Applied Ergonomics

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Module – 05
Lecture – 24

Hello everyone. Now again I am solving problem on the based on cycle time analysis of manual work. In previous module we tried to cover the productivity, problems on productivity and we calculated labour productivity, machine productivity and manpower productivity etcetera. So, in this module what we will I will try to focus on cycle time analysis of manual work. So, in this in this module you know you have a studied in previous week lecture modules that cycle time cycle time manual cycle time there is a two types of cycle time. Manual cycle time and machining cycle time. So, in this module I am focusing on the cycle time analysis on the manual work.

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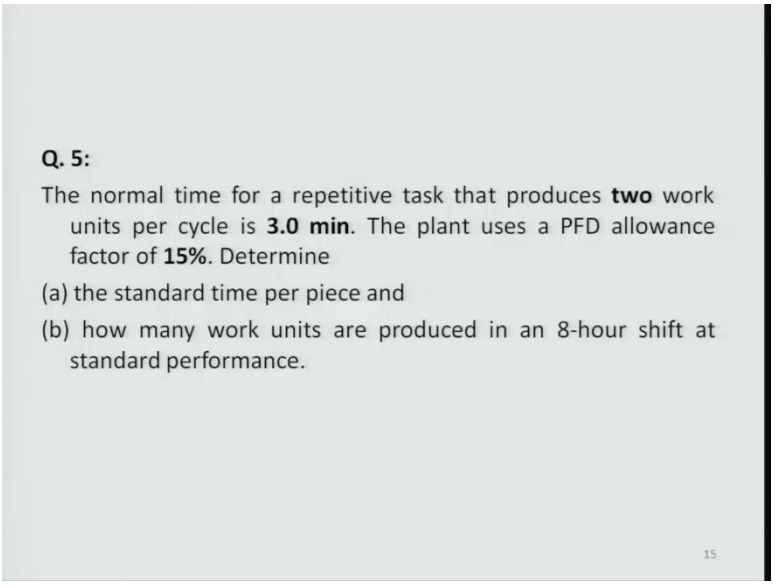

Now problem, the fifth problem is that, the problem statement is as follow. The normal time for a repetitive task that produces two work unit per cycle is three minute; that

means, normal time what is the normal time? three minute and for two work unit. And the plant uses a PFD allowances factor of 15 percent. So, determine the standard time per piece and how many work unit are produced in an 8 hour shift at standard performance.

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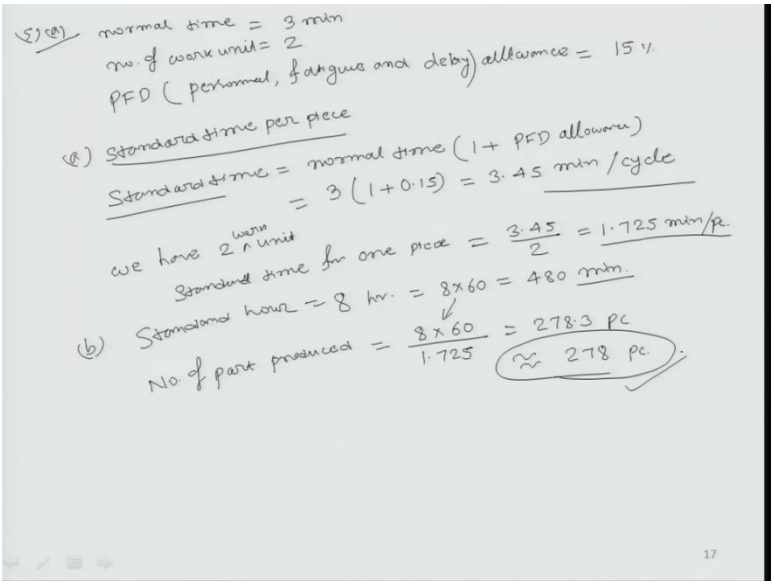

