Manufacturing System Technology - II
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Lecture – 15

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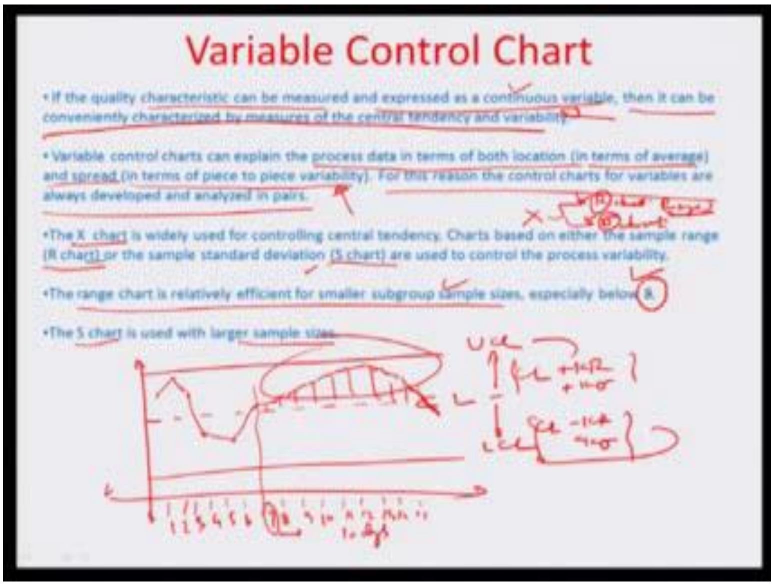

Hello and welcome to the manufacturing systems technology part 2 module 15. We were discussing about control charts, and we would like to see a little more of variable control charts. So, if the quality characteristic has I think I had discussed earlier is measured or can be is a measurable quantity, you can express this measurable quantity further is a continuous variable then it can be conveniently characterized by measures of the central tendency and variability are related to the distribution that we had talking about. And so therefore, that can be useful for controlling or floating the variable control charts. So, typically the charts can explain the process data in terms of both location, in terms of the average whether it is placed around the mean or it is significant deviated from the mean, and also the spread you know the spread is basically how away or how faraway is the whole distribute from the mean, is it having outlier is going to much out of control those kind of issues can be recorded in this control charts.

So, this is mostly in terms of piece to piece variability in the production process. And for this reason the control charts for variables or always developed and analyzed in pairs. The first important you know variable control chart is the X chart, and the X chart is widely used for controlling the central tendency of a process and the charts are based on either the sample range which is the R chart or the sample standard deviation which is the S chart. So, basically you are classifying the variable control chart X chart into either a R chart which is the range based, so obviously as the name range suggests the range of deviation from the mean that we are talking about the and standard deviation of course, as you know is conventionally floated as you know the mean square deviation from the mean samples, so from the mean of the particular distribution.

So, that is the sigma that we are talking about. So obviously, there is going to be an r chart and sigma chart in the way that you represent all the X charts. So, the range chart is relatively efficient and the smaller subgroup sample sizes are involved in floating the range chart and I am going to be actually show you have to float a range chart in a real problem. So, typically the sub sample or the subgroup files or the subgroup sample sizes especially is below 8 when you talk about illustrating that on the range chart, but if it goes beyond 8 then obviously the sigma chart or the standard deviation chart has to be based upon or has to be called for.

So, the sigma chart is also better known as the S chart; S stands for the standard deviation, and they are typically with the larger sample sizes. So, I think I had made clear earlier that the way to float these control charts is to sort of first of all record the mean value. So, this is really the mean value we can call the control line, and then there is an upper control limit and the lower control limit based on how far away from the mean you are basing this particular you know two lines or two specification limits, it can be CL plus k you know r or you know plus k sigma, and similarly CL minus KR or minus k sigma that you are comparing here for creating the UCL and the LCL values. And typically the samples are floated you know as points within this particular domain, and these are sort of recordings you can see that how these controls control lines with joining these different multiple observations can be obtained, and there many interpretations which you can have from this particular control data. For example, you can see that there is a tendency of the quantity or the quality to shift in this is recorded over number of days. So, you have probably some 10 days over which you are doing the recording you know. So, day 1 day 2, 3, 4, 5, 6, 7, 8, 9, 10 may be some more or 15, 16 days. So, you can see that below the or beyond the seventh day there has been a significant deviation in the way that the control variable is being floated here.

