

JTEKT Non-Conforming Material Area

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1.0 Introduction

JTEKT North America, located in Vonore, TN, is an automotive company that produces steering systems for multiple automotive companies. The quality of JTEKT's products is critical to customer safety. JTEKT needs assistance in improving the current Non-Conforming Material Area and creating a standardized and sustainable dispositioning process. In the current holding area, there is an inconsistency in holding tags, as well as missing tracking information of the material in the hold area. Furthermore, the holding area is unorganized and many papers get lost. We plan to resolve these organization issues as well as upgrade their manual data entry into a digital system with a visual dashboard.

2.0 Project Charter

The function of a project charter is to formally authorize the project and define fundamental information about the project. The charter is crucial to establish a common vision between stakeholders. The charter contains guiding information about the project purpose, objectives, expected deliverables, scope, milestones, risks, constraints, and external dependencies.

2.1 Purpose

The Non-Conforming Material Area hold areas in Plant 1 and Plant 2 are unorganized and material is manually recorded. The current documentation and location systems lead to material staying in the holding area for more than 30 days, some even up to 6 months.

The current Non-Conforming Material Area system has undesirable dispositioning times. Decreasing the time spent in the holding area will increase throughput by getting the held

material back into the line, rework, or scrap quicker. Decreasing hold time will also be aided by defining Key Performance Indicators (KPIs) for the holding area and creating a standard, easy-to-use documentation system for parts.

Decreasing cost for the company will be achieved by counting good material in the hold area and obtaining a dollar estimate to know how much money is sitting in the hold area. Furthermore, decreased cost will be achieved by obtaining a dollar estimate of external material that could be charged back to the supplier.

2.2 Objectives

Our goal is to implement a Non-Conforming Material Area documentation system to accurately keep track of material KPIs for the holding area. These must include at a minimum: date found on the line, supplier, part description, part number, quantity, Oracle LOC, external or internal, issue comments, actions taken, disposition date, and prime (all listed from current log sheet).

We seek to decrease holding times to 30 days or less for Non-Conforming Material Area. JTEKT's current assets in non-conforming hold areas are estimated to be approximately \$430K. We'd like to see a significant drop in this number after implementation.

2.3 Deliverables

Among our planned deliverables is an intuitive and easy digital record input for documentation. This will eliminate the inconsistency of the current manual tracking system. This should lead to less oversights and an ability to clearly see the status of a part. Next, we plan to use this data to create a visual tracking system for product status using Power BI. The dashboard will correlate to the digital data and include all relevant information about different parts. Lastly, we will deliver a

sustainable organization system with the use of 5S methodology. Organization of the products will lead to better visualization and easier disposition and tracking throughout the hold area.

2.4 Scope

To effectively manage the holding area and implement a labeling system that is sustainable to ensure the materials do not remain in the storage for more than 30 days. The goal is to increase throughput by reducing the holding times and minimizing the risk of inventory obsolescence.

This project will only be creating deliverables for Plant 2 throughout our 2024 project. The success of this project will become an example to other non-conforming holding areas around Plant 2 if time allows. The project will not address causes for defects, but could include line/department location on the dashboard for JTEKT to use in the future.

2.5 Project Milestones & Known Risks

Project Milestones <i>Propose start and end dates for Project Phases (e.g., Kick-off, Planning, Delivery) and other major milestones</i>		
Description	Start Date (MM/DD/YYYY)	Target Date (MM/DD/YYYY)
Kick-off	01/31/2024	02/16/2024
Project Charter	02/14/2024	02/23/2024
Scope Management Plan	02/21/2024	02/23/2024
Planning	02/19/2024	03/08/2024
Schedule Management Plan	02/28/2024	03/01/2024
Communications Management Plan	03/06/2024	03/08/2024
Presentation 1 (Mid-term)	03/08/2024	03/18/2024
House of Quality	03/18/2024	04/01/2024
Final Poster	04/01/2024	04/26/2024
Final Report	04/01/2024	05/03/2024
Final Presentation	04/01/2024	05/10/2024
Implementation	08/19/2024	10/04/2024
Validation	10/09/2024	12/10/2024
Major Known Risks (including significant Assumptions) <i>Identify obstacles that may cause the project to fail.</i>		
Risk Description	Risk Rating (Hi, Med, Lo)	
Illness	Med	
Schedule	Hi	
Change Aversion	Med	

Figure 1: Project Milestones and Known Risks

2.6 Constraints & External Dependencies

Throughout this project, our main constraint will be site access and travel time. We have limited opportunities to visit the site, especially as a full group, as it can be difficult to coordinate our personal schedules with the sponsor and plant's availability. Our difference in schedules will likely impact our ability to be on site, meet as a team, and meet with our sponsor, as we all have different responsibilities. Travel distance also contributes to our ability to visit the site because it impacts our time available, and we often need to coordinate drivers.

Our project is also constrained by the budget that JTEKT is willing to supply to implement our solutions. Currently, we plan to constrain our software to Power BI because it is free for us to use as students, and JTEKT currently has other Power BI dashboards throughout the plant.

Additionally, we may be limited by external dependencies. This includes any parts of our project that depend on something else being accomplished first. In our project specifically, this might include supplier issues, waiting to hear from other departments, or software sales. When a non-conforming issue stems from the supplier, the process can be very complicated. There are many departments through which the information must travel. Upon ensuring the supplier is willing to accept the material back, it also takes time for repayment, U.S. customs and charges, and shipping time. When a non-conforming issue is internal, there are still many decisions that must be made by many departments. Decisions travel through manufacturing, supplier quality engineering, and may even require quality testing. Due to schedules and other responsibilities, this may constrain how much we are able to reduce dispositioning time. Lastly, implementing the Power BI dashboard depends on our ability to purchase the necessary materials. Software suppliers may be slow to respond to students, there may be a long lead time, or software compatibility issues with the existing systems.

2.7 Communication Strategy

Roles	Delivered by	Frequency	Methods	Description – What will be communicated?
Update department sponsor	Jacob Magill	Once per week	Weekly Report, Team Meeting	Project updates from previous week and goals for current week
Update project sponsor	Jacob Magill	TBD	Call, text, email	Project Updates & Questions on Project
Internal team communication	All team members	As needed	GroupMe	

Figure 2: Communication Strategy

3.0 Scope Management

The Scope Management Plan defines, develops, and verifies the scope of the project. This document clearly defines the responsible parties for managing the project scope, as well as serving to guide, manage, and control the scope. In this document, project requirements have been collected, scope has been defined, a work breakdown structure (WBS) was created from the project scope and requirements, and a plan to verify and control the scope has been constructed. The scope of this project is defined by the scope statement in the project charter, the statement of work, the WBS, and WBS dictionary. Our scope is measured and verified against schedule, cost, and performance baselines using variance analysis.

The objective of this project is to effectively manage the holding area of JTEKT and implement a labeling system that is sustainable to ensure the materials do not remain in the storage area for more than 30 days; to increase throughput by reducing the holding times; and to minimize the risk of inventory obsolescence. Throughout this project, the above scope will be directed by our executive sponsor and project team lead. As the scope is adjusted, it will be the responsibility of the entire team to ensure that we manage our project effectively based on the scope. It will also be our responsibility to update the scope management plan as needed.

The scope change process will involve the entire project team. A change in scope can be initiated by the executive sponsor and main project contact and will be communicated to the project team leader. The team leader is responsible for communicating the requested scope change to all team members. The entire senior design team must come to an agreement to accept the scope change. Once the team has accepted the change, the team leader will communicate the accepted scope change and any adjustments the team sees fit and agrees upon. The executive sponsor will then formally authorize the scope change.

