

Pareto Charts

Pareto (pa-RAY-toe) analysis is named after Vilfredo Pareto, an Italian economist who lived in the late 19th and early 20th centuries. In 1897, he presented a formula that showed that income was distributed unevenly, with about 80% of the wealth in the hands of about 20% of the people.

In a similar way, a disproportionately large percentage of errors or defects in any process are usually caused by relatively few problems. Pareto analysis helps identify those significant few problems so people can target them for action. It is particularly helpful in the *measure* and *control* phases of Six Sigma methodology.

What can it do for you?

There are so many aspects of work that can be improved, knowing where to begin is often difficult. Pareto analysis will help you:

- Categorize and stratify such things as errors, defects, delays, customer complaints or any other measures of the resulting quality of your process so that you can identify different classes or types of problems.
- Graphically display your results so that the significant few problems emerge from the general background.

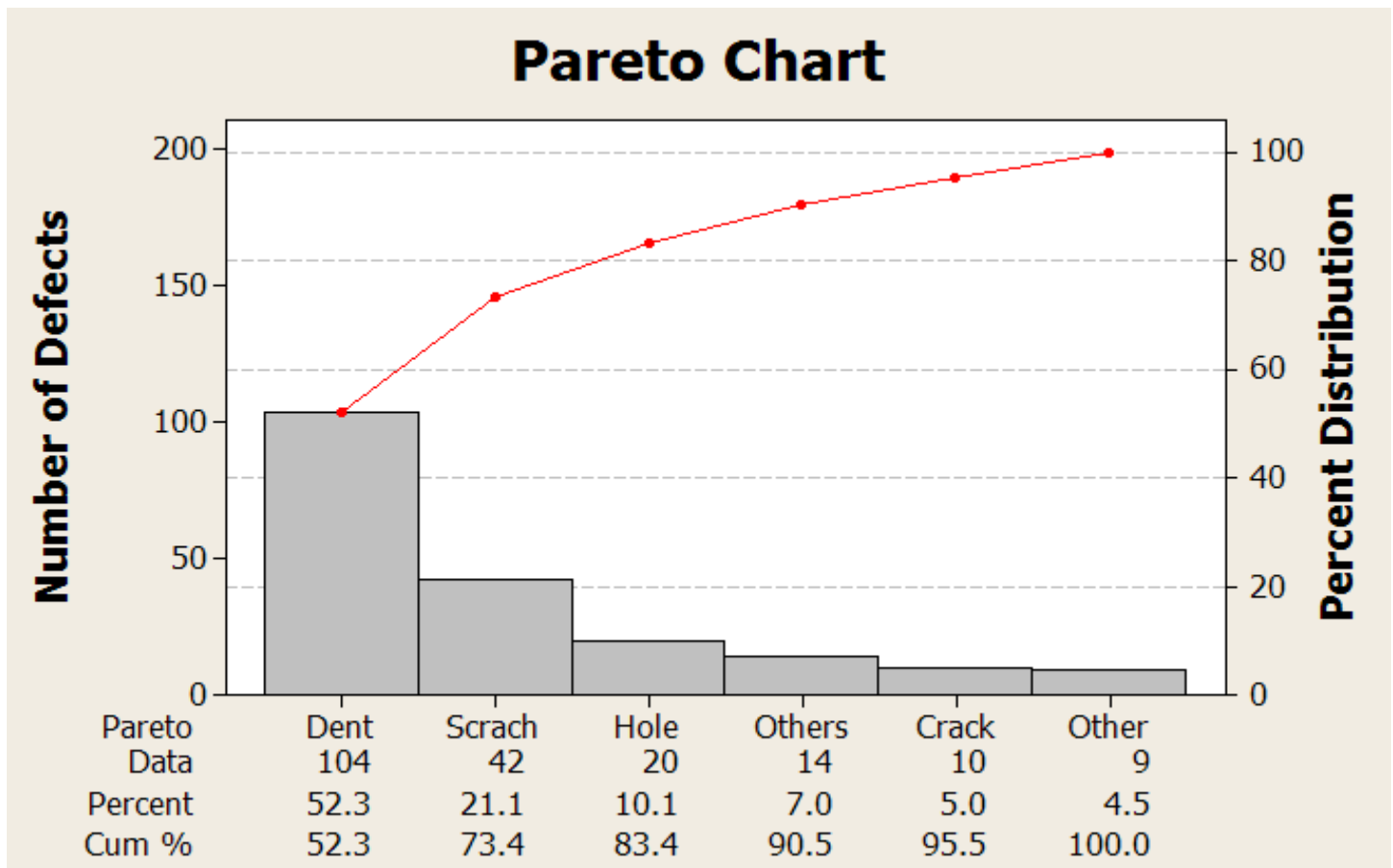
How do you do it?

