

# CompMon

Compliance Monitoring for Marpol Annex VI

## Summary report of the experiences with the handheld XRF-device

---

The sub-activity 3.3 in the CompMon-project consisted of piloting the use of handheld fuel analysis equipment during onboard sulphur inspections by national inspection officers. The measuring instrument that was used in this project is an XRF spectrometer, which has the capability to measure the amount of sulphur in a bunker sample within minutes during the inspection. This gives the inspector instant information regarding the compliance of the bunker used without the need of sending the sample to laboratory for analysis. It should be noted that the result gained with a handheld XRF-device cannot yet be used as only evidence in legal proceedings, but gives the inspector a very good indication on the need of analyzing the sample in a laboratory. The equipment was acquired by the Swedish, Finnish and Dutch inspection authorities. During the action period about 430 onboard samples were analyzed with the handheld XRF spectrometer.

The equipment:

The equipment that was used in the project was the Bruker S1 Titan handheld XRF spectrometer. It is capable of detecting and measuring the concentration of elements in different substances. The equipment is used by different industries and applications e.g. mining, food safety, soil contamination analysis, plastic analysis etc. For analyzing sulphur content of the bunker, the equipment was configured to meet the specific requirements of this application.



Co-financed by the European Union  
Connecting Europe Facility



# CompMon

## Compliance Monitoring for Marpol Annex VI



After the sample is taken, it is placed on a designated sample cup for analysis. The amount needed for sample is 20 ml. The analysis takes about 30 seconds, after which the result can be read from the equipment's display. The device can also be connected to the computer and the results can be stored in multiple formats. A certificate of the measurement can be printed digitally on paper immediately after measurement. The equipment itself weighs about 1,5 kg and it is stored in a plastic case for easy transportation.



Measurement accuracy:

When comparing the results obtained with the handheld equipment with the laboratory results, the handheld equipment tends to give slightly higher values. The



Co-financed by the European Union  
Connecting Europe Facility



# CompMon

## Compliance Monitoring for Marpol Annex VI

Dutch inspection team made in 2015 a comparison with over 30 samples that were analyzed both with the handheld equipment and in a SGS laboratory.

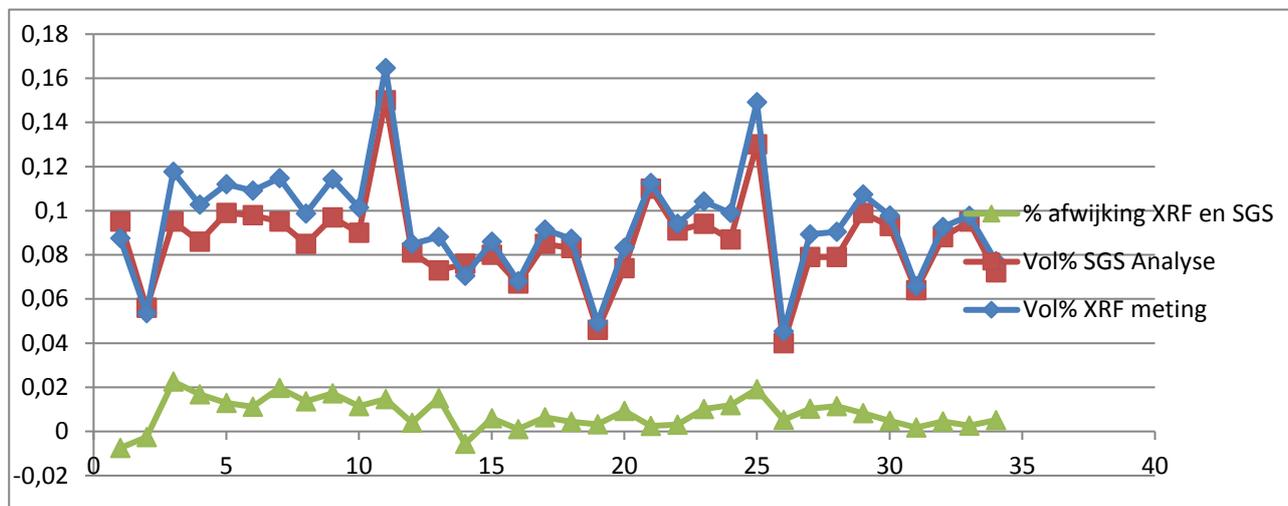


Table 1.

