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Application of Statistical Quality Control Techniques in Paint Manufacturing Process: A Case Study of Best Choice Interior Paint.

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Abstract

In a highly competitive manufacturing environment, product quality is a critical determinant of customer satisfaction and brand reputation. In the paint manufacturing process, variations may result in defects such as incorrect colour shades, off-spec viscosity, poor adhesion, and prolonged drying time, leading to increased production costs, material wastage, and customer dissatisfaction. This study aims to apply Statistical Quality Control (SQC) techniques in enhancing product quality and process stability at Best Choice Interior of Alba-bello Trading Company, Zaria. Statistical Quality Control tools, including the $\bar{X}$, P , and EWMA chart, together with process capability analysis, were employed to monitor the production process. A P-chart was used to analyse attribute data collected, while $\bar{X}$ and EWMA charts were applied to variable data over 51 weeks. Results from the analysis revealed that the P control chart was within the control limits; likewise, on the $\bar{X}$ control chart, wet abrasion, viscosity, and pH level of paints are all within the control state, except for drying time of paint. Also, the pH level of paint on the EWMA chart indicated that the overall production process was stable. Furthermore, analysis of process capability showed that wet abrasion and pH level of paints meet the required specification except for viscosity and drying time. The study demonstrates the efficiency of SQC techniques in providing a proactive framework for quality management in paint companies, which will ensure that all critical quality characteristics are not only stable but also highly capable of meeting customer specifications.

Keywords: SQC, control charts, Process capability, Paint, Paint production.

1. Introduction

In today's highly competitive manufacturing environment, product quality is a critical determinant of customer satisfaction, brand reputation, and operational efficiency. This is particularly true in the paint manufacturing industry, where product consistency, colour accuracy, drying time, viscosity, and durability directly affect user experience and long-term product performance (Asamoah, 2025). Paint production involves various complex stages such as raw material blending, pigment dispersion, milling, mixing, and packaging. Each of these stages presents opportunities for process variation due to human error, machine malfunction, inconsistent raw material quality, or environmental conditions. Defects in paint products may include improper texture, incorrect colour shades, settling of pigments, container leakage, and off-spec viscosity, all of which can result in rework, waste, customer complaints, and loss of market trust (Akhter *et al*., 2025). In paint manufacturing, several quality characteristics are routinely monitored because they directly influence the performance, durability, and acceptability of the finished product. Among the most critical are viscosity, wet abrasion resistance, pH level, and drying time. Viscosity governs the flow behaviour of paint during mixing, pumping, storage, and ease of application (ASTM, 2014) and also measures the resistance of paint to constant flow (Aloui *et al*., 2018). Wet abrasion measures the ability of a dried paint film to withstand repeated washing or scrubbing, making it an important indicator of durability in paint and suitability for high-frequency cleaned surfaces (Vaida, 2026). The pH level reflects the acidity or sharpness of paint formulation and plays a vital role in maintaining chemical stability, improving pigment dispersion, preventing microbial growth, and extending product shelf life; also, the standard recommended pH level is based on the chemicals used and added to the solution (Talbert, 2007). Also, the Drying time of paint determines the rate at which paint reaches different stages of curing and directly influences recoating intervals and production efficiency (Egbewatt *et al*., 2014). Deviations from the specified limits of any of these quality characteristics can result in poor product performance, increased production costs, customer dissatisfaction, and reduced competitiveness.

Statistical Quality Control (SQC) offers a proactive, data-driven approach that allows manufacturers to monitor and control process variation in real time, where the quality control team can detect shifts or defects early and implement corrective actions before the products are produced on a large scale via some statistical quality control tools like P-charts, R-charts, Exponentially Weighted Moving Average (EWMA) charts, and process capability charts. In the context of paint production, SQC tools are particularly valuable for tracking the frequency and types of defects in both in-process and finished goods. For example, a P-chart may be used to monitor the proportion of defective paint batches based on parameters like incorrect pH or colour mismatch (Olalere *et al*., 2024), while a U-chart may be useful for tracking the average number of defects per batch, such as the number of complaints per drum or defects per litre. The application of process capability analysis is crucial in ensuring that key quality attributes such as viscosity, drying time, adhesion strength, wet abrasion, pH level, and gloss level remain within acceptable thresholds. By continuously monitoring these parameters, companies can identify variations that might compromise surface finishing or colour uniformity.

In Nigeria today, few companies handle their industrial transformation processes in the best way, and this affects the quality of products, which lose competitiveness compared to similar products or processes that come from foreign companies. This makes manufacturing firms at all levels make plans for future quality assurance, and this is achieved through statistical quality control and operational performance (Kajuru *et al*., 2022). The application of quality control in paint manufacturing is grounded in several intersecting theories, most notably Total Quality Management (TQM), Statistical Process Control (SPC), and Operations Management Theory. Total Quality Management (TQM) is a comprehensive approach that promotes organisation-wide commitment to continuous quality improvement, customer satisfaction, and process excellence. It integrates management principles with statistical quality control tools to ensure that quality is embedded in every aspect of production (Evans & Lindsay, 2014). The philosophy of TQM goes beyond inspection and correction; it emphasises prevention through employee participation, leadership commitment, and evidence-based decision-making. Recent research has shown that integrating TQM principles with statistical process control improves operational efficiency and reduces rework in the chemical and paint industries (Ali & Khan, 2021). Similarly, Rahman and Idris (2022) found that organisations implementing TQM systems experience higher levels of customer retention and fewer product failures due to enhanced monitoring and feedback mechanisms. While studies on statistical quality control in the paint industry are relatively limited, related research in chemical and process-based industries offers useful insights. Paint manufacturing shares similar quality assurance challenges with pharmaceuticals, plastics, and food production, where batch consistency, contamination risk, and variability in raw materials are common concerns (Al-Momani & Al-Qudah, 2021; Deshmukh & Thombre, 2020; Nguyen et al., 2023). Statistical quality control techniques such as control charts, process capability analysis, and Six Sigma methods have proven effective in minimising variation and improving overall product quality across these sectors (Singh & Kumar, 2022; Zhang & Lee, 2021).

