Work System Design
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Lecture - 45
Work Measurement: Applications

Namashkar friends. Welcome to the last session for this week and in this week our focus was primarily to find out the standard time for performing a task and we have seen certain numerical problems also in which we have try to find out the standard time required for performing the task. So all of you are well aware about the approach that we follow for calculation of the standard time.

We use various entities; we try to record the observed time then we try to find out the allowances or we try to fix up the allowances. Then, based on the observed time and the allowances as well as based on the rating factor or the performance rating factor, we do mathematical calculations and establish the standard time for performing a task. So up to this point it is purely mathematical as well as theoretical.

But the important point that we must note is that how to use this standard time or what are the applications of this standard time and if you see in the previous introductory part of work measurement we have seen that there are lot of applications of this standard time. Why do we need to measure the work, why do we need to establish the standard time for performing a task? we have already seen that.

Today we will try to further understand or develop and understanding that work measurement data or the time that is required for performing a task or the standard time required for completion of a task or an activity or an operation is very, very important, not only from the point of view of assessing our capabilities or projecting our expectations.

It is also important from the point of view of procurement of materials, from the point of view of establishing the salary of our employees, from the point of view of giving bonus, extra time to our employees. So the standard time data is not only relevant in one particular domain but it is useful in multiple domains and in multiple areas. So therefore we have

specifically tried to give adequate attention or adequate time for finding out the application areas of this data.

Or the standard time that we are going to calculate using the standard approach which we have already understood. So in today's session, it maybe a brief session but we will try to see what are the application areas, where the data that we find out or we calculate using the standard formulae can be used. Now let us see what are the applications now? Why work measurement?

We have already seen that it is just a repetition so again I am quickly going to read through.

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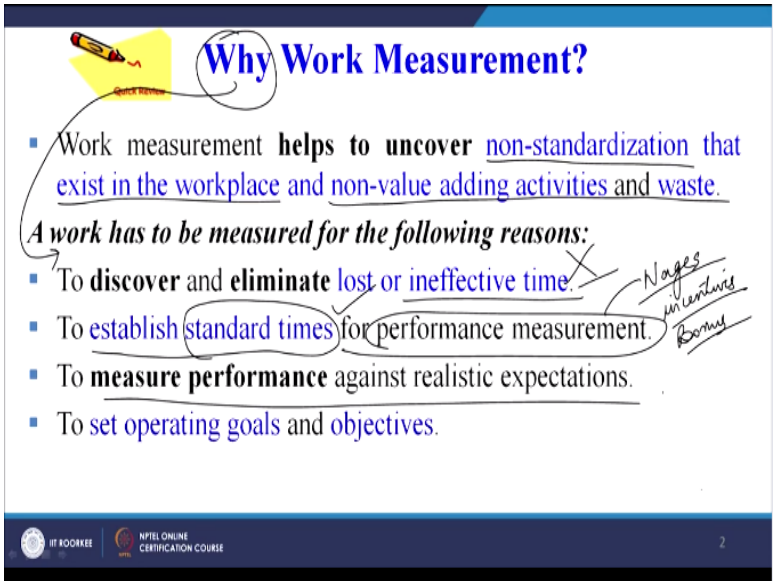

Now work measurement helps to uncover the non-standardization that exists in the work place and non-value adding activities and waste. So we can very easily establish some of the activities or some of the operations which are redundant or may not be required but certainly they may be adding up some time into the overall work cycle or the overall time that is being spent for performing that task.

So sometimes we may not be able to identify this non-value adding activities until and unless we do a regress analysis of each and every work element. Now suppose the work can be divided into 5 different elements. So element number one, e1, e2, e3, e4, e5 so you have 5 elements. Now we add up these 5 elements to get the complete work but when we do the analysis we may find out that element number 4 is taking lot of time.

And it can be redesigned in some way or some assistive device can be used for performing the work element number 4 and the overall time can be reduced and in many cases there may be a work element which is being done but is not adding any value to the overall work cycle. So those type of non-value added activities can easily be identified, non-standardization that exist in the work place can also be identified if we do a proper work measurement.

Now non-standardization can be that there can be a standard operating procedure or a protocol against which we have to work or as per the guidelines we have to work. So as per the SOP or the standard operating procedure we may indirectly or may be unknowingly add one or 2 additional work elements which may not be relevant or which may not be required but are there because of our habit of doing the way in a particular manner.