1. Decide how to classify your problems. This may involve looking at the reasons cited for returned or rejected material, talking to your customer, or examining the rework aspects of your process.
2. Create a preliminary list of problem categories. Try to keep this list to no more than six or seven. (You may find yourself modifying this list as you continue your analysis.)
3. Decide on a time frame or other scope limitations on the material you will consider. The time frame or scope you choose should be representative of the whole process you are examining.
4. Tally the occurrences in each problem classification. (If cost or time is an issue, you may wish to tally the cost or time involved in each problem classification.) If a problem does not fit in any of your classifications, tally it as “other.”

Type of Defect	Tally	Total
Crack		10
Scratch	42
Stain		6
Dent	104
Gap		4
Hole		20
Others		14
Total		200

Example of a data tally sheet

5. Determine the total occurrences (or total cost or total time) in each classification. Add these totals to produce a grand total.
6. Divide each classification total by the grand total to determine the percentage that each individual problem classification represents of all the problems.
7. Arrange the problem classifications in order from highest value or most frequent to lowest value or least frequent. The “other” category should always be put last even if it is larger than some of the others.
8. Draw a horizontal axis and two vertical axes. Mark the left vertical axis in increments from zero to the grand total of all the problem classifications. Mark the right vertical axis in increments from zero to 100%.
9. Construct the vertical bar diagram beginning on the left with the highest percentage classification and progressing to the lowest and ending with “other.” The height of each bar should correspond with the value or number of occurrences on the left axis and the percentage of the total on the right axis. The width of the bars should be the same and they should be touching.
10. Label the bars under the horizontal axis.
11. Beginning at the left zero point, plot a line showing the cumulative percentage total reached with the addition of each problem classification. The line should end at the 100% mark on the right axis.
12. Title the chart. It is also a good idea to write a brief summary telling how and when you collected the data you used to produce your Pareto chart.



