

# Monitor Process with a Control Chart



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Static comes and goes. Sometimes it is just a distraction or an annoyance. Other times, static is disruptive and requires action. How do you decide when it is time to set aside other priorities and focus on solving a static problem?

Control charts are a valuable tool for monitoring your process, for identifying abnormal performance, and for helping you decide when it is time to take corrective actions. One good reference for learning about control charts is a fine book by Kaoru Ishikawa: *Guide to Quality Control, Asian Productivity Organization* [Kraus Intl. Publications, White Plains, NY (1982), ISBN: 92-833-1036-5].

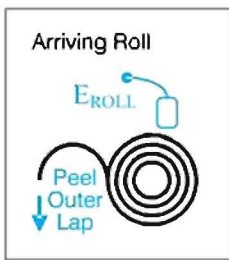
Let's use an "Xbar and R" control chart to monitor the static on rolls arriving from a supplier. It is important to unwrap the outer lap or two to get reliable readings as in **Figure 1**. For our control chart, take three readings per roll; left, center, right. **Table I** shows simulated data on ten rolls.

Columns 5 and 6 in **Table I** show the averages and ranges for each roll, which are plotted in **Figure 2**. Clearly, the electric fields measured on rolls 6, 7, and 8 are unusually high. Should these high readings trigger a phone call to your supplier?

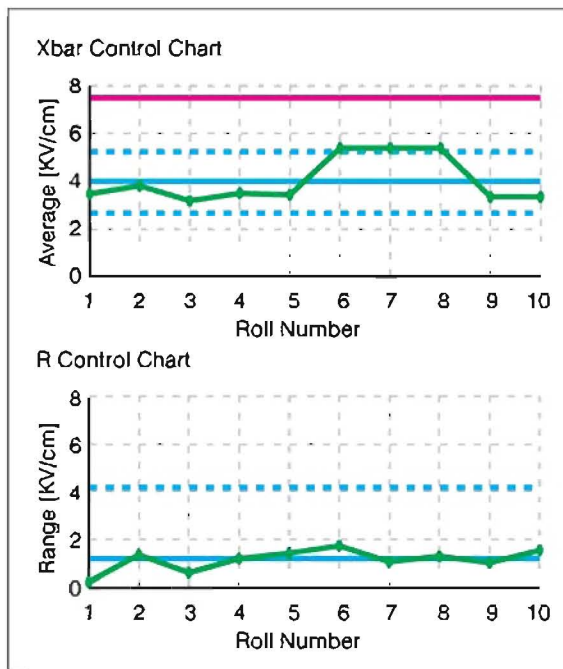
In the Xbar chart in **Figure 1**, the average for each roll is plotted in green along with four control lines. The solid red line is the level of static that you expect

Roll No.	Left Side	Center	Right Side	Avg.	Range
1	3.6	3.4	3.4	3.47	0.2
2	4.5	3.9	3.1	3.83	1.4
3	3.5	3.2	2.9	3.20	0.6
4	4.3	3.3	3.0	3.53	1.3
5	4.3	3.1	2.9	3.43	1.4
6	6.4	5.1	4.6	5.37	1.8
7	5.6	5.9	4.7	5.40	1.2
8	5.9	5.6	4.6	5.37	1.3
9	3.8	3.5	2.7	3.33	1.1
10	4.3	3.1	2.7	3.37	1.6
<b>Avg.</b>	<b>4.6</b>	<b>4.0</b>	<b>3.5</b>	<b>4.03</b>	<b>1.19</b>

Table I. Electrostatic Fieldmeter Measurements on Arriving Rolls



▲ **Figure 1.** Unwrap the outer lap to measure the electric field on a roll.



▲ **Figure 2.** The average and range of the electric field measurements are plotted on control charts.

will cause problems in your process or that have caused problems for your customer. While I have drawn this line at 7.5 KV/cm, you should draw a line that is appropriate for your operation based on your knowledge and experience. The blue lines are calculated from the data that you collect. The solid blue line is the average. The blue dashed lines are the upper and lower control limits: the UCL and LCL. The control limits show the minimum and maximum average measurements that are expected from a process that is running normally. The Xbar control chart shows that high electric fields measured on rolls 6, 7, and 8 exceed the UCL, so these rolls have higher readings than are expected from a process that is running normally.

In the R chart in **Figure 2**, the range for each roll is plotted along with two control lines. The solid blue line is the average, and the blue dashed line is the control limit showing the maximum expected range. The range for each roll is well below the maximum expected from the process that it is running normally.

It is not necessary to call your supplier given the picture presented by the control charts. The electric fields measured on rolls 6, 7, and 8 indicate that there was some problem with the supplier's process. Apparently, the issue was resolved, as rolls 9 and 10 look normal. All readings are below the red line, which indicates the level of static that will cause problems.

Control charts give you an interesting and valuable view of your process, including your incoming materials. These charts help you decide when you need to take action to solve a static problem and when you can focus your time on other priorities.