

Histograms

A histogram is a picture of the history of your process. It helps answer the following questions:

- Which result (or range of results) occurs most frequently?
- How much variation is there about that result?
- What does the shape of the variation about that result look like?
- Are any results out of specifications?

Remember, a process is designed to produce a product or service. But in addition, the process produces data. You can use the data to improve the process. All processes have variation. Processes that are in statistical control (only common cause of variation present) tend to generate results that form a stable pattern. This pattern is called a distribution. Distributions are characterized by three parameters: *location* (average or typical value), *spread* (amount of variation) and *shape* (the pattern of variation - bell-shaped, symmetrical, etc.). These parameters of a distribution can be estimated by using a histogram.

Purpose

The purpose of this module is to introduce the histogram. Control charts present a picture of how a process varies over time. Histograms, on the other hand, present a picture of how the process “stacks up” over time.

Histograms illustrate how many times a certain data value or range of data values occurred in a given time frame. Histograms provide estimates of the location, the spread and the shape of a distribution.

Understanding the Histogram Diagram

You are in charge of a heat treating line that is used to heat treat steel bars to certain hardness depending on the customer’s application. One product has a Rockwell specification of 28 to 36. This product is run often. After start-up, a sample is taken and tested for hardness. If the sample is within specification, the run continues. Additional samples are taken during the run and tested for hardness.

The hardness varies from sample to sample. This is not surprising for any process. There are always common causes of variation present in a process and these cause variation in the process output. The sources of variation include people, measurements, machines, methods, materials, and the environment. And, then sometimes there are special causes of variation present.

Although each hardness result is different, the results, taken as a group, will form a pattern or distribution over time. Figure 1 illustrates this concept. The individual hardness results vary. However, if the hardness results that are similar are “stacked up” over time, the pattern or shape of the distribution begins to form. Histograms provide a method of determining this pattern or shape.

