Da Vinci Smart Manufacturing

BRD S05.02_Core Process_Production

Version History:

Version	Created/Modified by	Description	Date
1.0	Leopoldo Rivera Sahana Badal	S05.02 First draft	04/06/2025

1. Tap List

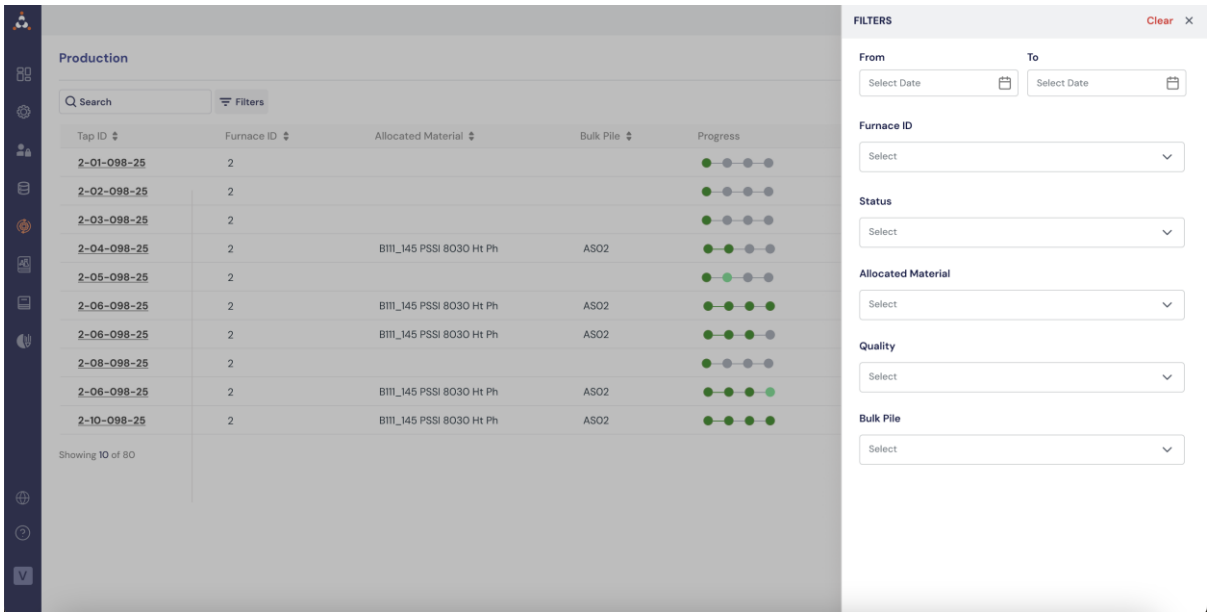
The Production screen is designed to manage the creation and tracking of taps throughout various stages of the production process until the tap is finalized. This includes monitoring tap status, inputting relevant data, and ensuring that all necessary steps are completed before the tap can be finalized.

1.1. Header Section

The header must always be visible and contains the following

- **Title**: "Production"
- **Action Buttons in Header:**
  - Add Tap: Button to create a new Tap
- **Search Bar**: Tooltip text: Search by Tap ID (Furnace ID_ Tap of the Day_Julian Day_YY)
- **Filters**:
  - From To (Tap ID date range) -
    - Date range picker
  - Furnace ID -
    - Multiselect Dropdown:
    - All furnaces for which Tap IDs exists.
  - Status -
    - Multiselect Dropdown:
    - Values: Tap Created/Spout Linked / Tap Linked / Grading Finalized / Production Saved / Refining Steps Saved / Tap Finalized
  - Allocated Material
    - Multiselect Dropdown:
    - Values : List of Materials (Materiall ID + Material Name) that are mapped to Tap Analysis ID during grading
  - Quality
    - Multiselect Dropdown
    - Values: Target / Off Grade/ On Grade
  - Bulk Pile
    - Multiselect Dropdown
    - Values: Bulk Piles associated with Allocated Materials
  - Created At:
    - Date record was created
    - Sorting: Yes
    - Frozen: No
  - Created By
    - User ID | First Name Last Name of user who cretaed the record
    - Sorting: Yes
    - Frozen: No
  - Modified At

        - Last record modified Date and time
        - Sorting: Yes
        - Frozen – No
    - Modified By
        - User ID | First Name Last Name of user who last modified the record
        - Sorting: Yes
        - Frozen – No
    - Clear Filter - This will clear all the applied filters
    - All Filter drop downs should be sorted alphabetically / numerically
    - Filter options will not reset unless the user navigates to a different menu or module. This means any filters applied will persist as long as the user remains within the same menu option, ensuring continuity until a module change occurs.



1.2. Tap List

The tap list will display key details for each tap, including:

Table Default Sorting : Default sorting of Tap IDs will be in descending order, prioritizing the most recent Tap ID based on year, Julian day, and tap of the day in that order.

- **Tap ID**:
    - System-generated ID in the format (Furnace ID_ Tap of the Day_Julian Day_YY).
    - Sorting: Yes
    - Frozen - Yes
- **Furnace ID**:
    - The furnace number from which the sample was taken.
    - Sorting: Yes
    - Frozen: No
- **Allocated Material**:

    - The product that matched with the analysis after grading, representing the quality or type of silicon produced.
    - Sorting: Yes
    - Frozen: No
- **Bulk Pile**
    - The bulk pile associated with the Allocated Material, indicating where the material will be stored or processed.
    - Sorting: Yes
    - Frozen: No
- **Quality**
    - The Quality associated with the Allocated Material
    - Sorting: Yes
    - Frozen: No
- **Progress**:
    - The progress bar will visually represent the tap's progression through the following stages:
        - Tap Created - First Stage, Dark green
        - Spout Linked - Second Stage, Light green
        - Tap Linked - Second Stage, Light green
        - Grading Finalized - Second Stage, Dark green
        - Production Saved - Third Stage, Dark green
        - Refining Steps Saved - Fourth Stage, Light green
        - Tap Finalized - Fourth Stage, Dark green
    - The bar will fill incrementally as the tap moves through each stage, with the following color scheme which helps users quickly assess the current state of each stage in the process.
        - Green: Indicates that a stage is complete.
        - Light Green: Shows that a stage is in progress or partially completed.
        - Grey: Denotes that a stage is yet to be started.
    - Sorting: Yes
    - Frozen: No
- **Status**
    - Displays the status of the tap, which could be one of the following:
        - Tap Created
        - Spout Linked
        - Tap Linked
        - Grading Finalized
        - Production Saved
        - Refining Steps Saved
        - Tap Finalized
    - Sorting: Yes
    - Frozen: No
- Created By
    - Displays the Userid and Name of user that created the record

  - Sorting: Yes
  - Frozen: No
- Modified By
  - Displays the Userid and Name of user that modified the record
  - Sorting: Yes
  - Frozen: No

Note: Horizontal scroll is required to be able to navigate through all columns and visualize all data but always respecting the frozen columns.

- **Action Buttons**: Depending on the status, allows users to edit or view the record. Finalised Taps cannot be edited or deleted
  - Tap Created, Spout Linked, Tap Linked
    - View – TAP details can be viewed in non-editable mode
    - Edit Details – Additional details can be included in the Tap record prior to finalization of Tap.
    - Delete – Selected tap record will be deleted
  - Grading Finalized, Production Saved, Refining Saved:
    - View – TAP details can be viewed in non-editable mode
    - Edit Details – Additional details can be included in the Tap record prior to finalization of Tap.
  - Tap Finalized:
    - View – Record details can be viewed in non-editable mode
- **Pagination Controls**: Navigation buttons to browse through multiple pages of records, if applicable (for more than 10 records).
- Rows Per page : Default 10, Dropdown values: 10, 20, 30, 40, 50

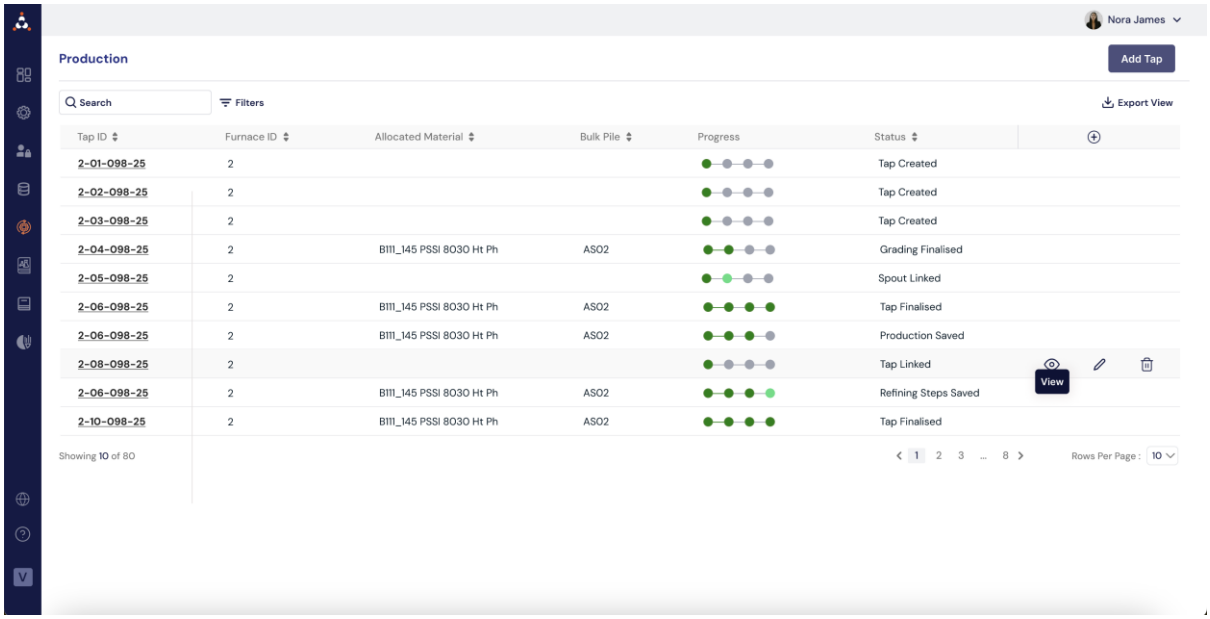
Export Function: The export function must extract ALL the information of the list of records shown based on the combined results of filter selection, sort and search criteria

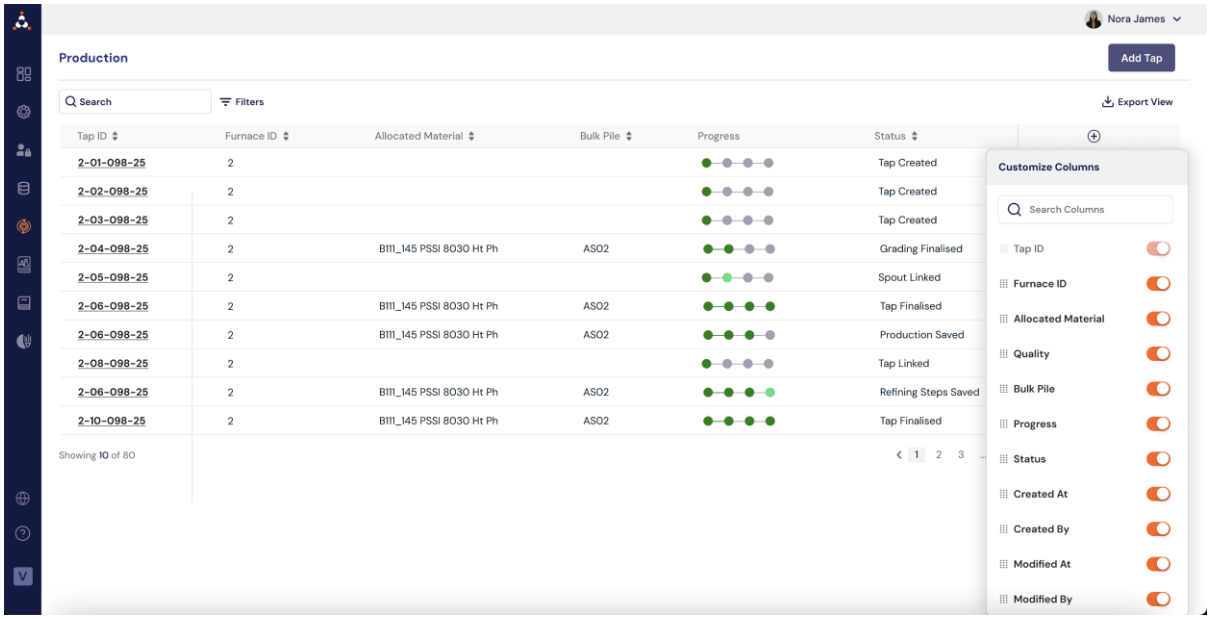
Furnace ID					Created At	Created by	Modified At	Modified by	Status
1					19/05/2025 | 02:46 AM	UserID | First name + Last name			Tap created
1					19/05/2025 | 02:46 AM	UserID | First name +	19/05/2025 | 02:46 AM	UserID | First name +	Grading Finalized

						Last name		Last name	
1					19/05/2025 | 02:46 AM	UserID | First name + Last name	19/05/2025 | 02:46 AM	UserID | First name + Last name	Grading Finalized
1					19/05/2025 | 02:46 AM	UserID | First name + Last name	19/05/2025 | 02:46 AM	UserID | First name + Last name	Tap created
1					19/05/2025 | 02:46 AM	UserID | First name + Last name	19/05/2025 | 02:46 AM	UserID | First name + Last name	Tap created

Exported File Name: ProductionTaps_DDMMYY

Customize Columns: Users can enable or disable all columns based on their preference. Only the enabled columns will be visible in the list. Columns marked as 'frozen' will be enabled by default and cannot be modified.





2. Add Tap

The “Add Tap” feature is an essential function in the Production screen that allows users to create and initiate a new tap in the system. When the “AddTap” button is clicked, it opens a slider form with the following fields:

Header: Add Tap | Close Icon

- **Furnace ID***:
  - User selects the furnace ID from a single select dropdown
  - Mandatory - Yes

    - Default value - No
    - Field Type - Single Select Dropdown Values: All active furnaces
    - Validation - No
- **Target Material**
    - Target material associated to the active Grading plan of the selected furnace is populated once furnace is selected
    - Mandatory - Yes, it is Auto Populated, Save will be disabled when there is no active grading plan
    - Validation - An active grading plan for the particular furnace must exist in the system as prerequisites for creating a Tap ID.
- **Tap Hole No.**
    - Active tap Hole No. of the furnace selected
    - Mandatory - Yes, it is Auto Populated, Save will be disabled when there is no active Tap Hole No. associated with the furnace
    - Validation - An active Tap Hole No. for the particular furnace must exist in the system as prerequisites for creating a Tap ID.
- **Observation Date & Time***
    - Users select the date and time of the using a date picker.
    - Mandatory - Yes
    - Default value- Current Date and time will be displayed as default.
    - Field Type Single Date and time picker
    - The date can be chosen as one day before, on, or after the current date.

