Abstract

In today's rapidly evolving industrial landscape, maintaining optimal production efficiency and product quality is of paramount importance for organizations seekingto remain competitive.

The project titled "**Production Analysis Using Statistical Quality Control**" delvesinto the application of advanced statistical methodologies to analyse and enhance production processes, thereby ensuring consistent quality output and minimizing defects.

This research project harnesses the power of **Statistical Quality Control (SQC)** techniques to provide a comprehensive framework for assessing, monitoring, and improving production processes. SQC is a data-driven approach that enables organizations to make informed decisions by quantifying variations within production systems and identifying opportunities for optimization.

The project's primary objective is to develop a systematic methodology for integrating SQC principles into the production environment, facilitating evidence- based decision-making and promoting a culture of continuous improvement.

The project commences with a thorough literature review, exploring the foundationalprinciples of statistical quality control, including concepts such as control charts, process capability analysis, and statistical process control. By building upon this theoretical foundation, the research then transitions into a practical phase where real-world production data is collected, analyse, and interpreted using SQC techniques.

Various control charts are employed to monitor key production parameters, detect deviations, and trigger corrective actions. Process capability indices are calculated to assess the potential of production systems to meet quality specifications, therebyaiding in process optimization.

INTRODUCTION

Statistical Quality Control (SQC)

Statistical Quality Control (SQC) is a scientific method to analyse manufacturing data. Based on this analysis, measures are taken to maintain the quality of the manufactured product. A control chart is the tool used to monitor the variation in a process and ensure that the process is in a state of control. This allowsthe operator to monitor the trends occurring in the process. The control chart reflectsthe specification limits or control limits, namely the Upper Control Limit (UCL), Central Limit (CL) and the Lower Control Limit (LCL). In addition, it has upper andlower control limits that lie within the specification limits. The Upper Control Limit(UCL) and the Lower Control Limit (LCL) are determined by evaluating thedispersion (variability) in process. In a well-controlled process, these limits can be chosen to be equal to $\mu \pm 3\sigma$ respectively, where σ is the process standard deviationand μ is the process mean. These statistical limits are normally called the 3 sigma control limits. ln a normal (Gaussian) distribution, 99.73% of the values measured lie in interval of width 6 σ.

The production process cannot be separated from consumers and resulting product. Consumers certainly hope that the items they buy will be able to meet their needs and desires so that consumers hope that these products have right and guaranteed conditions. Therefore, companies need to maintain that the quality of the products produced are guaranteed and accepted by consumers and can compete in the market.Excellent quality will generate trust from consumers. Meanwhile the production must pay more attention to the quality of the products result therefore required quality control to find out whether the product defects produced are still within limits. As we know quality control in companies both service companies and manufacturing companies is essential. The production hopes to attract consumers and can meet the needs and desires of consumers with the quality of services or goods produced.

Quality control that is carried out correctly will have an impact on the quality of theresulting product. The quality of the products produced by production is determinedbased on specific characteristics. Although the production processes have been carried out well, in reality, there are still errors that the quality of the product produced is not following the standard, or in other words, the product is damaged ordefective in the product.

The result of the excellent quality of the product comes from good quality control. Many companies use specialized methods to produce good-quality products. For thisreason, the quality control necessary to keep the product generated by the applicablequality standards. The company's quality standards are usually dependent on raw materials, production process, and the finished product (results). Therefore, the activities of quality control can be done starting from the selection of materials, theproduction process up to the final result in the form of products and customized by the standards set in the company.

Statistical Process Control (SPC) is the process control tool that is commonly used,this tool is often used to find out the source of variations in the control chart along with the analysis of process capabilities. In may statistical applications, control charthas important role to assess the "quality" of product; either in control or out of control (Lestari, 2015). Control Chart was first introduced by Dr. Walter Andrew Shewhart of Bell Telephone Laboratories, the United States, in 1924 intending to eliminate abnormal variations through separation of variations caused by the particular causes of variation and common causes. This variation means that the production process must be stable and capable of operating in such a way so that allproducts are produced according to specifications.

Quality requires an ongoing improvement process. Quality improvement can be appropriately made when the measured values are within the SPC approach expectations. The incompatibility of such quality characteristics net weight of the products will have an impact on the one hand, which the producer or the consumer.If the characteristics of the quality exceed the specifications of the manufacturer will be harmed, and if the characteristics under the specifications of the consumers will be harmed.

By the research problem described before, the writer can conclude that the objectives of the study to analyse quality control of bread using attributes P-chart tomeet in quality control statistics.

Control Chart

The control chart is perhaps the most widely used of the "seven basic quality controltools". It is the key tools in statistic quality control because it displays process behaviour graphically and it is used to monitor and control processes within the specified control limits. There are two basic types of control chart, depending on the type of data collected; namely variable control chart and attribute control chart. Variable control chart is designed to control product characteristics and process parameters which are measured in continuous scale.

The primary variable control chart used are the X-bar and R chart and moving rangechart, while the other two, rarely used charts include X-bar and s chart and median chart.

Attribute control charts are designed to control the process. Measurements used arein terms of good or bad, accept or reject, go/no-go, or pass or fail criteria (e.g. conforming or nonconforming) The distinction between nonconforming or defectiveunit and nonconformities or defects is very important in attribute control chart because twill determine the selection in the type of attribute control chart used. A nonconforming or defective unit, however, may fail to meet the assessment criteria because of one or more nonconformities or defects exist. For attribute data, there are: p chart, np chart, c chart and u chart. The p and np charts are the most widely used. They are primarily used to monitor the fraction of nonconforming unit, while,the c and u charts are used to monitor the number of nonconformities or defects.

STATISTICAL PROCESS CONTROL (SPC)

Statistical process control (SPC) involves using statistical techniques to measure andanalyse the variation in processes. Most often used for manufacturing processes, theintent of SPC is to monitor process quality and maintain processes to fixed targets. SPC is used to monitor the consistency of processes used to manufacture a product as designed. It aims to get and keep processes under control. No matter how good orbad the design, SPC can ensure that the product or service is being produced as designed and intended. Thus, SPC will not improve a poorly designed product's reliability, but can be used to maintain the consistency of how the product is made and, therefore, of the manufactured product itself and its as- designed reliability.

A primary tool used for SPC is the control chart, a graphical representation of certain descriptive statistics for specific quantitative measurements of the manufacturing process. These descriptive statistics are displayed in the control chart in comparisonto their "in-control" sampling distributions.

The comparison detects any unusual variation in the manufacturing process, whichcould indicate a problem with the process. Several different descriptive statistics can be used in control charts and there are several different types of control charts that can test for different causes, such as how quickly major vs. minor shifts in process means are detected. Control charts are also used with product measurements to analyse process capability and for continuous process improvement efforts.

Acceptance sampling refers to the process of randomly inspecting a certain numberof items from a lot or batch in order to decide whether to accept or reject the entire batch. What makes acceptance sampling different from statistical process control isthat acceptance sampling is performed either before or after the process, rather thanduring the process.

Acceptance sampling before the process involves sampling materials received froma supplier, such as randomly inspecting crates of fruit that will be used in arestaurant, boxes of glass dishes that will be sold in a department store, or metal castings that will be used in a machine shop. Sampling after the process involves sampling finished items that are to be shipped either to a customer or to a distributioncentre. Examples include randomly testing a certain number of computers from a batch to make sure they meet operational requirements, and randomly inspecting snowboards to make sure that they are not defective.

Statistical Process Control (SPC) involves using statistical techniques to measure and analyse the variation in processes. Most often used for manufacturing processes,the intent of SPC is to monitor product quality and maintain processes to fixed targets. SPC is used to monitor the consistency of processes used to manufacture a product. It aims to get and keep processes under control.

Statistical process control methods are applied to virtually any type of organization,including service, manufacturing, and educational organizations.

process is said to be in statistical control when all special causes of variation have been eliminated and only natural (or common) cause variation remains. On a controlchart, this is illustrated by data that falls within control limits and by the absence ofnon-random patterns or trends.

OBJECTIVES

The objective of Statistical Quality Control (SQC) is to ensure and enhance the quality and consistency of products, processes, and services by using statistical methods and techniques to monitor, control, and improve various aspects of production and delivery. SQC aims to:

1. **Identify Variability**: SQC helps to detect and quantify variations in processes andproducts, enabling organizations to understand the sources of variability and take measures to reduce it.

2. **Monitor Process Performance**: SQC involves continuous monitoring of processes to ensure they remain stable and produce consistent, predictable results over time.

3. **Detect and Address Defects**: SQC aids in the timely identification of defects or deviations from established standards, allowing for prompt corrective actions to prevent further defects and waste.

4. **Optimize Processes**: By analysing data and performance metrics, SQC supports process optimization and improvement efforts, leading to more efficient and effective operations.

5. **Ensure Compliance**: SQC helps organizations meet regulatory and industry standards by providing evidence of consistent quality control practices.

6. **Enhance Customer Satisfaction**: SQC contributes to delivering products and services that consistently meet or exceed customer expectations, leading to higher levels of customer satisfaction and loyalty.

7. **Reduce Costs**: SQC's focus on identifying and reducing variability and defects leads to decreased waste, rework, and resource inefficiencies, resulting in cost savings.

8. **Facilitate Decision-Making**: SQC provides actionable insights based on data analysis, helping organizations make informed decisions about process improvements and quality management strategies.

REVIEW OF LITERATURE

The quality of a product is one of the important keys for companies to influence progress in producing a product and got satisfaction for consumers. The quality of goods or services has specifications such as durability, design, reliability,purity or a combination of these various factors which then shows that one of the factors of quality control depends on its ability (Availability), performance (Performance), reliability (Reliability), and also maintenance (Maintainability). A company that does not pay attention to the quality of its products is tantamount to suicide or does not care about the future of the company, because the quality of a product will affect consumer purchasing decisions. Therefore, quality control is needed to maintain the quality of a product so that it is in accordance with predetermined standards and does not cause defects or damage during the productionprocess

Quality control is how a technique and activity are carried out in a planned manner to achieve, improve and maintain the quality of a product and service so that it is in accordance with predetermined standards to meet consumer satisfaction. According to Sofjan (2008), quality control is a form of effort to maintain the quality or qualityof the products produced, so that they are in accordance with the product specifications that have been determined based on the policy of the company leadership. So that in maintaining product quality, the company must be able to always maintain the quality value of quality of products produced in order to produceproducts that are in accordance with company management policies.

Quality control if implemented properly will also have a good impact on the value of product quality produced by the company. The quality of the products produced by the company is also determined by various models, sizes, and certain characteristics. The main objective of quality control itself is to ensure that the quality of the products or services produced is in accordance with the quality standards or specifications that have been determined at an economical or lowest.

possible cost. Quality control is part of production control, because quality control is part of production control. Control of production both in quality and quantity is avery important activity in a company. This is because all activities in production thatare carried out will be controlled, so that the goods and services produced are in accordance with a predetermined plan.

Vardhman Group is a textile group based in Ludhiana, Punjab, India, that was established in 1965. The group is engaged in manufacturing and trading in Yarn andProcessed Fabric, Sewing Thread, Acrylic fibre and Alloy steel. Vardhman group was incorporated in 1962 as Vardhman Spinning & General Mills (VSGML).

One thing that has anchored Vardhman's growth over five decades of an ever evolving, complex, cyclical and often disruptive business environment is the unwavering pursuit of excellence. This drive to continuously raise the bar and benchmark ourselves to the global best has seen us exceed customer expectations and sharpen our competitive edge.

