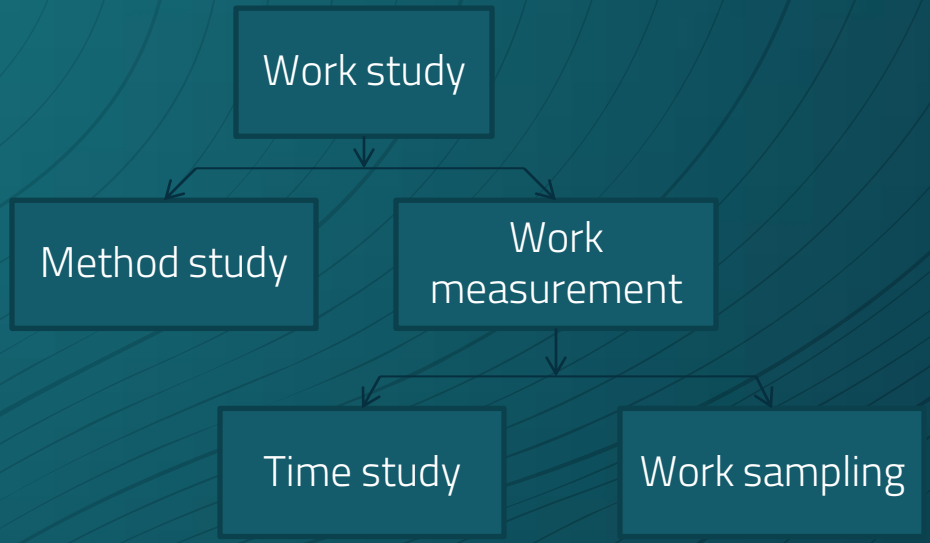
Work Study

IPE 4111

Presented By
Mahjabin Moon
Lecturer
Department of Mechanical and Production Engineering
Ahsanullah University of Science and Technology

Overview


Work study
Method study
Work measurement
Time study
Work sampling

Work Study

- Work study is the systematic examination of the methods of carrying out activities to improve the effective use of resources and to set up standards of performance for the activities being carried out.

- Work study deals with the techniques which are employed to ensure the best possible use of man, machine and material resources in carrying out a specified activity.

Objectives

- To analyze the work in order to achieve work simplification and thereby improving productivity of the system.
- To have optimum utilization of resources i.e., 3Ms.
- To evaluate the work content through work measurement.
- To set time standards for various jobs.

Method Study

- It is related with the study of methods of work for a job to design effective and efficient work system in order to achieve process improvements, improved layout, better working environment and reduced fatigue.

- It is a systematic procedure to analyze the work to eliminate unnecessary operations.

Areas of application of method study

- Improved layout of office, working areas of factories
- Improved design of plant and equipment
- Improved use of materials, plant, equipment and manpower
- Most effective handling of material
- Improved flow of work
- Standardization of methods and procedures
- Improved safety standards
- Better working conditions

Method study steps

- Select (the work to be studied)
- Define (the scope of work and identify process ownership)
- Record (all relevant information about that work)
- Examine (the recorded information)
- Develop (an improved way of doing things)
- Install (the new method as standard practice)
- Maintain (the new standard for sustainability)

ECRS

- ECRS is a process improvement tool, expanded as-
  - Eliminate
  - Combine
  - Rearrange
  - Simplify

- It is one of the lean improvement methods where different ECRS questions are asked and then execute to remove/reduce waste.

ECRS

Eliminate	• Remove redundant or non value added step
Combine	• Integrate the process step with the next
Rearrange	• Change the sequence of the process steps
Simplify	• Maintain the process step but simplify the work content

Work Measurement

- Work measurement is the techniques designed to establish the time for a qualified worker to carry out a task at a defined rate of working or at a defined level of performance.

- The fundamental purpose of work measurement is to set time standards for a job.

- Time standard provides an indication of expected output. It reflects the amount of time it should take an average worker to do a given job working under typical condition.

Work Measurement

Standards for job times are vital inputs for:

- Scheduling and capacity planning
- Measuring performance
- Provide benchmark for improvement
- Setting due date for customers

Work Measurement Techniques

There are many techniques of work measurement, two important techniques are –

1. Time study (using stop watch)
2. Work sampling

Time study

- It is used to develop a time standard based on observations of one worker taken over a number of cycles. However, it is very difficult to select the right person who should perform the job. Hence, average of a few properly trained workers' performed time is taken as the standard.

- The standard time is then applied to the work of all others in the organization who perform the same job.