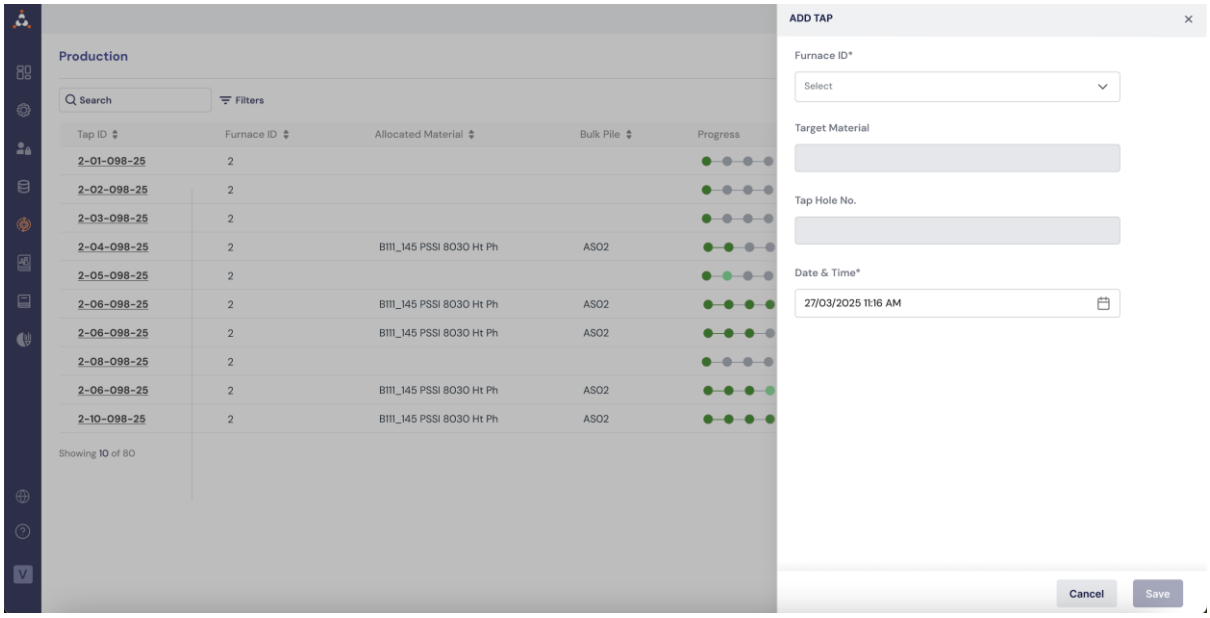
Action Buttons

- **Save**: Saves the record and navigates to the list screen
- **Cancel**: Cancels the current operation and returns to the list screen

Note:

- During the creation of a Tap ID, the system validates these requirements. If either the active grading plan or active taphole number is not present, the system prompts the user to create them before proceeding.
    - **“There is no active Grading plan associated with the furnace. It needs to be created to proceed further.”**
    - **“There is no active Tap Hole No. associated with the furnace. It needs to be created to proceed further.”**
- After the tap is created, the Tap ID will be available in the list screen.
- **Tap ID -** Automatically generated using the formula: Furnace No._ Tap of the Day_Julian Day_YY. based on the inputs provided. Note: Julian Date will be considering 3 digits.
- The Status will be “Tap Created, and the progress bar will be in the first stage.
- This setup ensures that the tap is accurately created with the correct furnace, grading plan, and taphole configuration, while also allowing for controlled date selection. To enter further details, users can click on the “Edit” option, which appears in the list. This allows users to update or add more information about the tap as needed.
- Julian Day Validation based on Plant Shift From and To time. **Assuming Plant has a 24hr shift from 4 AM - 3:59 AM**

- Current date - time before 4:00 AM => tap should be create previous julian day with latest tap of the day
- Current/past/future date - time between 4:00 AM to 3:59 AM => tap should be created for the selected julian day with latest tap of the day
- Next Date - Time before 3:59 AM => tap should be created for selected julian date with latest tap of the day
- Next day - time after 3:59 AM => tap should be created for the next julian date with latest tap of the day



3. Edit Tap

When the “Edit” option is clicked in the list, a detailed form opens, displaying non-editable basic information about the tap, including

- Furnace ID
  - read only, Pre-populated with value
- Target Material
  - read only, Pre-populated with value
- Tap Hole No.
  - read only, Pre-populated with value
- Date and Time
  - read only, Pre-populated with value
- Allocated Material
  - read only, Pre-populated with value
  - Will be empty until Tap linked
- Quality
  - read only, Pre-populated with value
  - Will be empty until Tap linked

Below this, the form is divided into three tabs for additional information.

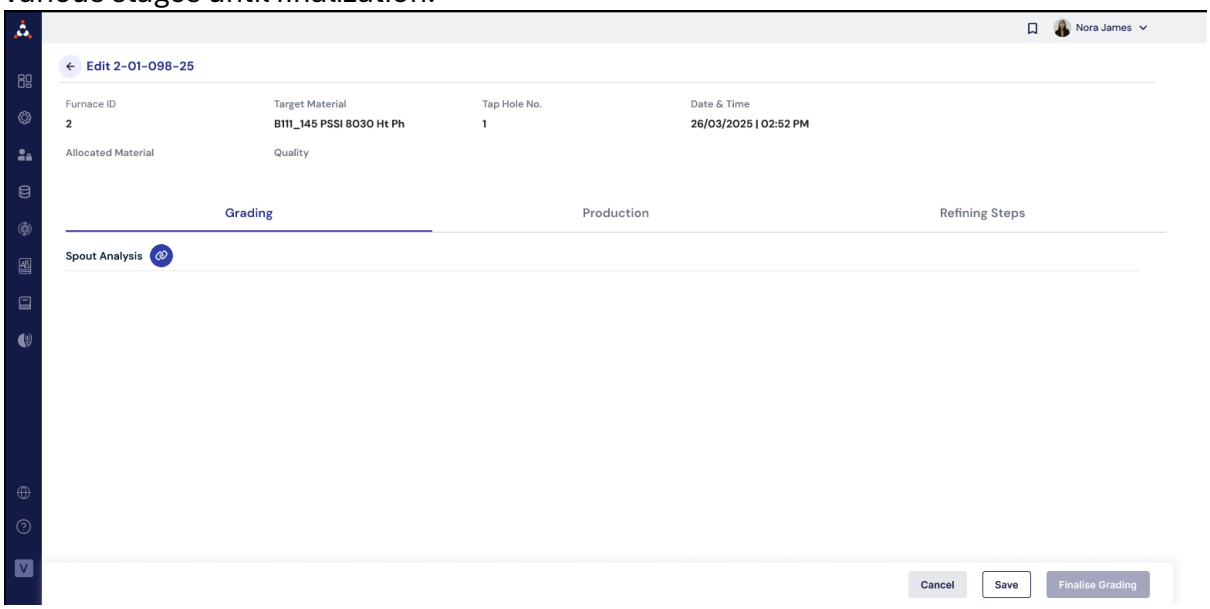
- **Grading:** The “Grading” tab in the “Add Tap” form is designed to facilitate an iterative process where tap analysis records are compared with the active grading plan. This comparison helps determine the allocated grade, which is the product

that best matches the analysis results and assesses the quality of the product produced against the target material specified in the grading plan. Users can select from multiple analysis IDs available based on the date chosen for the tap, ensuring that the most relevant data is used for grading.

- **Production:** In this tab, relevant production data is automatically populated based on the Tap number, which is linked to the tap analysis ID. This data is retrieved from the RAAF table **from external system** and can be edited by users. Also, if the production data is not available in the Automate system, users can manually enter the required production details, ensuring all necessary information can be accurately recorded.

- **Refining Steps:** In this tab production data specific to the furnace refining steps is automatically populated and is editable. Users can view the refining steps specifications that were configured during the furnace setup. **It is assumed that the production data will be limited to the information available in the furnace configuration for each refining step. If the data does not match the configured specifications, it will be ignored, ensuring consistency with the established furnace setup.**

This three-tab structure ensures that all aspects of the tap's creation are thoroughly documented, facilitating efficient monitoring and management of the tap through its various stages until finalization.



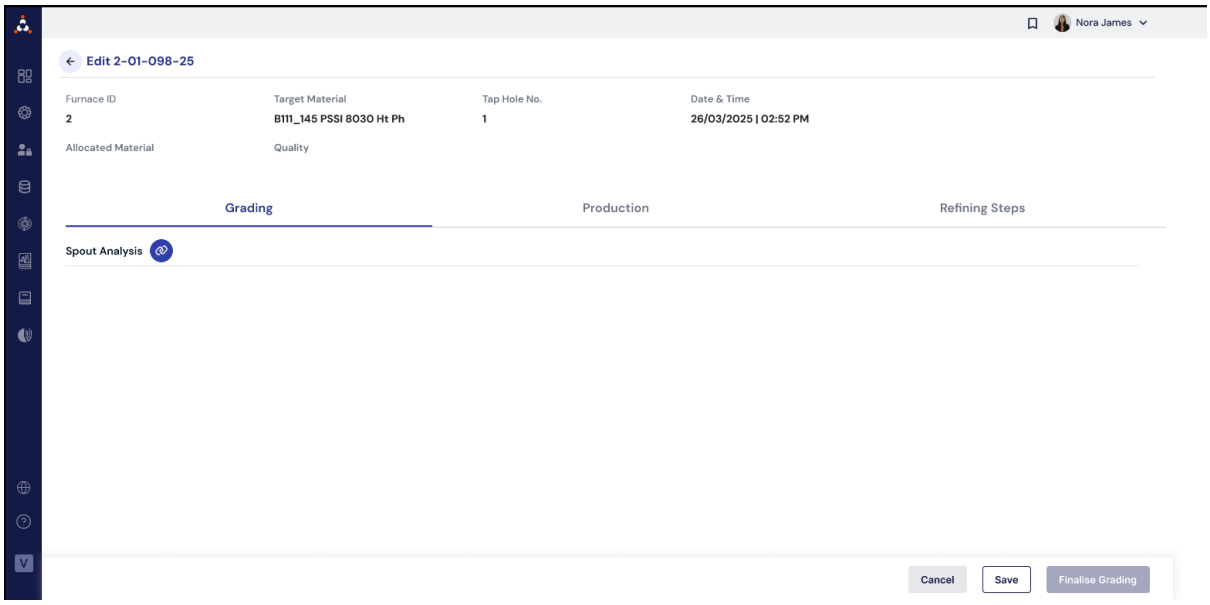
3.1. Grading:

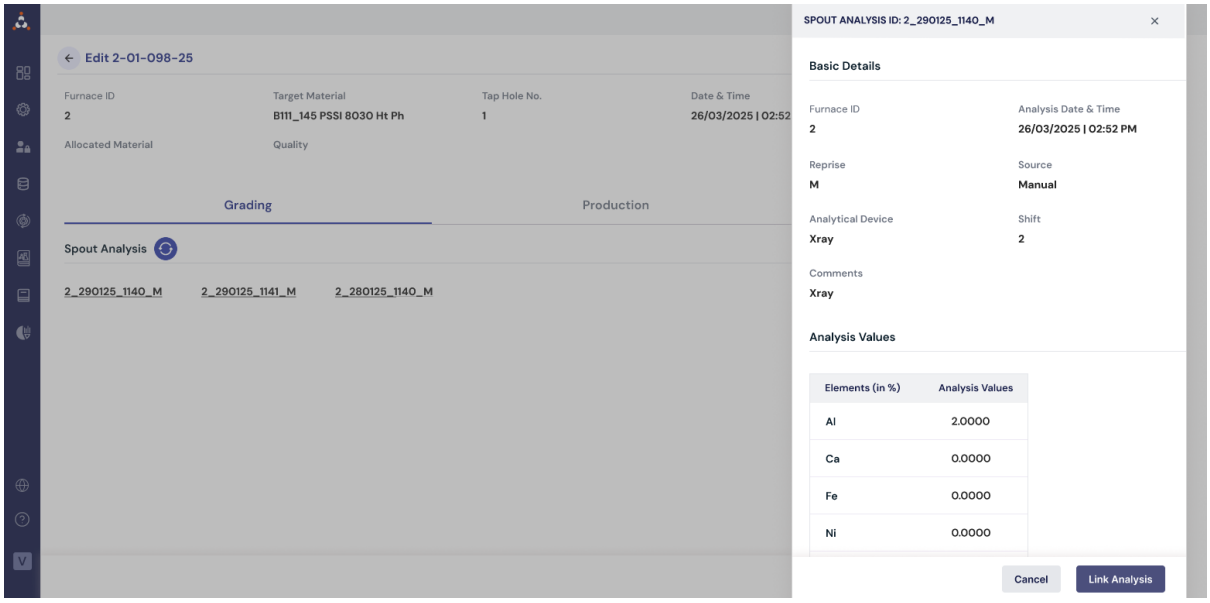
3.1.1. Link Spout Analysis ID

The user needs to first link the Spout Analysis ID by clicking the link icon.

- Upon clicking the link icon, the system displays a list of relevant Spout Analysis IDs.

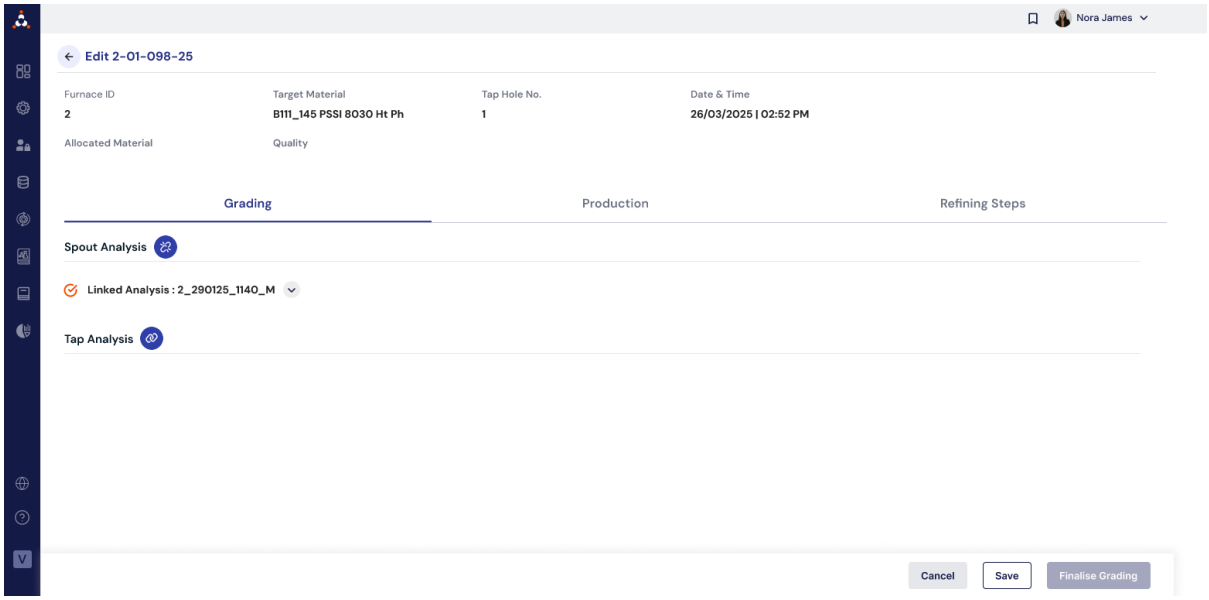
- The list is limited to 4 IDs from the past date and time of the Tap ID sorted (left – right) from most recently added analysis id to oldest.
- Upon clicking a specific Spout Analysis ID, its details are shown in a slider in a read only format. The following details are available
    - Header: Spout analysis id: 2_290125_1140_M | Close Icon
    - Basic Details
        - Furnace ID
        - Analysis Date
        - Reprise
        - Source
        - Analytical Device
        - Shift
        - Comments
        - Analysis Values - Elements and its %
    - **Action Button**
        - Link Analysis -
            - If the results are appropriate, clicking “Link Analysis” temporarily completes the linking process.
            - A single spout analysis ID can be linked to multiple Tap IDs.
        - Cancel -
            - If not click on “Cancel” to view other spout analysis ids