With a turnover of more than a billion dollars, Vardhman is the largest vertically integrated textile manufacturer in India. Annually, we produce 2,40,000 metric tonsof yarn and 220 million metres of woven fabric, providing direct employment to over 28,000 people

Quality control carried out by companies can vary, some are carried out as a whole(100% inspection) and some are statistical. Statistical quality control is carried out by using a combination of statistical tools found in Statistical Quality Control (SQC)

METHODOLOGY

SPC data is collected in the form of measurements of a product dimension / feature or process instrumentation readings. The data is then recorded and tracked on various types of control charts, based on the type of data being collected. It is important that the correct type of chart is used gain value and obtain useful information. The data can be in the form of continuous variable data or attribute data. The data can also be collected and recorded as individual values or anaverage of a group of readings. Some general guidelines and examples are listed below. This list is not all inclusive and supplied only as a reference.

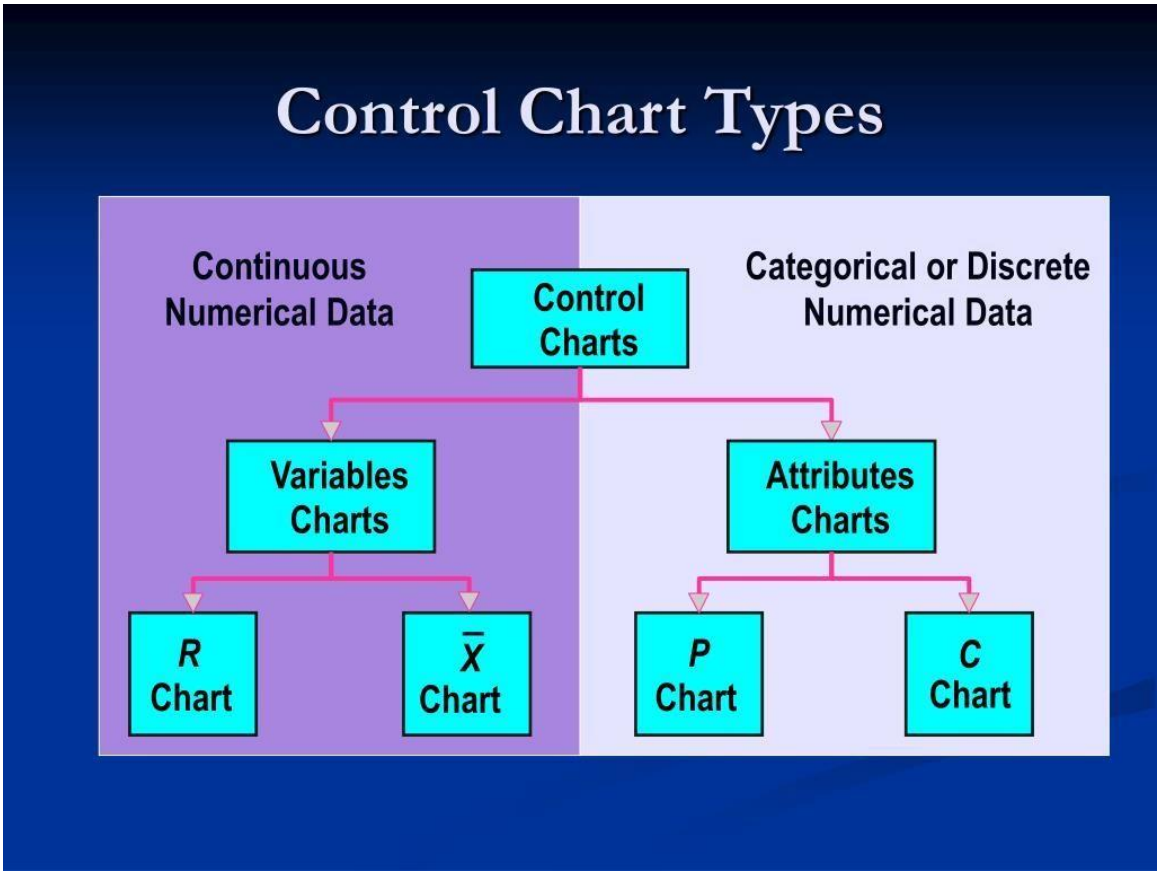

Image-1

Variables

Variables are characteristics that can be measured on a continuous scale, usually involving quantitative data. These characteristics can take any value within a certainrange.

- X-bar Chart
- R-bar Chart

Examples of variables include length, weight, temperature, diameter, height, and time.

When monitoring variables, control charts such as X-Bar and R charts or IndividualsControl Charts are commonly used to track the central tendency (mean) and variability of the measured data.

Attributes:

Attributes are characteristics that are measured on a categorical scale, typically involving qualitative data. These characteristics are often binary (defective or non- defective) or belong to a discrete category.

- p chart
- np chart
- c chart

Examples of attributes include pass/fail, yes/no, defective/non-defective, color (red,green, blue), and presence/absence.

When monitoring attributes, control charts such as P-charts (Proportion Charts) or C-charts (Count Charts) are commonly used to track the proportion of defective items or the count of defects per unit.

- The choice between variables and attributes control charts depends on the nature of the data, the type of defects you're dealing with, and the goals of your quality control analysis.

P Chart (Proportion Chart)

P Chart, also known as a Proportion Chart, is a type of control chart used inquality management and process control to monitor the proportion of nonconformingitems or defects in a sample of items from a process.

Here's an overview of what a P Chart is and how it is used:

P Chart is a graphical tool that helps monitor the stability and consistencyof a process in terms of its defect rate or the proportion of defective items. It is particularly useful when dealing with categorical data, such as the presence or absence of a particular attribute or characteristic. P Charts are commonly used whenthe sample size varies from one subgroup to another.

How to Construct a P Chart

- **Collect Data:** Collect data by taking random samples from the process at different time intervals.
- **Determine Subgroup Size:** Determine the size of each subgroup or sample. This might vary based on the process and the objectives of the quality control.
- **Calculate Proportions:** Calculate the proportion of defective items (or itemswith the specific attribute of interest) within each subgroup. This is usually done by dividing the number of defective items by the total number of items in the subgroup.
- **Calculate Control Limits:** Calculate control limits for the P Chart based on statistical principles. These control limits help identify when the process is exhibiting unusual variation.
- **Plot Data:** Create a P Chart by plotting the calculated proportions of defectives for each subgroup over time. The control limits are also plotted onthe chart.
- **Analyse Patterns:** Monitor the P Chart over time. If the plotted points fall within the control limits, the process is considered stable and in control. If points go beyond the control limits or show a consistent pattern, it indicates that the process may be out of control and requires investigation.

Three sigma control limits of the p-chart are to define the quality of the items asthe

- Upper control limit (UCL)
- Central limit (CL)
- Lower control limit (LCL)

For equal sample size as

Upper Control Limit (UCL) = p + (3 * σp)

CL = p = (Total Number of Defectives) / (Total Number of Items Inspected)Lower Control Limit (LCL) = p - (3 * σp)

- σp = √ (p-bar * (1 - p-bar) / n)

For **unequal sample** sizes as

p Chart

$$UCL = \bar{p} + 3\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_i}\right)}$$

$$CL = \bar{p} = \sum p_i \Big/ \sum n_i$$

$$LCL = \bar{p} - 3\sqrt{\left(\frac{\bar{p}(1-\bar{p})}{n_i}\right)}$$

Where p_i = number of non-conforming items n_i = sample size

Interpreting a P Chart:

Points within the control limits: The process is considered stable and under control.

Points outside the control limits: The process may be exhibiting unusual variation ormay be out of control. Further investigation is needed to identify and address the root cause of the variation.

Determination of the purpose of the p chart

A p-chart (sometimes called a p-control chart) is used in statistical quality control to graph proportions of defective items. The chart is based on the binomial distribution; each item on the chart has only two possibilities: pass or fail. An "item"could be anything you're interested in charting, including: gadgets from a productionline, wait times, or delivery times.

As and to 100% inspection, a control chart for fraction rejected may have any of thefollowing purposes:

1. To discover the average proportion of nonconforming articles or parts submit ed for inspection over a period of time.

2 To bring to the attention of management any changes in this average quality level

3. To discover those out-of-control high spots that call for action to identify and correct causes of bad quality.

4. To discover those out-of-control low spots that indicate either relaxed inspec on standards or erratic causes of quality improvement that might be converted to causesof consistent quality improvement.

5. To suggest places for the use of X and R charts to diagnose quality problems.The p chart

as applied to sampling inspection on a lot-by-lot basis may have any or all of the purposes

cited for 100% inspection. An additional purpose sally is:

6.To afford a basis for judgment whether successive lots may be considered as representative of a process. This judgment may properly influence the severity of customer acceptance criteria (discussed in Chap. 12) and affect contractual compliance stipulations.

The p chart is used to evaluate process stability when counting the number or fractiondefective.

NP Chart (Number of Nonconforming Units Chart)

A np-chart is a type of control chart used to monitor the number of nonconforming units when measuring subgroups at regular intervals from a process.Each point on the chart represents the number of nonconforming units in a subgroup.The canter line is the average number of nonconforming units.

An NP Chart is another type of control chart used in Statistical Quality Control(SQC) to monitor the number of nonconforming items or defects in a sample of itemsfrom a process, where the sample size is constant. The NP Chart is specifically designed for situations where the sample size remains the same for each subgroup or batch.

Here's an overview of what an NP Chart is and how it is used:NP Chart

(Number of Nonconforming Units Chart):

An NP Chart is used to monitor the number of nonconforming items or defectsin a fixed-size sample. It helps assess whether the process is in a state of statistical control or if there are variations that need to be investigated.

How to Construct an NP Chart:

- **Collect Data:** Collect data by taking random samples from the process atregular intervals. The sample size should remain constant for each subgroup.
- **Determine Subgroup Size:** Determine the size of each subgroup or sample. It remains constant for each subgroup in the NP Chart.
- **Count Nonconforming Units:** For each subgroup, count the number of nonconforming items or defects.
- **Calculate Control Limits:** Calculate control limits for the NP Chart based on statistical principles. These control limits help identify when theprocess is exhibiting unusual variation.
- **Plot Data:** Create an NP Chart by plotting the number of nonconformingitems for each subgroup over time. The control limits are also plotted onthe chart.
- **Analyse Patterns**: Monitor the NP Chart over time. Points falling withinthe control limits indicate that the process is stable and in control. Pointsoutside the control limits or showing specific patterns suggest that the process might be out of control and require investigation.

Three sigma control limits of the np-chart are to define the quality of the items asthe

- Upper control limit (UCL)
- Central limit (CL)
- Lower control limit (LCL)

$$n\bar{p} = \frac{\sum np}{k}$$

$$\bar{p} = \frac{\sum np}{\sum n}$$

$$UCL_{np} = n\bar{p} + 3\sqrt{n\bar{p}(1-\bar{p})}$$

$$LCL_{np} = n\bar{p} - 3\sqrt{n\bar{p}(1-\bar{p})}$$

CL = p-bar

Interpreting an NP Chart:

- **Points within the control limits**: The process is considered stable and undercontrol.
- **Points outside the control limits:** The process may be exhibiting unusual variation or may be out of control. Further investigation is needed to identifyand address the root cause of the variation.

- NP Charts are valuable tools for monitoring the count of nonconforming itemsor defects when the sample size remains constant. They help organizations identify and address quality issues in a timely manner, ensuring that productsmeet the desired standards.

C Chart (Count Chart)

The C Chart is used to monitor the count of defects or nonconforming items ina fixed-size sample. Unlike the NP Chart, the sample size may vary between subgroups in a C Chart. The C Chart is particularly useful when the variation in thenumber of defects is of interest.

Here's how you can construct and interpret a C Chart:

- **Collect Data:** Collect data by taking random samples from the process at regular intervals. The sample size can vary between subgroups.
- **Count Defects:** For each subgroup, count the number of defects or nonconforming items.
- **Calculate C-bar:** Calculate the average number of defects (C-bar) across allsubgroups by summing up the number of defects and dividing by the total number of subgroups.
- **Calculate σc:** Calculate the standard deviation of defects (σc) using the formula mentioned above.
- **Calculate Control Limits:** Calculate the upper and lower control limits usingthe formulas mentioned above.
- **Plotting the C Chart:** On the C Chart, plot the individual counts of defects for each subgroup, the C-bar line (canter line), and the UCL and LCL lines representing the control limits.

