# CHAPTER 4
STOP WATCH TIME STUDY AND MOST:
WORK MEASUREMENT TECHNIQUES

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CHAPTER 4

STOP WATCH TIME STUDY AND MOST: WORK MEASUREMENT TECHNIQUES

4.1 Introduction:

Chapter 3 attempts to know what is productivity, productivity improvement, Work study and Work measurement and their relationship with improved productivity. Whereas, an attempt is made in this chapter to introduce stop watch time study and MOST measurement technique. The concepts of Stop watch time study and MOST, evolution and history, importance, uses and types is covered in this chapter. Therefore, the objective of this chapter is to know and understand above cited aspects with respect to Stop watch time study method and MOST and to achieve this present chapter is arranged as follows:

4.1 Introduction

4.2 Stop Watch Time Study Method

4.3 MOST Work Measurement technique

4.2 Stop Watch Time Study Method:

4.2.1 Meaning of Time Study:

Time study is the technique of establishing an allowed time standard to perform a given task, based upon measurement of work content of the prescribed method, with due allowance for fatigue and personal and unavoidable delays\(^1\). ILO defines time study as a work measurement technique for recording the times and rates of working for the elements of specified job carried out under specified conditions, and for analyzing the data so as to obtain the time necessary for carrying out the job at a defined level of performance\(^2\). According to Meyers (2002)\(^3\), time standards can be defined as “the time required to produce a product at a work station with the three
conditions: (1) a qualified, well-trained operator, (2) working at a normal pace, and (3) doing a specific task.”

4.2.2 Time Study Techniques/Types:

Time study is usually referred to as work measurement and it involves the technique of establishing an allowed time standard to perform a given task, based on measurement of the work content of the prescribed method and with due allowance for fatigue, personal or unavoidable delays. Establishes time values are a step in systematic procedure of developing new work centers and improving methods in existing work centers. Chart 4.1 presents time study techniques.

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Source</th>
<th>Time Study Techniques</th>
</tr>
</thead>
</table>
| 1     | Barnes, (1980) | • Standard Data  
|       |        | • Work Sampling  
|       |        | • Predetermined Time Standard System (PTS)  
|       |        | • Stopwatch Time Study |
| 2     | Niebel, (1993) | • Stopwatch Time Study  
|       |        | • Computerized Data Collection  
|       |        | • Standard Data  
|       |        | • Fundamental Motion Data  
|       |        | • Work Sampling and Historical Data |
| 3     | Lawrences, (2000) | • Time Study  
|       |        | • Standard Data Systems  
|       |        | • Predetermined Time Systems (PTS)  
|       |        | • Work Sampling  
|       |        | • Physiological Work Measurement  
|       |        | • Labor Reporting |
|       |        | • Stopwatch Time Study  
|       |        | • Work Sampling  
|       |        | • Standard Data  
|       |        | • Expert Opinion and Historical Data |
| 5     | Niebel and Freivalds, (2003) | • Time Study  
|       |        | • Standard Data and Formulas  
|       |        | • Predetermine Time Systems  
|       |        | • Work Sampling  
|       |        | • Indirect and Expense Labor Standards |

To do time study various experts provided with the various techniques of time study which are summarized in chart 4.1. The time technique is discussed by five different sources. Most of the technique had a same method but differ by name. The detail descriptions on the techniques are shown as below:

4.2.3 Stopwatch Time Study Method:

Work study is divided in two groups in order to gain higher productivity. First group is a group of method studies which are used to simplify the job and develop more ergonomic methods of doing it. Second group is a group of work measurements which are used to find the time required to carry out the operation at a defined level of activity (Russell, Taylor, 2005a)⁴.

Stopwatch time study measures how long it takes an average worker to complete a task at a normal pace. A “normal” operator is defined as a qualified, thoroughly experienced operator who is working under conditions as they customarily prevail at the work station, at a pace that is neither fast nor slow, but representative of an average. The actual time taken by the above-average operation must be increased, and the time taken by the below-average must be reduced to the value representative of normal performance. Performance rating is a technique for equitably determining the time required to perform a task by the normal operator after the observed values of the operation under study have been recorded (Nakayama, 2002)⁵. Hence, when a work is measured with the stop watch device it is known as stop watch time study method. Stop watch time study method is a technique of establishing an allowed time standard to perform a given task with the help of stop watch along with due allowance. When a stop watch is used as a work measurement technique to record times and rates of working for the element of specified job carried out under specified conditions and for analyzing the data so as to obtain the time necessary to carry a specified job at specified level of performance is referred to as stop watch time study method.