Statistical Process Control (SPC) involves the systematic use of statistical tools, particularly control charts, to monitor, control, and improve production processes. It helps in distinguishing between assignable and unassignable causes of variation within a system (Montgomery, 2019). The fundamental principle of SPC is that consistent product quality can only be achieved by maintaining control over process inputs rather than merely inspecting finished outputs. This proactive approach allows organisations to identify deviations early, minimise waste, and prevent the production of defective products. In paint manufacturing, SPC plays a critical role in ensuring batch-to-batch uniformity and maintaining key process parameters such as viscosity, pH level, wet abrasion, and pigment dispersion quality. By applying statistical quality control mechanisms, production managers can visualise real-time variability, detect process drift, and take prompt corrective action before the quality of paint is compromised. Omoregbe and Eniola (2017) examined the effect of production facilities maintenance practices on the competitive advantage of selected paint manufacturing firms in Benin City, Nigeria. Using structured questionnaires administered to 395 staff across eight paint firms, the study employed Pearson correlation and regression analysis. The findings revealed a weak but positive relationship between reactive maintenance and competitive advantage, while preventive maintenance showed a strong positive relationship. The study concluded that effective maintenance practices enhance firms' competitive advantage. The implementation of SPC techniques in coating and chemical industries reduces rework, improves colour consistency, and enhances operational efficiency (Kumar & Patel, 2022; Singh, Adebayo, & Chen, 2021). Furthermore, the integration of SPC with modern data analytics tools enables predictive monitoring, allowing paint manufacturers to optimise production schedules and minimise downtime (Nguyen & Zhao, 2023).

Overall, SPC remains one of the most powerful frameworks for sustaining high-quality standards and continuous improvement in the paint production process. Process Capability Theory centres on assessing the inherent variability of a process and determining whether it can consistently meet predetermined design or customer specifications. The theory utilises process capability indices such as Cp, Cpk, Pp, and Ppk to evaluate how well a process performs relative to its specification limits (Ryan, 2011). These indices provide quantitative measures of process performance and help manufacturers understand whether observed variability is due to natural causes or special assignable causes. A higher capability index of Cp greater than signifies that the process is well-centred and capable of producing outputs within tolerance limits, thereby minimising the risk of defects. Thus, process capability analysis serves as a vital component of modern statistical quality control by supporting evidence-based decision-making and sustainable production efficiency. Similarly, Adebayo *et al*. (2020) applied some quality control techniques to monitor and evaluate the batch-level rejections of paint production in a Nigerian company and observed that the use of control charts enabled early detection of process drift, particularly during pigment dispersion and packaging stages. Their findings emphasised that statistical quality control was important during colour matching and filling operations, where even minor deviations could produce visible quality inconsistencies (Kumar & Patel, 2022). Liu et al, (2022) proposed and applied an exponentially weighted moving average (EWMA) control chart to achieve quality control (QC) in asphalt mixture production based on the statistical process control (SPC) theory. They established a mathematical model of multiple-source variation and considered the effect of three sources of variation, including internal variations in materials, variations between materials, and variations between material batches in asphalt mixture production. Their finding revealed that the EWMA chart is more sensitive to offset quality detection data. Also, Gupta & Sharma (2017) applied process capability indices to evaluate the consistency of a water-based paint line. Their findings revealed that capability processes with $Cp < 1.0$ consistently failed to meet customer specifications, while those with $Cp > 1.33$ maintained high satisfaction rates. Also, Gacharia (2013) reported that companies that embedded internal quality audit mechanisms into their SQC systems experienced fewer non-conformance reports and higher product reliability.

Maintaining consistent product quality in the paint industry is essential due to the functional and decorative role of paint production. Despite improvements in paint production and quality assurance systems, manufacturers still face some challenges such as colour off-shade, improper texture, off-spec viscosity, and inconsistent container weight. The major issue lies in the inability to identify and mitigate process variation before it escalates into large-scale defects. However, many companies enhance their quality standard by introducing quality control departments in their organisations whose policies are aimed at satisfying customers by giving them standard quality products, excellent services, and timely delivery. Hence, the study aims to evaluate the quality control process of paint at Best Choice Interior Paint, Zaria.

2. Materials and Methods

The data for this research study were collected from Best Choice Interior of Alba-Bello Trading Company, Zaria, from the year 2024 to 2025, based on viscosity, wet abrasion, drying time, pH level, and the number of paints produced and the number of defects for 51 weeks, as seen in the Appendix. Statistical quality control techniques such as $\bar{X}$, P , and EWMA control charts together with process capability analysis were employed to monitor the production process.

2.1. X-bar Charts

The X-bar control chart is one of the Statistical Process Control (SPC) methods used for monitoring and improving the company's quality and productivity. The X-bar chart is used to monitor the average value of a production process over time on the variable of interest. According to Montgomery (2009), the control limits for the X-bar chart become:

$$UCL = \overline{\overline{X}} + A_2 \overline{R} \quad (1),$$

$$CL = \overline{\overline{X}} \quad (2),$$

$$LCL = \overline{\overline{X}} - A_2 \overline{R} \quad (3),$$

where $A_2 = {3}/{d_2\sqrt{n}}$ is tabulated for various sample sizes in the appropriate SQC table.

