



# **Analysis of The Effect of Machine Painting on The Number of Machines Certified as Green Line at Testing Area**

## **Final Project Proposal**

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Batam, 13 June 24



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# Approval Sheet

The Final Project was prepared to fulfill one of the requirements for  
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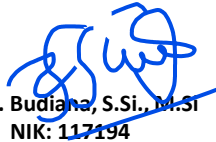
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# Analysis of The Effect of Machine Painting on The Number of Machines Certified as Green Line at Testing Area

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**Abstract**—PT Infineon Technologies is a German semiconductor company established in April 1999 after Siemens AG, its parent company, was divided to establish new companies, one of which is in Batam. PT Infineon Technologies Batam (IFBT) makes Integrated Circuit (IC) electronic components. The four main areas of Infineon's IC production process are FOL, EOL, Test, and MSP. When Infineon implemented the Green Line concept, launched in 2012, to achieve a stable and controlled manufacturing process, the company's performance improved significantly and the company successfully achieved operational targets such as efficiency, productivity, and quality. In the Green Line concept, four M's were established: People, Machines, Methods, and Materials. To ensure that these standards are applied in the production field, a Man and Machine certification process is conducted. Although the name refers to Machines, other factors such as Man, Method, and Materials are also included in the assessment criteria during the certification process. Once the machine is deemed to meet all the set criteria, the certification process is considered complete and the machine is marked with a sticker indicating its status. This research will study how the condition of paint on engine covers impacts the success of the Green Line engine certification process. The goal of this project is to address the issues found regarding the paint condition on the engine covers so that the number of engines that successfully obtain Green Line certification reaches the set target. The benefits of this research include reducing the failure rate during the machine certification process, achieving the targeted number of certifications, and achieving the targeted number of Green Line machine certifications improving machine condition and ensuring the workplace is clean, sanitary, and easy to use. This research is also expected to improve employee morale, foster trust and confidence with superiors and management, and receive positive feedback from stakeholders such as customers, visitors, and auditors entering the production hall. Using Handler and Tester as objects and using the existing machine database, this research will focus on the Test Area as the research location.

**Keyword:** Green Line, Machine Certification, Test Area

## I. INTRODUCTION

PT Infineon Technologies is a German semiconductor company established in April 1999 after the operations of its parent company, Siemens AG, were broken up to create new companies, one of which is located in Batam[1], [2]. Similar to

the central company, PT Infineon Technologies Batam (IFBT) also produces electronic components in the form of Integrated Circuit (IC)[2]. The IC production process at Infineon consists of four main areas, namely FOL, EOL, Test, and MSP.

Infineon implements a concept called the Green line, which was first introduced in 2012. The goal of this concept is to achieve stable and well-controlled manufacturing processes. After implementing the Green line concept, the company's performance significantly improved and successfully met the operational targets set by management, including efficiency, productivity, and quality[3]

Within the Green Line concept, expectations are set for the 4Ms: Man, Machine, Method, Material. These expectations are embodied in the 4M criteria within the Green Line as follows: Leaders show interests and set expectations for Man. Discipline to follow rules and proactive feedback on abnormality are essential for Man. For Machine, the expectations include 'Green' tower lights, cleanliness, order, and state-of-the-art features with known limitations excluded. Clear rules defined for every situation, error-proof workplace design, and predictive maintenance are the key criteria for Method. Lastly, Material is expected to fulfill design rules and address known product and package weaknesses.

To ensure that these criteria are implemented in the production area, a process called the Man and Machine certification process is carried out. Despite its name, Machine, other factors such as Man, Method, and Material are also included in the assessment criteria during the certification process. Once the machine is confirmed to meet all the specified criteria, it can be considered as passing the certification process, which will then be marked by affixing a sticker as an identification of its status.

