

the central office in order to secure coordination and then the details are delegated to the individual departments. In either case, however, the object is always to secure the maximum economical control under the given conditions.

(a) *Size.* In order to perform all planning, scheduling, and dispatching for the entire plant at one central point the plant must be comparatively small. Size is the primary consideration in deciding between centralized and decentralized control. A plant like the Watertown Arsenal is too large for central control. However, a central planning office may do the master planning; that is, materials may be secured for the entire plant and delivered on time to the individual departments. Where the work is to be done and when each department will start and finish each order can be specified, but it would be extremely inadvisable for the central planning room to attempt to specify when each job on each machine or process within the individual department shall be performed. These details must be left to the individual units in a large plant.

In a small plant the situation is reversed. By decentralization the management would lose a great deal. The central control department is the pulse of the plant and when the plant is small enough all details of planning, scheduling and dispatching can be performed there and one office can competently supervise the entire machinery of production. If the information were decentralized much extra effort, running around and possible duplication would result. Indirect savings are affected by centralized control.

(b) *Product.* There are, however, plants between these two types which may require decentralized control in some departments and centralized in others. In manufacturing watches and speedometers a central control is absolutely necessary so that requirements of each grade of product may be most economically scheduled through departments, processes or assemblies, and the product completed and available when needed in relation to other parts or assemblies. For some parts of sub-assemblies only the central control is needed; this is the case where automatic machines are adequate and where the operations are few and the foremen responsible for production. The physical means of control are the records of production against requirements and the balance of stores cards in the central control.

In punch work for example where parts are varied and set-up time is a consideration the situation

necessitates departmental control and central control with balance records and graphs. In the assembling of a watch production control routine was reduced to a minimum by establishing central scheduling for gangs and by detailing the dispatching of the work of each operator from the central stockroom.

The type of product is a vital factor in determining the method of control. If the article is a technical one and is made mostly in one department there is no object in bringing the control back to central headquarters; the department heads know the problems and immediate situation much better than any central authority can know them and manufacture is entirely independent of other departments in the plant. The reverse is true in a small plant if the products pass through several departments and many products are fabricated on the same machinery. In such a case central control is absolutely essential for economical manufacture. In a large plant control by departments would be desirable while in a small one control would extend to individual machines or work places.

2. Process of Job System

Production and cost systems tie together to a very great extent and they should be considered one and the same thing. There are two principal methods of cost gathering: (1) process costs, (2) job costs. The process system is merely controlling production and costs by processes. The cost is secured by accumulating the total cost of the operation and dividing it by the number or amount of parts sent through. In the job or lot system each lot of parts has separate job tickets for each operation performed on them. In this way tight control and exact cost records are secured for each operation of each lot.

Whether a process or job system should be installed is largely a question of practicability. In certain industries, such as a paper mill or a blast furnace, it is impossible to secure exact costs of each operation of each lot. Lots are not separated and process costs only are possible. In many industries, although it is possible to secure job costs, this is not necessary or practical; only when they are easily available should job or lot costs be collected. However, it is possible to have a combination of both process and lot cost systems. In a tannery, for example, up to a certain point process control is best; then the lot system can be used, and finally process costs again. In a paper mill process costs can be used up to the finishing operation but from there on only job costs can be utilized.

3. Form of Organization

Many varieties and combinations of types of plant organization have been used in industry. Practically all, however, fall within one of four classes: (a) committee; (b) line; (c) staff; (d) functional.

(a) *Committee.* The committee system is extremely valuable where deliberative action is necessary. In this system a committee composed of the heads of the important divisions of the business performs the function of general administration. It brings together the best minds in the organization for frank discussion of problems as they arise and for decisions requiring definite action. Since the heads of departments have a voice in reaching decisions they will tend to cooperate in carrying out the decisions effectively. The weaknesses of the system are the lack of authority over individual members of the committee, the possibility of shifting responsibility, the often indefiniteness of decision, and the time which it may take to reach a conclusion.

(b) *Line.* The line form has its advantages in a stable business but in ordinary usage it is poorly adapted to meet emergencies. Usually one man is in active charge of all the departments of the business; his decision in all matters is final and he personally supervises all the work. This does not provide for complete coordination of effort between the various heads as each acts independently and is responsible only to the chief. An additional weakness is that each official covers both administrative and executive functions. Small organizations find this method very good because the weakness of lack of cooperation can be easily overcome by the personal touch.

(c) *Staff.* The staff type of organization is best where new problems of an expert nature are constantly arising. A group of experts, each one a specialist in some technical or non-technical branch of the business, is attached to the office of the higher executives. Whenever problems of a peculiar nature arise the best course of action is not left to the haphazard decision of a foreman but is delegated to an expert member of the staff. The precaution is unnecessary in an organization where such problems do not arise or where they come very infrequently.

(d) *Functional.* The functional organization is adapted to rapid changes. The supervision is divided by functions; instead of a foreman being in charge of all functions in his one department, the duties will be segregated and each duty or function will be controlled through the department or plant by one expert.

Each specialist knows his function and can meet emergencies immediately and completely. Under this plan the manager need not bother about intimate details of the business; he can devote his energies to affairs of administration and policy. The sharp division into functions, however, makes it extremely necessary for the manager to supply the coordinating and stabilizing influence by calling frequent conferences of the functional heads.

An organization must be designed to meet the individual needs of the business. Many factors bearing on the industry must be considered in selecting the proper type of organization: size, location, personnel, product, and technical qualities. Even in the same industry a difference in methods or character of personnel may make it desirable to develop a different type of organization.

4. Labor Control

Labor control methods used must be adapted to the organization. The character of the management, owner, and labor all affect the choice of methods.

Different types may of necessity prevail in open and closed shops. Different forms of representation, shop committees, and works councils apply only in particular cases. Labor union policies may seriously affect the control system. Similarly, the general traditions of laborers or employees in the plant, for instance with regard to the proportion of union and non-union help working side by side, have much weight and influence.

The size of the plant plus the type of organization will determine largely the kind of labor control. Centralized labor control and records are desirable in smaller plants. Hiring, discipline, and discharge can best be handled in a central office under the employment manager. As the size increases or as the union situation becomes more complex it may sometimes be better to perform these functions in each unit or department, or work out a combination of partial centralization and decentralization.

5. Material Control

Part of the problem of production control is the control of materials. Certain definite policies for their handling must be determined. The size of the plant, layout, type of product and the materials themselves will all decide whether to have centralized or decentralized material storage, records, and replenishment. Smaller plants usually should have complete central control but in the larger plants the wisdom of high centralization is doubtful. In the latter cases