Samples from: MINITAB BOOK

Quality and Six Sigma Tools using MINITAB Statistical Software: A complete Guide to Six Sigma DMAIC Tools using MINITAB®

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One of the major objectives of this text is to teach quality, data analysis and statistical tools used in the Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) process. The chapters in this book provide concepts, understanding, and computer applications of Six Sigma DMAIC tools. The statistical tools used in the DMAIC process are discussed with step-wise MINITAB computer applications.

The following are samples from the book randomly selected from different chapters:

CHAPTER 2 Visual Representations of Data: Charts and Graphs for Six Sigma

Chapter Highlights

This chapter will enable you to master the techniques of summarizing and describing data using charts and graphs. In this chapter you will learn to:

1. *Construct a frequency distribution from a set of data*
2. *Calculate relative frequency, cumulative frequency, and relative cumulative frequency from a frequency table and interpret their meanings*
3. *Construct different types of graphs using quantitative data including histograms, frequency polygons, ogives, stem-and-leaf plots, dot plots, box plots and interpret these plots*
4. *Construct bar charts and pie charts using qualitative data and their applications*
5. *Construct other types of charts and graphs including time series plots and scatter plots*
6. *Construct matrix plots and three dimensional plots*
7. *Understand the applications of these visual techniques in Six Sigma*

This chapter contains numerous plots with step-wise MINITAB instructions and data files. Some examples are given below.

You will learn how to construct and interpret the following widely used charts and graphs used in six sigma and data analysis:

Histograms Graphical Summary of Data Stem-and-leaf Plots Box Plot Dot Plot Character Graphs Bar Charts Pie Charts Scatter Plots Interval Plots Individual Value Plots Time Series Plots Graphing Empirical Cumulative Density Function (CDF) Probability Plots	Matrix Plot Marginal Plot 3D Scatter Plot 3D Scatter Plot with Groups 3D Scatter Plot with Projected Lines 3D Surface Plot/Wireframe Plot Sur Contour Plot Summary of Plots and Their Application Hands-on Exercises

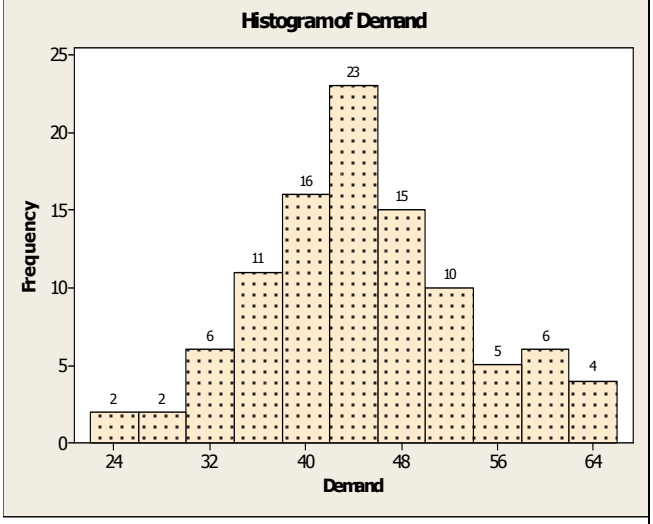
Examples:

Constructing a Default Histogram

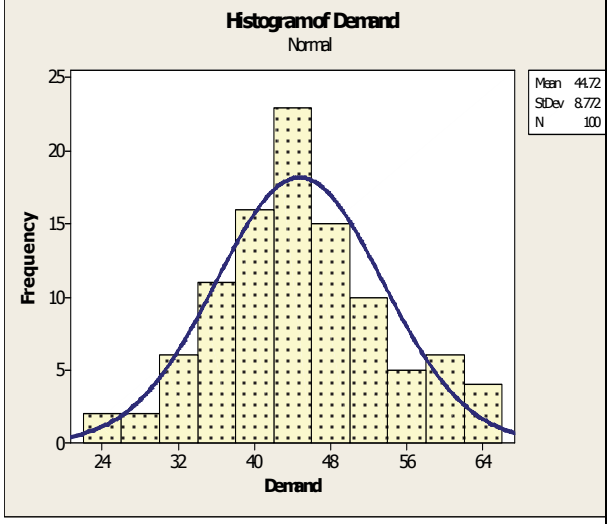
To construct a default histogram, follow the instructions in Table 3.1 below.

