CHAPTER 2

THEORETICAL FOUNDATION

2.1. Production and Operation Management

Terminology of production and operation is used in an organization as output, like goods or services. Production activity means an activity or a process that transform input to output. So production and operation means include each process that changes inputs and uses all resources to produce outputs. It means an activity can be measured the capability that is often called productivity for each input, except material.

In the broad view, production means as transforming of an input to become an output, belonging to all activity that result goods and services, and the other's activity that supports to produce that product (Assauri 1998, p. 11). Besides of this, production activity can be found in manufacturing, mining, hotel, hospital, services, etc.

In narrow view, production means just activity that results goods as half finished goods or finished goods, industrial material, spare part and component. It means, production as manufactured activities.

Production and Operation are the action to regulate and coordinate using all resources, such as human, machinery, money, and material. Production and Operation Management are as process to create goods or services that be useful for force to

achieve organization goal. Organization has a goal to get a given profit or maximize profit, give the service in the best one and try to guarantee organization existence.

A decision in Production and Operation Management is done to achieve organization purpose and goal in the short time and the long time. A decision-making can cause the physical and organization problem, which can be predicted. A decision can be like marketing plan, production and operation plan, labor plan or human resource, and financial plan. A decision can be achieved through modeling system that calls Simulation Modeling. This model is used if in the certain condition needs mathematical model than outside simple model, because too complex and need a lot time. In production and operation, a decision has five main responsibilities (Assauri 1998, p. 15):

1. Process

   This decision involves equipment type, technology, lay out and all physical aspects. This decision cannot be changed easily, because it is as long-term decision.

2. Capacity

   This decision intends to give amount of capacity and stock in the right time. Long-term capacity is established by how many facilities that build. In short-term, capacity often adds with subcontract to the outside or shift time.

3. Stock

   This decision is made to know what order, how much order, when order should be done.

4. Labor

A decision in labor involves selection, salary, training, placement, and supervising.

5. Quality

Production and operation function recognize a bigger responsibility to quality of goods or services that produce.

2.2. Production Process

Before production process is defined, meaning of process should be known. Process means a way, method and technique about how all resource (labor, machinery, material, and fund) changing into getting a result. Production means to create or add utilization of a good or service. Production Process means as the way, method and technique to create or add value a good or service with using all available resources. Although production process has many variances, extremely can be divided into two categories (Assauri 1998, p. 75):

1. Continuous-flow processes.
2. Intermittent-flow processes.

The selection of a production process structure is ascertained by many factors. The most important factors of production process selection are:

1. The expected volume and required pattern for the products.
2. The number of different product to be made by system and the type of processing each requires.

3. The customer order type.
4. The physical characteristic of the product and the specific technologies required producing them.

If all products to be manufactured by a production system use a same type process in the same sequence, so this process is called a flow process. A flow process is divided into several tasks or operations that must be performed. The tasks are located to perform at workstations as in figure 2.1.

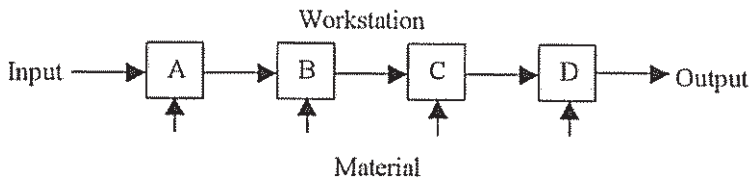

Figure 2.1. Flow process structure

Each unit of product flows through the workstation in sequence with the appropriate task performed in order. All products should go through the same process. The transformation process is differed on the continuous processes and intermittent flow processes.

2.2.1. Continuous flow processes

Continuous processes are used in base process industries, like paper, chemical, petroleum, etc. This process is designed to produce large volume of a small variety of product, which needs the same processing activities to be performed in a

strict sequence. These processes have a tight interconnected structure whereby material moves continuously through the system.

Continuous flow process also can be used to produce discrete product. Many products like detergent and candy use continuous processes.

The advantages of these processes (Assauri 1998, p. 77) are:

1. Mostly product is resulted in a big amount.
2. They use specialized machine that has designed to create a product.
3. If one workstation is broken down, all process will be stopped.
4. Material handling used fixed equipment like belt conveyer or bucket elevator.
5. Cost per unit and labor cost are cheaper, if they are produced in a big volume.

The disadvantages of these processes (Assauri 1998, p. 77) are:

1. They are rather difficult to change, if customer wants to change the specification.
2. Production process will stop, if one workstation in a production flow system is in trouble.
3. It is more difficult, if there is capacity increasing.

