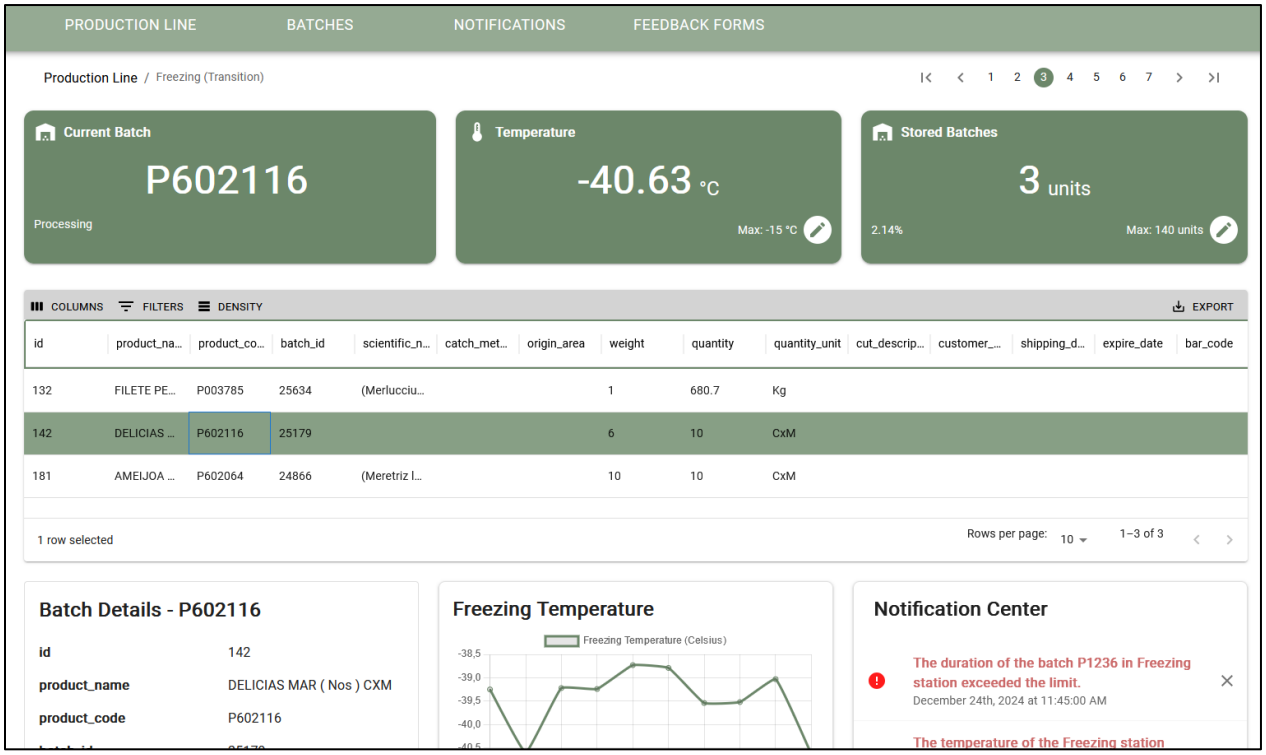
AGILEHAND Project - WP6.1 Traceability Solution



1st Software Demonstrator for the WP 6.1 Traceability Solution

Documentation

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1. Introduction

This document describes the implementation status of traceability solution function for the 1st demonstrator (April 2025).

The documentation is as follow structured: After a general introduction in chapter 1, the connection to the software demonstrator will be described in more detail in chapter 2. After that a general overview of menu of the software demonstrator will be presented in chapter 3. Moreover, in chapter the implemented functions of the 1. Demonstrator will be explained. As an outlook the next implementations steps a teaser for 2. Demonstrator is given in chapter 5. Additional to that, a video for guiding the user to the menu should support the usage of the demonstrator and is uploaded to the Agilehand Teams folder: 250417_First_Demonstrator

2. Connection to the software demonstrator

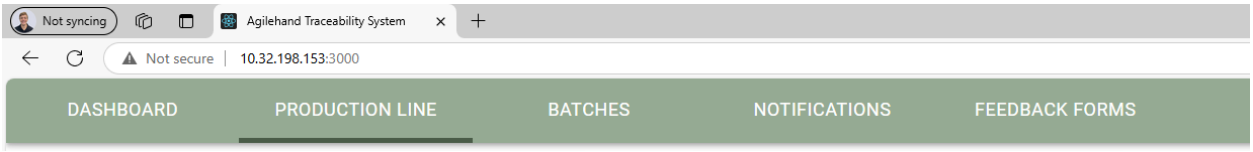
Check the attached document with the title 250417_VPN_Connection_Fraunhofer which you can also find here: 250417_VPN_Connection_Fraunhofer.pdf.

To access it, it is necessary to be connected to the Fraunhofer IPT's network or VPN and enter the following URL in a browser: http://10.32.198.147:3000/.

3. General Overview

This software is part of the AgileHand project (AgileHand Project - AgileHand) and aims to deliver a comprehensive product-oriented solution to ensure compliance with international standards, integrating systems and data sources. It will also make it possible to analyze the production line in real time and track performance to support decision-making.

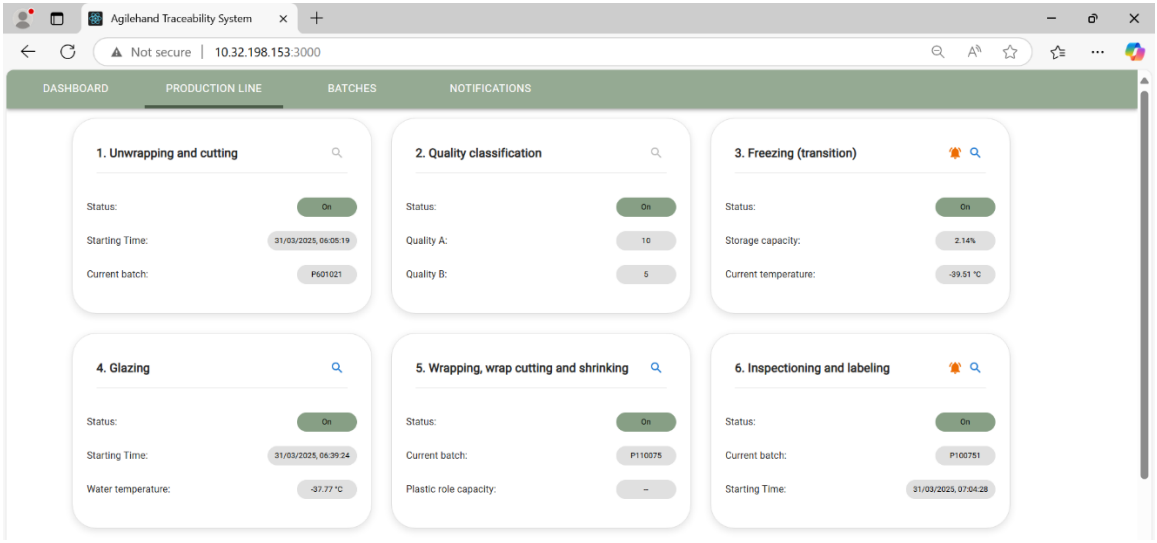
Via the navigation bar on the top of the screen, it is possible to access the 4 main pages of the application.