As our scope changes, our executive sponsor will be responsible for accepting the final project deliverable and approving acceptance of project scope. It is crucial that our team is on the same page as our executive sponsor and knows exactly what is to be completed.

3.1 Work Breakdown Structure

The WBS breaks the overall project into sections and further divides the sections into actionable tasks and deliverables. We have identified four phases of the project: Planning, Design, Implementation, and Validation. These phases are the broad descriptions of the project lifecycle, which are followed by more specific tasks beneath such as the project charter, 5-S design, etc.

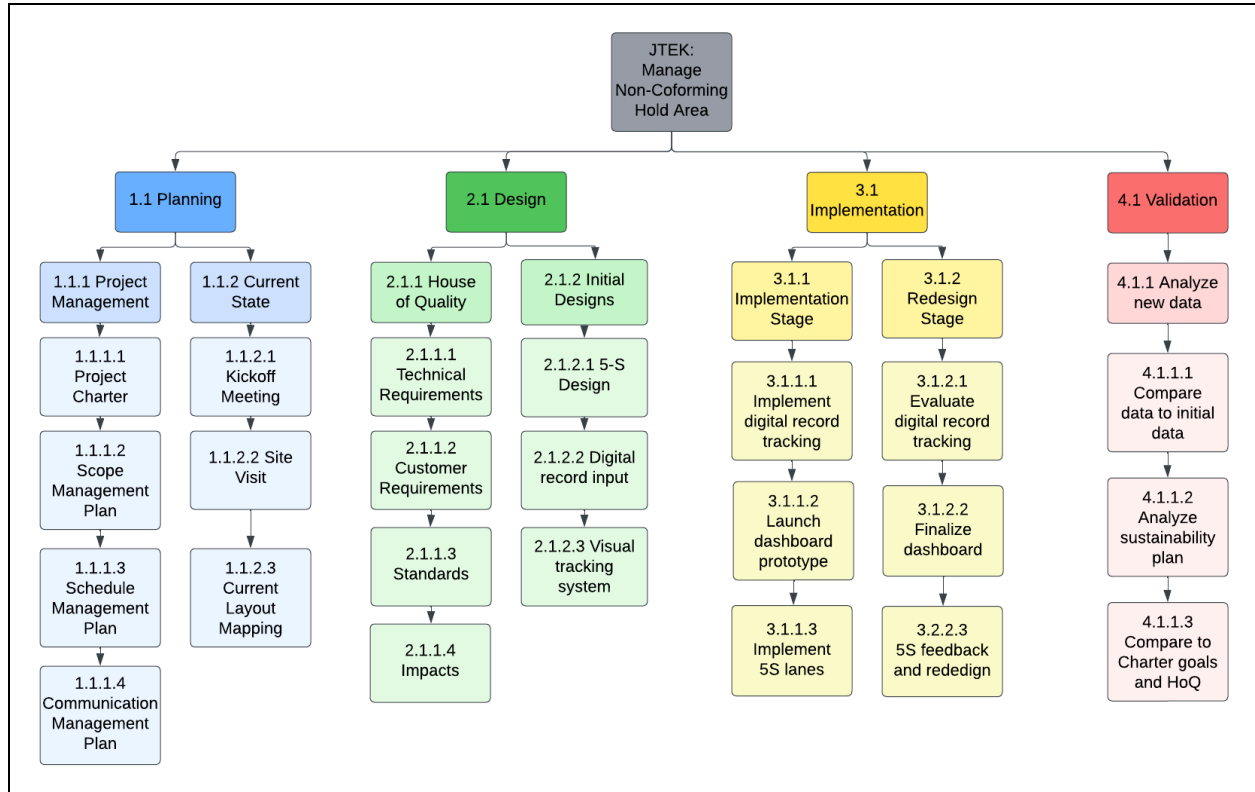


Figure 3: Work Breakdown Structure

4.0 Schedule Management

Our Schedule Management Plan shows the projected schedule for all major project activities. It lists the duration to complete each element in our WBS dictionary, as well as the start and end dates. It also shows key milestones following our schedule, as well as how we plan to control our schedule. The overall goal is to create a planned schedule for our key activities in the project, show how these events and dates connect, and find ways to ensure we can accomplish these milestones by the planned dates.

To outline the importance of the deliverables defined in the work breakdown structure, we utilized a “scheduling tool,” which includes each element from our WBS, the estimated duration, as well as planned start and finish dates. Furthermore, we created a four week rolling Gantt chart, beginning with the date of our first activity, and including each of our schedule milestones and the dates on which we plan to complete them.

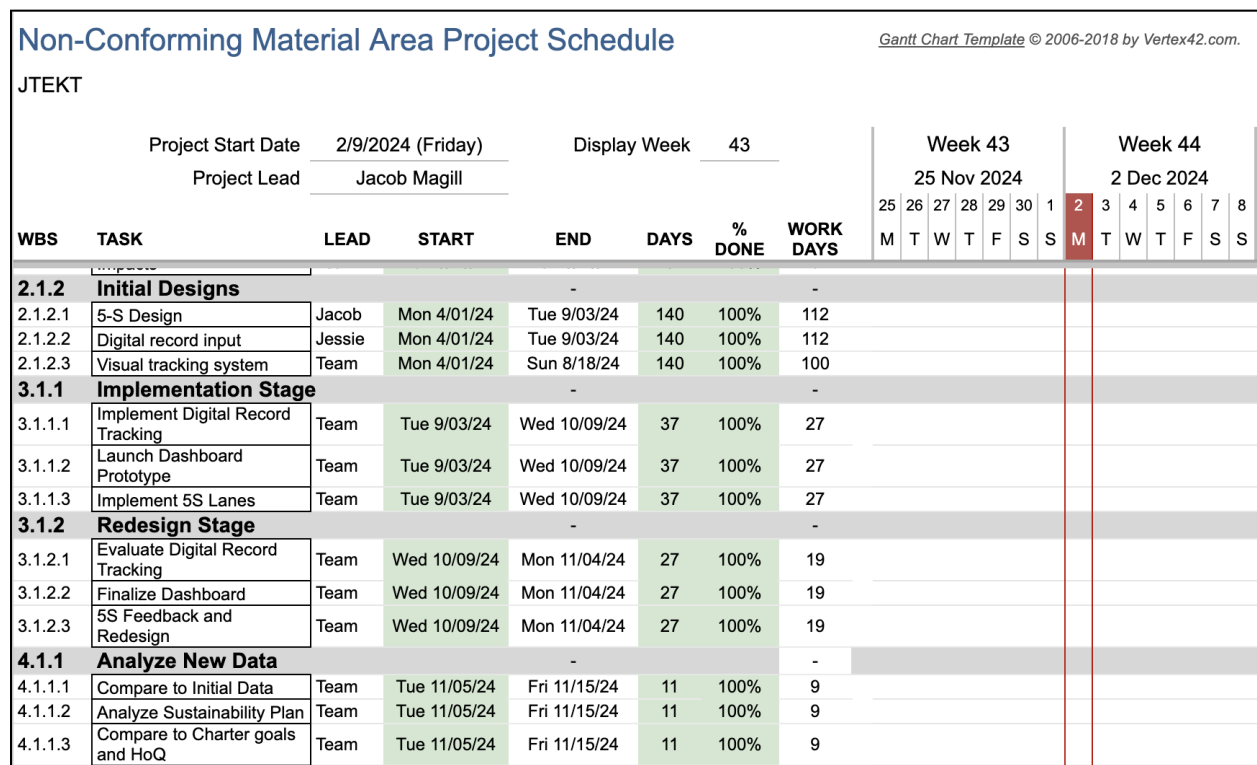


Figure 4: Four Week Rolling Gantt Chart

In addition to scheduling, we laid out key milestones, their corresponding deliverable, as well as their target end dates. These larger schedule milestones have allowed us to stay on track when smaller deliverables may shift.