2.2.2. Intermittent flow processes

These processes are similar to continuous flow process in that workstations are tightly connected. The difference of these processes is in work required, because

the tasks are performed in the same sequences. A common version of these processes is an assembly line.

The advantages of these processes (Assauri 1998, p. 77) are:

1. These processes result in a small amount with big variety.
2. They have high flexibility to face product change.
3. Machinery that used is general.
4. Production process is not easy to stop, when there is a trouble in a workstation.

The disadvantages of these processes (Assauri 1998, p. 77) are:

1. They need big investment in raw material supply because the process is intermittent.
2. Labor cost and material-handling cost are high.
3. Production control is very hard to control, because complexity of scheduling and routing.
4. Scheduling and routing is not easy to control, because the combination is too much

2.3. Maintenance Management

Maintenance function is a very important function in a company like the other functions. A Factory manager will try production activity in guaranteed continuity.

The equipment needs maintenance activity, like inspection, lubrication and repair trouble.

Most companies do not concern in maintenance, so maintenance activity is not done regularly. Maintenance activity will be felt important, when the equipment has been broken down. The activity should guarantee as long as production-activity is processed, that there is no trouble of machinery or production equipment.

After maintenance function is known, maintenance terminology itself should be known. As Assauri (1998, p. 95): "Maintenance is all activity to maintain or keep all equipment and take repairing action or replacement, so production operation can satisfy that have been planned". Therefore maintenance activity can keep that there is no trouble as long as the equipment can be operated in a certain time. Production Division also hopes that the process can run well, because all trouble possibility has been decreased or disappeared.

Main functions of maintenance (Assauri 1998, p. 95) are:

1. Production capability can achieve requisite production planning.
2. To keep quality in the right level to achieve required product.
3. To help decreasing consumption and deviation and keep capital that has been invested for a long time depending on company policy.
4. To achieve low maintenance-cost effectively and efficiently.
5. To avoid maintenance activity, that can endanger labor safety.

Maintenance Activity can be grouped in five main areas (Wireman 1994, p. 1), as listed below:

1. Maintenance of Existing Equipment

These activities are the basic reason why this division is formed. This division will make repair to the machinery as fast and economically as possible. This division should anticipate repairing based on previous experience. To prevent rapid wear, this division should utilize cost-effective preventive maintenance program. To perform this task, they need a trained workforce, modern tools and maintenance method. All above task depend on accurate record keeping. Without this task, it will not be possible to complete the assigned task timely and effectively.

2. Equipment Inspection and Service

Inspection activities contain regular inspection of building and machinery according to planning and make report from those activities. These activities can make sure all equipment run well. If there is a trouble or an indication, the worker can repair as soon as possible and try to avoid from serious trouble. After repaired work is finished, the foreman makes an inspection report. This report is made by maintenance division to judge what should we do to this equipment, if this equipment often breaks down.

3. Equipment Installation

This activity has variation from industry to industry and depends on the size of installation and workforce. Some facilities require constant changeover. If

there are large installation project, outside contractor are supplied to fulfill the required manpower

4. Maintenance Storekeeping

   This job should receive and distribute spare parts necessary for the repair of machinery. The first is recording the necessary spare for each piece of equipment. After all spare parts are recorded, they can set the inventory level for each part. When the spares are used, the replacement should be ordered.

5. Craft Administration

   This job is the activity that has relationship with cost transaction happening in maintenance activity and the other activities, like spare parts, progress report, and inspection and repair time. This work is administration activity of maintenance work that guarantees about the important thing about maintenance job.

2.4. Maintenance Planning

The survey has shown that average productivity of employee is between 25 and 35% (Wireman 1994, p. 41). This means that if one day has 8 hours working time, a craftsman has less than 4 hours. This waste time is caused by:

- Multiple trip to store for material,
- Return trips for tools to do the job,

- Trip to the job site to look what is required,
- Wait for delivery from vendor, if the spare parts are not in stock,
- Incomplete planning and communication,
- Insufficient worker scheduled for job,
- Waiting for equipment to be shut down,
- Emergency works.

The concept of job scheduling is to determine what is to be done and how it is to be done. Job scheduling consists of two main areas: craft skills and material required for the job. This labor and craft skill also can estimate the cost of completing the work order.

2.4.1. Type of work to be planned

Emergency and critical work are seldom planned (Wireman 1994, p. 43). These jobs are requested in the short time and should be done in the short duration. These jobs should not be considered in the planning functions.

Normal or routine work should be the primary consideration of the planning function. These works are received and placed in the work backlog. When the workforce and material are available, these works are scheduled. Preventive and predictive maintenance works are included of this type. The work request also can be planned