Work System Design
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Lecture – 38
Steps Involved in Time Study

Namaskar friends, welcome to session 38 in our course on work system design and as you are well aware that we have started the discussion on an important topic or an important technique which is used for work study that is work measurement and currently, we are in the eighth week of our discussion and in eighth week, in the very first session we discussed about the basics or the fundamental aspects of work measurement that why do we need to time the work.

Why do we need to find out a standard time for the work? What can be the uses of this time that we have set up or that we found out using different techniques? so we have found out that there is a need to establish a standard time for doing each and every task, each and every operation and that time is very, very useful to us for establishing the other decision making in the organisation or for establishing the salaries or for finding out the task to be assigned to a person.

Or to enter into contract with our vendors that at what particular moment of time or at what particular date or in which particular month we will be able to deliver the consignment or the agreed upon material, so it is an important we can say topic which helps us in doing the overall planning of our operations in a much better manner and in work measurement, we have seen 2 sessions; the very first session was related to the utility or the importance of work measurement.

In the next session, we have seen that what are the various techniques that are used for finding out the standard time for different operations or tasks or elements or jobs and in that we have seen that there are direct methods of finding out that a standard time as well as there are indirect methods in which we use the previously available data for synthesising the standard time with the help of different types of motions of the body or the operations that are being done.

For example, the total work is divided into 3 or 4 operations, so what we can do; we can try to look up for the data for these 4 operations that what type of data is already available with us, now

whatever is already available, we will take that data and then for the operations for which the data is not available, we can do the direct observation or direct measurement and then synthesised by adding all the information available.

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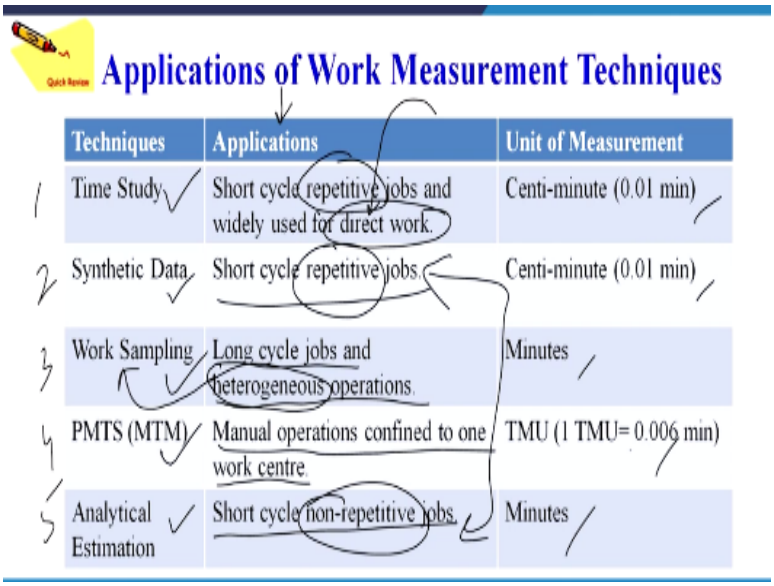

And find out the standard time for doing the task, so in the previous session, we have seen different techniques and on your screen now, you can have an idea that what are these techniques. The first one was the time study that we usually do with the help of stopwatch, then the synthetic data technique, work sampling technique in which an operator can time number of workers, he will go to the shop floor at random intervals of time.

And then he will try to see whether the worker is performing the task or he is idle and also he will see; he or she will see that whether the machine is working on its an idle state, so accordingly then based on this statistical data that is collected, we are able to find out the standard time. So, we can have a direct measurement using time study, we can use the synthetic data, then works sampling, then predetermined motion time systems like motion time measurement, MTM is given here.

And finally, the analytical estimation, we have also seen that historical data sometimes is available can also be used for finding out the standard time for doing the work. Now, these are all; 1, 2, 3, 4 and 5 techniques which are used for work measurement. Now, what are the specific

application areas for these techniques? We can see the time studies use a short cycle repetitive jobs and widely used for direct work.

So, which is important because here in this case we will directly time, operator will be told that we are going to note down the time that you are taking for performing this task and then once the operator starts working, we will use a stopwatch to find out how much time he or she is taking to complete the task, so therefore, the word direct is coming into picture here because we do the direct measurement of the operator.