Figure 1: Histograms and Variation

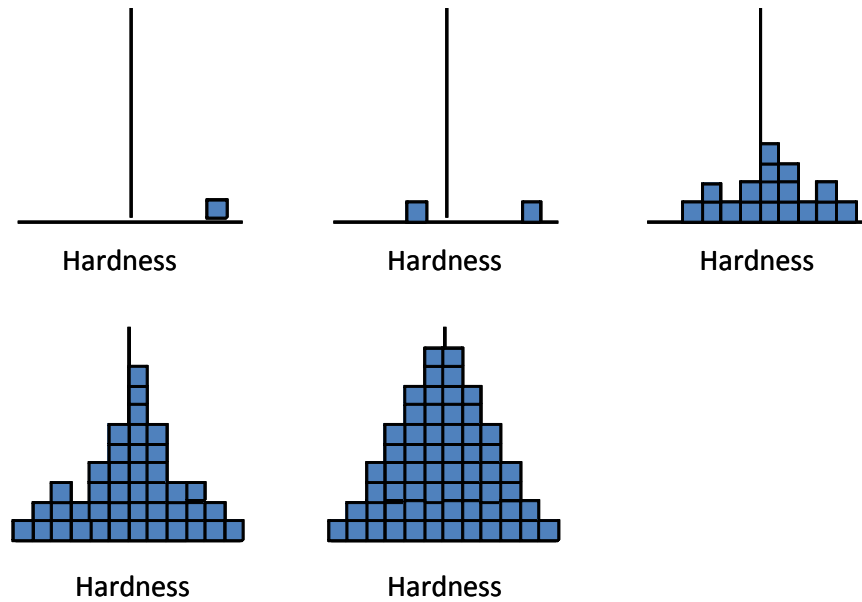
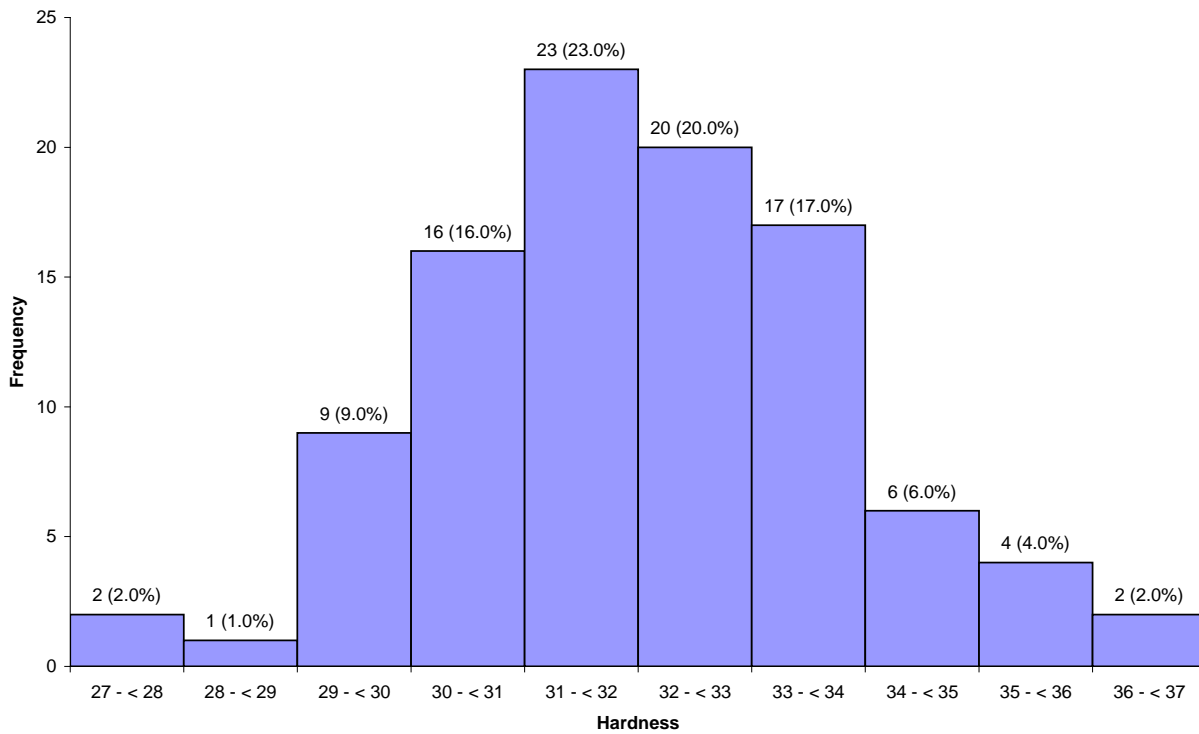
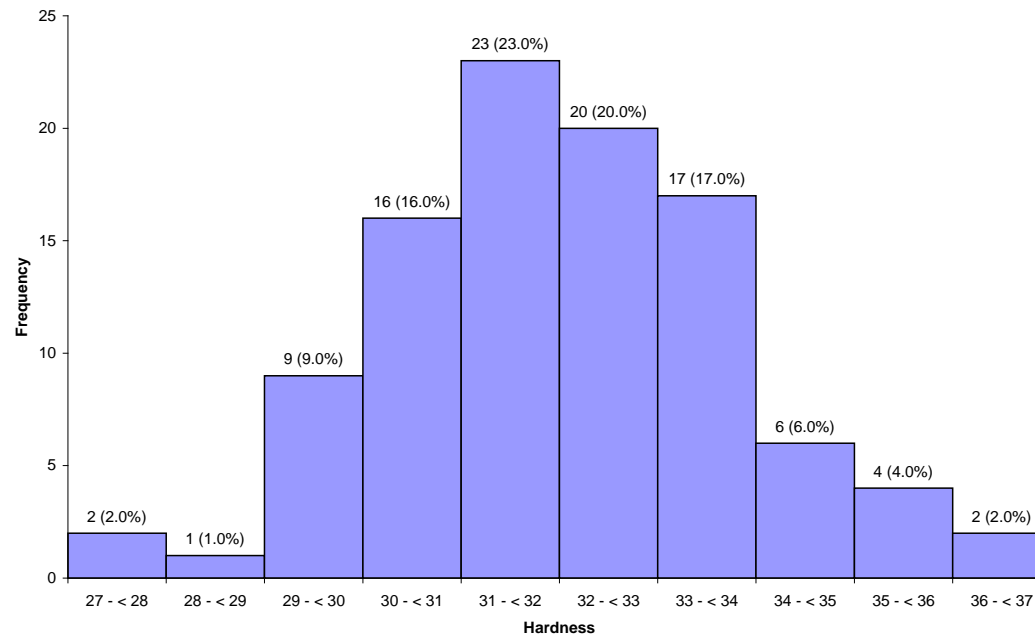


Figure 2 shows a completed histogram for hardness results over the past two months (the historical time frame). There are 100 hardness results.

Histogram: Rockwell Hardness



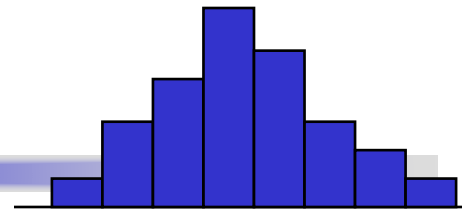
Histograms



You cannot define being exactly on time.

-Dr. W. Edwards Deming

Introduction



- Picture of process history
- Most frequent result
- Amount of variation
- Shape of variation
(distribution)
- In/out of specifications

Location

Spread

Shape