Navigation bar

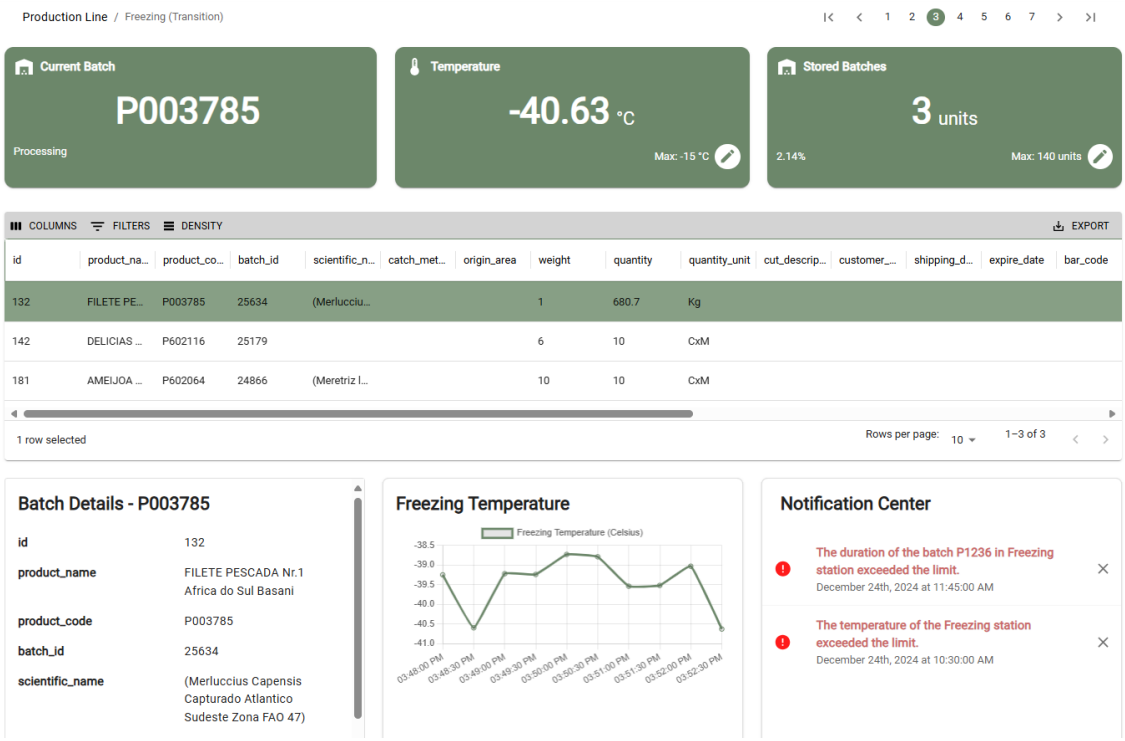
Pages are Dashboard, Production Line (where can also access the Production Line Details for each station), Batches and Notifications. Feedback Forms stands for a link to send suggestions or report bugs of this version.

The Production Line page provides real time data about each station at http://10.32.198.147:3000/.



Production Line page

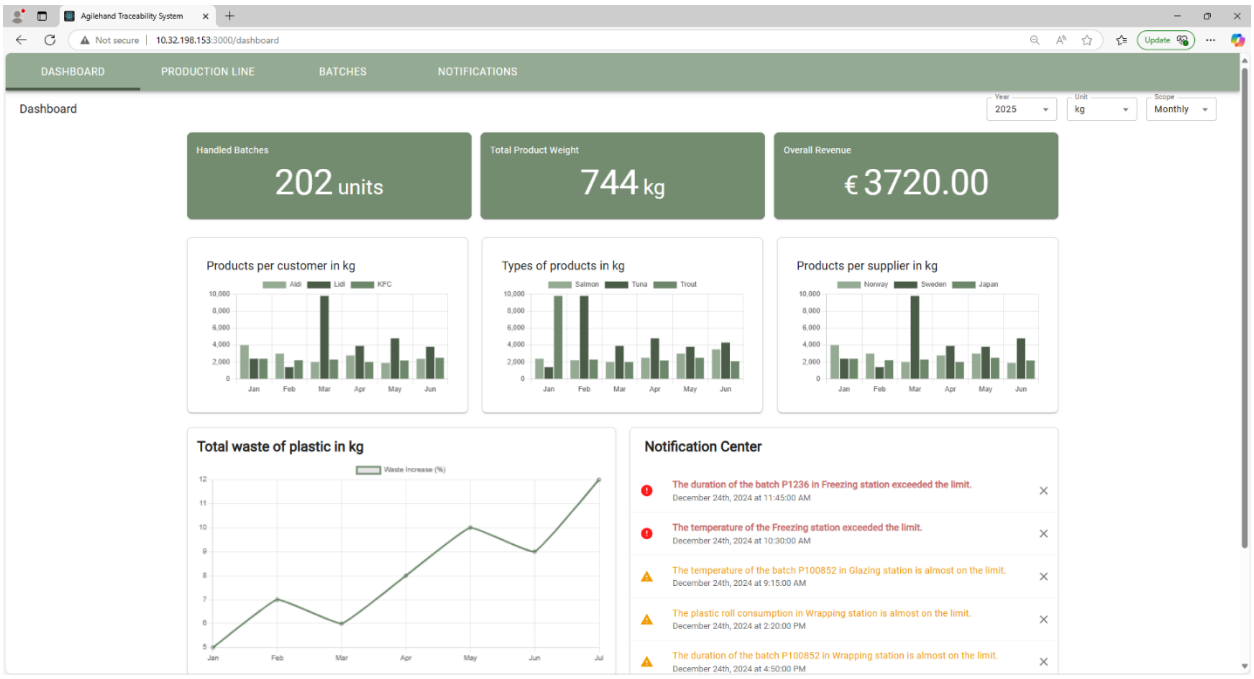
Production Line Details about each station can be accessed by clicking on the magnifier glass icons, which will show more detailed information from the sensors and the current batches that are being processed there.



Freezing details

The numbers navigation bar at the top right can be used to go to the other station pages without clicking on the Production Line magnifier glasses. Observe that stations 1, 2 and 7 are not available in this version, therefore redirect to the main page.