Also, I must tell it is a continuous measurement of the time, so we will not stop in between as in case of work sampling, in case of work sampling, the worker will, sorry; the time study analyst will go to the worker and see whether he is working or not working, so he will not continuously observe the worker using the stop watch, he will just take a data that whether the worker is working or not working.

So, there the measurement is not direct but in this case, where we are using a stopwatch, the measurement is a direct measurement, whereas the synthetic data can be used for short cycle repetitive jobs, work something can be used for a long cycle jobs because here the other person is operating, he is doing his work independently, the time study analyst will go there and try to find out whether he is working or not.

And he can do this work sampling and not a single worker but he can do it for a combination of worker or for a team of workers also suppose, there are 10 people working on the shop floor, he can go and take the reading for all 10 workers that whether how many of them are working, how many of them are idle, maybe 5 are working, 5 are idle, he will note down worker 1, working, worker 2 idle, worker 3 working.

So, in that form he can synthesise or he can analyse the data at a later stage. First, the data collection is important, then work sampling is use for long cycle job as well as for heterogeneous operations, so wherever in case of short cycle repetitive jobs, time study is more relevant,

heterogeneous jobs work sampling is more relevant and some of you may be getting confused, maybe that where which method will be used.

So, we have around 3 weeks of discussion focused on work measurement only, so we will see each one of this technique with the applications in the form of numerical as well as the specific application areas, where these techniques can be employed. So, today, maybe we are just revising what we have covered in the previous session, we have seen that all these techniques can be used to find out the standard time for performing the work.

Then the PMTS that is predetermined motion time system, it is used for manual operations confined to one work centre, similarly the analytical estimation can be used for short cycle non-repetitive job, so synthetic data is used for short cycle repetitive jobs and analytical estimation is used for short cycle non-repetitive, so this is a major difference, repetitive and non-repetitive. So, now depending upon the application, why this slide we are showing here?

Because target for today is that we want to see the steps involved in work measurement, now for the steps we have different techniques, so different techniques may have a little variation related to the steps that we follow for establishing a standard time, so here we just want to revise that what are the various techniques and then when we go forward, when we see the steps involved maybe we will focus on the most common procedure that is adopted for finding out the standard time, which may be related to more with direct measurement of the operator.

And finding out the time required by that operator to perform the task but yes, we have different techniques as listed on your screen, which can be used for finding out the standard time. Then the units of measurement are also given for time study; centiminute, centiminute, minutes, TMU, then minutes in case of analytical estimation. Now, depending upon the type of work that we are timing or the type of work that we are trying to set the standard time for, we can use the different time units also.

And these time units we will specify when we will go to the each and every technique that is used for work measurement, so when we talk about PMTS, we will discuss, what is TMU and

why it is used for setting or why it is use a time unit for PMTS system, so this is the summary of what we have already covered in the previous 2 sessions, in our session number 36, we have just introduced the concept of work measurement, scope and objectives of work measurement, some application areas.

And then, we have seen what are the various techniques, these are the techniques which we have covered in the previous session, today, I think in the first 7 or 8 minutes, we have just revised what are the various techniques now, coming on to the steps procedures of time study, it is easy if we follow the procedure systematically, if we follow the procedure religiously, we will be able to find out the standard time for performing the task.

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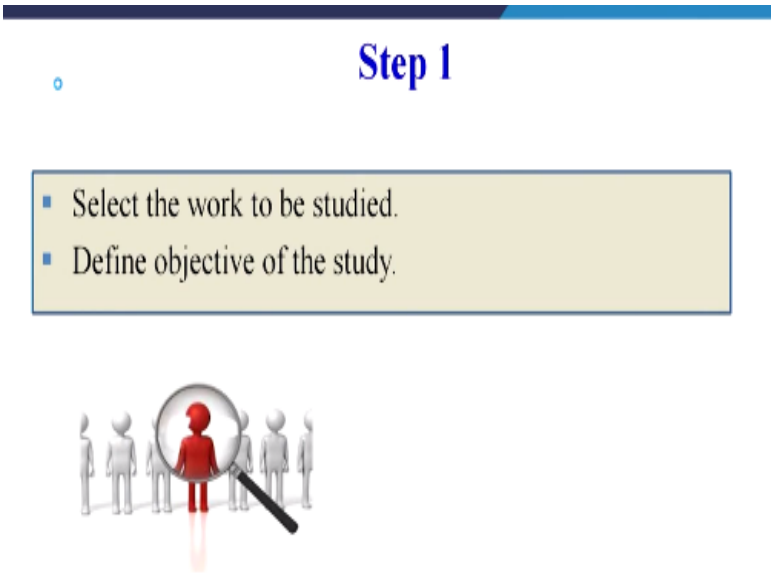

Now, what are the steps or the procedure of time study, step one is select the work to be studied, define the objective of the study, so the first you can say, step is as in the case of method study, what do we do? I have taken an example that for example, a time study or a work study analyst goes to an organisation and he is tasked with improving the productivity of the organisation, he can definitely use both these techniques.