## II. METHOD

This paper uses the Seven Tools Quality method to formulate steps in the machine certification process at PT Infineon Technologies Batam. Seven Tools Quality (7 QC) is a tool used to assist quality control.[4]. Some that are used include:

### 1. Flowchart

Flowchart is an image that presents the main steps,

branches, and actual outputs of a process. [5]. The use of flowcharts makes it easier when conducting checks related to problem analysis [6]. The following are the steps to certify the machine and perform repairs on the machine.

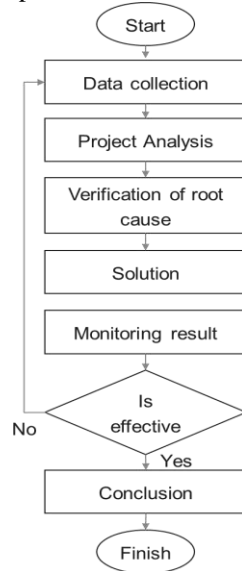


Figure 1. **Flowchart**

## 2. Check Sheet

Check Sheet contains data that has been compiled to facilitate checking [7]. It is designed to facilitate the collection of real-time data in a simple and efficient manner. This tool is commonly utilized in quality control, process improvement, and data collection activities to identify patterns, frequencies, or trends in the data. In this project, a check sheet is utilized to gather data on the current condition of the machines, based on previous observations, and then documented in the following format.

## 3. Pareto Chart

Pareto Chart is a type of vertical bar chart that ranks various categories or causes of issues in descending order, with the most significant category on the left. It combines both bar and line graphs, where the bars represent individual categories in decreasing order of frequency or impact, and the line represents the cumulative total [4]. Pareto diagrams are commonly used to identify the most significant factors contributing to a specific problem or issue, allowing for a focus on the vital few rather than the trivial many. This approach is based on the Pareto principle, also known as the 80/20 rule, which suggests that roughly 80% of the effects come from 20% of the causes.

## 4. Fishbone

Fishbone diagrams are known as Isikawa diagrams because they resemble fish bones that represent possible causes of problems such as material, machine, man, method, environment[5]. Fishbone diagram itself serves to know the core cause of the problem [8]. Root cause verification is the process of determining the underlying reason or source of a problem or issue within a system or process. It involves thoroughly investigating and analyzing the factors that led to

the occurrence of the problem in order to address it effectively and prevent its recurrence. Here are the steps to certify the machine and make repairs to the machine.

## III. RESULT AND DISCUSSION

Based on the experiments that have been carried out, the data can be grouped as follows.

### 3.1. Data collection

From the analysis of visual data extracted from the database, it can be seen that the achievement of Green Line machine certification for green stickers during January - September 2023 is not consistent in achieving the set targets. A machine certification target of 90% for all Infineon back ends (Asia Pacific) was decided at the Greenline Cluster Workshop. In Infineon Batam, the machine certification target is 2 for assembly and 35% for test, with an overall target of 55%.

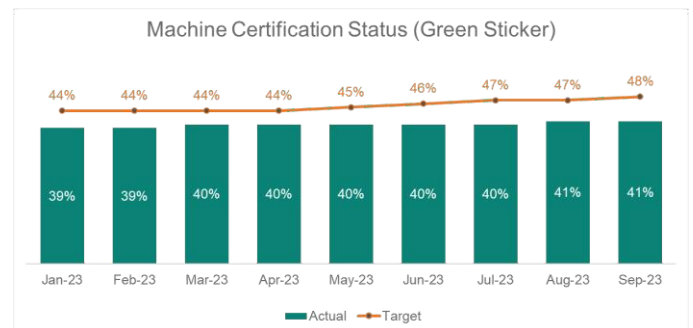


Figure 2. **Green Status**

This is the underlying issue that prompted the implementation of the project. As time passes, the set targets will continue to increase, for example, by the end of May 2024, the target for green line machine certification is set at 64%. If the issue is not resolved promptly, the gap between actual performance and the target will widen. This will lead to poor performance of Infineon Batam in the eyes of the management and other external Infineon entities.

