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THE PRODUCTION CAPACITY. CONTENT AND DETERMINATION

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Una dintre condițiile esențiale pentru supraviețuirea unei entități economice pe o piață concurențială constă în utilizarea coerentă şi conştientă a facilităților de care aceasta dispune. În acelaşi timp, este necesară şi stabilirea corectă a necesarului de personal şi de echipamente, în scopul dimensionării ofertei în funcție de cererea prevăzută.

Entitatea economică trebuie să-şi definească un nivel „normal" al activității în funcție de valoarea producției, orele de funcționare a utilajelor, gradul de utilizare a capacității de producție. De aceea, determinarea capacității normale sau a activității normale poate fi dificilă.

Determinarea capacității normale se poate realiza în două modalități: 1) prin stabilirea producției necesare pentru a satisface valoarea vânzărilor aferente unui exercițiu, producție ce corespunde utilizării unei capacități reale, considerată capacitate normală de producție. În acest caz, capacitatea normală variază de la un exercițiu la altul; 2) prin stabilirea producției de realizat în funcție de volumul vânzărilor pentru mai mulți ani şi pentru a nivela fluctuațiile, producție ce corespunde unei utilizări a capacității reale care constituie capacitate normală. În acest caz, capacitatea normală este constantă.

Gradul de utilizare a capacității de producție are două semnificații majore: pe de o parte, exprimă faptul că capacitatea de producție reflectă potențialul productiv al entității economice, fiind o mărime obiectivă, independentă de volumul producției efective; pe de altă parte, arată partea folosită din potențialul de producție.

One of the most important conditions necessary for the survival of an economic unit on a competitive market, is that of a coherent and responsible usage of its facilities. At the same time, an accurate setting of its human and technical needs is also necessary, so as to thus establish the supply in accordance with the foreseen demand.

The production capacity represents the maximum production (with a specific structure and quality) which can be obtained under certain specific conditions: a precise production unit (working place, department, section, economic unit, and branch), a specific period of time, specific (optimum) technical and organizational conditions.

According to the framework of *International Accounting Standards Committee*, the production capacity (or the operating capacity) is a way of defining the capital (the physical concept of the capital). According to *The Second International Accounting Standard*, the normal production capacity represents "the estimated production to be obtained within a period of time, in normal conditions, taking also into account the loss of capacity as a result of the planned maintenance of the equipment".

The economic unit needs to define a "normal" level of its activity, in accordance with the production value, with the equipment's working time, with the usage degree of the production capacity. Yet, the term "normal activity" is not clearly defined. Therefore, the precise setting of the normal capacity or of the normal activity may be difficult to accomplish.

From a theoretical perspective, there are two types of production capacity:

- **a theoretical capacity**, corresponding to a continual and constant usage of the equipment;
- **a real capacity**, determined as a difference between the theoretical capacity of the interruption periods of time (maintenance periods, start-up periods of time, absences, vacations etc.).

The real capacity corresponds to the normal production capacity. If we also take into account the possible sales volume, the normal capacity may be inferior to the real capacity. The normal capacity setting can be obtained in two ways.

- by establishing the necessary production so as to satisfy the sales value for a year, production that corresponds to a real capacity usage, which will be considered as a normal production capacity; in this situation, the normal capacity varies from one year to another;
- by establishing the production to be achieved in accordance with the sales volume for more than one year (many more years) and in order to equalize the fluctuations, production that corresponds to suit a real capacity usage, that is a normal capacity; in this case, the normal capacity remains constant.

As a result, a normal activity coincides with a real activity only in the stage of cost forecast.

The production capacity may be expressed in two ways:

- **physical form**, by the physical production per unit of time, or by the maximum working period of time, expressed in hours or days;
- **value form**, by the production value per unit of time.

Accordingly, the usage degree of production capacity can be determined as follows.

$$UD = \frac{\textit{Obtained production (physical or value)}}{\textit{The maximum production capacity (physical or value)}}$$

Or:

$$UD = \frac{\textit{The number of hours of working time}}{\textit{The maximum working capacity (hours)}}$$

The usage degree of production capacity implies two major aspects: the production capacity expresses the productive potential of an economic unit, being an objective dimension, irrespective of the effective production value; on the other hand, it shows how much of the production potential is being used.

The experts in the field suggest a usage degree as high as possible, taking into account that the extreme situation ($UD = 1$) is neither achievable, nor efficient, because the usage of the production capacity in a ratio of 100% requires, theoretically, sudden maintenance and maintenance costs, which implies infinite resources.

In practice, the setting of the production capacity is good for the following purposes.

- to establish the production plan and the investment plan;
- to establish the production units and the technical equipment necessary;
- to identify and to evaluate the internal resources of the production (the internal resources are proportional to $1 - UD$);
- to establish in a technical and economic way the options regarding the reconstruction, the re-equipment and the development of the productive units;
- to draw up a development plan;
- to establish an adequate strategy regarding the production process (concentration, systematization, specialization, cooperation);
- to determine, to compare and to assess the results of the productive units, in order to increase the general economic efficiency.