So when we do the work measurement, we break down the work into the individual elements then only we are able to identify that these are some of the additional elements that we are doing and can easily be avoided. Therefore, the work measurement helps to uncover non-standardization that exist in the work place and non-value adding activities as well as waste. So a work has to be measured for the following reason.

Now that is very, very important why the work need to be measured. So one by one let us see to discover and eliminate lost of ineffective time. So we want to reduce the ineffective time or we want to eliminate the ineffective time. To establish standard times for performance measurement so this is something which we try to calculate.

And we have already calculated in our previous sessions that a standard time required for performing a task at a defined level of performers using the standard method of doing the work or the best method of doing the work. So we try to find out the standard time, why? For performance measurement because based on the performance measurement we have to identify the wages, we have to identify the incentives and sometimes the bonus also.

So therefore the performance measurement is required and based on which criteria we can evaluate or we can compare the work being done by the various operators or workers based on the standard time. Now suppose the standard time for performing a particular work cycle or particular work is one hour. Now suppose 6 work elements or maybe we can say 6 products have to be produced by the person or the operator in 8-hour shift.

So each product as I have already told will take one hour, may be it can be stitching of a shirt or a stitching of a trouser or it can be any work. So that work will take one hour and in an 8-hour shift 6 products have to be made by the worker. So that is as per the standard time calculated for stitching of a shirt or stitching of a trouser or the manufacturing of the product. Now suppose a person is producing 4 only therefore that can be a performance measurement for him.

That as per the standard time 6 products must have been manufactured but he has manufactured 4. On the contrary, there can be other person who has manufactured 7 whereas 6 were only required to be manufactured as per the standard time. So he has manufactured 7 so the performance measurement in case of 7 is better as compared to the expected performance.

So therefore the standard time will help us to do the comparative or the relative analysis or relative grading of the operators. The third point is to measure the performance against realistic expectations so that already is explained in the previous point only that there have to be realistic expectations that maybe a person is in the shop floor for 8 hours. He can produce a product in one hour, so maybe realistically if he performs as per the capability he may be able to perform at the maximum 7 or 8 products.

So that is the performance can be measured in the realistic terms also to set the operating goals and objectives. So based on that there can be universal or institutional goals can be set that for example 100 workers can assemble 200 cars suppose in a day, so they can set the realistic goals or the institutional objectives and goals that this many number of cars we will be able to produce in a week.

And this many number of cars we must be able to produce in a month then in a quarter followed by a year. So we can set our operating goals and objectives if we have this standard time data available with us for performing the various operations, activities, tasks and in a more general form the work being done in an organization. So if we can find out the standard time for performing the work, we can achieve all these 4 points which are mentioned here.

So we will try to go in slightly more depth related to this topic and try to see one by one that how this data is useful for us or how this number in terms of standard time is useful for us.

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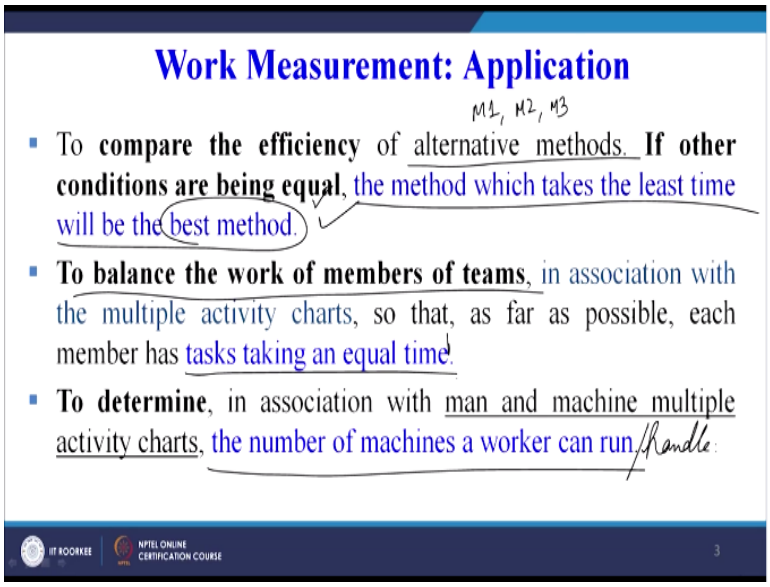

So another point is to compare the efficiency of the alternative methods. So alternative methods can be that we may have method 1, method 2 and method 3, so we can compare the efficiency. So we can say that if all other things remain same so we must choose the method which is taking the less time but how do we find out that which method is taking the less time and which method is taking the more time.