Three sigma control limits of the np-chart are to define the quality of the items asthe

- Upper control limit (UCL)
- Central limit (CL)
- Lower control limit (LCL)

$$UCL = \bar{c} + 3\sqrt{\bar{c}}$$

$$CL = \bar{c} = \sum c_i / n$$

$$LCL = \bar{c} - 3\sqrt{\bar{c}}$$

- **Interpret the Chart:** Monitor the C Chart over time. Points falling within thecontrol limits indicate that the process is stable and in control. Points outsidethe control limits or showing specific patterns suggest that the process mightbe out of control and require investigation.

C Charts are useful for monitoring the variation in the number of defects or nonconforming items in a sample, allowing organizations to identify and address quality issues effectively.

SOFTWARE REQUIREMENTS

Introduction to Microsoft Excel

There are numbers of spreadsheet programs but from all of them, Excel is most widely used. People have been using it for last 30 years and throughout these years,it has been upgraded with more and more features.

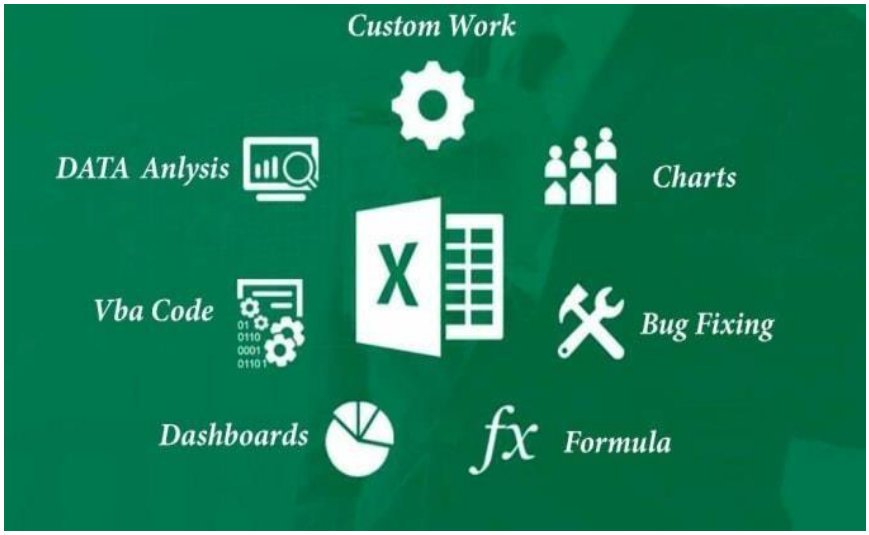

Image-2

Excel is, it can apply to many business tasks, including statistics, finance, data management, forecasting, analysis, inventory, billing, and business intelligence. Following are the few things which it can do for you:

- Number Crunching
- Charts and Graphs
- Store and Import Data
- Manipulating Text
- Templates/Dashboards
- Automation of Tasks
- And Much More...

Three most important components of Excel is which you need to understand first:

1. ***Cell:*** A cell is a smallest but most powerful part of a spreadsheet. You can enteryour data into a cell either by typing or by copy-paste. Data can be a text, a number, or a date. You can also customize it by changing its size, font colour, background colour, borders, etc. Every cell is identified by its cell address, celladdress contains its column number and row number (If a cell is on 11th row and on column AB, then its address will be AB11).

2. ***Worksheet:*** A worksheet is made up of individual cells which can contain a value, a formula, or text. It also has an invisible draw layer, which holds charts,images, and diagrams. Each worksheet in a workbook is accessible by clickingthe tab at the bottom of the workbook window. In addition, a workbook can store chart sheets; a chart sheet displays a single chart and is accessible by clicking a tab.

3. ***Workbook:*** A workbook is a separate file just like every other application has. Each workbook contains one or more worksheets. You can also say that a workbook is a collection of multiple worksheets or can be a single worksheet. You can add or delete worksheets, hide them within the workbook without deleting them, and change the order of your worksheets within the workbook.

Microsoft Excel Window Components

Before you start using it, it's really important to understand that what's wherein its window. So ahead we have all the major component which you need to knowbefore entering the world of Microsoft Excel.

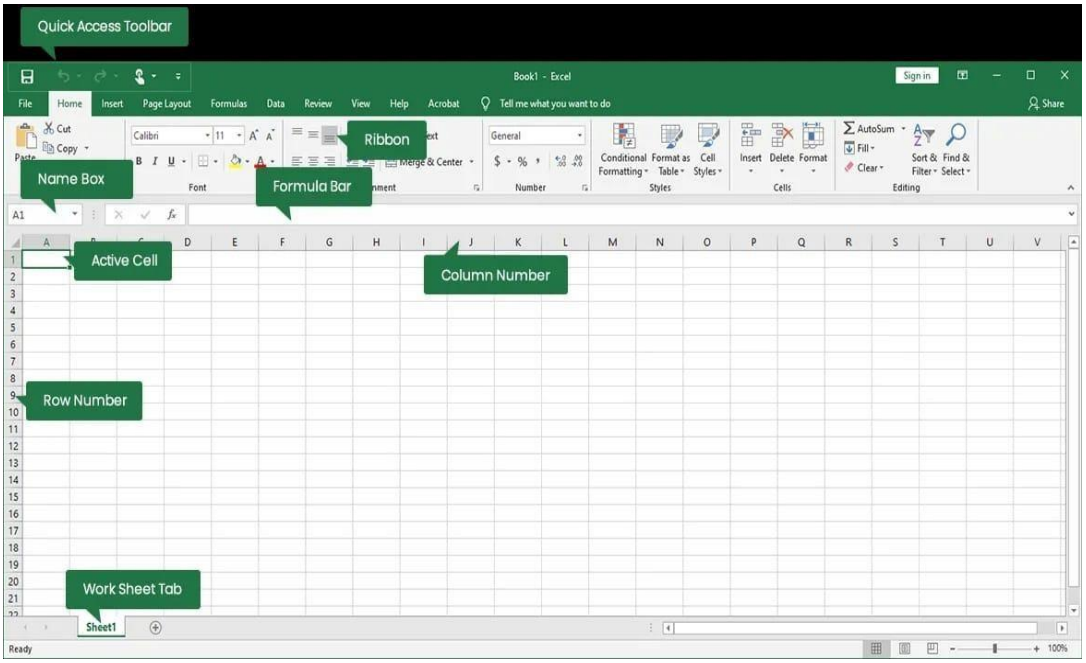

Image-3

1. ***Active Cell:*** A cell which is currently selected. It will be highlighted by a rectangular box and its address will be shown in the address bar. You can activate a cell by clicking on it or by using your arrow buttons. To edit a cell,you double-click on it or use F2 to as well.

2. ***Columns:*** A column is a vertical set of cells. A single worksheet contains 16384 total columns. Every column has its own alphabet for identity, from Ato XFD. You can select a column clicking on its header.

3. ***Rows:*** A row is a horizontal set of cells. A single worksheet contains 1048576total rows. Every row has its own number for identity, starting from 1 to 1048576. You can select a row clicking on the row number marked on the leftside of the window.

4. ***Fill Handle:*** It's a small dot present on the lower right corner of the active cell. It helps you to fill numeric values, text series, insert ranges, insert serialnumbers, etc.

5. ***Address Bar:*** It shows the address of the active cell. If you have selected morethan one cell, then it will show the address of the first cell in the range.

6. ***Formula Bar:*** The formula bar is an input bar, below the ribbon. It shows thecontent of the active cell and you can also use it to enter a formula in a cell.

7. ***Title Bar:*** The title bar will show the name of your workbook, followed by theapplication name ("Microsoft Excel").

8. ***File Menu:*** The file menu is a simple menu like all other applications. It contains options like (Save, Save As, Open, New, Print, Excel Options, Share,etc).

9. ***Quick Access Toolbar:*** A toolbar to quickly access the options which you frequently use. You can add your favourite options by adding new options toquick access toolbar.

10. ***Ribbon Tab:*** Starting from the Microsoft Excel 2007, all the options menusare replaced with the ribbons. Ribbon tabs are the bunch of specific option group which further contains the option.

11. ***Worksheet Tab:*** This tab shows all the worksheets which are present in the workbook. By default, you will see, three worksheets in your new workbookwith the name of Sheet1, Sheet2, Sheet3 respectively.

12. ***Status Bar:*** It is a thin bar at the bottom of the Excel window. It will give youan instant help once you start working in Excel.

DATA

From Vardhman group of textiles we collected five different types of fabricsfor the year of 2021-2022.

2021-2022		Cotton		silk		Polyester		Nylon		Rayon	
january		manufactured	no.of defects	manufactured	no.of defects	manufactured	no.of defects	manufactured	no.of defects	manufactured	no.of defects
1	Saturday	20	1	25	2	30	2	89	1	22	2
2	Sunday	25	0	30	3	50	4	90	2	66	3
3	Monday	30	1	50	5	34	5	100	5	30	5
4	Tuesday	50	3	34	6	55	7	24	2	50	6
5	Wednesday	34	1	55	8	76	1	38	3	34	8
6	Thursday	55	2	76	9	89	9	78	5	55	9
7	Friday	76	8	89		90	0	67	6	76	0
8	Saturday	89	9	90	7	100	2	13	8	89	7
9	Sunday	90	2	100	0	24	3	34	9	90	0
10	Monday	100	12	24	4	38	5	56	0	100	4
11	Tuesday	24	2	38	5	78	6	78	7	24	5
12	Wednesday	38	3	78	3	67	8	90	0	38	3
13	Thursday	78	4	67	1	13	9	12	4	78	1
14	Friday	67	2	13	2	34	0	30	5	67	2
15	Saturday	13	1	34	4	56	7	50	3	13	4
16	Sunday	34	0	56	5	78	0	34	1	34	5
17	Monday	56	5	78	8	90	4	55	2	56	8
18	Tuesday	78	4	90	9	12	5	76	4	78	9
19	Wednesday	90	3	12	0	35	3	89	5	90	0
20	Thursday	12	2	35	5	54	1	90	8	12	5
21	Friday	35	1	54	6	24	2	100	9	35	6
22	Saturday	54	3	24	8	34	4	24	0	54	8
23	Sunday	24	4	34	7	89	5	38	5	24	7
24	Monday	34	2	36	7	90	8	78	6	34	7
25	Tuesday	36	4	78	2	100	9	67	8	65	2
26	Wednesday	57	2	90	1	24	0	13	7	23	1
27	Thursday	67	3	12	2	38	5	34	7	12	2
28	Friday	89	2	35	3	78	6	56	2	45	3
29	Saturday	89	3	54	4	67	8	78	1	66	4
30	Sunday	32	4	24	3	13	7	90	2	88	3
31	Monday	45	2	34	0	34	7	12	3	90	0