Table 1. **Actual Data**

Area	Total Machine	Actual Certified Machine	% of Certification (Sep-23)	Target (Sep-23)
EOL	68	43	63%	48%
FOL	401	228	57%	48%
MSP	59	29	49%	48%
TEST	275	11	4%	48%

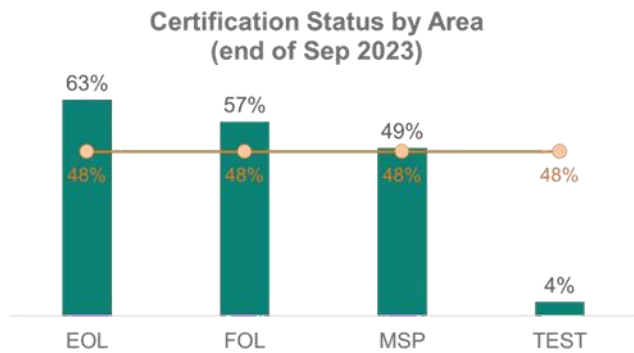


Figure 3. Certification Status Test Area

The breakdown of machine certification by area indicates that the Test Area has the lowest achievement at 4% compared to the other areas. Meanwhile, the other three areas, namely EOL, FOL, and MSP, have higher achievements, even exceeding the set target of 48% in September 2023. Therefore, the focus area for project implementation is determined to be the Test Area. If the certification achievement in the Test Area can be high, it is expected that the overall achievement of Green Line machine certification in Infineon Batam can reach the target.

### 3.2. Checklist

The following standard checklist is used as a reference for machine certification.

Table 2. Checklist

Green Line Machine Checklist		Certification			
A	Appearance (machine painting)	Yes	No	N.A	Remarks
1	Good Finishing Quality				
2	Same color for all same machine model				
3	No paint residue beyond area to be painted				
B	Maintenance Standardization Cleanliness	Yes	No	N.A	Remarks
1	No missing screws and used standard screws type for same machine platform				
2	Plastic ribbon indicator for permanently working exhaust fan without controller				
3	No crack/broken acrylic surface				

4	Standard accessories used within the same model				
5	Standard cables arrangement within the same model				
6	No worn out/broken critical parts.				
7	No debris / stray unit outside / inside machine				
8	Temper Seal (part list available, standard color, condition)				
9	Checklist records (PM, Health Check, calibration) are available without overdue				
10	Critical parts list is defined in PM Checklist without overdue				
11	Clarity of monitor				
12	Safety switch available, standardized with same model & no violation / by pass				
C	Machine KPI	Yes	No	N.A	Remarks
1	<b>Qualification /Certification</b>				
	UDT ( Unschelduled Down Time )				
2	MTBA ( Maen Time Between Assist )				

D	Quality	Yes	No	N.A	Remarks
1	All Camera installed are functioning and calibrated				
2	All sensor installes are functioning and calibrated				
3	Machine is using updated software or firmware				
4	Password protection is enabled and functioning				
5	Other quality related features are functioning				

The table above represents the inspection procedure in the Green Line Machine Checklist, consisting of several criteria that must be met to ensure that the machine meets quality and safety standards. Here is an explanation for each part of the checklist:

#### A. Appearance (machine painting)

Ensure that the paint quality of the machine is good and meets the set standards, all machines of the same model are consistent in colour, and there is no paint residue on the machine.

#### B. Maintenance Standardization Cleanliness

Point B focuses on the machine accessories as well as checking the following:

- Checking for any missing screws and whether the type of screws used is standard for the same machine platform.
- Ensuring that there is a plastic ribbon indicator for a permanently operating exhaust fan without a controller.
- Inspecting for any cracks or breakage on the acrylic surface.
- Ensuring that standard accessories are used within the same model.
- Checking for standard cable arrangements within the same model.
- Ensuring that there are no worn-out or damaged critical parts.
- Inspecting for any debris or units that should not be outside/inside the machine.
- Checking temperature seals to ensure the availability of parts list, standard color, and appropriate condition.
- Ensuring that checklist records (PM, Health Check, calibration) are available without delay.
- Ensuring that the list of critical parts is defined in the PM Checklist without delay.
- Inspecting the clarity of the monitor.