A typical control chart is a graphical display that is used to estimate the parameters of a production process in order to determine the quality characteristic that has been measured or computed from a sample statistic versus the sample number or time. The chart contains a centre line (CL) that represents the average value of the quality characteristic together with two other horizontal lines called the Upper Control Limit (UCL) and Lower Control Limit (LCL). These control limits are chosen so that if the process is in control, nearly all of the sample points will be within the centre line in a random pattern. Even if all the points are inside the control limits and they behave in a non-random manner, then this could be an indication that the process is abnormal.

2.2. Exponential Weighted Moving Average (EWMA) Chart

The EWMA control chart is used to detect small shifts in the process mean. EWMA charts are used to monitor the mean of a process based on the samples considered at a given time that constitute a subgroup. The EWMA chart relies on the specification of a target value and a known or reliable estimate of the standard deviation. The control limit of the EWMA control chart is presented as follows:

$$UCL = \mu + L\sigma\sqrt{\frac{\lambda}{(2-\lambda)}\left[1-(1-\lambda)^{2i}\right]} \tag{4}$$

$$CL = \mu \tag{5}$$

$$LCL = \mu - L\sigma\sqrt{\frac{\lambda}{(2-\lambda)}\left[1-(1-\lambda)^{2i}\right]} \tag{6}$$

where L = 2.7 is called the multiplier or width of the control limit, λ is the exponential smoothing constant, and i is the period.

2.3. Proportion of Defective (P) Chart

A P-chart is used when there are some defective items in the production line. This chart monitors the proportion of defective paint batches over a period of time. The defects may include incorrect colour shade, Phase separation, off-spec viscosity, and so on. The P-Chart is given by:

$$\text{UCL} = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \tag{7}$$

$$\text{Central Line (CL):} \quad \bar{p} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} n_i} \tag{8}$$

where d_i = number of defective units in Sample i, and n_i = sample size.

$$\text{LCL} = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \tag{9}$$

If LCL < 0, it is set to zero.

2.4. Process Capability Analysis

Process capability refers to the ability of a process to produce items that meet specification limits. It also helps to quantify, monitor, and eventually reduce production process variability, which is determined by using the process capability index Cp. In paint production, this involves evaluating whether processes like tinting, dispersion, and filling consistently stay within desired performance boundaries. The process capability index is defined as the ratio of the specification width over the width of the process variability (Montgomery,2009). Mathematically, the process capability index Cp is given by:

$$C_P = \frac{USL - LSL}{6\sigma} \quad (10),$$

where USL is the upper specification limit, LSL is the lower specification limit, and 6σ is the standard deviation of the samples that fall within the specification limits.

The output of this measurement is usually illustrated by a histogram, and the value of Cp helps to better understand process performance. Generally, if

$C_p \leq 1$ means the process variation exceeds the range of specification (the process is not capable)

$C_p = 1$ means the process just meets specification.

$C_p \geq 1$ means the process variation is within specification (the process is capable).

3. Results and Discussions

The paint production process of Best Choice Interior was examined using a statistical quality control modelling approach. The $\bar{X}$, P , and EWMA charts, together with process capability analysis of paint, were employed for the analysis as follows:

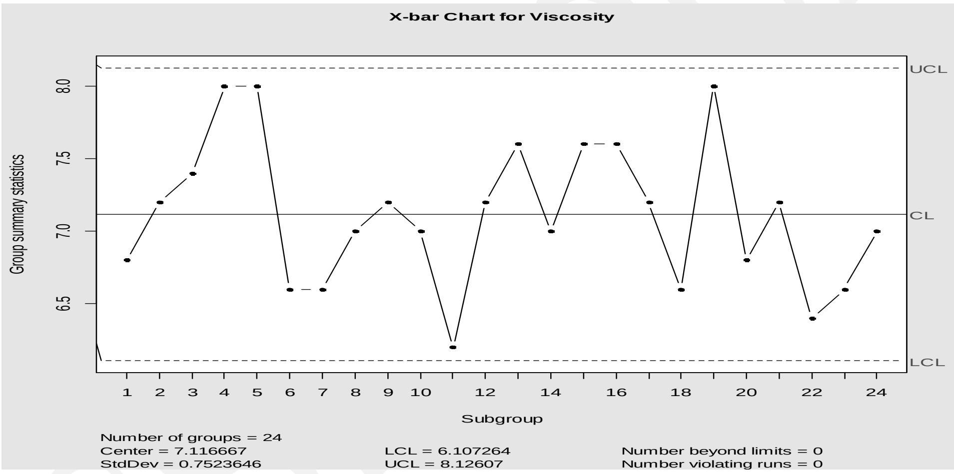

Figure 1. X-bar chart for viscosity of paint.

The X- bar chart for viscosity revealed that all plotted sample means were within the specified control limits, indicating that the production process was statistically stable and free from assignable causes of variation. This implies that the viscosity of the paint was consistently maintained across production batches.

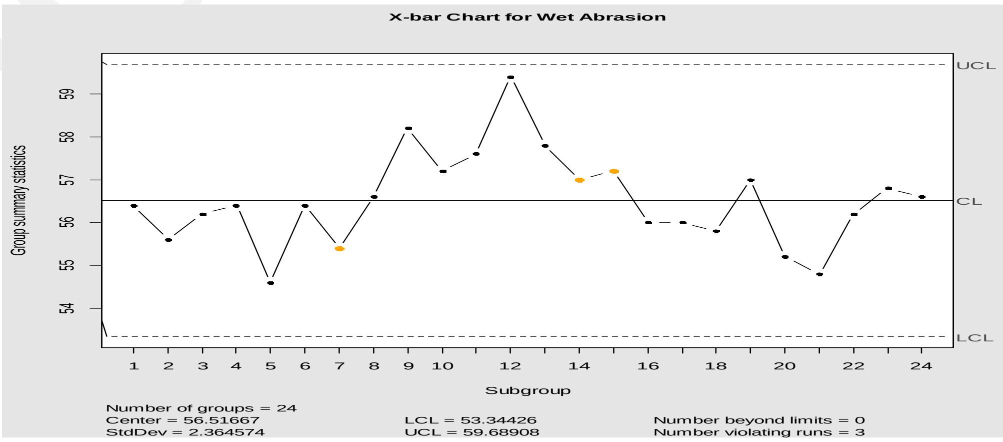

Figure 2. X-bar chart for wet Abrasion.

