detailed separate study of various elements and of the connected work, provides data for any method and therefore covers constant improvement; requires standardization previous to study and maintenance; is in close harmony with an engineering approach and in most instances calls for distinct data for cutting and forming; approaches the engineering idea of continuous machines and time for engineering standards established; necessitates separate method provision in arranging and setting time for a method; provides at the outset data representative of a highly effective technique; provides the same time for an element of work regardless of where that element is performed, and thus gives a basis for equality and change. It also provides a very clear cut employer-employe relation on the question of rates.

The study of individual operations done on a machine provides time directly for an operation on a product; provides for some correction and standardization of conditions, but does not necessitate overall standardization. The study can be made under almost any conditions and therefore gives a quicker start and correspondingly quicker results. In many instances it covers forming and cutting; it gives a connected study of work which at times absorbs unusual conditions; it is a study of what is being done with a view to correction; it calls for additional studies with improvement in conditions and the consequent adjustments in rates, which in the end means the study of the same element over and over again. This is necessary under this plan of time study, but gives various times for the same element of work. Over a period of years, in order to obtain the same results as under the plan of fundamental studies, a greater amount of study is necessary.

Because of the wide range of work in industry, including continuous work of very minute times, continuous work of large elements of time, and non-continuous work, both methods of study are at times used jointly. That is, the continuous method may be used to develop elementary data, and vice-versa, the fundamental to develop overall times.

### Conclusion

I trust that the question of the technique that the time studies of the one method give, and how long it will take under the other method to reach this technique, and also the question of what is reasonable from the human standpoint and most apt to give results, will receive attention and call forth discussion here.

It is my belief that time study and what it aims at—facts—can be, and are in many instances, the strongest link between employer and employe. Time study should give that integration in industry that we often look for, for it is a strong human influence when properly exercised. What time study will do for the individual in a moral way should be of major interest. If I had been permitted to choose I should have preferred to give that side the same emphasis as the mechanism of time study. The work of moral influence should be an integral part of the objects of time study and should go hand in hand with its development. It would be desirable, I believe, if in all time study presentation the human relations could be treated as an integral part.

In this age of mechanization of industry and the study of the mechanism of Nature's laws it appears that, if the moral features are not kept in the foreground, they are apt to be neglected or lost to the worker. The scientist who follows his text in his research no doubt has the ability to see the moral law as well as the mechanism of laws, and thereby receives double remuneration.

Is it a surprise that F. W. Taylor in his intensive study of production and the sciences involved should have been the first to include in "The Principles of Scientific Management" the development of a science for each element of a man's work, and at the same time include the question of employer and employe relations—that subject of human engineering we hear so much about? They were one and the same to him.

As an illustration of the educational and moral force of time study well constructed and applied, an early contribution by Colonel H. K. Hathaway stands out. He learned that he could take a large crew of men on a job and train them for work that called for both mental and physical dexterity, by the adoption of uniform standards arrived at by time study. He also repeatedly pointed out that time study, once taken properly, will stand for an indefinite period and has indicated this in some of his writings. The significance of this early work is still lost to many an educator and engineer. It is of the essence of time study and methods training.



## Unit Times Versus Overall Times

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AFTER considering the printed program of this meeting, it appeared to me improbable that anyone interested in the purpose of the Taylor Society, or in the principles and practices of time study engineering, to the extent that he is in attendance at this meeting, should need any explanation of the relative merits of unit or elemental times and overall times. But, possibly, a review of the subject may prepare for the papers to follow.

Unit times are considered to be the times taken or required to complete a given motion, element or subdivision of a complete operation.

Overall times are recorded times for the operation as a whole.

It would be useless to enter into a discussion of my subject without first touching upon the object of any system of task time measurement. Dr. Taylor, in his "Shop Management" has defined the art of management as "knowing exactly what you want men to do, and then seeing that they do it in the best and cheapest way." All systems of time study are designed, primarily, to advance the knowledge of what constitutes a day's work. It follows that the method which results in the most complete analytical information is the most effective.

Overall times, beyond establishing as a fact a time actually taken to complete a given task, add nothing to the "art of management." Such times, affording no possibilities of analysis, do not uncover improper or useless methods or lead to the development of a permanent "best and cheapest way." Dependent entirely either upon the judgment of an observer or the performance of an individual, they are obviously quite apt to be unfair to management, labor, or both.

On the other hand, unit times, compelling the observer to analyze the elements of a given task, automatically force consideration of the method involved and, as Mr. A. B. Segur has said in a recent paper on "The Mission of the Engineer in Relation to Motion Time Studies,"[a] "So far as time required is concerned, the job is fully ninety per cent method and not over ten per cent physical effort." Unit times enable the analyst to pick out, measure and eliminate useless and inefficient elements. Unnecessary or unusual delays are made apparent and are possible of correction. Remaining elements of the operation may be grouped and regrouped until the best possible combination has been arranged and tested and compared with similar elemental times for other operations and other workmen.

It may be advanced in the discussion to follow that elemental or motion analysis is not impossible under the overall time method. That the observer may consider and correct inefficiencies while making the observation, and reflect that correction in his final observed times is possible. But, granting the possibility, the life of the improved method is limited to the employed term of the workman observed. No descriptive record is established to perpetuate the method.

Unit time, on the other hand, captures the skill and the method of the best workers and makes it permanently available. Dr. Taylor prophesied the day when fundamental times would be established for almost every class of labor and made a matter of record. Engineers, notably the Gilbreths and Mr. A. B. Segur, have gone far towards advancing that day by the discovery of basic principles and underlying laws governing all motion. It remains for other engineers to apply such laws to standard and carefully considered methods of operation, and to classify and compare elemental operations and unit times. Already much has been done along this line and accepted standard unit times covering many different classes of work have been established. Too often, however, so-called time study is used solely for the purpose of establishing a piece work or bonus rate and, in the eyes of a short sighted management the time study engineer's value is proportionate only to the number of rates determined in a given time. Management must be made to see clearly that today reduced costs are to be expected, not so much as the result of any particular wage incentive plan, but rather, as the result of better methods determined by sound analytical time study practice. And only by such practice can time study hope to become a scientific guide to "the best and cheapest way"—"the best and cheapest way" to reduced production costs, and to advance labor.

[a] *Society of Industrial Engineers Bulletin*, Vol. 8, No. 10, October, 1926, p. 9.