

Field test of microLFA modules for on-line measurement of nutrients in Ship of Opportunity application

*(P. Moschetta, L. Sanfilippo, E. Savino – SYSTEA S.p.A., Italy
W. Petersen and H. Thomas – Helmholtz-Zentrum Geesthacht (HZG), Germany).*

Under the frame of TransNational Access to Coastal Observatories of Jerico EC funded research project, SYSTEA had the chance to use the technical infrastructure of Helmholtz Centrum Geesthacht (HZG) to test in field conditions the new microLFA modules to measure orthophosphate and ammonia for on-line measurement of nutrients in Ships of Opportunity (SoO) application.

Both modules were developed to apply fluorimetric methods: ammonia is using the well-known OPA method and orthophosphate a modified version of molybdenum-phosphate complex spectrophotometric method, where rhodamine is used to induce fluorescence in a blank water sample, that is later mixed with the sample itself detecting the residual fluorescence. The decrease of fluorescence is proportional to the orthophosphate concentration. This PO₄ method has a much higher sensitivity (down to ppb or even sub-ppb levels) than the standard spectrophotometric one: the related microLFA module has been setup and calibrated on the measurement range 0-1 µmol/L, with the possibility to extend the measuring range up to 2-5 µmol/L too.

Three experiments were setup and performed:

- two months session at one hour measurement frequency inside the Cuxhaven fixed monitoring station placed at Elbe river mouth, where nutrients are already continuously measured from several years by a Micromac C MP4 on-line analyser
- a short session of validation tests in HZG laboratories
- one month session of field measurements on board of Ferrybox Lysbris, where NH₃ and PO₄ are already continuously measured by two Micromac-1000 on-line analysers. This ship based in Moss (Norway) is regularly performing a weekly route in the southern North Sea to Halden (Norway), Ghent/Zeebrugge (Belgium) and Immingham (England).

Measurement data were collected by HZG's Ferrybox datalogging system and they were available over the Internet accessing the HZG Time-Series Database and the FerryBox database respectively.

A technical update was identified during the start-up in Cuxhaven station and later improved on a second orthophosphate module, in order to allow a quicker and more efficient microLFA reactor autocleaning.

For Cuxhaven and Lysbris field tests, measured data were post processed by HZG to compensate the offsets from different calibrations between the microLFA modules and the existing on-line analyzer. The results will be compared with regularly token bottle samples analysed in the lab.