The X-bar chart for wet abrasion resistance depicts that all observations fell within the established upper and lower control limits, indicating that the process remained statistically stable and under control. This suggests that the wet abrasion resistance of the paint was consistently maintained throughout the production process, with no evidence of special-cause variation.

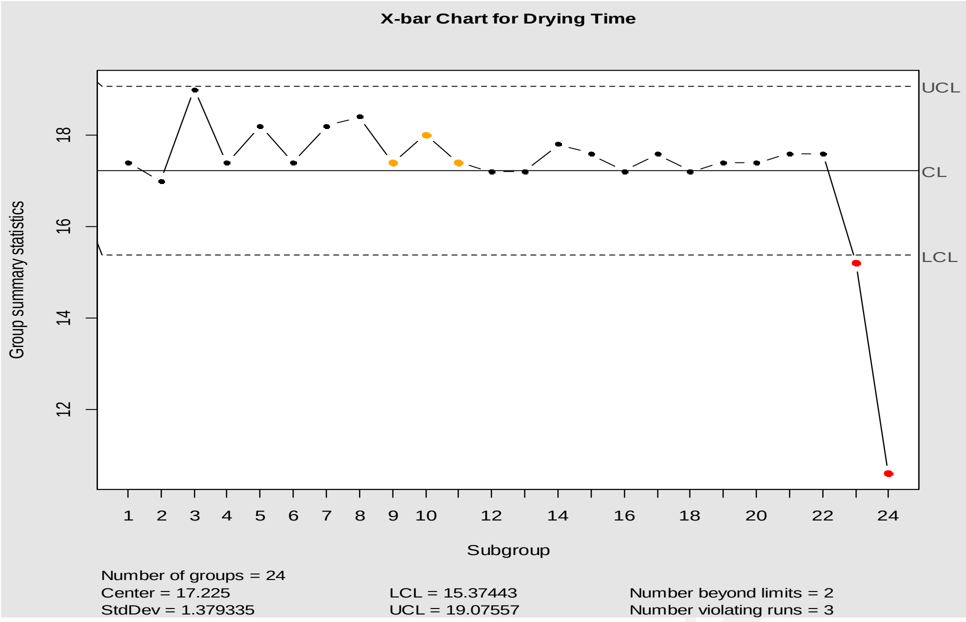

Figure 3. X-bar chart for drying time.

The X- bar chart for drying time showed that not all observations fell within the established upper and lower control limits, indicating that the process was not under statistical control. Almost all the points are within the central line and the upper control limit. This indicates that the process is not stable and may experience abnormalities in drying duration.

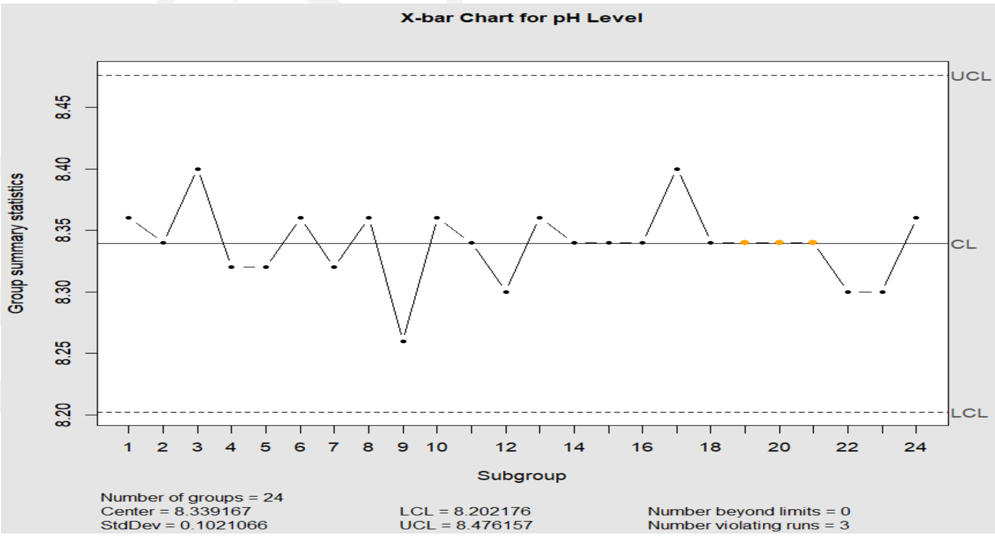

Figure 4. X-bar chart for paint pH level.

The X-bar chart for pH level indicated that all the plotted points were within the established upper and lower control limits, demonstrating that the process was under statistical control. This means that the pH regulation during production is effectively controlled and consistent over time.