That we can find out easily using the work measurement technique or the time study technique. So to compare the efficiency of alternative methods if other conditions are being equal which I have already highlighted, the method which takes the least time will be the best method. So we can easily find out that which one is the best method or best alternative among a number of alternatives if we are able to find out the standard time required for each and every alternative which is possible for completion of the task or for completion of the work.

Also the work measurement will help us to balance the work of the members of a team. Now suppose there are 10 members working on a particular project, so we can very easily establish you can say uniformity of work allocation among these workers if we know with precision that how much work can be accomplished by an individual in a given shift of 8 hours. So immediately we will be able to divide the total work content among the workers uniformly.

So the work measurement information or the work measurement output will be helpful in distribution of the work among the various operators, workers, programmers or may be the type of individuals engaged in performing the work. To balance the work of members of a team in association with the multiple activity charts so that as far as possible each member has tasks taking an equal time which I have already explained.

To determine in association with man and machine multiple activity charts, the number of machines a worker can run or a worker can handle. If you remember we have seen in our discussion on method study that we can very easily calculate the workers idle time and the machines idle time by plotting it in the form of a graphical chart.

So from there if the worker is idle may be 4 hours in a day and the day for him accounts for 8 hours of working time that is 8-hour shift, so out of 8 hours if he or she is free for 4 hours very easily we can do a calculation that how that 4 hours can be useful, so based on that method study tool we can very easily try to use this person not only for operating one machine but we can ask this operator to work on 2 machines.

So that simultaneously now he is operating 2 machines, he is satisfied he has more work control or decision making power, overall time utilization also improves for this worker, so the labour productivity also improves. So based on the method study information we can very easily see that the worker's time can be better utilized so in work measurement also if we have the data that this particular work can be done by one person in this much time very easily we can see that he is available with us for 8-hour duration.

And he can perform the task assigned to him on machine number A in 3 hours only. So we can see that there is remaining 5 hours we can utilize his services for operating machine B. So we can see if we have the standard time data available with us we can make lot of decisions in our organization which will lead to improvement in the productivity of our organization. So work measurement this is another list we have seen that what are the application areas.

This is another list of application areas and let us try to see that what is different in this list as compared to what we have already covered.

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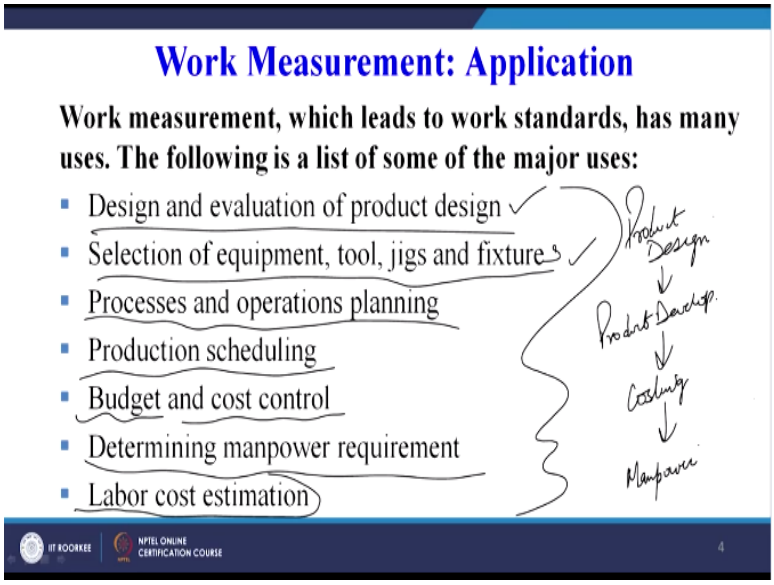

So the work measurement which leads to work standards has many uses. Now what are these uses we will see. The following is a list of some of the major applications or uses. First is design and evaluation of product design. So when we are designing a particular product we may have lot of alternatives available with us, may be the product is an assembly of 4 or 5 different parts.

Now we can see that whether these 4 or 5 parts must be used because these 5 parts will require this many number of assembly operations and for these assembly operation this much time will be required, in other part if we change the product design or in an another alternative if we change the product design we may use a different manufacturing process and then if the product can be assembled in 3 parts only but now the time required for manufacturing these 3 parts will be different.

