

Standards¹

Successful Development and Operation of Scientific Management Call for the Establishment and Maintenance of Standards

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(Continued from October number)

Standardization of Machines

THE MOST general lack of standards will be found in the speeds at which machines are operated. In a mill in which literally thousands of identical machines were engaged on exactly the same work, variations of over ten per cent were found in the speeds of line shafts driving different groups. In view of the fact that these were continuous process machines, the importance of the loss from this single source will be evident.

In a handkerchief factory, when we started to make time studies, preparatory to putting the operation of machine ironing on task and bonus, we found that the machine speeds varied sixty per cent between the lowest and the highest. With other conditions standardized the higher speed was found to be satisfactory. It was also found that no particular attention was paid to the pressure of the steam supplied for heating the machines and consequently it fluctuated over a wide range during the day with a corresponding fluctuation in the temperature; some of the machines were equipped with traps for removing any water from the steam and some were not. These did not seem to be matters of any importance while the work was being done on ordinary day work; some of the girls produced less than others, but that was regarded as inevitable; "some operators are good and some not so good" was the accepted explanation. After standardizing these conditions—as well as the preceding operation, that of dampening—the production was increased one hundred per cent, the operator's earnings increased one hundred and sixty per cent, while their work was made easier and more agreeable.

The studies and work required to accomplish this extended over a period of more than six

months. They involved the determination of laws governing the absorption and evaporation of moisture by each of the wide variety of fabrics from which handkerchiefs are made, the development of a special machine for controlling the amount of water supplied to the handkerchiefs, and of a "damp closet" in which they were stored to permit even diffusion of the water by capillary attraction and to prevent excessive evaporation while stored at the machine waiting to be ironed. Figure 10 shows the machine for "dampening" and Figure 11 (pp. 502-3, October number) a standardized mangle or ironing machine with its "damp closet" and standard trucks for receiving the work as ironed and transporting it to the next operation.

In a paper box factory similar studies and the establishment of standards in connection with a board lining machine—i.e., a machine for covering pasteboard with white paper—resulted in increasing the output one hundred and fifty per cent and enabling two men to operate the machine instead of three, as well as in effecting a considerable saving in indirect labor cost.

This is one of the best examples of machine standardization resulting from real elementary time study made by a competent time-study man whose work ranks with the best. His report made at the time is worthy of careful attention for it shows the pains and perseverance called for:

On applying time study to the lining machine several changes were found necessary to get the machine into proper condition for applying the task and bonus. Formerly the procedure for loading the elevator of this machine, which rested about six inches above the floor at its lowest point, was to bring a load of board to the elevator and then repile it on the elevator. We have sunk the feeding elevator of this machine into the floor on a level with the floor, so that a Cowan platform of loaded board can be rolled right on to the elevator with a Cowan truck.

Time study showed that the manner in which a roll of paper was made ready for the job being run on the lining machine was wrong, it being done as follows:

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There was a shaft with square-faced cones. The object of these square-faced cones was to drive the corners into the wooden cores of the paper rolls, but as our paper here has not come with wooden cores for the last few years past, it has been found that these square cones from the constant driving into the iron cores, which are now supplied in the rolls of paper, have worn the corners off from these square cones, so that the man making the roll of paper ready has to drive wooden wedges in to secure the rolls of paper tightly to the reel shaft. There was also an inadequate friction brake on the end of the shaft, held together by means of a carpenter's C clamp in order to get the proper tension required to pull this paper smoothly over the paste rolls.

It was deemed advisable to have a new reel shaft made. This in turn suggested another idea, that of having two reel rods and always having the next roll of paper needed ready and resting on extra brackets, which were provided at this time to hold the next roll of paper to be used on the machine. It was the previous custom when the roll of paper ran out to stop the machine and all hands start to make the next roll of paper ready. At the present time, with the use of the new roll rods, the machine tender will make the next roll ready while the machine is running.