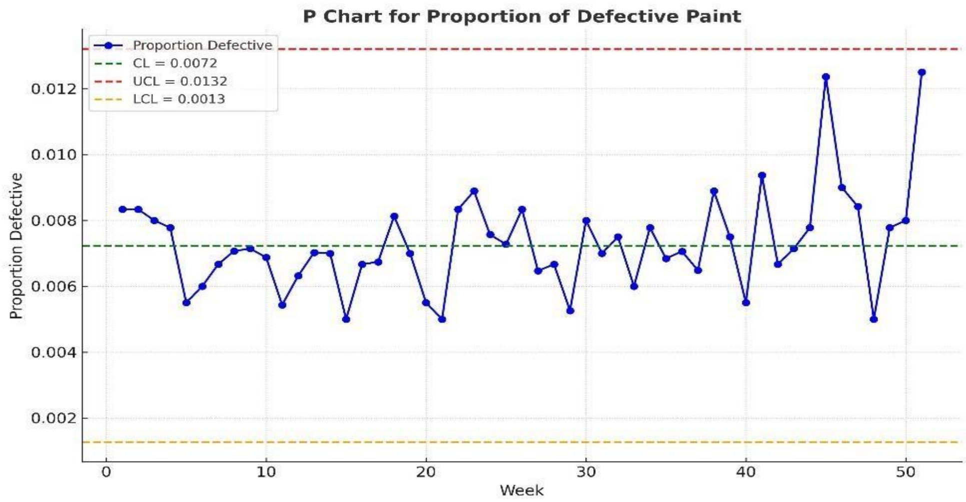

Figure 5. P-Chart for proportion of defective paint.

The P-chart showed that the paint production process remained under statistical control throughout the 51-week monitoring period. With an average defect proportion of CL = 0.00723, all weekly defect rates were contained within the upper and lower control limits, indicating a stable production process and consistent product quality without evidence of special-cause variation.

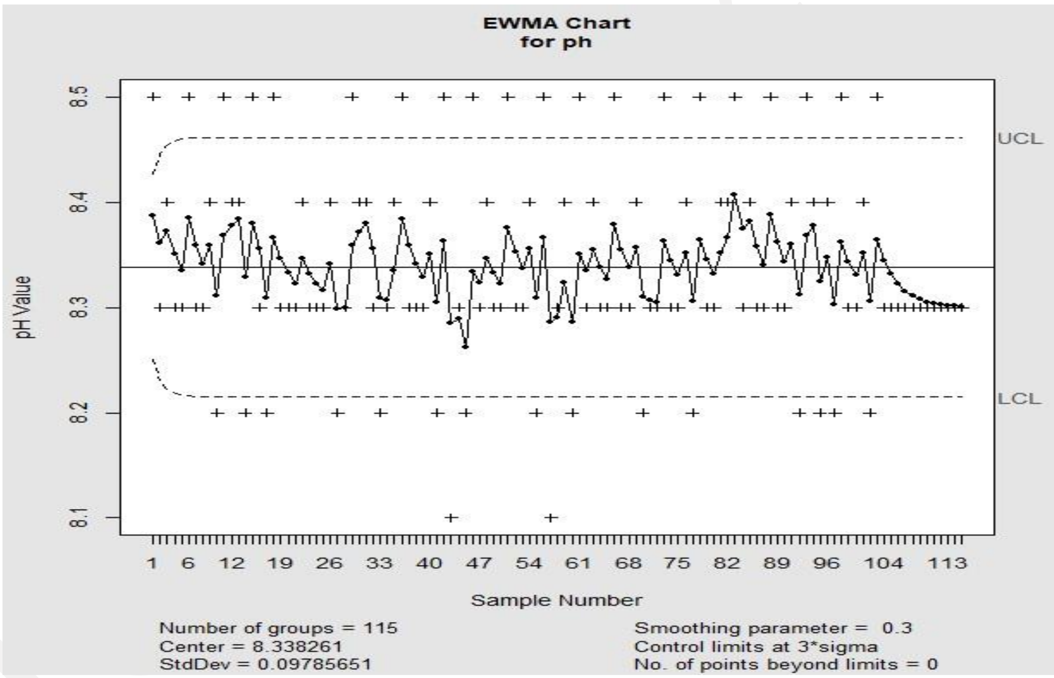

Figure 6. EWMA Control Chart of paint pH level.

The EWMA chart showed that the paint production process remained under statistical control throughout the 115-sample monitoring period. All observations were within the upper and lower control limits, indicating that the pH regulation process was stable and consistently maintained with no evidence of special-cause variation.

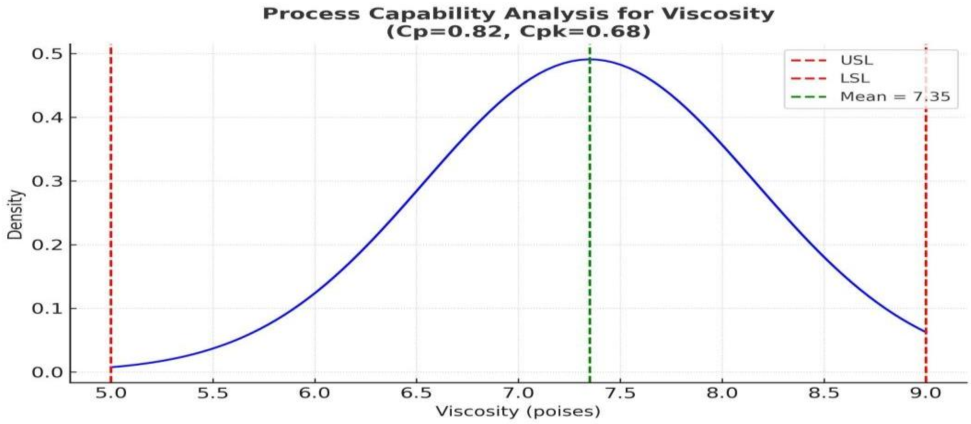

Figure 7. Process Capability for Viscosity.

The process capability analysis produced capability indices of Cp=0.82 and Cpk=0.68, both of which are below the acceptable threshold of 1.00. This indicates that the viscosity process is not capable of consistently satisfying the specified paint quality requirements, suggesting the need for improvements in process variability and centring to achieve the desired specifications.