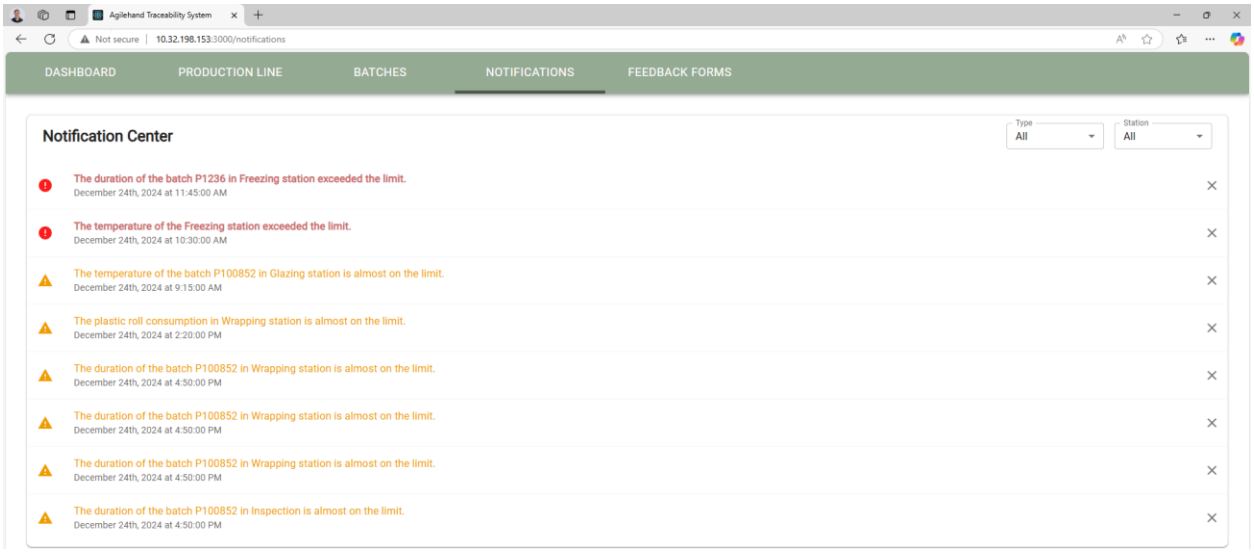
The Dashboard page is accessed at http://10.32.198.147:3000/dashboard and provides a bigger and more general view about the batches that were handled in a yearly scope.



Dashboard page

Batches page (http://10.32.198.147:3000/batches) provides a list of all registered batches in the database, along with their details and production line historical information.

Notifications page (http://10.32.198.147:3000/notifications) summarizes all main occurrences of the production line, regarding the temperatures and process durations, for example.



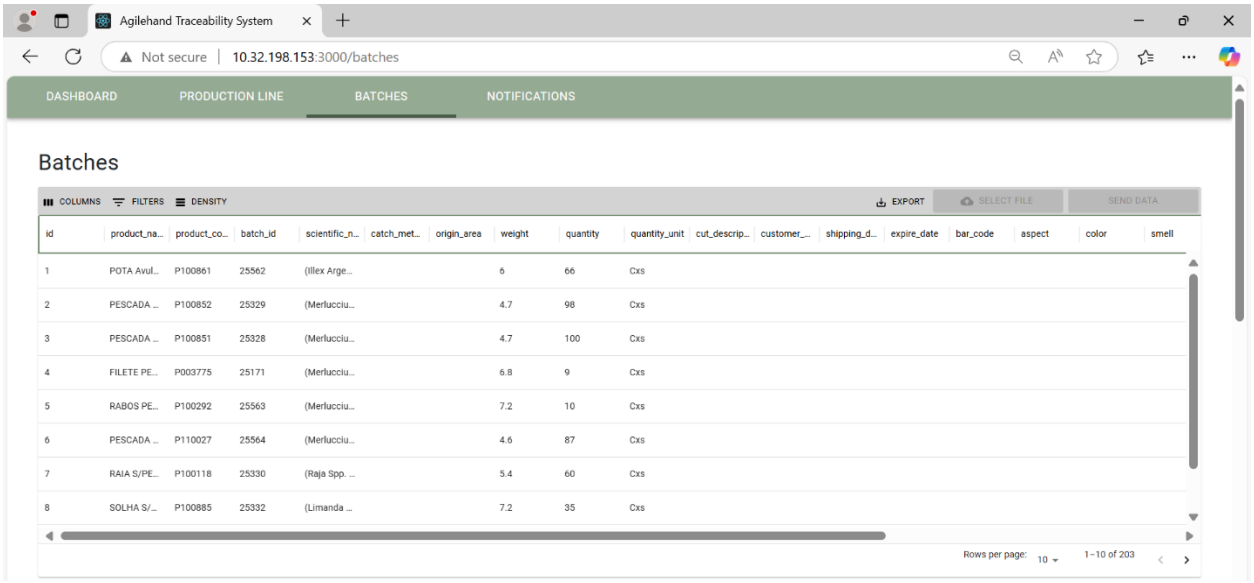
Notifications page

4. Implementation details of 1. Demonstrator

For the development of the 1. Demonstrator different functions were taken into account. These functions are transferred into specific functions which will be described in more detail below.

Function #1 – List all batches

Table that can be accessed in http://10.32.198.147:3000/batches.

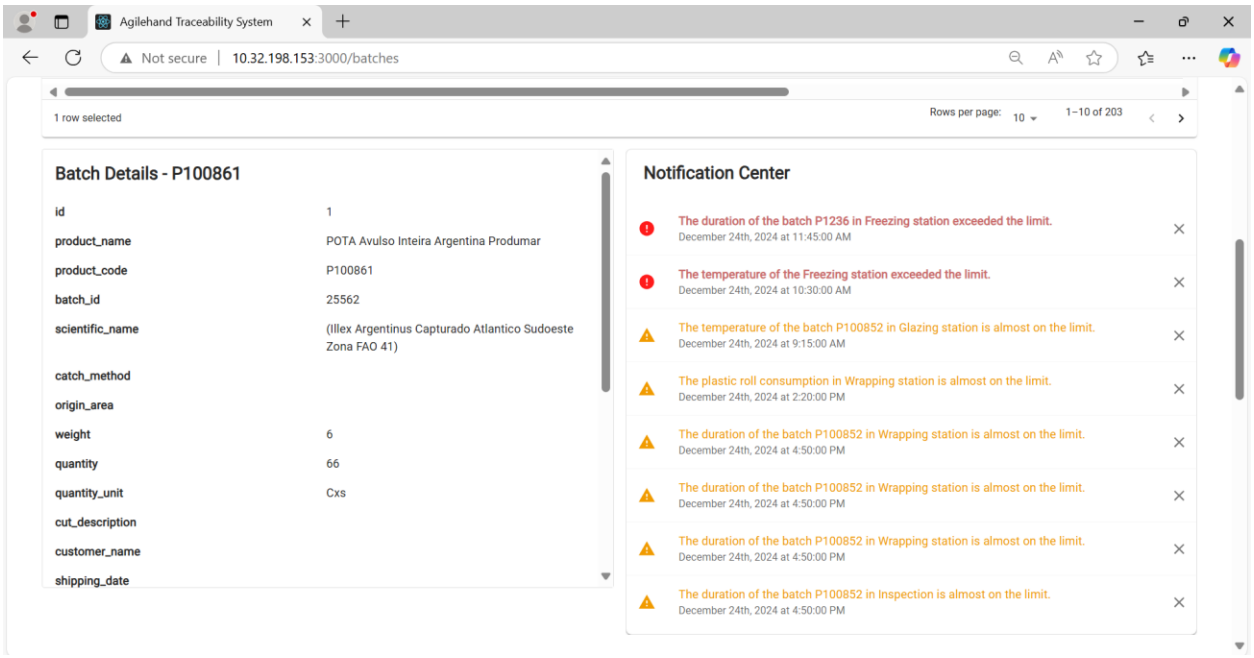


List of registered batches

This data comes from the file *Producao.csv* and is integrated with the database.