Frederick W. Taylor started to develop time study in 1881 when he started measuring time at a machine shop at home with stopwatch and clipboard. That was the beginning of time study. Even Taylor used stopwatch, as basic tool for recording time, present
tools hasn’t changed much. Today besides standard tools of time study, stopwatch and clipboard, we use digital stopwatches, computers, barcodes and accustudy software (Izetbegovic, 2007).

4.2.3.1 Evolution of Stop Watch Time Study Method:

The Chart 4.2 showed the major evolution milestone of time study in the industry. This is given according to year and the person that contribute to the evolution of the time study technique.
## Chart 4.2

### Major Evolution Milestones of Time Study

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Year</th>
<th>Person</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1760</td>
<td>Jean Rodolphe Perronet-</td>
<td>Extensive time studies on the manufacture of No. 6 common pins and arrived at a standard of 494 per hour (2.0243 hrs/1000).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>French engineer</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1820</td>
<td>Charles W. Babbage-</td>
<td>Conducted time studies on manufacture of No. 11 common pins. It has determined that one pound (5,546 pins) should be produced in 7, 6892 hours (1.3864 hrs/1000).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>an English economist</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1856-1915</td>
<td>Frederick W Taylor</td>
<td>The first person to use a stopwatch to study work content and as such is called the father of time study. He accomplishes the four Principles of Scientific Management. Responsible for the following innovations stopwatch time study, high-speed steel tools, tool grinders, slide rules and functional-type organization. He emphasized the analytical and organizational aspect of work.</td>
</tr>
<tr>
<td>4</td>
<td>1853-1931</td>
<td>Harrington Emerson</td>
<td>He was the expert that was needed to make Scientific Management, the Taylor system, a household name and his experience proved that the use of efficient methods would lead to tremendous savings. Accounts of his work were never extensively published and no comprehensive biography exists but his work is best remembered as an example of how the creative engineer can find the tools to improve any operation.</td>
</tr>
<tr>
<td>5</td>
<td>1861-1919</td>
<td>Henry Laurence Gantt</td>
<td>He invented the task and bonus system or earned-hour plan. He also developed a technique for scheduling work and performance control system. Rather than penalizing the less proficient worker, he advocated a livable wage with a sizable bonus for performance over 100 percents. He also designed the antisubmarine tactics known as convoy zigzagging that permitted escort ships to protect the slow freighters.</td>
</tr>
<tr>
<td>6</td>
<td>1868-1924 and 18781972</td>
<td>Frank and Lilian Gilbreth</td>
<td>Develop method study technique like cyclograph, chronocyclographs, movie cameras, motion picture camera and a special clock called a microchromometer. They also study fatigue, monotony, transfer of skills and assisted the handicapped in becoming more mobile. Their systematic study of motion reduced costs greatly and founded a new profession of method analysis. The Gilbreths also developed flow diagrams, process chart, and operation chart. Also the apprentice on the 17 elementary subdivisions of motion, later engineers coined a short word therblig.</td>
</tr>
<tr>
<td>7</td>
<td>1900-1984</td>
<td>Ralph M. Barnes</td>
<td>His achievements included writing the longest published text on work measurement, through description of the Gilbreths micro motion study, time study and the procedure for work sampling.</td>
</tr>
<tr>
<td>8</td>
<td>1993-2003</td>
<td>Niebel, Lawrences, Meyers and Stewart, Niebel and Freivalds</td>
<td>Their contribution includes Stopwatch time study, Computerized data collection, Standard data, PTS, Work Sampling, Physiological work measurement, Expert opinion and Historical data and Labour Reporting.</td>
</tr>
</tbody>
</table>

4.2.3.2 Importance and Uses of Stop Watch Time Study:

Generally this technique is used to determine the time required by a qualified and well trained person working at a normal pace to do a specified task. The result of time study is the time that a person suited to the job and fully trained in the specific method. The job needs to be performed if he or she works at a normal or standard tempo. This time is called the standard time for operation. This means the principle objectives of stop watch time study are to increase productivity and product reliability and lower unit cost, thus allowing more quality goods or services to be produced for more people. The importance and uses of stop watch time study can be stated as under:

(i) Determining schedules and planning work

(ii) Determining standard costs and as an aid in preparing budgets

(iii) Estimating the costs of a product before manufacturing it. Such information is of value in preparing bids and determining selling price.