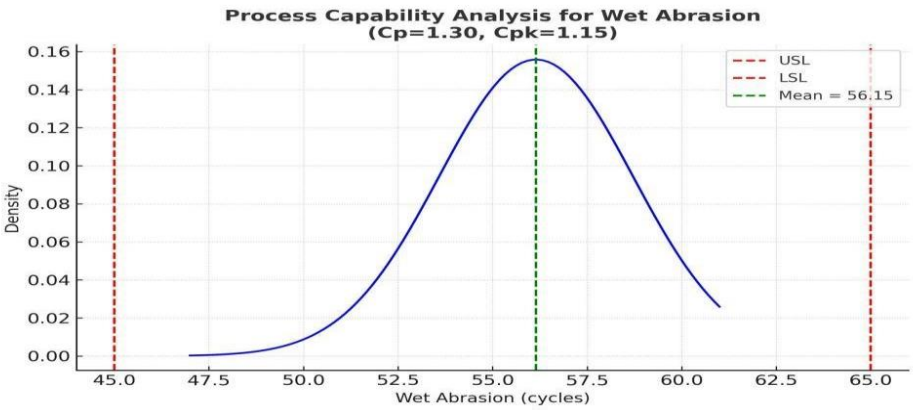

Figure 8. Process capability charts for wet abrasion.

The process capability analysis produced capability indices of Cp=1.30 and Cpk=1.15, both of which exceed the acceptable threshold of 1.00. This indicates that the wet abrasion resistance process is capable of consistently meeting the specified quality paint requirements and is expected to produce conforming products with minimal variability.

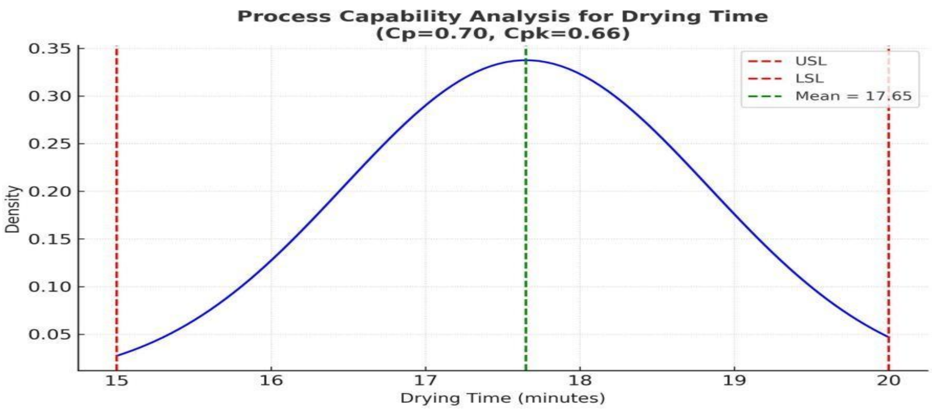

Figure 9. Process capability chart for drying times.

The process capability analysis revealed capability indices of Cp=0.70 and Cpk=0.66. As both indices are less than 1.00, indicating that the drying time process is incapable of consistently meeting the specified paint quality requirements and suggests the need to reduce process variability and improve process centring to achieve the desired level of process performance.

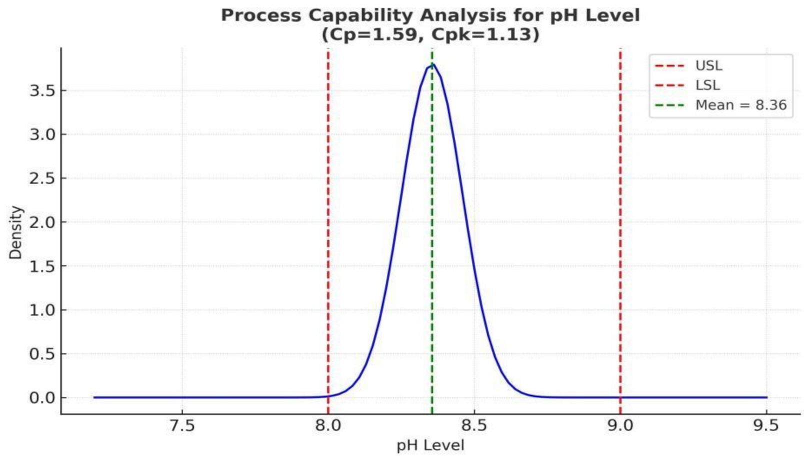

Figure 10. Process Capability Chart for pH level.

The process capability analysis revealed capability indices of Cp=1.59 and Cpk=1.13. As both indices are greater than 1.00, the pH control process is considered capable of consistently meeting the specified paint quality requirements, indicating that the process exhibits acceptable variability and conforms to the required engineering specifications.

4. Conclusion

The study concludes that the application of SQC provides an effective and data-driven framework for quality management in paint manufacturing firms. However, based on findings from the study, it was concluded that the overall production process of Best Choice Interior Paint Company was satisfactorily stable, as EWMA control charts are within the control limits; likewise, on the control charts, wet abrasion, viscosity, and pH level of paints are all within the control limits, except for the drying time of paint. Furthermore, analysis on process capability showed that wet abrasion and pH level of paints meet the required specification, except for viscosity and drying time. It is recommended that management of Best Choice Interior Paints of Al-Babello Trading Company, Zaria, and other paint production companies should take immediate and decisive action driven by the SQC findings in moving their companies from a reactive to a proactive inspection process to prioritise process stability and capability improvement across the entire paint production chain.

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Appendix.