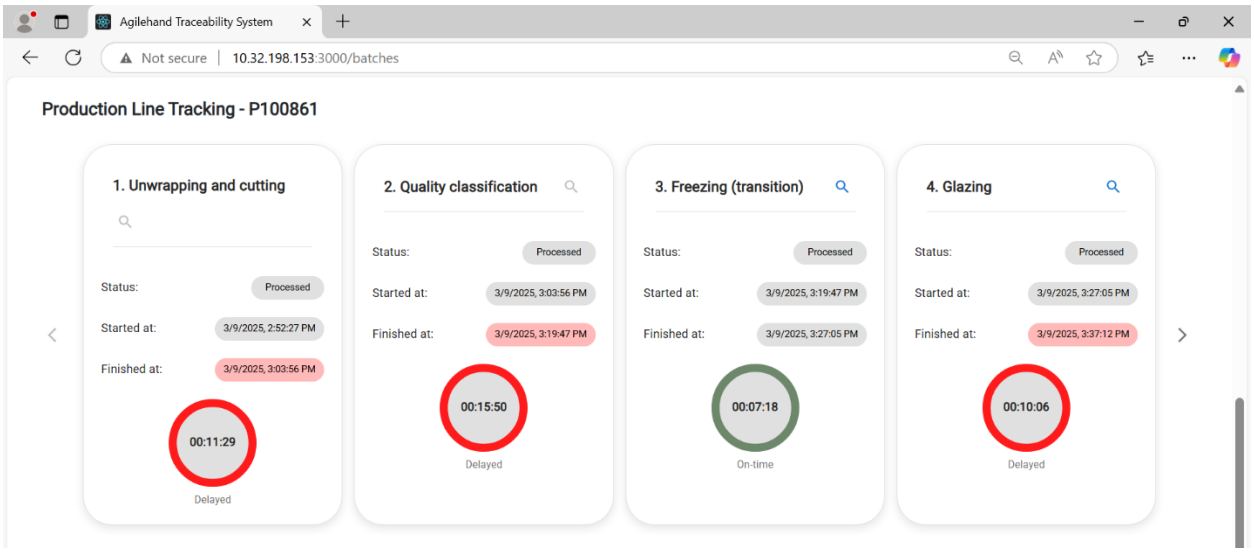
Function #2 – Batch information about current production stage and general batches details

Entering the batches page at http://10.32.198.147:3000/batches, it is possible to filter and sort the batches table to select a specific batch and visualize this information.



General batch details

Batch details come from the file *Producao.csv* sheet and are stored in the database. Information displayed in the dashboard is integrated to the back end.

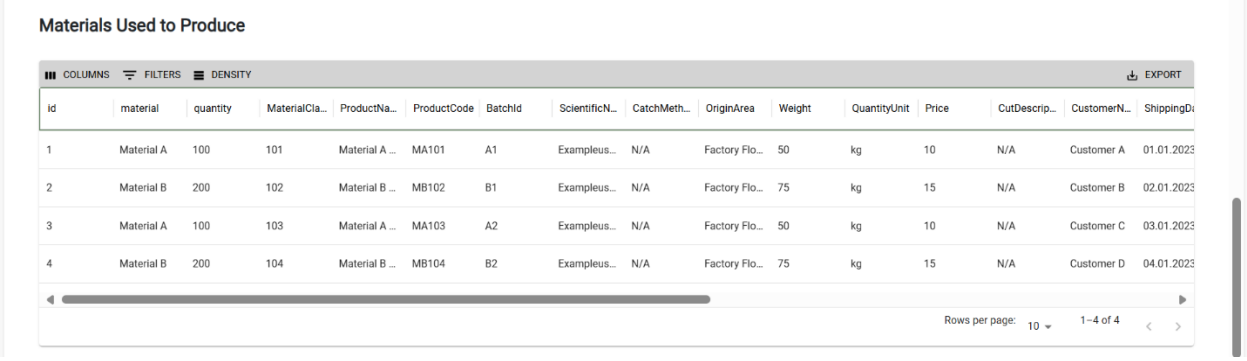


Current production stage of a batch

Production line tracking information is stored in the database and the display is connected to the back end. However, all data currently stored about start and end of processes is dummy. Therefore, a script which creates synthetic data was created to simulate already incoming sensor data. The generated mockup data represents data from March 2025. Also to show the individual pages in more detail it was assumed that every station is in this scenario in an active mode. This mode was chosen only to display for every production line

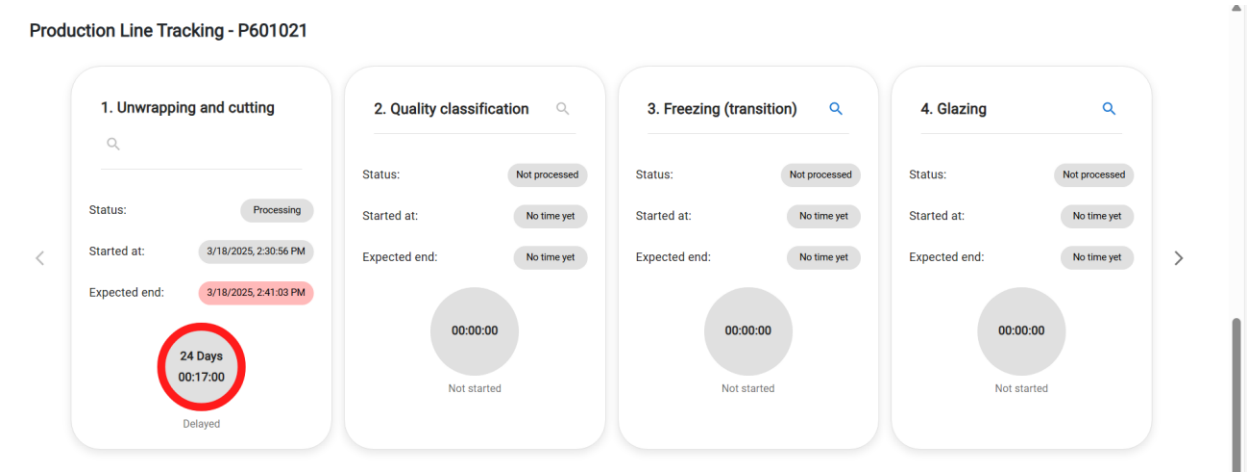
detail page, all already implemented functions. The integration of original sensor data is planned to be integrated in the 2. Demonstrator.