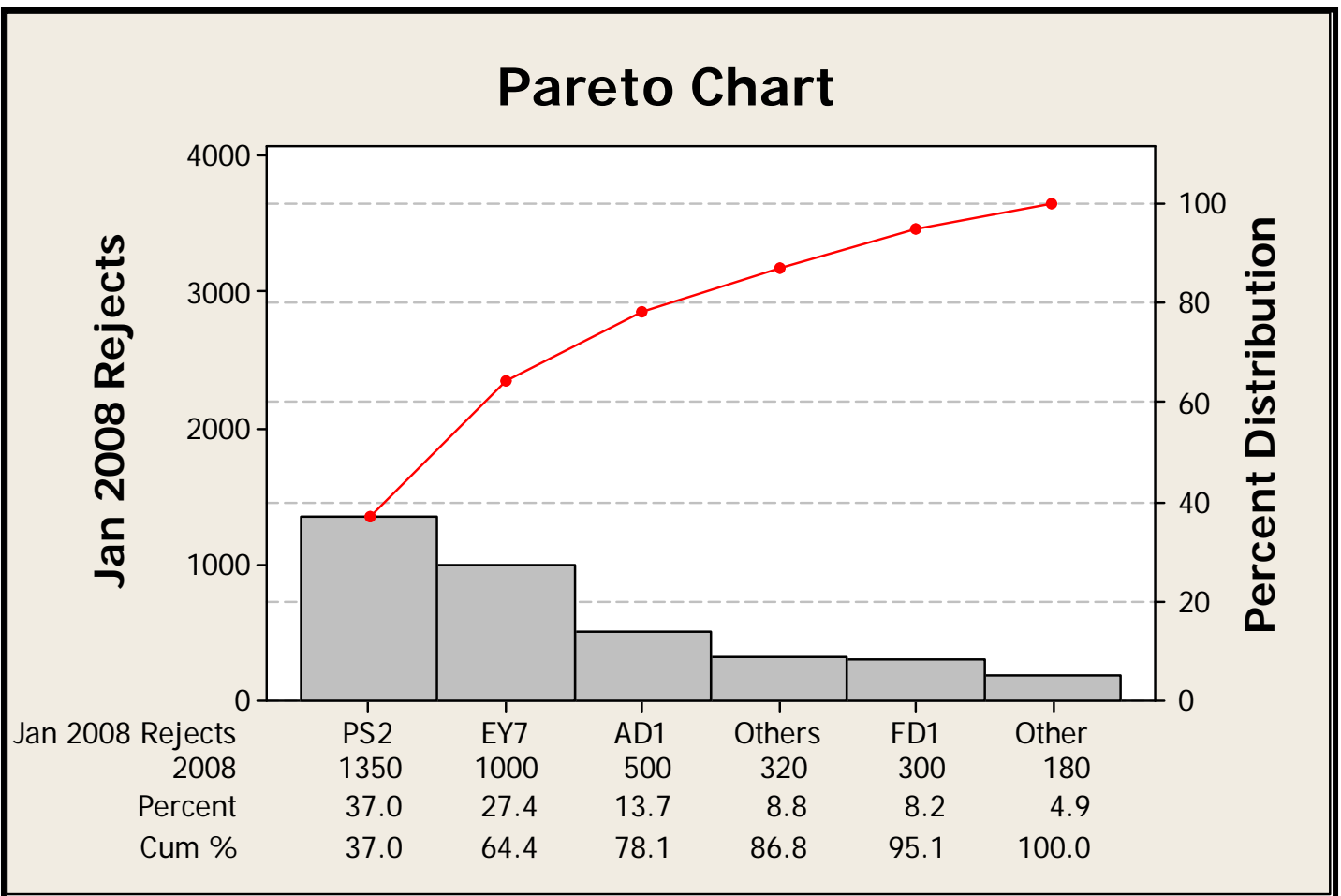
NOTE: The first pass at a Pareto chart may identify a significant problem that is still too big to work on. A second Pareto analysis may be necessary to break this most significant problem into workable pieces.

