Industrial Engineering
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Module - 03
Lecture - 10
Work Measurement and Time Study Contd…

Dear students, in this presentation, first of all I shall complete the remaining portion of the time study and there after I shall take up the portion related to the development implementation and maintenance of a new method in an organization. So, the time is study as I have said is one of the work measurement techniques in which time for carrying out the particular job is identified using this stop watch method and suitable allowances are added to calculate this standard time, and the set the standard of performance. For a successful measurement and accurate measurement of the time it is necessary that the job which is to be timed is broken into the small elements, because a timing of a complete task as one element is not found satisfactorily and it does not give the accurate time values for setting these standard of performance.

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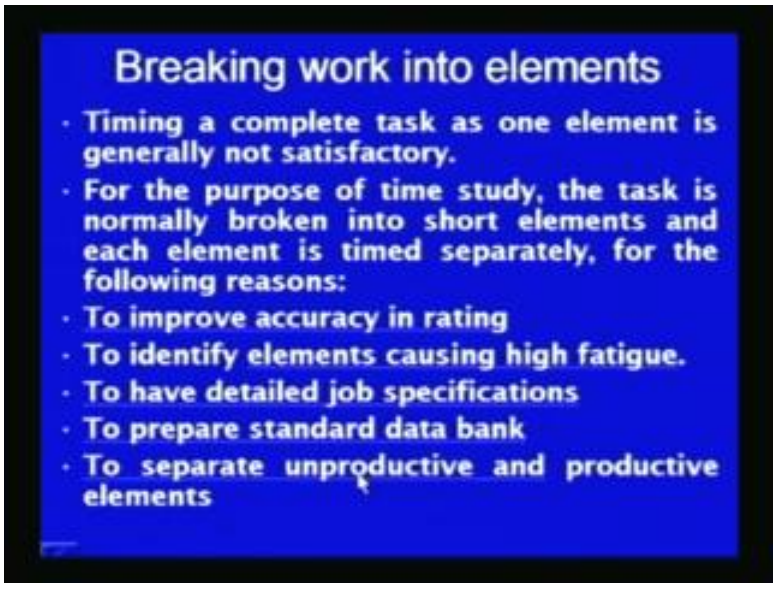

Another reason for breaking the job into the elements is that, it helps to time the things accurately to find out the fatigue causing elements, to find out the productive and unproductive elements. So, it helps also to see the process into the greater detail that is

why for the purpose of time study task is broken into the short elements and each element is timed separately.

So that, accurate rating of the each element, accurate rating of the worker for each element can be done and the time for each element can be obtained accurately. So, as to set the time standard as accurate as possible, it also helps to find out the high fatigue causing elements, so that the steps can be taken to isolate those elements which are causing excessive fatigue. And also helps in add in fixing the suitable fatigue allowance to the workers who are carrying out those high fatigue causing elements.

The another reason of breaking the job into the elements is that it helps to develop the job specifications in detail. So, that if later on worker is start to follow the different methods it becomes easy to detect, whether they are following the standard practice or they are following anything else or deviating from the standard practice, because of which they may taking longer time.

Another purpose of breaking the job into the elements is to prepare the standard data bank, because in time study many elements are timed for the different small components. And, the different types of the elements are timed which occur very frequently or very rarely like working putting on or putting off keeping the job a side or switching on or switching off kind of activities or very frequently carried out in number of types of the operations.

So, if the time values are developed for the common elements, which are repeated in general, in different kinds of the operations. And, that helps to develop the data bank related to time values for carrying out those elements which are repeated number of times in different operations. So, development of the time values for small elements which are repeated in various operations helps to develop the standard data bank and which can be used time study in a standard data method and also in predetermined motion time study method. And, another objective of breaking the job into the elements is to separate the productive and unproductive elements.

So, identification of the unproductive elements help to improve the method, and so as to reduce the ineffective time and set the standard time in such a way that it can be done in the less possible time and more accurate time standard is set for the performance.

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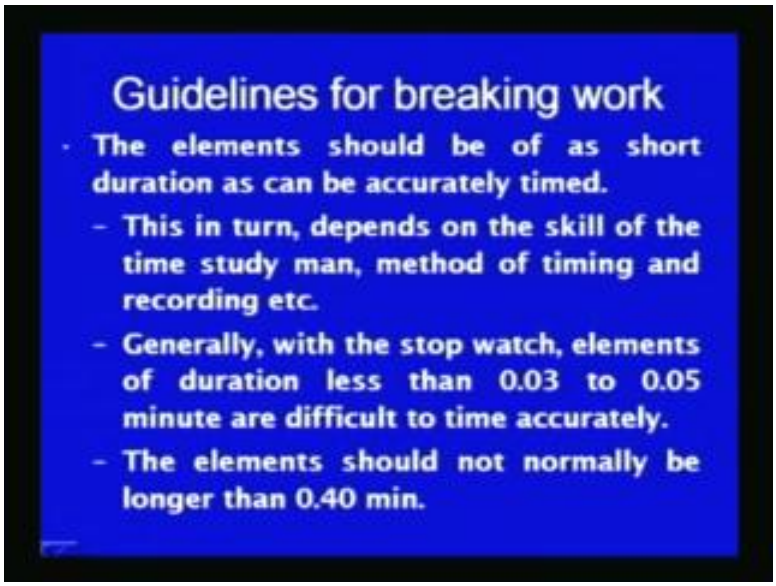

For breaking the job into the elements, the certain guidelines are followed, so that the bank can be measured accurately and it can be analyzed for setting the standard of performance. The element should be broken into the size as short as possible, so that it can be a timed accurately.

The element should be of as short duration as possible which can be timed accurately using the available timing the sizes available timing devices. The size of the element intern depends upon the skill of the time study men the method of the timing and the recording technique which is being used.

If very sensitive timing devices available even very short timed elements can be obtained for their study, if the timing device is not very accurate and also the study men is also comparatively new it is better to go for the element which are of slightly longer duration. And that is why, the element should be broken as short as possible, so that it can be timed accurately by the time study men and the available resources inform of timing and the recording techniques.

The generally with this stop watch method, the elements of the duration less than 0.03 to 0.05 minutes are found difficult to accurate. So, the elements should be broken in such a way for the stop watch study method that they are of slightly will of longer duration than this range of the duration.

The elements should not normally be longer than 0.40 minutes. So, as short as 0.03 minutes and as long as 0.40 minutes elements can be obtained for the analysis purpose, because we know the element is a very distinct part of the work which can be analyzed observed and measured accurately. So, this breaking of the job into the elements depends upon that, how efficiently it can be measured, and what it the experiences of the time study men in carrying out the time study of the small elements.

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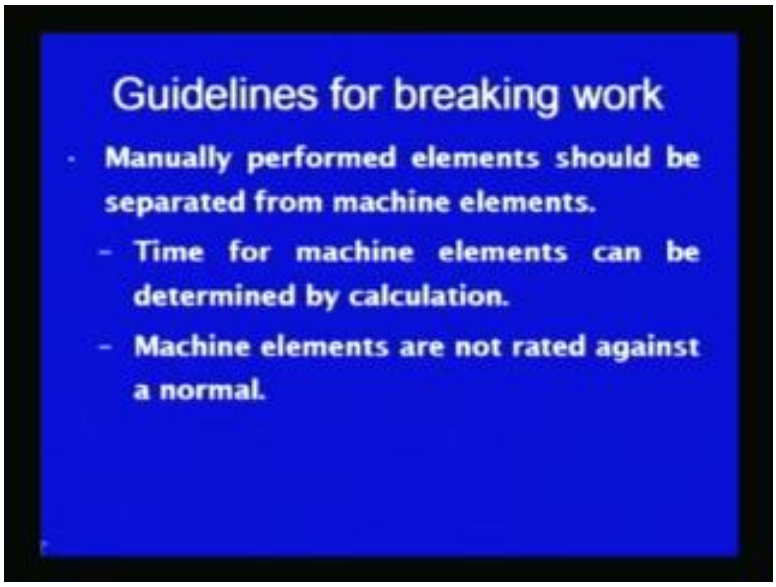

When job is broken down into the number of elements and different types of the elements are segregated in one particular manner or other way, so that they can be treated according to their nature. For example, a manually performed element is separated from the machine elements.

Manually carried out elements which are performed manually are rated by the time study men for when they are performed, while when the machine elements are carried out by the worker is the machine elements are not rated. But, the time for machine elements can be determined by the calculation and the machine elements are not rated against the normal performance.

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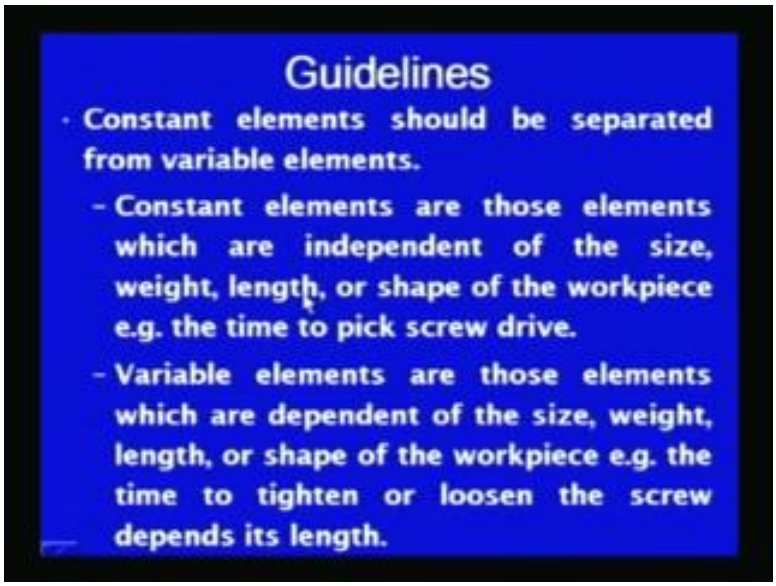

Another way by which the elements can be segregated is the time required in carrying out a particular kind of element. Like certain elements always take a fixed time irrespective of nature of the job which is being done if the weight length or any other characteristics of the work. So, such elements which always take a fixed time in carrying out those activities and they are independent of the size weight length shape of the work piece.