Key Milestone Description	Deliverables	Target Date (MM/DD/YYYY)
Initial Designs	5s design, Digital Record Input System, Visual Tracking System	09/03/2024
Implementation Stage	Digital record tracking, Dashboard prototype, 5s lanes,	10/09/2024
Midterm Project Report/Presentation	Project Charter, Scope Management plan with WBS, Schedule Management Plan, Needs Analysis, Requirements Analysis, Functional Analysis, Technical Performance Measures, Implementation	10/18/2024
Redesign Stage	Finalized dashboard, 5s redesign, digital record redesign	11/04/2024
Acceptance of Final Deliverables	Final presentation and final report	12/06/2024

Figure 5: Schedule Milestones

Lastly, we assigned roles to each of the report deliverables as well as their frequencies. We have checked each of the project management documents monthly and updated them accordingly. This has included, and may continue to include, scope changes, data changes, etc.

Report Deliverable	Role	Frequency	Responsibilities
Master Schedule - Gantt Chart	Team Member	Monthly	Insert task lists and work packages into Gantt Chart
Project Schedule Report	Team Member	Monthly	Generate the schedule progress report for communications use
Sponsor Project Updates	Team Leader: Jacob Magill	Weekly	Review schedule updates with Department Sponsor
Project Charter Updates	Team Member	Monthly	Review Project Charter periodically with team.

Figure 6: Report Deliverable Milestones

The Schedule Management Plan over the course of the semester has helped us visualize the timeline of our project and keep track of important milestones and their due dates. By creating our scheduling tool, Gantt Chart, schedule milestone chart, and report deliverables chart, we have been able to break down a large-scale, long-term project into clearly defined blocks that allow for optimal planning and completion.

5.0 Communications Management

The purpose of our Communications Management Plan is to facilitate suitable communication among team members and stakeholders. It establishes the communication types between stakeholders, and identifies who is the sender and the receiver for each mode of communication; the frequency of each channel of communication are also understood. With the RACI (Responsibility Assignment Matrix) diagram, four roles are designated for all stakeholders, with them being who is responsible, accountable, consulted, and informed for communications.

Along with the specified ways of communication and the RACI chart, individual impact for the project is also listed. This provides roles for each member and stakeholder, and describes their impact(s) and involvement with the project.

Communication channels for where information and interactions are made are also listed, which provides the applications where they happen, and the importance of each.

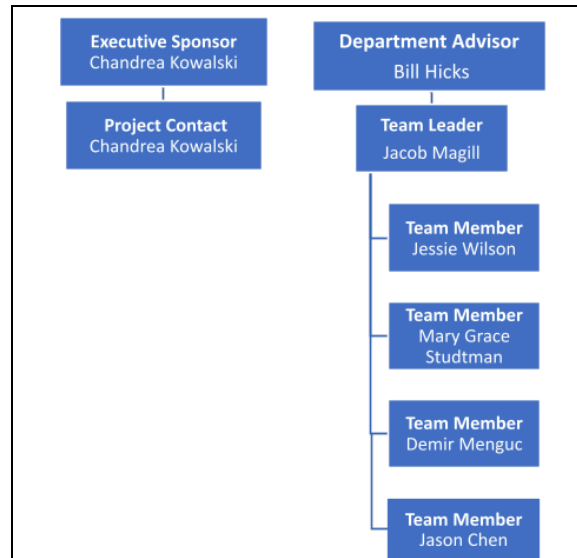


Figure 7: Project Organization Diagram

	Team Leader (JM)	Team Members	Executive Sponsor	Project Advisor
Weekly Report	A	R (Jessie)	I	C
Video Conferencing	R	A (All)	C	I
Email Communication	R	A (All)	C	I
Text Messaging	R	A (All)	C	I
GroupMe Messaging	A	R (All)	I	C
Canvas Submission	A	R (Jessie)	I	C
Project Plan Revisions	A	R (All)	I	C

Figure 8: RACI Communication Content Matrix

6.0 Needs Analysis

The needs analysis identifies problems, goals, and requirements for our stakeholders and customers. The basis of each process within a stakeholder's work is based on customer needs. It helps to translate the desires of customers into a business/technical sense, so organizations will understand how they can achieve these goals. We are considering our needs analysis, and deem it

very important, so we can assist JTEKT in serving their consumers while aligning with their standards and workflow.

6.1 Requirements Analysis

The House of Quality (HOQ) is defined as a product planning matrix that is built to show how customer requirements relate directly to methods our team can use to satisfy the customer. The measurable methods and tools we can employ are called technical requirements. For each customer and technical requirement, we assign a weight of the strength of the relationships between each pairing. The more the conditions relate to one another, the higher the relationship strength weight is on the HOQ matrix. These relationships are how we evaluate which technical specifications are most important during implementation to ensure we are meeting customer requirements. The following section details the customer and technical requirements identified in this project, as well as engineering standards and codes that must be adhered to. The HOQ matrix tool can be found in Appendix A.

6.1.1 Customer Requirements

Defining our customer requirements in our House of Quality allowed us to ensure that our project was focused on meeting the needs of the customer. When going over these requirements with the customer, it was crucial for us to understand exactly what they were hoping to achieve through our project to ensure the best results. Once we defined our customer requirements, we rated the level of importance of their interactions with each of the technical requirements as well. This allowed us to visualize positive and negative correlations between each requirement so that we can understand where we need to focus our efforts.

Our most important customer requirement is ensuring safety through quality for the end-customer. In the automotive industry, it is crucial that the focus remains on the individual that will be receiving the part and interacting with it on a regular basis. The next most important customer requirements, ranked equally, are as follows:

- Creating a standardized documentation system
- Implementing a visual dashboard in the holding area
- Organizing the hold area
- Ensuring the ability to track material
- Creating a simple labeling system that is easy to manage and sustain
- Decreasing the holding time for faster material disposition

Our third most important customer requirements include ensuring that the material information is easy to input and easy to read, and being able to implement a control system that prevents Non-Conforming Material Area from being removed from the holding area. Lastly, the customer requires that we adhere to ISO9001, OSHA 1910, NFPA 101, IATF16949, as well as the end-customer specific requirements. With these requirements clearly defined and related to the technical requirements, we are able to visualize our top priorities with regard to customer needs.

6.1.2 Technical Requirements

Technical Requirements are measurable attributes that the products must have in order to satisfy the customer requirements that are needed. This is the part above customer requirements, which show what needs to be done to satisfy technical requirements for our project. This area of Requirement Analysis helps to guide our team to satisfy customer expectations, convert customer requirements to technical terms that engineers and manufacturers can work towards, and evaluate product performance in regards to customer needs.

Technical Requirements are interrelated to customer requirements in the HOQ, where their relationship is rated from 1-6, with 6 being the highest correlation, and 1 being little to no correlation. This helps to show what areas of technical requirements are most important to satisfy certain customer requirements.

We are also concerned with Direction of Improvement with respect to technical requirements in our Requirements Analysis; this is the area right above our listed technical requirements that show either an up or down arrow, which represents what requirements we should look to expand and make more of in an improved system. An example of an “up arrow” requirement that we look to grow would be accuracy of labeling. On the other hand, a “down arrow” requirement that should not be expanded would be time to label. “Tracking Database” and “Material Label System” are requirements that are neutral, and are not considered to change in regards to an improved system.