He can use the method study technique also, he can use the work measurement technique also, now, what is expected out of him? He will try to try to find out, he will try to select that which is the work that I must improve or what is the procedure or technique of doing work which I must

improve or I must focus in the very beginning, so first is selection that which particular department, which particular shop, which particular workstation must be focused for improving the way the work is being done.

Also, we can select that where do we see that ineffective time is more and that work we can select that here, we feel that lot of time is being wasted, now how this can be avoided. Let us find out that what can be the right method in combination to that the right time that must be utilised are used for performing this task and how much percentage saving can be accounted for by the changed method in terms of the time required for doing the task.

So, both of these techniques; the method study and the work measurement go hand in hand as we have seen in the very first session in week 8, now when we introduced the concept of work measurement in that case, we have seen that work measurement will help us in doing a better decision making related to the various operations involved in the organisation. So, the important point here is that identification of the work which we want to time.

Or the identification of the work for which we want to set the time standard is the first step that has to be followed for work measurement and then we have to define the objective of the study. The objective can be defined in a very crisp and concrete manner in a very, very maybe brief description, we can give for example, to find out the standard time for drilling in 8 mm thick stainless steel plate maybe this is a very, very concrete definition of doing the time study.

Defining the objective of the study, now what is expected; thickness of the sheet is also specified, material of the sheet is also specified, maybe we can even specify the diameter of the hole also in defining the objective, so we have to be need to do there is operation being done and we want to find out the standard time for doing that operation that is the first step related to the setting up of the standard time or for performing the work measurement study.

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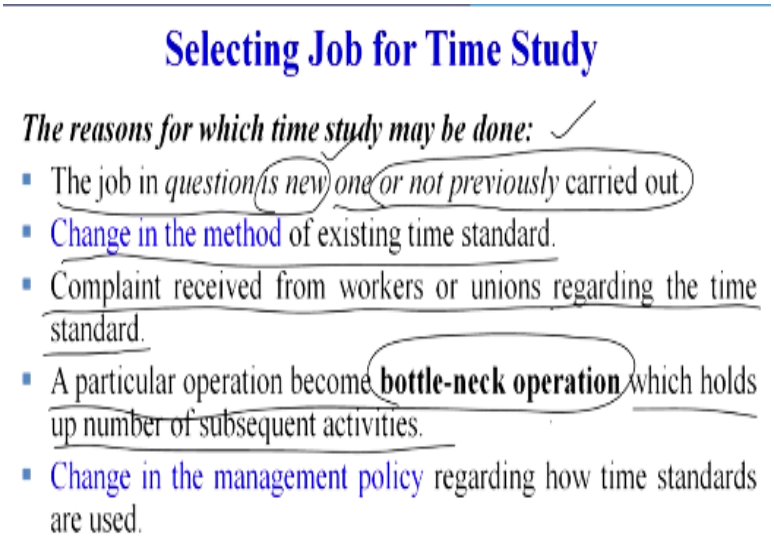

Now, for selecting the job for time study what must be kept in mind, the reasons for which time study may be done maybe we have to identify the job for which we want to find out the standard time, now how to identify that job. The job in question is new, so it may be a new job, we do not have any time standard available for that, so there is no synthetic data available or not previously carried out.

So, we may have a completely new job or there is a job which is being done in the organisation but the time standard is not available for that job, so that job can be identified and selected for doing the time study. Change in the method of existing time standard, so if there is a change in the method again, we will need to carry out the time study, complaint received from the workers or unions regarding the time standard.

So, there is already a time standard existing but the workers and the union are not satisfied, they want may be in order to deliver the quality or in order to provide proper rest to the workers between the work they are doing, they want the time must again we studied and it must be regulated for ensuring the safety as well as the wellbeing of the workers, so if there is a complaint received from the workers or unions regarding the time standard, again you need to do the time study.