It has also been found necessary in connection with the raising of the rolls of paper on the machine, owing to the height between the top of the machine and the ceiling, to have a set of tongs made which will enable us to get a very short hitch with the tackle blocks on the roll of paper. Before, a rope sling was used, and by the time the roll had been drawn up into the machine there would be slack enough occasioned by the stretch of the rope sling so that the roll could not be pulled up high enough to get it on the bearings of the machine; so it was usually the custom to call, four or five men in and all hands boost the roll up on to the bearings.

Another condition which showed up at this time was the fact that sometimes at the finish of an order there would be quite a sizeable roll of paper left on the machine, it being too heavy for the machine tender and move man to remove from the machine. It has been found necessary to provide another track on the ceiling directly over where this roll would be resting, to enable us to lift this roll off with the tackle block. We could not use the track that the next roll ready is raised by, because it is some two feet back of the center of the roll that is being used.

Time study on this machine has also shown that it is advisable, if the scheme is practical, to feed the sheets of board into the lining machine the narrow way of the sheet instead of the long way of the sheet. The gain in sheets (ranging approximately from ten per cent to fifty per cent) against each size of board run per minute is shown on report made relative to changing the sizes of lining paper. In order to accomplish this end it was found necessary to put a wider canvas on the lining machine, the width of the canvas then used being thirty-six inches. This width could not be used any longer, as the longest sheet of board that we would need to run in the machine would be thirty-eight inches. In order to get a canvas to accommodate these thirty-eight inch sheets, it was thought best to provide one the full face of the rolls,

which is forty inches, and in doing this it meant that we had to reconstruct the guides which caused this canvas to run in the center of the machine and not traverse from side to side.

It was also found necessary in connection with the running of the sheets the opposite way in the machine to provide a new side gauge. This should have been done sometime ago, as the gauge that was on was in a dilapidated condition, and in order to feed these sheets into the machine the narrow way, it was necessary to bring the end roll next to the feeder back toward the feeder a distance of about eighteen inches, so that feeder could reach the feed-in canvas.

Having received the new width canvas and installed it on the machine, we decided to make a run of the five sizes of board that we could use, the longest rolls of lining paper that we had, to see what the effect would be on the board of running it the grain with the circumference of the rolls. We soon found out after starting this that the sheets came out of the machine badly curled, so much so that it was almost impossible to pile them, to say nothing of the trouble that might be occasioned at the scoring machines later on. Rather than discard the idea of running these sheets this way and returning to the old way, we raised the canvas coming off the last drier about two feet, running it over a four and one-half inch roll instead of a seven inch roll, and placing two iron rolls on the top of this one, thereby bending the board over a small diameter roll in the opposite direction from what the board is curled, coming from the large drier. This attachment is running at the present time, and the board is coming from the machine straighter than it did under the old system of running the sheets in the machine the old way; but it was found that in bringing the sheets down to the man breaking at the end of the machine vertical instead of coming out to him horizontally, it inconvenienced the breaker so that it has been decided to put an automatic cut-off on to this machine, most of the apparatus for which is on hand in the plant at the present time.

Another adjustment which was found necessary in connection with the operation of this machine was one which would raise the paper off from the paste roll when the machine would be stopped to reload the elevator. The previous custom was to break the paper off by hand after the load which was on the elevator had been run and then rethread the machine. This appliance is now on the machine, and shows a saving of one-half the time.

The conclusions to be drawn from this report are as follows:

The second track to go on the ceiling has arrived but has not been put in place. The inside gauge is being made at the Chapel Machine Shops. New tongs for lifting the paper rolls are forged up and in the machine shop. New reel rods are made and are in use. The elevator has been lowered even with the floor to receive the Cowan truck load of board. A new canvas is running on the machine at the present time.

As soon as the rest of the alterations are made on this machine and the new sizes of lining paper have arrived, there is no reason why the task and bonus cannot be immediately applied.

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