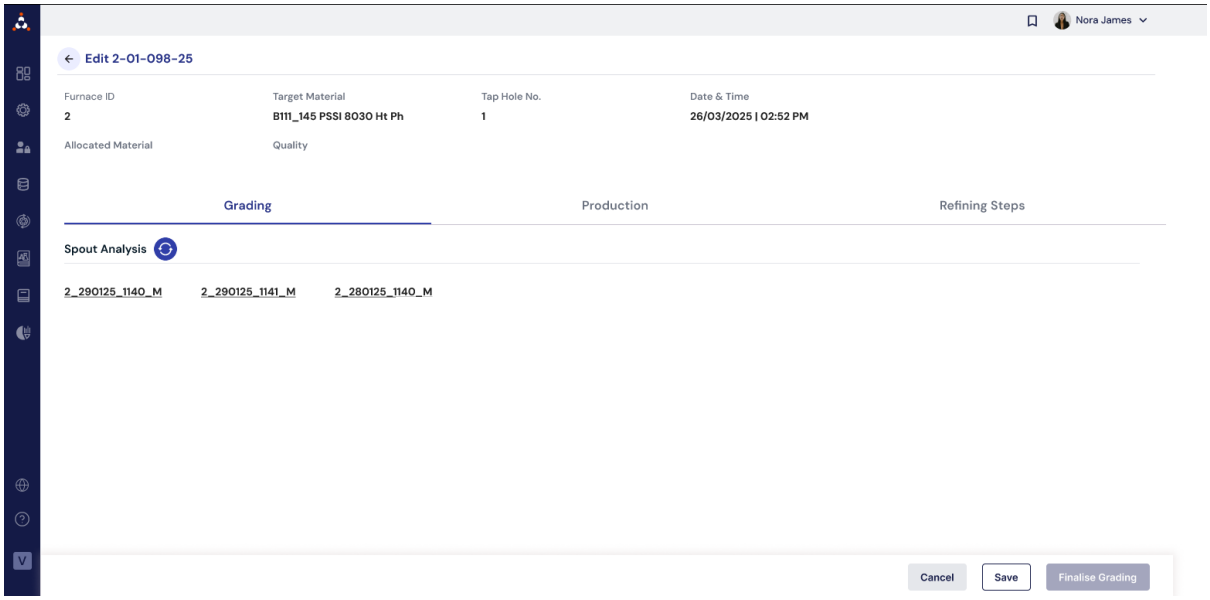
Viewing Linked IDs:

- Once linked, the Spout Analysis ID appears on the screen in an accordion format which is by default collapsed mode.
- Upon clicking the down arrow in the accordion, the linked Spout Analysis details are displayed.



Regenerating the List:

- By clicking the refresh icon, the system regenerates the list of Spout Analysis IDs.
- The updated list displays new IDs relevant to the date and time of the Tap ID.



Saving Grading Details

- Users can save the details in the Grading tab by clicking on “Save”
- Upon saving, the system show the Tap analysis link option to proceed further.
- The status of the Tap in list screen will change from “Tap Created” to “Spout Linked.”
- Cancel - Cancels the current operation and returns to the list screen
- Finalise Grading button will be disabled

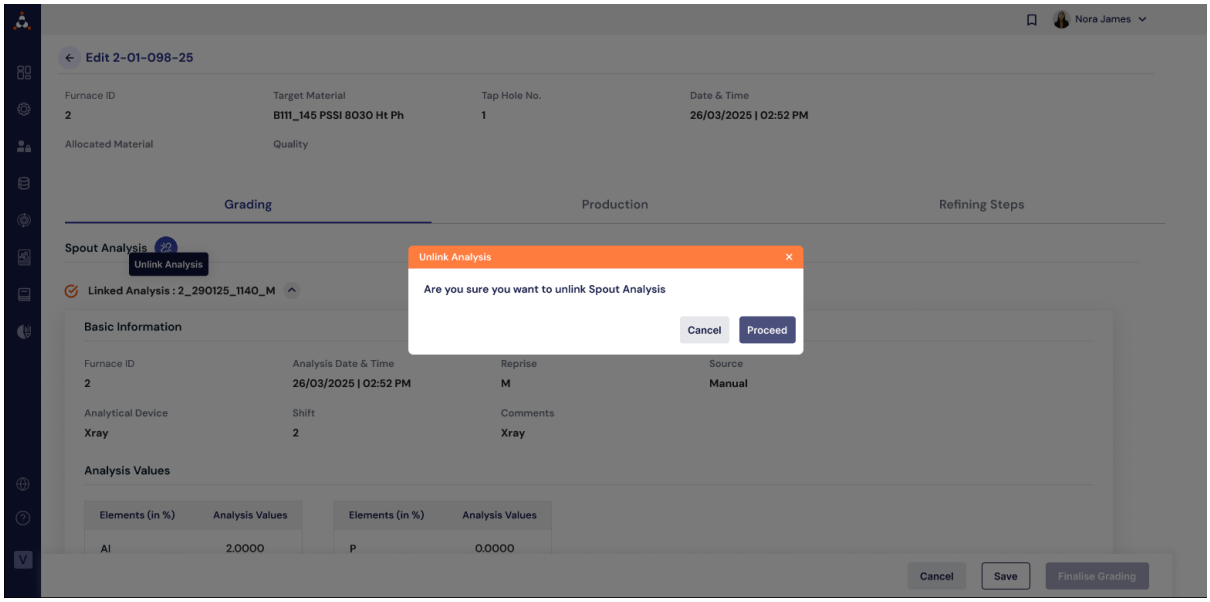
Actions During Save in Spout Analysis

- **Linking**
  - The status of the linked tap analysis in Spout Analysis list screen is changed from “New” to “Linked.” during linking process
  - Additionally, when one spout analysis (with the same Furnace ID, Date, and Time) is **linked** in the production screen, all other records with the same Furnace ID, Date, and Time—regardless of their **Reprise**—and in either **New** or **Draft** status, will be **automatically updated to “Rejected”**.
- **Unlinking**
  - If there is no other Tap Id is linked to the spout analysis, the status of the linked tap analysis in Spout Analysis list screen is changed from “Linked” to “New.” during unlinking.
  - If the analysis is later **unlinked** from the production screen, those automatically rejected records will **revert to “New/Draft”** their previous status.

Unlinking a Spout Analysis ID

After linking, clicking the unlink icon removes the ID.

- Upon unlinking, the list of IDs is regenerated, allowing the linking process to be repeated.
- Tap status will revert to “Tap Created" from “Spout Linked”
- Finalize Grading button will be disabled until tap analysis id is linked. Once grading is finalized, Spout Analysis IDs cannot be unlinked any further.



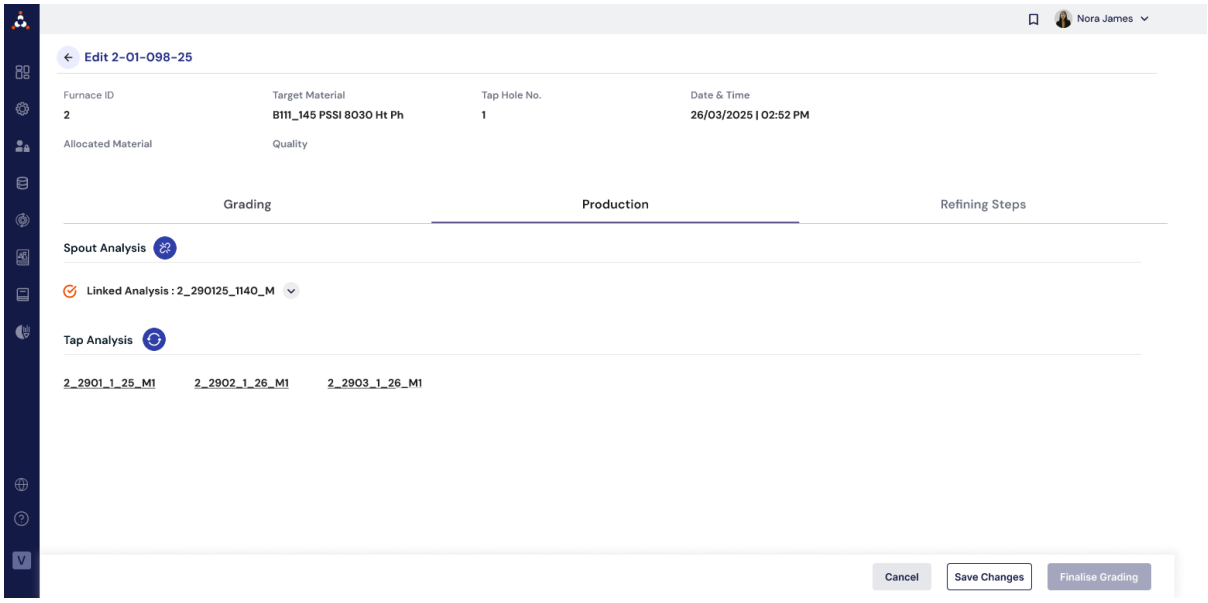
3.1.2. Link Tap Analysis ID

Once the spout is linked, tap analysis IDs can be linked. Navigation to this screen can be done in two ways:

- Continue Linking Tap: Proceed with linking the tap analysis IDs directly after linking the spout.
- Edit Details: Click on the “Edit Details” icon in the list screen after the spout is linked.

Linking Tap Analysis IDs:

- Upon clicking the link icon, the system populates appropriate tap analysis IDs. Tap IDs will be linked to Tap Analysis without time restrictions. Only the most recent 10 Tap Analysis IDs in the “new” status will be available for linking, ensuring up-to-date records are displayed for selection.
- The list includes relevant tap analysis IDs with different reprise numbers, sorted (left – right) from most recently added analysis id to oldest.



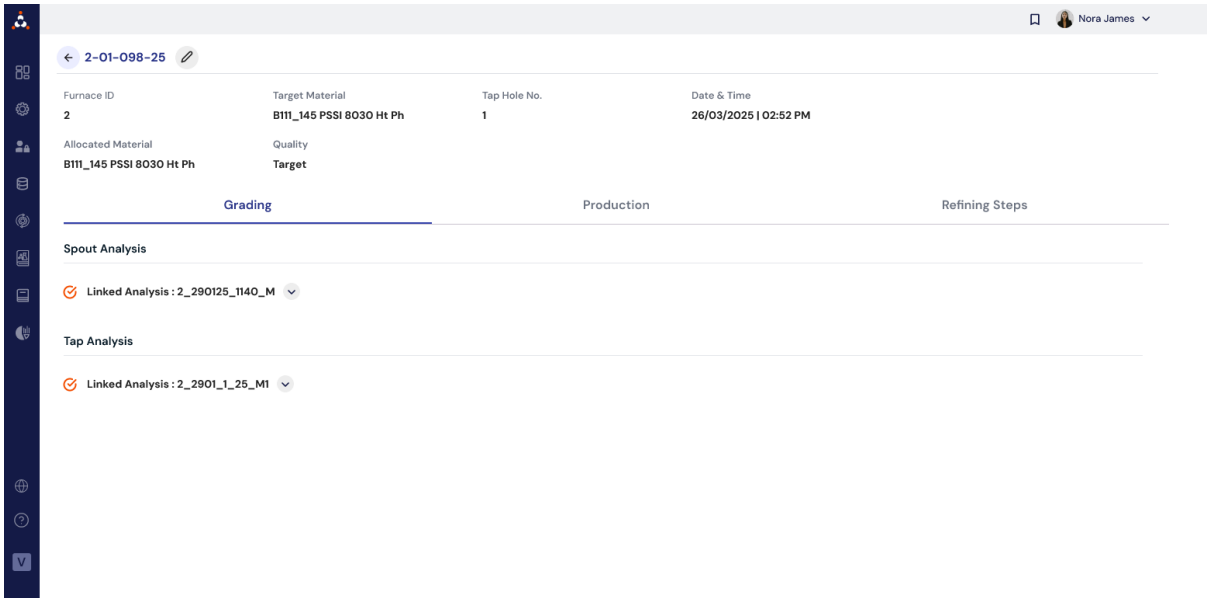
Clicking a Tap Analysis ID: Initiates the grading process.

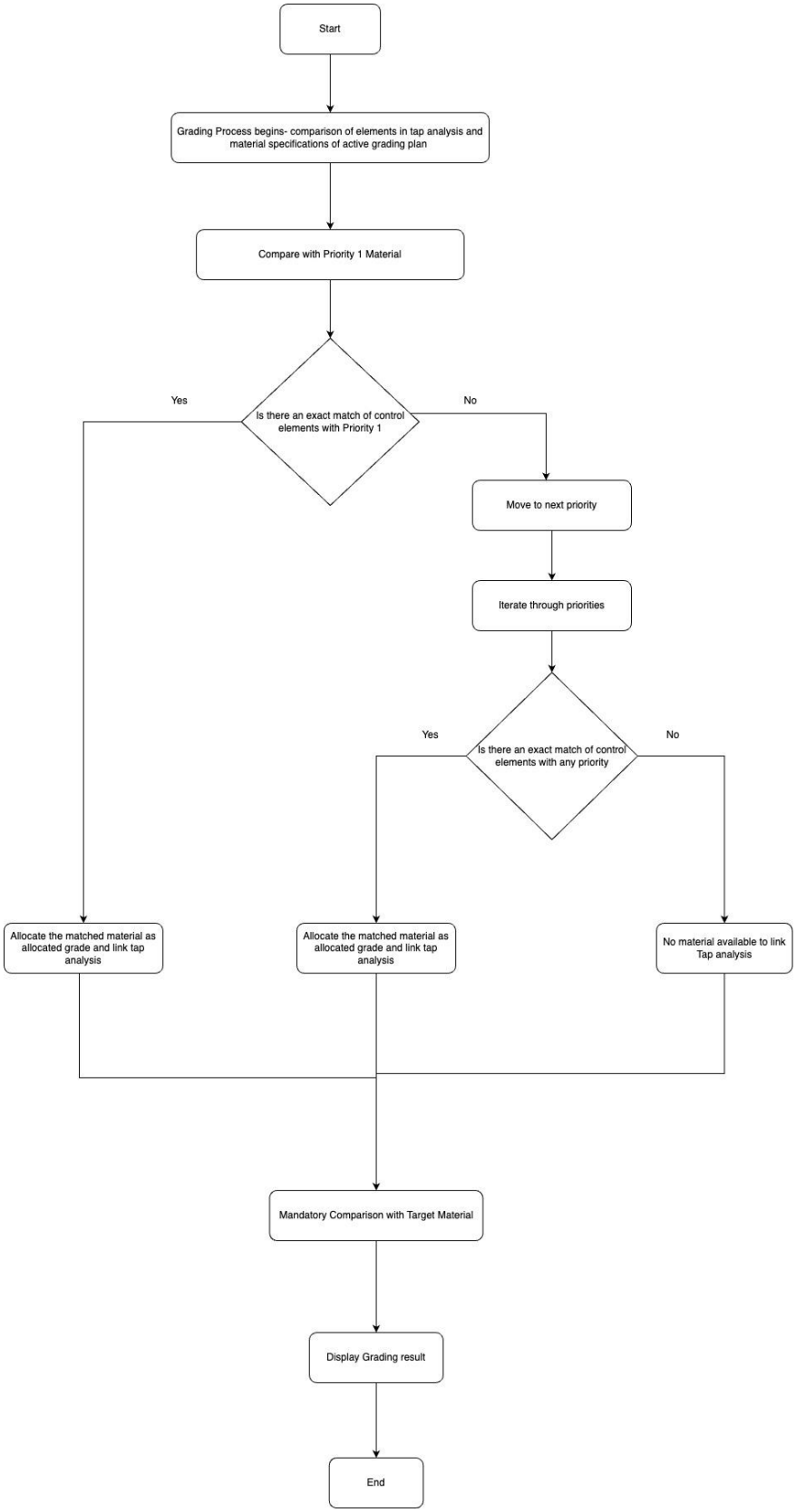
Grading Process

Involves iteratively matching the tap analysis values with the active grading plan.