february											
1	Tuesday	34	0	90	1	78	1	54	3	89	1
2	Wednesday	45	5	100	1	90	2	24	0	23	1
3	Thursday	67	4	24	3	12	3	34	2	34	3
4	Friday	87	3	38	2	34	4	56	1	54	2
5	Saturday	45	2	78	1	67	3	76	1	67	1
6	Sunday	56	1	67	4	45	0	23	3	45	4
7	Monday	45	3	13	5	34	2	109	2	34	5
8	Tuesday	34	4	34	6	12	1	90	1	12	6
9	Wednesday	12	2	56	7	90	1	89	4	90	7
10	Thursday	90	4	78	8	89	3	90	5	89	8
11	Friday	89	2	90	9	78	2	100	6	78	9
12	Saturday	78	3	78	0	56	1	24	7	56	0
13	Sunday	56	2	90	7	67	4	38	8	67	7
14	Monday	67	3	12	0	60	5	78	9	60	0
15	Tuesday	60	1	35	9	45	6	67	0	45	9
16	Wednesday	45	2	54	0	45	7	13	7	45	0
17	Thursday	45	3	24	9	23	8	34	0	23	9
18	Friday	23	1	34	8	32	9	56	9	32	8
19	Saturday	32	1	89	0	31	0	78	0	31	0
20	Sunday	31	0	90	2	42	7	90	9	42	2
21	Monday	42	3	100	3	53	0	12	8	53	3
22	Tuesday	53	5	24	1	90	9	31	0	90	1
23	Wednesday	90	6	38	5	89	0	42	2	89	5
24	Thursday	89	2	78	1	70	9	53	3	70	1
25	Friday	70	7	67	1	67	8	90	1	67	1
26	Saturday	67	8	13	6	89	0	89	5	89	6
27	Sunday	89	0	34	8	45	2	70	1	45	8
28	Monday	45	1	56	2	65	3	67	1	65	2

march											
1	Tuesday	76	3	98	3	45	5	45	8	99	3
2	Wednesday	87	4	78	4	23	1	65	2	76	4
3	Thursday	45	9	90	1	32	1	34	2	45	1
4	Friday	24	0	12	2	31	6	87	3	56	2
5	Saturday	25	8	35	5	42	8	27	4	24	5
6	Sunday	35	6	54	6	53	2	45	1	78	6
7	Monday	46	4	24	7	90	2	34	2	45	7
8	Tuesday	47	2	34	1	89	3	12	5	34	1
9	Wednesday	48	1	89	2	70	4	90	6	12	4
10	Thursday	50	3	90	5	67	1	89	7	90	3
11	Friday	56	4	100	4	89	2	78	4	89	2
12	Saturday	29	5	24	2	45	5	56	2	78	1
13	Sunday	57	5	38	1	65	6	67	1	56	3
14	Monday	35	7	78	3	45	7	60	3	67	4
15	Tuesday	35	8	67	4	78	4	45	4	60	5
16	Wednesday	25	0	13	5	45	2	45	5	45	5
17	Thursday	36	5	34	5	34	1	23	5	45	7
18	Friday	54	4	56	7	12	3	32	7	23	8
19	Saturday	55	3	78	8	90	4	31	8	32	0
20	Sunday	59	2	95	0	89	5	42	0	31	5
21	Monday	70	2	67	5	78	5	53	5	42	4
22	Tuesday	45	3	56	4	56	7	90	4	53	3
23	Wednesday	39	4	23	3	67	8	89	3	90	2
24	Thursday	24	3	43	2	60	0	70	2	89	2
25	Friday	25	5	78	2	45	5	67	2	70	3
26	Saturday	26	7	90	3	45	4	89	3	67	4
27	Sunday	27	8	12	4	23	3	45	4	89	3
28	Monday	90	0	35	3	32	2	65	3	45	5
29	Tuesday	67	9	54	5	31	2	78	5	65	7
30	Wednesday	68	8	24	7	42	3	90	7	78	8
31	Thursday	69	1	34	8	53	4	12	8	90	0

april											
1	Friday	65	1	90	9	89	5	54	9	35	8
2	Saturday	67	3	100	8	70	7	24	8	54	1
3	Sunday	56	4	24	1	67	8	34	1	24	2
4	Monday	55	5	38	2	89	0	89	0	34	3
5	Tuesday	24	5	78	3	45	9	90	2	89	5
6	Wednesday	25	7	67	5	65	8	100	3	90	6
7	Thursday	26	8	13	6	78	1	24	5	100	8
8	Friday	76	0	34	8	90	2	38	6	24	9
9	Saturday	75	5	56	9	12	3	78	8	38	0
10	Sunday	78	4	78	0	35	5	67	9	78	7
11	Monday	90	3	90	7	54	6	13	0	67	0
12	Tuesday	97	2	45	0	24	8	34	7	13	4
13	Wednesday	89	2	56	4	34	9	56	0	34	5
14	Thursday	57	3	45	5	89	0	78	4	56	3
15	Friday	67	4	34	3	90	7	90	5	78	1
16	Saturday	56	3	12	1	100	0	22	3	90	2
17	Sunday	55	5	90	2	24	4	38	1	38	4
18	Monday	24	7	89	4	38	5	78	2	78	5
19	Tuesday	25	3	78	5	78	3	67	4	67	8
20	Wednesday	26	4	56	8	67	1	13	5	13	9
21	Thursday	76	5	67	9	13	2	34	8	34	0
22	Friday	75	5	60	0	34	4	56	9	56	5
23	Saturday	78	7	45	5	56	5	78	0	78	6
24	Sunday	67	8	45	6	78	8	90	5	90	8
25	Monday	78	0	23	8	90	9	108	6	108	7
26	Tuesday	65	5	32	7	108	0	45	8	45	7
27	Wednesday	43	4	31	7	45	5	32	7	32	2
28	Thursday	42	3	42	2	32	6	43	7	43	1
29	Friday	34	2	53	1	43	8	12	2	12	2
30	Saturday	37	2	90	2	12	7	23	1	23	3

may											
1	Sunday	71	4	70	4	32	2	45	3	45	3
2	Monday	80	3	67	3	10	1	23	4	23	0
3	Tuesday	70	5	89	0	98	2	20	3	20	2
4	Wednesday	68	7	45	2	45	3	90	0	90	1
5	Thursday	75	1	65	1	23	4	78	2	78	1
6	Friday	23	2	76	1	20	3	55	1	55	3
7	Saturday	35	4	87	3	90	0	32	1	32	2
8	Sunday	65	5	45	2	78	2	76	3	76	5
9	Monday	78	7	24	0	55	1	32	2	12	4
10	Tuesday	79	3	25	4	32	1	76	2	32	5
11	Wednesday	70	4	35	5	76	3	34	4	34	6
12	Thursday	54	5	46	6	34	2	95	5	56	7
13	Friday	56	5	47	7	95	9	98	6	76	8
14	Saturday	76	7	48	8	98	4	29	7	45	9
15	Sunday	34	8	50	9	29	5	78	8	55	0
16	Monday	23	0	56	0	78	6	56	9	66	7
17	Tuesday	54	5	29	7	56	7	57	0	78	0
18	Wednesday	65	4	57	0	57	8	34	7	88	9
19	Thursday	65	3	35	9	34	9	30	0	22	0
20	Friday	67	2	35	0	30	0	49	9	34	9
21	Saturday	98	2	25	9	49	7	29	0	45	8
22	Sunday	70	3	36	8	29	0	45	9	23	0
23	Monday	43	4	54	0	45	9	67	8	32	2
24	Tuesday	12	3	55	2	34	0	54	0	34	3
25	Wednesday	24	5	59	3	78	9	78	2	54	1
26	Thursday	35	7	70	1	45	8	40	3	12	5
27	Friday	56	5	45	5	34	0	23	1	50	1
28	Saturday	46	7	39	1	23	2	47	5	34	1
29	Sunday	35	8	24	1	34	3	87	1	56	6
30	Monday	87	0	25	6	45	1	34	1	38	8
31	Tuesday	76	5	26	8	65	5	38	6	78	2

june											
1	Wednesday	45	3	90	2	69	1	67	2	13	3
2	Thursday	56	2	67	3	78	6	13	2	34	4
3	Friday	67	2	68	4	78	8	34	3	56	1
4	Saturday	34	5	69	1	67	2	56	4	78	2
5	Sunday	54	5	89	2	13	2	78	1	90	5
6	Monday	76	7	65	5	34	3	90	2	108	6
7	Tuesday	89	8	67	6	56	4	108	5	45	7
8	Wednesday	76	0	56	7	78	1	45	6	32	2
9	Thursday	23	5	55	2	90	2	32	7	43	5
10	Friday	34	4	24	5	108	5	43	2	12	5
11	Saturday	56	3	25	5	45	2	12	5	23	7
12	Sunday	45	2	26	7	32	5	23	5	67	8
13	Monday	34	2	76	8	43	5	67	7	68	0
14	Tuesday	23	3	75	0	12	7	68	8	69	5
15	Wednesday	12	4	78	5	23	8	69	0	89	4
16	Thursday	12	3	90	4	67	0	89	5	65	3
17	Friday	34	5	97	3	68	5	65	4	67	2
18	Saturday	45	7	89	2	69	4	67	3	56	2
19	Sunday	65	0	57	2	89	3	56	2	55	3
20	Monday	76	7	38	3	65	2	55	2	24	4
21	Tuesday	89	4	78	4	67	2	24	3	25	3
22	Wednesday	9	5	67	3	56	3	25	4	26	4
23	Thursday	56	2	13	3	55	2	26	3	76	5
24	Friday	45	4	34	4	24	5	76	3	75	2
25	Saturday	23	5	56	5	25	5	75	4	78	6
26	Sunday	43	5	78	2	26	7	78	5	90	1
27	Monday	56	7	90	6	76	8	90	2	97	0
28	Tuesday	55	8	108	1	75	0	97	6	89	9
29	Wednesday	50	0	45	0	78	5	89	1	57	8
30	Thursday	60	5	32	9	90	4	57	0	38	9

july											
1	Friday	67	3	12	9	89	2	87	8	68	4
2	Saturday	87	2	23	5	57	2	67	9	69	2
3	Sunday	67	2	87	4	87	3	45	5	89	8
4	Monday	45	3	67	2	67	4	34	4	65	0
5	Tuesday	34	4	45	0	45	3	23	0	67	0
6	Wednesday	23	3	34	0	34	2	12	0	56	0
7	Thursday	12	5	23	0	23	5	32	0	55	3
8	Friday	32	7	12	3	12	5	34	3	24	2
9	Saturday	34	2	32	2	32	7	56	2	25	1
10	Sunday	56	3	34	1	34	8	76	1	26	2
11	Monday	76	5	56	2	56	0	45	2	76	3
12	Tuesday	45	6	76	3	76	5	55	3	75	4
13	Wednesday	55	7	45	4	45	4	66	4	78	5
14	Thursday	66	9	55	5	55	3	78	5	90	7
15	Friday	78	0	66	7	66	2	66	7	97	6
16	Saturday	88	8	78	6	78	2	78	6	89	2
17	Sunday	22	0	45	2	87	3	87	2	87	1
18	Monday	34	0	87	1	67	4	67	1	67	0
19	Tuesday	45	0	67	2	45	2	45	0	45	0
20	Wednesday	23	3	45	3	34	5	34	0	34	0
21	Thursday	32	2	34	2	23	5	23	0	23	3
22	Friday	34	1	23	1	12	7	12	3	12	2
23	Saturday	54	2	12	2	32	8	32	2	32	1
24	Sunday	12	3	32	3	34	0	34	1	34	2
25	Monday	24	4	34	4	56	5	56	2	56	3
26	Tuesday	42	5	56	5	76	4	76	3	76	4
27	Wednesday	19	7	76	7	45	3	45	4	45	5
28	Thursday	20	6	45	6	55	2	45	5	55	7
29	Friday	30	2	55	2	66	2	87	7	66	6
30	Saturday	50	1	66	1	78	3	65	6	78	2
31	Sunday	44	2	78	2	45	4	34	2	56	1