So during product design only work measurement will be very, very useful because now we know that using alternative one this much will be the time required for making the product and using alternative 2 in which 5 different parts have to be assembled together what is the time required.

So therefore during the product design stage only we can change our design, we can do the iterative design based on the standard time required for actually manufacturing the product. Similarly, we can take other examples also. So if we have this data available with us that for converting our idea into the product or for actually manufacturing the product on the shop floor this much time will be required.

Or this is the standard time required that will help us to reiterate our design or may be do the iterations in the design in order to make it possible that we are able to produce the product or the design that we are making in the minimal possible time. Then, it will also help us in the selection of equipment, tools, jigs and fixtures. In this case also, may be many times we will use jigs and fixtures in order to do the clamping of the product.

So for clamping purposes even we have to select that which type of jigs, which type of fixtures have to be employed, in that case also it will help us that if we use these type of work holding or tool holding devices this much time will be required. If we have auto clamping or magnetic type of work holding, tool holding devices this much time will be required. So based on that time we can select our equipment.

We can select our tools so may be many times we may have a tool which can perform 2 operations in a single go and there can be another 2 different tools who can perform or which can perform the same operation. So instead of choosing 2 different tools to perform the task we may try to choose a single tool which can perform both that tasks. Now that we can only decide if we know that what is the order of difference in the time.

That if we choose the 2 separate operations or we choose a single operation with multi point tool or may be a tool which can perform 2 operations. When we know the standard time for both these opportunities, both these alternatives then only we will be able to make a scientific judgment or an informed judgment regarding which particular tool to select which particular work holding, tool holding fixtures and jigs to choose.

So therefore this data is also useful in the selection of our equipment also. Then also based on the same thing same logic we have selection of processes and operations planning also. So tools and equipment is selected work holding, tool holding fixtures, jigs are selected then we already have initially changed the design, then we have selected the equipment then the processes are also selected.

Sometimes there may be a competition between casting as well as machining whether to go for casting or to go for machining both can be used for making the product. So when we know that by casting this is the standard time required for performing the task or for getting

the product and for machining this is the standard time required for manufacturing the product, so then it will help us to make our decision in a much better manner.

Similarly, the operations planning can also be done. Now we know out of casting and machining now suppose we have chosen machining, now for machining now we know what is the standard time required so we can do the complete analysis and we can do a complete sequencing of the various operations to be done out of which machining is one operation followed by the subsequent operations which may be a finishing operation may follow the machining operation.

We can do the operational planning that how or what will be the sequence for the product manufacturing when we are making a product. Then, once this route is final, we can use our standard time data for production scheduling. Now we can schedule our things properly because for each and every work station we know how much time will be required or what is the standard time required for performing the various operations on the different workstations.

So once we know that we can very easily do the production scheduling that this much time will be required for machining, this much time will be required for final grinding, this much time will be required for packaging, this much time will be required for moving the material to the warehouse. So once on each and every workstation we know what is the standard time required, our scheduling becomes much much better.

Then, we have to find out that what must be the budget required for making may be 100 products or 100 cars, 500 cars, 5000 cars, 50,000 cars. So when we know this much time will be required for performing a task very easily we commit our machines, we commit the labour for that particular operation. Therefore, based on the labour requirements, based on the machine requirements, based on the raw material that goes into the product we can prepare our budget.

And once our budget is ready we can focus on various approaches to control the cost involved in the budget. So therefore the standard time or the work measurement information is not only useful for preparing our budge but is also useful for the cost control purposes also.

Then, it can help us in determining the manpower requirement which is also very, very important. We know that a single person can perform this much work in an 8-hour shift.

Why? Because we have done a time study analysis. Based on that information very easily we can determine the total work content is this much, how many people will be required to perform this task, so we know that with certainty with scientific calculations that this many number of people will be required or this many number of labour hours will be required to perform or to complete this task.

Then, once we know the number of people very easily we can calculate that what will be the labour cost involved because now we can calculate how much wages needs to be paid to these workers who are going to perform this task. So if you look at the overall points we can see that from product design to product development to the costing to the manpower our work measurement data or the standard time that we calculate for performing a particular element or the overall task or job is useful at the various stages.