The time is found fixed and such kinds of elements are defined as constant elements. So, the constant elements should be separated from the variable elements, variable elements are those for which time required varies with one or other characteristic of the product. For example here, the size of the way size weight length shape of the work piece can directly affect the time required for carrying out the job.

For example the time required to tighten or loosen the screw depends on its length, while in case of the constant elements switching on switching off putting the things a side are always constant. So, those elements which take a fix time they are segregated as constant elements and the elements for which time varies with the characteristic of the work piece.

Then, those variable elements are segregated separately, so that they can be treated in different way during the analysis. For breaking the job into the elements the job should be broken into the elements in such a way that each element has a definite beginning and

end points which helps in easy identification of presence of particular element, irregular elements should be separated from the regular elements.

Regular elements are those which occurs rarely and the randomly they may not even they may not be the part of the work cycle itself, while the regular elements are repeatedly consistently in irregular or in a particular interval. So, the irregular elements are those which are not repeated in every cycle like jig is cleaned of after every ten parts produced.

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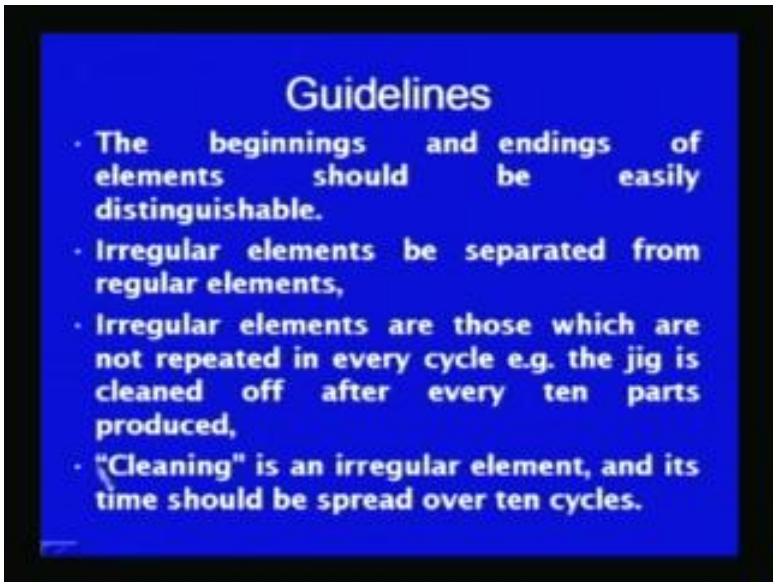

While the cleaning activity is an irregular element and its times should be spread over the 10 cycles. So, it will be detected only if the study is continued for until the 10 pieces are produced then one cleaning element will appear that is why, the study should be continued for a certain period of time. So, that the all those elements which are involved in production process can be obtained and they can be timed suitably.

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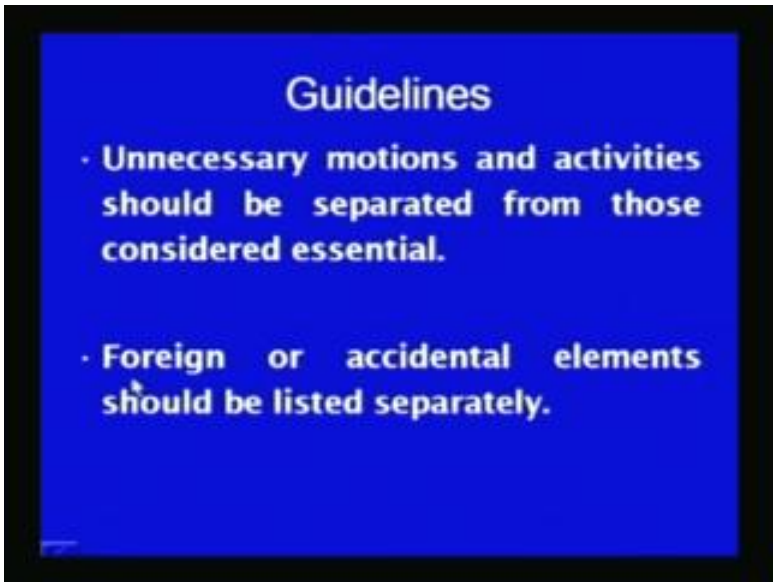

Other guidelines which are used in breaking of the job into the elements is that unnecessary motions are to be separated from those which are required for carrying out a particular job. So, that unnecessary movements which are not required or which are redundant can be separated and isolated, so as to reduce the time required for carrying out the job and for improving the improving the method which is being used for carrying out the job. Foreign element an accidental elements also should be listed separately.

And, when these different a when the job to be studied is broken down into the different small distinguished parts called elements depending upon their nature of occurrence. And, a nature of occurrence and whether they are required or not, how much time they take, are they of fix type or the variable type the different elements can grouped in the eight different categories.

Like repetitive elements which occur in every work cycle, for example putting the finished job aside and locating a work piece in a holding device, here are the activities which will be repeated in every work cycle. So, the activities or the elements which are repeated an every work cycle or called repetitive elements, while the occasional elements are those which are not repeated in every work cycle, but they may occur in regular or irregular intervals.

For example, adjusting the tension or receiving the instructions for foremen. So, those activities which are repeated in every work cycle called repetitive elements, while those

activities which occur regularly or irregularly at a certain intervals are called occasional elements.

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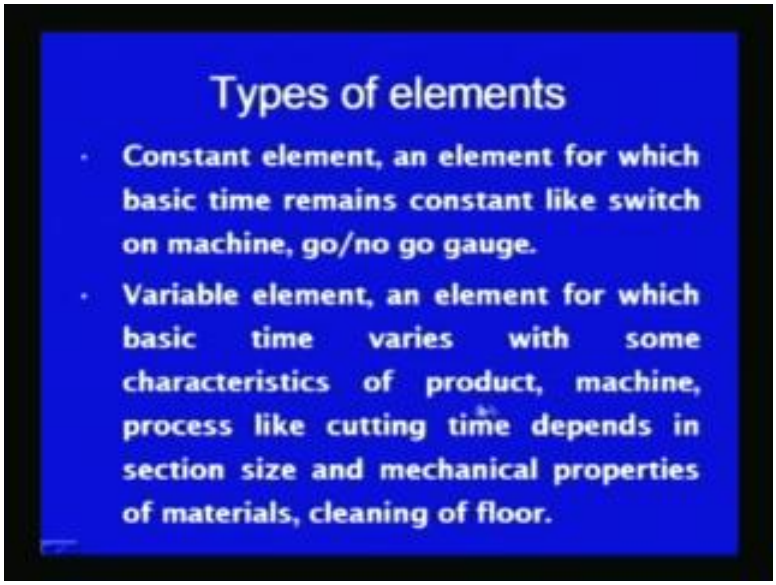

The elements can also be classified and categorized as a constant elements for which the time required does not change a with the characteristic of the work which is being processed like switching on or switching off or using the measurement techniques or the carrying out the measurement using go and no go gauge. And, the variable elements an element for which basic time varies with some characteristic of the product machine process are called the variable element.

And, for example, cutting time for a job depends upon the section size mechanical properties of the material in the same way, the time required for cleaning the floor depends upon the area which is to be covered. So, in this way the time required for carrying out a particular element if depends upon the certain characteristics of the process or the product which is to be carried out, .then those elements are termed as variable elements.

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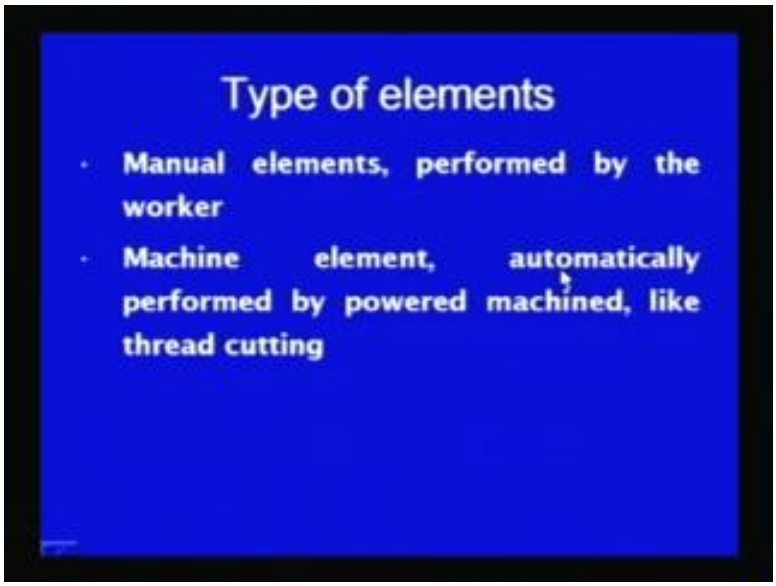

Manual elements are those which are carried out by the operator by giving it is own energy, while the machine elements are those which are automatically performed by the powered machine like thread cutting turning or the metal cutting operations.

