

The net result of all this was that dependence on combinations in the routing of the major part of the shop production was the means of forcing a high standard of performance on the part of the Order of Work Clerk; perhaps a higher standard than would be the case with straight routing, because under the combination scheme any shortcomings or neglect in the order-of-work function were more quickly apparent and measurable. In large part, also, this is the answer to the objection that might be raised to combination routing; namely whether it would not result in an undue amount of work in process. The most common cause (outside of sales conditions, with which I am not dealing) of an excessive amount of work in process, is in non-existence of any order-of-work function worthy of the name. The routing I am describing demands and forces high efficiency in this function, and the spotlight that bears always on the Order of Work Clerk is comparable in intensity with, and a great deal more productive of useful results than, the "strong light that beats upon a throne." Moreover, as far as the amount of work ahead to be done is concerned, the rule followed of always having a second job assigned to each operator is not characteristic alone of combination routing, but was adopted as good, sound practice. Jobs averaged in length five to six hours, and orders required on the average a week to ten days to go through the works. There is no reason inherent in combination routing for the fear that by its very nature it is likely to clutter up the plant. It was devised and installed solely to secure a steadier and more orderly progress of work through the plant. It effected this purpose; and it is only uninterrupted progress of work that can keep down the work-in-process account.

To sum up as far as the order-of-work function is concerned: combination routing meant fewer jobs to watch; a much decreased number of transactions at the bulletin board, with the resultant elimination of commotion, confusion, and (incidentally) of clerks; less changing of jobs and time cards by operators; a corresponding decrease in the number of transactions handled by gang bosses, inspectors, and movemen; and a more peaceful, orderly administration all through the operating departments. The benefit accruing took all the curse off the old joke about being so busy running the system that you have no time to run the business.

I believe that to this method of routing, which provided jobs of respectable length, were also largely due the small measure of difficulty met in installing, and the highly satisfactory results secured from the task

and bonus scheme used. Gang bosses, inspectors and instructors were not required to dash about madly from operator to operator, giving inadequate attention to each job. On the contrary they could and did give to their functions a systematic and well-ordered attention that produced the results expected and desired of them.

An interesting development of the routing was the control of storeroom operations from the bulletin board, in the same manner as all other operations in the shop. Failure to do this is a source of annoyance in the many shops where priority of issue of material is left entirely in the control of the Storekeeper. The Order of Work Clerk may as well control the issue or putting away of materials as any other work, and the storeroom personnel may as well be on the same task and bonus basis as the other work-people. In many shops the sole reason why this is not done is because it seems impracticable to handle systematically a very large number of petty transactions. In this situation, combination routing is most valuable.

Combination routing not only cuts down the number of different jobs in the shops and stores, and decreases storeroom transactions, but it also very appreciably diminishes planning room transactions such as balance sheet entries, payroll entries, production record entries, etc. It holds down the volume of current manufacturing orders and route sheets, and generally contributes to an economical consolidation of both records and effort.

I do not mean to imply that there were not difficulties about combination routing, but they were merely difficulties of installation. The operation of the method of routing I have been talking about, requires only the same unremitting, intelligent direction that good shop administration demands under any scheme. As a useful resource when confronted with the problem of small quantities and short operations, I suggest it for your consideration.

(Following its reading, Mr. Walsh illustrated his paper by lantern slides.)

DISCUSSION

CARL G. BARTH:¹ In his paper Mr. Walsh has given us one concrete example of how the simple fundamental principles for routing work and operations in an establishment must be specially worked out to suit

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local conditions. In so far he has presented a lesson that should be of great service to the inexperienced who may undertake to establish a routing system under similar or kindred conditions that do not permit of the simplest and most elementary form of routing.

However, it appears likely that Mr. Walsh has paid no attention to the question of cost finding in connection with his combination routing, either because, at the time the same was instituted, cost finding was not attempted, or else because the cost-finding method in use was one of average-operation cost, or some other method different from cost finding by manufacturing lots of similar unit articles.

In nearly every machine shop we are up against the problem of cost finding in connection with numerous short individual cost orders implying similar operations on a single machine. This has been solved in a fully satisfactory manner through a kind of combination routing that has to be effected by the Order of Work Clerk independently of individual route sheets originally prepared, at a time when it would be impossible to foresee with which other short operations a particular short operation might eventually be performed.

Whenever a number of job cards representing short operations appear as work on hand for a particular machine, the Order of Work Clerk stamps these in succession (in the space ordinarily set aside for the time stamping), Job No. 1, Job No. 2, etc. on Summary of so many Jobs, and then clips them together with a so-called Summary Job Card, which is either a specially printed form or else merely a regular job card. This he stamps, Summary of so many Jobs Herewith, in the space ordinarily set aside for the charge of an individual operation job.

In the body of this Summary Job Card he then enters the sum of the prices recorded on the individual job cards, in the case of simple piece work; both the sum of the total high rates and the sum of the total low rates and of the task times, in the case of differential piece rates; the sum of the bonuses and of the task times in the case of task with bonus; and, finally, the total premium time, in the case of premium work.

In the settlement for the work where a time limit is implied, it is simply taken for granted that each individual operation has been done within its own time limit, if the total of the time limits recorded on the Summary Job Card has not been exceeded; and vice versa.

Different pay methods cannot be summarized in this

way, but in the case of plain day work it can be done, though this necessitates the operator marking down on each individual job card the time he spends on the work it calls for, in a manner such that the total will substantially agree with the elapsed time eventually shown on his Summary Card.

The operator is given credit on the payroll by reference to the Summary Job Card alone, while this is of no interest to the cost department.

I have had instances of more than eighty very short operations having thus been combined by means of a Summary Job Card, with still the cost of each operation charged properly to its own cost order.

In connection with the building (they were not manufactured) of gun carriages at the Watertown Arsenal, we had excellent examples of combination routing of parts belonging to the same cost order. Several of the parts of a gun carriage had to be partially machined together with other parts, as it did not pay to make the large expensive jigs that would have been required to machine them independently of each other.

Each part had an independent route sheet, but this would at certain stages of partial machining show that the part had either to be moved to some other place to be machined together with one or more other parts, or how it at another stage perhaps had to await the partial completion of some other part, before a particular operation could be started.

In a certain other machine shop a machine to be routed had thirteen different, but in a general way similar, cams to be machined. The engineer of limited experience in daily charge under an occasional visit by me, at first had an independent route sheet made for each cam; a matter at once, and correctly, criticized by the plant superintendent, who said that when they had no system he just had all these cams put in one tote box and sent from one machine to the other, each operator performing his particular operation on the cams that needed it, leaving the others alone, until eventually all cams were finished. When the matter was called to my attention, I had no difficulty in showing how a single route sheet, i.e., combination route sheet, would do, on the system, just what they had done before the advent of the system.

Every shop and every industry has its own problems, and great ingenuity is always required in fitting the system to the particular needs of each place; and unfortunately, the professional engineer can rarely hope to stay long enough at a place to get it all accomplished.