- Checking the availability of safety switches, standardized with the same model, and no violations/bypasses.

#### C. Machine KPI

To ensure the efficiency and effectiveness of machine performance, machine owners are committed to submitting data relating to UDT (Unscheduled Down Time) and MTBA (Mean Time Between Assistance) on a regular basis. This data is part of the results of routine checks carried out on the machine. The main purpose of this activity is to set targets for machine performance, which in this case is to reduce UDT to below five. By setting specific targets, machine owners can measure and monitor machine performance more accurately, and identify areas that require attention or improvement. This initiative not only improves machine reliability and availability but also supports continuous improvement in the overall production process.

#### D. Quality

In the quality checklist, 5 points are checked on the checklist, while the explanation of each point is as the following;

- Camera

Camera checking is done to check whether the camera is working and has been calibrated. However, in the certification process in the testing area, camera checks are not carried out because there are no cameras on the machines in this area.

- Sensor

Sensor checks are carried out to check that the sensors are functional and calibrated. During the certification process in the testing area, sensor checks are carried out on the temperature sensor and double device sensor.

- Software

Software checks are performed to check whether updated software or firmware is being used.

- Password

Checking passwords is done to find out if there is a difference between operator and technician passwords and ensure password protection is enabled and functioning.

- Other quality

Other quality checks are carried out to check whether it is functioning and has been calibrated. In the certification process in the test area ground check and Rotary Track checks.

#### 3.3. Check Sheet

To identify the actual issues, data collection was conducted using the observation method with reference to the existing Green Line machine certification checklist, consisting of 4 items. Data collection was carried out on 102 machines in the Test Area in December 2023. The obtained results were then presented in the following table.

Table 3. **Data Collection**

Machine	A. Appearance (machine painting)	B. Maintenance Standardization Cleanliness	C. Machine KPI	D. Quality
Id 001	Fail	Pass	Pass	Pass
Id 002	Fail	Pass	Pass	Pass
Id 003	Fail	Pass	Pass	Pass
Id 004	Fail	Fail	Pass	Pass
Id 005	Fail	Fail	Pass	Pass
Id 006	Fail	Fail	Pass	Pass
Id 007	Fail	Fail	Pass	Pass
Id 008	Fail	Fail	Pass	Pass
Id 009	Fail	Fail	Pass	Pass
Id 010	Fail	Fail	Pass	Pass
Id 011	Fail	Fail	Fail	Pass
Id 012	Fail	Fail	Pass	Pass
Id 013	Fail	Pass	Pass	Pass
Id 014	Fail	Pass	Fail	Pass
Id 015	Fail	Pass	Pass	Pass
Id 016	Fail	Fail	Pass	Pass
Id 017	Fail	Fail	Pass	Pass
Id 018	Fail	Fail	Pass	Pass
Id 019	Fail	Fail	Pass	Pass
Id 020	Fail	Fail	Pass	Pass
Id 021	Fail	Fail	Pass	Pass
Id 022	Fail	Fail	Pass	Pass
Id 023	Fail	Fail	Pass	Pass
Id 024	Fail	Fail	Pass	Pass
Id 025	Fail	Fail	Pass	Pass
Id 026	Fail	Fail	Pass	Pass
Id 027	Fail	Fail	Pass	Pass
Id 028	Fail	Fail	Fail	Pass
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Id 030	Fail	Fail	Pass	Pass
Id 031	Fail	Pass	Pass	Pass
Id 032	Fail	Fail	Pass	Pass
Id 033	Fail	Fail	Pass	Pass
Id 034	Fail	Fail	Pass	Pass
Id 035	Fail	Fail	Pass	Pass
Id 036	Fail	Pass	Pass	Pass
Id 037	Fail	Pass	Pass	Pass
Id 038	Fail	Pass	Pass	Pass
Id 039	Fail	Pass	Pass	Pass
Id 040	Fail	Fail	Pass	Pass

