

WATER ALIQUOTING SYSTEM

AUTOMATED PLATFORM FOR PREPARATION AND ALIQUOTING OF WATER SAMPLES

INTRODUCTION

Regulatory requirements mandate that governments and companies maintain strict control over their water samples, which may include industrial wastewater, surface water, and groundwater. These samples require multiple analyses to determine the presence of various elements and contaminants. To assist customers in this time-intensive process, Nucomat has developed an advanced water aliquoting robot.

This automated system efficiently subsamples from a primary source recipient into six designated vials, each allocated for a specific analysis: total nitrogen (TN), total phosphorus (TP), total Kjeldahl nitrogen (TKN), Dissolved / Total organic carbon (DOC/TOC), and Chemical oxygen demand (COD). In addition, the system also executes essential sample preparation steps, such as reagent addition, pH adjustment, mixing, capping, and decapping.

With a processing capacity of up to 300 source recipients per 24-hour period, the system generates an average of 900 aliquots daily, significantly optimizing workflow and accuracy.



Figure 1: Picture of the aliquoting system

AUTOMATED ALIQUOTING SYSTEM

To ensure precision and efficiency, the system incorporates:

- An integrated **Kinematica disperser** for mixing samples.
- A **transfer station with a mixer**, ensuring homogeneous samples before aliquoting.
- **Peristaltic pumps** for accurate sample liquid transfer and addition of 3 reagents into designated vials.
- **Gravimetric control with an integrated balance**, ensuring precise volume measurement and data storage in a centralized database.

The system consists out of 3 robotic areas: an input robot, a decap robot and an output robot.

1. **The input robot:** Handles the source samples. The pneumatic gripper on the XYZR gantry robot moves the samples and (de)caps the bottles. Each bottle is automatically tracked by barcode. The system will retrieve the relevant data from the customers LIMS database to assign the proper sample protocols.
2. **Output robot:** This XYZ gantry robot is equipped with 6 pneumatic cylinders with a gripper. The robot collects and moves all required output vials of a sample at once. The output vials are collected from storage racks and are placed on the balance in the sample transfer station. The dispenser pumps the fluid of input sample at the input robot to the designated output vials. Duplicate vial positions allow for one set to be filled while a second set of vials is moved in position to accept the next sample.
3. **The decap robot:** functions as substation to the output robot, dedicated to decapping, moving and recapping 50ml vials for total nitrogen and total phosphate. Shuttles in the 50ml vial transfer station move the empty decapped vials to the output robot and return them for recapping after filling in the output robot.