6.1.3 Engineering Standards and Codes

JTEKT North America must adhere to multiple levels of engineering, safety, and quality standards and codes. The most well-known standard JTEKT follows is the International Organization for Standards (ISO) 9000 family of quality management system standards. JTEKT is ISO9001 certified, meaning they follow all requirements of that standard and are audited by a third-party organization to assess adherence to the code. As an automotive part manufacturer, JTEKT must also comply with the International Automotive Task Force (IATF) 16949 standards for quality management. General codes we must keep in mind are the Occupational Safety and Health Administration (OSHA) 1910 and the National Fire Protection Agency (NFPA) 101 Life

Safety Code. As a supplier to multiple automotive manufacturers, JTEKT is also required to meet their end customers' quality standards.

6.2 Technical Performance Measures

This section of the report touches on the data our team has decided to measure and the techniques we'll use to document and interpret this data. The measures we intend to collect are defined, as well as the methodologies of collecting, interpreting, and using the data. Our measurement methodologies may be subject to change as this project progresses, and those possible changes are acknowledged in section 6.2.2 below.

6.2.1 Definition of Measures

For this Non-Conforming Material Area holding process, we are looking to measure the time in system of each material group in the area, along with the total cost of all material in the hold area. Most of the steps in the process, discussed in 6.2.2, are relatively long durations, ranging from one week to six months based on qualitative interviews with the floor worker in this area. Additionally, some materials do not follow those steps exactly, so an accurate division of time spent in each step is infeasible to quantify. Therefore instead of finding the average time in each step and creating a value stream map, we will focus on the average days in system (DIS) of each material in the hold area. While time will be our most measurable component of this project, we would also like to define a measurement of material cost within the hold area. We have been given an estimate of \$430,000 of material currently contained within the Non-Conforming Material Area hold area. JTEKT does not have a goal for us to reduce this stagnant capital, but as a team we would like to decrease this value by around 30% to \$300,000.

6.2.2 Measurement Methodology

To visualize the number of days that parts were being kept in the system, we created a histogram of days in system from a snapshot of time in April 2024. This provided us with a baseline and clearly showed the wide range of days that parts were being held. As shown, some parts were being held for over a year, with one part over two years. Having a benchmark histogram helped us visualize a realistic goal for the desired DIS. The average DIS in April was 163 days with a standard deviation of 183 days. This dataset has a high degree of variability, which is another factor we would like to reduce.

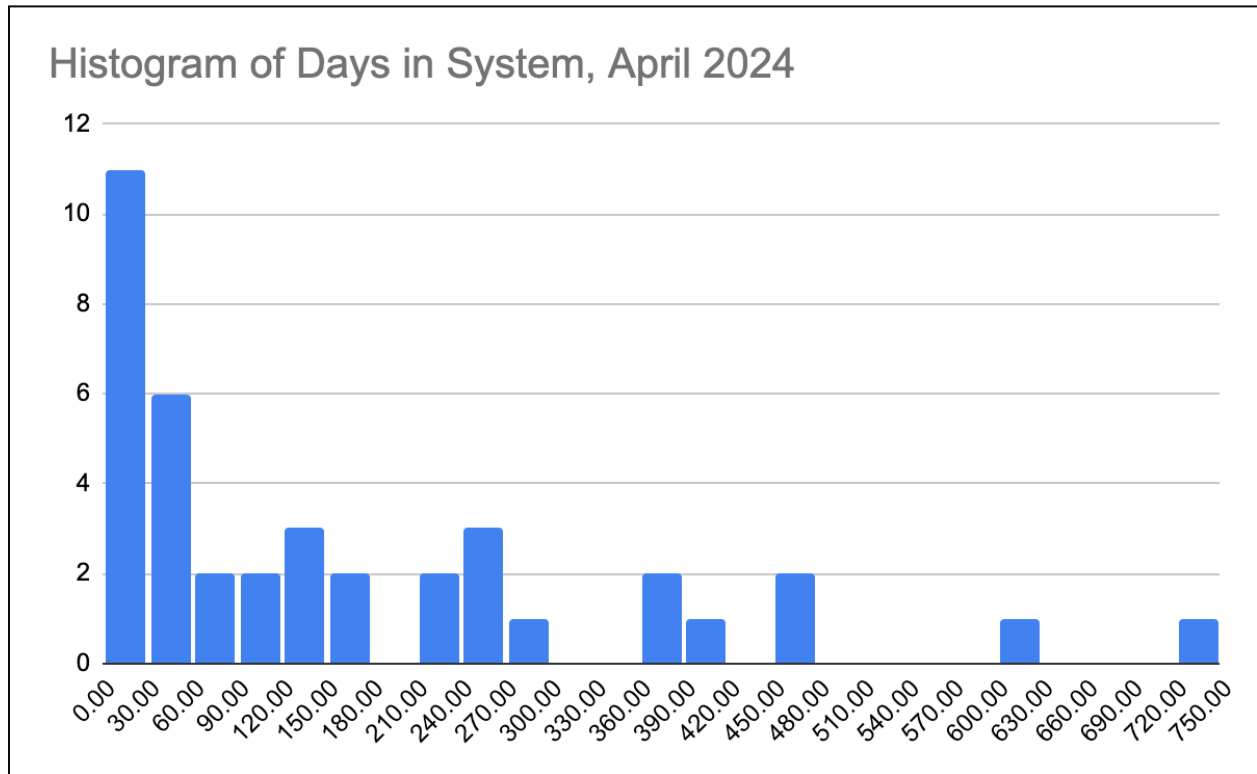


Figure 9: DIS Histogram April 2024

7.0 Design

The goal of our project is to enhance the hold area in Plant 2 so that JTEKT can improve operations and have the opportunity to reduce sitting material costs. Redesigns of this area will help make this possible. After meeting with our sponsor and employees at JTEKT, we have brainstormed different alternatives to their current layout that will increase storage capacity and enhance the management of their Non-Conforming Material Areas. 5S methodology and visual control systems will assist us in cleaning up the area and addressing the concerns and problems JTEKT currently faces.

7.1 Design Alternatives

We are considering several design alternatives to improve the Non-Conforming Material Area. One idea is to reorganize the space to increase available storage for Non-Conforming Material Area and enhance overall organization. Utilizing 5S tools in the space will help increase throughput by making material, tools, and technology clear and accessible.

Another design idea is to use colored tape and stickers to sustain organization. The colored tape will be used to mark off designated areas on the floor, creating lanes that form organized storage aisles. The colored stickers will be placed on the material hold tags and coordinate with the color-coded digital data. When the part has been in the area for a certain amount of time, the digital data will turn green, yellow, or red. Upon this, the materials should be updated with the appropriate sticker. These combined methods not only maximize space but also visually separates different areas and materials for ease of access and inventory management.

7.2 Design Development

We have gathered measurements for both the Non-Conforming Material Area and specific employee work areas, including desks, filing cabinets, and other office furniture, as well as the dimensions of items like pallets of Non-Conforming Material Areas. These measurements will be crucial in mapping and planning the area, as well as changing the layout of the Non-Conforming Material Area to maximize space and improve organization.

Swim lanes for all departments involved in the decision-making process for non-conforming material were incorporated into the process maps. The process maps are also divided into non-conformities found externally from suppliers or internally after parts have started on the assembly lines. The purpose of this is to display the different processes that occur among multiple departments at JTEKT. These departments and employees work alongside one another and have different responsibilities, so the swim lanes help identify how the work is separated or shared.

Our plan includes creating a new layout for the non-conforming area to ensure that all materials and objects will fit in their intended locations and take into account space for a forklift and electrical panel safety zones. Originally, we had planned to conduct a spaghetti mapping exercise, but due to the limited space and extended time of steps in the process, we have determined that it is infeasible.