Machine	A. Appearance (machine painting)	B. Maintenance Standardization Cleanliness	C. Machine KPI	D. Quality
Id 041	Fail	Fail	Pass	Pass
Id 042	Fail	Fail	Pass	Pass
Id 043	Fail	Fail	Pass	Pass
Id 044	Fail	Fail	Pass	Pass
Id 045	Fail	Fail	Pass	Pass
Id 046	Fail	Fail	Pass	Pass
Id 047	Fail	Pass	Pass	Pass
Id 048	Fail	Pass	Pass	Pass
Id 049	Fail	Pass	Fail	Pass
Id 050	Fail	Pass	Pass	Pass
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Id 073	Fail	Pass	Pass	Pass
Id 074	Fail	Pass	Pass	Pass
Id 075	Fail	Pass	Fail	Pass
Id 076	Fail	Pass	Pass	Pass
Id 077	Fail	Pass	Pass	Pass
Id 078	Fail	Pass	Fail	Pass
Id 079	Fail	Pass	Pass	Pass
Id 080	Fail	Pass	Pass	Pass
Id 081	Fail	Pass	Pass	Pass
Id 082	Fail	Pass	Pass	Pass

Machine	A. Appearance (machine painting)	B. Maintenance Standardization Cleanliness	C. Machine KPI	D. Quality
Id 083	Fail	Pass	Pass	Pass
Id 084	Fail	Pass	Pass	Pass
Id 085	Fail	Pass	Pass	Pass
Id 086	Fail	Pass	Fail	Pass
Id 087	Fail	Pass	Pass	Pass
Id 088	Fail	Pass	Pass	Pass
Id 089	Fail	Pass	Pass	Pass
Id 090	Fail	Pass	Pass	Pass
Id 091	Fail	Pass	Pass	Pass
Id 092	Fail	Pass	Pass	Pass
Id 093	Fail	Pass	Pass	Pass
Id 094	Fail	Pass	Pass	Pass
Id 095	Fail	Pass	Fail	Pass
Id 096	Fail	Pass	Pass	Pass
Id 097	Fail	Pass	Pass	Pass
Id 098	Fail	Pass	Pass	Pass
Id 099	Fail	Pass	Pass	Pass
Id 100	Fail	Pass	Pass	Pass
Id 101	Fail	Pass	Pass	Pass
Id 102	Fail	Pass	Fail	Pass

3.4. Project Analysis

3.2.1. Bar Chart

The issues identified in the Test machine were previously gathered using the check sheet method, and they are now visually presented using a bar chart to facilitate problem analysis.

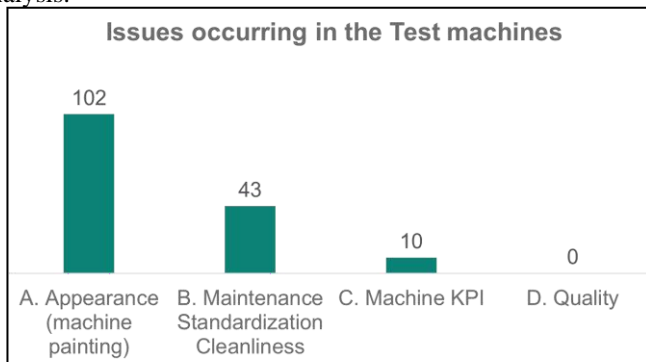


Figure 4. Issues Occurring In The Test

From the above bar chart, we can see that the most prevalent issue found in the Test area is the condition of the machines not meeting the criteria specified in item A of the Green Line machine certification checklist, which is Appearance (machine painting).