- **Base Assumption**: There must be an exact match between the list of elements in the tap analysis and the Work-in-Progress (WIP) material specification. This ensures consistency and accurate comparison with the WIP material's expected composition.
- **Focus on Control Elements:** The comparison prioritizes checking for an exact match with the control elements between the tap analysis and the WIP material. The match is considered within limits (low to high of WIP specification), rounded to 4 decimal points (0.0000).
- **Non-control element** can be present or absent without affecting the match decision.
- **Grading Starts from Priority 1**: The system first compares the tap analysis against the material with Priority 1 in the active grading plan.
- **Iterate Through Priorities:** If no match is found with Priority 1, the system moves to the next priority and continues until a match is found.
- **Stop at First Match:** The iteration stops as soon as a match is found, preventing further comparisons down the priority
- **Mandatory Comparison with Target:** Regardless of whether a match is found, the system compares the tap analysis with the target material from the active grading plan to evaluate alignment with the desired target.
- **Priority of Target Material:** If the tap analysis matches both the On Grade and Target materials, the highest priority material typically takes precedence as the allocated Material. This reflects the desired outcome or specification for the production process.
- **No Match Found:** If no match is found during grading, the Allocated Material will be empty, and the Link Analysis button will be disabled. Unless a match is found with any grading material of an active grading plan, tap analysis cannot be linked.

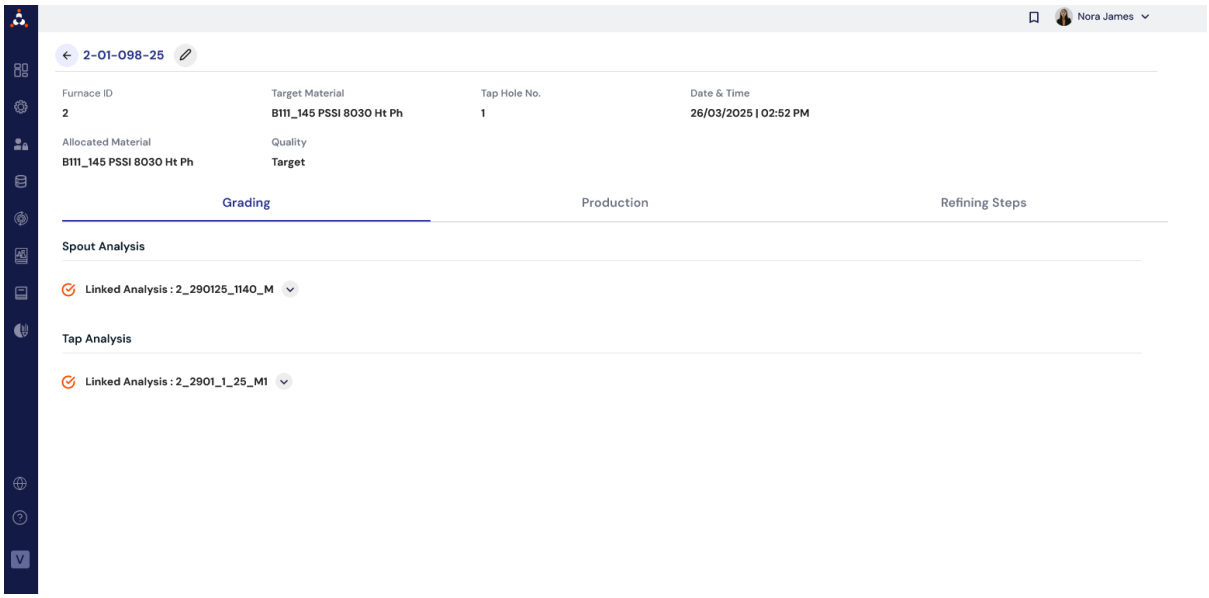
- **Displaying Grading Results:**
    - Once grading is complete, the results are visible in a slider.
    - The grading results include the following
        - Allocated Material: Matched WIP material from the grading plan based on analysis values.
        - Priority: Priority configured in the grading plan associated with the allocated material.
        - Bulk Pile: Bulk pile associated with the allocated material configured in the grading plan.
        - Casting Process: It is a mandatory user input in the grading result, with dropdown values sourced from master data.
        - Analysis Result Grid: Displays a list of elements with:
            - Specifications of the target material (low-high range) set up in the WIP master data screen.
            - Analysis values shown in green if within range of the target specification and red if outside the range.
            - This color-coding helps in understanding how closely the produced material matches the target material.
        - If satisfied with the grading results, clicking the “Link Analysis” button links the tap analysis ID
        - One Tap analysis ID with a tap number can be linked to a single tap ID.
        - If not satisfied, clicking “Cancel” allows the user to select another tap analysis ID to initiate its grading process.
        - Both the Allocated Material and Quality will be displayed in the General Information section above the tabs. These fields will remain empty for "Tap Created" and “Spout Linked” status as grading results are not available.
        - The mapping of Analysis ID and Tap ID is only visible in the Production screen and not in Lab Analysis screens.

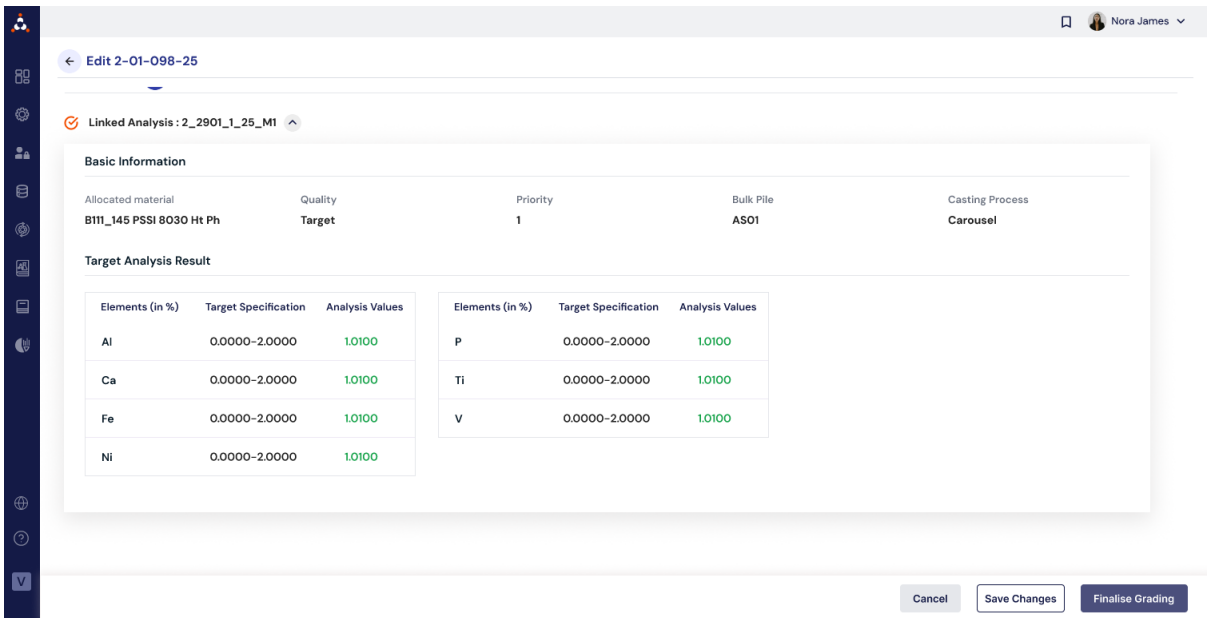



Start
Grading Process begins- comparison of elements in tap analysis and material specifications of active grading plan
Compare with Priority 1 Material
Is there an exact match of control elements with Priority 1
Yes
No
Move to next priority
Iterate through priorities
Is there an exact match of control elements with any priority
Yes
No
Allocate the matched material as allocated grade and link tap analysis
Allocate the matched material as allocated grade and link tap analysis
No material available to link Tap analysis
Mandatory Comparison with Target Material
Display Grading result
End

Viewing Linked IDs:

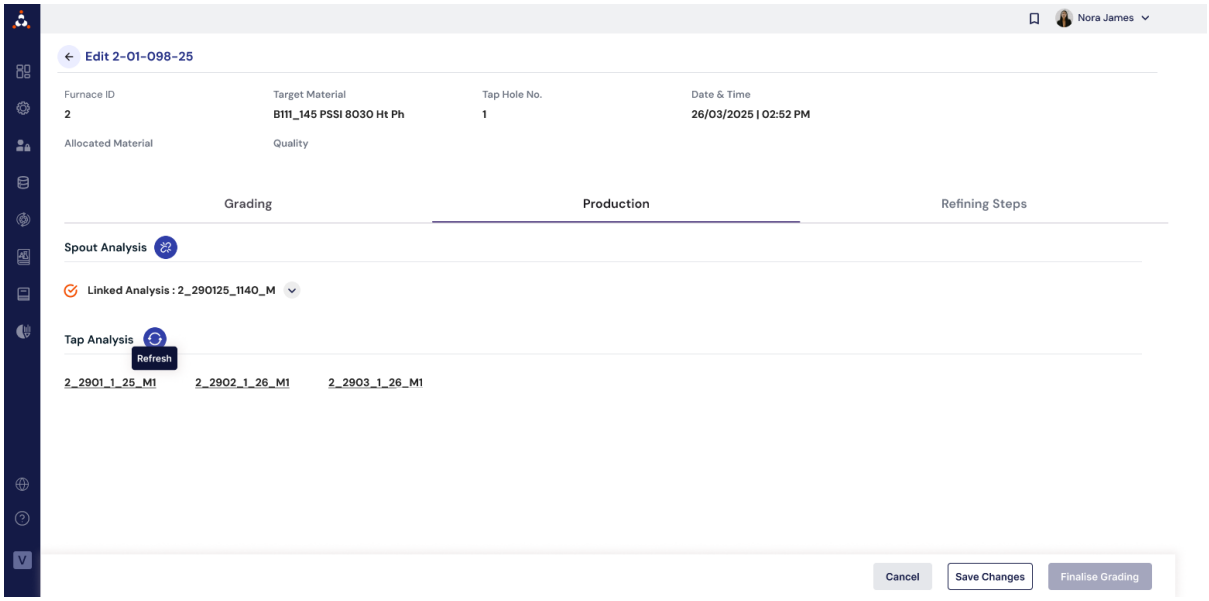
- Once linked, the Tap Analysis ID appears on the screen in an accordion format which is by default collapsed mode.
- Upon clicking the down arrow in the accordion, the Grading results of the Tap Analysis Id are displayed.





Regenerating the List:

- By clicking the refresh icon, the system regenerates the list of Tap Analysis IDs.
- The updated list displays new IDs relevant to the date and time of the Tap ID.

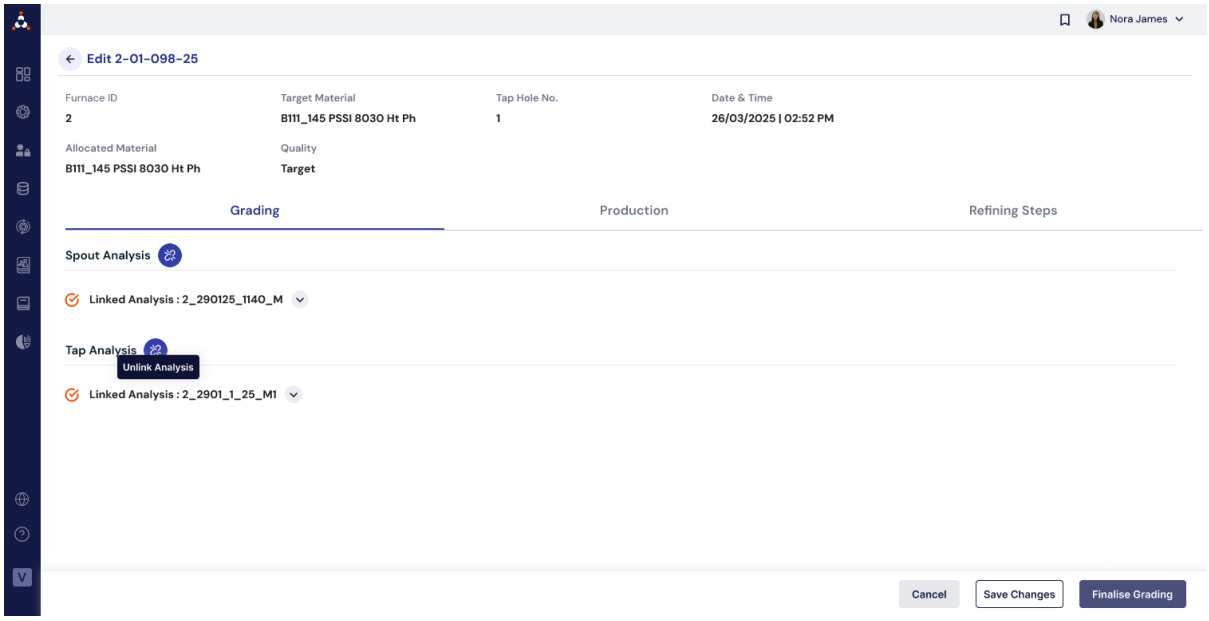


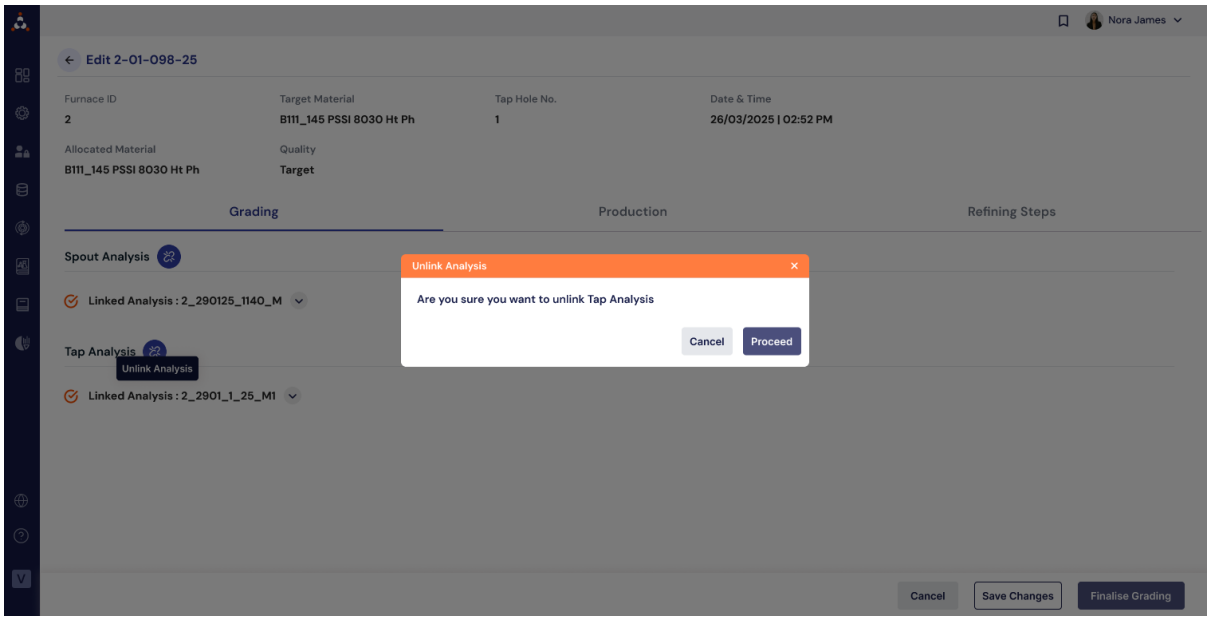
Saving Grading Details

- Users can save the details in the Grading tab by clicking on “Save” option.
- Upon saving, the system will redirect to the list screen.
- The status of the Tap will change from “Spout Linked.” to “Tap Linked”.
- Both Allocated Material and Bulk Pile will be visible in list screen for Tap Linked status.
- Finalise Grading button will be enabled. Users can also directly Finalise grading. The status of the Tap will change from “Spout Linked.” to “Grading Finalised”
- Once grading is finalized, Tap Analysis IDs cannot be unlinked any further.
- To proceed further, clicking on the “Edit” option in list screen is required.