august											
1	Monday	66	2	78	4	78	2	38	2	38	1
2	Tuesday	77	3	67	3	67	5	78	4	78	2
3	Wednesday	45	4	13	2	13	5	67	3	67	3
4	Thursday	34	4	34	6	34	7	13	2	13	2
5	Friday	23	5	56	8	56	8	34	7	34	7
6	Saturday	24	5	78	2	78	0	56	8	56	8
7	Sunday	45	5	90	5	90	5	78	9	78	9
8	Monday	56	7	108	5	108	4	90	4	90	4
9	Tuesday	76	8	45	7	45	3	87	0	108	0
10	Wednesday	12	0	32	8	32	2	67	9	45	9
11	Thursday	23	9	43	0	43	2	45	8	32	8
12	Friday	32	6	12	5	12	3	34	2	43	2
13	Saturday	54	4	23	4	23	4	23	1	12	1
14	Sunday	87	3	32	3	87	3	12	8	23	8
15	Monday	86	1	87	2	67	3	32	9	87	6
16	Tuesday	84	2	67	2	45	5	34	0	67	0
17	Wednesday	45	0	45	3	34	6	56	7	45	4
18	Thursday	53	8	34	4	23	1	76	0	34	5
19	Friday	52	7	23	3	12	2	45	6	23	0
20	Saturday	32	5	12	4	32	0	55	0	12	2
21	Sunday	98	3	32	3	34	3	66	4	32	6
22	Monday	66	4	34	2	56	4	78	5	34	1
23	Tuesday	54	5	56	2	76	5	88	0	56	0
24	Wednesday	50	2	76	3	45	2	22	2	76	9
25	Thursday	34	6	45	4	55	6	34	6	45	8
26	Friday	54	1	55	3	66	1	45	1	55	9
27	Saturday	56	0	66	2	78	0	23	0	66	5
28	Sunday	89	9	78	5	88	9	32	9	78	4
29	Monday	67	8	88	5	22	8	34	8	88	2
30	Tuesday	74	9	22	7	34	9	54	9	22	7
31	Wednesday	65	5	34	8	45	5	12	5	34	8

september											
1	Thursday	54	2	23	5	32	2	42	2	23	5
2	Friday	32	2	32	4	34	6	19	7	32	4
3	Saturday	45	11	34	3	54	0	20	8	34	3
4	Sunday	65	2	54	2	12	4	30	0	54	2
5	Monday	32	2	12	2	24	5	50	5	12	2
6	Tuesday	9	3	24	3	42	0	44	4	24	3
7	Wednesday	87	9	42	4	19	2	45	3	42	4
8	Thursday	60	7	19	3	20	6	66	2	19	3
9	Friday	45	2	20	3	30	1	77	2	20	3
10	Saturday	65	10	30	4	50	0	45	3	30	4
11	Sunday	85	11	50	5	44	9	34	4	50	7
12	Monday	95	2	44	2	67	8	23	7	44	8
13	Tuesday	52	1	49	6	66	9	24	8	89	0
14	Wednesday	32	0	66	1	77	5	45	0	66	5
15	Thursday	98	9	77	0	45	4	56	5	77	4
16	Friday	66	5	45	9	34	2	76	4	45	3
17	Saturday	54	3	34	8	23	7	12	3	34	2
18	Sunday	50	1	23	9	24	8	23	2	23	2
19	Monday	34	1	24	5	45	0	32	2	24	3
20	Tuesday	54	2	45	4	56	5	54	3	45	4
21	Wednesday	56	3	56	7	76	4	87	4	56	3
22	Thursday	89	1	76	8	12	3	86	3	76	3
23	Friday	67	2	12	0	23	2	84	3	12	4
24	Saturday	74	4	23	5	32	2	24	4	23	5
25	Sunday	34	2	32	4	54	3	45	3	32	8
26	Monday	55	3	54	3	87	4	56	3	54	0
27	Tuesday	67	7	87	2	87	3	76	7	87	5
28	Wednesday	87	9	86	2	67	3	12	8	86	4
29	Thursday	56	6	84	3	45	7	23	0	84	3
30	Friday	45	5	24	4	34	8	34	5	34	2

october		32									
1	Saturday	54	2	56	3	12	5	12	3	12	3
2	Sunday	67	3	76	4	32	4	32	2	32	4
3	Monday	80	4	12	7	34	3	34	2	34	3
4	Tuesday	79	4	23	8	56	2	56	3	56	3
5	Wednesday	89	5	87	0	76	2	76	4	76	4
6	Thursday	23	4	67	5	45	3	45	3	45	3
7	Friday	43	3	45	4	55	4	55	3	55	8
8	Saturday	65	2	34	3	66	3	66	4	66	0
9	Sunday	87	1	23	2	78	3	78	8	78	5
10	Monday	90	2	12	2	88	4	88	0	88	4
11	Tuesday	34	3	32	3	22	3	22	5	22	3
12	Wednesday	56	4	34	4	34	3	34	4	34	2
13	Thursday	32	5	56	3	45	7	45	3	45	2
14	Friday	76	9	76	3	23	8	23	2	23	3
15	Saturday	78	0	45	4	32	0	32	2	32	4
16	Sunday	80	0	55	5	34	5	34	3	34	3
17	Monday	52	6	66	3	54	4	54	4	54	3
18	Tuesday	32	7	78	3	12	3	12	3	12	4
19	Wednesday	98	9	88	7	24	2	24	3	67	3
20	Thursday	66	0	22	8	42	2	42	4	54	3
21	Friday	54	2	34	0	19	3	19	3	66	8
22	Saturday	50	3	45	5	20	4	20	3	34	0
23	Sunday	34	3	23	4	30	3	30	0	23	5
24	Monday	54	1	32	3	50	3	50	8	12	4
25	Tuesday	56	2	34	2	44	4	34	0	32	3
26	Wednesday	89	2	54	2	56	5	23	5	34	2
27	Thursday	67	1	12	3	66	8	12	4	56	2
28	Friday	74	1	24	4	77	0	32	3	76	3
29	Saturday	45	2	42	3	45	5	34	2	45	4
30	Sunday	89	3	19	3	34	4	56	2	55	3
31	Monday	56	4	20	4	23	3	76	3	66	3

november											
1	Tuesday	43	6	50	8	45	2	55	3	88	3
2	Wednesday	43	7	44	0	56	3	66	3	22	3
3	Thursday	33	8	45	5	76	4	78	4	34	4
4	Friday	35	9	66	4	12	3	88	3	45	3
5	Saturday	45	6	77	3	23	3	22	3	23	3
6	Sunday	56	5	45	2	32	4	34	4	32	4
7	Monday	77	4	34	2	54	3	45	3	34	3
8	Tuesday	65	3	23	3	87	8	23	3	54	8
9	Wednesday	55	2	24	4	86	0	32	4	12	0
10	Thursday	13	1	45	3	84	5	34	3	34	5
11	Friday	15	2	56	3	34	4	54	8	23	4
12	Saturday	85	3	76	4	23	3	12	0	12	3
13	Sunday	19	2	12	3	12	2	34	5	32	2
14	Monday	34	4	23	3	32	2	23	4	34	2
15	Tuesday	34	9	32	2	34	3	12	3	56	3
16	Wednesday	23	8	54	3	56	4	32	2	76	4
17	Thursday	34	7	87	5	76	3	34	2	45	3
18	Friday	56	9	86	8	45	3	56	3	55	3
19	Saturday	45	6	84	0	55	4	76	4	66	4
20	Sunday	32	6	56	5	66	3	45	3	78	3
21	Monday	54	5	76	4	78	3	55	3	88	4
22	Tuesday	67	4	45	3	88	8	66	4	22	3
23	Wednesday	80	4	55	2	22	0	78	3	34	3
24	Thursday	79	3	66	2	34	5	88	4	45	4
25	Friday	89	3	78	3	45	4	22	3	23	3
26	Saturday	23	2	88	4	23	3	34	2	32	8
27	Sunday	43		22	3	32	2	45	2	34	0
28	Monday	65	2	34	3	34	2	23	3	54	5
29	Tuesday	87	2	45	4	54	3	32	4	56	4
30	Wednesday	90	4	23	4	12	4	34	3	76	3

decembe											
1	Thursday	67	7	34	3	76	3	12	4	55	2
2	Friday	54	8	54	4	45	4	56	3	66	3
3	Saturday	54	9	12	3	55	3	76	4	78	4
4	Sunday	43	0	56	8	66	4	45	3	88	3
5	Monday	32	8	76	0	78	3	55	3	22	3
6	Tuesday	87	7	45	5	88	3	66	4	34	4
7	Wednesday	76	9	55	4	22	4	78	3	45	3
8	Thursday	54	5	66	3	34	3	88	8	23	2
9	Friday	52	4	78	2	45	8	22	0	32	2
10	Saturday	32	3	88	2	23	0	34	5	34	3
11	Sunday	98	2	22	3	32	5	45	4	54	4
12	Monday	66	4	34	4	34	4	23	3	12	3
13	Tuesday	54	2	45	3	54	3	32	2	34	3
14	Wednesday	50	6	23	3	12	2	34	2	98	4
15	Thursday	34	7	32	4	34	2	98	3	12	3
16	Friday	54	8	34	3	23	3	12	4	34	4
17	Saturday	56	9	54	2	24	4	34	3	54	3
18	Sunday	89	1	34	2	45	3	54	3	12	3
19	Monday	67	2	23	3	56	3	12	4	34	4
20	Tuesday	74	6	24	4	76	4	34	3	23	3
21	Wednesday	98	5	45	3	12	2	23	2	24	8
22	Thursday	67	0	56	3	23	2	24	2	45	0
23	Friday	52	9	76	4	32	3	45	3	56	5
24	Saturday	32	8	12	3	54	4	56	4	76	4
25	Sunday	98	4	23	4	87	3	76	3	12	3
26	Monday	66	3	32	3	86	3	12	3	23	2
27	Tuesday	54	1	54	3	84	4	23	4	32	2
28	Wednesday	50	2	87	4	34	3	32	3	54	3
29	Thursday	34	3	86	3	23	4	54	4	87	4
30	Friday	54	1	84	8	12	3	87	3	86	3
31	Saturday	56	7	34	0	32	3	86	3	84	2

SOURCE OF DATA

We have collected the data from Vardhman Company

Vardhman Group is a textile group based in Ludhiana, Punjab, India, that was established in 1965. The group is engaged in manufacturing and trading in Yarnand Processed Fabric, Sewing Thread, Acrylic fibre and Alloy steel. Vardhman groupwas incorporated in 1962 as Vardhman Spinning & General Mills (VSGML).

One thing that has anchored Vardhman's growth over five decades of an ever evolving, complex, cyclical and often disruptive business environment is the unwavering pursuit of excellence. This drive to continuously raise the bar and benchmark ourselves to the global best has seen us exceed customer expectations and sharpen our competitive edge.

With a turnover of more than a billion dollars, Vardhman is the largest vertically integrated textile manufacturer in India. Annually, we produce 2,40,000 metric tonsof yarn and 220 million metres of woven fabric, providing direct employment to over 28,000 people.

Image-4

Vardhman Group is involved in the manufacturing of various types of fabricsand textile products.

A general overview of the types of fabrics that textile manufacturers like Vardhman might produce. Keep in mind that their product range may have evolvedsince then. Some common types of fabrics produced by textile manufacturersinclude:

- **Cotton Fabrics:** Cotton is a widely used natural fiber, and cotton fabricscome in various weaves and finishes, such as plain weave, twill, denim, poplin, and more.

- **Polyester Fabrics:** Polyester is a synthetic fiber known for its durability andwrinkle resistance. Polyester fabrics can mimic natural fibres like silk, cotton, and wool.

Image-5

- **Blended Fabrics:** These fabrics are made by combining two or more different types of fibres, such as cotton-polyester blends, which offer a mixof properties from each fibre.

- **Linen Fabrics:** Linen is a natural fiber made from the flax plant. Linenfabrics are lightweight, breathable, and known for their crisp texture.

- **Wool Fabrics:** Wool comes from sheep and is known for its warmth and insulating properties. Wool fabrics include various types like worsted, tweed,and flannel.

- **Silk Fabrics:** Silk is a luxurious natural fiber produced by silkworms. It isknown for its smooth texture and sheen. Different types of silk fabrics include satin, chiffon, and crepe.
- **Rayon Fabrics:** Rayon is a semi-synthetic fiber made from wood pulp. Itcan mimic the appearance of silk, cotton, or linen and is used in various types of fabrics.