So it can be used at the product design stage also, it can be used by an economist or the financial advisor of the organization to prepare the budget also. So it has got within the organization it is globally required it is not just a local calculation which is going to affect a single workstation within an organization.

It is going to affect almost all the decisions within the organization related to the salaries, related to the wages, related to the bonus, related to even the selling price of the product, the cost price of the product, each and every information which we develop as a part of our work measurement exercise is very, very important for decision making in an organizational that already we have established in the previous 3, 4 slides.

So it is very important to go when we go beyond our discussion in the next week we will again be trying to see that what can be the other techniques for finding out the standard time but prior to that we need to understand the importance because already we know that how to mathematically calculate the standard time but how and where that standard time can be used that is very, very important.

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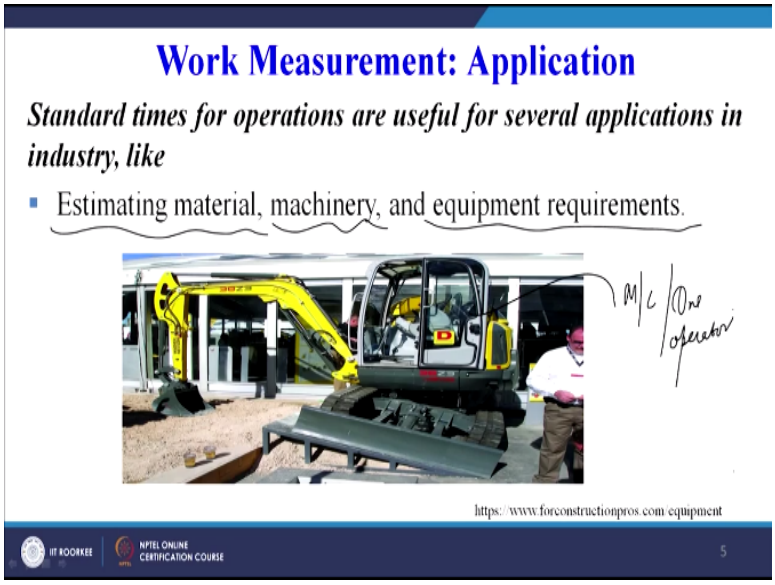

Now let us see one by one, now this is one example. Standard times for operations are useful for several applications, one by one we will try to see. It will help us in estimating the material, machinery and equipment requirements. Now we know that if we know the standard time required for maybe here we can see a single machine with one operator that how much work can be done by this machine using a single operator in an 8-hour shift.

Or what is the standard time of doing a particular work using a single machine and one operator, we can very easily see that how many such equipment will be required or how many such machines will be required to perform the complete task.

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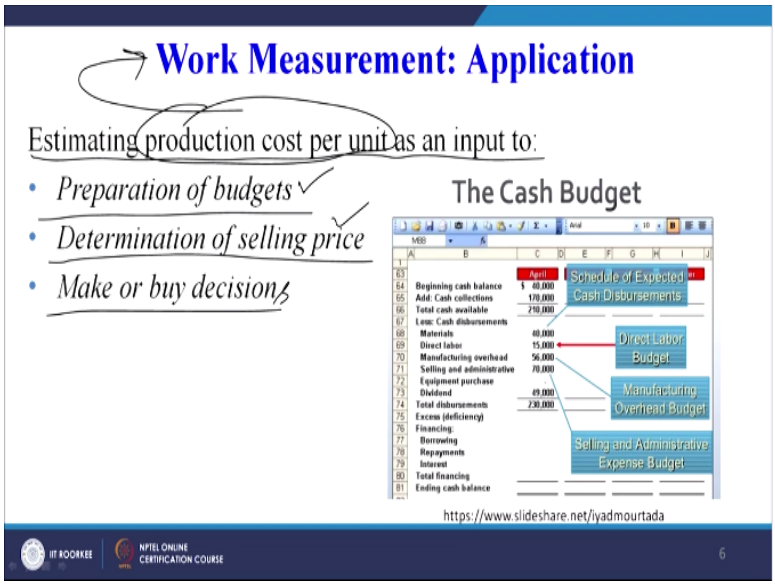

Then coming on to the estimating production cost per unit as an input to, now we can very easily estimate the production cost per unit and this can be used as an input for preparation of

budgets which we have already seen. Determination of selling price already I have explained, make or buy decisions. So many times it may so happen that we have option available with us, we are manufacturing a product for example we are manufacturing this pointer.