3.2.2. Pareto Chart

For a deeper problem analysis, the next step involves using a Pareto chart to identify the most significant factors contributing to machines not meeting the criteria specified in item A of the Green Line machine certification checklist, which is Appearance (machine painting). This approach is based on the Pareto principle, also known as the 80/20 rule, which suggests that roughly 80% of the effects come from 20% of the causes.

Table 4. Problem Percentase

No	Problem	Total	Persentase	% cumulative
1	Good Finishing Quality	56	55%	55%
2	Same color for all same machine model	32	31%	86%
3	No paint residue beyond area to be painted	14	14%	100%
Total		102	100%	

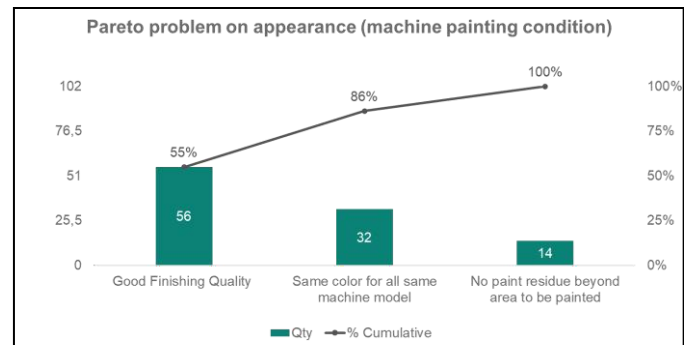


Figure 5 .Pareto chart

From the Pareto chart, it can be observed that the condition of machines not meeting the criteria for Good Finishing Quality and Same color for all same machine model contributes the most significant issues, with frequencies of 56 and 32, respectively. These two factors contribute to a total contribution of 86%. Therefore, further analysis will be focused on these two issues.

- Good Finishing Quality

Current painting condition is not meet the certification criteria due to found may scratches and dirty.



Figure 6. Dirty and scratches found on machine cover

- Same color for all same machine model

Aligned with the goal of the green line, which is to achieve a clean and neat workplace, one of the efforts undertaken is to standardize the color of machine covers for all machines with the same platform/type. However, based on the conducted checks, several machines in the Test area do not meet this criterion due to different machine, especially for newly arrived machines.



Figure 7. Different Paint Color

Based on the image above, it is evident that the newly arrived machine has a different color compared to the machine in Batam. This indicates that the green line objective has not yet been achieved, as the machines are not yet standardized, particularly in terms of color.

3.5. Verification of root case

3.3.1. Fishbone diagram

In the root cause analysis process, a fishbone diagram is used to identify potential causes originating from the 4M1E factors, which include Man, Machine, Material, Method, and Environment.

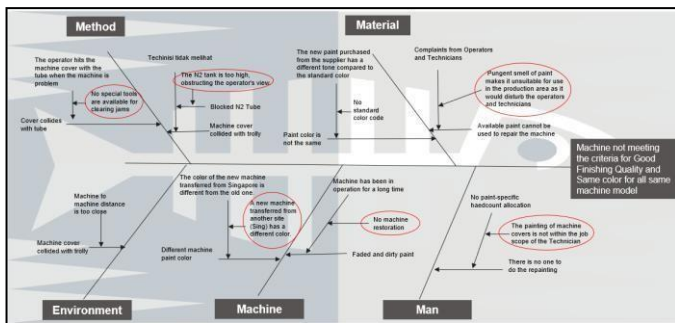


Figure 8. Fishbone Diagram

From the above fishbone diagram, we can see that there are 8 potential causes originating from 4M1E (Man, Machine, Material, Method, and Environment), which will undergo further verification.