Steps of Time Study

- **Step 1:** First select the job to be studied. Breakdown the work content of the job into smallest possible elements. Then inform the worker and define the best method.

- **Step 2:** Observe the time for appropriate number of cycles.

- **Step 3:** Determine the average *cycle time (CT)*

  $CT = \sum Times / \text{No. of cycles/observations}$

Steps of Time Study

- **Step 4:** Determine the *normal time (NT)*

  NT = CT × PR (Performance rating)

- **Step 5:** Determine the *standard time (ST)* using the following formula

  ST = NT/ 1- AF

Example

- In a tailor shop, a direct time study was done on a sewing operation. One experienced Textile Engineer conducted the study. He rated the worker 120 percent. He used a 10 percent allowance factor. Determine the standard time using the following data.

Observation Number	Recorded Time (mins)
1	20
2	24
3	29
4	20
5	32

Example

Given that,

PR = 120%

A = 10%

$$CT = \frac{\sum \text{Recorded Time}}{\text{No.of observations}}$$

$$= \frac{20+24+29+20+32}{5}$$

= 25 mins

Example

NT = CT × PR

= 25 × 1.2

= 30 mins

$$ST = \frac{\text{Normal Time}}{1 - \text{Allowance Factor}}$$

$$= \frac{30}{1 - 0.1}$$

= 33.33 mins

Work Sampling

- Work sampling is also a technique for establishing standard times of activities, based on statistical analysis.
- It basically focuses on determining the proportion of time the worker remains idle and the proportion of time the worker spends busy in manufacturing.
- This method is suitable for analyzing group activities and repetitive activities which take longer duration.
- NOTE: If a given individual performs more than one activity, then the time standard for each activity may be computed using this method.

Steps of work sampling

- Select the jobs which is to be studied
- Decide the total duration of observation
- Total duration of observation = No. of hours/shift × No. of shifts/day × No. of days
- Determine the number of observations to be made
- Prepare a tour schedule to take the specified number of observations over the specified time duration

Steps of work sampling

- Record performance rating of the workers and their activities as per the schedule
- Determine the acceptable no of units produced during the period
- Compute the percentage of working time on a given task using the following formula

$$\text{Percentage of working time} = \frac{\text{Frequency of performance of a task}}{\text{Total no.of observations}} \times 100$$

- Determine the Normal Time (NT)

$$\text{NT} = \frac{(\text{Total study time}) \times (\text{Percentage of working time}) \times (\text{Performance rating})}{\text{Number of acceptable units produced}}$$

Steps of work sampling

- Determine Standard Time (ST)

$$ST = \frac{\text{Normal Time}}{1 - \text{Allowance Factor}}$$

Example

- A Work-sample study was conducted over 80 hours (or, 4800 minutes) of a 2-week period. In this period, 225 accepted parts were produced by an operator, who was of 95% rating. The operator's idle time was 20%, and the total allowance for this task, given by the company is 25%. Find out the standard time for this task.

Solution:

Given,

Total study time = 4800 minutes

Number of acceptable units produced = 225

Performance Rating = 95 % = 0.95

Example

Operator's idle time = 20%

So, percentage of working time = 100-20 = 80% = 0.8

Allowance Factor = 25% = 0.25

$$NT = \frac{(4800\ \text{mins}) \times (0.8) \times (0.95)}{225\ \text{parts}}$$

= 16.21 minutes/part

$$ST = \frac{16.21}{1 - 0.25}$$

= 21.61 minutes/part

Example

- A job consists of three work elements and all are performed by the same operator. An analyst conducted work sampling to determine the standard time for the job. The duration of the study is one shift with 400 minutes of effective time. The details of the observations are summarized in following table. The total number of acceptable units produced during the study period is 150 units. Determine the standard time by assuming allowance of 10 percent.

Work element number	Frequency of performance	Performance rating
1	70	80%
2	80	120%
3	50	110%

Example

Total duration = 400 Minutes

Total number of observations = 200

The calculations for determining normal time and standard time of each of the work elements are summarized in following Table.

Work Element Number	Percentage of Working	Normal Time (Minutes)	Standard Time (Minutes)
1	(70/200)*100 = 35%	(400*0.35*0.8)/150 = 0.75	0.75/0.9 = 0.83
2	(80/200)*100= 40%	(400*0.40*1.2)/150 = 1.28	1.28/0.9 = 1.42
3	(50/200)*100= 25%	(400*0.25*1.1)/150 = 0.73	0.73/0.9 = 0.81
			Total = 3.06

Thank You