(iv) Determining machine effectiveness, the number of machines which one person can operate, and as an aid in balancing assembly lines and work done on a conveyor.

(v) Determining time standards to be used as a basis for labor cost control.

(vi) Helps to know the Labour productivity, Labour efficiency, Labour Performance and overall time required to perform the task.

(vii) Helps to improve the process of operation.

4.2.3.3 Procedure for conducting stop watch time study:

Generally, the following procedure is followed in conducting stop watch time study:

1. Selection of task to be timed:

Select the task or job that needs to be timed for study purpose. There are various priorities on the basis of which task or job to be studied is selected such as bottleneck
or repetitive jobs, jobs with longer cycle time, to check correctness of existing time, comparison of two methods etc.

2. **Standardize the Method of Working:**

   To achieve performance standard accuracy it is necessary to record the correct method of working.

3. **Select the operator for study:**

   Select the consistent worker whose performance should be average or close to average so that observed times are close to normal times.

4. **Record the details:**

   The following information is recorded on observation sheet: Name of labour, task/job performed, department, section of work activity, general information about activity performed etc.

5. **Break the task into element:**

   Each operation is divided into a number of elements. This is done for easy observation and accurate measurement.

6. **Determine number of cycles to be measured:**

   It is important to determine and measure the number of cycles that needs to be observed to arrive at accurate average time. A guide for the number of cycles to be timed based on total number of minutes per cycle is shown below in Chart 4.3.
Chart 4.3

Number of recommended cycles for time study

<table>
<thead>
<tr>
<th>Minutes Per Cycle</th>
<th>To 0.10</th>
<th>To 0.25</th>
<th>To 0.50</th>
<th>To 0.75</th>
<th>To 1.0</th>
<th>To 2.0</th>
<th>To 5.0</th>
<th>To 10.0</th>
<th>To 20.0</th>
<th>To 40.0</th>
<th>Over 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Cycles Recommended</td>
<td>200</td>
<td>100</td>
<td>60</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>


7. Measure the time of each element using stop watch:

The time taken for each element is measured using a stop watch. There are two methods of measuring. *viz.*, Fly back method and Cumulative method. The time measured from the stop watch is known as observed time.

8. Determine standard rating:

Rating is the measure of efficiency of a worker. The operator's rating is found out by comparing his speed of work with standard performance. The rating of an operator is decided by the work study man in consultation with the supervisor. Various rating methods used are speed rating, synthetic rating and objective rating.

9. Calculate the Normal time:

The observed time cannot be the actual time required to perform the work for a worker. Therefore, Normal time needs to be calculated. Normal time is the time that a worker takes when working at normal pace. It is calculated as below:

\[
\text{Normal Time} = \text{Observed time} \times \text{Rating}
\]

10. Determine the allowance:

A worker cannot work all the day continuously. He will require time for rest going for toilet, drinking water etc. Unavoidable delays may occur because of
tool breakage etc. So some extra time is added to the normal time. The extra time is known as allowance. It is generally allotted as per the company policy.

11. Determine the standard time:

The standard time is the sum of Normal time and allowances. Thus it is calculated as below:

\[
\text{Standard Time} = \text{Normal Time} + \text{Allowances}
\]

4.2.3.4 Methods of timing using Stopwatch:

There are two methods of timing using a stop watch. They are: Fly back or Snap back method and Continuous or Cumulative method.

1. Fly back Method:

Here the stop watch is started at the beginning of the first element. At the end of the element the reading is noted in the study sheet. At the same time, the stop watch hand is snapped back to zero. This is done by pressing down the knob, immediately the knob is released. The hand starts moving from zero for timing the next element. Thus the timing for each element found is called observed time.

2. Continuous method:

Here the stop watch is started at the beginning of the first element. The watch runs Continuously throughout the study. At the end of each element the watch readings are recorded on the study sheet. The time for each element is calculated by successive subtraction. The final reading of the stop watch gives the total time known as observed time.