7.2.1 Implementation Plan

Our strategy involves relocating the Non-Conforming Material Area to ensure compliance with quality and safety standards and to create more space for storing these materials. We intend to

designate specific taped-off lanes for storing Non-Conforming Material Areas to maintain organization. Additionally, we plan to implement a color-coded system to indicate the status of each material (ready, in-process, or requiring attention) or length of time each material has been in the area for workers to identify easily. By the end of the implementation phase, our goal is to provide a clearly delineated storage area with designated taped-off lanes, a color-coded system for easy status identification, and full compliance with all relevant standards.

7.2.2 Compliance with Standards and Codes

The Non-Conforming Material Area in Plant 2 that our project focuses on was recently audited internally in April of 2024 for IATF 16949 compliance, with a dual-purpose of preparing if an external ISO 9001 audit were to occur unexpectedly. From their findings, JTEKT gave us some key points that need to be addressed by our solutions. The first is that all Non-Conforming Material Area must be contained within the caged area, which is not the case of the current state. Our reorganization and 5S of the Non-Conforming Material Area must contribute to solving this issue. Additionally, the current handwritten Non-Conforming Material Area log is not a controlled document, which is a requirement for ISO 9001, IATF 16949, and JTEKT customer quality standards. Our team will need to consult with these standards as we create a digital record input system or any other record-keeping materials.

7.3 Design Revisions

As we completed our initial implementation stage, we analyzed the probability and feasibility of our designs actually working, and researched ways we could improve our implementations to achieve more desirable results. A few things that needed to be addressed was the initial lanes and overall layout in the hold area we designed, the ability of achieving 30 days for material in the

hold area due to the time frame of our project, being able to create an effective and efficient Power BI dashboard and how we can connect that dashboard to our excel tracking log data, and other concerns that came along the way. We spent a few weeks of the second half of the project after our initial implementation to improve these concerns and issues. We are confident that the changes we have made will yield positive results, and allow JTEKT to use our designs in the future with hopes of achieving the original goals and going above and beyond.

7.3.1 Project Charter Revisions

The main revision that we needed to make for this project was our final goal for the December timeframe. Initially, Our sponsor desired the lead time of material in the hold area to be approximately 30 days. After further inspection and data collection in the process, it was apparent that this goal was not realistically achievable by December. With that being discussed with our sponsor, we decided that 60 days was a more realistic goal considering the project tenure. Our project is meant to be sustainable, and because we are seeing a gradual positive change towards the 30 day mark, we consider this project a success.

7.3.2 Issues in Initial Design

Throughout the design and implementation process, there have been a fair share of bumps in the road in the process. Initially, the goal stated by our sponsor was that non-conforming material in the hold area was dispositioned by an average of 30 days. After some data collection and physical observation, it was apparent that this goal was unrealistic for the time frame of this project. Another oversight we faced was the human error factor of this project. Our initial design of the updated hold log spreadsheet didn't factor the probability of input error into the sheet. The original log required the operator to type in a 12-digit part number, which included letters,

numbers, and dashes. This led to an undesirable percentage of mis-inputs into the system. For our design to be effective, the information put into the log must be accurate. We also felt the initial design of our spreadsheet still didn't show the key information we wanted the operator to see at first glance. Some important columns were still placed all the way to the back of the log, which forced the operator to waste unnecessary time looking for this data. Our initial hold log design was also not used immediately by the operator, which was a considerable setback for our evaluation phase. It's important to note that the log lacked any instructions, and there were no indicators to distinguish between data entered manually by the operator and information that was automatically inputted.

Focusing on another design implementation flaw, our initial layout plan involved creating taped cells onto the floor of the hold area. That way, we could identify how long some materials had been in the hold area based on the cell color displayed in our dashboard. Unfortunately, this solution still didn't give us much visual control of the hold area. Hold materials in varying parts of the process could still be anywhere on the floor, resulting in continued wasted time. Finally, when it came to implementing our Power BI dashboard, it was still unclear how we were going to merge our dashboard that was designed using fictitious data with JTEKT's actual data log. Data is not always filled in correctly in their log, which can lead to errors in generating the dashboard.

7.3.3 Final Design

The final designs of our project include a digital hold area tracking log, updated hold area layout, Power BI Dashboard, and a weekly Gemba meeting for the hold area. These designs will greatly improve the overall operating efficiency of the Non-Conforming Material Area. With previously

manual data entry, the tracking log along with the Power BI dashboard and 5S improvements will aim to reduce the amount of time that material is in the hold area.

7.3.3.1 Hold Area Tracking Log

As previously mentioned, the tracking system in the hold area at the beginning of the project was completely manually and on paper. After noticing that information was not being properly filled out, JTEKT constructed a temporary digital tracking system; however, the spreadsheet was complicated to use and still allowed for many errors to be input. Due to the previously mentioned errors in the original tracking log, we designed a new system for the spreadsheet. Instead of having the status of the part at the end, the first column shows whether the case is open or closed. When a case is closed, the macros move the entire row to a different sheet in the workbook titled “closed” for documentation. Next, the operator enters the Oracle number, which populates the part description. By entering a 6-digit Oracle number instead of a 12-digit part number consisting of letters and numbers, the chance of error is reduced greatly. Furthermore, the population of the part description allows the operator to know if the Oracle number was entered correctly. Next, the operator will enter the date opened and the DIS cell is automatically populated. If the DIS are above 90 days the cell turns red, if it is between 60 and 90 days the cell turns yellow, and if it is 60 days or less the cell turns green. This allows clear visualization of what parts need immediate attention. For further description of the part, there are drop downs to indicate the status, internal or external to JTEKT, the supplier or area, and whether the supplier is domestic or international. Next, the operator will input the quantity of parts that are in the whole area and the cost of those parts will automatically populate. Lastly, the operator enters which plant the part is located in, the part nickname, and any comments or issues that need to be noted. The updates to the

spreadsheet aim to minimize error, create clear visualization, and ultimately lower the average DIS.

7.3.3.2 Hold Area Layout

Originally, there was no standard layout for the whole area. Parts were not organized by how long they had been in the holding area, which led to minimal visualization and ultimately longer dispositioning times. Furthermore, the staging areas for sorting were in the way of the forklift aisles, so if sorting was going on, forklifts could not move in and out of the area. The original state of the hold area can be seen in Appendix D. To fix this, we went to the facility and first tagged the hold tags with green, yellow, or red stickers depending on how long the parts had been in the area. Then, we taped off the areas to separate the green, yellow, and red material. The green area holds parts that have been in the hold area for 60 days or less or are ready to be dispositioned. The yellow area holds parts that have been in the hold area for 60 to 90 days, and the red area holds parts that have been in the hold area for over 90 days. When a part is ready to be dispositioned, no matter how long it was in the whole area, it will be moved to the green area. The new layout design, which can be seen in Appendix E, aims to create visibility and organization within the hold area for faster dispositioning.

7.3.3.3 Power BI Dashboard

For even more visibility of part status in the hold area, we will be integrating the hold area tracking log into a Power BI Dashboard that will be on a monitor in the hold area. At its resting state, the dashboard will display a graph of each Oracle number and the days in the system. To the right of the graph, there will be a box displaying the average DIS as well as the sum of the cost of all the parts in the area. Below the graph there are green, yellow, and red filters. By

clicking one of these filters, the graph will show only the parts that are tagged that color. To the right, the average days will change to the average days of the selected parts, and the total cost of the selected parts. Furthermore, any single Oracle number can be selected, and the dashboard will show the color indicator, the number of days the part has been in the area, and the cost of the parts. The Power BI dashboard, along with our other designs, will allow for clear visibility in the hold area and aim to create a standardized process that will reduce dispositioning time and cost.