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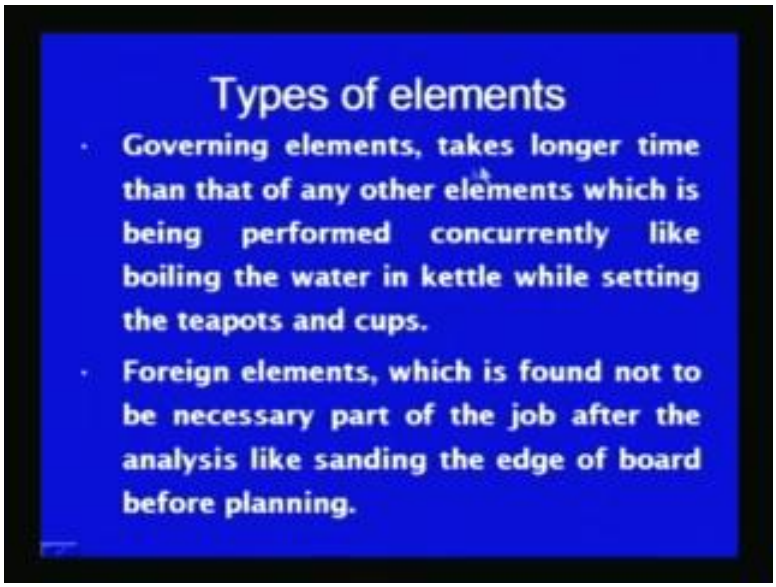

Another way of a classifying the element is that the governing elements, so governing elements and the foreign elements. The governing elements all are those, which takes the time longer than any other activity related a particular operation. So, the governing elements take the longest time than the other elements which are there, so the governing

elements takes longer time than that of any other element which is being performed concurrently.

For example, the boiling the water in kettle while setting the teapots and the cups, so if the one particular element takes maximum time and in that period all other elements can also be done, then the main element which is consuming most of the time is termed as a the governing element.

The foreign elements are those which are not considered as a part of a the work cycle and if it is found that the particular element is not necessarily part of the job after the analysis then it is considered as a foreign element. And for example, like sending the edge of the board before planning or just like a cleaning of the grease before currying out the machining.

So, those activities which are not required or redundant can be considered as a foreign element or these elements may not be the part of the standard practice seat. So, after breaking the job into the elements, next job is to the timing the different elements, so the elements which are to be timed or listed down.

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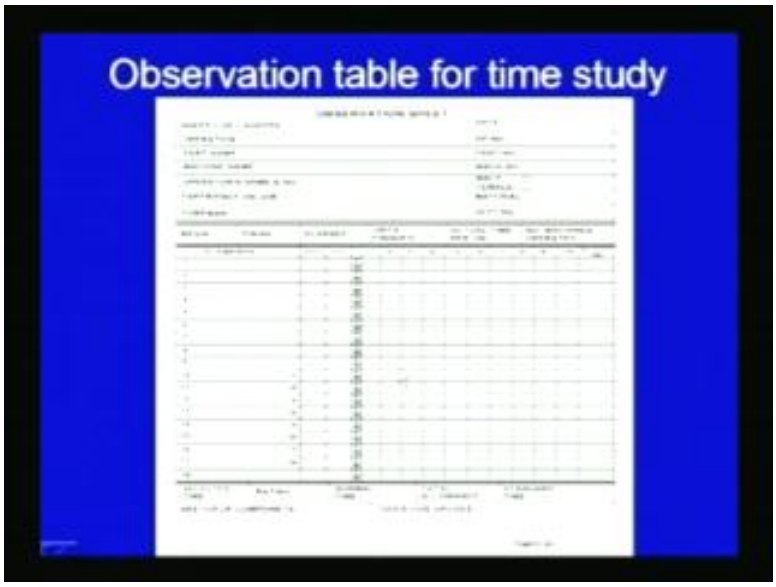

And, the time for each element is obtained by the stop watch study and the each element is rated for the operator performance. So that, the average operator's performance and

the average time for carrying out the entire job and that for each elements can be obtained.

So, the observation seats are designed in such a way that the time for each element can be obtained easily and the accurately and the same can be recorded without any difficulty and confusion. So, that the data is available at the end of the recording for the analysis, so the recording should be done in the observation seat in such a way that it is available for easy analysis and easily understandable form.

For carrying out the time study for the each element it is not just sufficient to carry out the stop watch time study once for an element. It is necessary to continue or to carry out the stop watch study for each element until for the number of cycles until the representative time value for each element is obtained, so that we will have some degree of confidence in our data related to the time value for each element and will also be sure of the degree of accuracy related with the measurement.

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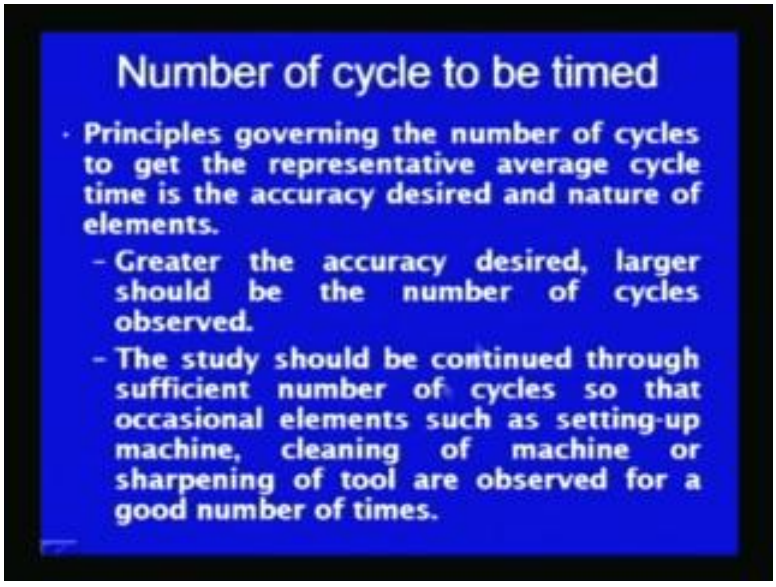

So, the main principle that is governing, the number of cycles for which an element is to be timed depends upon the accuracy desired and the nature of the element. Greater is the accuracy desired larger should be the number of cycles to be observed. The study should be continued through the sufficient number of cycles, so that the occasional elements such as setting up of the machine, cleaning up of machine, sharpening of tool are observed for the good number of times.

Then, only the representative picture of the all the elements involved will be obtained and the observer and the time study men will have some degree of confidence on the data which has been recorded and on it is accuracy.

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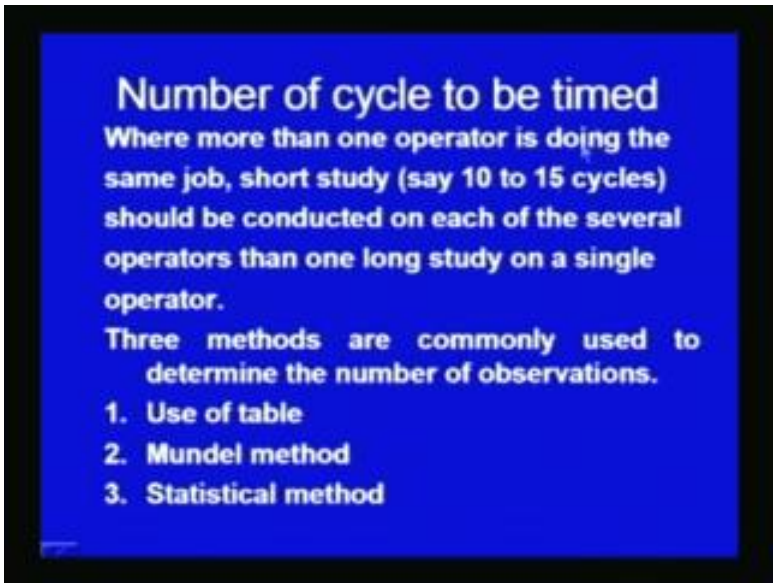

When more than one operator is doing the same job, then the study should be conducted for sufficient number of cycles. But, if the more if more than one operator is doing the same job it is prepared to carry out the study for certain number of the cycles instead of carrying out the large of cycles study for one worker.

And, if the same job is being carried out by the number of workers it is always good to carry out the time study on the number of workers instead of selecting just one worker for the study. And, when the numbers of workers are carrying out the same job few cycles say 10 to 15 numbers of cycles can be timed for each of the operator for each element, so that a representative picture a representative time values for each element can be obtained instead of going for a very longest study on the single operator.

This is a very general kind of situation where preference should be given for timing the different elements for a group of workers rather than on a single worker. The three methods are commonly used to determine the number of observations to be carried out for each element related with the job, so that the desired accuracy and the degree of confidence in the data can be obtained. And, these methods related to the number of

cycles for which each element is to be timed are the use of the table Mundel method and the Statistical method one by one these three methods will be covered in detail.