Unlinking a Tap Analysis ID:

- After linking, clicking the unlink icon removes the ID.
- Upon unlinking, the list of IDs is regenerated, allowing the linking process to be repeated.
- Status of Tap will be changed to “Spout Linked” from “Tap Linked”
- Both Allocated Material and Bulk Pile will become empty in list screen for Tap Linked status.
- Finalize Grading button will be disabled when tap analysis id is unlinked.





Actions During Save in Tap Analysis:

- During Linking
  - The status of the linked tap analysis in Tap Analysis list screen is changed from “New” to “Linked.”
  - All other reprises associated with the same tap number of the linked tap analysis IDs, either in New or Draft status, are also changed to “Linked” in the Tap Analysis list automatically by the system.
- During Unlinking
  - The status of the linked tap analysis in Tap Analysis list screen is changed from “Linked” to “New.”
  - All other reprises associated with the same tap number of the linked tap analysis IDs are also reverted to “New/Draft” their previous tap analysis status, in the Tap Analysis list automatically by the system.

3.1.3. Finalize Grading

Once the spout and tap are linked, the grading tab details can be finalized. After finalization, the grading details can no longer be edited.

Finalize Grading Enablement Logic

- **Condition**: The **Finalize Grading** action becomes **enabled only after the Tap is linked**.
- **User Flow Options**:
    1. The user can **save the Tap linking**, which moves the status to **Tap Linked**, and then proceed to **Finalize Grading**.
    2. Alternatively, the user can **Finalize Grading directly from the Spout Linked** status, as long as the **Tap linking is completed in the same action**.

A popup message will appear asking the user to confirm the grading process, proceeding upon which the system navigates to the "Production" tab.

Validation:

- Taps must be Grading finalized in the order of their Tap IDs.
- A tap with a higher sequence of the same Julian Date, Furnace ID and Year (e.g. 11-02-241-24) cannot be finalized until the previous one (e.g. 11-01-241-24) has been grading finalized.
- Tap Ids can be created, Spout Linked, Tap Linked in any order. Once Grading Finalised, they can be Production saved, Refining Steps saved and Tap Finalised in any order.
- Once grading is finalized, Tap Analysis IDs cannot be unlinked any further.

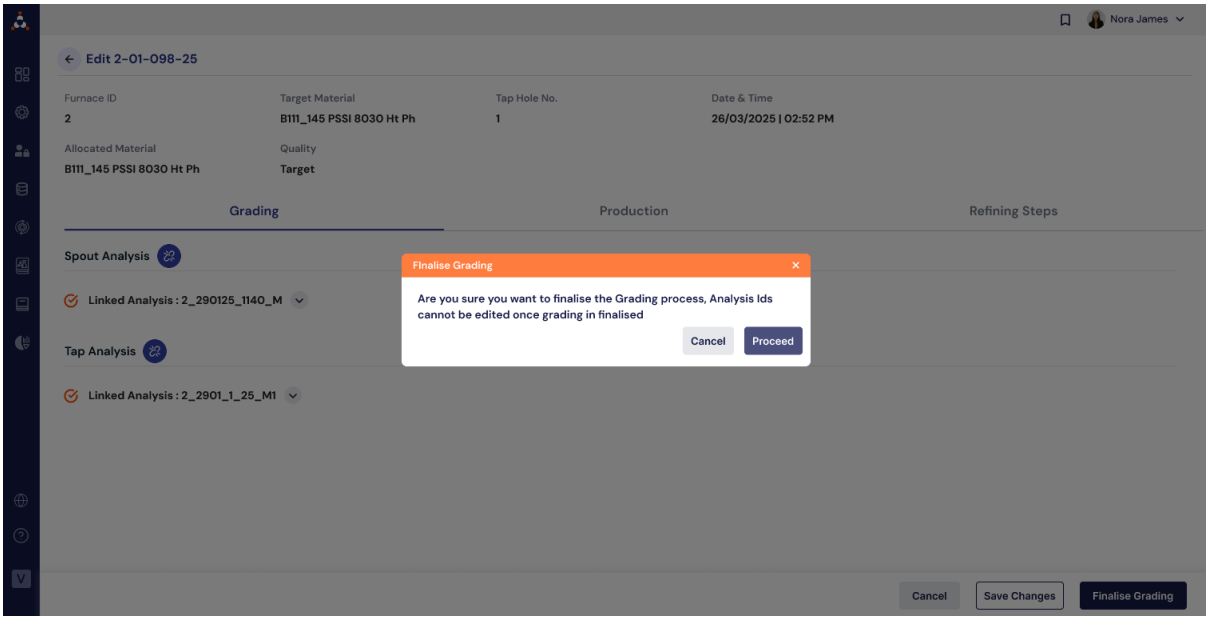
List Screen Updates: In Production Tap ID list screen,

- The status of the tap is updated to "Grading Finalized."
- The progress bar is updated to dark green in the second stage, indicating "Grading Finalized."

Actions During Grading Finalization to Tap Analysis

- The status of the linked tap analysis in the Tap Analysis list screen is changed from "New" to "Linked."
- All other reprises associated with the same tap number of the linked tap analysis IDs are "Mark as Rejected" in the Tap Analysis list automatically by the system.
    - **If Grading is Finalized from "Tap Linked" status**
        - All other reprises will have their status changed to **Rejected** (if they were previously marked as **Linked**).

- **If 'Grading Finalized' is selected directly**:
  - All other reprises with status **New** or **Draft** will be updated to **Rejected**.zz`



3.2. Production:

3.2.1. Data from Automate

Relevant production data is automatically populated based on the Tap No. linked to the tap analysis ID.

This data is retrieved from the **Production Table (Currently named RAAF)** in the Automate system and can be edited by users. Production data– fields, data type and units to be captured are predefined.

- Source:
  - Non Editable and pre-populated as "Automate".
  - Default value - No
- Tap No.:
  - Non Editable and pre-populated with automate value.
  - Default value - No
- Production Date and Time
  - Non Editable and pre-populated with automate value.
  - Default value - No
- Ladle Number
  - Editable and pre-populated with automate value.
  - Mandatory - Yes
  - Field Type - Single Select Dropdown
  - Values - A01 - A20
  - Default value - No

- **Tinject No. - It will be removed from front end alone and made Non-Mandatory.**
- Ladle Weight: before tap (Empty)
    - Editable and pre-populated with automate value.
    - Mandatory - Yes
    - Field Type - User Input
    - Validation - 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ladle Weight : after tap (Full)
    - Editable and pre-populated with automate value.
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Recycling Metal Weight
    - Editable and pre-populated with automate value.
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ferrous Pans
    - Editable and pre-populated with automate value.
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ladle Weight : after casting
    - Editable and pre-populated with automate value.
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ladle Weight : after Slag removal
    - Editable and pre-populated with automate value.
    - Mandatory - Yes
    - Field Type - User Input
    - Validation - 1.00 to 999,999.00 . Numeric with 2 decimals
    - Default value - No
- Energy
    - Editable
    - Mandatory - Yes
    - Field Type - User Input
    - Validation - 1.00 to 999,999.00 . Numeric with 2 decimals
    - Default value - It will have a default 0 if no data is available. In case of Manual data it will be a mandatory user input (0 value is allowed) in the MES system.
- Downgrade (Total)

    - Editable
    - Mandatory - Yes
    - Field Type - User Input
    - Validation - 1.00 to 999,999.00 . Numeric with 2 decimals
    - Default value - It will have a default 0 if no data is available.
- Downgrade Material
    - Editable
    - Mandatory - No
    - Field Type - Single select dropdown
    - Values - off-grade elements mapped to the active grading plan of the selected furnace.
    - Validation - If Downgrade Quantity is greater than 0, it is mandatory to select a downgrade material.
- Liquid Weight
    - Non-editable field,
    - Calculated based on the following formula Liquid Weight = [Ladle Weight After tapping (full)] –[Ladle Weight After casting (empty)]-[Recycling Metal Weight] + [Ferrous Pans]
- Total Cast Weight:
    - Non-editable field
    - Calculated based on the following formula [Ladle Weight (Full - after tap)]-[Ladle weight after Slag removal]
- Slag Weight
    - Non-editable field
    - Calculated based on the following formula = Ladle Weight After casting (empty) - Ladle Weight After slag removal.
- Graded Cast Weight
    - Non-editable field
    - Calculated based on the following formula [Cast Weight] - [Downgrade (Total)]
- Energy Efficiency
    - Non-editable field
    - Calculated based on the following formula [Energy]/[Liquid Weight/1000]19
    - Note: The number 1000 is to convert Liquid weight from Kg to Tons.
- Tapping Metal Flow
    - Non-editable field
    - Calculated based on the following formula = (Liquid Weight/1000) / (Duration of Refining Step FILL / 60)

Note - For all calculated values, hovering over the formula icon will display the calculation formula in a tooltip. Additionally, the fields used in the calculation will be highlighted in red for easy reference.

Action Buttons

- **Save & Continue:**

- Once satisfied with the adjustments, the user clicks Save and Continue. This action commits all changes to the database, making the adjustments final. The user is then navigated to the Refining Steps tab.
- These details can be edited by clicking the Adjust button. Editing is allowed until Tap is Finalized.
- The status of the tap in the tap list changes from Grading Finalized to **Production Saved**

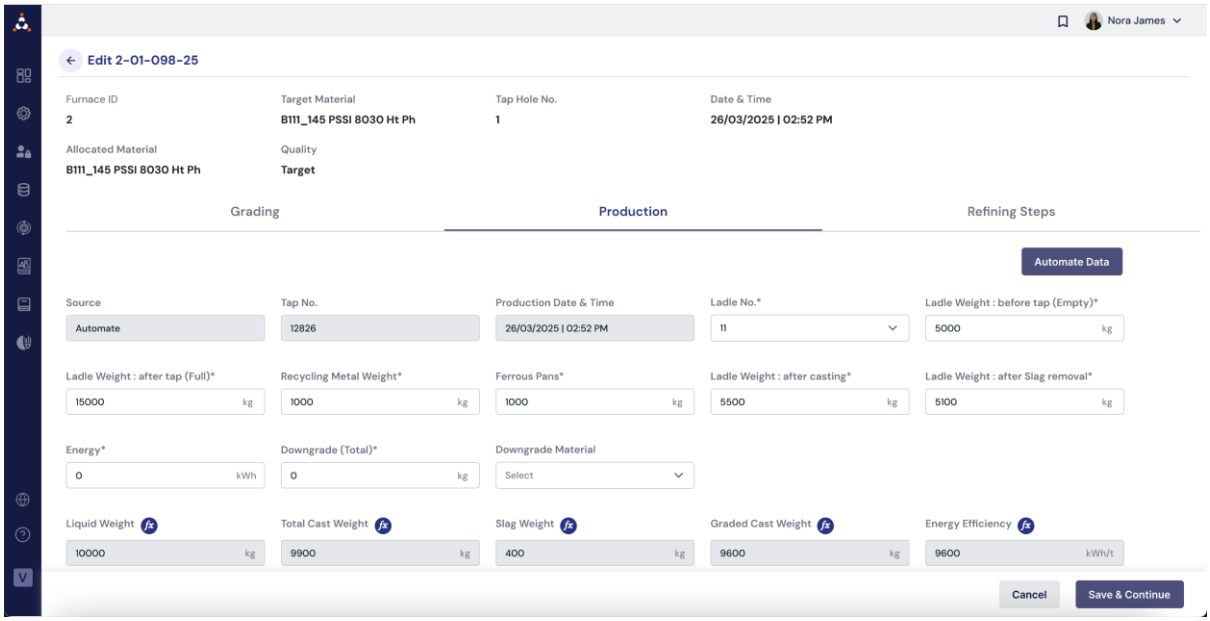
- **Cancel**: Cancels the current operation and returns to the list screen

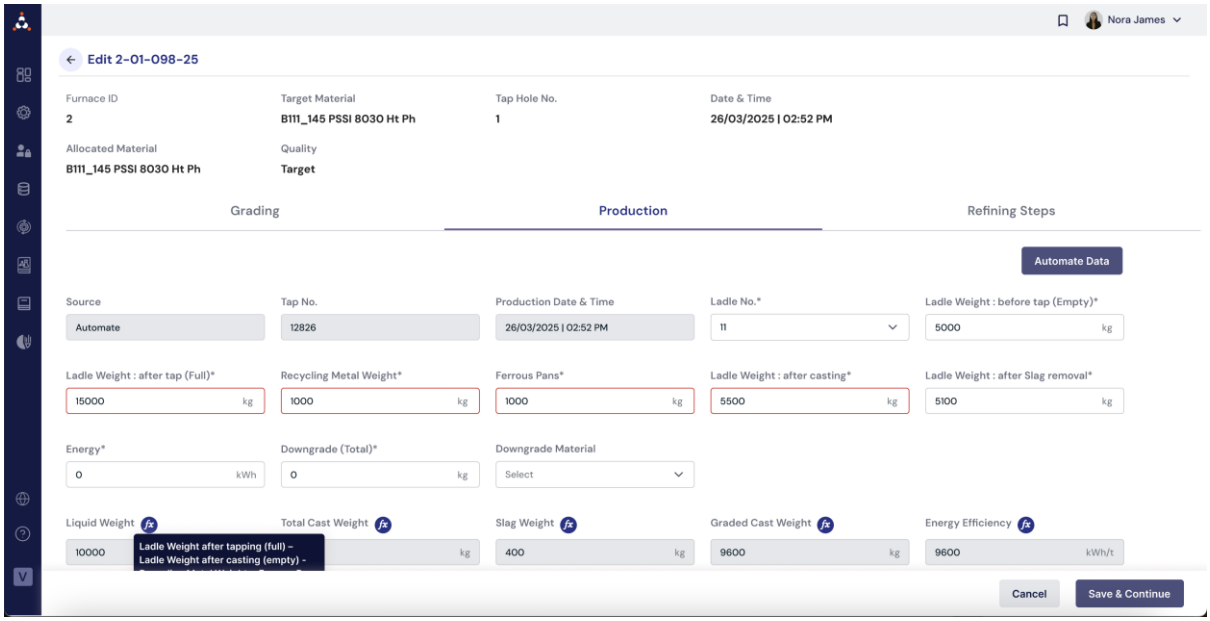
Adjust

When the Adjust button is clicked, the corresponding fields become editable, allowing further changes to be made and saved.