First, you identify that job and you can perform a time study again by thinking of may be relaxing some of the allowances that are usually added for finding out the standard time and you need not worry, we will come to the allowances also, what are the different types of allowances, why they are given, why they are important, so here just you can remember that we can work on our methodology that we have used for setting up the standard time and try to tweak it slightly.

So that the workers feel well or workers feel satisfied and the unions are also happy and the workers contribute towards the productivity of the organisation. In many cases, a particular operation may become a bottle neck operation, which holds up a number of subsequent activities. So, if there is a bottle neck operation, we can again try to find out the time required or the standard time required for performing that operation, so that we can balance our line.

We can stop the holding up of the subsequent activity, we can avoid the holding up of the subsequent activities by doing time study on that operation for example, suppose it is a slow machine, it is holding up, there is lot of work in process waiting to be processed on that particular machine, we can do a time study and find out that what can be the standard time for doing a one work cycle or one operation on this machine.

And if you are able to find out that work time, we can very easily try to balance by putting a number of machines in series, so in maybe a line, so that there is work in process is reduced and the subsequent activities are not hanged up or not held up because of this particular a bottle neck operation. So, once we know that this machine, this is the capacity, this many number of parts it can produced in one hour accordingly, we can see that how many machines must be put in order to balance the production line.

Change in the management policy regarding how time standards are used, so as we have already seen in our session number 36 that it is very, very important for the management to know that how much work can be accomplished by n number of men and women or n number of operators working for the organisation, now the management may change their policy and because of the change in the policy, we may require the time standards to be calculated again.

And therefore, we need to; we can select those particular operations for which the management wants analysis to be done, so here we are getting some hints, we are getting some leads that these are the areas in which we can do our time study.

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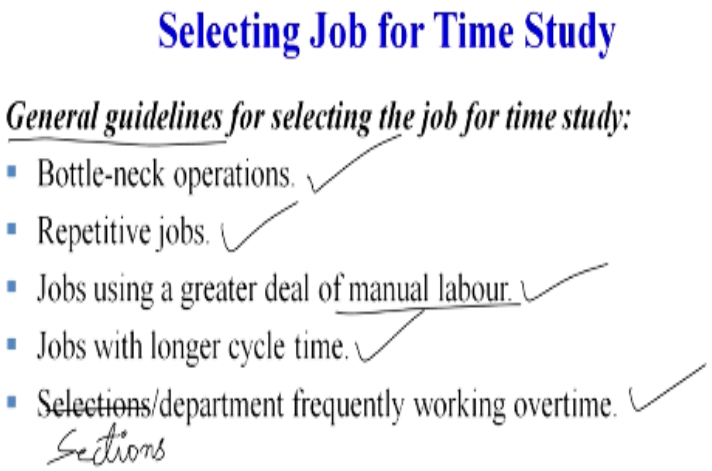

Now, general guidelines for selecting the jobs, these are the previous slide has given us some hints that these are the areas may be management wants to change the policy, their complaint, there are complaints by the workers and the unions or there is a new method which has been introduced, so these are some hints which are giving us an idea that this is the direction in which we must move and we must first focus on these operations.

But there we have put them in a very, very concrete form, general guidelines for selecting the job for time study, bottleneck operation, repetitive jobs, jobs using a greater deal of manual labour, then jobs with longer cycle times, selections, departments frequently working overtime or this is maybe this may not be the selections, it may be the sections; sections, departments frequently working overtime.

So, if may be let us focus on the last one, if constantly there is a department in which the people have to work overtime, it is really important to find out that whether the workload is higher or the rate at which the workers are working is not standard or there can be some improvements in

the procedure, so that the productivity or the labour productivity may be improved, so that is important.

We can focus on departments where people are usually working overtime to find out that what can be the standard time for performing a particular task and on top of that all are the technical factors like the bottleneck operations, already discussed, repetitive jobs, same job being done again and again we can definitely try to find out the standard time for doing their job, jobs using greater deal of manual labour.

Because it is easier to find out the time required for performing the task on a fully automatic machine but it is sometimes difficult here, wherever the manual intervention is there for manufacturing or for fabrication or processing, so there we may definitely like to do the time study analysis, so these are some of the points which will guide us that how to select and another thing is just a standard.