So, first you know what is the PFD? PFD is the personal fatigue and delay allowance, and that is giving 15 percent. So, first I am writing what are the things I given that is the normal time. Normal time that is 3 minute and number of work unit that is equal to 2 PFD personal fatigue and delay allowance, that is the 15 percent. Now we have to calculate standard time per piece. So, you have studied the formula for standard time. That is equal to normal time and 1 plus PFD allowance. In this case normal time is 3 minute and PFD allowance is 15 percent. So, 0.15 that will equal to 3.45 minute per cycle.

$$Standard\ time = normal\ time\left(1 + PFD\ allowance\right) = 3\left(1 + 0.15\right) = 3.45\ min/cycle$$

So, this is the standard time for per cycle. So but we have two work unit, then standard time or one piece will be equal to 3.45 divided by two. That is equal to 1.725 minute per piece. In next part what question is saying, how many work unit are produced in an 8 hour shift at standard performance. Again standard time is given, standard hour is 8. If you will convert it in minute, then what will be 8 into 60? That will be equal to 480 minute. That is the ideal time allotted to each worker in a day to work in a workshop. So, then number of part produced that is equal to 8 into 60, this one divided by how was the

in standard time per piece, that is the 1.725. This is equal to say 278.3 piece equivalent to 278 piece.

$$No\ of\ part\ produced = \frac{8*60}{1.725} = 278\ pc\ .$$

So, this one is the number of parts will be produced in a one day for giving for a given circumstances.

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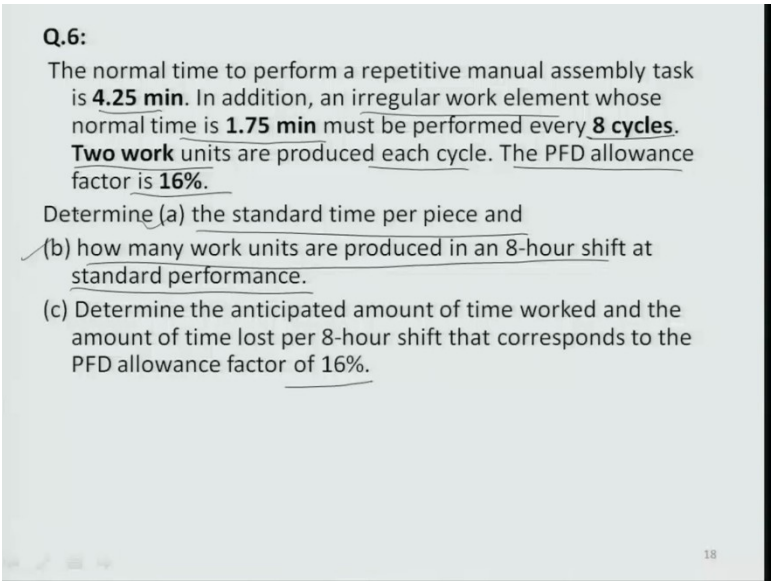

Now, I am moving to next question. In this question a normal time to perform a repetitive manual assembly task is 4.25 minute, in addition and irregular work element was normal time is 1.75 minute must be perform every 8 cycle. In addition to the normal time in this case there is an irregular work element time that is a 1.75 minute, and this to be performed in every 8 cycle. Now 2 work unit are produced each cycle the PFD allowance is 16 percent.

So, what will have to calculate? The standard time per piece. How many work units are produced in an 8 hour shift at standard performance? Then determine the anticipated amount of time worked and the amount of time lost for 8 hours shift. That corresponds to the PFD allowance factor of 16 percent.