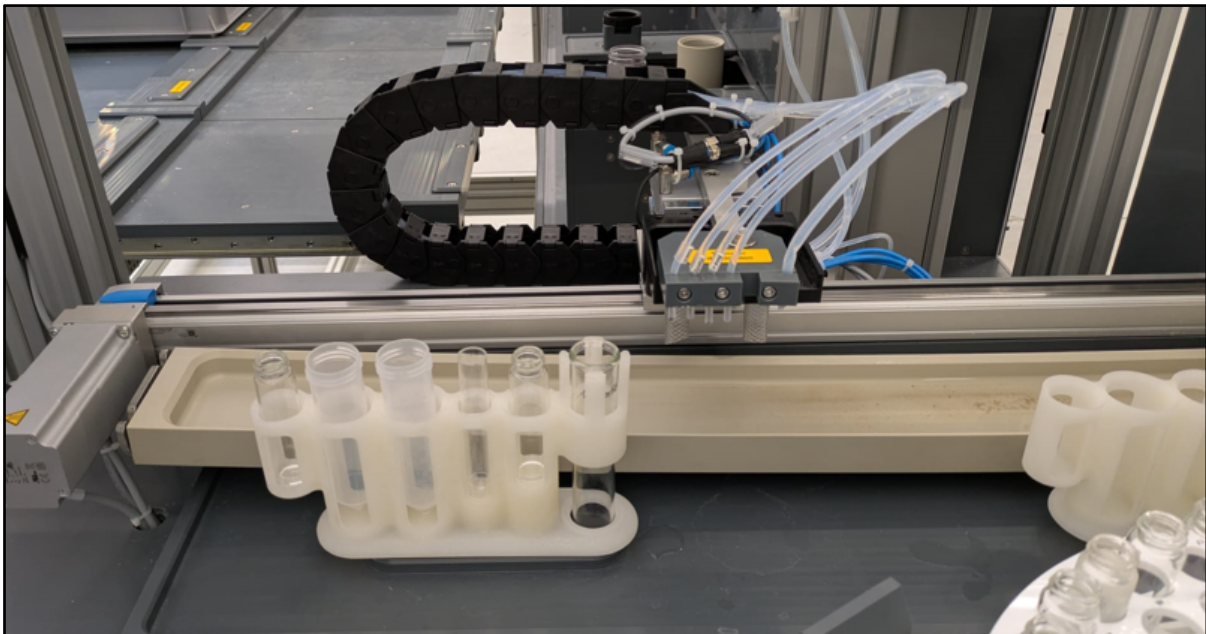


Figure 2: Motorized sample liquid transfer shuttle with dispensers

This innovative system streamlines the water sample preparation process, reducing manual intervention while ensuring consistency and regulatory compliance. Designed for high throughput and precision, Nucomat's water aliquoting robot is an ideal solution for laboratories and industries requiring automated, high-volume water sample analysis.

Technical specifications:

- Total dimensions: 5200 L x 2000 W x 2000 H mm
- 24/7 Operation
- Sample identification by barcode and direct communication with the customer's LIMS
- Estimated throughput: 300 source samples, resulting in 900 aliquots
- Devices:
 - o 2 XYZR gantry robots capable of (de)capping
 - o 1 XYZ gantry output robot with 6 grippers
 - o 1 Dispenser (Kinematica)
 - o 1 Dispenser transfer station with 2 parallel positions
 - o 2 pH adjustment stations
 - o 1 Conductivity measurement station
 - o In- and output drawers for samples and aliquoting vials