In Finland a similar observation was also made.

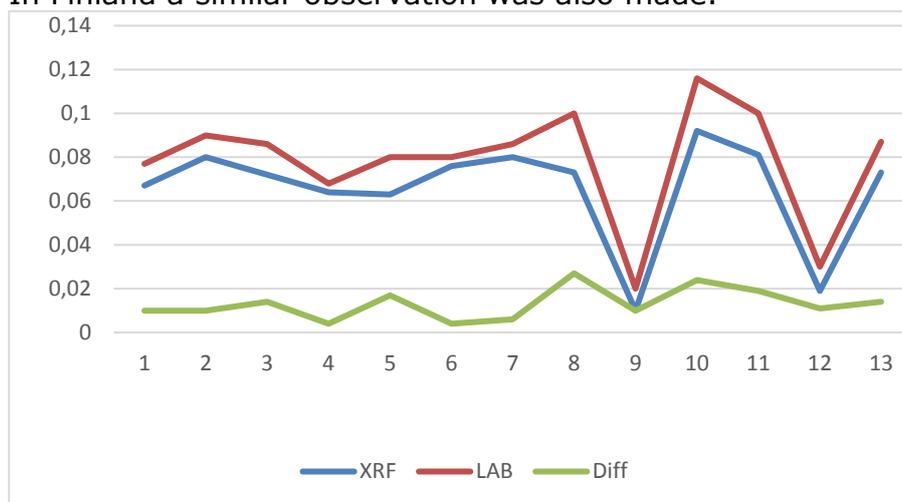


Table 2.

The XRF measurements being lower than laboratory analysis results is in fact a good thing in the inspector point of view: a slightly non-compliant XRF-measurement is more likely to be an actual non-compliance. Risk of false positives is lower.

Experiences:

A handheld XRF-scanner has proven to be a very useful tool for the inspectors. Below are some pros and cons that have been identified:



Co-financed by the European Union  
Connecting Europe Facility



# CompMon

## Compliance Monitoring for Marpol Annex VI

### Pros:

- It's easy to use. National inspection officers are not laboratory workers, but with the handheld XRF-spectrometer they don't even need to be. A short training with the device is enough.
- The accuracy of the measurements is very good.
- XRF-scanning reduces the need to send samples to laboratories, which not only saves money, but also time. Laboratory analysis results are seldom available before the next day.
- According to the Commission Implementing Decision (EU) 2015/253 on the sampling and reporting under Council Directive 1999/32/EC as regards the sulphur content of marine fuels article 6, the on-board spot sample of marine fuel shall be taken through a single or multiple spot sample at the location where a valve is fitted for the purpose of drawing a sample in the fuel service system, as indicated on the ship's fuel piping systems or arrangement plan. Such sampling points do not always exist. Thus, the sampling point(s) used may not be the optimal for the purpose. It is easy for a vessel to challenge the sampling point in court not meeting all the conditions outlined in article 6 (2). If multiple samples are taken and analyzed quickly onboard, the risk of errors is lower than in just sending one sample to laboratory. In such cases, the use of an XRF-device, can help authorities present stronger evidence in legal proceedings.
- Transportation of the equipment is easy and it can be taken into an aircraft too.
- Multiple inspections can be made with one charge of the battery.
- If national laws make it possible, sanctioning of non-compliant vessels could be done quickly without heavy and time-consuming legal proceedings.
- If the results seem to be questionable, the inspector can easily verify the function of the device during an onboard inspection by analyzing the sulphur content of a control sample that is always carried with the device.

### Cons:

- The equipment is expensive, it costs around 25 000€. The repayment when comparing the costs of sending samples to laboratory requires up to 350-400 samples.
- The use of equipment may require a radiation protection supervisor or radiation safety officer to be nominated in the organization that uses the equipment.
- Some airlines don't accept the XRF-equipment as handluggage due to safety reasons.
- Some ports don't accept the XRF-equipment on board due to safety reasons.



**Co-financed by the European Union**  
Connecting Europe Facility