And so you can actually a certain that a something happen during a 7 day and beyond which cause that this process to become more like an out lair from the main tendency of the process. So, very quickly you can actually see what are the aspects related to the process and do some counter measures. So, there it can come back to control like you saw the process came back to control in this particular region. So, that is how the variable control chart is plotted.

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Let us look at the attribute control chart. So, as I already told you that the many quality characteristics which cannot be measured on a continuous stale scale; for example, let us say looking into the polish aspect that how bright is the or how good is the polish related to a car body or may be if you talk about the overall a statistics of a interior of a car system; that is again something which cannot be measured its only the beholder who actually appreciates the beauty or the process in this particular manner. So, you actually develop a rating scale on to the experiences of different people; obviously, the people are the customers over to use the product later one, and so their reference or their use very, very important and try to formulate that scale as acceptable 100 percent or 80 percent or acceptable 60 percent and that way you create a scale or even completely an acceptable for such attributes, and these are known as the attribute control charts which don not have any hard core measurements its only the intuition of a person that is being utilized here.

So, this happens when the quality of an item is judged as either conforming or non conforming to a specification. So, you can have let us say you know as I told you different examples in the car many other examples exists like, items having crack, missing components, appearance defects, visual imperfections may be rendered as rejects, defective or non conforming items. So, basically these are something which there is no measurable pieces of recording you know. And so that chart is known as P chart. The P chart is basically for proportion of units which are non conforming typically. So, and we talk about the fraction reject, you know that is what really this term P means there out of 100 samples, if you rejected thirty samples our P values is 30 percent and that particular lot.

Simultaneously the many other recordings, so this kinds of the chart there is the NP chart where you talk about not only the units which are non conforming, but the number of units which are non conforming for samples of constant sizes, you have the C chart for the number of non conformity or defects from samples of constant sizes I am going to record and float; all these different charts as we go along. Then there is a U chart for the number of non conformities per unit for samples not necessarily of constant sizes, and there a many interpretations which are there and their many situations where these are very important to take a qualitative decision statistically on the overall production process at do something governing, which can change the really the process quality. So, that is the attribute control chart.

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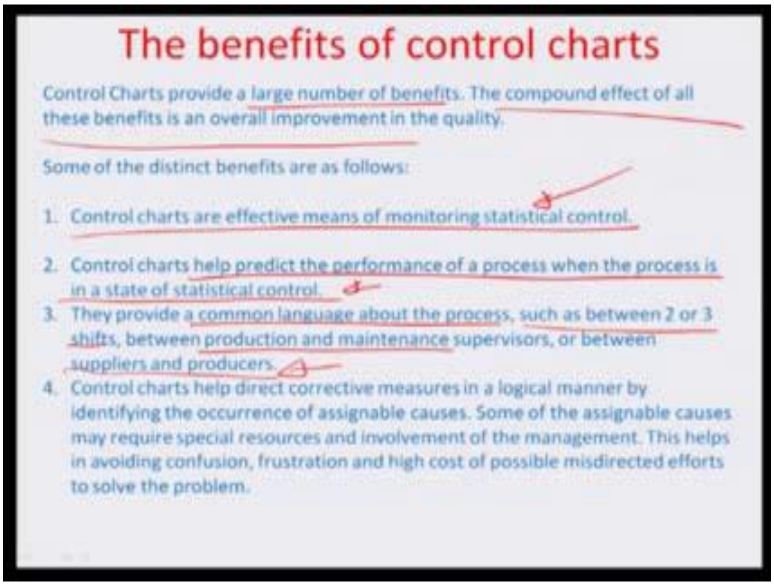

Let us talk a little bit about the benefits which are associated with the control charts. The provide a very, very large number of benefits the compound effect of all these benefits is really an overall improvement in the quality as you can see related particular a process quality. And some of the distinct benefits are that the control charts are effective means of monitoring statistical control on a process help to predict the performance of a process when the process in the state of statistical control. And they provide a common language about the processes between may be one or two different shifts, which are being operating for example, in an particular assembly line there may be a shift towards the morning, there may be a shift towards the evening, and there is really no inter phase between the supervises of the both shifts unless the over states etcetera, which is again a financial burden to the company. So, the control chart is the really way to share their experiences.

