

# Time Study

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## The Taylor Technique of Time Study

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IT IS fitting that a meeting devoted to consideration of the present status of time study should be held in this city. It was here in 1895 at a meeting of the American Society of Mechanical Engineers that Frederick W. Taylor presented his first paper on time study and rate setting, "A Piece Rate System."

His audience was not at all prepared for his ideas and methods. Consequently the discussion of that paper ignored consideration of the new idea of determining the time allowance for work by means of time studies, which seemed impracticable to his audience, and centered on the differential piece rate system, which to Taylor was secondary and only illustrative of the possibilities of measurement of work. He tried to lead the discussion toward time study, but with little success. He decided to try again and eight years later presented a second paper, "Shop Management," in which was virtually an appeal to manufacturers to give time study the attention it merited. Since that time, and more particularly since the publicity given scientific management by the Eastern Rate Case hearings in 1910-11, the use of time study has spread rapidly and has become an essential function in well organized plants.

The idea of time study was not absolutely original with Taylor. Something over a hundred years ago the French engineer Perronet, and later the English economist Babbage, made time studies of the production of pins; but there is no evidence that these studies ever became widely known or influenced management. Taylor got the idea from watching one of his professors at Exeter time students working on mathematical problems.

Credit must be given to Taylor for demonstrating the practical use of time study, as a tool of management, and particularly for conceiving, first the measurement of work, and second the measure-

ment of elementary times which can be used over and over again in building up times for variable operations. He early recognized that it would be more accurate to take each element of the various kinds of work with a stop watch and find the quickest time in which a job could be done by summing up the total time of its component operations, and adding a reasonable percentage of allowance, than by searching through records of previous performances.

At first many mistakes were made. For example, time studies were started without giving due consideration to standardization of methods and equipment, or to assurance of a steady flow of material to the worker. Also, it was at first thought by some that time studies should be taken without the knowledge of the worker. Stop watches were concealed, sometimes in cases made to look like a book, and sometimes in the observer's pocket. The time study man in these instances had to go behind some object of concealment in order to make a record of his observations. In another instance, the observer sat in a glass cage near the worker and telephoned his readings to the men in the office. These methods were soon discarded by reputable engineers, first, because they are underhanded, and second, because they are absolutely futile in view of the fact that they do not permit continuous runs or secure workers' co-operation. Without these, results are valueless.

### Procedures

Much has been said and written on present methods of time study—equipment, workers to be selected, methods of making observations, various ways of computing times, allowances for fatigue and delays, and on incentive methods of wage payment based on standard times. Every technician is more or less familiar with these variations in

<sup>1</sup>For the author's methods consult his "Time Study for Rate Setting," The Engineering Magazine Company, New York, 1919.

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detail. It is hoped that profitable appraisal of these will be brought out in the discussions of this meeting.

However, whatever variations in detail may be found in the methods of individuals, there seems to be a basic procedure which should be observed. This basic procedure involves:

First: preparatory steps—(1) a careful survey of the operations and perfection of all influencing conditions; (2) analytical breaking down of the operation into its simple elements:

Second: time study itself—(1) observation and record of the times taken in performing each of the simple elements; (2) analytical study of the recorded times; (3) computation of allowances for fatigue and unavoidable delays; (4) determination of standard times, due and fair consideration being given to the character of the work and the demands upon the operator; (5) preparation from the analysis of an instruction sheet which shows the sequence of elementary motions, the standard time for each, the allowance for fatigue and delays, and the time in which the work should be performed.

Taylor included motion study, and other aspects to which special names have since been given, under the general term time study.

Too much emphasis cannot be placed upon the importance of taking elementary times, rather than of taking overall times—the times of complete jobs without detailing the motions. The method of taking elementary times is flexible and lends itself easily to standardization and classification, and to adjustments on instruction sheets under changing conditions. Such classified unit times permit comparisons of time studies of a job before and after a change in the details of operation, on different types of machines, such as single and multiple purpose. They lend themselves to at least predetermining prospective times where changes in processes or models are made periodically.

### Uses of Time Study

Experience with time study has disclosed uses as a tool of management more numerous than was at first perceived. At first, and until recently, it was looked upon primarily as a means of increasing output per worker, with little thought of method. Now, as a result of experience, one is able to enumerate a long list of uses. The most

important follow. Many of these will undoubtedly be elaborated upon in the subsequent discussion.

1. Determination of possible improvement in the equipment and in the surrounding conditions for performing a given operation.

2. Improvement in conditions extending as far as shop layout generally.

3. Improvement in methods of performing operations on the basis of improved equipment and conditions.

4. Establishment of a permanent record of best practices, in terms of units which may be combined to fit various circumstances.

5. Establishment of clear and understandable instructions for workers.

6. Increase of output per worker.

7. Reduction in unit costs.

8. Maintenance of quality at a predetermined standard. In competitive industries quality of product is now more important than it has been in the past. In such industries items usually have an established market price. If the standard of quality is not maintained there is danger of another factor contributing to sales resistance.

9. Establishment and maintenance of equitable rates of pay to workers.

10. Facilitation of the routine work of design in the engineering department, and of the estimation of the influence of design on cost and other factors.

11. Facilitation of the planning, scheduling and general control of operations. Standard times and capacities of machines and of operatives, supplemented by data relative to the degree to which particular operatives have acquired capacity to achieve standard performance, permit proper balance of equipment and of labor force, and proper flow of materials through the various processes.

12. Standardization of costs. Only to the degree to which there are standard conditions reflected in standard times of operation performance, can standard costs become efficient. Symbols for individual operations can be set up on instruction sheets and used in cost distributions. Then, by having the actual labor cost analysis and actual time of production parallel the incentive rate and the time of performance shown on the instruction sheet, a direct comparison can be made between actual and ideal conditions and costs.

13. Budgeting. The standard conditions and times