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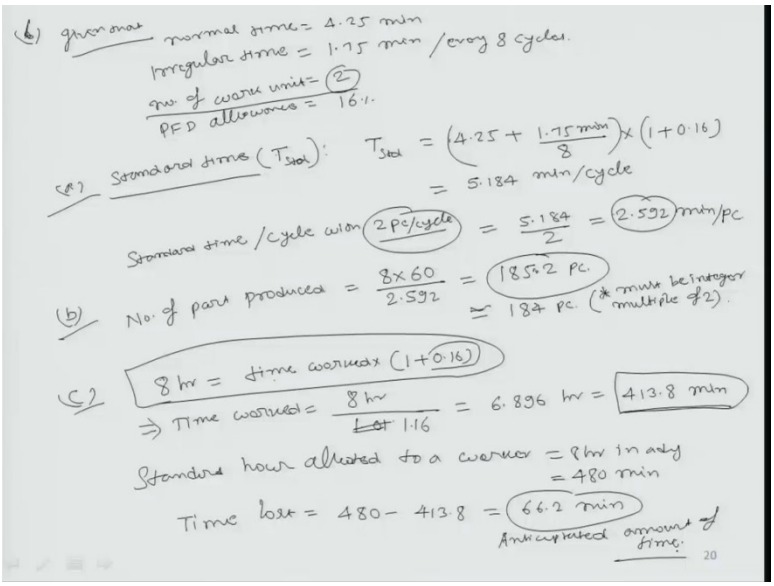

First we will calculate (a) and (b) then we will move to (c) part.

So, again in this question given that normal time that is equal to 4.25 minute irregular time is equal to 1.75 minute, and this is to be performed in every 8 cycle. Number of work unit is equal to two, PFD allowance 16 percent. Then first part is the standard time. T standard we can denote it by T standard, and what it will be? Normal time that is the 4.25 minute plus that irregular time that is the 1.75 minute and it occurs in every 8 cycle. So, per cycle what will be it can be divided it 1.7 minute divided by 8. There is a total time into 1 plus PFD allowance. That will be equal to 5.184 minute per cycle. Again number of work unit is 2.

$$Standard\ time = (normal\ time + irregular\ time) * (1 + PFD\ allowance) = \left(4.25 + \frac{1.75}{8}\right) * (1 + 0.16) = 5.184\ min$$

So, standard time per cycle with 2 piece per cycle that is the number of work unit. So, what will be? 5.184 divided by 2. That is equal to 2.592 minute per piece. Now b part. B part what question is saying how many work unit are produced in an 8 hour shift at standard performance. So, standard performance what we have to do? Is standard hour we know 8 hour? So, number of part produced 8 hour is standard hour. If you will convert into the minute then you have to multiply with 60 divided by this one standard time per piece 2.592. That is equal to 185.2 piece. Now you will have to round and this is this has to be even number, because there is number of work unit is 2.

So, this has to be even number. So, we can not go beyond 1.8, 0.2 piece. So, you will have to this one will be 184 piece. Must be integer multiple of 2.

$$No\ of\ part\ produced = \frac{8*60}{2.592} = 185.2$$

now we have calculated standard time and number of part produced till now. So, again we will move to part third. There what question is saying determined the anticipated amount of time worked and the amount of time lost per 8 hour shift that corresponds to the PFD allowance factor of 16 percent. So, standard what is the standard time for a worker in a day? That is the 8 hour. And which is to equal to how much time they have worked multiplied by, because we are doing this. Because in standard time everything is included allowance time is included. So, actual working hour this one and this is if you will include this thing the PFD allowance. So, this will be a standard working hour.

So time worked, what will be time worked? So, if you will rearrange this thing that is the 8 hour divided by 1.16 that is equal to 6.896 hour. And it if it will converted in minute then it will be 413.8 minute. So, you can see that standard time allotted to a worker that is the 8 hour in a day means 480 minute, but in actual actually they have worked for only 413.8 minute. So, what will be the time lost? 480 minus 413.8 that is the 66.2 minute. This is the anticipated amount of time.