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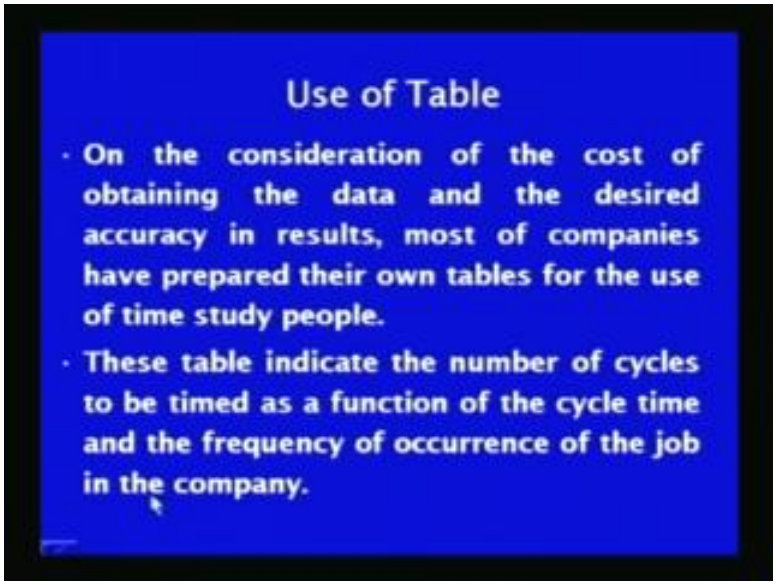

Use of the table method is a very common in the industries, because of the economical reasons. It is a costly affair to find out the number of observations to be carried out for timing and the each element. Therefore, industries have developed their own the tables for identifying the number of observations to be carried out for each element. And, these tables have been developed in view of the time required for a particular element and it is possible frequency in the organization or frequency of performing a particular kind of element.

So, on the consideration of the cost of obtaining the data and the desired accuracy in the results most of the companies have developed their own tables for use by the time study people. These tables indicate the number of cycles to be timed as a function of the cycle time and the frequency of occurrence of the job in the organization. In general, if the time value is more, then a cycle time is more than less number of observations are carried out

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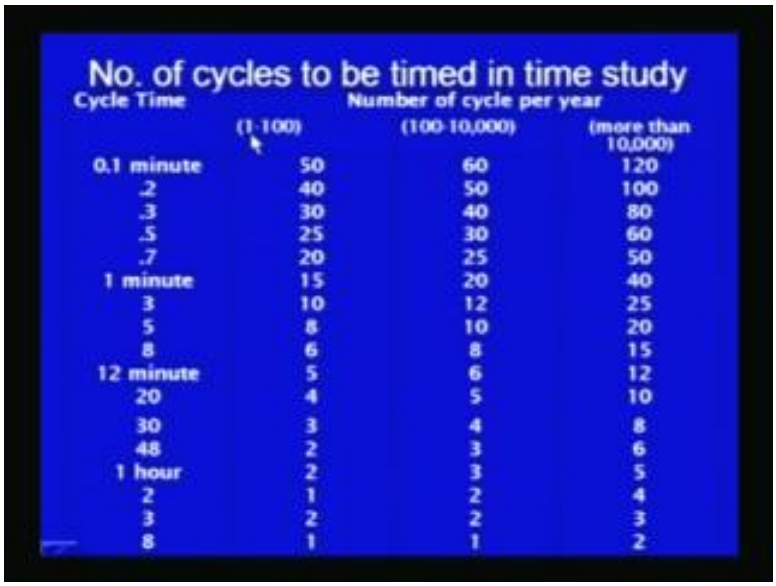

It can be seen from this table that the activities with the different cycle times say from 0.1 minute to the 0.7 minute, from 1 minute to the 12 minutes, from 12 minutes to the 1 hour, 1 hour to the 8 hour of the cycle time of the job or of an element. Here you can see, this is the cycle time parameter and this is about this row indicates the number of cycles per year of a particular element which can occur during the year. So, for a an element of a duration say 0.1 minute and if it is a frequency of occurrence is in range of 1 to 100, then to 50 number of observations are to be carried out.

If the frequency of occurrence is 100 to 10000, then the number of cycles to be timed says60 and the number of occurrence is more than 10000 than the number of cycles to be observed for each element is 120. So from here, we can see with the given cycle time with the increase in frequency number of observations to be carried out for each element increases in the same way for a given frequency of occurrence increase in cycle time decreases the number of observations to be carried out.

For example, if the cycle time is 8 hours and a frequency of occurrence is in range of 1 to 100, then only one observation is required, while for the frequency of occurrence is 100 to 10000 again 1 and if it is more than 10000 then it is 2. So, in increase in cycle time decreases the number of cycles to be timed for each element and increase in frequency increases the number of observations for which each element is to be timed.

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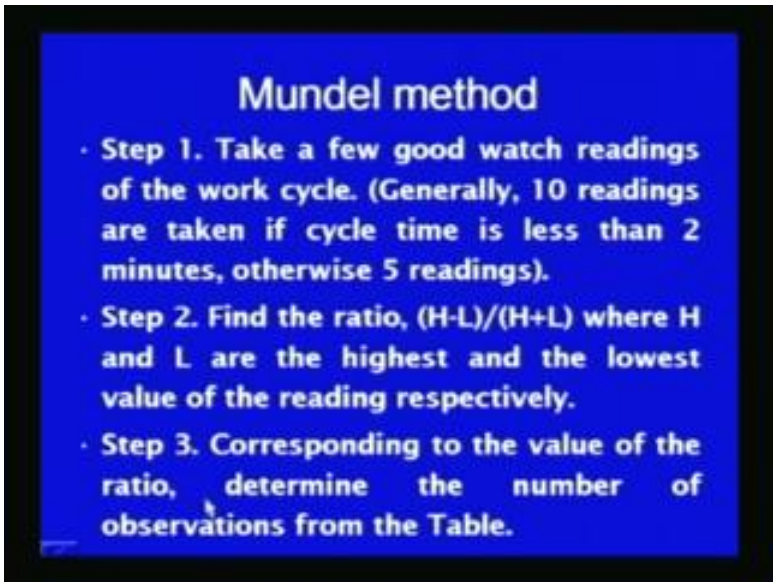

The second method of finding the number of observations required for timing each element it depends upon that, what is the degree of a scatter in the data, which is being obtained; In this method initially good watch readings are obtained of the work cycle and then the maximum and minimum values are determined. Generally, 10 readings are taken if the cycle time of the job is less than 2 minutes and for the jobs more than 2 minutes and for normally 5 readings are taken. After taking these watch readings for 10, 10 in numbers or 5 in numbers their highest a values and their lowest values are determined.

So, using the highest and lowest values the ratio of H minus L divided by H plus L is determined where H and L are the highest and lowest values of the reading which have been taken earlier. These readings may be of 10 in numbers for the jobs of cycle time a less than 2 minutes and these H this ratio can be obtained from the 5 readings if the job cycle is more than of 2 minutes. So, from this ratio is further used to find out the number of observations from the table Mundel has proposed.

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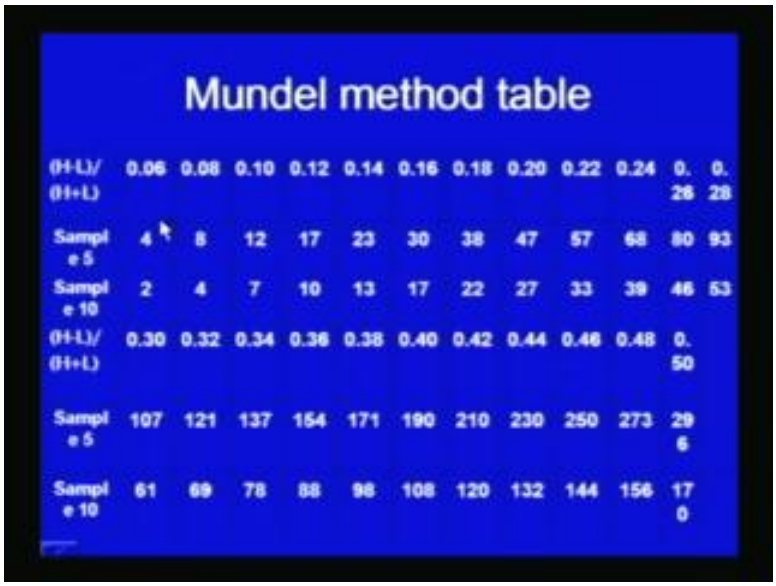

This table shows the different values of the ratios like H minus L divided by H plus L with the different values in these rows here another set of the values for the this ratio. And, thereafter there are two more rows here this one show the H minus L divided by H plus L ratio value of say 0.06 number of observations to be taken is four, if the sample size is of five readings. We have taken the sample size of 10 readings then number of observations to be carried out only 2.

In the same way if the for the different values of this ratio and for the different sample size and number of observations required can be seen directly from the table. Another example, if we take if the ratio value is say 0.4, then for the sample size of 5 readings the number of observations to be carried out will be 190, while if the sample size is of 10 readings, then the number of observations to be carried out will be of 108.

So, this is how using the preliminary survey of the cycle time of the job by the watch readings we determined the highest and the lowest value of the readings and from the ratio of the difference in highest and lowest value. And, the sum of highest and lowest values ratio the number of observations required for timing the each element and the total work cycle is determined.