Table 3.1

CONSTRUCTING A DEFAULT HISTOGRAM	Open the worksheet **Demand. MTW** then select **Graph ➢.....** Click on **Simple** then.... : : Click **Labels** In the Title box, type: **Histogram of Demand Data** Click on **Data Labels** and select **Use Y-value label** Click **OK** Click on **Data View** and check **Bars** then click **OK**



A Default Histogram



A Histogram with Normal Curve

Table 3.6

HISTOGRAM WITH FIT AND GROUPS	Open the worksheet **ShaftDia. MTW** Select **Graph ➢ ....** Click on **With Fit and Groups** then… In the dialog box that is displayed, select **Shaft Dia 1** and **Shaft Dia 2** for **Graph Variables** Click **Labels** and type **Comparing the Variability** in the **Title** box Click **OK**.

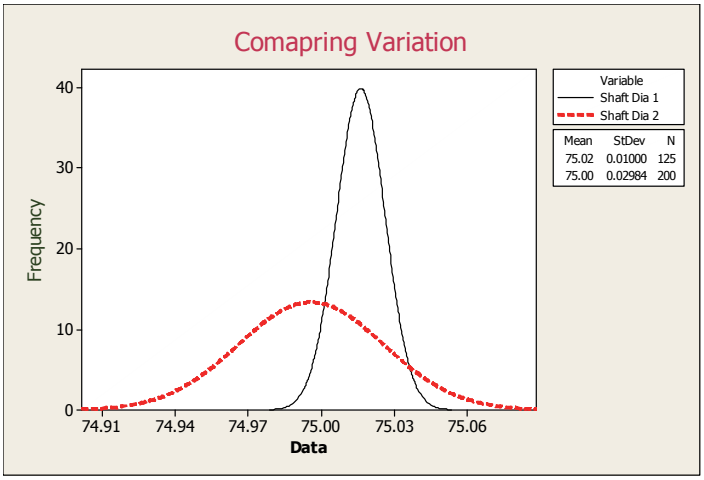
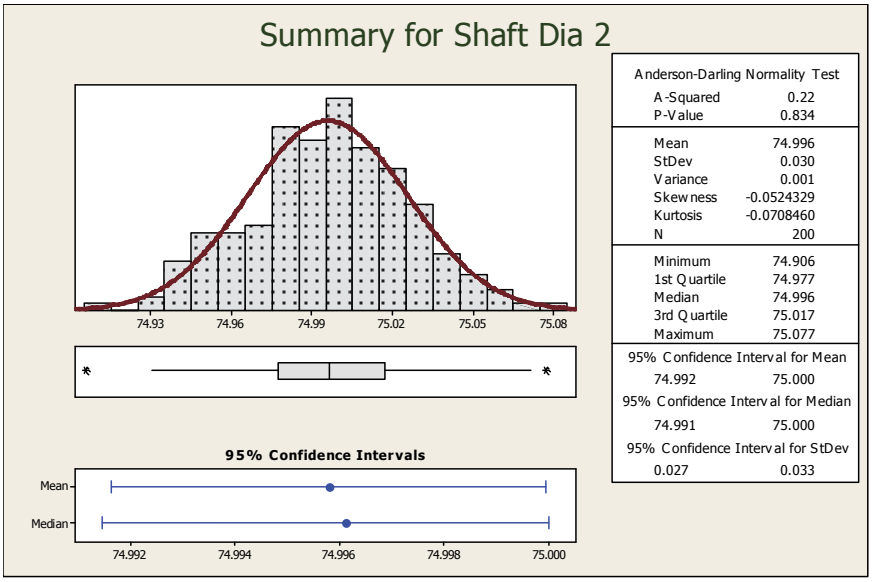


Table 3.8

GRAPHICAL SUMMARY OF DATA	Open the worksheet **ShaftDia.MTW** Select **Stat ➢Basic Statistics ➢....** For **Variables,** type or select **Shaft Dia 2** Click **OK**.