View Automate Data

To view the original data retrieved from Automate, the user can click the **Automate Data** button. This opens a slider displaying all the above information in read-only mode.





3.2.2. Add Manual

When there is no relevant data available in Automate, there will be a following message "There is no relevant Production data in Automate".

User can click on Add Manual button to be able to add following details

- Source:
  - Non Editable and pre-populated as "Manual".
  - Default value - No
- Tap No.:
  - Non Editable and pre-populated with Tap No. associated with Tap Analysis ID value.
  - Default value - No
- Production Date and Time
  - User picks from calendar
  - Default value - Tap ID Date and time
  - Validation - **The date and time selected by the user must be within the same shift time of date and time associated with the Tap ID**
- Ladle Number
  - User input
  - Mandatory - Yes
  - Field Type - Single Select Dropdown
  - Values - A01 - A20
  - Default value - No
- **Tinject No. - It will be removed from front end alone and made Non-Mandatory.**
- Ladle Weight : before tap (Empty)
  - User input

    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ladle Weight : after tap (Full)
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Recycling Metal Weight
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ferrous Pans
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ladle Weight : after casting
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Ladle Weight : after Slag removal
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - No
- Energy
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -** 1.00 to 999,999.00 . Numeric with 2 decimal**s**
    - Default value - In case of Manual data it will be a mandatory user input (0 value is allowed) in the MES system.
- Downgrade (Total)
    - User input
    - Mandatory - Yes
    - Field Type - User Input
    - **Validation -**
    - Default value - It will have a default 0 if no data is available.

- Downgrade Material
    - User input
    - Mandatory - No
    - Field Type - Single select dropdown
    - Values - off-grade elements mapped to the active grading plan of the selected furnace.
    - **Validation -** If Downgrade Quantity is greater than 0, it is mandatory to select a

downgrade material.

- Liquid Weight
    - Non-editable field,
    - Calculated based on the following formula Liquid Weight = [Ladle Weight After tapping (full)] –[Ladle Weight After casting (empty)]-[Recycling Metal Weight] + [Ferrous Pans]
- Total Cast Weight:
    - Non-editable field
    - Calculated based on the following formula [Ladle Weight (Full - after tap)]-[Ladle weight after Slag removal]
- Slag Weight
    - Non-editable field
    - Calculated based on the following formula = Ladle Weight After casting (empty) - Ladle Weight After slag removal.
- Graded Cast Weight
    - Non-editable field
    - Calculated based on the following formula [Cast Weight] - [Downgrade (Total)]
- Energy Efficiency
    - Non-editable field
    - Calculated based on the following formula [Energy]/[Liquid Weight/1000]19
    - Note: The number 1000 is to convert Liquid weight from Kg to Tons.
- Tapping Metal Flow
    - Non-editable field
    - Calculated based on the following formula = (Liquid Weight/1000) / (Duration of Refining Step FILL / 60)

Note - For all calculated values, hovering over the formula icon will display the calculation formula in a tooltip. Additionally, the fields used in the calculation will be highlighted in red for easy reference.

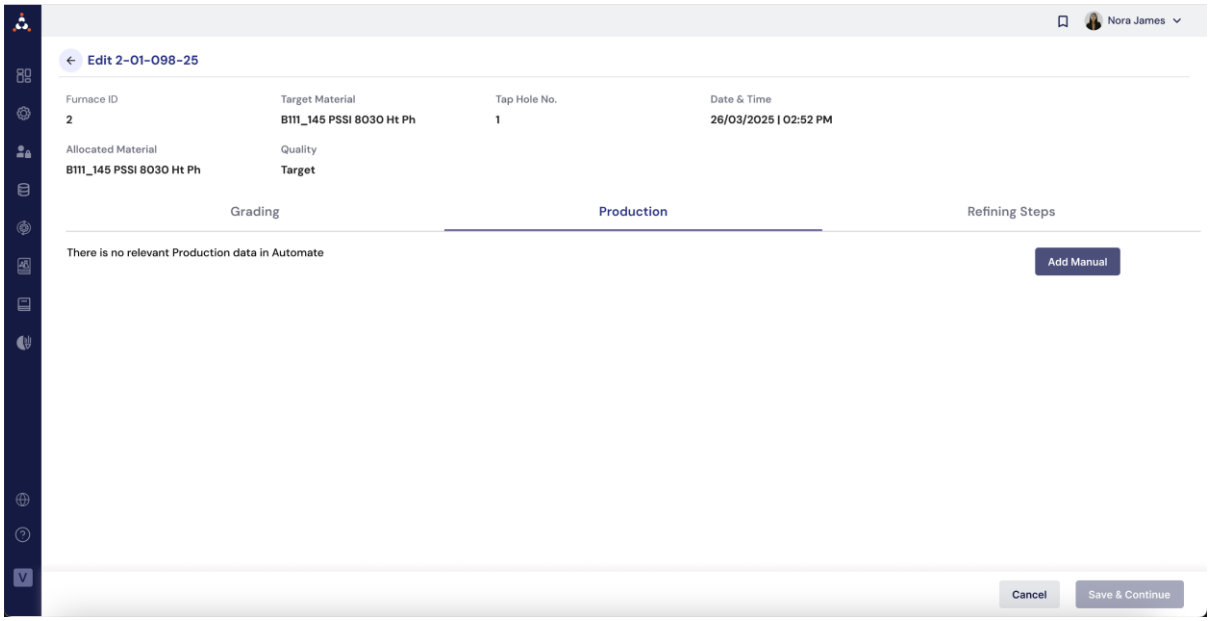
Action Buttons

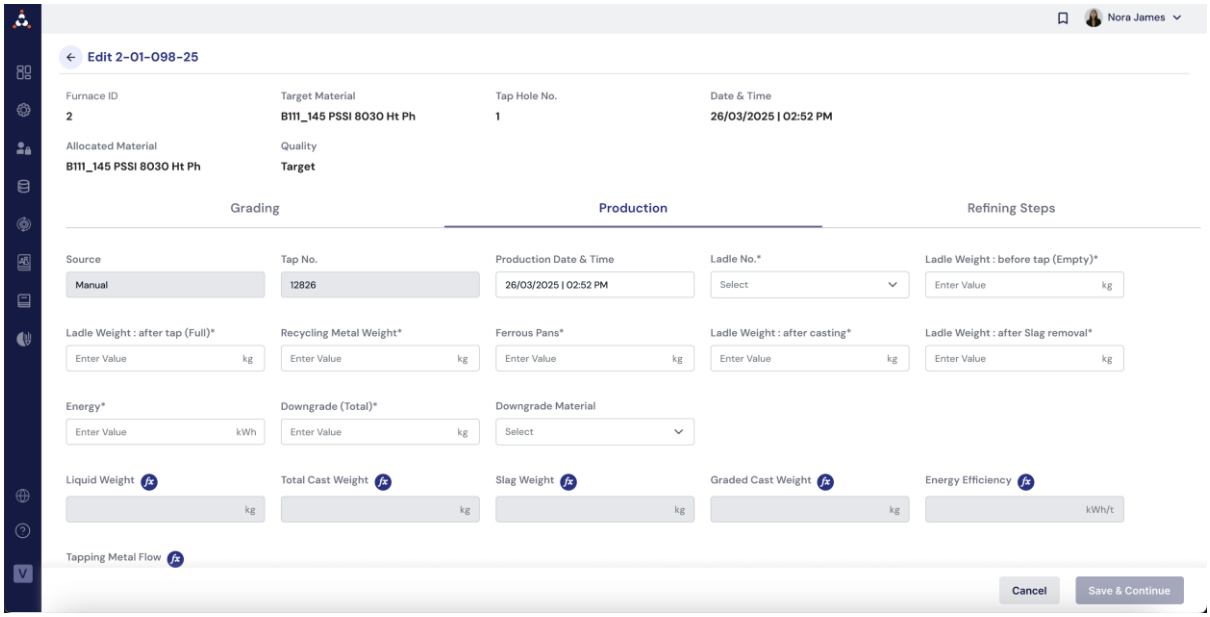
- **Save & Continue:**
    - Once satisfied with the adjustments, the user clicks Save and Continue. This action commits all changes to the database, making the adjustments final. The user is then navigated to the Refining Steps tab.

  - These details can be edited by clicking the Adjust button. Editing is allowed until Tap is Finalized.
  - The status of the tap in the tap list changes from Grading Finalized to **Production Saved**
- **Cancel**: Cancels the current operation and returns to the list screen

Adjust

When the Adjust button is clicked, the corresponding fields become editable, allowing further changes to be made and saved.





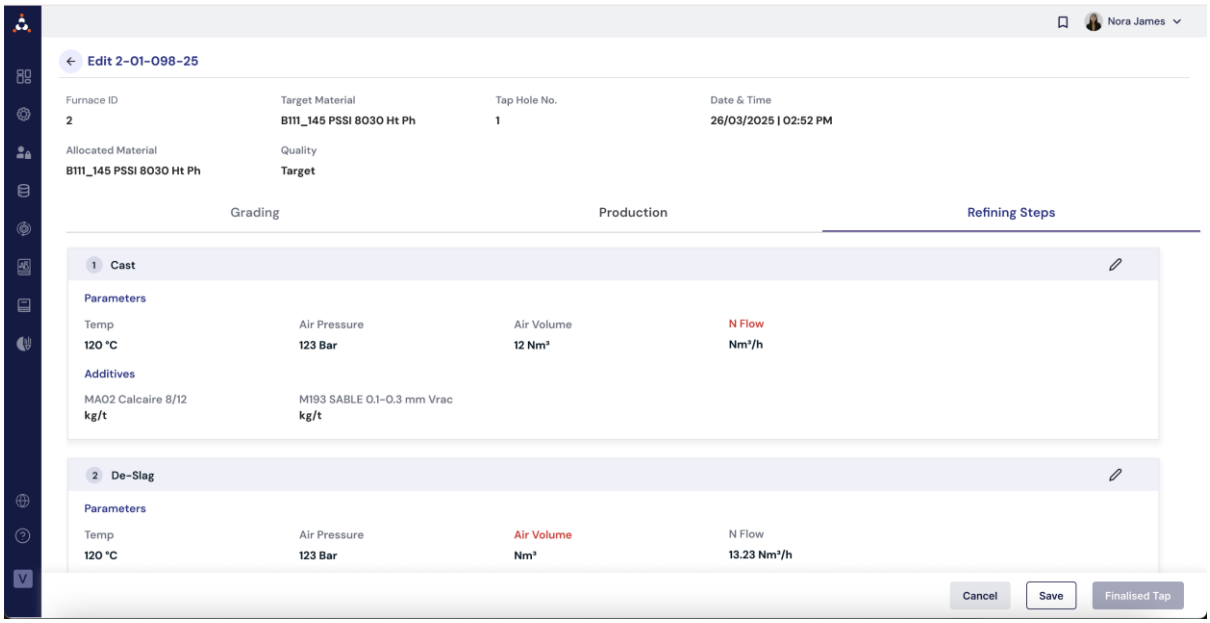
Saving Production Data:

- Upon clicking “Save,” the production details are saved. The user is then navigated to the “Refining Steps” tab.
- These details can be edited by clicking the Adjust button. Editing is allowed until Tap is Finalized.
- All fields marked with an asterisk (*) are mandatory.
- Units are based on the plant unit system selected during plant configuration.
- In the Tap ID list screen, the status changes from “Grading Finalized” to “Production Saved.”
- The production data values, including manually entered data from the Da Vinci system, can be adjusted by clicking an adjust icon.

3.3. Refining Steps:

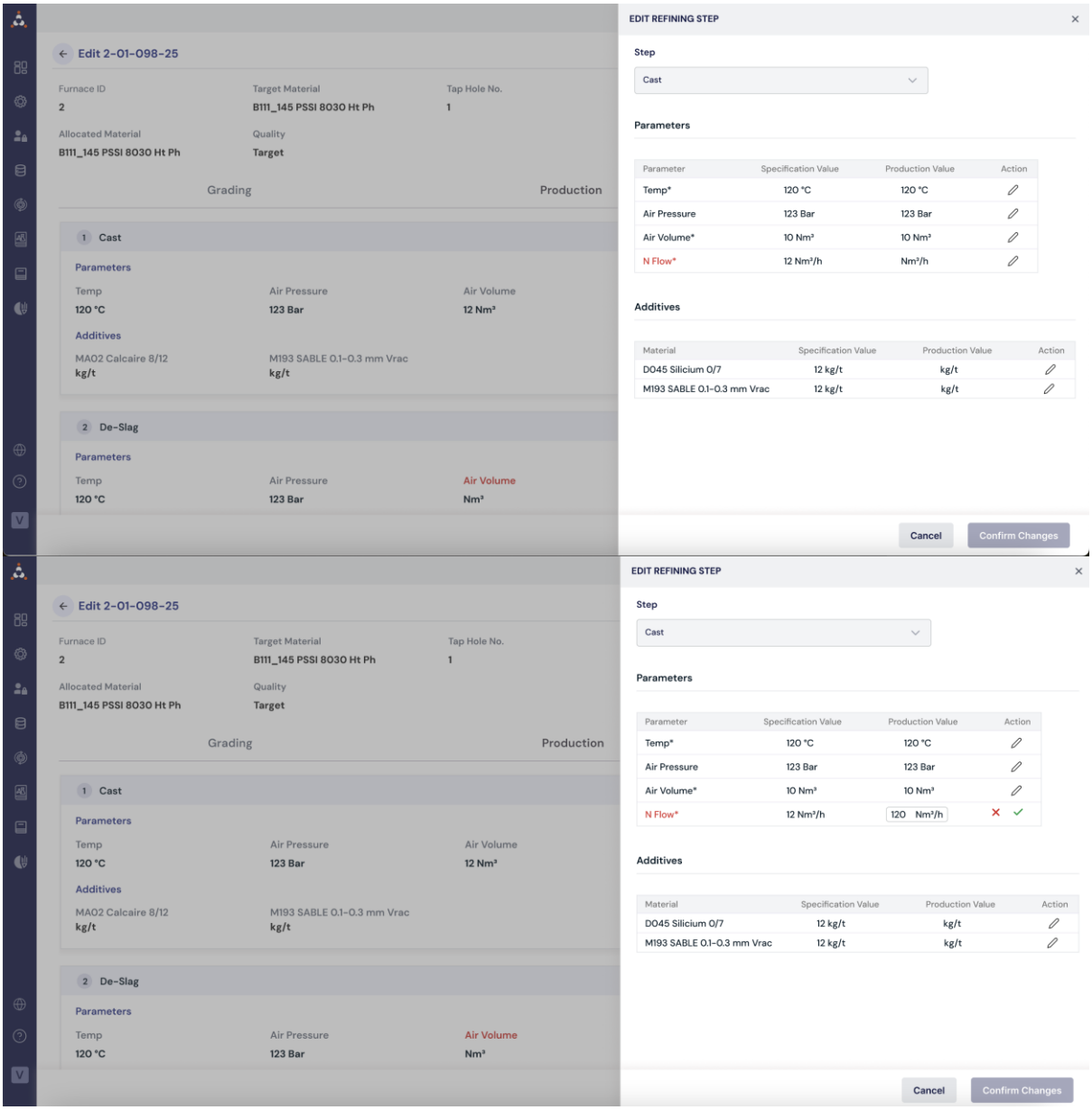
In this tab, production data specific to the furnace refining steps is automatically populated and editable.