Materials data for every batch are not currently stored in the database yet. Therefore, this table information is hardcoded in the front end and not integrated into the back end.



Materials information of a batch

Function #3 - Batch information about estimated time for completion



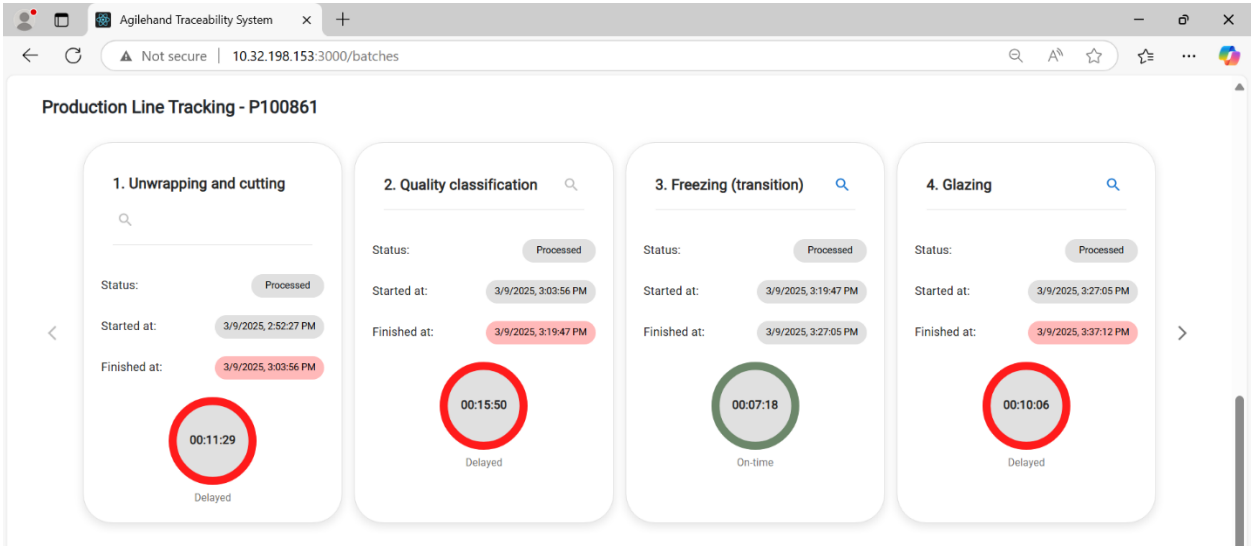
Production stage for running processes

Running processes have an “Expected end” parameter, that is calculated as follows:

- If there are at least 10 processed batches recorded for that station, the expected end is calculated based on the average duration of all past processes.
- If there are less the 10 processed batches, then it assumes 10 min for the expected duration.

As with the completed processes, the information about running processes is also linked to the database but corresponds to dummy data generated for test purposes.

Function #4 – Information of delayed batches



Current production stage of a batch

Processes which are having a delay will be displayed with a red circle. This is calculated based on the same logic for “Expected end” from the previous section. A process is considered delayed when its duration exceeded the expected end.

This information is also connected to the database but corresponds to dummy generated data for testing purposes.

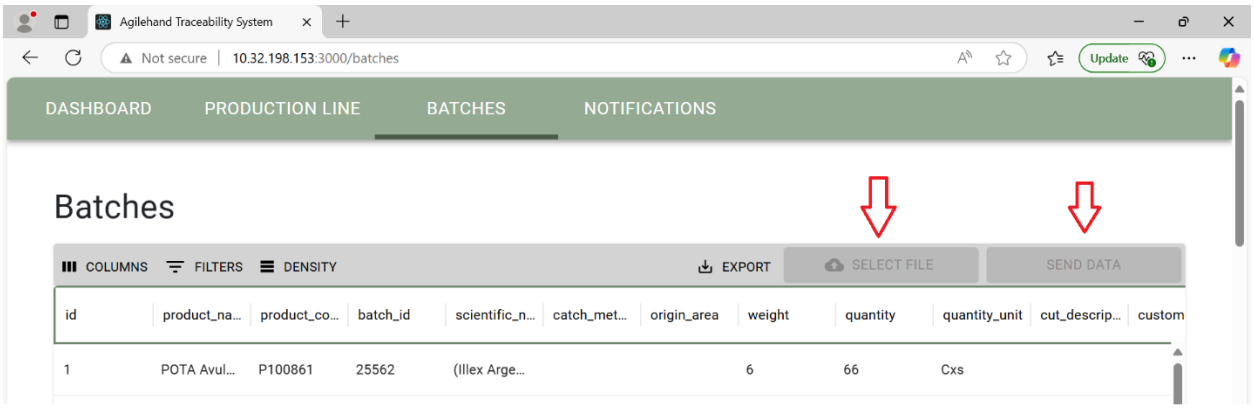
Function #5 – Batch and product backward tracking

As it was already described before, the backward tracking of a batch, regarding the stations that it passed by and when it was processed, can be seen in the batches page.

This function will be updated for 2. Demonstrator to include for example notifications about specific details of its process, like temperature warnings.

Function #6 – Upload function for new production data

This function was implemented in the batches page and was used to integrate data from the file *Producao.csv* into the database.



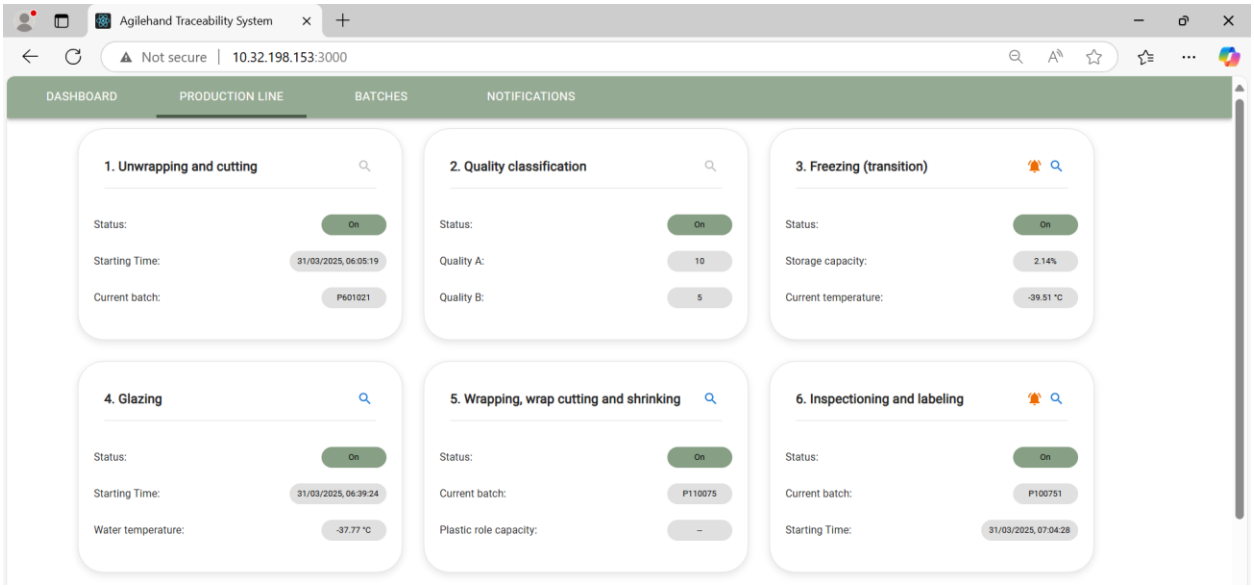
Screenshot highlighting the upload batches function

