

ers available" and the standard based upon the average results obtained.

The best worker available is not always studied because of the difficulties encountered with the stop watch technique in recording the time and method accurately enough to permit the transference of his skill to other workers. Another important reason why this person, if highly skilled, is sometimes not selected is because of the fear that the workers of a lower degree of skill, not understanding the methods of grading and adjustment used by the analyst to arrive at a fair standard, will suspect that a standard beyond their reach has been set.

#### Selection of Workers for Motion Studies

The workers studied by the investigator employing the motion study technique in which the late Major Frank B. Gilbreth pioneered, are selected largely on the basis of the contribution they can make toward the establishment of the best method. Usually much of the desired data is obtained from the study of the best available. By best available the worker who produces most is not necessarily meant, but the one whose method shows the greatest productivity possible, although he may not exert enough effort to realize its possibilities. In other words, the production record does not always indicate the best workers from the point of view of the methods employed by them. Invariably, however, the best workers, as indicated by their records, do have good methods and it is usually desirable to study them. Workers whose methods for any part of a cycle appear to be less fatiguing are also selected for the same study. The best workers available should be selected for the following reasons:

1. That they invariably employ methods of least fatigue.
2. That they usually have the highest degree of automaticity, thus making possible the analysis of a higher order of skill.
3. That the motion study technique, making use of the motion picture film and clock, permits a minute analysis of the method and performance.
4. That the technique permits a more detailed description of the established method (that is, in elements of motion) and shortens the learning period.

<sup>22</sup>Sanford E. Thompson, "Smoothering the Wrinkles from Management—Time Study the Tool," *Bulletin of the Taylor Society*, Vol. XIII, No. 2, April, 1928.

5. That the composite best method can be more easily transferred, making a higher performance standard attainable by all normal workers.

It may be well to state at this time that, in case of group work and if more than one group is engaged in the same kind of work, it is usually best to consider the part played by each worker in the group (assuming that each worker performs a different suboperation) and to study that particular part of each complete operation, selecting the best subject for it regardless of the group he is connected with.

Aside from the qualities already mentioned the worker selected for observation, regardless of the technique employed by the observer, should preferably be one with ability to learn and demonstrate new methods; one who is not disliked by his fellow workers and who will serve as nearly as possible as a co-investigator.

It is the opinion of the writer that the analysis of the performance of the best workers available, from the standpoint of method and economy of effort, and the transference of their combined skill contribute most toward elevating the performance standard of the department as a whole, and this, of course, is desirable from the point of view of lower cost and higher wages. We have both the intellectual and physical equipment to increase the effectiveness of our productive efforts and should make the most of our opportunity to practice, and benefit therefrom, the three regulative principles of industrial management ably stated by Church and Alford<sup>23</sup> as, "the systematic use of experience"; "the economic control of effort" and "the promotion of personal effectiveness." The greatest progress can be made by utilizing, to the best advantage, the facts derived from the study of leaders in their respective activities, whether these activities are carried on in the office or in the shop; in the store, or in the bank.

#### The Number of Workers to be Observed

By STEPHEN R. SPONDER  
Latham Machinery Company, Chicago, Ill.

IN THE development of time study technique, considerable stress is laid on the importance of the correct use of motions and of arriving at equitable operation times. Each is an integral part of the

<sup>23</sup>American Machinist, Vol. 36, p. 857.

scheme of scientific management in the introduction of which Dr. Taylor was the guiding genius. In developing a time study technique much time and effort can be saved if important preliminary details are given the proper consideration. Praiseworthy books have been written which emphasize this point but there is yet much to be done along this line. This paper aims to do its bit by bringing out certain points for your consideration and discussion.

In analyzing the subject of the number of workers to be observed when making a time study, it is apparent that several factors are involved.

The factors which will be discussed in this paper are general in character and applicable to practically all industrial operations. Naturally, the time study engineer will discover peculiar conditions surrounding some jobs which involve certain factors that are not universal in application. While they may be important in particular cases, they are disregarded here because of their limited application.

These general factors are: (1) the economic importance of the operation, (2) the nature of the operation, (3) the workers' efficiency, (4) the personnel, (5) the physical conditions affecting the work, and (6) the company policy.

While these factors are general, abnormal conditions may place one factor in a position of such importance that the others may be nearly obscured. Such a condition should not, however, influence the engineer to overlook the other factors.

If the time study engineer appreciates these general factors, and considers them thoroughly, any specific condition requiring his attention will automatically be discovered.

An elaboration of each of these factors follows:

1. *The Economic Importance of an Operation.* The total amount of money invested in material and time, and the overhead expense made necessary by the job, should be of major importance in deciding how extensive the observations should be.

A minor operation from the economic point of view should receive minor consideration from the time study engineer if he is to prove an asset to his company. Thus the economic value of the job immediately limits the engineer in the number of workers he selects for observation.

2. *The Nature of the Operation.* Under this heading both variations in product and variations in

the conditions affecting the time and motions on a job are important. A product of varied character must necessarily require extensive time study research, while in the case of a product of standard or constant character, the determination of standards of time is not so difficult.

All operations may be divided into two general classes, constant and variable. It follows that, for operations requiring only simple basic motions, the time may be so unvarying as to be constant. In these cases experience will enable the time study engineer to arrive at an equitable standard, from his observation of nearly any experienced operator. Therefore, it is not necessary to observe more than one experienced worker.

When many operations of a constant nature are being performed, or are expected to be performed in the future, the time study engineer will naturally derive and establish fundamental base times. When these fundamental times are established it is not necessary to make any observations except for purposes of checking.

When the job is of a variable nature, the motions employed may be so complex as to preclude a positive analysis of the operation elements. Under these conditions, it will probably be necessary to observe and compare each element of the operation as performed by various experienced workers, in order to arrive at an equitable time standard for the cycle.

3. *Worker's Efficiency.* The importance which this factor will have in determining the number of workers to study will depend in a large measure upon the time study technique employed. When the policy is to establish standards based on the performance of the average worker, with small allowances, the performance of a few operators may be satisfactory. When it is the policy to establish time standards based on the performance of an expert worker, with high allowances to bring his performance within the range of the average operator, his performance alone may be satisfactory. When he is not available, it may be necessary to analyze and compare each element of the cycle as performed by the various average workers.

4. *Personnel.* The morale, type, temperament, intelligence and the trade knowledge possessed by a group of workers often influences the number of workers to be observed. Naturally the desirable type of worker to observe is open minded, co-