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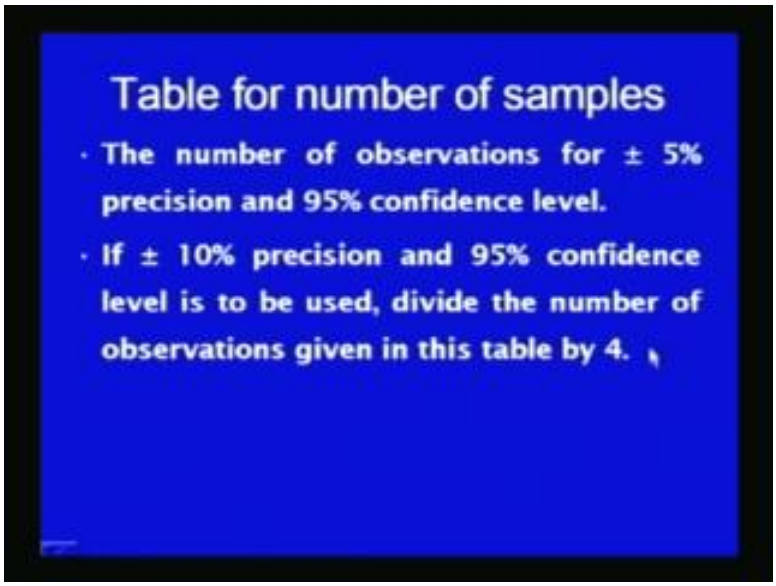

The number of observations which will be carried out number of observations for timing of particular element or of the work cycle will give an accuracy of 5 percent and the 95 percent confidence level. If a precision of 10 percent is required for with the 95 percent confidence level, then the whatever number of observations are carried out or obtained for either 10 reading set or 5 reading set and for a given H minus L divided by H plus L ratio the same observation number value is to be divided by the 4. So, with the increase in precision of 10 plus minus the number of observations required decreases.

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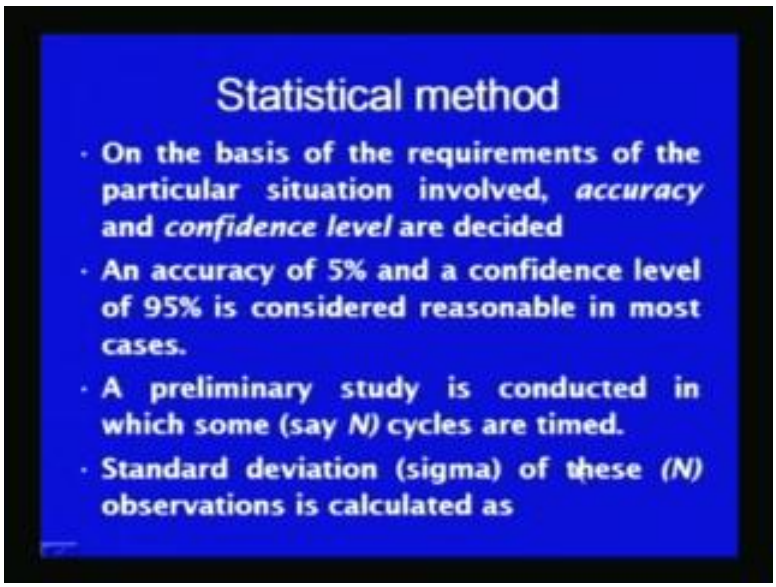

So here, if we will see the another method which is used for determining the number of observations to be carried out for each element for the work cycle. So, on the basis that method is the statistical method and this is a third method and on the basis of requirement of particular situation and the accuracy desired and the confidence levels which are required in the observed time values are decided

An accuracy of 5 percent and the confidence level 95 percent is only considered most reasonable in most of the cases. And, for carrying out for determining the number of observations to be carried out for timing of each element preliminary study is conducted in this method say for N number of cycles and then a standard deviation of the time values is calculated.

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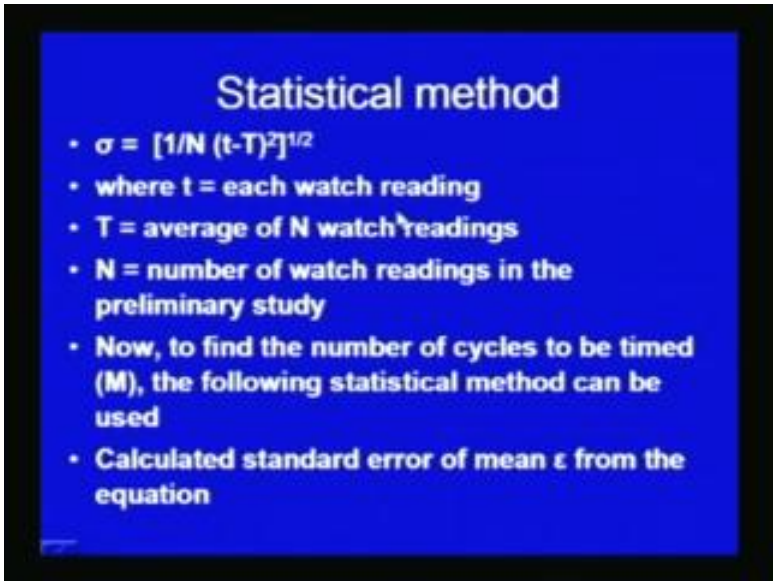

And, after determining the standard deviation value of the sigma from the timed values where the small t represents the each watch reading, Capital T represents the average of the N watch readings and N is the number of watch readings in preliminary study which has been conducted the sigma standard deviation in the data is calculated. Now, in order to find out the number of cycles to be timed M is calculated in the statistical method by the following way. Here, the standard error of the mean that is epsilon is used in the following equation.

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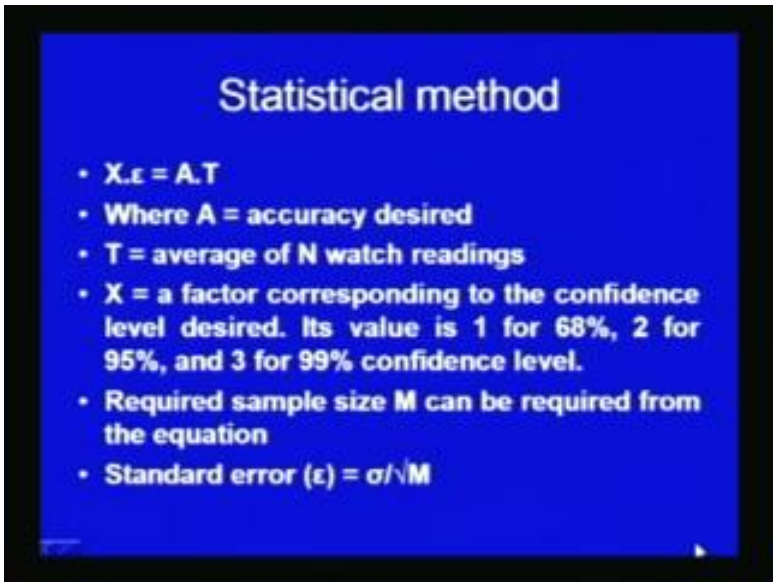

The number of observations to be taken for a timing the each element by the statistical method can be calculated using this equation where X into epsilon equal to the A into T where A represents the accuracy desired T is the average value of the N watch readings which have been taken.

And, X is a factor X is a factor which corresponds to the degree of the confidence desired. Its value is taken as a 1 for 68 percent of confidence desired, 2 for 95 percent of the confidence level desired and 3 for 99 percent of the confidence level desired. So, depending upon the degree of confidence desired in data.

The value of X is put in this equation suitably, the standard error of the means value of the time values which have been determined is also a determined. It can be 2 percent 5 percent or 10 percent as per the acceptable a level of the error and A is the accuracy and T is the average time value.

So, for determining the number of samples to be timed, number of observations to be carried out in terms of the M say can be the obtained from the following equation, where a standard error which has been which has been fixed like whether it will be 2 percent 5 percent or 10 percent. This is standard error epsilon is equal to the standard deviation divided square root of the M, M represents the number of observations to be taken for each element.. So, value of M can be determined form the acceptable level of the standard error and the standard deviation in the data which has been calculated.

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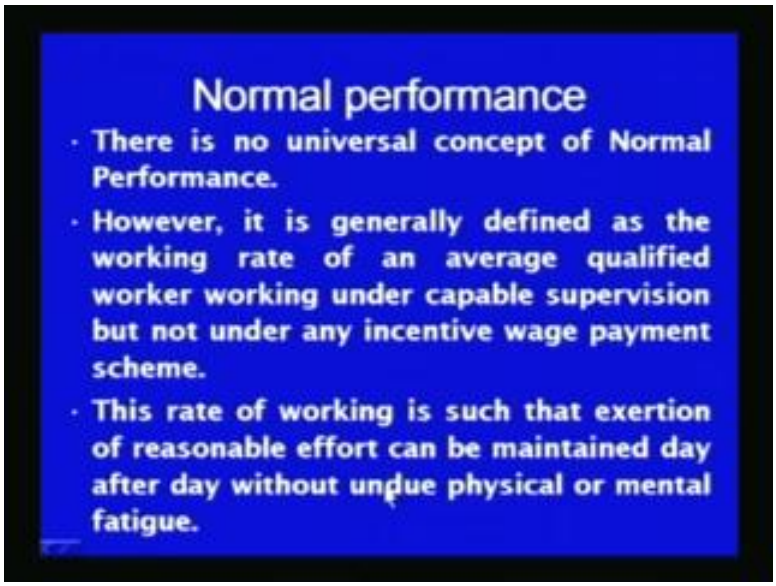

Now, this is another important point related with the time study that the performance of the operator is rated during the study and that performance is used for calculating the normal time. The observed time values are multiplied by the rating factor to find out the normal time.

