

the product at each operation is being made according to the specifications, and if not, point out the cause of variation. He should not leave until the workman has produced and is producing perfect work. The dispatching of work should include the directing of the inspector to operations that are just being started.

This inspection of work in process should not operate to dispense with final inspection of each part of the product after the last operation. In final inspection, the inspector should be advised as to just what faults or variations from standard are to be looked for, and the permissible amount of variation. The provision of a definite routine for inspection will render it more efficient and less costly.

Maintenance

Maintenance and repair form an exceedingly important function of production management. The duties of the maintenance department include the repair of equipment that fails or wears in service, and the establishment of a system of inspection and preventive repair that will remove causes of failure or make adjustments for wear before failure occurs.

Failure of equipment in service has many disadvantages. Not only is there the cost of repair, but also the wages of idle workmen while repairs are being made, and the loss of profitable production. Constant machine failures will prevent any schedule being laid down with the certainty that it can be met, and production control may become difficult if not impossible.

The maintenance department can avoid all or nearly all of these difficulties by establishing a routine that will insure inspection of the equipment of the plant at regular intervals. When conditions are revealed that require a remedy, arrange-

ments can be made for the necessary repairs outside of working hours or at a time when they will cause the least interruption to production. It is worthy of note that those plants that have a highly developed maintenance system seldom have equipment failures.

Forms

To carry out the routine of any system of management, certain forms are necessary. The system of forms should not be confused with the system of management. The latter is an organized scheme for obtaining certain results, based on definite principles. The former is simply the mechanism provided for the latter. And let it be stated here that scientific management is not a particular system, nor a set of forms. These are but a means to an end. They represent only the easiest and most economical method of applying the principles of management to the case in hand. Two plants may have entirely different systems and their forms may be totally unlike, and still both plants may be truly representative examples of scientific management. Forms are merely a permanent statement of the wishes of the management in regard to the matters to which they relate. They replace orders and instructions that in the early stages of an enterprise or program are given by written memoranda or verbally. When an order or instruction is repeated sufficiently often to warrant it, a form is devised to convey the same information, concisely and definitely, leaving only the necessity of writing in the figures, dates and symbols to make the form complete. Forms may also be considered a delegation of authority to the individual authorized to issue them, the authority, however, extending only to the subjects covered by the form.

THE effectiveness of financial self-interest as a motive to regularizing production depends on how closely the differential costs borne by the employer correspond to the true differential costs of added production to the industrial community as

a whole, and how closely the residual or constant costs of the employer correspond to the burdens which the industrial community must bear whether production is maintained or not. (J. Maurice Clark, *The Economics of Overhead Costs*, p. 167.)

Planning and Production Control

The Committee on Industrial Planning of the Boston Chamber of Commerce presents a composite picture of the planning methods found effective in Boston's most efficient factories.

I. Organizing for Master Planning

A. What Master Planning Is

A WELL-balanced and economically directed business must have worked out in advance a Master Plan which in turn is broken down into detailed schedules and budgets for Sales, Finance, and Production. It is obvious that the various elements of a business cannot be expected to work together as a unit except through the use of a coordinator or a Master Plan.

It is very doubtful if there exists any unanimity of opinion in regard to either the character or scope of a master plan. This paper is prepared on the basis that a master plan covers solely *future* operations (not current operations) and that it specifies the duties of each division of the organization affected by the plan and a finish date for the completion of the work of each division.

B. Purpose and Benefits

The usefulness of a master plan is founded on the necessity of translating market possibilities into a goal of production output which can be sold at prices affording a margin that will satisfy requirements for dividends and reserves. The benefits which result from the use of a master plan are many. Selling promises, as to quantity, quality, and delivery are kept and hence satisfied customers are one of the outstanding results. Idle time and overtime for both men and machinery are reduced to a minimum. Purchases are made at such time as to realize the most for the money expended and made far enough in advance so that suppliers are not constantly rushed to meet deliveries. Better relations with the banks are promoted, for only that which can be financed will be attempted; the banks will know in advance probable needs and will be prepared to meet them; and also definite knowl-

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edge is available as to when and how notes will be met. Consequently by the use of master planning, or foresight, better control of the business cannot help but result.

C. Work of Master Planning

The well balanced and economical plan of action worked out as a master plan should be based upon the following salient principles:

1. That the sales estimate should be matched against existing inventory.
2. That the resultant production schedule should be transposed into man hours.
3. That these man hours should be distributed to departments or processes.
4. That these hours should be matched against the existing personnel in the form of a direct labor budget.
5. That these hours should be transposed into money, making an expense budget.
6. That an estimated profit and loss statement should be prepared.
7. That an estimated balance sheet should be prepared.

D. Steps in a Master Plan

In order to develop true coordination of sales, production and finance by means of a master plan, six steps may be taken. They are—

1. Research
2. Analysis
3. Synthesis
4. Planning
5. Scheduling
6. Inspection

1. Research

By research for master planning is meant the gathering of information covering the potentialities of the market, the plant, and the financial resources. The master plan is based on multifold forms of research. One large phase—the one involving the most work—is the establishment of a sales quota. Into