7.3.3.4 Weekly Gemba Meeting for Hold Area

To create visibility in the Non-Conforming Material Area across different departments, we are implementing a weekly Gemba meeting for the hold area. This will be a 10-15 minute meeting held in the hold area with department managers, the supplier quality engineer, production control, the manufacturing supervisor, the quality representative, and the quality supervisor. The meeting agenda will include a review of the follow-up actions from the previous week's meeting, a discussion of the red tagged material and the next steps for dispositioning, and the green tagged material that is ready for dispositioning. By having regular updates with the previously mentioned positions, there is greater visibility of the Non-Conforming Material Area. This will allow the hold area to become more of a priority, decreasing dispositioning times and costs of sitting material.

8.0 Evaluation

For the evaluation stage, we are analyzing the final results after our initial design, revisions, and final design, and determining what the result is; we are also comparing it to our original goals and desires at the start of the project with our scope. We are also considering what can be done with our designs to ensure sustainable use as well as how it can be used for further improvements

to the hold area. Although changes were made to the project charter that may not have been as ambitious or significant compared to before, such as originally making material in the hold area stay less than 30 days by the end of our project timeframe, our goal is to teach and guide JTEKT with our creations to ensure this goal be met through further and proper use of the taped lanes in the hold area, digital tracking system, Power BI dashboard, etc. Through recommendations and discussion about future project use, we believe this to be achievable.

8.1 Final Measurements

After testing our final designs, our results and data show potential to continuously decrease days in the system as well as holding cost to eventually reach the initial goal of parts in the hold area averaging less than 30 days in the system. When compared to the average days in the system back in the spring, our number in the fall decreased an average of 75 days, from 163 to 88. The standard deviation also decreased by almost half from 183 to 68 days, meaning the spread of the DIS data has less variability. While this average DIS number still has a long way to go before reaching the desired 30 days, the average has decreased nearly half of what it was originally; with continued sustainability and tracking with the spreadsheet and dashboard, that number will continue to decrease.

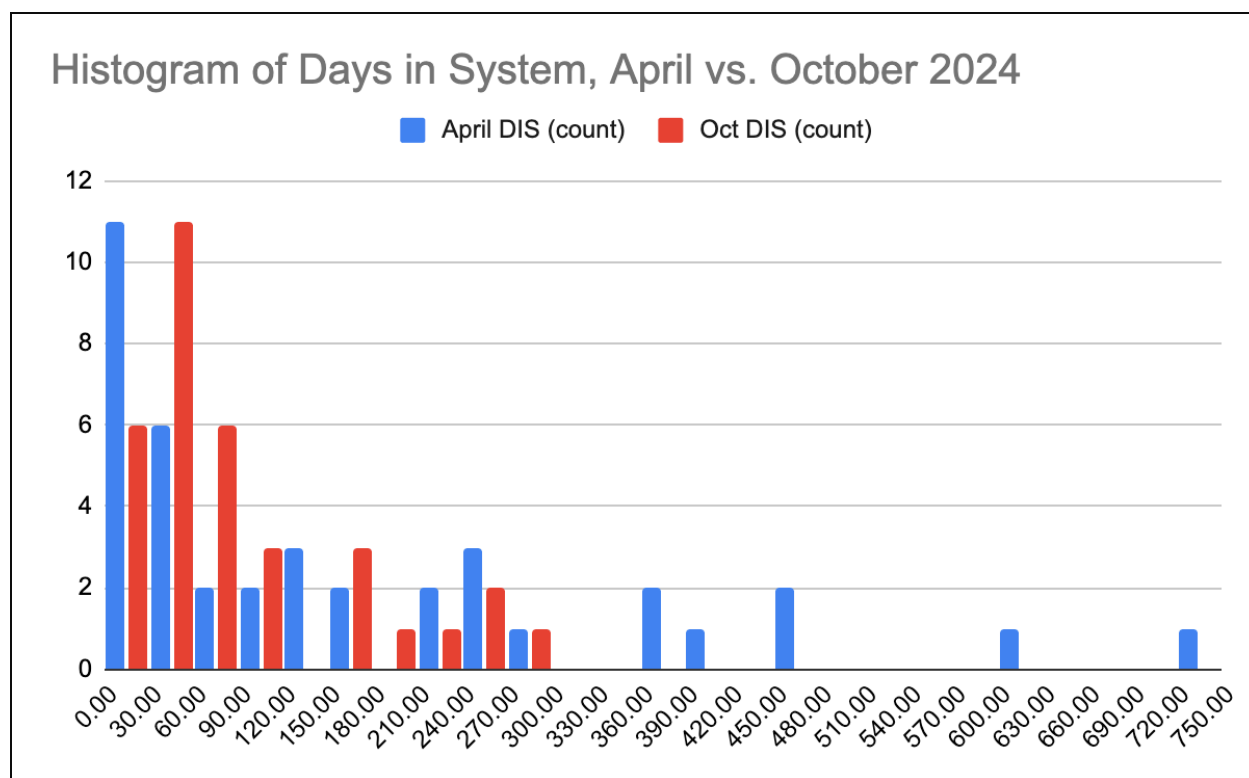


Figure 10: DIS Histogram April vs. October 2024

In regards to the total cost of the material sitting in the hold area, the initial value was around \$430,000. Our goal in regards to this in our project charter was to decrease this value, with a target goal to be around \$300,000 by the end of the fall semester. With our final measurements, we found our total cost of material in the hold area in December to be around \$315,000, nearly reaching our goal set at the beginning. With the use of the tracking system and designs we have set in place, we intend to ensure that JTEKT can sustain this lowered sitting cost, and continue to decrease this as they see necessary.

Another crucial change was the shift from a 12-digit alphanumeric code for part identification to a 6-digit Oracle number. By establishing the Oracle number as the key identifier for a part, the margin for error decreases dramatically, increasing the typing accuracy from 74% to 91%.

Furthermore, when the Oracle number is entered, the tracking log populates the part description and cost. This lets the operator double check that the Oracle number was entered correctly, and automatically pulling the costs saves a cost request from the accounting department that could take over a day to receive back.

8.2 Evaluation of Implemented Solution

There were many aspects of this project that were a success. The current state hold area map, along with the new hold area layout in the facility that we adjusted, was very beneficial for the operator of that hold area. The colored sections and lanes in the area helps JTEKT to organize the area, and distinguish which parts are which, how long it has been in the area, whether the part is waiting to be dispositioned or not, etc. The flow of which part goes where (green section at the far right, yellow section right beside it in the middle, and the red section to the far left with its own distinct section) helps the operator immediately realize what area needs attention, and how long the parts have been in there first as the first enter the area. This also helps him find specific parts with the use of the tracking system and their Oracle number.

The hold area spreadsheet was also a huge improvement for the hold area. As previously mentioned, we updated the tracking log to be simpler to use so that other departments can have visualization of the parts in the area. When the Oracle number of the part and the quantity are entered, the cost is automatically counted. Furthermore, when the operator enters the date opened, the days in the system are populated and will be green, yellow, or red, based on how many days it has been in the area. This information feeds into the Power BI Dashboard that we created for easy filtering. These improvements not only help the quality department track the material on hold, but the filters on the DIS column specifically will act as the agenda for the

Hold Area Weekly Meeting. Attendees can filter through what has been in the area for over 90 days, 60-90 days, and 0-60 days, giving clear visualization to other departments of what is in the area, and how much it costs, to decide what actions need to be taken.

One aspect of our project that could have been improved is the instructions for using the tracking log. While we currently include instructions for entering the required information, user instructions for troubleshooting the spreadsheet would provide value for JTEKT in case of glitches and errors. Concerns over formulas and conditional formatting no longer working in the spreadsheet could be handled by written user instructions of how to fix this. Equations, explanations of which box and sections need to be adjusted, etc., could be included in this.