- **Rayon Fabrics:** Rayon is a semi-synthetic fiber made from wood pulp. Itcan mimic the appearance of silk, cotton, or linen and is used in various types of fabrics.

- **Denim Fabrics:** Denim is a rugged cotton twill fabric, commonly used injeans and casual wear.

- **Nylon Fabrics:** Nylon is a silk-like thermoplastic, usually made from petroleum, that can be melt-processed into fibres, films, or shapes.

- Among Provided the data we selected the **5 types of fabrics**

- **Cotton**
- **Polyester**
- **Silk**
- **Rayon**
- **Nylon**

Types of fabrics

Image-6

IMPLIMENTATION OF TECHNIQUES

In this data we have calculated monthly wise total number ofManufactures and also, we calculated total number of defects. We selected the particular fabrics like., Cotton, Silk, Polyester, Nylon, Rayon.

Cotton

	Cotton		
Month	Manufactured Totals	Total defects	P
January	1581	95	6.008855
February	1536	89	5.794271
March	1474	133	9.023066
April	1728	119	6.886574
May	1790	133	7.430168
Jun	1442	122	8.460472
July	1350	107	7.925926
August	1713	140	8.172796
September	1744	127	7.28211
October	1894	106	5.596621
November	1519	136	8.953259
December	1854	150	8.090615
Totals	19625	1457	
Average	1635.416667	121.416667	

Table-1

Manufactured Totals = 19770

Total Defects = 1437

Average Manufactured Totals = 1647.5

Average Total Defects = 119.75

Upper Control Limit = 9.187465

Control Limit = 7.268589

Lower Control Limit = 5.349712

CONSTRUCTION OF P CHART FOR COTTON

By Considering sample number on the x-axis, Proportion defectives values (p-values) on the y-axis with suitable scale and drawing three horizontal lines whichcorresponding to UCL, LCL, CL. We can obtain a control chart as graph known as p-chart.

The chart can be represented as shown given below.

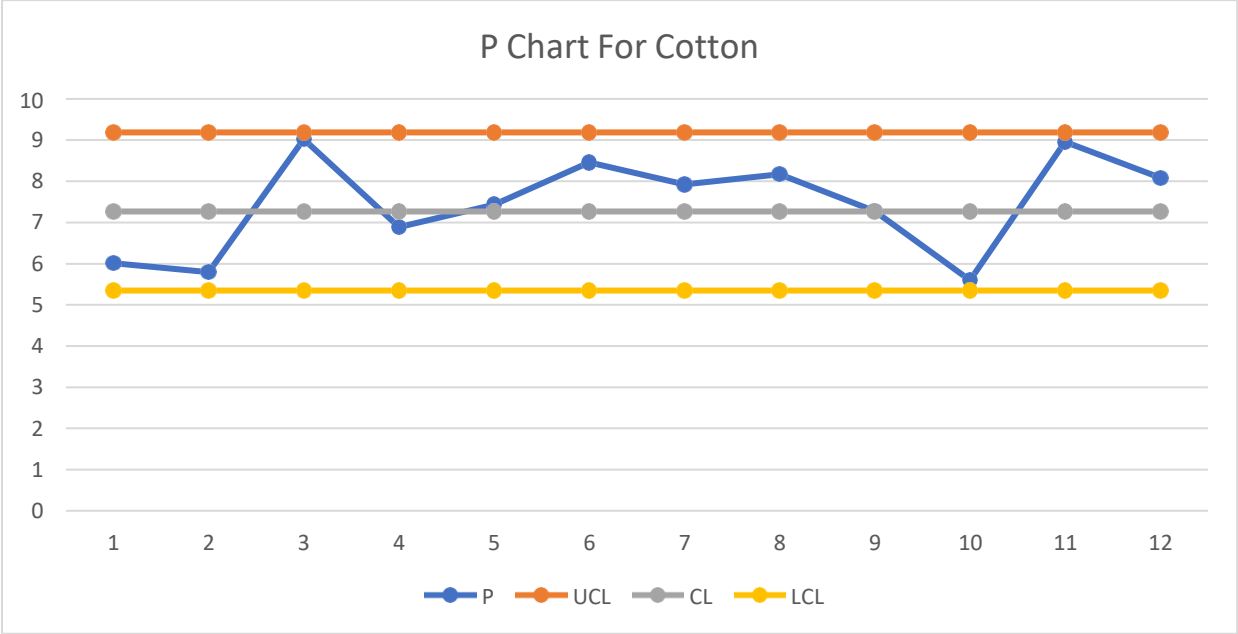

Chart-1

In this chart represents the Upper Control Limit, Control Limit, and Lower Control Limit. On the x-axis as the Months and y-axis as the Fraction Defectives.

In the above chart shows that given production of cotton data is in control limits.

Silk

	Silk		
Month	Manufactured Totals	Total defects	P
January	1549	129	8.33
February	1584	109	6.88
March	1703	121	7.11
April	1661	137	8.25
May	1489	115	7.72
Jun	1902	113	5.94
July	1500	96	6.40
August	1565	124	7.92
September	1281	120	9.37
October	1326	114	8.60
November	1551	102	6.58
December	1478	103	6.97
Totals	18589	1383	7.44
Average	1549.08	115.25	

Table-2

Manufactured Totals = 18589

Total Defects = 1383

Average Manufactured Totals = 1549.08

Average Total Defects = 115.25

Pi = (Total defects/Manufactured totals) *100

Upper Control Limit = 9.44010896

Control Limit = 7.4398838

Lower Control Limit = 5.43965864

CONSTRUCTION OF P CHART FOR SILK

By Considering sample number on the x-axis, Proportion defectives values (p-values) on the y-axis with suitable scale and drawing three horizontal lines whichcorresponding to UCL, LCL, CL. We can obtain a control chart as graph known as p-chart.

The chart can be represented as shown given below.

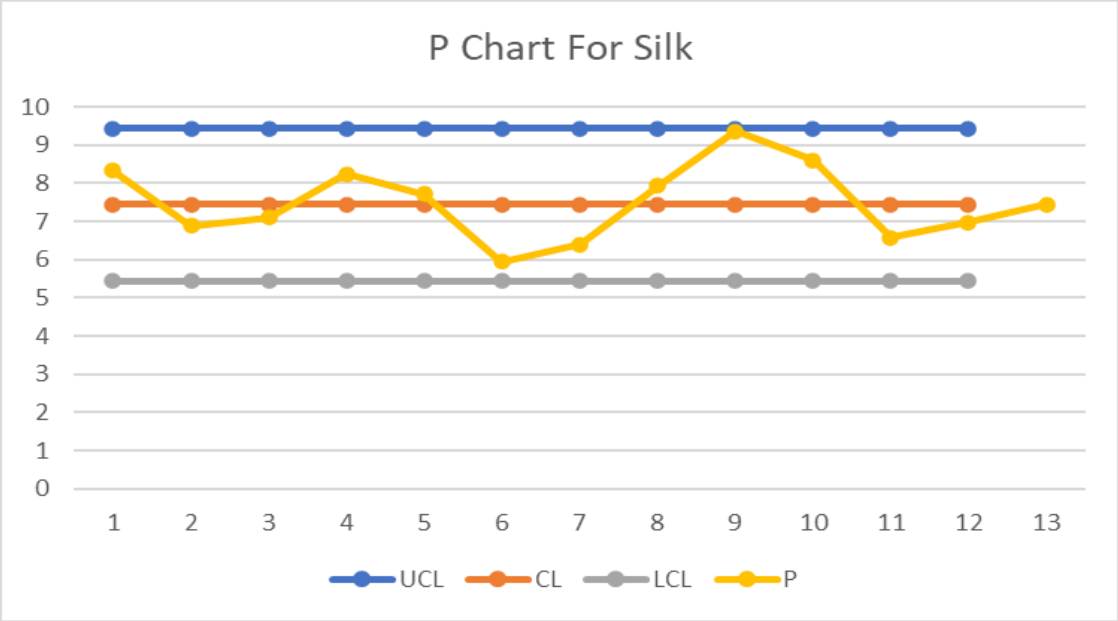

Chart-2

In this chart represents the Upper Control Limit, Control Limit, and Lower ControlLimit. On the x-axis as the Months and y-axis as the Fraction Defectives

In the above chart shows that given production of cotton data is in control limits.

Polyester

	Polyester		
Month	Manufactured Totals	Total defects	P
January	1694	142	8.382527
February	1598	100	6.257822
March	1666	115	6.902761
April	1749	145	8.290452
May	1551	116	7.479046
Jun	1756	116	6.605923
July	1611	114	7.07635
August	1578	122	7.731305
September	1315	122	9.277567
October	1328	112	8.433735
November	1410	100	7.092199
December	1401	102	7.280514
Totals	18657	1406	
Average	1554.75	117.166667	

Table-3

Manufactured Totals = 18657

Total Defects = 1406

Average Manufactured Totals = 1554.75

Average Total Defects = 1406

Upper Control Limit = 9.54443965

Control Limit = 7.53604545

Lower Control Limit = 5.52765125

CONSTRUCTION OF P CHART FOR POLYESETER

By Considering sample number on the x-axis, Proportion defectives values (p-values) on the y-axis with suitable scale and drawing three horizontal lines whichcorresponding to UCL, LCL, CL. We can obtain a control chart as graph known as p-chart.

The chart can be represented as shown given below.

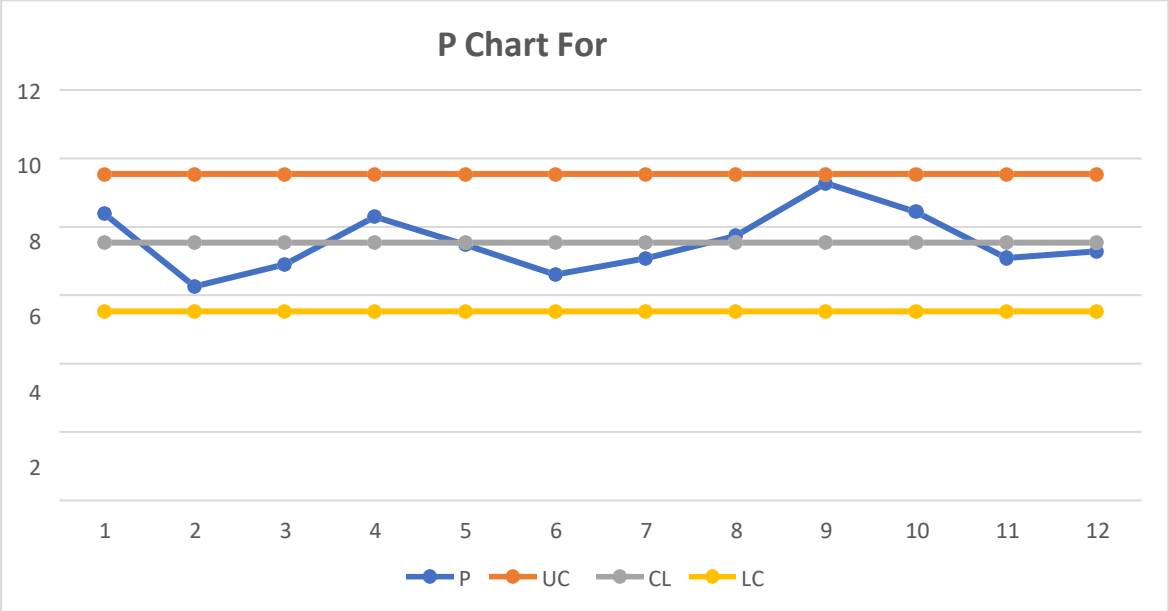

Chart-3

In this chart represents the Upper Control Limit, Control Limit, and Lower ControlLimit. On the x-axis as the Months and y-axis as the Fraction Defectives

In the above chart shows that given production of polyester data is in control limits.