$$Time\ lost = 480 - 413.8 = 66.2\,min$$

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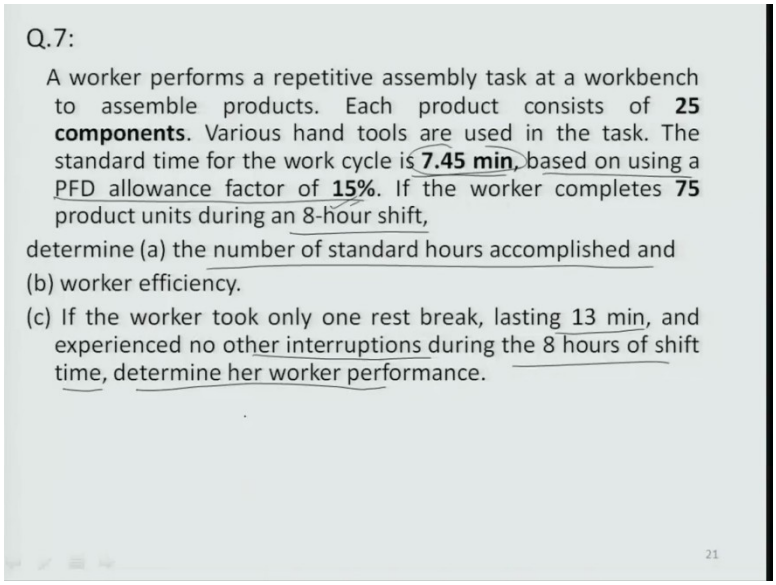

Now, we will move to next question. And in this question you can see that there is a problem statement as follows a worker performs a repetitive assembly task at a work bench to assemble products. Each product consist of 25 component. Various hand tool are used in the task. The standard time for the work cycle is 7.45 minutes based on using a PFD allowance of 15 percent. It means in this standard time they have included this PFD allowance. If the worker completes 75 product unit during an 8 hour shift, then determine the number of standard hour accomplished and work then second part is worker efficiency. Third part is if the worker took only one rest break lasting thirteen minute. And experienced no other interruption during 8 hour of the shift time determine the worker performance.

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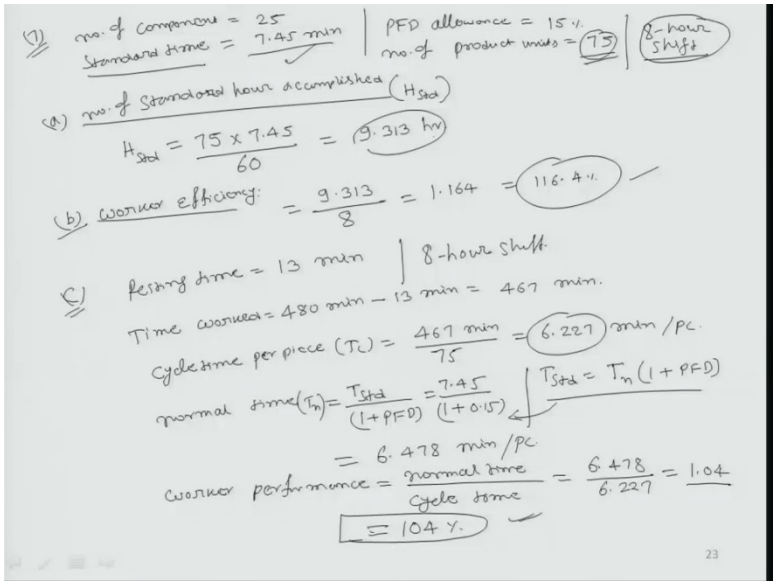

So, what problem is saying? Each product consist of 25 component, number of component is equal to 25. Standard time is equal to 7.45 minute. PFD allowance is equal to 15 percent. Number of product unit is equal to 75 and 8 hour shift. So, we will have to calculate number of standard hour accomplished. We can signify it with H std. And this will be equal to now number of product unit, how much product unit produced? 75 and what was the standard time? 7.45 minute.