Stem-and-leaf Plots

STEM-AND-LEAF PLOT	Open worksheet **MOISTURE.MTW** From the main menu, select **Graph ➢ Stem-and-Leaf** For Graph variables, select … Click **OK**

Stem-and-Leaf Display: Moisture Content

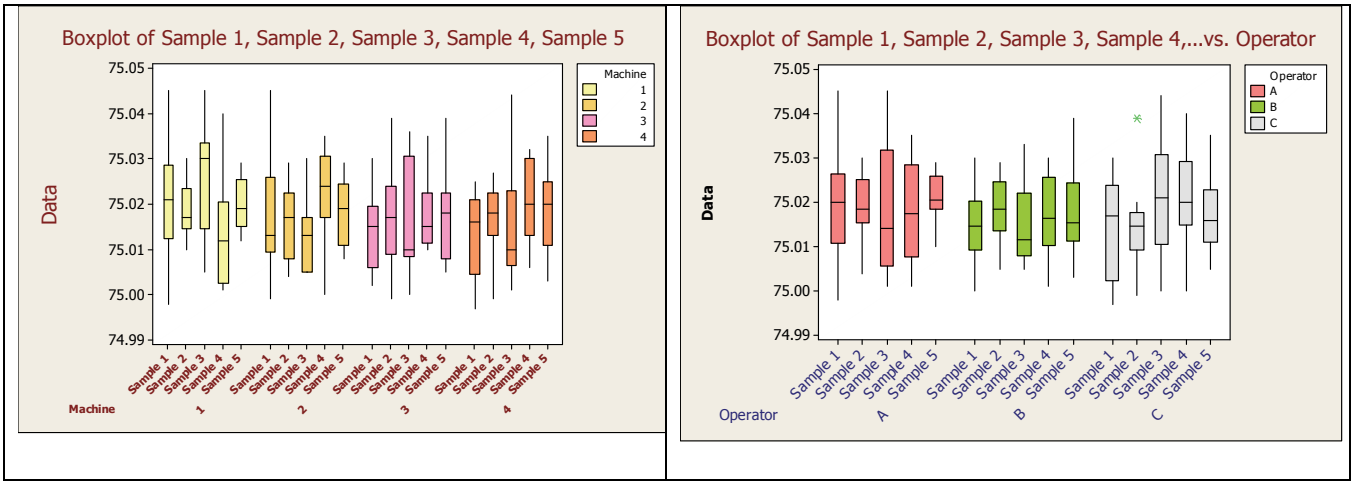
Content N = 55
Leaf Unit = 0.10

```
 1    8    0
 2    8    8
 3    9    4
 4    9    7
 9    10   02334
 16   10   5667888
 26   11   1223333444
(5)   11   56677
 24   12   24444
 19   12   5567
 15   13   2333
 11   13   578
 8    14   01
 6    14   6
 5    15   23
 3    15   56
 1    16   1
```