So, what is the normal performance and why it is required to find out the performance rating of the worker that will see in detail gradually. The normal performance is a concept, according to which that what should be the speed of the work by which operator should do a given job or a given element, according to the concept of the standard of the time study men.

So, there is no universal concept which is of one type for the normal performance, it is generally defined as a rate of an average qualified worker working under the capable supervision. But not, under any incentive wage plan or wage payment a scheme, if worker works with the average qualification in such a way that, he is not subjected to the undue fatigue and working is not influenced either by the supervisor or a because of any incentive a scheme.

Then, that average speed of working of an average qualified worker is considered as a normal performance that the rate of working is such that exertion of the reasonable effort can be maintained day after day without undue fatigue physical or of mental type. So, the normal performance is the performance by the average rate of working by average

qualified worker who can continue to carry out the job without undue physical or mental fatigue day after day and his working rate is also not influenced by the supervisor or any incentive scheme. So, that rate of performance is considered as the normal performance.

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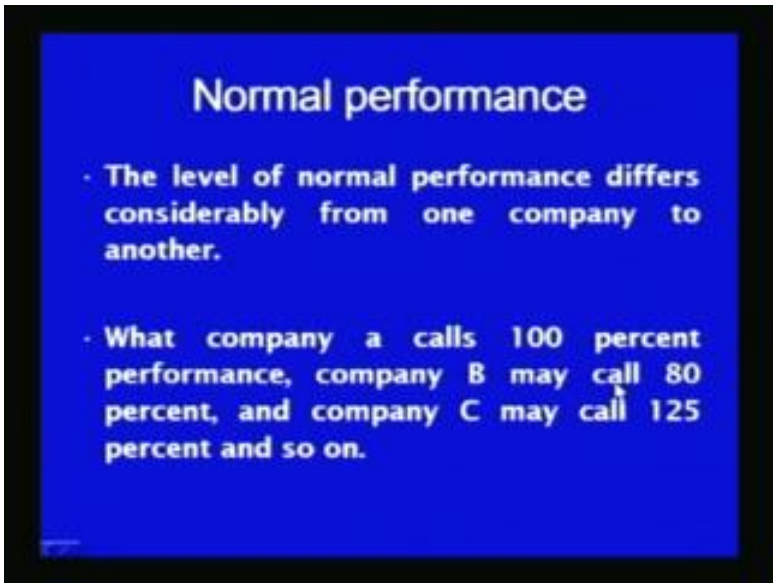

The level of normal performance differs considerably from one organization to another, what a company calls 100 percent performance, a company B may call it eighty percent and company C may call the same as 125 percent. So, there is no a standard rate at which worker should work and then only it can be called as a 100 percent performance or higher or lower rate of performance.

And that is why, it needs that the rate of who carrying out a job by a worker is rated by the time study men. So, that he can compare his own concept of the standard performance and the rate at which the worker is actually working the 100 percent rating represents the standard performance and this rate of working can be multiplied by with any rating factor according to the assessment of the work a study men.

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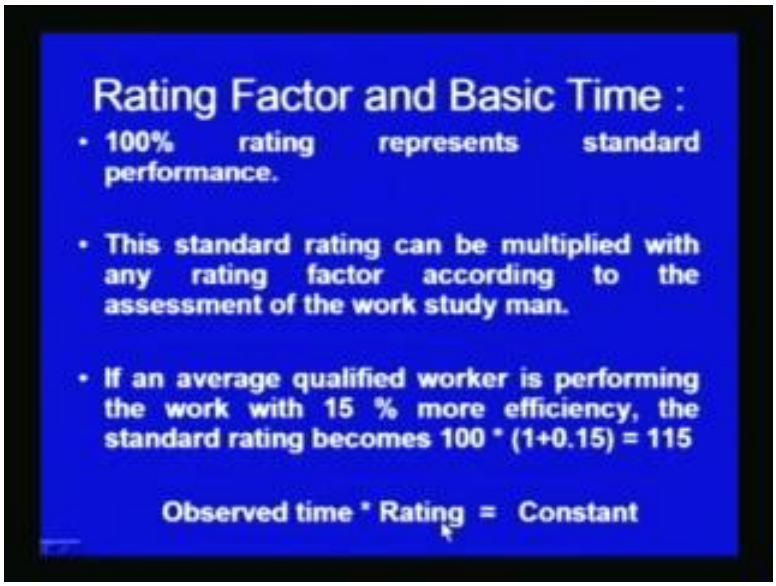

If the work is study men rates the 110 percent performance of a worker means his percent is his performance is 10 percent greater than the number or a standard performance. If an average qualified worker is performing work with a 50 percent more 15 percent more efficiency in a standard rating becomes for that worker as a 115, so using this rating that the basic time value is obtained for carrying out a particular element. The observed time represents the time, which is actually being timed by the time study men during the study while rating factor indicates the rating, which has been as assigned by the time study men to the worker as far as rate of his working is concerned. So, theoretically the observed time and the product of the rating factor becomes a constant. This we can see with the example.

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Here, which has been shown that if the observed time is 0.20 minus and rating is 100 percent and product of the two will result in 0.20 and this 0.20 will be constant if there is a increase in the time required for carrying out the job than the rating will decrease. And, if there is decrease in the observed time value then accordingly rating will increase.

Here, we can see if the observed time is 0.16, then he will rated as a 125 or 125 percent and again the product of two will be equal to 0.20. In the same way if the observed time or the time being taken by the worker is 0.25 minutes, then he will be taking longer time and he will rated low say 80 percent and the product of the two again will be the same.

So, for calculating the basic time, here we use the observed time into the rating being assigned by the time study men to the worker and the standard rating. The standard rating is always 100 percent and the rating of the worker can vary it depending upon his face of working.

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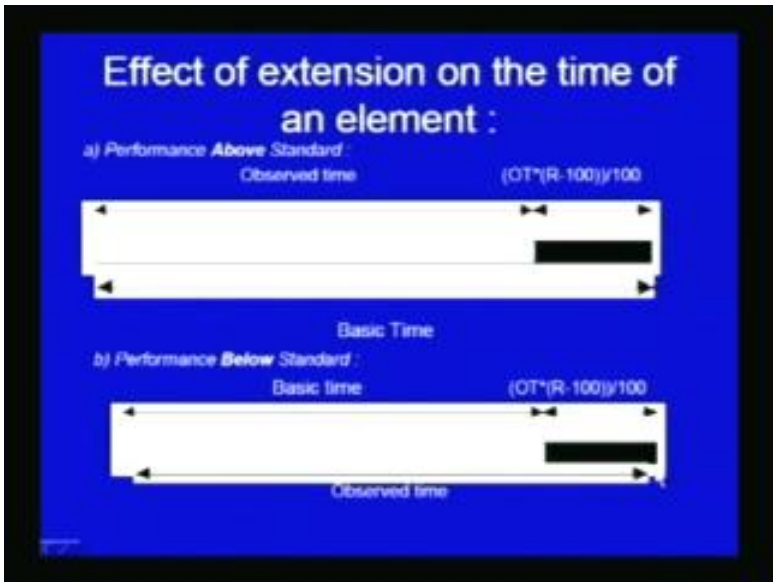

So here, now we will see another way by which we arrive to the standard time and how the performance of the worker or the rating which is being assigned to the worker can affect the total time required for carrying out the job. If we see here if the performance of the worker above the standard is can be shown using this block diagram schematically.

Here, it shows that if this is the basic time required for carrying out the job which is corresponding to the standard time and it actually worker takes less time that is this observed time is less than the basic time than the observe workers performance will be greater. And, that extent of the extent by which worker performance is greater than the standard performance is indicated by this dark zone which can be calculated means this extra time means the time by which the time which is less than the basic time can be calculated from the observed time into R minus 100 divided by 100.

So here, this is a block diagram shows that observed time being taken by the worker is less than the basic time and therefore, the performance of the worker is rated higher than the standard performance. If the worker performance is less than the standard performance, then he will be taking longer time the than the basic time and if here this is the basic time and observed time is shown by this block and this is the extra time being taken by the worker in carrying out the same job. Means his performance is below such a standard and the time, which is being taken extra by the worker for carrying out the job can be calculated using this equation.

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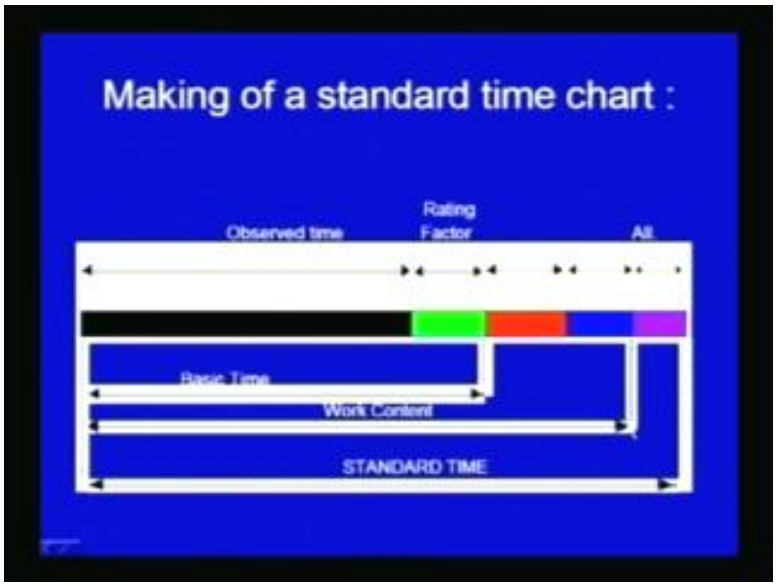

And here, this diagram shows the different constituents of the standard time which indicates that there is a basic time there is work content and the standard time in addition to the observed time rating factor and the allowance is related with. So here, this region from here to here indicates the basic time and from here to here it indicates the work content.