Because once you want; you know a particular technique, it is difficult to identify where I must focus my efforts, once you are able to identify the area of improvement, then the rest things are maybe kind of run of the mill only, it is kind of standard approach only, so your creativity, your intelligence, your brilliance comes in identification only that you are able to identify a situation where your efforts are going to a fruit for the organisations.

So, first is identification, you have identified the things that here if I put my efforts, it will lead to benefit for the organisation automatically, the other things will follow. Now, let us see; we have focused I think much more time on the selection only, now the rest of the things quickly we will try to wind up.

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Step 2

- Obtain and record all the information available about the job, the operator and working conditions likely to affect the time study.

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Second is obtained and record all the information available about the job, the operator and the working conditions, so 3 things; record all the observation regarding what; about the job, then about the operator, then about the working conditions likely to affect the time study, so there are 3 stakeholders here, the job being done or the method being followed for doing the job, the second is the operator who is performing the task or the job.

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Obtaining and Recording Information

All the relevant and necessary information regarding the method, operator and details of working conditions are recorded:

- The accuracy of time standards depends upon the correctness of the method employed by the operators. So wrong methods should not be timed.
- Details of the operator is essential to be recorded before starting actual time study.

Third one is the working conditions provided for him or her to perform the task, so we have to record all possible information, now what type of information? All the relevant and necessary information regarding the method, which I have already told operator and the details of the

working conditions are recorded. The accuracy of time standards depends upon the correctness of the method employed by the operators.

So, therefore we have already studied or we have already discussed method study, so in method study, we try to develop one best method of performing the job or the task and when we do the work measurement time study, the job must be performed as per the standardised method, which is documented, installed and maintained in the organisations, so it is very important. So, wrong methods should not be timed.

So, we must always try to find out the best method and then try to find out the standard time for performing the task using that best method, details of the operator are essential to recorded before starting the actual time study. So, if you see we already know that when we are trying to find out the standard time, we need to find time for the worker who is qualified, who is skilled, who is averagely experience, so experience, skills and qualification are important for selecting a worker for whom we are going to find out the standard time.

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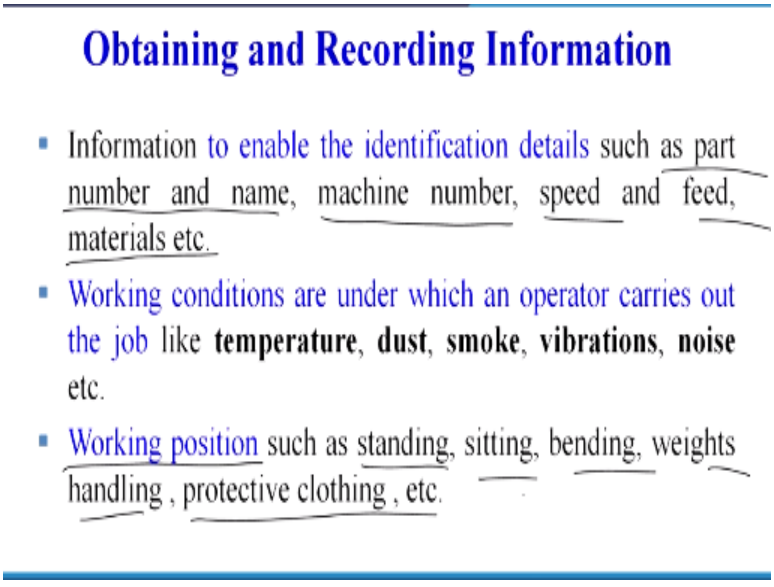

Information to enable the identification details such as part number and name, machine number, of speed feed materials, etc. must be there, so we will see in time study equipment, when we will see the time study form, in there, we will see on the top we have to fill all this information, so we have to get all possible information related to the work, the operator and the conditions. Working

conditions are under which an operator carries out the job like temperature, dust, smoke, vibrations, noise etc.

These have to also to be taken into account, working position such as standing, sitting, bending, weights handling, protective clothing etc. must also be taken into account, so when we are doing the time study we must go into all the minutest of detail related to the work, the condition, the operator, the part number, the machine number all possible information must be recorded.

