

be run, a sample of the box, and whatever else the particular job requires. Before he can proceed with the actual running of the job, he must have his work approved by the management. When he is given his "feeding" ticket, he is instructed as to the quantity to run, changes in printing, etc.

In the development of this work, we have tried to make everything as simple and effective as possible. We have time studies on some of our operations, principally the ones which are hand work. These studies have given us a good basis for bonus payment, which has been very satisfactory from all points of view.

Our planning board provides space for three groups of tickets; (1) goods in process; (2) goods ready and (3) goods not ready. As each ticket is returned, the operation is checked off on the route sheet, and the next operation's tickets are moved up to the "ready" space. This has been very satisfactory. The route-sheet records, which are up to the minute at all times, show exactly how far the job has advanced. This is a decided advantage when we are, at short notice, called upon to make a promise of delivery. Occasionally it is necessary for the writer to "run the shop." It is a very simple matter for him to step in and keep all hands busy, and to continue to keep the records up to date, although he may not have been called upon for some time to perform the other man's duties.

Stores cannot be considered much of a problem, since the majority of the items are bought for one particular order, and completely used on it. We have no trouble with stores being stolen, apparently because no one has any use at home for the material used in paper boxes. A perpetual inventory is maintained by means of a Visible Index. Each card contains space for the stores ordered, on hand, apportioned and available, as well as the total value. This inventory is checked periodically by a physical inventory and necessary adjustments made.

With the help of wage incentives, we have been able to maintain a high average production. And with a liberal application of "the loss of this bonus for poor work" we are able to maintain a good quality as well. We undoubtedly pay higher wages than most folding-box manufacturers do, but we have no labor trouble, no "soldiering," and a low labor turnover in addition to good production. A few years ago we instituted a rest-period plan. Twice a day, at 10:00 A.M. and at 3:00 P.M., the

men are given ten minutes to smoke, rest, eat, or do whatever they wish. If anyone is tardy, either in the morning or at noon, he loses his right to the next two rest periods. We feel that this plan has been satisfactory and more than pays its way. The men are paid for these rest periods, and do not abuse them by smoking at any other time during the working day. Only occasionally do we find a man who does not fit into the spirit of our organization. After a fair trial he generally eliminates himself if there is no improvement.

One of the important results of our work is the ability to arrive at reasonably accurate cost records. In addition to our time tickets and stores issues, we keep an analysis of our non-productive labor and also a record of actual machine-operation time. As soon as each order is finished, a cost sheet is made up, showing the material, labor, hours of overhead, delivery charges, etc. By making a comparison of this cost sheet with the estimate sheet made before the order was received, it is possible for us to quote prices which represent an intelligent estimate and not a wild guess.

Our construction sheet contains the following information and is made when the first order for the box is received: (1) name of customer, (2) box number (customer's), (3) size of box, (4) kind of material, (5) thickness of material, (6) size of stock which is used, with the number of boxes per sheet, (7) colors and numbers of each ink used, (8) the order numbers on which the box was made, (9) the size of stock used on each order (usually, but not always, the size which should be used) and (10) the number of boxes per bundle.

From our experience of nearly nine years of work under this method, we are not at all pessimistic about the application of scientific management principles to a small plant, provided they are introduced by a man who has either had years of experience in installing scientific management methods in a large plant or has worked for a long time in a large plant where the Taylor principles are adhered to. He must be thoroughly familiar with all details so that he is in a position to know what details are necessary and what can be eliminated to obtain the desired results.

While we are aware of the fact that in many ways we are not scientific, we still feel that we have made progress in the right direction, without an unwarranted expense.

Comparison of Time-Measuring Mechanisms¹

Their Characteristics and Uses

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VERY few words will suffice to describe the time-study machine which I exhibited at the informal conference on December 4 on "Comparison of Time-Measuring Mechanisms."

This machine comprises a mechanism which moves a tape of adding-machine paper at a uniform rate of speed under a pen which can be moved laterally across the tape in steps by the observer's pressure on a button at the end of each time element observed. At the completion of a cycle the pen can be returned to its starting position by another key.

The idea of the machine is that the observer has to make no readings of a stop watch or notations of same, but keeps his eye on the operation while making a graphic record on the tape. Upon completion of a series of observations the tape can be studied at leisure, and the graphic record turned into a numerical record by converting the lineal measure of each element into time with the aid of a scale or rule to which the speed of the tape is regulated. The tape moves so rapidly that elements as short as .002 or .003 of a minute can be timed, and longer elements with similar accuracy. So much for the time-study machine.

However, the whole subject of timing mechanisms of various kinds and of their uses in "time study" is very evidently in need of clarification if we are to judge by the papers presented at the conference and the discussion which ensued. Dr. Pearson has kindly invited me to make a contribution to such a clarification.

In the first place it is necessary to make some sort of subdivision of time-study work into its component parts so that we may discuss timing devices in connection with each phase. For this purpose I submit the following: (1) improvement of observed mechanisms; (2) motion study; (3) rate setting; (4) training of a group of workers.

1. *Improvement of Mechanisms.* The first and most important work to be done in undertaking a time study is to improve the mechanisms em-

ployed in the operations studied. The possibilities here are too wide to be discussed in any detail. They range from the design of special machinery, the adaptation of existing machinery, the improvement of tools, fixtures or work places, to the establishment of facilities for the maintenance of tools in proper condition for use.

How much or how little may be expected of the time-study man in this connection will depend entirely upon the organization of the company. There may be a highly developed mechanical engineering department which will take care of all work in connection with the design or adaptation of machinery. Then a great deal depends upon the time-study man himself because mechanical ideas may often and very naturally come from him.

But in the field of tools, work benches, facilities and gadgets to make work easy and speedy the time-study man in this connection will depend entirely upon the organization of the company. There may be a highly developed mechanical engineering department which will take care of all work in connection with the design or adaptation of machinery. Then a great deal depends upon the time-study man himself because mechanical ideas may often and very naturally come from him.

Whatever may be the nature of our time-study man's work in connection with the improvement of mechanisms as briefly outlined above, it is my opinion that a stop watch will suffice for all incidental timing work.

2. *Motion Study.* Having once determined upon the machine, fixtures, tools or other facilities for the best performance of the work in question, the next duty of the time-study man is to discover the sequence of motions, on the part of the worker, which will produce the largest output, and at the same time cause a minimum of fatigue. Should the worker stand here or there? Should he do this first or that? Should the worker do this with his right hand while his left hand is doing that, or vice versa? A combination of common sense and inventive or imaginative ability is required of the time-study man for this work.

A quick eye and a stop watch will, in my judgment, do all the timing that is necessary in this connection. I must confess that I am not familiar with the possibilities of usefulness of a motion-picture machine as an aid to motion study; it is simply an opinion that a stop watch is all that is necessary to determine which sequence of motions is the quickest.

3. *Rate Setting.* After the time-study man has done all that he can in the matter of developing the best mechanisms for accomplishing a given

¹Informal group conference of the Taylor Society, New York, December 4, 1930.