Furthermore, implementation of the Power BI dashboard has proven to be difficult due to the time it has taken for the Hold Area spreadsheet to be implemented. Without full use of the tracking log, the Power BI dashboard cannot be updated to display the accurate information. Furthermore, the sustainability of the dashboard may decrease if any updates are needed after the conclusion of our project. Once the dashboard is handed over to JTEKT, any updates will have to be made by the quality department. Due to the complexity of the dashboard, and its practicality compared to the tracking log, it may not be sustained if updates are necessary.

Overall, our project has helped shine a light on the non-conforming material hold area and bring some energy to addressing the problems within that area. While our solutions, if JTEKT continues to use them, are intended to aid in decreasing the average days in the system of

material on hold, our team hopes that the energy and focus itself of JTEKT and related departments will ultimately be the sustaining driver of change.

8.3 Recommendations

To improve overall efficiency, it is recommended to hold regular weekly meetings to discuss ongoing challenges, review progress, and set action steps for continuous improvement. These meetings should serve as a platform for identifying obstacles, tracking action items, and making adjustments to keep the team aligned and focused on its goals.

Another key improvement could include implementing a barcode scanner system to eliminate manual data entry of lengthy part numbers or Oracle codes. Automating the data entry process will streamline operations, reduce human error, and increase efficiency.

In terms of performance targets, the goal for DIS should be set to 30 days, with incremental improvements tracked to meet this target. Monitoring the DIS metric continuously will help ensure steady progress, allowing the team to refine processes as needed to reach the 30-day objective.

Additionally, at the beginning and end of each shift, the operator should conduct a walkthrough of the hold area to assess materials, their locations, and how long they have been stored. This process helps maintain a clear overview of the hold area's status and prevents material backlog or extended storage times. To support this, Quality will conduct a monthly 5S audit to keep the area organized and promote smooth, sustainable operations. This quick audit will encourage cleanliness and efficient material flow, which are essential for productivity.

Training backup personnel for Thomas's role, particularly in managing the hold area, is also essential. Relying solely on Thomas as the point of contact could create bottlenecks if he is unavailable. By training additional team members, operations can proceed smoothly even in his absence.

Lastly, if moving Thomas's workspace affects his productivity, consider relocating his desk back to the hold area. Having a personal workspace there may help him maintain focus and productivity, ensuring he continues to perform at a high level.

8.4 Future Projects

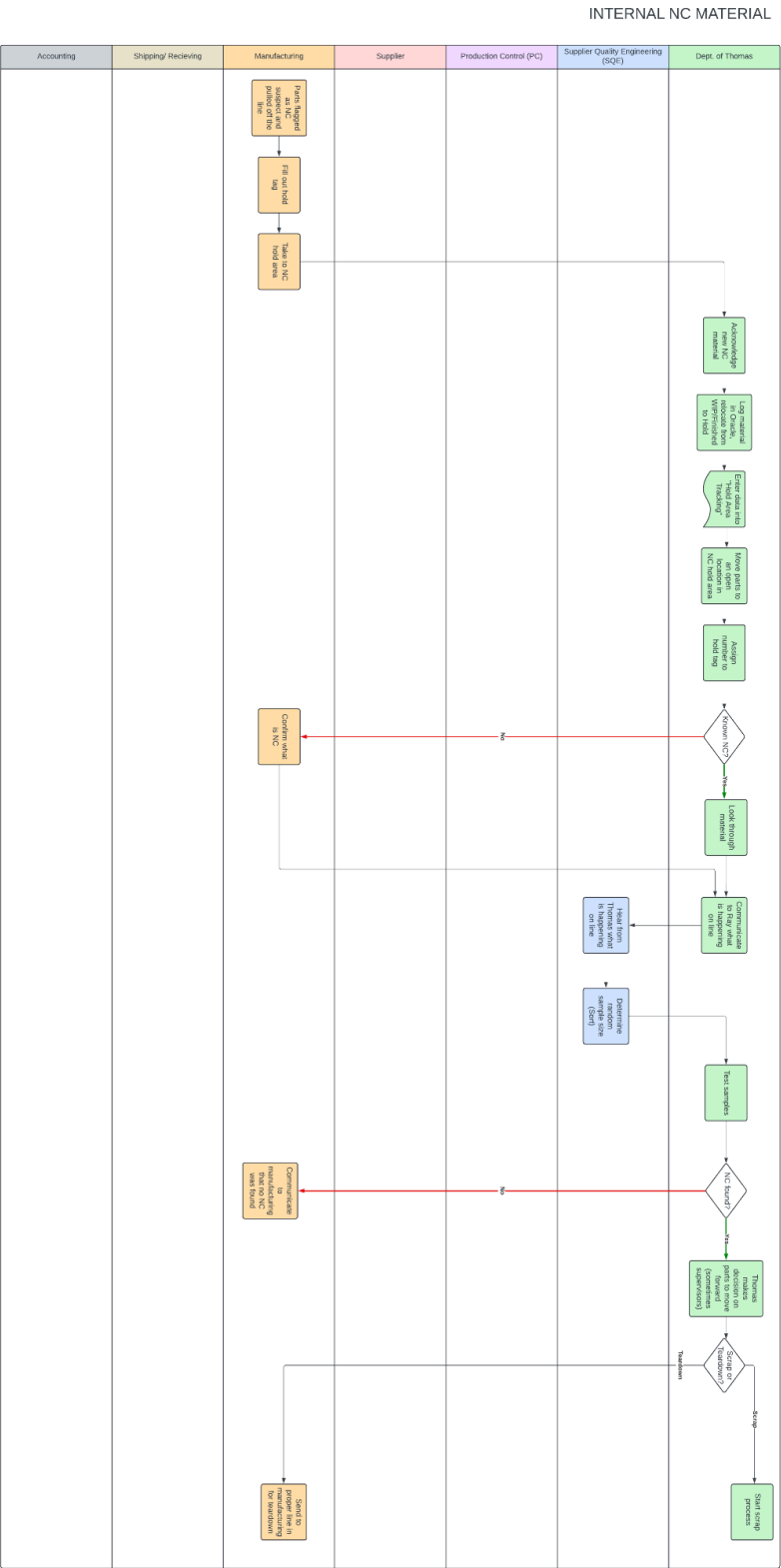
For future projects, it is recommended to replicate the proven hold area layout from Plant 1 in Plant 2. The setup in Plant 1 has effectively improved efficiency and aims to reduce the DIS to 30 days incrementally, so adopting the same approach in Plant 2 should yield similar benefits. Standardizing the layout across both plants will streamline processes and support more consistent performance.

Additionally, it is crucial to maintain organization of the hold areas. A clear system should be established to ensure that all items are stored in designated locations and that the main Hold Area is regularly updated on item placement. Rather than allowing items to be placed randomly, a structured approach will make materials easier to locate and access as needed. Following this system and maintaining organization will minimize confusion, improve efficiency, and help maintain smooth operations.