So, if the observed time and the rating factors are used it will give the basic time and if the some extra time is required due to re efficient product design and inefficient manufacturing method, he will take further extra time that that is the time in which some other work some additional work is required to be done on the job. And, if this work content is added with the allowances it will give us the standard time.

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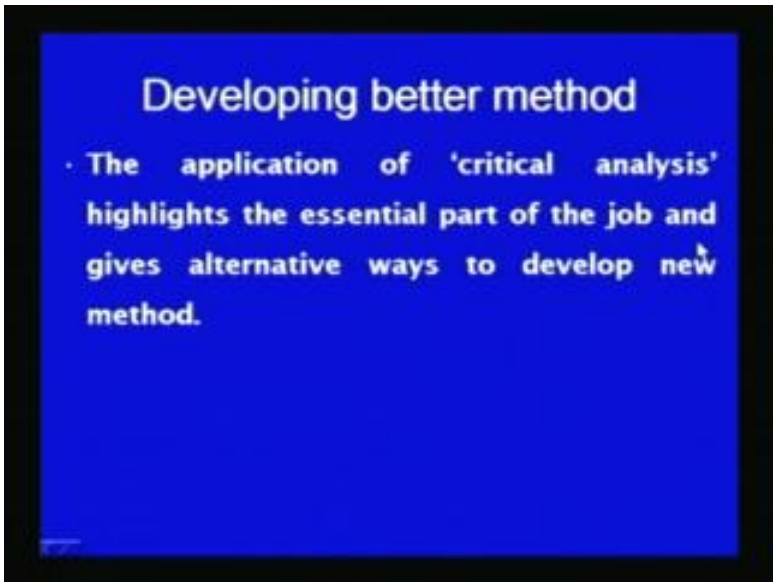

Now, after carrying out the work measurement. We will be able to see, what is the presence of ineffective time, in existing method and the presence of in a ineffective time and its extent in of the, it is in a extent in the existing method will provide the venues for developing the new method and for improving the existing method. Improvement of existing method and development of the new method is carried out effectively after work measurement which will help to identify the presence of the ineffective time and also after the critical analysis of the existing method.

Critical analysis as I have said will reveal that, what are the activities required, what are the redundant activities, where is the scope of elimination of some of the activities and what are the activities which can be combined and clubbed together in order to reduce the total time required to carry out the job.

And, that critical analysis is carried out as I have said by challenging each activity in terms of the purpose and the place where it is carried out sequence, in which it is carried out and the person who will carried out and the tools and techniques which are being used to carry out the same.

So, after identifying the presence of ineffective time carrying out the critical analysis of the existing method and from the inputs of these two areas are used inputs of these two areas are used to develop the new method. Application of the critical analysis highlights essential parts of the job and also gives the alternative ways to develop the new method.

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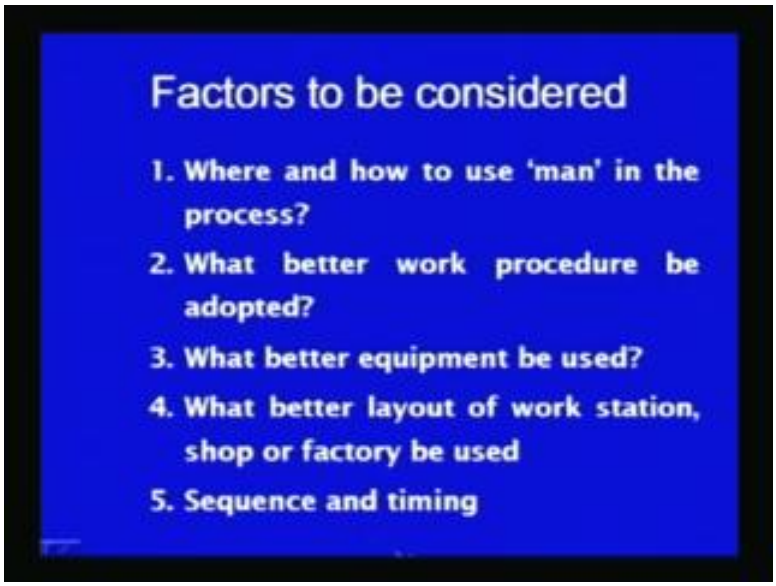

So, for developing new method we should consider some of these factors like where and how to use the man power which is available in the process, what better work procedures can be adopted, to reduce the operators fatigue and the time required for carrying out a given job.

And, what better equipment can be used; so that higher productivity can be achieved better quality product can be obtained, what better layout of the work station shop or factories to be used. So, that unnecessary extra movements and movement of men and material can be reduced in order to reduce ineffective time and added work content. Efforts can also be made to see what kind of changes in the sequence, and the timing of a particular activity or the different activities can be done or what changes can be done in carrying out the different activities for the improvement point of view.

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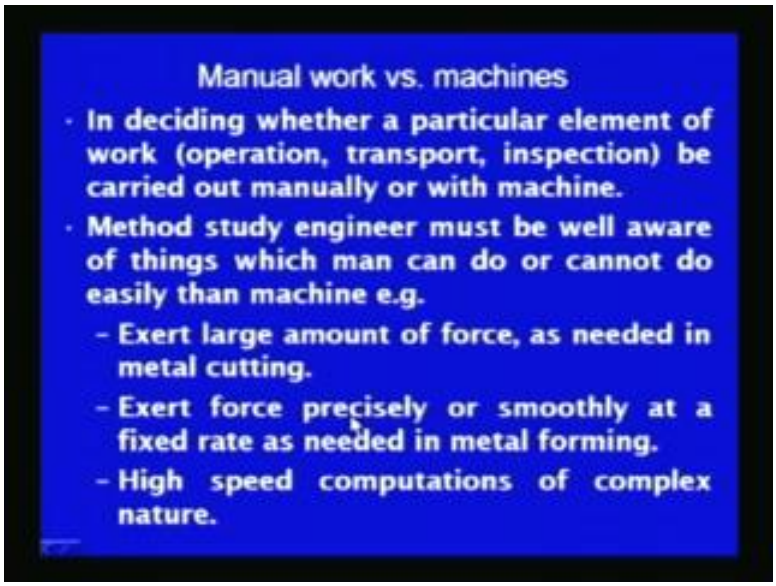

When making the efforts for developing new method and improving the existing method we have to consider whether a particular element or the activities to be carried out by the machine or by the person manually. So, decision regarding the use of the manual effort or the machine is based on the capabilities of the human being and the kind of the activities which are required to be performed either by the machine or the man.

The decision whether particular element of the work like operation transport and inspection is to be carried out manually or with the help of machine should be based on the based on the good idea about that, what a man can do and what a machine can do, what is possible to be done by man, and what will be better can be done by the machines.

For example, large amount of the force if required for say machining operation when workers cannot apply that consistently for longtime. Exerting the force precisely a smoothly at a fixed rate if required for metal forming operation and that cannot be done manually and high speed computational work, if is to be carried out then that also cannot be done manually. So, it is better to prefer the machines over the manual work, if the nature of job is such that it cannot be done effectively and easily by the operator manually.

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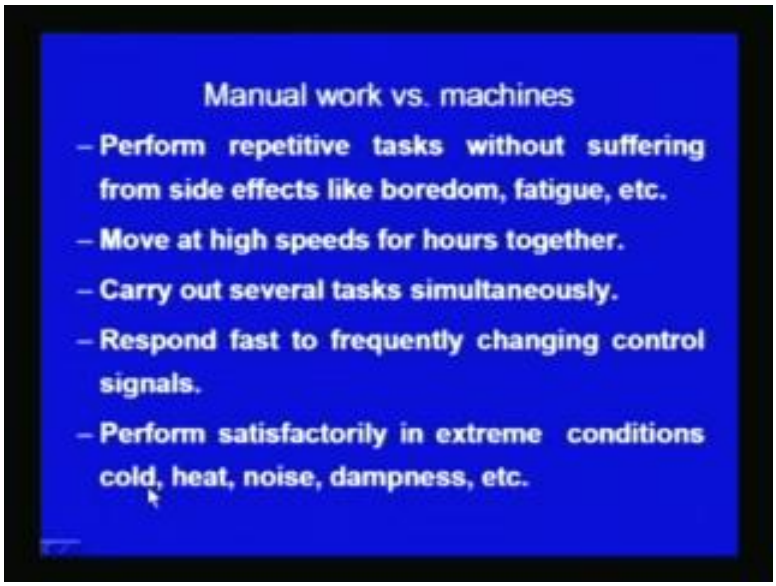

So, the decision regarding the use of the operator or of the machine for carrying out a particular job will depend upon up to what extent time study men is aware of an work is study men is aware of the capabilities of the men and the machines. To perform the repetitive tasks without suffering from the side effects like boredom and the fatigue movement at high speed for hours together. Carrying out the several tasks simultaneously respond fast to the frequent changing control signals and perform satisfactorily in extreme conditions of cold heat and noise and dampness. These are the situations where it will be better to use machines as compare to the manual work of the operator.