- Users can view the refining steps specifications configured during the furnace setup.
- **Base Assumption:** It is assumed that production data will be limited to the information available in the furnace configuration for each refining step. If the data does not match the configured specifications, it will be ignored, ensuring consistency with the established furnace setup.



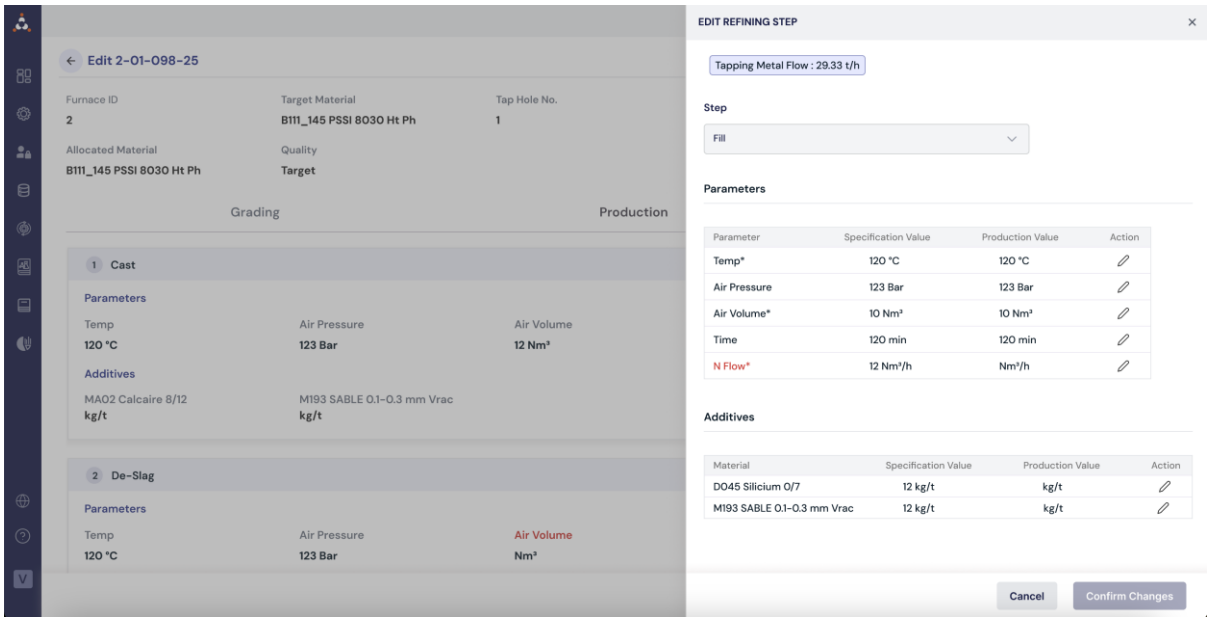
3.3.1. *Edit Refining Steps*

- If production data is not available, all steps and fields listed under the furnace configuration are populated here,
- Users can add values by clicking the “Edit” icon for each refining step. This opens a slider with the fields populated as per the furnace configuration.
- Fields marked as mandatory in the furnace configuration will be highlighted in red, indicating that they must be entered before the step is saved or tap be finalized.
- Step - Non editable field with pre populated value
- **Parameter Section**- A list of Parameters with the following fields
    - Parameter - Name of Parameter - Non editable. Validation - If Parameter is mandatory in furnace config specifications, it will be highlighted in red and “Confirm Changes” button will be disabled until Production values is entered.
    - Specification Value - corresponding value in refining steps specification in Furnace config - non editable
    - Production Value - pre populated with value from Automate, or empty, editable, Field Validations - same as the field validation of parameters in refining steps
    - Action
        - Edit - Upon clicking this icon Production Value will become editable and can be saved.



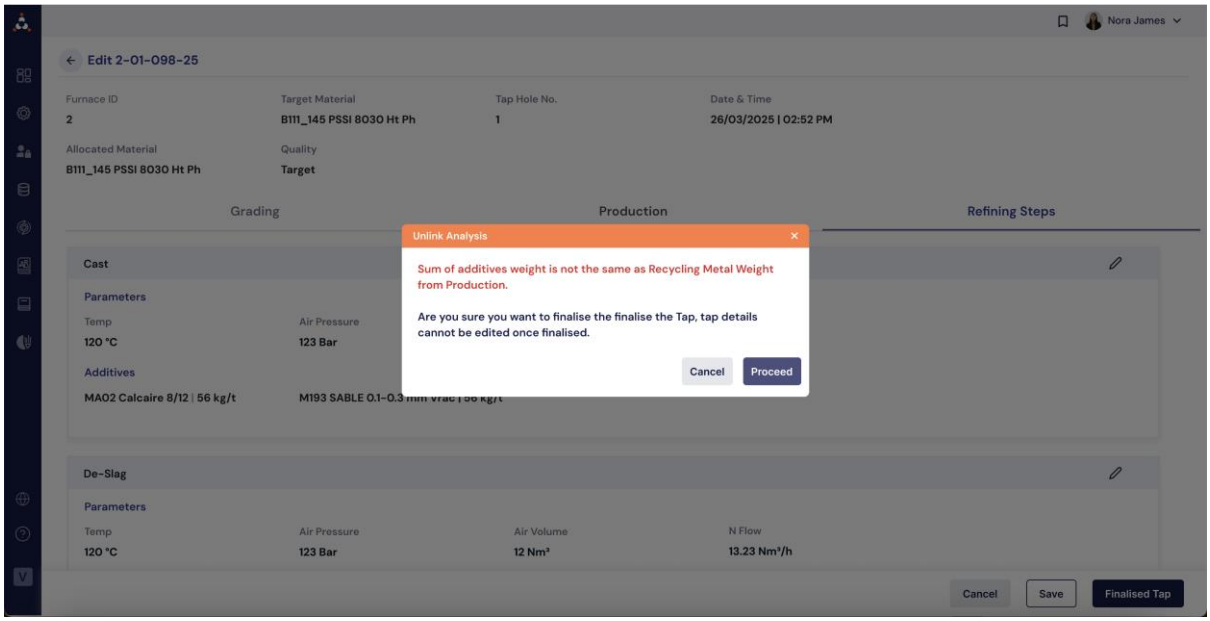
- **Additives Section -** A list of Additives with the following fields
  - Additives - All additives added in the refining steps of Furnace Config
  - Specification Value - corresponding value in refining steps specification in Furnace config - non editable
  - Production Value - pre populated with value from Automate, or empty, editable, Field Validations - same as the field validation of additives in refining steps
  - Action
    - Edit - Upon clicking this icon Production Value will become editable and can be saved.
- Validations - All field validations will be the same as applied to refining steps specification in Furnace Config.
- Upon Clicking “Confirm Changes, they get reflected in the refining steps tab. The changes need to be saved here for them to be saved in database.

- The “Finalize Tap” button will remain disabled until all mandatory fields within the refining step have been filled with valid data.
- Refining Steps can be saved by clicking the “Save” button without mandatory validation checks. This allows users to temporarily save data before finalizing the tap, providing flexibility to input or update information without completing all required fields immediately.
- **Note:** In the “Fill Step” editing feature, when the Time Parameter value is changed, the system will automatically calculate the Tapping Metal Flow based on the new Time. This calculated value will be displayed in the popup, ensuring that the user can see the updated Tapping Metal Flow value immediately, providing real-time feedback before finalizing the changes



3.3.3. *Finalize Tap*

- Once all refining steps are completed, the user can click on “Finalize Tap” in the Refining Steps tab.
- After finalization, all data related to the tap becomes view-only and cannot be edited further.
- **Validation for Tap Finalization:**
  - All mandatory fields in the refining steps must have valid inputs.
  - The sum of all additives’ weight across steps must match the total recycling material weight in the Production tab. If the numbers do not match, a popup appears, prompting the user to confirm if they wish to proceed with tap finalization despite the discrepancy.
    - “Sum of additives weight is not the same as **Recycling Metal Weight** from Production.
      Are you sure you want to finalise the finalise the Tap, tap details cannot be edited once finalised.
  - A default confirmation prompt always appears before Tap Finalization
    - “Are you sure you want to finalise the finalise the Tap, tap details cannot be edited once finalised.”



4. View Tap

Clicking the “View” icon in the tap list displays all tap details across the three tabs: Grading, Production, and Refining Steps.

The details are shown in view mode and are accessible only to users with the appropriate view permissions.

- Users with editing permissions can click the “Edit” button in view mode to navigate to the relevant tab and make changes as needed. This provides easy navigation and ensures that users can efficiently access and modify tap details based on their permissions.
- **Back Button | Tap ID “2-01-098-25” | Edit Icon**
- **General Tap Details**
- The following will be visible
    - Furnace ID - read only, Pre-populated with value
    - Target Material - read only, Pre-populated with value
    - Tap Hole No. - read only, Pre-populated with value
    - Date and Time - read only, Pre-populated with value
    - Allocated Material -
        - read only, Pre-populated with value
        - Will be empty until Tap linked

4.1 Grading Tab

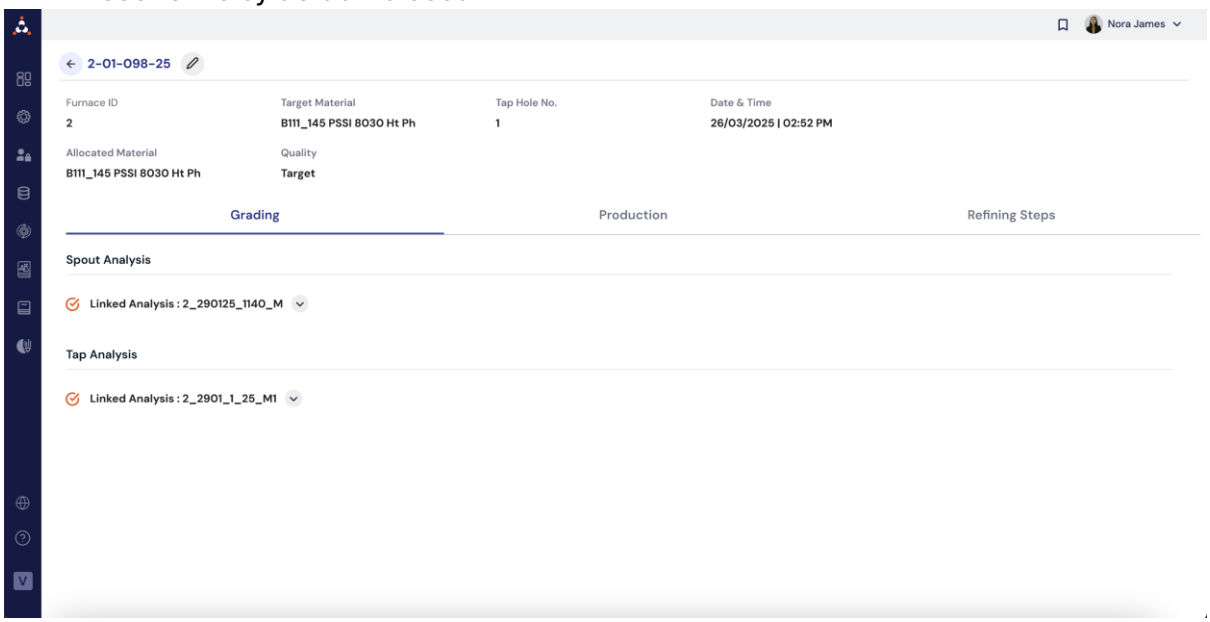
Spout Analysis: Viewing Linked ID:

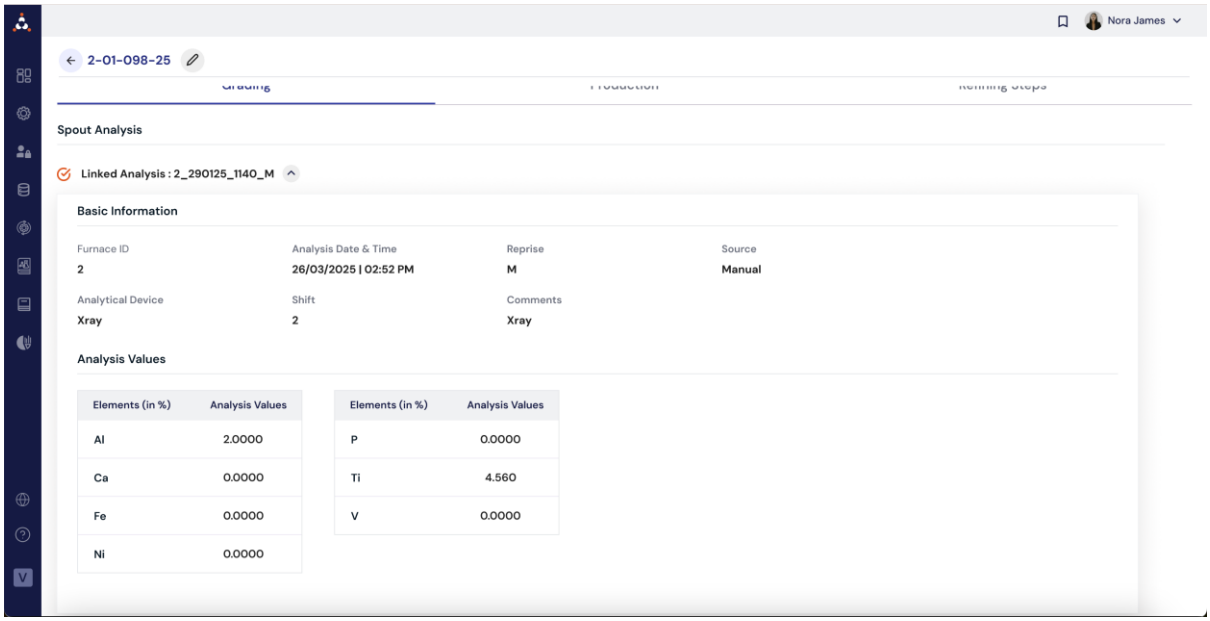
- Once linked, the Spout Analysis ID appears on the screen.
- Upon clicking the down arrow it opens a section with all the analysis details. This section is by default closed.