However, the button is disabled for the first demonstrator. The current implementation would erase the entire database to replace it with a new uploaded *CSV* file, so it is not useful for current test purposes.

For the 2. Demonstrator, adaptations will be made so it adds more rows to the database instead of replacing it, with also some extra verifications if the uploaded file is valid.

Function #7 – Active stations in production line

Production line information in real time can be accessed at http://10.32.198.147:3000/.



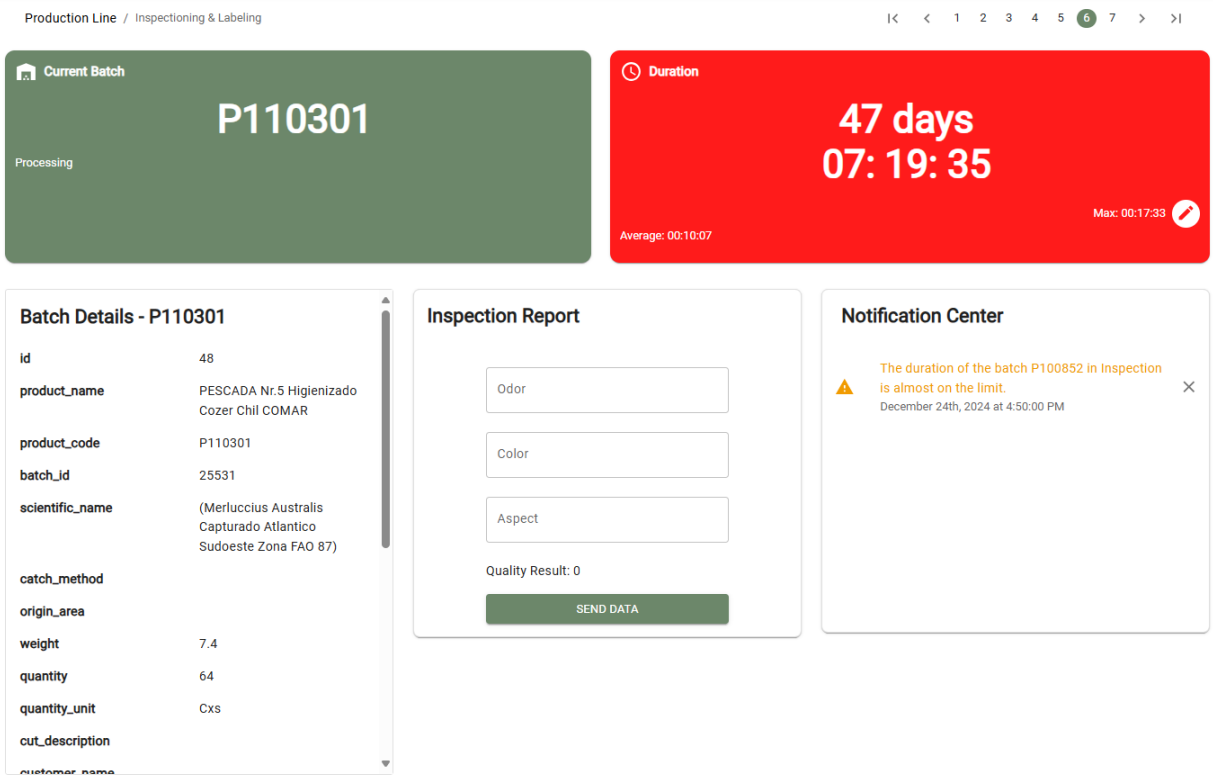
Real time state of production line

The production status of each station is marked as “On” or “Off” on this page. (Only in actual test mode is the station status marked as “On”) This information is retrieved from the

database. However, this is dummy data that has been generated for testing purposes as described before.

Function #8 – Quality inspection results

Quality inspection details can be checked at http://10.32.198.147:3000/inspectioning.