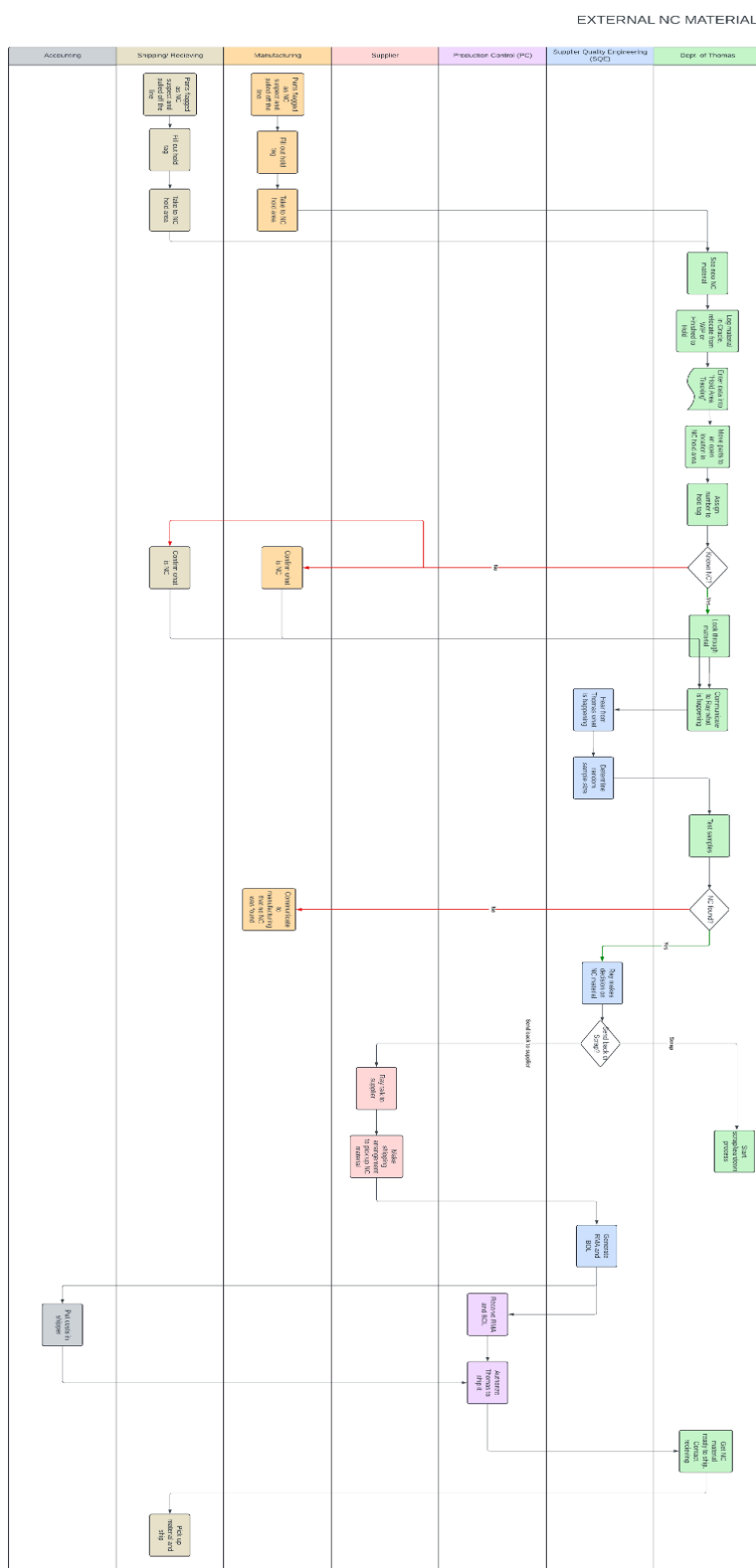
Appendix A: House of Quality

		Technical Requirements										
Direction of Improvement		▼	▲	▼	□	▲	□	▼	▲	▲	▲	▲
Customer Requirements		Customer Importance	Training Hours Needed	Readability/Technician Friendly	Time to Input New Material	Tracking database	Data visualization	Material label system	Time to label	Accuracy of label	30 days or less in hold area	NC Material Org. System (5S)
Process	Standardize documentation system	5	6	6	1	3	1	6	6	6	6	3
	Create visual dashboard	5	6	6	3	6	6	3	1	1	3	6
	Organize holding area	5	6	6	6	6	6	6	6	6	6	6
	Ability to track material	5	6	6	3	6	6	6	3	3	1	6
	Material label simplicity	5	6	6	6	3	3	6	6	3	6	6
Customer	Easy to input	4	6	6	6	6	3	6	6	3	6	1
	Easy to read	4	6	6	1	6	6	6	3	6	3	6
	Easy to manage	5	6	6	6	6	6	6	3	6	6	6
	Easy to sustain	5	3	6	3	6	6	6	6	6	6	6
Standards	ISO9001	3	3	1	1	3	3	3	3	3	1	3
	IATF16949	3	3	1	1	3	3	3	3	3	1	3
	End-Customer Specific (Honda, Toyota, BMW, etc.)	3	3	1	1	3	3	3	3	3	1	3
Impacts	Decrease holding time for faster material disposition	5	1	3	3	6	3	6	3	6	3	3
	Control and prevention of NC material being removed from hold area	4	1	3	3	6	3	6	3	6	3	6
	Safety through quality for end-customer	6	6	3	1	6	1	3	1	6	1	3
	Importance Rating		123	117	73	198	90	162	60	174	99	112
Sum (Importance x Relationship)			10%	10%	6%	16%	7%	13%	5%	14%	8%	9%
Relative Weight			10%	10%	6%	16%	7%	13%	5%	14%	8%	9%
Rank			4	5	9	1	7	3	10	2	8	6

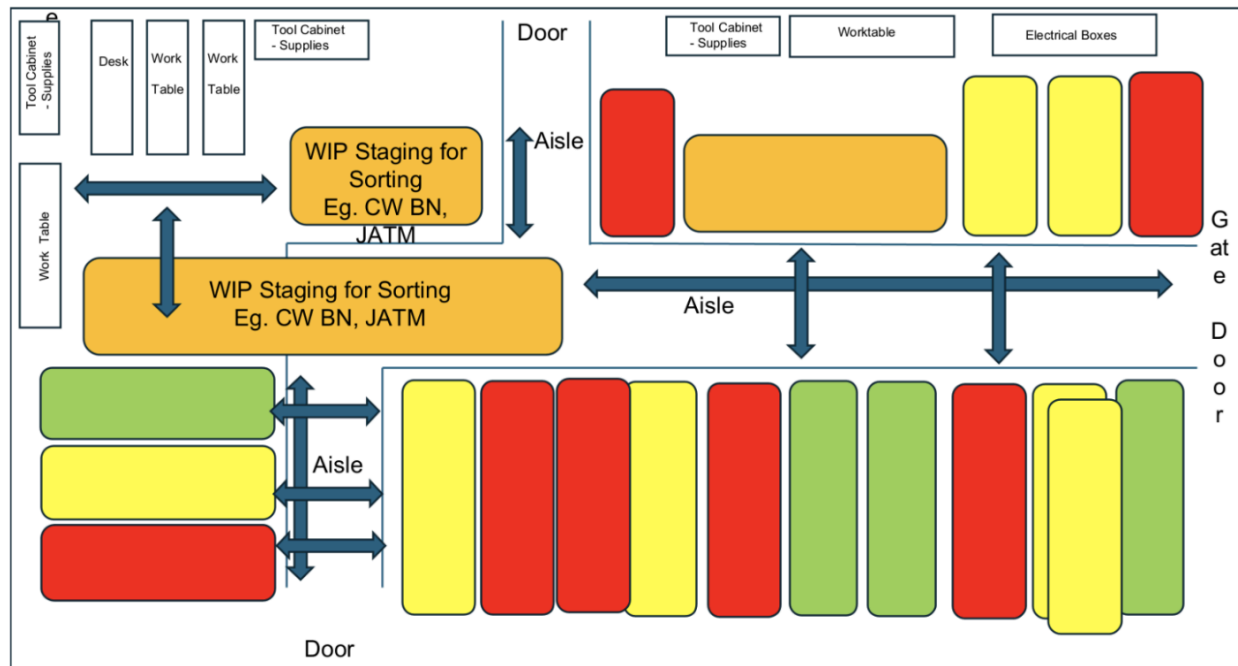
Appendix B: Internal Non-Conformity Process Flow



Appendix C: External Non-Conformity Process Flow



Appendix D: Initial State Hold Area Layout Map



Appendix E: Current State Hold Area Layout Map