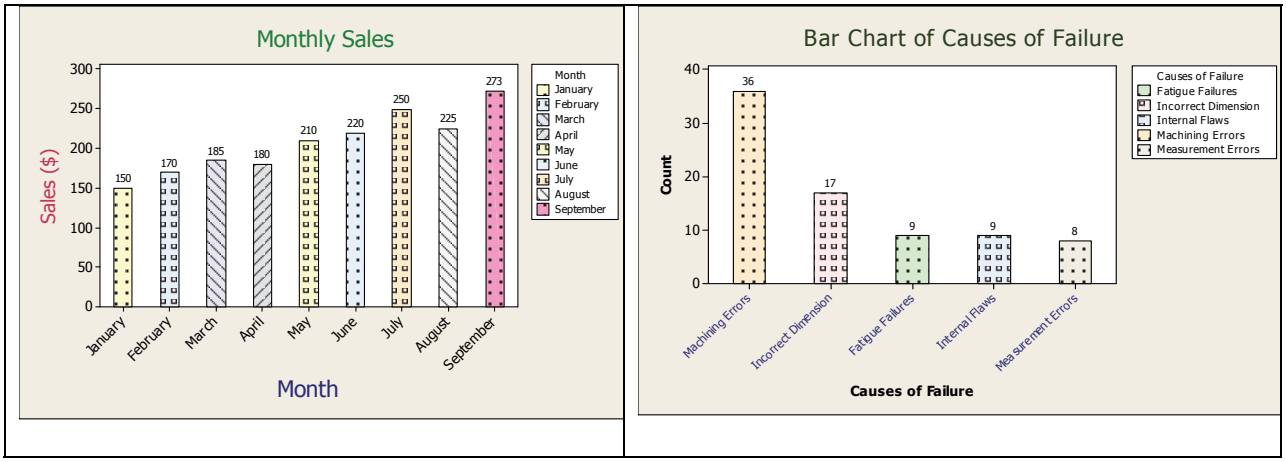
Table 3.14

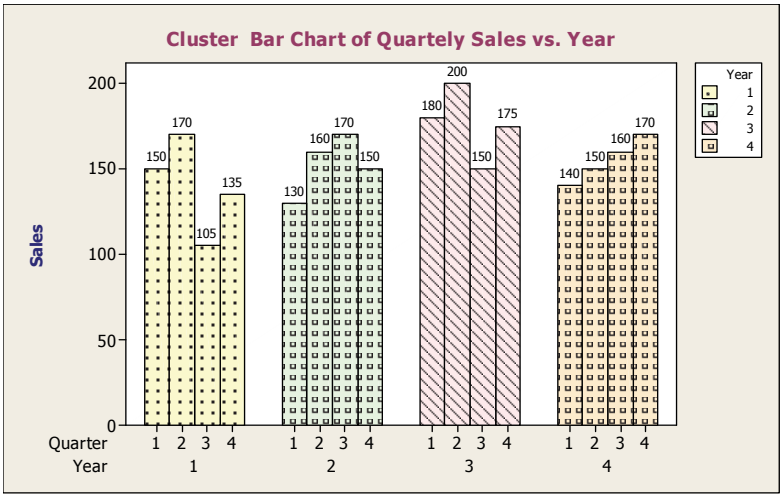
BOX PLOT **MULTIPLE Y'S – GROUPS**	Open the worksheet **DIAMETER3.MTW** From the main menu select, **Graph ➢Box plot** Select **With Groups** under **Multiple Y's** For **Graph variables,** Select **Sample 1 Sample 2 Sample 3 Sample 4 Sample 5** For **Categorical variables grouping (1-3, outermost first)** select **:** **:** Under **Scale Level for Graph Variables**, … **Graph variables displayed innermost on scale** Click on **Data View** Box and type or select **Machine** in …variables for attribute assignment Click **OK** in all dialog boxes.

The box plot shown below will be displayed.