4.2.3.5 Equipments used to measure time using Stop watch:

Following equipments are used to measure time using Stop watch time study method:
1. Digital or electronics stop watch
2. Electronic data collector and computer
3. Observation board
4. Observation sheet
5. Stationary – Pen, Pencil, Eraser, Calculator.

4.2.3.6 Major Companies using Stop watch time study method:

Majority of the manufacturing industries use stop watch time study method as tool for work measurement. Following are some of the manufacturing industries those apply stop watch time study method for work measurement as shown in Chart 4.4.

**Chart 4.4**

List of Major Companies using Stop Watch time study Method

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>List of Major Companies using Stop Watch Time Study method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mahindra and Mahindra (Automobile)</td>
</tr>
<tr>
<td>2</td>
<td>Tata Motors (Automobile)</td>
</tr>
<tr>
<td>3</td>
<td>Honda Motors (Automobile)</td>
</tr>
<tr>
<td>4</td>
<td>Bajaj Motors (Automobile)</td>
</tr>
<tr>
<td>5</td>
<td>Ford Motors Company</td>
</tr>
<tr>
<td>6</td>
<td>General Motors</td>
</tr>
</tbody>
</table>

*Source: www.wikipedia.com*

The above list is indicative and not exhaustive.
4.3 MOST Work Measurement technique

After understanding stop watch time study method section 4.3 introduces MOST work measurement technique in this section.

4.3.1 Concept of MOST Work Measurement technique:

MOST stands for Maynard operation Sequence technique. It is one of the important work measurement technique used for management decisions. Work measurement is a tool used as a basis for planning, scheduling, estimation of costs and evaluation of performance. Motion Time Analysis (MTA) was developed in 1920. Method Time Measurement (MTM) published in 1948 was one of the base methods for many simplified and more efficient techniques. MOST is one of the recent MTM based techniques that is used for work measurement. MOST is the activity based work measurement system that enables us to calculate the length of time required to perform a task i.e. a system to measure work. The concept of MOST was developed in 1967 and Basic MOST system was introduced in Sweden in 1972 and in the United States in 1974. MOST is easy and faster action based system known as user friendly work predetermined motion time system. It is a breakthrough work measurement technique that allows a greater variety of work (both repetitive and non-repetitive) for manufacturing, engineering to administrative service activities to be measured quickly with ease and accuracy.

Work means exerting energy to accomplish some task or to perform some useful activity. Physics defines work as the product of force times distance (W = f x d), or simply work is the displacement of a mass or object. This definition applies quite well to the largest portion of the work accomplished every day (e.g. pushing pencil, lifting a heavy box, or moving the controls on a machine). For the overwhelming majority of work, however, there is a common denominator from which work can be studied, the displacement of objects. All basic units of work are organized for the purpose of accomplishing some useful result by simply moving objects. That is what work is. MOST is a system to measure work; therefore, MOST concentrates on the movement of objects. Efficient, smooth, productive work is
performed when the basic motion patterns are tactically arranged and smoothly choreographed commonly known as methods engineering. It was noticed that the movement of objects follows certain consistently repeating patterns, such as reach, grasp, move, and position the object. These patterns were identified and arranged as a sequence of events (or sub activities) followed in moving an object. A model of this sequence is made and acts as a standard guide in analyzing the movement of an object. In other words, to move an object, a standard sequence of events occurs. Consequently, the basic pattern of an object’s movement is described by a universal sequence model instead of random, detailed basic motions. For each type of move, different sequence models of events occur; therefore a separate MOST activity sequence model applies. The use of tool is analyzed through a separate activity sequence model that allows the analyst the opportunity to follow the movement of a hand tool through a standard sequence event which is a combination of two basic sequence models. The technique helps in benchmarking the methods and activities followed in various operations in the industry with world class standards. It eliminates the subjective performance rating and has a much better acceptance of workmen/unions because it is totally transparent and easy to demonstrate.

This concept provides the basis for MOST sequence models. The primary work units are no longer basic motions as in MTM, but fundamental activities dealing with moving objects. These activities are described in terms of sub activities fixed in sequence. Therefore, it is a powerful analytical tool that helps to increase productivity, improve methods, facilitate planning, establish workloads, estimate labor costs, improve safety and maximize resources.