So we have a choice that whether we can make the body and the internal circuitry also in our organization or we buy the body from some other organization we only focus on the internal circuit of this pointer. So that decision we have to make that whether we must make the body or we must buy the body from any injection molder, so therefore this type of decisions can easily be made when we have the work measurement data or information available with us.

So work measurement another application is estimating the production cost per unit as an input to so this production cost per unit can be estimated using the work measurement data and once we know the production cost per unit very easily we can prepare the budget. We can determine our selling price as well as we can decide whether to make the product or to buy the product.

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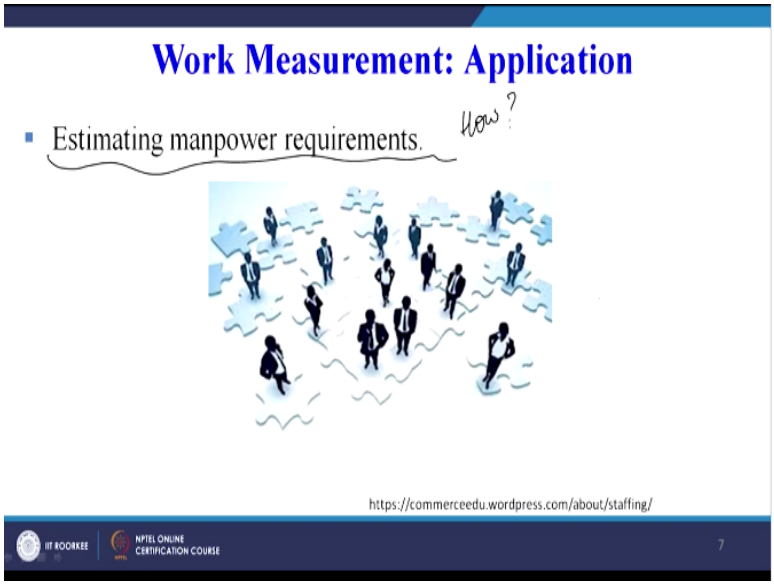

Similarly, we have already seen it can be used for estimating the manpower requirements that how many people are required for completing the work because we know now that one person can perform this much amount of work in this much time that standard time is already known to us as an output of the work measurement techniques.

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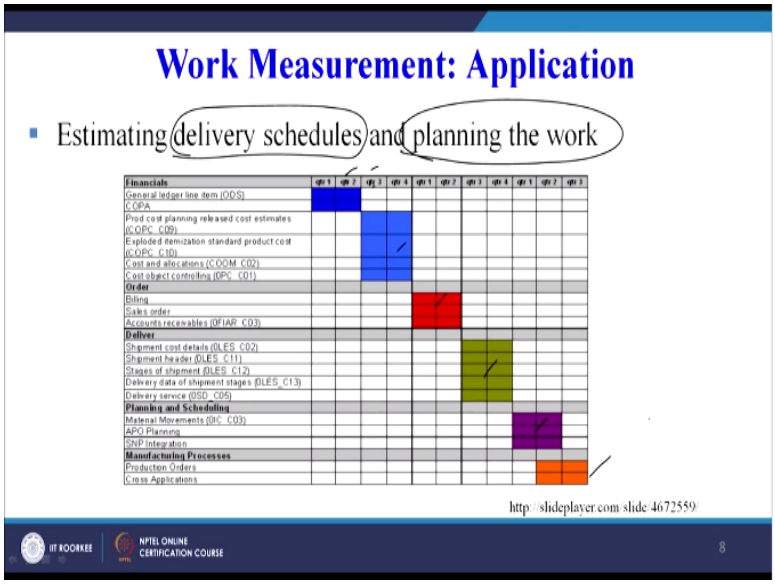

Then, estimating delivery schedules and planning at work already we have seen that delivery schedules and planning the work can easily be done because here we can see that in different quarters what are the various work elements or the activities which must be completed in order to meet the delivery schedule.

So work measurement information can be useful for calculating our delivery schedules as well as getting into contract agreements with our vendors because now we know that this is the standard time required for performing the work and based on that standard time we can calculate that how much time will be required to finish the work or how to schedule the various activities that are leading to the completion of the work so that we are able to meet the delivery schedule.