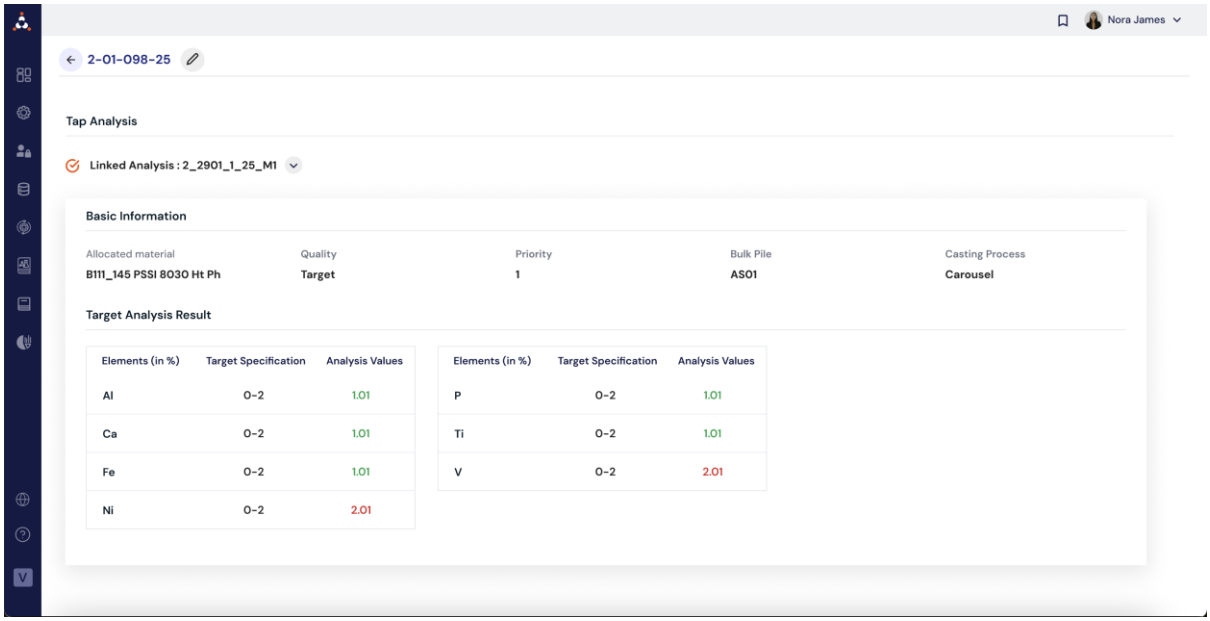
Tap Analysis: Viewing Linked ID:

- Once linked, the Spout Analysis ID appears on the screen.

- Upon clicking the down arrow it opens a section with all the analysis details. This section is by default closed.







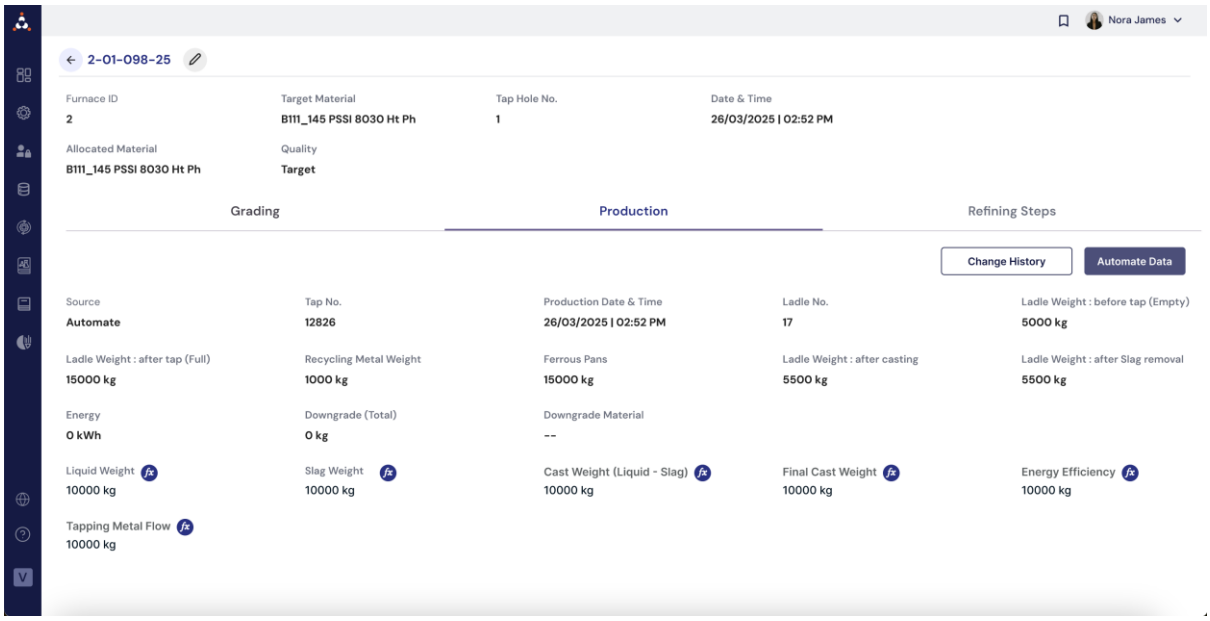
4.2 Production Tab

In the list screen, the user clicks on the View icon that appears when hovering over a record. After clicking the View icon, the user is redirected to a detailed view of the tap. In the detailed view, the user selects the Production tab to view the production values. The following fields will be populated:

- Furnace No.
- Tap No.
- Date and Time
- Ladle Number
- Tinject Number
- Ladle Weight Before Tapping
- Ladle Weight After Tapping (Full)
- Recycling Metal Weight
- Ferrous Pans
- Ladle Weight After Casting (Empty)
- Ladle Weight After Slag Removal
- Energy
- Downgrade(Total)
- Downgrade Material
- Liquid Weight
- Total Cast Weight
- Slag Weight
- Graded Cast Weight
- Energy Efficiency
- Tapping Metal Flow

In view mode, users will always see the most recent updates for all production-related values associated with the selected tap.

Note - For all calculated values, hovering over the formula icon will display the calculation formula in a tooltip. Additionally, the fields used in the calculation will be highlighted in red for easy reference.



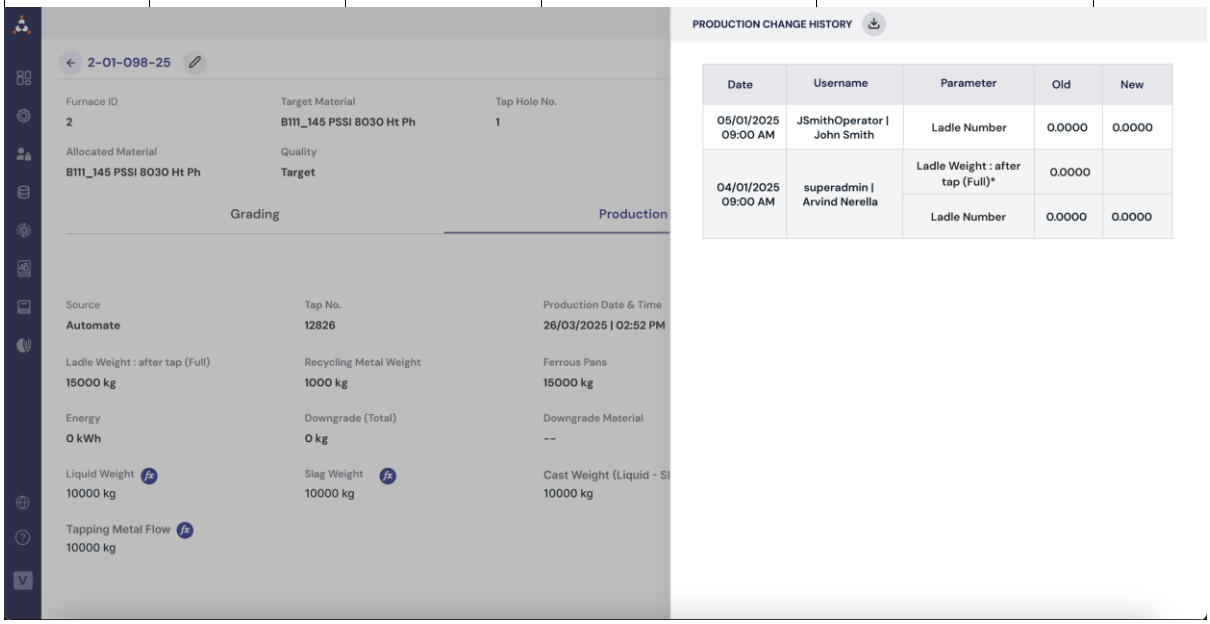
Change History

Viewing Change History: In view mode, there is a Change History button that provides access to detailed records of modifications made to the production data. When the user clicks on the Change History icon, a slider opens with the following details:

- Date & Time of change
- Username | First name + Last name - user who made the change is displayed.
- Changes Made
- Field Name: The specific field that was changed.
- Old Value: The value of the field before the change.
- Adjusted Value: The new value of the field after the change.
- Change history records are created only after the user confirms adjustments the production data by clicking Save & Continue. This action commits the changes to the database
- The change history logs all changes made during each database commit, ensuring a complete and accurate record of modifications.
- Users can download the change history as an CSV file by clicking on the Download button within the change history popup. The CSV file will contain all the detailed information, including the date and time of changes, user information, and the specific changes made to the production data.
- Exported Filename - “DDMMYY_ProductionChangeHistory”
- **Sample Data**

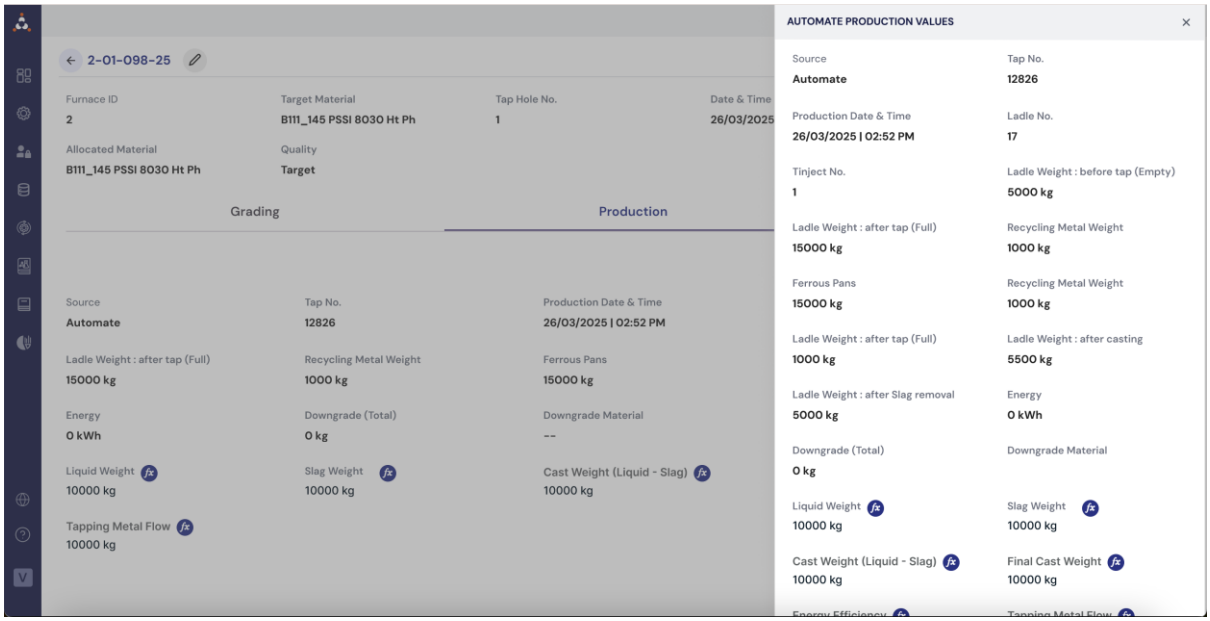
Modified At	Modified by	Field Name	Old Value	Adjusted Value

19/05/2025 | 02:46 AM	UserID | First name + Last name	Recycling Metal (ton)	100	200
19/05/2025 | 3:46 AM	UserID | First name + Last name	Recycling Metal (ton)	200	225



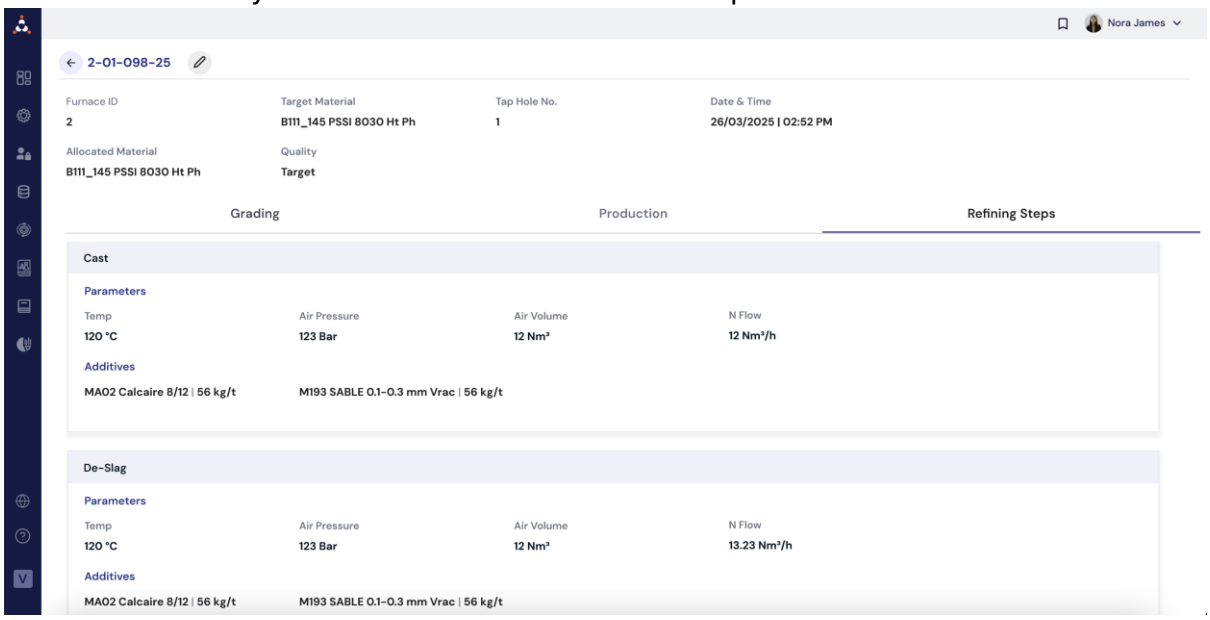
View Automate Data

To view the original data retrieved from Automate, the user can click the **Automate Data** button. This opens a slider displaying above production information in read-only mode.



4.3 Refining Steps Tab

- Users can view the refining steps specifications configured during the furnace setup as well as the changes made.
- Base Assumption: It is assumed that production data will be limited to the information available in the furnace configuration for each refining step. If the data does not match the configured specifications, it will be ignored, ensuring consistency with the established furnace setup.



5. Delete Tap

- Clicking the “Delete” icon in the tap list prompts a confirmation message for deletion.
- The ability to perform the delete action is based on the user’s permissions.

- Upon confirmation, the system deletes the tap. A tap cannot be deleted once grading is finalized.
- Validation : User cannot delete prior taps, until latest taps are all deleted. Deletion is Hard delete ie., they will be permanently deleted from the system, this is so we can reuse the tap of the day and sequence is maintained.