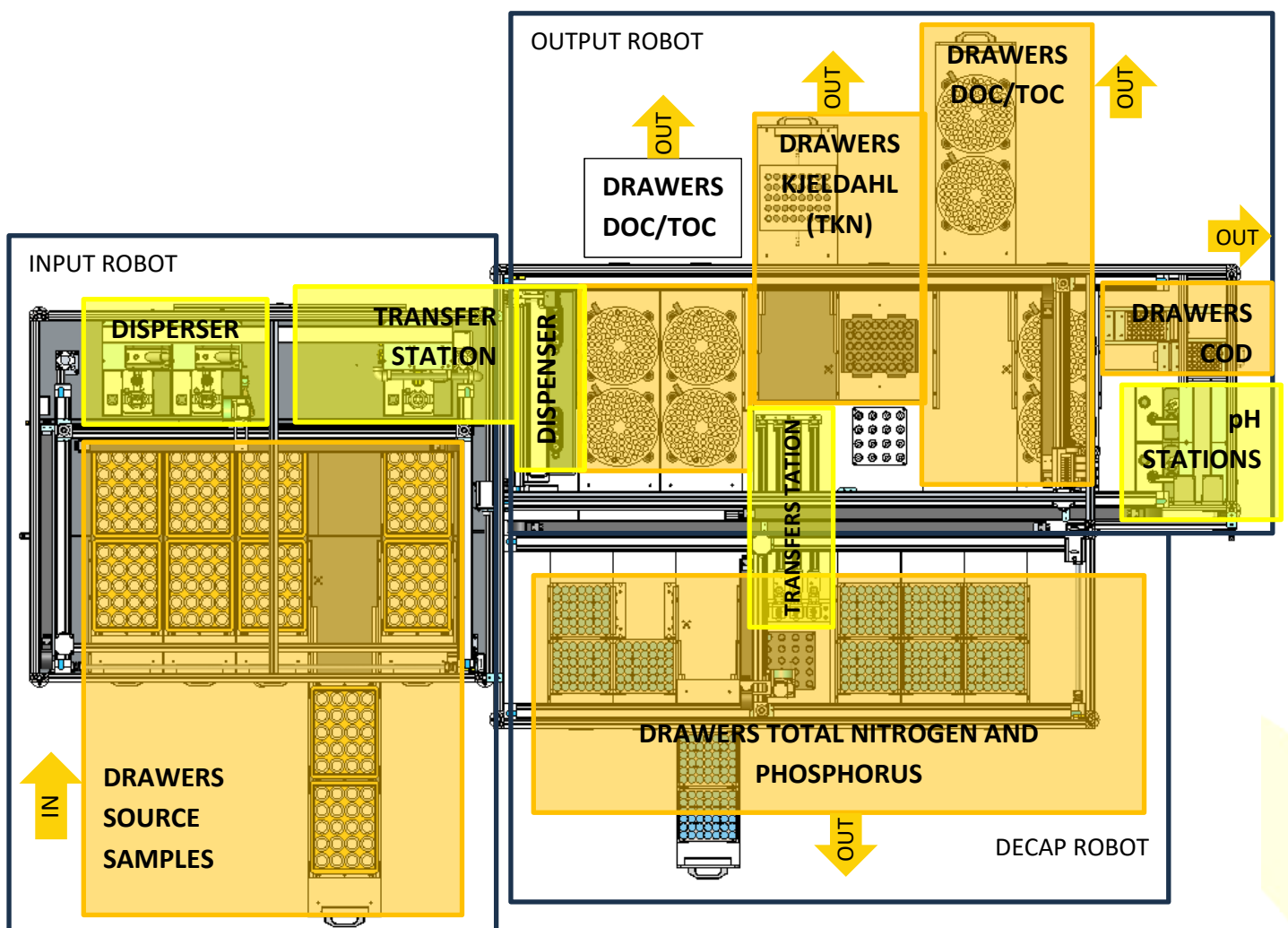


Figure 3: Layout of the water aliquoting system

CENTRAL WEB BASED SOFTWARE

The platform is controlled by **ROBIN**, a real time event driven **scheduling software** developed by Nucomat. The user-friendly web interface allows the user to run samples, oversee the processes and get information and timely warnings or errors. All samples are electronically **tracked** from registration to result and relevant actions are logged to a database. Sample data can be validated online through the web interface and released for reporting, typically to a LIMS system. **Input and reporting** functionality is available with various file formats or with a direct connection between the Robin database and the customers LIMS.

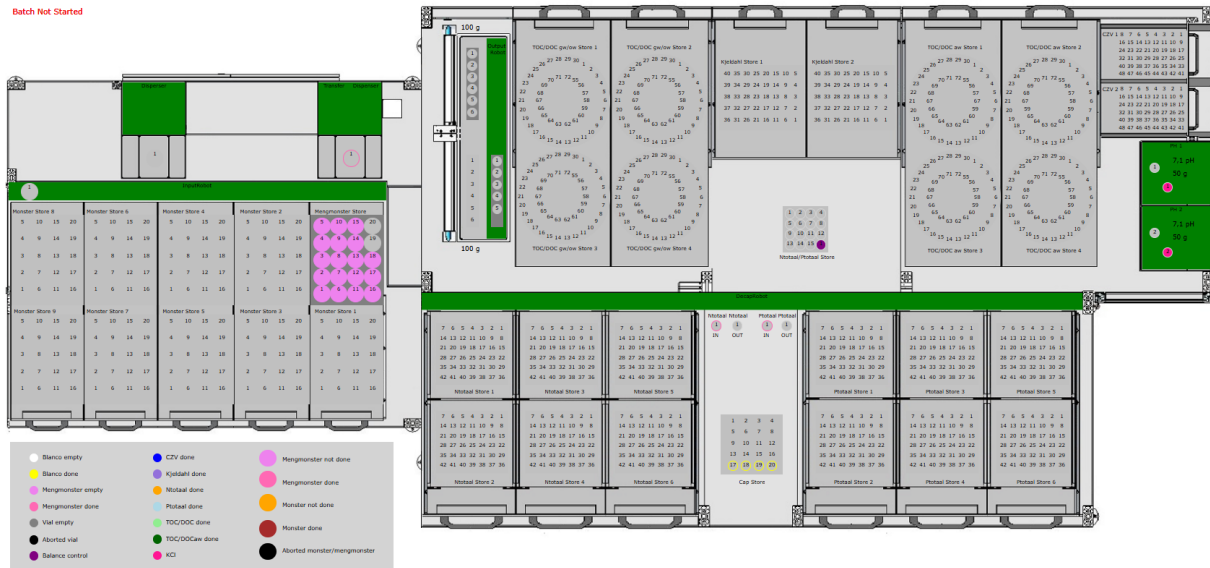


Figure 4: Web interface of the water aliquoting system

BENEFITS FOR THE USERS

- Operator safety
- Gravimetric accuracy
- Free up time for lab technicians
- Traceability and repeatability

TAILOR-MADE SOLUTIONS

Next to turnkey automated system projects based on your requirements (capacity, sample prep, characterization protocols, ...), Nucomat also provides standard products for dedicated routine tasks like dispensing or powder dosing. Instruments from 3rd party manufacturers can be integrated in the automated system to expand the system specifications.

CONTACT

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