Table 5. Varitication Potential

No	Category (4M1E)	Potential root causes	Verification result	Conclucation
1	Man	The painting of machine covers is not within the job scope of the Technician	Based on the job description review and interview with maintenance Manager, the main task of the technician is to perform setup/conversion and take corrective actions when unscheduled machine downtime occurs. There is no specific person assigned to perform the painting of machine covers.	Confirmed a root cause
2	Machine	No machine restoration	Based on observations, many machines in the Test area are over 10 years old. Since the beginning of their arrival until now, there has been no history of machine cover restoration.	Confirmed a root cause
3	Machine	A new machine transferred from another site has a different color.	Upon observation of all new machines transferred from another site (ING), it has been confirmed that there are several differences compared to the existing machines in the production area. Therefore, these newly arrived machines cannot be certified immediately due to this color discrepancy.	Confirmed a root cause

No	Category (4M1E)	Potential root causes	Verification result	Conclucation
4	Material	Pungent smell of paint makes it unsuitable for use in the production area as it would disturb the operators and technicians	There is a lot of feedback from operators and technicians about paint odorless issues (5 feedbacks in the last 3 months).	Confirmed a root cause
5	Material	The new paint purchased from the supplier has a different tone compared to the standard color	The Equipment Engineer, acting as the machine owner, has stored the standard color code. Whenever a new paint purchase is made, this color code is consistently included in the purchase order document. As a result, the vendor will always deliver paint in the appropriate color.	Not a root cause
6	Metode	No special tools are available for clearing jams.	A tool made of torlon is provided on each test machine for clearing jams. The operator does not use a tube for this purpose.	Not a root cause
7	Metode	The N2 tank is too high, obstructing the operator's view.	The N2 tank height is more than 2 meters, which poses a potential risk of collision with the machine when being pushed to the side, as the operator cannot clearly see the machine's position.	Confirmed a root cause
8	Environment	Machine to machine distance is too close	The distance between machines has been meticulously determined by the IE department. As a result, the position of each machine has been established in accordance with the layout standards set by the IE department.	Not a root cause

From the root cause verification process, five issues have been identified as the root causes for machines not meeting the criteria for good finishing quality and uniform color for the same machine model.

- The painting of machine covers is not within the job scope of the Technician.
- No machine restoration
- A new machine transferred from another site (Sing) has a different color.
- Pungent smell of paint makes it unsuitable for use in the production area as it would disturb the operators and technicians
- The N2 tank is too high, obstructing the operator's view.

### 3.6. Solution

#### 3.4.1. Solution Development and Selection

In the root cause analysis process, a fishbone diagram is used to identify potential causes originating from the 4M1E factors, which include Man, Machine, Material, Method, and Environment.

Table 6. Solution Development

Root causes	Alternative solution-1	Alternative solution-2	Selected solution	Justification
The painting of machine covers is not within the job scope of the Technician	Hiring an external vendor to conduct the painting process for a specific duration	add specialized technicians specifically for operating the painting machine	Alternative-1	The painting process is temporary, as ideally, once the certification is completed, the machine is in good condition and does not require periodic painting. Therefore, temporary contract with external vendor is sufficient
No machine restoration	Perform machine cover restoration	Replace with new machine cover (order new part)	Alternative-1	lower cost

Root causes	Alternative solution-1	Alternative solution-2	Selected solution	Justification
A new machine transferred from another site (Sing) has a different color.	Repainting machine covers to match the standard color	Replace with new machine cover (order new part)	Alternative-1	lower cost
Pungent smell of paint makes it unsuitable for use in the production area as it would disturb the operators and technicians	Replacing the paint type with a less odor	Applying a stainless steel coating to the machine cover to eliminate the need for painting.	Alternative-1	lower cost
The N2 tank is too high, obstructing the operator's view.	Installing a barrier at the rear/end of the machine to prevent direct contact between the trolley and the machine cover	Replacing the N2 tank with a smaller size	Alternative-1	Replacing the tank with a smaller size reduces the capacity, necessitating more frequent replacement of the N2 tank. This results in decreased productivity due to more frequent machine stoppages

### 3.4.2. Solution Implementation

After experiencing a machine certification failure, the action that the user takes is to take corrective action on the machine as shown in Figure 7 below.