Best choices interior data set for the production of paint for the Year 2025

S/N	Production Date	BATCH NO.	VISCOSITY (POISES)	Wet abrasion (CYCLES)	Foreign matter	Drying Time	pH Level	Defect
1	1/1/2025	BCCO101bc2	6	56	≤ 0.5	16	8.5	Viscosity
2	1/1/2025	BCCO101bc2	6	58	≤ 0.5	19	8.3	
3	2/1/2025	BCCO101bc1	7	54	≤ 0.5	16	8.4	
4	2/1/2025	BCCO101bc2	7	59	≤ 0.5	17	8.3	
5	3/1/2025	BCW0101bc1	8	55	≤ 0.5	19	8.3	
6	3/1/2025	BCW0101bc1	6	57	≤ 0.5	16	8.5	
7	3/1/2025	BCCO301bc2	8	48	≤ 0.5	18	8.3	Adhesion
8	3/1/2025	BCCO301bc2	8	56	≤ 0.5	17	8.3	
9	6/1/2025	BCOF0601bc1	8	60	≤ 0.5	18	8.4	
10	6/1/2025	BCOF0601bc1	6	57	≤ 0.5	16	8.2	
11	6/1/2025	BCB0601bc1	7	56	≤ 0.5	19	8.5	Viscosity
12	6/1/2025	BCF0601bc1	7	59	≤ 0.5	19	8.4	
13	7/1/2025	BCCA0701bc1	7	54	≤ 0.5	19	8.4	
14	7/1/2025	BCW0701bc1	8	56	≤ 0.5	19	8.2	
15	7/1/2025	BCW0701bc1	8	56	≤ 0.5	19	8.5	
16	8/1/2005	BCCO8011bc2	8	58	≤ 0.5	17	8.3	Viscosity
17	8/1/2025	BCCO8011bc2	8	58	≤ 0.5	17	8.2	
18	9/1/2025	BCW0901bc1	8	56	≤ 0.5	18	8.5	
19	9/1/2025	BCW0901bc1	8	56	≤ 0.5	18	8.3	
20	10/1/2025	BCCA1001bc1	8	54	≤ 0.5	17	8.3	
21	10/1/2025	BCCO1001bc1	8	56	≤ 0.5	18	8.3	

22	10/1/2025	BCW1001bc1	8	49	≤ 0.5	19	8.4	Adhesion
23	13/01/25	BCD1301bc1	8	56	≤ 0.5	18	8.3	
24	13/01/25	BCCA1301bc1	8	56	≤ 0.5	18	8.3	
25	13/01/25	BCW1301bc1	8	56	≤ 0.5	18	8.3	
26	17/01/25	BCC1401bc1	6	59	≤ 0.5	16	8.4	
27	20/01/25	BCA1401bc0	7	57	≤ 0.5	18	8.2	
28	20/01/25	BCG2001bc0	6	54	≤ 0.5	18	8.3	
29	20/01/25	BCLG15011bc	8	54	≤ 0.5	17	8.5	
30	21/01/25	BCG2001bc0	6	58	≤ 0.5	18	8.4	
31	21/01/25	BCW1601bc	7	55	≤ 0.5	19	8.4	
32	21/01/25	BCG2001bc0	8	56	≤ 0.5	18	8.3	
33	22/01/25	BCW1601bc2	6	60	≤ 0.5	18	8.2	Adhesion
34	22/01/25	BCP2101bc0	6	57	≤ 0.5	17	8.3	
35	23/01/25	BCW1601bc0	6	49	≤ 0.5	19	8.4	
36	23/01/25	BCC2101bc0	8	57	≤ 0.5	18	8.5	Adhesion
37	23/01/25	BCG1701bc0	8	59	≤ 0.5	19	8.3	
38	24/01/25	BCCA2101bd	6	54	≤ 0.5	19	8.3	
39	24/01/25	BCC2201bc2	6	58	≤ 0.5	18	8.3	
40	24/01/25	BCG2201bc0	7	55	≤ 0.5	18	8.4	
41	27/01/25	BCOF2301bd	8	59	≤ 0.5	18	8.2	
42	27/01/25	BCC2301bc2	7	56	≤ 0.5	18	8.5	
43	28/0125	BCC2301bc2	8	60	≤ 0.5	18	8.1	
44	28/01/25	BCOF2401bd	8	59	≤ 0.5	16	8.3	
45	29/01/25	BCC2401bc2	5	57	≤ 0.5	17	8.2	
46	29/01/25	BCC2401bc2	6	55	≤ 0.5	18	8.5	
47	30/01/25	BCB2701bc1	8	60	≤ 0.5	19	8.3	
48	30/01/25	BCB2701bc1	6	56	≤ 0.5	18	8.4	
49	30/01/25	BCB2801bc0	8	60	≤ 0.5	17	8.3	
50	31/01/25	BCC2801bc1	7	55	≤ 0.5	18	8.3	
51	31/01/25	BCW2901bd	6	58	≤ 0.5	19	8.5	
52	3/2/2025	BCCA2901bd	7	59	≤ 0.5	17	8.3	
53	3/2/2025	BCH3001bd	7	60	≤ 0.5	16	8.3	
54	10/2/2025	BCD3001bc0	5	57	≤ 0.5	18	8.4	Adhesion
55	10/2/2025	BCOF3001bd	6	54	≤ 0.5	17	8.2	
56	11/2/2025	BCW3101bc1	6	58	≤ 0.5	18	8.5	
57	11/2/2025	BCC3101bc2	8	60	≤ 0.5	16	8.1	
58	12/2/2025	BCD0302bc0	6	59	≤ 0.5	18	8.3	
59	12/2/2025	BCH0302bd	8	60	≤ 0.5	18	8.4	
60	13/02/25	BCC0302bc1	8	60	≤ 0.5	16	8.2	

