES ADMINISTRATEURS  
DES AFFAIRES MARITIMES  
(article 4-1 et 4-2 du décret statutaire n°2012-1546)**

## **ÉPREUVE 3**

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(article 6-1 du décret statutaire n°2012-1546)**

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**Harbouring a problem with air pollution from ships or ports**

Ports have long been gateways for global trade and are critical to economies around the world. They are hubs of economic activity; they are also major sources of ship pollution, vehicle emissions, dust and noise. Ports are often close to heavily populated urban areas – which can mean exposing millions of inhabitants to additional pollution. As city environmental agencies look to improve air quality, ports are becoming a target for air pollution control measures.

Shipping vessels with engines run on heavy fuel oil. Heavy fuel oil is much cheaper than the petrol used in land transport, but it also has a high polluting impact. The SO<sub>2</sub> content of Heavy Fuel Oil is 2700 times higher than road fuel! In developed countries SO<sub>2</sub> emissions have been dropping so that now SO<sub>2</sub> pollution is rare in urban environments. The main SO<sub>2</sub> source remaining is from ships coming into port.

Finally, ports handle large amounts of bulk materials e.g. aggregates, foodstuffs, fertilizer and wood products. These materials in dry and windy conditions inevitably result in dust drifting into neighboring areas. Dust, because it can be seen and felt by affected people, can be a major nuisance. These materials can often be smelly, which further upsets the neighbors.

This pollution causes an array of environmental impacts, can seriously affect the health of workers and contributes significantly to regional air pollution.

Major air pollutants generated by port activities include carbon monoxide (CO), volatile organic compounds (VOCs), nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), and particulate matter (PM). The health effects of prolonged exposure to these compounds include respiratory diseases, cardiovascular disease, lung cancer and premature death.

A recent study found that emissions from diesel engines, commonly used in the freight industry, are significantly more harmful to humans than those from petrol vehicles and more than 30 human epidemiological studies have found that diesel exhaust exposure directly increases cancer risk. In addition to diesel exhaust, the negative health effects of exposure to inhalable particulate matter are also well documented. These tiny particles get into the lungs and are small enough to pass through tissues and enter the blood stream. They can then trigger inflammations which eventually cause heart and lung failures. The World Health Organisation estimates that long term exposure to PM<sub>2.5</sub> is associated with an increase in the risk of cardiopulmonary mortality.

Reducing port pollution is a top priority for many governments, however it can incur significant cost and is often politically challenging. So the first step is to quantify the problem and to fully understand the type and sources of pollution. To do that an air quality monitoring programme must be put into action.

Real time air quality monitoring in areas directly surrounding port operations is the most effective way to study the impact of port related emissions. Providing continuous real-time data, a network of air quality monitoring stations can be helpful to determine what days experience elevated levels of port generated pollution. Pollution data can also be combined with meteorological parameters to help identify those most affected by port operations and explain why some monitoring sites experience better or poorer air quality days. This allows port authorities to track historical trends in air pollution, quantify the effects of port related emissions and provide a benchmark for gauging the effectiveness of pollution reduction measures. It also allows government authorities to compare local air quality with state or national clean air standards.

Once the pollution problem has been quantified through an effective air quality monitoring program steps can be taken to reduce emissions. Shipping emissions are a major contributor to overall port pollution, and here are a few ways shipping pollution is being tackled.

- **Low Sulfur Fuels**

Switching to low sulfur fuels is one of the easiest measures to reduce ship pollution. The sulfur content of Heavy Fuel Oil (up to 35,000ppm) is almost 35 times that of low sulfur alternatives such as Marine Gas Oil (MGO), which only contains up to 1,000 ppm. In addition, using low sulfur fuels also reduces other pollutant emissions.

- **Scrubbers**

Using scrubbers can cut emissions of SO<sub>2</sub> by 99% and considerably reduce emissions of other polluting particles. The advantage of scrubbers is the ability for shipping companies to continue to use cheaper bunker fuel rather than expensive low sulfur fuel. However, the scrubbing process only transfers the unwanted substance from the exhaust gases into a liquid or solid form. This material still requires disposal and there are often concerns surrounding disposal methods.

- **Engine modifications**

Internal engine modifications aim to reduce NO<sub>x</sub> production during the combustion process. Techniques such as water injection and exhaust gas recirculation can reduce NO<sub>x</sub> emissions by as much as 50%.

- **Humid Air Motor (HAM)**

HAM technology is able to reduce NO<sub>x</sub> formation by up to 80%. In HAM systems water vapor is added to combustion air to reduce temperature peaks in the combustion chamber, which are normally the main reason for NO<sub>x</sub> formation.

- **Selective Catalytic Reduction (SCR)**

SCR is an active emissions management system used to treat exhaust gasses after formation but prior to discharge into the atmosphere. Catalytic Reduction utilizes a chemical reaction to convert NO<sub>x</sub> into nitrogen, water and tiny amounts of carbon dioxide (CO<sub>2</sub>). SCR technology can reduce NO<sub>x</sub> emissions by up to 90%.

- **Shore Side Electricity**

Shore side Electricity allows ships to turn off their engines and plug into an electrical grid while at berth and has been steadily growing in popularity as a reliable solution to cutting shipping emissions. However, adoption has also been hindered by a general distrust in the industry over high initial investment costs and the lack of a level playing field in international regulations.