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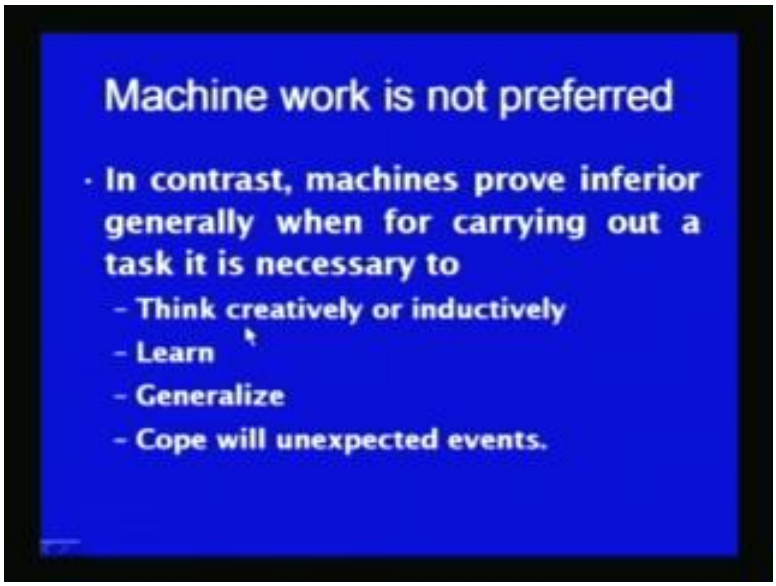

And, there are some of the situations where machine should not be preferred over the manual work. For example, if the activity such that creative thinking is a required or things are to be seen and sensed first before a taking any decision and taking the action. If the thinks are very generalized in nature, and if it is required to deal with the unexpected events during the work and under those conditions. It is good to use the machines, but the manual the activities should be carried out manually by the operator. So, in contrast machine prove inferior generally when activities are required to that thinking creatively learn generalize into cope with the unexpected events.

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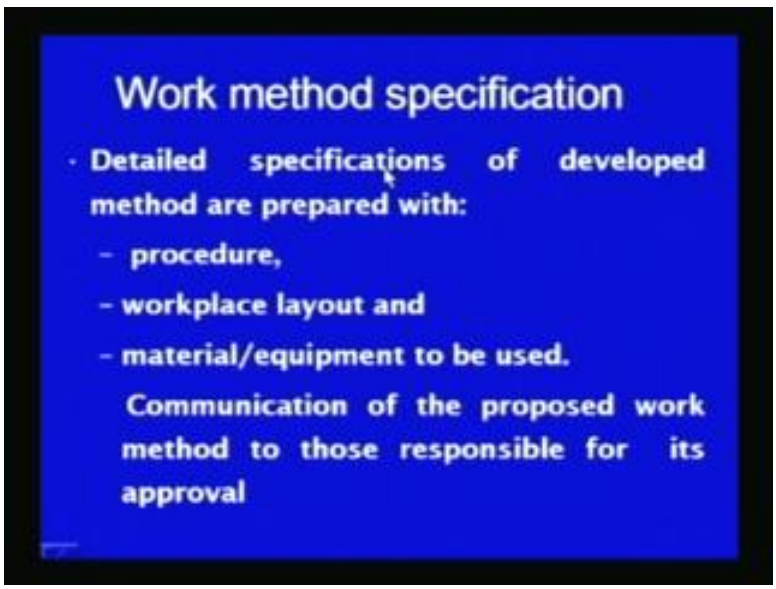

After development of the new method, should be developed about to procedure workplace layout materials and equipment to be used. And the information about the same should be communicated to for the approval of the management.

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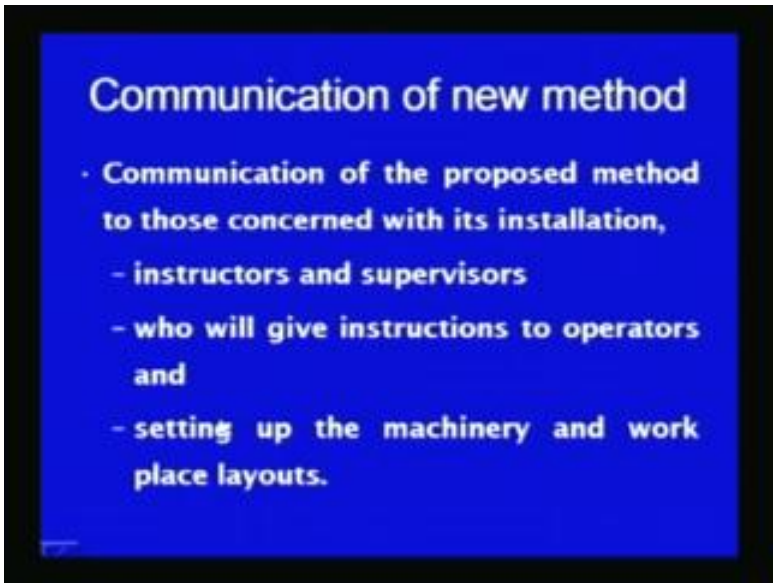

Once if the things are approved then the same should be communicated to the concerned person like operators supervisors instructors will give the suitable instructions further to the operators and other concern people. And, the information should also be given to those who are responsible for setting up of the machinery and work place layouts.

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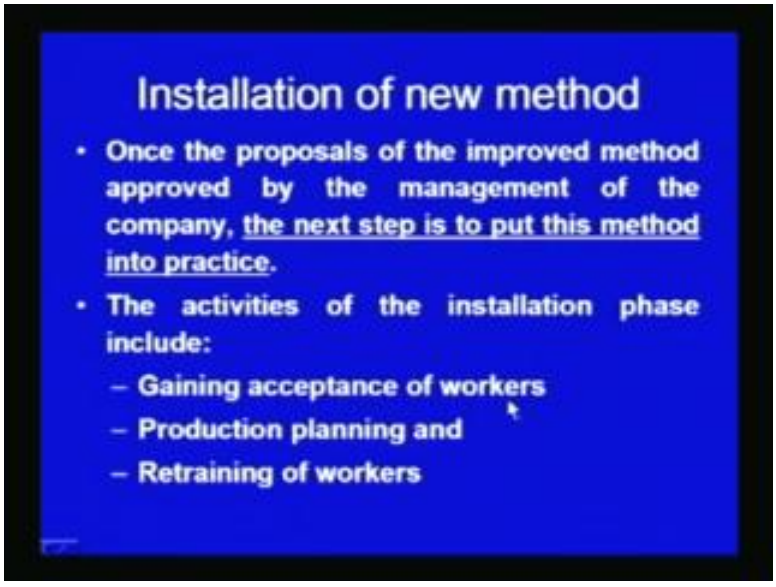

And, after communicating the things required for implementing, the new and developed method the things are installed in place. Once the proposal has been approved by the management next step is to put the things into practice. And, for putting the things into practice it is necessary to gain the acceptance of the worker, because workers may come against the new that it is not good from the standard time point of view or from the wage incentive point of view. So, they should be taken into the confidence the suitable production plans should be prepared, so that the job can be made available for carrying out as and when the operators are free. And, the retraining of the worker may also be required according to the according to the kind of change which has taken place in the new method.

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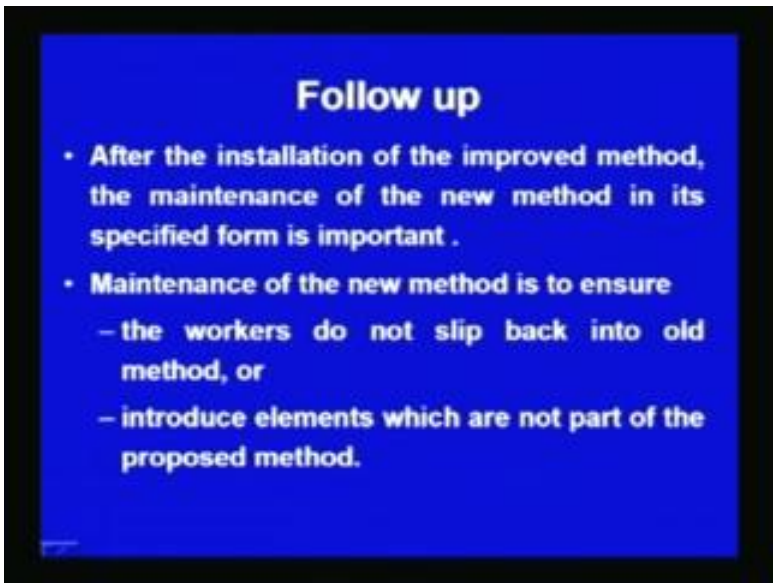

And, after gaining the acceptance of workers and a proper production planning and giving the training the new method should be implemented. And, after implementation it should be checked regularly to see that it is being followed a continuously, and maintenance of the new method is ensure to see that workers do not slip back into the old method and also they do not introduced any such thing which not a part of the standard practice.

So, now I shall conclude this presentation in which I have completed the things relate the time is study first. We have seen the different types of the elements how to find out the number of observations required for each element and how to find out the standard time,

and there after the things to be taken care of for a development of the new method and then implementation of the new method and the required follow-ups.

Thank you for your kind attention please.