Bar Charts

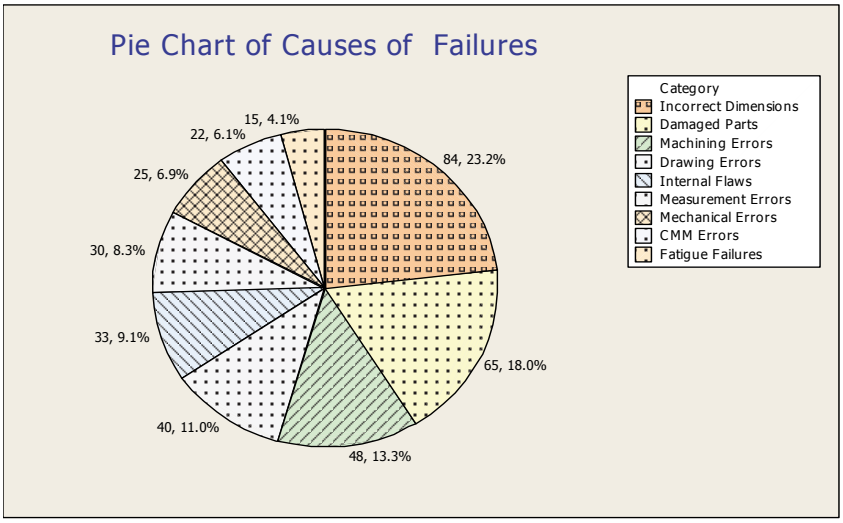




Pie Charts

Table 3.30

PIE CHART	Open the worksheet **PIE.MTW** From the main menu, select **Graph ➢Pie Chart** In the Pie Chart dialog box, click on the circle next to **...** In the **Categorical variable** box, type or select **Failures** In the **Summary variables** box, ... Click on **Pie Options** tab : : Click on **Slice Labels** and check **Frequency and Percentage** Click **OK** in all the boxes



Scatter Plot with Regression Line

SCATTER PLOT WITH REGRESSION LINE	Open the worksheet **SCATTER1.MTW** From the main menu, select **Graph ➢Scatterplot** Click on **With Regression** then click **...** **:** For **Y Variables**, type or select **....** For **X variables**, type or select **Summer Temperature** Click **OK**

The plot is shown in Figure 3.36.

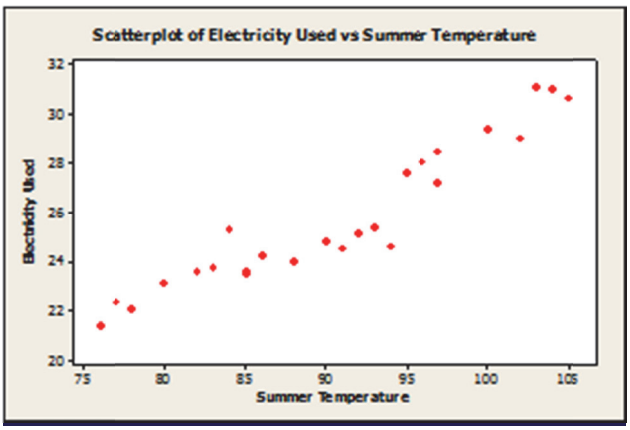


Figure 3.35: A Simple Scatter Plot

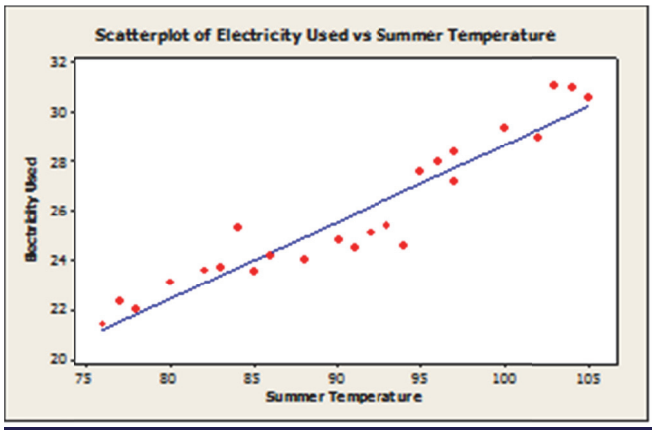


Figure 3.36: Scatter Plot with Regression Line

If you want to know the equation of the fitted line and assess the quality of line, follow the steps in Table 3.34.

Interval Plots

INTERVAL PLOT	Open the worksheet **INTERVAL2.MTW** From the main menu select, **Graph ➢ ...** or **Stat ➢ANOVA ➢Interval Plot** Under **One Y**, click on **……** For **Graph Variables**, type or select **Content (oz)** In **Categorical variables** for grouping (1-4, outermost first), type or select **....** Click on **Labels** box then click **Data labels** tab From the drop down menu in **Labels** box, select **:** Click on **Data View** Under **Categorical variables for attribute assignment**, type or select **...** Click **OK** in all the boxes.