Thus a MOST work measurement technique is a complete study of an operation or a sub operation consisting of one or several method steps and corresponding sequence model, parameter time values and normal time values for the operation or sub operation. It also includes the Basic, Mini, and Maxi versions; it makes the measurement of work a practical, efficient, and inexpensive task for manufacturing industry.
4.3.2 Evolution of MOST Work Measurement Technique:

The scientific process of engineering a task using the time study methods described has following weak points:

1. The individual analyst must subjectively rate or compare the operator to an Estimated 100% performance standard.

2. A watch simply does not forecast, predict, or accurately determine times for future situations; it only determines what has already occurred.

3. Methods improvement neglected

4. When using time study, a quantitative comparison of methods cannot be produced unless another time study is taken of the new method.

A combination of the time study technique and the motion study philosophy was arranged to form the predetermined motion Time systems (PMTS). Since in PMTS the catalogs of predetermined times already leveled to 100%, there no need to rate an operator and hence focus shifted from operator to actual work. These drawbacks lead to evolution of Methods-Time Measurement (MTM) which was developed by Harold B. Maynard, G. J. Stegemerten, and J. L. Schwab and published in 1948. Synthesized versions of MTM were developed to reduce applicator errors and the time of analysis. (see Figure 4.1)

The evolutionary stages of MOST ar shown in the above Figure 4.1. Further advanced version of MTM technique were developed and named as MTM-2 and MTM-3. Many efforts have been made to simplify the work measure merit analyst's task. This has led to a establishment of variety of higher level MTM data systems like MOST Maynard Operation Sequence Technique (MOST) is a system to measure work; therefore, MOST concentrates on the movement of objects. A model of this sequence is made and acts as a standard guide in analyzing the movement of an object. It was also noted that the sub activities in that sequence vary independently of one another in their actual motion content. The operation time may be kept in TMU or converted to minutes or hours. This time reflect the work content without allowances at the 100% performance level.
Figure 4.1
Evolutionary stages of MOST work measurement technique

Thus, advancement in the technology brought further innovation to field of work measurement and hence advanced version of MOST were developed and adopted by the industries.

4.3.3 Importance of MOST Work Measurement Technique:

MOST is important because it helps in benchmarking the methods and activities followed in various operations in the industry with world class standards. It eliminates the subjective performance rating and is totally transparent and easy to demonstrate. MOST is used to expose wastes and unproductive methods of work quickly and rectify problems at the workplace as they arise at the design stage. MOST continues to be the most important and widely-accepted predetermined time and motion system used worldwide today because of following-

1. Latest Benchmarking tool for all type of operations in various industries
2. Streamlines operations and quickly identifies inefficient methods
3. Provides consistent standards and accuracy to within ± 5% with a 95% confidence level.
4. Timings can be obtained in advance before actual start of production
5. Universal Application to all types of industries
6. Reduces the time required for data development and standard setting
7. Easy to learn and use
8. Universal Approach, Fast to Apply, Adequate Accuracy
9. Minimum of Paperwork
10. Encourages Method Development and Improvement
11. No Rating System as required in Time Study
12. Can be applied to any method-defined manual work.
13. Can be applied largely from memory.
Thus, brief description of why MOST is important for an organization includes: accurate work standard, capacity analysis and manpower planning, workplace design and job activity analysis for re-organization and allocation for work balancing, cost estimating for existing and new processes.

4.3.4 The MOST systems:

The MOST Systems has grown significantly advanced since its evolution in 1967. It now provides a comprehensive set of practical work measurement tools that have been put to use in many situations. Because of its excellent reputation, MOST is used as top choice for tasks related to work measurement in industries. Figure 4.2 shows the basic MOST systems:

Figure: 4.2
The Basic MOST Systems


(1) MOST Work Measurement System

The consistent multilevel design of MOST Systems made it possible to establish simple guidelines for deciding which version is the most appropriate for measuring work. Appendix A provides a detailed explanation of the theory that supports these guidelines. Distances are analyzed to the nearest inch (centimeter) with
Mini MOST, within reach or a few steps with Basic MOST, and more than two steps with Maxi MOST.