So, this will be in minute. So, if you will convert. So, if you want to convert it in hour then will have to divide it with 60. Then this one will be 9.313 hour

$$H_{std} = \frac{75 * 74.5}{60} = 9.313\, hr$$

and number of standard hour accomplished. Now (b) part is saying determine worker efficiency. So, to produce 75 part and for giving given standard time 7.45 minute, and standard hour shift is 8 hour. Number of standard hour they have been accomplished is 9.313 hour, it had it is it has exceeded from exceeded from 8 hour shift.

So, worker efficiency you can see that it has been increased now. So, what will be efficiency? 9.313 divided by 8 hour. That is equal to 1.164. If you want to write in percentage then will have to multiply it with 100. So, it will be 116.4 percent.

$$Worker\ efficiency = \frac{9.313}{8} = 1.164 = 116.4$$

It means the efficiency of a worker has been increased 16.4 percent has been increased. Now we will move to third part, what question is saying? If the worker took only one rest break means resting time is equal to 13 minute. And experience no other interruption during an 8 hour of shift, then determine the worker performance.

So, first we will calculate how much time that worker worked, time worked. Allotted time was 480 minute. And resting time was 13 minute. So, exact time was 467 minute. So cycle time, what will be cycle time per piece? 467 minute divided by how much parts of product 75. That is the 6.227 minute per piece. Again normal time, and what will be normal time? You we know that T standard is equal to Tn into one plus PFD. From this relation we will calculate normal time. Then T standard divided by one plus PFD, that is equal to standard time is given 7.45 minute divided by one plus PFD allowance 0.15. And this will equal to 6.478 minute per piece.

$$Normal\ time = \frac{T_{std}}{(1 + PFD)} = \frac{7.45}{1.15} = 6.478\, min/pc$$

So now if you want to calculate workers performance, than what will be? Worker performance that will be equal to normal time divided by cycle time, 6.227 this one. And this will be equal to 1.04. So, if you will do if you want to calculate converted in percentage, then it will have to multiply this one with 100, it 104 percent. So, in this

from this question you can see that the worker performance has been increased by 4 percent. By given on given standard time to 7.45 minute.

$$Worker\ performance = \frac{normal\ time}{cycle\ time} = \frac{6.478}{6.227} = 1.04 = 104$$

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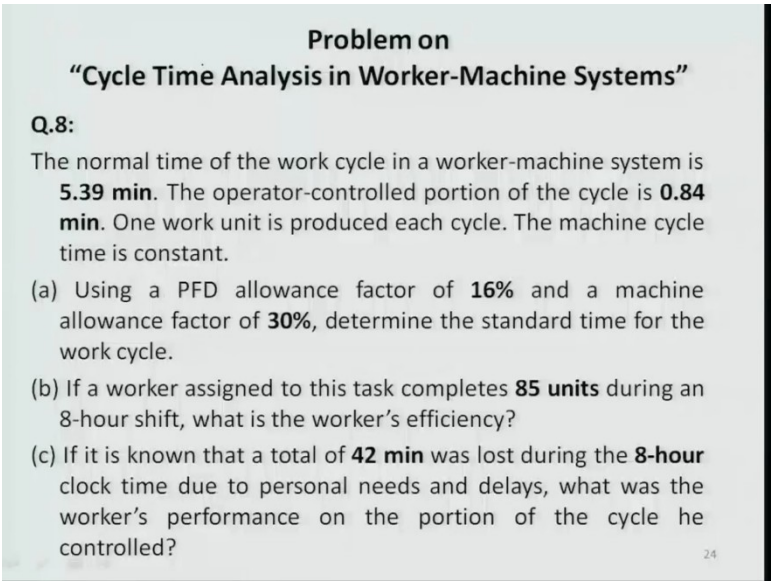

Now, I will move on next question. And again this question is based on cycle time analysis in worker machine system. So, this question based on the cycle time analysis in worker machine system. Earlier we solved problem based on earlier solved problem was based on the manual system. So, this time now we will slow on the worker machine systems. And this question I will solve in next lecture module.