Nylon

	Nylon		
Month	Manufactured Totals	Total defects	P
January	1783	130	7.291082
February	1645	118	7.173252
March	1755	125	7.122507
April	1645	126	7.659574
May	1629	112	6.875384
Jun	1644	118	7.177616
July	1550	107	6.903226
August	1718	127	7.392317
September	1643	124	7.54717
October	1278	98	7.668232
November	1350	98	7.259259
December	1428	102	7.142857
Totals	19068	1385	
Average	1589	115.416667	

Table-4

Manufactured Totals = 18684

Total Defects = 1353

Average Manufactured Totals = 1557

Average Total Defects = 112.75

Upper Control Limit = 7.81031308

Control Limit = 7.24149004

Lower Control Limit = 6.67266701

CONSTRUCTION OF P CHART FOR NYLON

By Considering sample number on the x-axis, Proportion defectives values (p-values) on the y-axis with suitable scale and drawing three horizontal lines whichcorresponding to UCL, LCL, CL. We can obtain a control chart as graph known as p-chart.

The chart can be represented as shown given below.

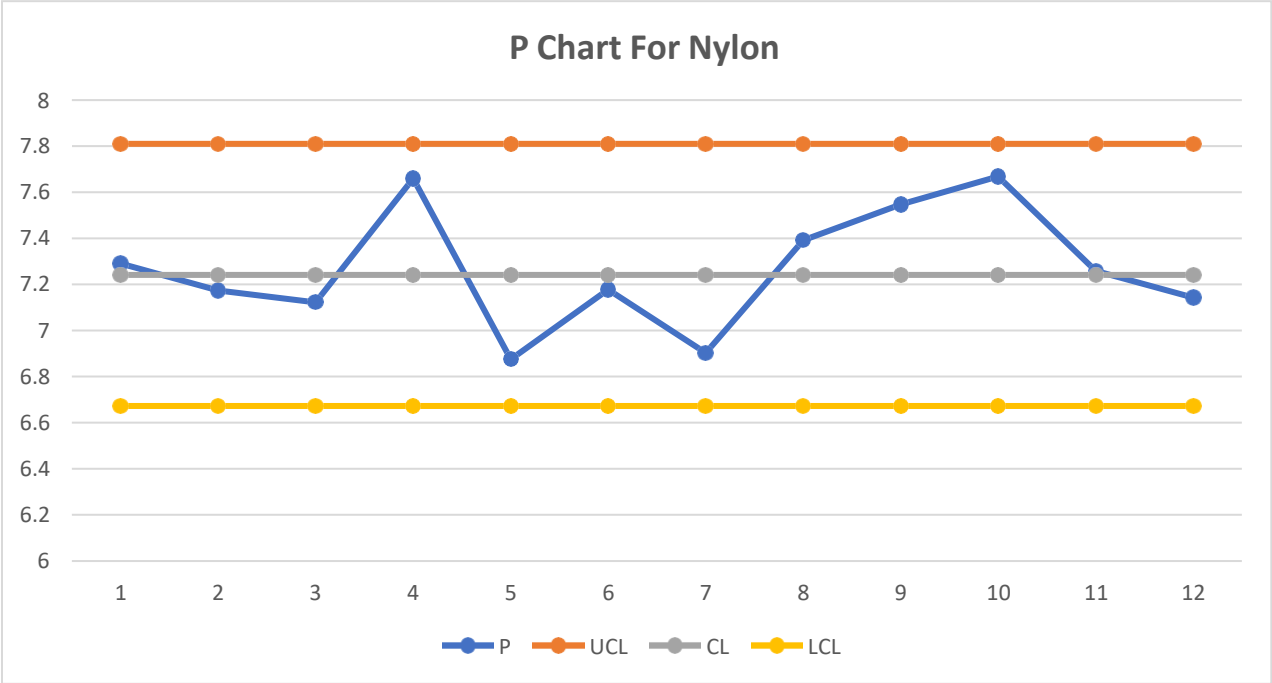

Chart-4

In this chart represents the Upper Control Limit, Control Limit, and Lower ControlLimit. On the x-axis as the Months and y-axis as the Fraction Defectives

In the above chart shows that given production of nylon data is in control limits.

Rayon

	Rayon		
Month	Manufactured Totals	Total defects	P
January	1638	124	7.570208
February	1584	109	6.881313
March	1721	117	6.798373
April	1621	125	7.711289
May	1473	103	6.992532
Jun	1625	125	7.692308
July	1642	111	6.760049
August	1571	123	7.829408
September	1428	108	7.563025
October	1418	104	7.334274
November	1385	104	7.509025
December	1423	99	6.957133
Totals	18529	1352	
Average	1544.083333	112.666667	

Table-5

Manufactured Totals = 18801

Total Defects = 1370

Average Manufactured Totals = 1566.75

Average Total Defects = 114.16

Upper Control Limit = 7.85553078

Control Limit = 7.28684644

Lower Control Limit = 6.71816211

CONSTRUCTION OF P CHART FOR RAYON

By Considering sample number on the x-axis, Proportion defectives values (p-values) on the y-axis with suitable scale and drawing three horizontal lines whichcorresponding to UCL, LCL, CL. We can obtain a control chart graph known as p-chart.

The chart can be represented as shown given below.

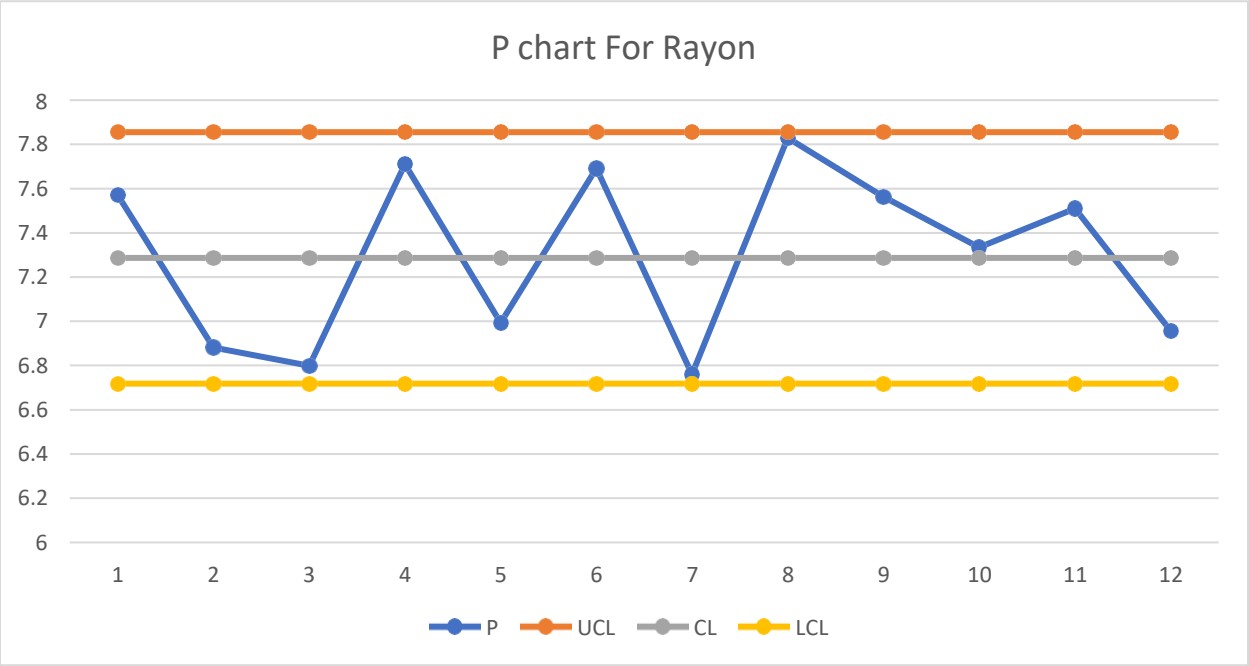

Chart-5

In this chart represents the Upper Control Limit, Control Limit, and Lower ControlLimit. On the x-axis as the Months and y-axis as the Fraction Defectives

In the above chart shows that given production of rayon data is in control limits.

Conclusion

FOR COTTON

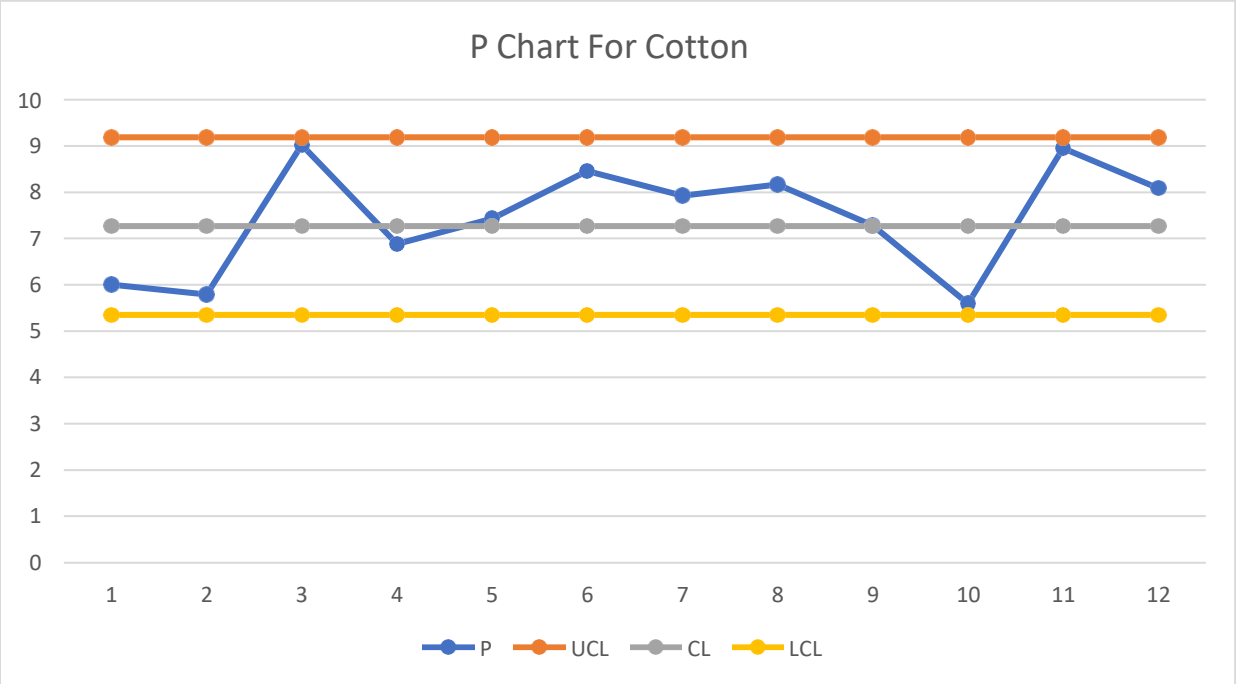

Chart-1.1

By taking months on x-axis and fraction defectives on y-axis we plot graph. Upper Control Limit(UCL), Lower control limit(LCL), Central Limit (CL) and original points on graph. Upon watching graph all points are under control they are not crossed the upper control limit hence from above p-chart shows that given production cotton data is in control.