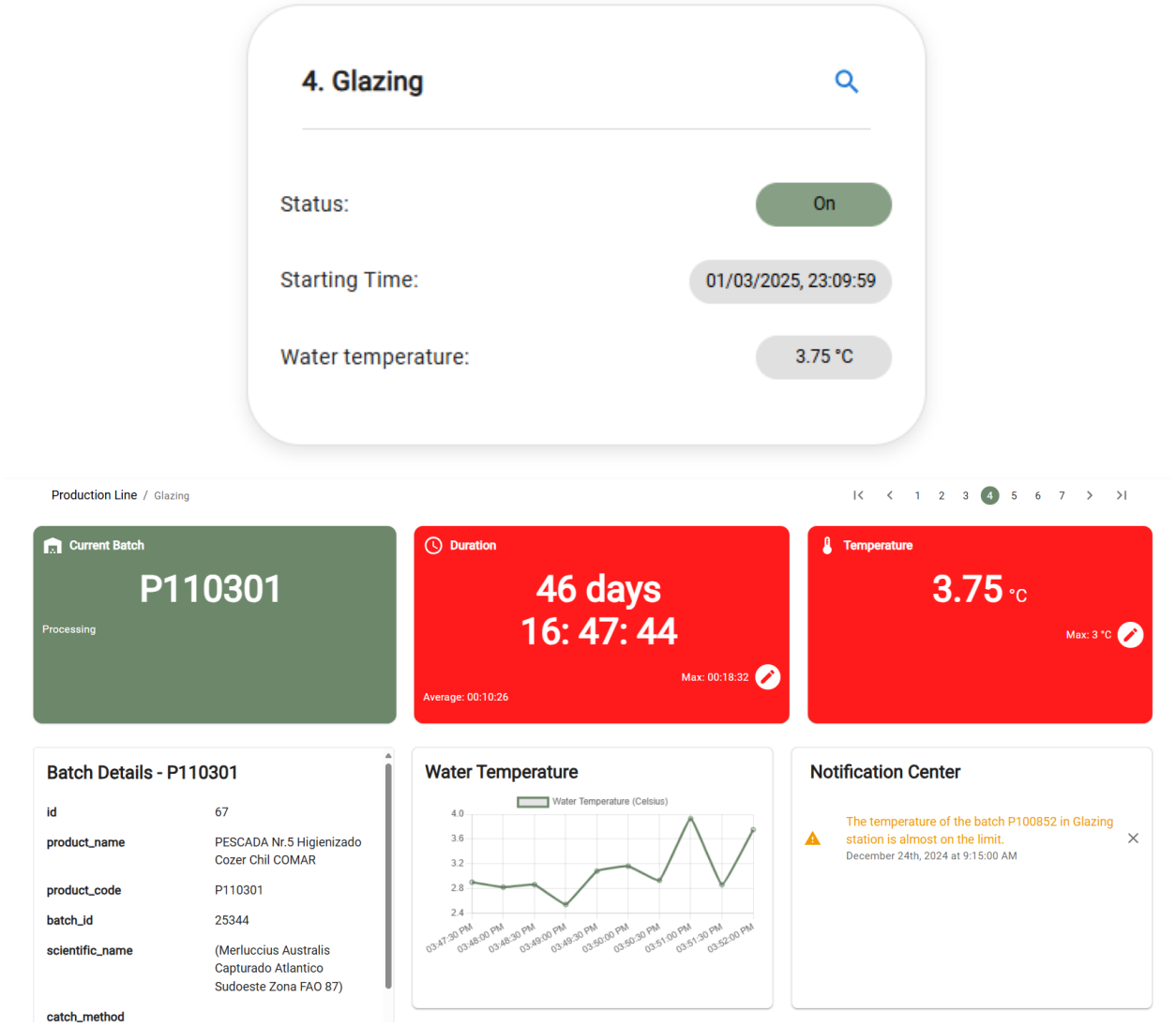


Inspection report tool

Information saved with this tool is saved to the database and can be verified in Batch Details card after refreshing the page. However, further review and adaptation to it is needed, regarding the "Quality result" calculation based on the user input. Here it is possible to include a new quality calculation based on Produmar's suggestions.

Function #9 – Temperature information of water bath

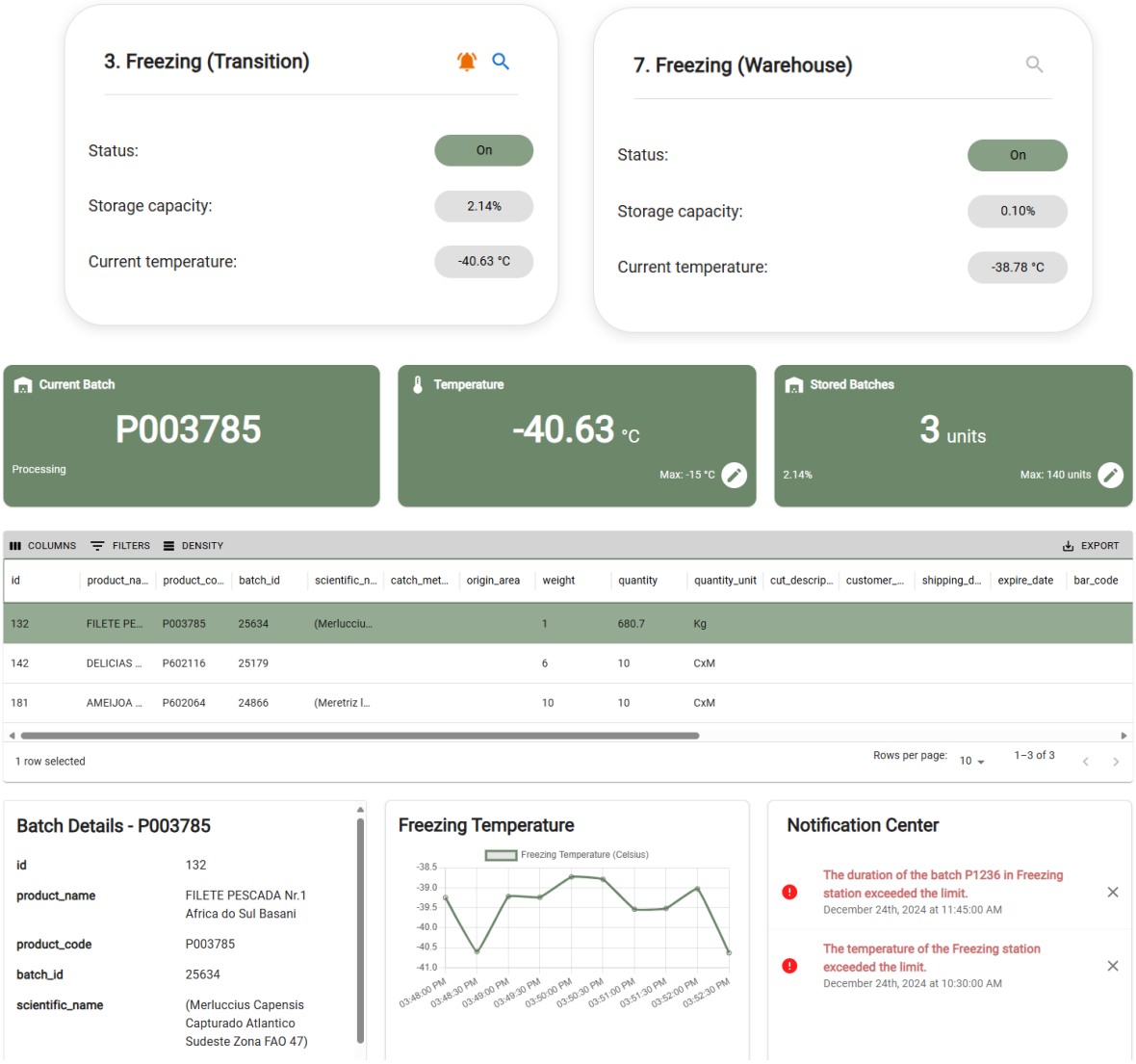
Water temperature for the glazing station can be seen in production line overview page (http://10.32.198.147:3000/) and glazing details page (http://10.32.198.147:3000/glazing). Overview page, just as the card on top of the details page, shows the last recorded temperature. The details page also shows a graph with the last 10 recorded temperatures (5 minutes – 1 record every 30 seconds).