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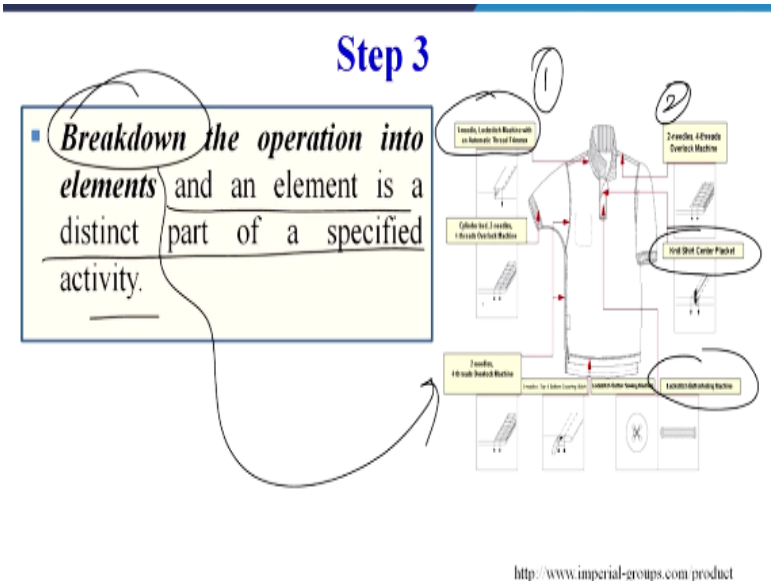

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Then, step 3 is the breaking down the operation into the elements and an element is a distinct part of the specified activity, now here you can see maybe this is stitching off a shirt, one needle locks stitch machine with an automatic thread trimmer, then knit shirt centre placket, then lock stitch, button holding machine, so for stitching a T-shirt, you can see there are number of operations which I need to be done.

So, we need to break down, so this is an example of breaking down the operation into individual elements, so these are various elements; element number 1, this can be element member 2, then may be and there will be sequence of elements which will lead to the completion of the whole operation. Now, breaking the jobs into element, which we have already seen in the previous with the help of stitching of a shirt or a T shirt.

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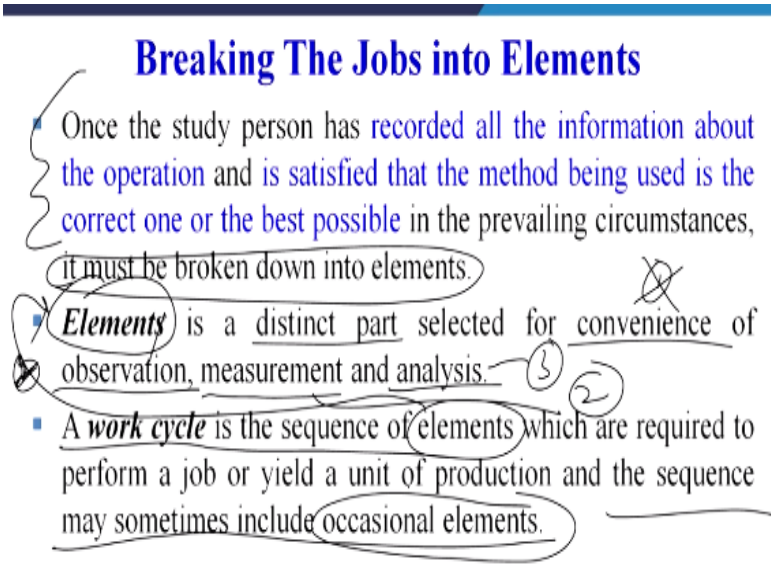

Once the study person has recorded all the information about the operation and is satisfied that the method being used is the correct one or the best possible in the prevailing circumstances, it is broken down into elements, so this is what we have already covered in the previous slide. Now, from here on we move on to breaking down the total operation into the individual elements. Now, what are the elements?

Element is a distinct part selected for convenience of observation, measurement and analysis, so we breakdown that overall operation into individual work element, now, what is the element; element is a distinct part of the work, which is selected for convenience for which we can easily find out the time observation, we can observe it distinctively and measurement and analysis, so we find it for the convenience of observation.

I think I must put one number here, these are the observation, measurement and analysis, so we want to break down the overall operation for the convenience of 3 things, we must be able to observe it properly, we must be able to record the time because we will see in our subsequent lectures what are the different types of recording instruments, which are used for recording the time, so there has to be a least count for that instrument.

And that there has to be a breakdown of the operation into the elements and the element must be such that we are able to record the time for that element using the equipment available with us.