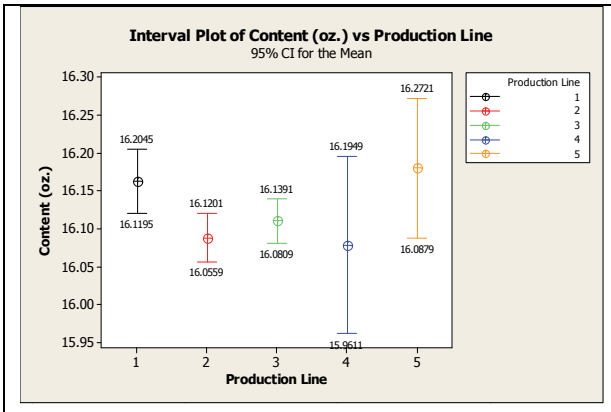


Figure 3.42: Interval Plot with Groups

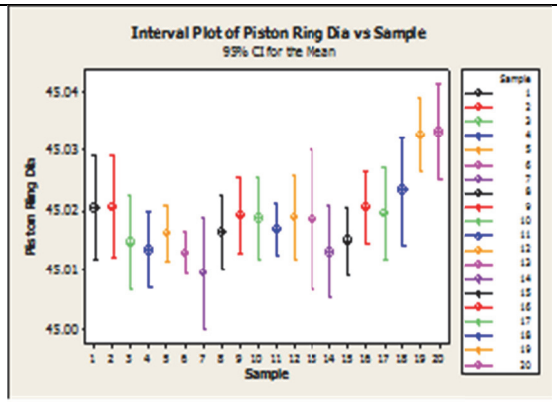


Figure 3.43: Interval Plot of Piston Rings vs. Sample

TIME SERIES PLOT WITH TIME/SCALE STAMP	Open the worksheet **TIMESERIES2.MTW** From the main menu select **Graph ➢Time Series Plot** In the Time Series dialog box, click on **Simple** then click **OK** For **Series**, type or select… Click on the **Time/Scale** … Click on the circle next to **Stamp** under **Time Scale** **Click on Stamp columns (1-3, innermost first)** then select **Week, T** and **Quarter** Click **OK** in all dialog box.

A time series plot shown in Figure 3.49 will be displayed.

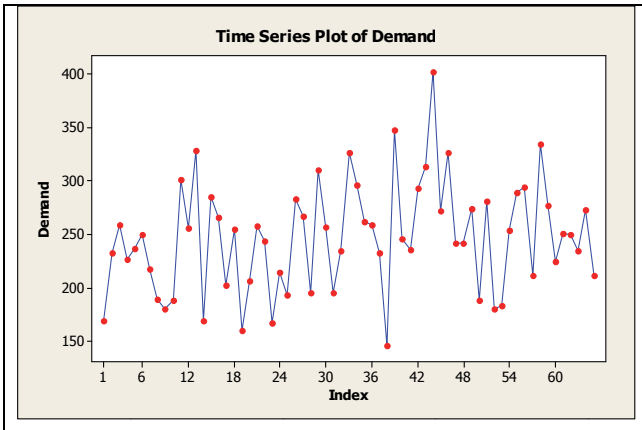


Figure 3.48: A Simple Time Series Plot of Demand Data

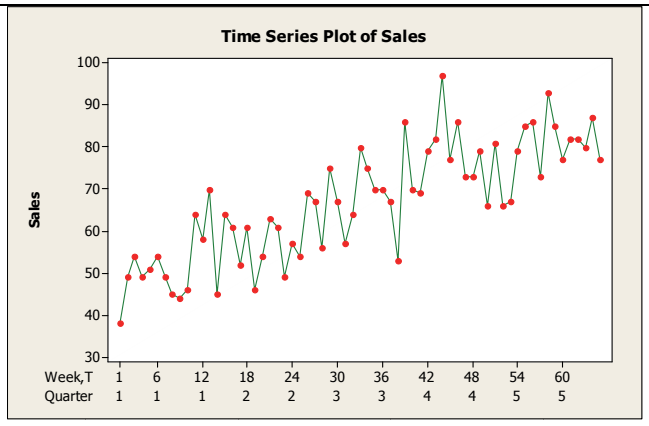


Figure 3.49: A Simple Time Series Plot of Sales Data