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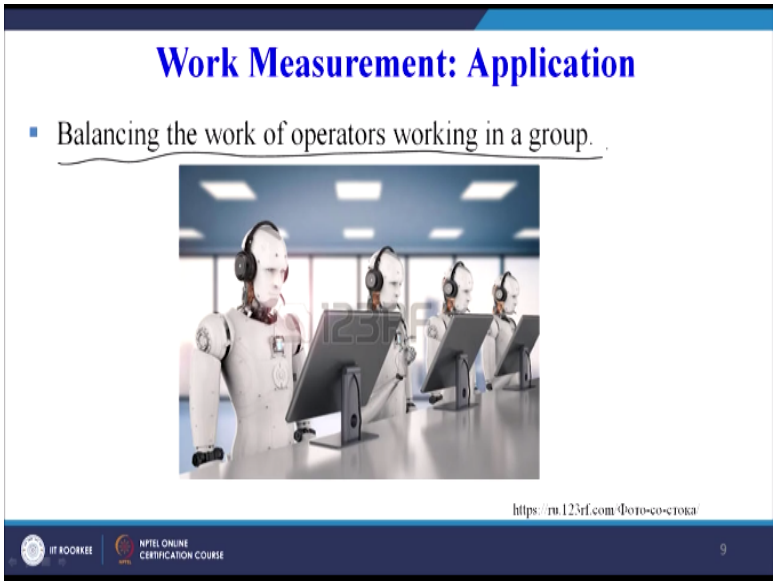

Then, it can also help these 4 people are working here, so it can help in balancing the work of operators working in a group. It must not happen that one person is only doing all the work and the remaining 3 are just passing time. So therefore it is very, very important to uniformly distribute the work among the various workers and that is only possible if we have the work measurement information available with us.

We know that a single person will be able to perform this much amount or may be a defined amount of work within an 8-hour shift and once that information is available very easily we can distribute the work among the various workers in the organization.

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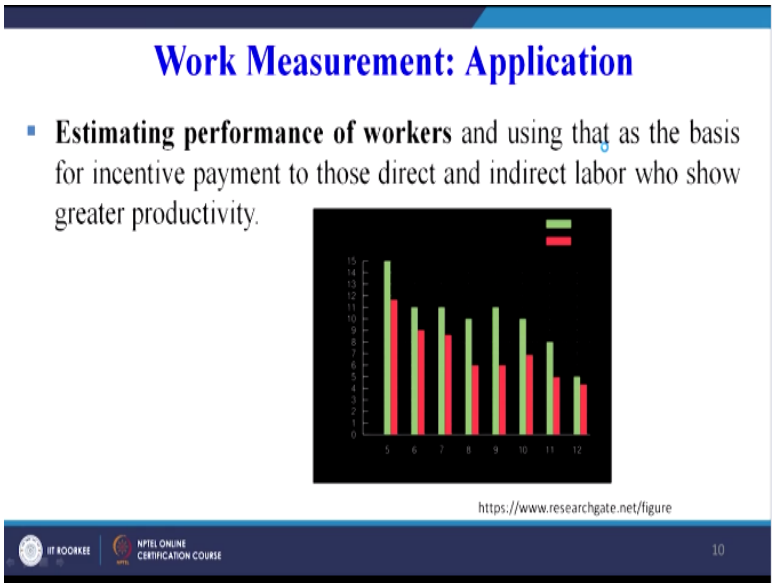

So another example another application I must say is estimating performance of workers and using that as the basis of incentive payment to those direct and indirect labour who show greater productivity. So in the beginning of today's session only we have seen that when we establish the standard time it can be used as performance measurement criteria, so here also again we can see that we can compare the performance of the various workers.

And then we can use this criteria for establishing their incentives, establishing the additional benefits that can be passed on to the workers who show the better productivity. So with this we come to the end of session number 45 and we have finalized our discussion on the calculation of standard time and in today's session our focus primarily was to establish the importance of the work measurement calculations or the work measurement information.

And how it can be used in the difference spheres of an organization so usually we see that it can be used for calculation of salary as well as the calculation of the man hours required for performing a work but after today's discussion we can very easily understand that it has got a lot of applications.

So if we are able to properly establish the standard time required for performing a task, it can help us in making a lot of decision in an organization which can lead to improvement in the productivity as well as efficiency and effectiveness of the organization. In our subsequent sessions, we will carry forward our discussion on work measurement and try to learn the various other techniques that can be used for calculation of the standard time. Of course, our focus will be on the practical applications also. Thank you.