(a) Maxi MOST

At the highest level Maxi MOST is used to analyze operations that are likely to be performed fewer than 150 times per week. An operation in this category may be less than 2 minutes to more than several hours in length. Maxi MOST index ranges accommodate the wide cycle-to-cycle variations that are typical in such work as setups or heavy assembly. Even at this level, the method descriptions resulting from Maxi MOST are very practical for instructional purposes.

(b) Basic MOST

At the intermediate level, operations that are likely to be performed more than 150 but less than 1500 times per week should be analyzed with Basic MOST. An operation in this category may range from a few seconds to 10 minutes in length, (Operations longer than 10 minutes may be analyzed with Basic MOST, with 0.5-3 minutes being typical cycle time for Basic MOST). The majority of operations in most industries fall into this category. Basic MOST index ranges readily accommodate the cycle-to-cycle variations typical at this level. The method descriptions that result from Basic MOST analyses are sufficiently detailed for use as operator instructions.

(c) Mini MOST

At the lowest level, Mini MOST provides the most detailed and precise methods analysis. In general, this level of detail and precision is required to analyze any operation likely to be repeated more than 1500 times per week. Operations having an occurrence frequency this high have cycle times of less than 1.6 minutes (10 seconds or less is typical). Such operations usually have little variation from cycle to cycle owing to the operator's high level of practice and to management efforts to improve the design, Layout, and method. Opportunities for small but significant improvements in these areas are often highlighted by a Mini MOST analysis.
Regardless of the cycle length, Mini MOST should also be used to analyze any operation in which nearly all reach and move distances for an operation are less than 10 inches (25 cm). However, since its focus is on highly repetitive work within reach of the operator, Mini MOST was not designed for analyzing operations in which the operator action distances exceed two steps, body motions other than Bend and Arise occur, or the weight or resistance per hand exceeds 10 pounds (5 kg). Basic MOST would normally be used to analyze these situations.

(2) MOST Application Systems

MOST Applications assures that MOST work measurement data are obtained and used in the most efficient and effective manner. This expertise has been applied to a large variety of work measurement projects leading to reduced resources and increase the immediate usefulness and long-term integrity of the data. MOST Application Systems training is usually provided at the beginning of a data development project.

(3) MOST Computer Systems

MOST Computer Systems can be considered a remarkable development in the field of industrial engineering. MOST Computer systems is used to convert common-language method descriptions into Completed MOST analyses. It utilizes the power of computer in the development, application, and maintenance of both small and extremely large collections of work measurement data.

4.3.5 Basic MOST Method:

The Basic MOST system is the most common and practical work measurement system used in industries. Since the objects or materials follows General move sequence model of Basic MOST system is used by the researcher to measure the time required to perform activities by all the selected respondents in their respective sections.
4.3.5.1 Basic MOST Work Measurement technique:

There are various basic MOST work measurement techniques as shown in chart 4.5.

**Chart 4.5**

**Basic MOST Work Measurement technique**

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Activity</th>
<th>Sequence Model</th>
<th>Sub-Activity/ Parameter</th>
</tr>
</thead>
</table>
| 1     | General Move   | A B G A B P A A| A- Action Distance  
B- Body Motion  
G- Gain Control  
P - Placement |
| 2     | Controlled Move| A B G M X I A   | A- Action Distance  
B- Body Motion  
G- Gain Control  
M - Move Control  
X - Process Time  
I - Alignment |
| 3     | Tool Use       | A B G A B P _ A B P A | A- Action Distance  
B- Body Motion  
G- Gain Control  
P - Placement  
**Blank Space (_) is filled with below tool use parameter:**  
F - Fasten  
L - Loosen  
S - Surface Treatment  
M - Measure  
R - Record  
T - Think |


4.3.5.2 Selection of Basic MOST General Move sequence Model:

If the objects or material displacement follows spatial displacement or unrestricted path through the air under manual control general move sequence model is used.
4.3.5.3 Parameters of Basic MOST General Move Sequence Model:

The parameters are the series of letters representing various activity elements. The parameters of the Basic MOST General Move Sequence consist of 5 step pattern as below:

A B G A B P A

Where: A = Action Distance

B = Body Motion

G = Gain Control

P = Placement

- **Action Distance (A):**

  This parameter is used to analyze all the movements of operator related to hands or feet for either loading or unloading of the material.

- **Body Motion (B):**

  This parameter is used to analyze the body motion of the operator like bend, arise, sit or stand while performing activity.