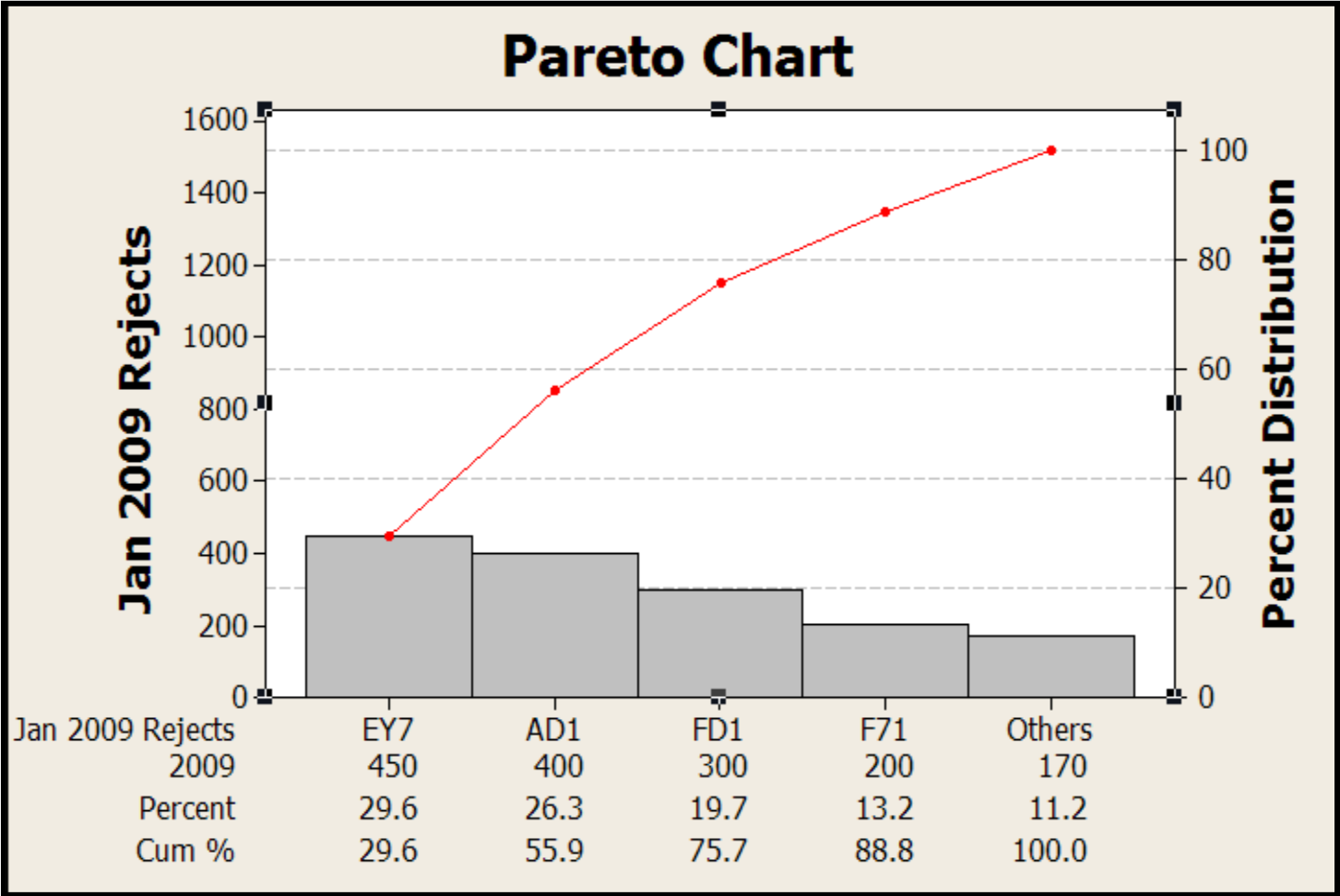
Now what?

If everyone tried to make improvements individually with no definite basis for what they were doing, much energy would produce disappointing results. A Pareto chart is a useful tool to draw the attention and cooperation of all concerned to target the most important problems affecting quality.

- Use the Pareto chart as a basis to “divide and conquer” problems. It tells you what to work on first.
- It is normally easier to reduce a tall bar by half than to reduce a short bar to zero. Use the Pareto chart like a map to “island hop.” Significantly reduce one big problem, and then hop to the next. Leave the smaller problems for “mopping up” later.
- Of course, if you find a small problem that is easy to fix, don’t ignore it. But don’t get tangled in chasing small problems or trying to fix everything at once.
- After you have worked on the problems for a while, use the same techniques to collect data again and create a new Pareto chart.

The new chart will tell you how you are doing. Use the data on the new chart to identify and target the *new* most significant problems.





Pareto charts can be used to identify problems to work on. They can help you produce greater efficiency, conserve materials, reduce costs or increase safety. They are most meaningful, however, if your customer—the person or organization that receives your work and helps define the problem categories.



Steven Bonacorsi is a Certified Lean Six Sigma Senior Master Black Belt instructor and coach. Steven Bonacorsi has trained hundreds of Master Black Belts, Black Belts, Green Belts, and Project Sponsors and Executive Leaders in Lean Six Sigma DMAIC and Design for Lean Six Sigma process improvement methodologies. He has led some of the largest deployments in the world and has saved hundreds of millions with his project teams results.

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