So, whatever has been processed floated as a quality parametric in the first shift can be just floated in the diagram in the supervisor from the second shift and just come, and sees the diagram to interpret that these are the areas where really there has been a deviation and where we need to focus in this particular shifts, so that the quality can be coming back to normal C. So, it is a sort of a unseen its sort of a lots undefined kind of language between you know 2 or 3 different shifts when they are running it can be related to a shifts of production or maintenance or between again suppliers and producers many different aspects. So, without physically talking to each other, there is a way to sort of share their experiences using the control chart. Obviously, control charts help direct corrective measures in a logical manner by identifying the occurrence of a assignable causes, you can pin point again using the other tools of qc that I have illustrated earlier there if a certain defects is coming why it is coming.

So, if you have a recording of a certain particular defect going out of control, you can easily focus on that particular defect, and then do the man material machine method analysis to see what are the different causes, and try to eliminate those route causes or even you can do a famine a as a matter of factor and try to see what are the most priority defects in the particular system. So, some of the assignable causes may require special resources and involvement of the management. So, this helps in avoiding confusion frustration and high cost of possible misdirected efforts to solve the problem, and 0 you down to the actual ground reality as to what is the exact cause of a certain problem coming in. So, that is the overall benefit that the control charts would have.

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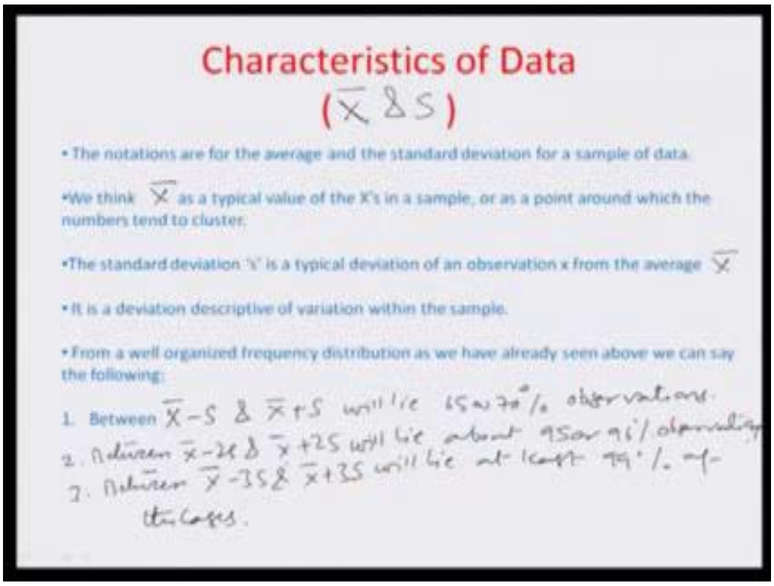

Let us a now look into little bit of these x bar chart, and the S charts that I was talking about. So, notations are of the average and the standard deviation for a sample of data. So, let us first learn how to calculate these X bar and S, and then we will see what are the percentage observations typically which will lie between a certain range around the mean X bar in terms of number of times the s can be executed. So, we think X dash as a typical value of x in a sample or as a point around which the numbers tends to cluster, the standard deviation S is a typical deviation of an observation X from the average X bar, and it is the description of deviation descriptive of variation within the sample. So, from a well organized frequency distribution as we have already seen above, we can say following. So, the between x bar minus S and X bar plus S their will be about 65 to 70 percent observation between the mean plus minus 2 sigma limits or 2 S limits will be about 95 to 96 percent observations.

And then between mean plus minus 3 sigma limits there will lie at least about 99 percent of the observations, this is typically how normal distribution is program and all the processes as I think I will illustrated many times earlier follow a typically a normal distributions whether they are production processes etcetera. And they are other distributions also which can be force fitted on this normal distribution related really to the subgroup size, the sample size so on so for. So, will talk about all that detail in the following modules as of now I think I will close this particular module in the interest of time, and the next module will discuss exactly how to calculate the X bar and S from distributions.

Thank you.