

8th FerryBox Workshop

*Robust Sequential Injection Analyzer for autonomous
Nutrient Analysis*

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Robust Sequential Injection Analyzer for autonomous Nutrient Analysis

Mission Objective and resulting Design Goals

“To construct a platform for the development of reliable, autonomous nutrient Analysers, usable on-board ships in ocean and river environments in liaison with the FerryBox-System”

→ Flexibility

→ Remote supervision and control

→ Low detection Limits

→ High Reliability

→ Low reagent consumption

→ High Sample Frequency

Robust Sequential Injection Analyzer for autonomous Nutrient Analysis

Implementation of Requirements and Design Goals

→ Flexibility

- 16-Port Valve
- Raspberry Pi; Python

→ Remote controllable

- Connectivity via Ethernet, W-Lan, Bluetooth, Serial, ...

→ Low detection Limits

- 50 mm cuvette for NO_x
- Hamamatsu Spectrometer

→ High Reliability

- Atmega Microcontroller
- Internal Error detection

→ Low reagent consumption

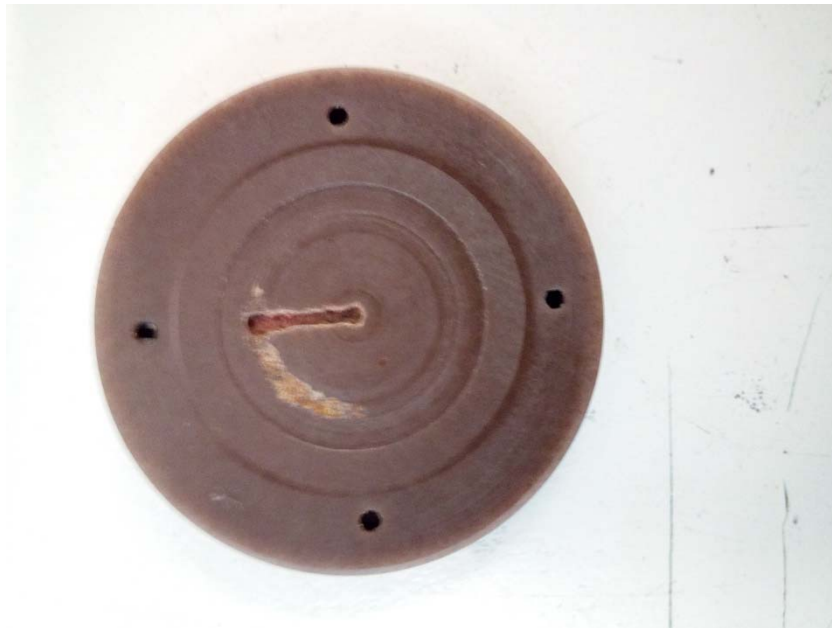
- Small diameter piping (0.25 mm)
- Smallest available diameter for cuvette

→ High Sample Frequency

- Hamamatsu Spectrometer

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Drawbacks of the chosen Set-up



- Material of sealing disk
- Blocking due to small diameter
- Cavitation effects
- length of the cuvette

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NOx Analyser | Limits | Experience | Outlook



Reagent Consumption

Puffer:	0.17 ml
Colour:	0.17 ml
Sample:	0.50 ml

NO₂

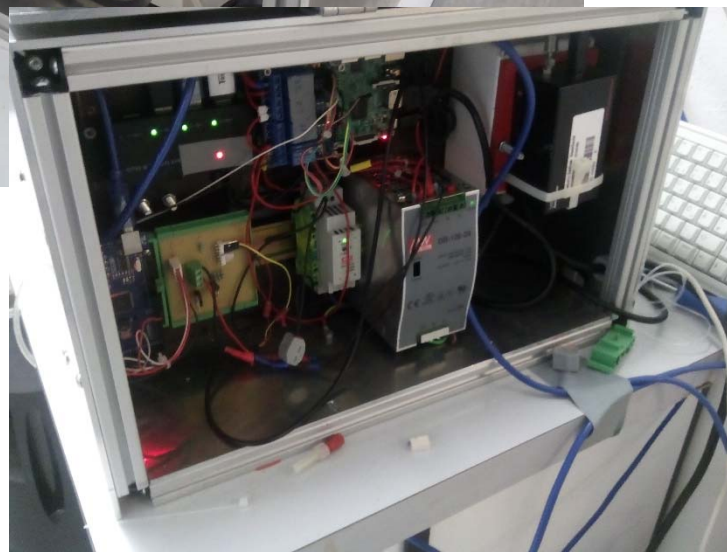
Detection Limit:	~ 0.1 µmol/l
Duration:	~ 50 s

NO₃

Detection Limit:	~ 1.9 µmol/l
Duration:	~ 10 min

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PO₄- Analyser | Limits | Experience | Outlook



Reagent Consumption

Acid:	0.20 ml
Colour	0.20 ml
Sample:	0.50 ml

PO₄

Detection Limit:	~ 0.05 µmol/l
Duration:	~ 60 s