Temperature information of the water bath

Functions #10 and #11 – Capacity information and current temperature of freezing chamber

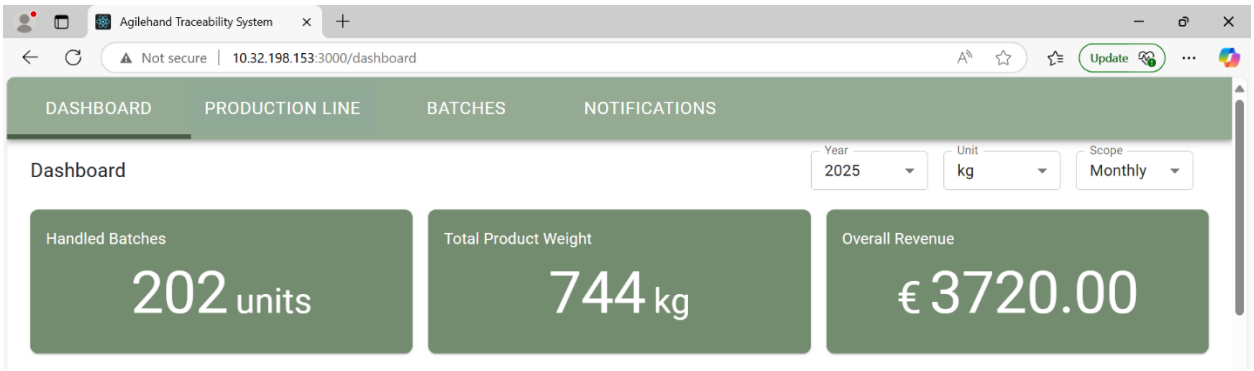
Capacity and current temperature for freezing transition station can be seen in production line overview page (http://10.32.198.147:3000/) and freezing details page (http://10.32.198.147:3000/freezing_transition). Overview page, just as the card on top of the details page, shows the last recorded temperature. The details page also shows a graph with the last 10 recorded temperatures (5 minutes – 1 record every 30 seconds).



Capacity information

Functions #12, #13 and #14

“Number of processed batches per year”, “Total batch weight per year” and “Overall revenue per year” KPIs can be seen in http://10.32.198.147:3000/dashboard.



Annual KPIs in dashboard page

This information is integrated into the database and comes from the *Producao.csv* table, except for the revenue. An amount of €5/kg was estimated for the calculation of this indicator.

5. Outlook of 2. Demonstrator functions

Function #15 – Final batch report

Planned for the 2nd demonstrator.

Functions #16 and #17 – Notifications

Planned for the 2nd demonstrator.

Function #18 – Production line details for unwrapping, classification and freezing warehouse

Details page for stations 1, 2 and 7 are planned for the 2nd demonstrator.

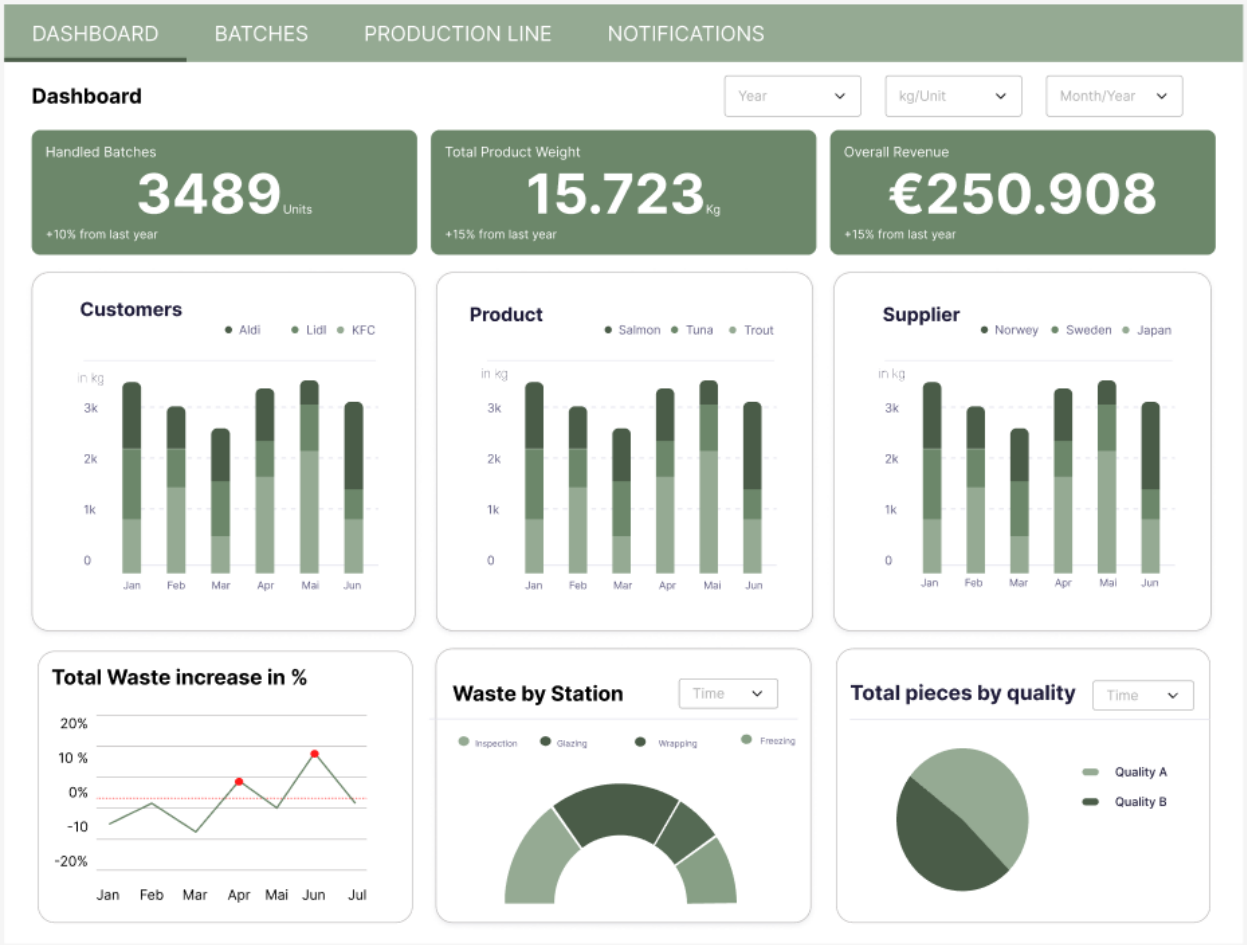
Function #19 – Batch forward tracking

This function was not implemented for the 1st demonstrator version of the project.

To implement it, it would be ideal for the production order information of batches (customer name and when it must be delivered) to be integrated into the solution.

Functions #20, #21 and #22

"Customer details", "Supplier details" and "Plastic consumption tracking" functions were not implemented for the 1st demonstrator. But their sketches were designed in Figma and are planned to be developed for the 2nd demonstrator.



Draft design for the dashboard page

For this to be implemented, data about customers and suppliers must be provided, besides plastic usage integration from the production line.

Function #23 – Early notification of water temperature

Notifications were not implemented for the 1st demonstrator version, and all of the pages showing notifications tables are hardcoded data that is not currently saved on the database.

Functions #24 and #25 – Documentation of defects at cutting and inspection station

Sketch is already designed, and back-end endpoints are implemented. However, this feature is planned to be available for the 2nd demonstrator.

Function #X

Based on the feedback from Produmar after testing the 1. Demonstrator, adaptations or further function can be planned and implemented for 2. Demonstrator.