- **Gain Control (G):**

  This parameter is used to analyze the complete control of the material before moving the material to another place.

- **Placement (P):**

  This parameter analyzes the material placement, alignment, adjustment with pressure.

4.3.5.4 Phases of Basic MOST General Move sequence Model:

Movement of the object through air occurs in three phases as under shown in chart 4.6.
Chart 4.6
Phases of Object Movements for Basic MOST general Move Sequence Model

<table>
<thead>
<tr>
<th>Get</th>
<th>PUT</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>G</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

1. **First Phase – GET:**

   It is the action that is performed by the labour to reach to the object in combination with the body motion and gain control of the object. The A parameter indicates the distance the hand or body must travel to reach the object. The B parameter indicates the body motion while performing the action and the G parameter indicates the control gained by the labour on the object.

2. **Second Phase- PUT:**

   This phase indicates the action to move or place the object to another location. Parameter A and B indicates the same function as mentioned in first phase (GET) to place the object at required place. The parameter P indicates the way in which the object is placed at the desired place.

3. **Third Phase- RETURN:**

   This phase indicates the distance travelled by the labour to return to the work place after the object is placed at the desired place.

4.3.5.5 **Steps to observe the Phases of parameter for Basic MOST General Move sequence Model:**

1. Reach to the object covering distance of few steps in combination with the body motion.

2. Gain manual control of the object

3. Move the object at certain distance for placement in combination with the body motion
4. Place the object as required

5. Return to the workplace

**4.3.5.6 Procedure of Basic MOST Method:**

Generally, 9 steps are used for applying basic MOST methods such as: (i) Selection of Job (ii) Select the Operator for study (iii) Record details of activity and conditions of Work (iv) Observation of each parameter Phases (v) Parameter Indexing (vi) Addition of all the parameter Index values of activity (vii) Convert the total of Index values into TMU (viii) Convert the TMU value in corresponding time (Hours) (ix) Convert the time from hour into Minutes.

**4.3.6 Major Companies using MOST Work Measurement Techniques:**

Since MOST is a universal technique with applicability to any type of manual work situations, it can be used in traditional as well as new work measurement areas. Standards based on MOST are used for the manufacturing of products and components in electronics, automotive, power generation and other heavy industries. Some of the industries which had implemented MOST for productivity improvement in their organization are:

The above list is indicative and not exhaustive; moreover, the Figure 4.7 shows the MOST technique applied by various industries globally.
<table>
<thead>
<tr>
<th>Sr. No</th>
<th>List of Major Companies using MOST</th>
<th>Sr. No</th>
<th>List of Major Companies using MOST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Areva (Switchgear)</td>
<td>11</td>
<td>Mahindra and Mahindra (Automobile)</td>
</tr>
<tr>
<td>2</td>
<td>Bharat Forge (Crank Shaft/Axles)</td>
<td>12</td>
<td>Menon and Menon (Foundry/Machining)</td>
</tr>
<tr>
<td>3</td>
<td>Bilt (Paper)</td>
<td>13</td>
<td>New Holland (Tractors)</td>
</tr>
<tr>
<td>4</td>
<td>Crompton Greaves (Electrical)</td>
<td>14</td>
<td>Siemens (Electrical)</td>
</tr>
<tr>
<td>5</td>
<td>Cummins (Engines)</td>
<td>15</td>
<td>Siporex (Construction Blocks/Slabs)</td>
</tr>
<tr>
<td>6</td>
<td>Dana Spicer (Automobile Transmission)</td>
<td>16</td>
<td>Tata Motors (Automobile)</td>
</tr>
<tr>
<td>7</td>
<td>Gabriel (Auto Component)</td>
<td>17</td>
<td>Techumseh (Compressors)</td>
</tr>
<tr>
<td>8</td>
<td>Honda (Automobile)</td>
<td>18</td>
<td>Vishay Components (Capacitors)</td>
</tr>
<tr>
<td>9</td>
<td>IPCA (Pharmaceutical)</td>
<td>19</td>
<td>Whirlpool (Refrigerators)</td>
</tr>
<tr>
<td>10</td>
<td>JCB (Excavators)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: [www.hbmayanrd.com](http://www.hbmayanrd.com)
Reference