So, we have to divide the overall work into the individual elements which we can observe which we can measure and which we can analyse. A work cycle is a sequence of elements, now the overall work is divided into the elements.

Now, work cycle is a sequence of elements, what are these elements? These elements are written here, which are required to perform a job or yield a unit of production and the sequence may sometimes include occasional elements also, so many times there may be some occasional elements which are not a part of our standard procedure or standard work cycle but maybe for some of the work cycle these occasional elements may creep in.

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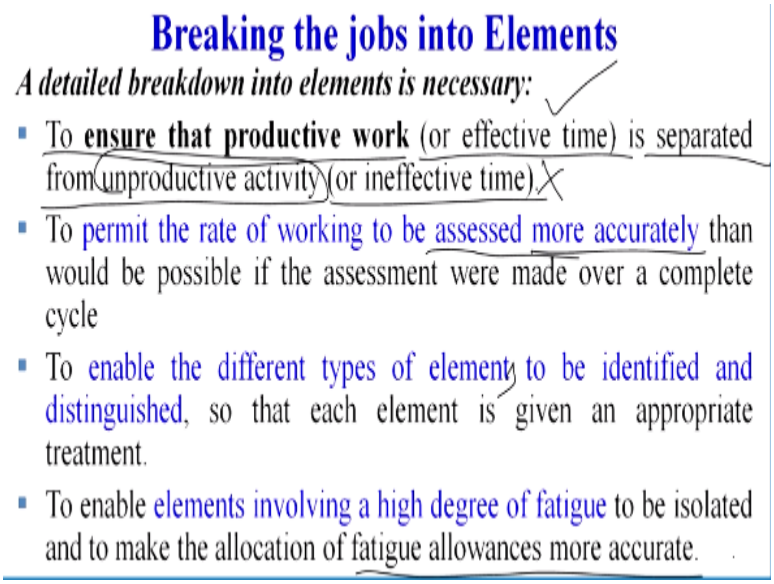

Because of certain reasons beyond the operators control, now a detailed breakdown into elements is necessary, why do we need to break down the work into the elements, to ensure the productive work or effective time is separated from unproductive activity or ineffective time, which we want to avoid, we want to focus on the effective time only, to permit the rate of working to be assessed more accurately then would be possible if the assessment were made over a complete cycle.

So, it is also possible that if we want, we do not divide the work into the individual elements has taken an example of our short; stitching of a shirt, now we try to divide it into individual elements for doing the microanalysis, we can also start the timing when the worker starts

stitching the shirt, he can use his own procedure whatever comes or right to him or whatever he feels right and when he has completely stitch the shirt and hanged in the cupboard.

Then, only we can say, now okay, now he has taken this much time but that may not yield good results, we would like, what we would like? We would like to see that among the various elements, which are adding up to the stitching up of the shirt which is the element which takes more time, which is element which takes less time, which is the element which it can be combined with another element or there can be equipment which can helped to do 2 of elements simultaneously thus saving the time.

So, micro detailing will help us giving us hints that these are the ineffective times and can easily be avoided, so we breakdown in order to ensure that productive work is separated from unproductive activity to permit the rate of working to be assessed more accurately than would be possible if the assessment were made on an overall complete cycle to enable the different types of elements to be identified and distinguished.

So, that each element is given an appropriate treatment which I have already highlighted to enable elements involving a high degree of fatigue to be isolated and to make the allocation of fatigue allowance more accurate, so the elements involving a high degree of fatigue can also be identified with the help of breaking down of the overall job into the individual elements and these elements with high degree of fatigue we can focus on them.

And try to identify means and mechanisms to lower down this fatigue or we can give them specific treatment and add certain fatigue allowances; allowances we will cover in our subsequent sessions. Now, step 4 is now, what we have done just briefly revise what we have done, we have identified the job, then we have broken down the job into the individual elements and we have understood why do we need to break down the job into individual element.