The necessary principles to be obeyed in the production capacity determination are the following:

1. The production capacity should be determined only in accordance with those productive units which contribute directly to the achievement of the specific production of the economic unit (for example, the maintenance activity may not contribute directly to the main activity field of the economic unit).
2. The production capacity should be determined in a bottom – up sense, that is to begin with the calculation of the production capacity of the lower organizational components, and that of the higher ones (working places, groups of machines, departments, sections, and economic units).
3. The determination of the production capacity of the upper organizational component should be done according to the production capacity associated to the main component, explaining "the limited places".
4. The production capacity is an independent dimension of the temporary lack of resources. Thus, the determination of the production capacity requires the existence of a normal degree of material, human and financial resources of the productive units. The possible deficiency of resources may affect the utilization degree of the production capacity and not its value.
5. The production capacity is a dynamic dimension, depending on the influential factors of the production process.

The influential factors of the production capacity's dimension are the following:

- the investment funds' value regarding the development and the re-equipment of the productive units, obeying the start-up terms of the objectives;
- the size of the frame of fixed assets, the rate of the replacement of worn and torn used equipment;
- the mechanization and automatization degree of the production activity;
- the capacity of adoption and extension of the new production technology;
- the degree of concentration, systematization, specialization of production.

The influential factors of the utilization degree of the production capacity are the following:

- the work regime (the number of working days per year, the number of working shifts, the duration of one working shift);
- the period of the scheduled maintenance programs, the maintenance level and the probability of the fixed assets service interruption;
- the deviation from the optimum assortment of production or from the programmed objective, for every productive unit;
- the deviation from the technical standards regarding the shape, the dimension, the quality of the semi-finished and end products;
- the qualification degree of the human resources;
- the elimination of the "limited places".

The working time pool of the equipment

The working time pool is expressed, in general, as the number of hours throughout one year. In specialty literature, the following categories of the time pools are specified:

The calendar time pool = $365 \cdot 24$ *hours / year*

The individual time pool = The calendar time pool – t_r = $D \cdot S \cdot h$ *hours / year*,

where D – the number of working days per year;
S – the number of working shifts per day;
h – the number of hours per shift;
t_r – the scheduled break time.

The effective time pool = The individual time pool - $t_{rep} = D \cdot S \cdot h\left(1 - \frac{r}{100}\right)$,

where t_{rep} – the maintenance periods of time.

In practice, the maintenance periods of time are given as a percentage *(r)* of the individual time pool. For machine – tools, $r \in (3{,}5\% - 12\%)$; the average value that can be taken into consideration is 6 %.

The technical time pool = The calendar time pool – t_{rep}.

The technical time pool represents the maximum limit of the productive potential (leaving the break time aside) and is used for the technical capacity determination.

For a mechanical processing operation, the production capacity can be calculated as a rate between the time pool and time quota per piece.

$$PC = m \cdot \frac{F_t}{n_t} \text{ (pieces / year)},$$

where m – the number of the devices from the same category;
F_t – the time pool for an equipment (the same for the equipment of one category);
n_t – the time quota per unit of product according to technical standards.

The time pool is the same for the equipment from a specific category, only if this equipment has the same technical condition, requires the same maintenance periods of time and works in an equal number of shifts.

When the period of time actually used to obtain a unit of product is different from the standard time period specified in the technological documentation, the determination of the production capacity can be done by using the following formula:

$$PC = m \cdot \frac{F_t}{n_t} \cdot k_p,$$

where k_p – the progressive average coefficient of the fulfillment of production rates.

The determination of the k_p coefficient requires the following stages:

1. Division of workers within a professional field into G groups, so that every group has the same coefficient of the fulfillment of production rates. The group is graded with g, $g = \overline{1;G}$. Under these circumstances, the individual coefficient of the fulfillment of production rates will be:

$$k_g = \frac{n_t}{t_{efg}},$$

where k_g – the individual coefficient of the fulfillment of production rates g;

t_{efg} – the required effective period of time in g group to accomplish the operation for which it has been accorded a given period of time n_t.

2. Computation of the progressive average coefficient of the fulfillment of production rates k_p, as a multiplied average of the coefficients k_g:

$$k_p = \sum_{g=1}^{G} k_g \cdot \frac{M_g}{\sum_{g=1}^{G} M_g},$$

where M_g – the number of workers from g group, with the same coefficient of the fulfillment of production rates.

3. Computation of the technical progressive quota (n_{tp}), in order to determine the production capacity.

$$n_{tp} = \frac{n_t}{k_p}$$

In accordance with the time pool taken into consideration, one may determine the nominal, the effective, or the technical production capacity.

Observation: when there are differences between the time quota provided by the technological standards and the achievement of the workers, n_{tp} shall be used instead of n_t in the formula above.

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