61	14/02/25	BCC0302bc1	8	60	≤ 0.5	17	8.5	
62	14/02/25	BCC1102bc1	8	56	≤ 0.5	18	8.3	Viscosity
63	17/02/25	BGG1102bc0	7	58	≤ 0.5	16	8.4	
64	17/02/25	BCD1202bc0	7	55	≤ 0.5	16	8.3	
65	18/02/25	BCCA1202bd	8	60	≤ 0.5	19	8.3	
66	18/02/25	BGG1302bc0	7	59	≤ 0.5	17	8.5	
67	19/02/25	BCP1402bc0	8	55	≤ 0.5	19	8.3	
68	19/02/25	BCG1402bc0	8	58	≤ 0.5	19	8.3	
69	19/02/25	BCC1702bc1	6	56	≤ 0.5	16	8.4	
70	20/02/25	BCG1702bc0	6	57	≤ 0.5	18	8.2	
71	20/02/25	BCG1802bc5	8	60	≤ 0.5	18	8.3	
72	21/02/25	BCH1802bd	8	56	≤ 0.5	16	8.3	
73	21/02/25	BCB1902bc1	6	58	≤ 0.5	18	8.5	
74	21/02/25	BCC1902bc2	8	56	≤ 0.5	18	8.3	
75	24/02/25	BCDF1902bd	8	56	≤ 0.5	18	8.3	
76	24/02/25	BCA2002bc0	6	55	≤ 0.5	17	8.4	
77	25/02/25	BCCA2002bd	8	58	≤ 0.5	16	8.2	
78	25/02/25	BCC2102bc2	8	55	≤ 0.5	17	8.5	
79	25/02/25	BCW2002bc	8	56	≤ 0.5	18	8.3	
80	26/02/25	BCC2002bc2	8	56	≤ 0.5	18	8.3	Viscosity
81	26/02/25	BCC2402bd	6	58	≤ 0.5	17	8.4	
82	27/02/25	BCC2402bd	8	54	≤ 0.5	18	8.4	
83	27/02/25	BSC2502bd	6	58	≤ 0.5	18	8.5	
84	2802/25	BCB2502bd	8	54	≤ 0.5	18	8.3	
85	28/02/25	BCB2502bd	6	56	≤ 0.5	17	8.4	
86	3/03/225	BCB2602bd	6	54	≤ 0.5	19	8.3	
87	3/3/2025	BCPU2602bd	7	54	≤ 0.5	17	8.3	
88	5/3/2025	BCOF2702bd	6	57	≤ 0.5	16	8.5	
89	6/3/2025	BCOF2702bd	8	59	≤ 0.5	18	8.3	
90	6/3/2025	BCC2802bd	8	55	≤ 0.5	16	8.3	
91	6/3/225	BCD2802bd	8	59	≤ 0.5	18	8.4	
92	11/3/2025	BCC0303bd	8	56	≤ 0.5	17	8.2	
93	12/3/2025	BCD0303bd	8	56	≤ 0.5	17	8.5	
94	12/3/2025	BCC0503bd	8	59	≤ 0.5	17	8.4	
95	17/03/25	BCC0603bd	6	55	≤ 0.5	18	8.2	
96	18/03/25	BCC0603bd	6	50	≤ 0.5	18	8.4	
97	18/03/25	BCD0603bd	8	59	≤ 0.5	16	8.2	
98	19/03/25	BCA1103bd	6	56	≤ 0.5	18	8.5	
99	19/03/25	BCG1203bd	8	57	≤ 0.5	16	8.3	

100	24/03/25	BCW1203bd	8	54	≤ 0.5	19	8.3	
101	24/03/25	BCS1703bd0	8	56	≤ 0.5	17	8.4	
102	24/03/25	BCP1803bd0	6	58	≤ 0.5	18	8.2	
103	28/03/25	BCC1803bd1	6	56	≤ 0.5	18	8.5	
104	28/03/25	BCW1903bd	8	54	≤ 0.5	19	8.3	Adhesion
105	31/03/25	BCW1903bd	6	50	≤ 0.5	16	8.3	
106	31/03/25	BCA2403bd0	7	58	≤ 0.5	16	8.3	
107	1/4/2025	BCC2403bd1	8	53	≤ 0.5	19	8.3	
108	1/4/2025	BCC2403bd1	5	53	≤ 0.5	17	8.3	
109	8/4/2025	BCD2803bd0	6	59	≤ 0.5	18	8.3	Viscosity
110	9/4/2025	BCC2803bd1	7	58	≤ 0.5	18	8.3	
111	9/4/2025	BCA3103bd0	6	59	≤ 0.5	16	8.3	
112	14/04/25	BCC3103bd1	6	58	≤ 0.5	18	8.3	
113	14/04/25	BCG0104bd0	8	56	≤ 0.5	18	8.3	
114	15/04/25	BCS0104bd0	6	56	≤ 0.5	19	8.3	
115	15/04/25	BCOF0804bd0	8	55	≤ 0.5	5	8.3	
116	16/04/25	BCG0904bd0	8	59	≤ 0.5	1	8.3	
117	16/04/25	BCA0904bd0	7	56	≤ 0.5	1	8.3	

Number of Paints Produced and Number of Defectives for the Year 2024

Weeks	Sample size (Produced)	Number of defectives observed	Weeks	Sample size (Produced)	Number of defectives observed
1	1200	10	27	1700	11
2	1800	15	28	1800	12
3	2000	16	29	1900	10
4	1800	14	30	2000	16
5	2000	11	31	2000	14
6	2000	12	32	2000	15
7	1950	13	33	2000	12
8	1980	14	34	1800	14
9	1680	12	35	1900	13
10	1600	11	36	1700	12
11	1840	10	37	1850	12
12	1900	12	38	1800	16
13	1850	13	39	2000	15
14	2000	14	40	2000	11
15	2000	10	41	1600	15
16	1650	11	42	1500	10
17	1780	12	43	1680	12
18	1600	13	44	1800	14

19	2000	14	45	1780	22
20	2000	11	46	2000	18
21	2000	10	47	1900	16
22	1800	15	48	2000	10
23	1800	16	49	1800	14
24	1850	14	50	1500	12
25	1650	12	51	1200	15
26	1680	14			