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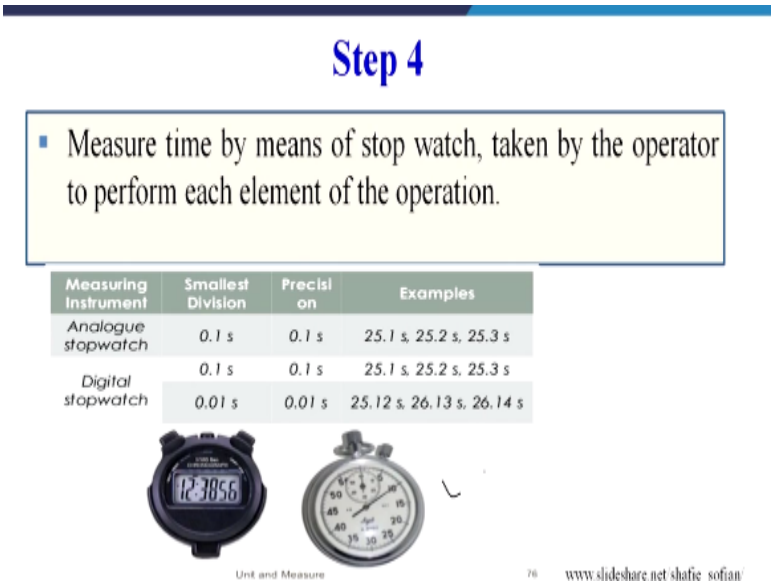

Measure the time by means of a stop watch taken by the operator to perform each element of the operation, now there are few stop watch is shown here and one digital one is shown here, so we will focus this in our next session that what are the different types of stopwatches, so once we have record; once we have broken down the overall work into the individual elements, we will find out time required for each element.

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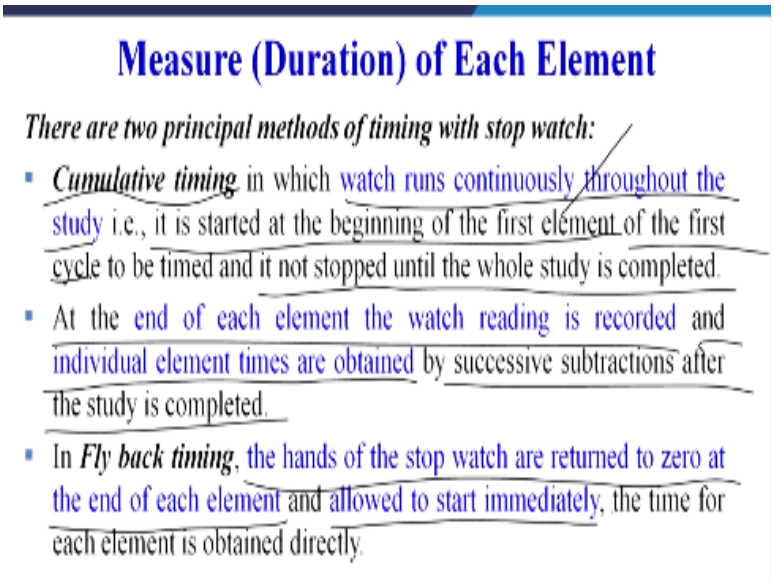

Then, when we measure the time for each element, there are 2 principal methods of timing with the stopwatch. What are these elements? Now, these elements are cumulative timing in which watch runs continuously throughout the study that is it is started at the beginning of the first element of the first cycle to be timed and it stopped until the whole study is completed, so it is very, very cumulative.

You start for the first element and then continue this till the end of the work cycle, cumulative in which watch runs continuously throughout the study, it is started at the beginning of the first element, so when the first element is starting, you will start your watch of the first cycle, it is not stopped until the whole study is completed, so that is once you start, it will keep on recording the time.

At the end of each element, the watch reading is recorded and individual element times are obtained by successive subtraction after the study is completed. Now, for each and every element you can find out the time from the total time that we have recorded, so again I am reading; at the

end of each element, the watch reading is recorded and individual element times are obtained by successive subtractions after the study is completed.

Whereas in fly back timing, the hands of the stop watch are returned to 0 at end of each element, whereas in previous case cumulative timing is taken, so cumulative timing means that continuously at the start of the first element you will start and then after the end of the work cycle you will stop but here the hands of the stop watch are returned to 0 at the end of each element and allowed to start immediately, the time for each element is obtained directly.

Whereas, in case of the cumulative timing we are doing success subtractions to find out the time for each element but here it is obtained directly, so with this we closed down the today's session, the time is over, I wanted to cover the complete steps involved but at least we know now by the end of today's session that we are going to record the time directly using a stopwatch. In the next session we will start with the subsequent steps.

Once we have noted down the time for each element using the direct observation, what we can do with this time and how the standard time is found out, so in the next session we will also focus on the different types of time study equipment. Thank you.