Figure 9. **New Type of Painting (Odorless)**

In the figure above, it can be seen when the machine user takes corrective action on the machine cover, namely by removing the damaged machine cover and then taking it out of the production area and then taking corrective action by applying paint to the machine cover. And it should also be noted that the paint used on the engine cover prioritizes paint that does not smell strong like odorless paint.



Figure 10. **Install Barrier**

It can be seen from the image above that barriers have been installed in the area behind the machine and in areas frequently traversed by N2 cylinders. This is done to minimize collisions or direct contact with the machine.

### 3.7. Result

#### 3.5.1. Monitoring Result

To ensure that all implemented corrective actions yield effective results, an intensive process of monitoring the outcomes is conducted. This process is based on the number of machines successfully achieving Green Line certification each month. The ultimate goal is for the actual achievements to successfully meet the pre-established targets.

Based on observations during the Green Line machine certification, there is a significant difference in terms of appearance (machine painting) as stated in section A of the Green Line machine certification checklist.

- The paint condition on the machine cover meets the certification criteria, with good paint quality, no dirt or scratches.
- Same color across all machines with the same platform.



Figure 11. After Painting

The monitoring result will be displayed using a combination bar and line chart is a visual representation that combines the features of both bar and line charts in a single display. This chart will comparing the actual condition (bar chart) with the specified target values (line chart).

Table 7. Machine Certification Status

New FY2324	Target (Green)	Actual (Green)	Delta	Summary
Sep-23	-	11	0	Meet target
Oct-23	6	6	0	Meet target
Nov-23	11	11	0	Meet target
Dec-23	20	20	0	Meet target
Jan-24	20	20	0	Meet target
Feb-24	22	22	0	Meet target
Mar-24	25	25	0	Meet target
Apr-24	25	26	0	Meet target
May-24	25	25	0	Meet target

The table above shows data related to the achievement of green targets for the new fiscal year FY2324. From September 2023 to May 2024, targets and actual achievements are compared monthly. In September 2023, the target data is unavailable (indicated by "-"), but the actual achievement is 11. From October 2023 to May 2024, each month has a set target and actual achievement that always matches the target, resulting in a delta of 0 each month. This indicates that the monthly targets are consistently met. Overall, the table shows that during the observed period, all green targets have been met every month.

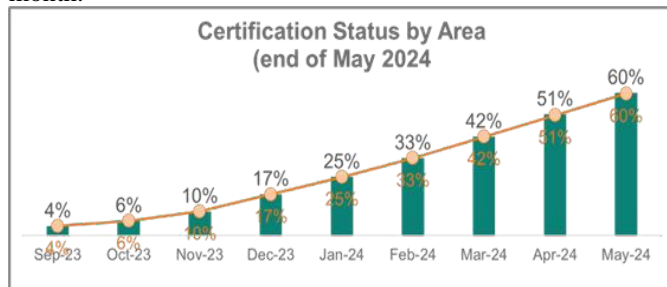


Figure 12. Machine painting Status from Test Area

As depicted in the chart above, the Test area has successfully attained the target machine certification status. This demonstrates the effectiveness of all implemented corrective measures, attributable to thorough analysis and the selection of suitable solutions.

#### IV. CONCLUSION

Based on the results of the research conducted in this project, it can be concluded that all aspects of the research objectives in

this project can be achieved after making improvements to the machine. The achievement of these research objectives can be detailed as follows:

- Based on the quality of the paint finish or protective coating on the machine which should be smooth and flawless to give a professional and well-maintained impression.
- Machines of the same model should be uniform in color, creating aesthetic consistency in the production environment.
- It can improve the performance of the certified number of machines and create a clean and comfortable working environment.
- There should be no paint residue outside the area that should be painted, signifying cleanliness and thoroughness in the painting process.
- The stability and safety of the machine is affected by each screw being in place and in accordance with the standard.

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