FOR SILK

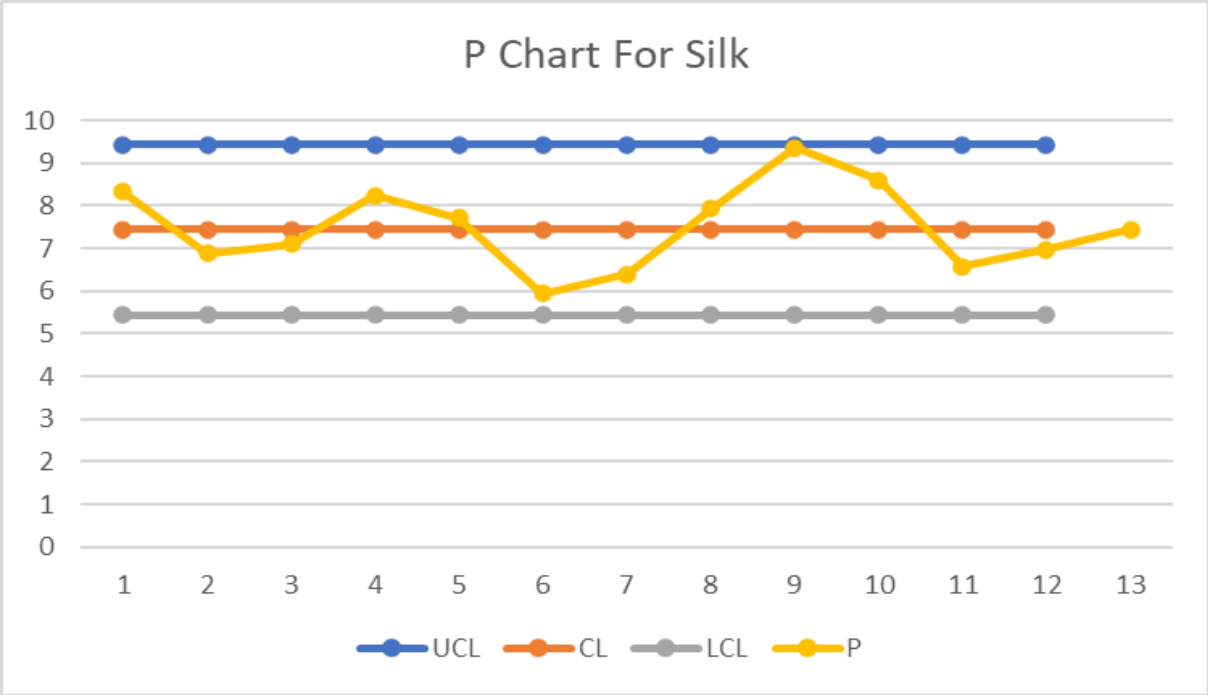

Chart-2.1

By taking months on x-axis and fraction defectives on y-axis we plot graph. Upper Control Limit(UCL), Lower control limit(LCL), Central Limit (CL) and original points on graph. Upon watching graph all points are under control they are not crossed the upper control limit hence from above p-chart shows that given production silk data is in control

FOR POLYESTER

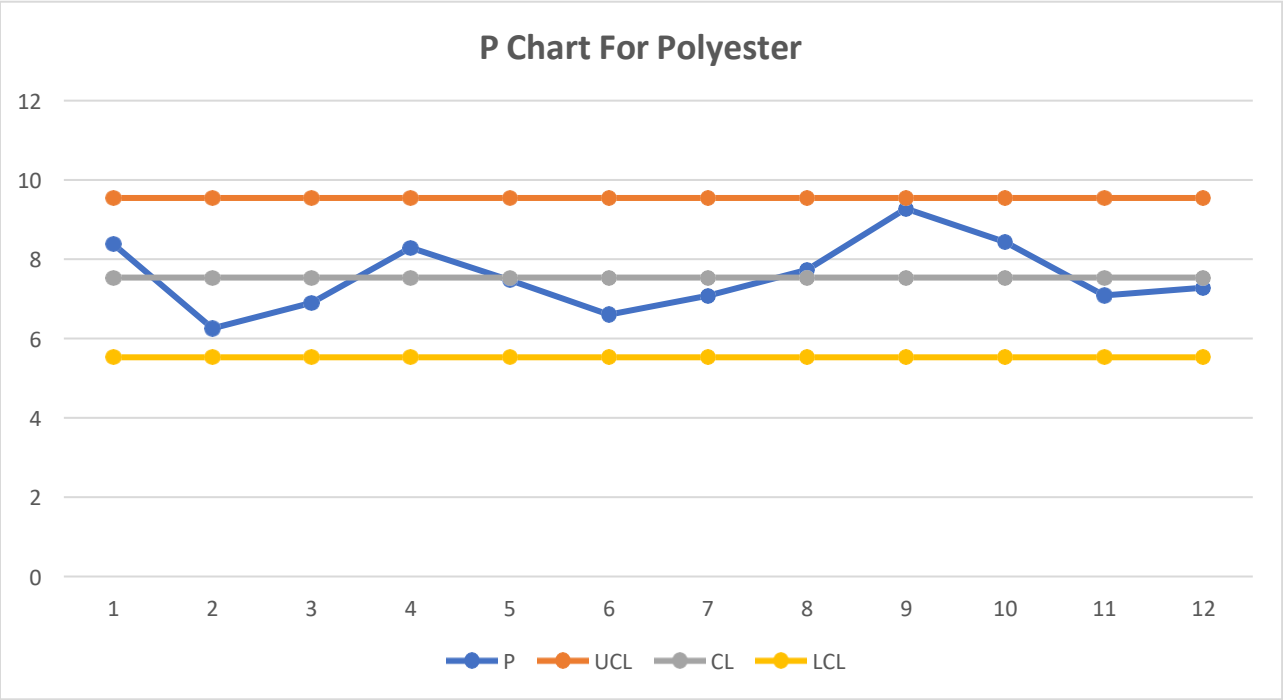

Chart-3.1

By taking months on x-axis and fraction defectives on y-axis we plot graph. Upper Control Limit(UCL), Lower control limit(LCL), Central Limit (CL) and original points on graph. Upon watching graph all points are under control they are not crossed the upper control limit hence from above p-chart shows that given production polyester data is in control.

FOR NYLON

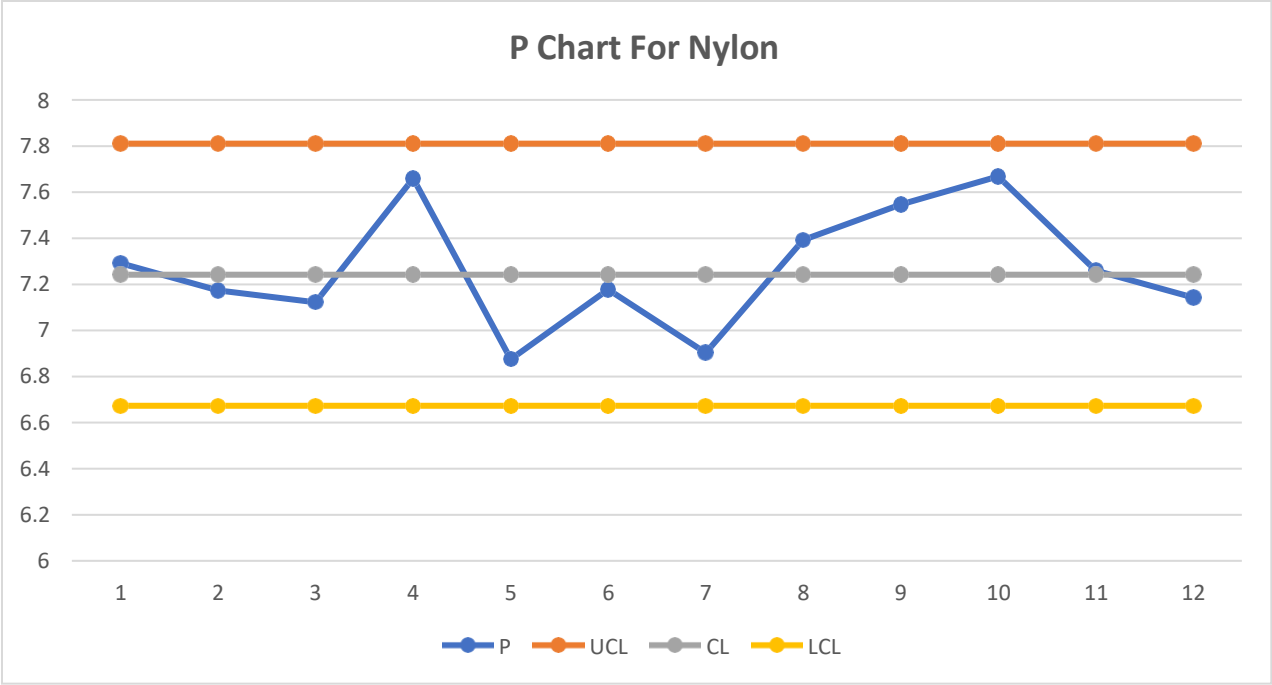

Chart-4.1

By taking months on x-axis and fraction defectives on y-axis we plot graph. Upper Control Limit(UCL), Lower control limit(LCL), Central Limit (CL) and original points on graph. Upon watching graph all points are under control they are not crossed the upper control limit hence from above p-chart shows that given production nylon data is in control.

FOR RAYON

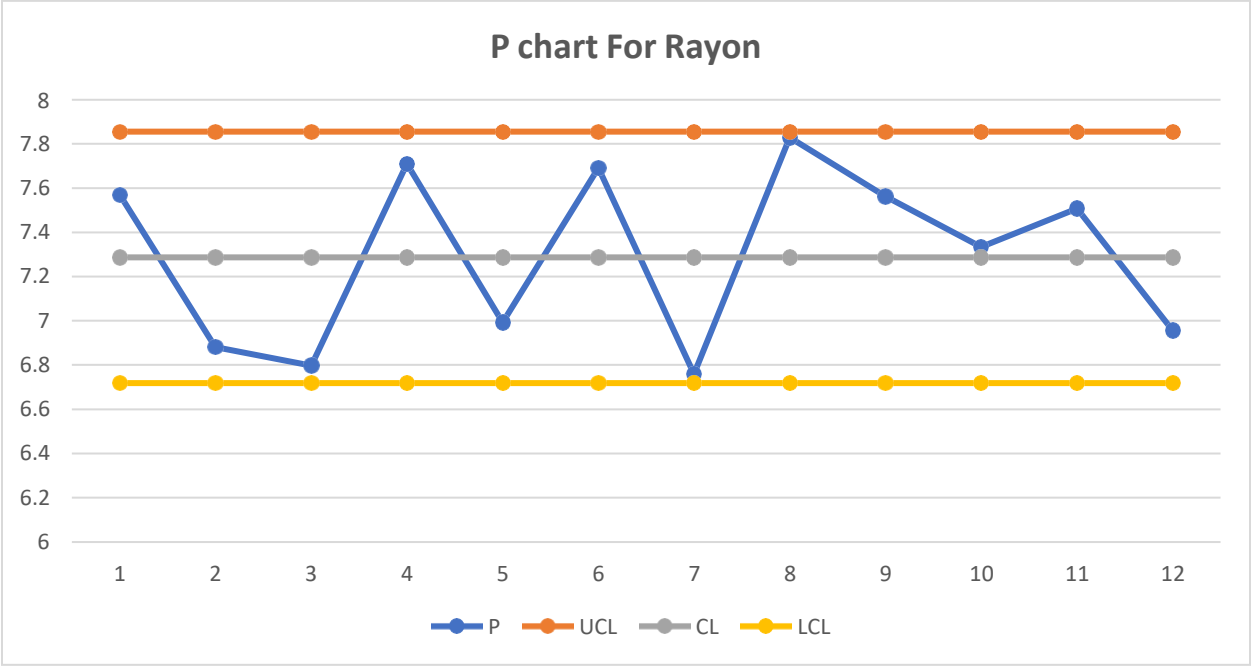

Chart-5.1

By taking months on x-axis and fraction defectives on y-axis we plot graph. Upper Control Limit(UCL), Lower control limit(LCL), Central Limit (CL) and original points on graph. Upon watching graph all points are under control they are not crossed the upper control limit hence from above p-chart shows that given production rayon data is in control.

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