IMPROVING THE EFFECTIVENESS OF USING EQUIPMENT DURING THE ELEVENTH FIVE-YEAR PLAN

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The need to speed up production and boost usage levels of the main capital stock was stated at the Twenty-Sixth Congress of the Communist Party of the Soviet Union (CPSU). Most attention during the Eleventh Five-Year Plan should be paid to improving the use of the working part of the basic plants, i. e., the main production equipment.

In the refractories industries, in recent years we have introduced a large number of new plants. Generally, it is being successfully developed and the efficiency is continuously being increased (Magnezit combine, Bogdanovich and Vnukovsk factories). However, in some enterprises the effective use of the main plant in the Tenth-Five Year Plan was actually reduced compared with previous years (Suvorovsk mining commission, East-Siberian and Novomoskovsk refractories factories).

The effective use of the plant depends on many factors, including timely delivery of materials, fuels, electricity, and also the levels of unplanned downtime. Plant downtime because of late deliveries of materials and fuel is relatively infrequent, and as a rule, is frequently reflected in shift and dispatch reports. The most often repeated are downtime periods for the plant due to damage to parts and technical supplies, and also as a result of production restructuring (transfer to other batches, cleaning of containers, change in the temperature schedules, absence of working force, and various management shortcomings).

Unplanned downtime can be substantially reduced by increasing the efficient use of the basic plant. It is primarily necessary to study the causes of unplanned downtime and to determine their extent.

However, in certain enterprises downtime is badly organized, without determining the effective utilization of equipment; furthermore, because of the absence of a single method of determining the efficiency, it is impossible to reproduce data from different factories as a means of comparison for analyzing the loading of equipment as a whole for the association. The planned assignment for the enterprises is determined starting from the existing production potential. Therefore, in order to carry out comparative analysis of the effectiveness of the plant and to compile planned assignments it is necessary to develop a single method of determining it.

TABLE 1. Expenditure on Plant Repairs

Enterprise	Expenditure on repairs, % of cost of basic investment		
	total	including	
		running repairs	capital repairs
Magnezit combine	7,3	4,9	2,4
Bagdanovich factory	6,7	4,2	2,5
Vnukovsk factory	8,3	4,4	3,9
Suvorovsk mining commission	4,1	1,1	3,0
East Siberian factory	4,2	2,6	1,6
Novomoskovsk factory	5,5	2,5	3,0
Total for VPO Soyuzogneupor	6,6	3,9	2,7

*Here and subsequently data is given for 1980.

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TABLE 2. Potential for Repairs to Equipment in Various Enterprises

Enterprise	Cost of equipment undergoing repairs	No. of fitters working on	Cost of equipment attended by one repair fitter, 10^3
Magnezit combine	84629	966	79
Bogdanovich factory	20693	411	50
Vnukovsk factory	8006	162	49
Suvorovsk mining commission	5896	39	151
East-Siberian factory	19141	202	95
Novomoskovsk factory	8134	99	82

It is most simple to express effectiveness through the coefficients of extensive and intensive loading. The first coefficient for the plant is characterized by the use of equipment with respect to time, and the second — the use with respect to productivity in unit time. The coefficient of extensive loading K_e is determined by the ratio of actually worked time F_f to the calendar F_k or the maximum schedule F_p for time [1, 2]:

$$K_e = F_f/F_k \quad \text{or} \quad K_e = F_f/F_p.$$

We must consider that in determining the coefficient of loading intensity, we can use different time funds: calendar, maximum schedule, and actual.

The calendar fund F_k equals the number of calendar days in the calculated period multiplied by 24 h.

The maximum schedule fund F_p consists of the working period with the exclusion of Sundays, holidays n_1, and preholiday reductions n_2 of the working day, and is determined on the basis of a 3-month 7-h working day according to the equation $F_p = 3(7 \cdot 365 - 7n_1 - 1n_2)$.

The actual time fund F_d equals the maximum scheduled level for the time extracted for planned repair: $F_d = \beta F_p$. On the basis of experimental results for the enterprise, and also the data for standard projects designed for production, work and control in repair-mechanical shops of metallurgical enterprises, as a function of the production characteristics as a function of the production style, the coefficient β should be assumed to be equal to 0.92 for chamotte production, 0.90 for chrome—magnesite, and 0.88 for dinas.

Thus, in order to determine the effectiveness of the use of tunnel and rotary kilns, the coefficient of extensive loading should be considered with respect to the calendar time input ($K_e = F_f/F_k$), and the mechanical equipment — in regard to the actual time input ($K_e = F_f/F_d$).

TABLE 3. Quality and Quantity of Components Prepared in the Repair Shops of Enterprises

Enterprise	Quantity of machined parts, tons	Quantity of strengthened parts	
		tons	%
Magnezit combine	6656	2428	36
Bogdanovich factory	1532	644	42
Vnukovsk factory	769	183	24
Suvorovsk mining commission	234	19	8
East-Siberian factory	938	219	23
Novomoskovsk factory	519	97	18
Total for VPO Soyuzogneupor	15688	5458	35

The effectiveness of the plant utilization can be expressed also by the productivity for the fixed time in items, mass, or volume units, i. e., by the coefficient of intensive loading, determined as the ratio of the actually executed work A_f for a given time to the theoretically possible A_T:

$$K_i = A_f / A_T.$$

The magnitude of the theoretically possible work for a certain time is computed from the technical norms for the productivity of the corresponding equipment.

The existence of data on the effectiveness of the plant in use and on the causes of downtime enables us to develop and execute the necessary measures to which the following are essential:

continuous supply of raw materials, fuel, electric power, materials, spare parts, and alternative equipment;

combining the work force of backward sections, and offering technical assistance;

improving the technical servicing on the side of the working basic production section and repair personnel; increasing the responsibilities for the condition of the plant in the shifts;

increasing the repair standards and increasing the wear resistance of the parts and alternative equipment; organizing the maintenance jobs after completion of repairs.

One of the main causes of the reduction in the level of basic plant utilization is the unplanned downtime. Concerns in which unplanned downtime is moderate are tackling the planned assignments successfully (the Magnezit combine, Bogdanovich and Vnukovsk factories); here the unplanned downtime is significant, and as a rule, this situation is unsatisfactory (Suvorovsk mining commission, East-Siberian and Novomoskovsk factories). Even with external examination of the equipment it is difficult to state that its technical condition in the first concerns is much better than in the second.

Table 1 shows data on expenditure for equipment repairs, from which it follows that at the Suvorovsk mining commission, the East-Siberian and Novomoskovsk factories they are using on repairs much less than at the Magnezit combine and the Bogdanovich and Vnukovsk factories. Hence, in the first three enterprises repairs are done inadequately. This is confirmed by the marked difference in the cost of equipment allocated to one repair fitter in the above concerns (Table 2), i. e., the Magnezit combine, Bogdanovich and Vnukovsk factories possess great potential for production repairs to their plant.

One of the important conditions to achieve efficient use of the plant is to increase the wear resistance of the rapidly wearing parts and replaceable equipment (technical spares), frequent replacement of which increases both the planned and the unplanned downtime.

Table 3 shows data on the number and quality of components prepared in the repair shops of these six enterprises. In the first three, these factors are much better.

Progressive organization of repairs and setting up technical servicing would improve the quality of production and ensure continuous and regular working, as well as boost efficiency.

In the Tenth Five-Year Plan in enterprises of the refractories industry improvements were made to the repair economy. We increased the intrafactory centralization of repair jobs from 39% in 1975 to 44% in 1980, and during this period there was an increase of 7% in the output of strengthened components.

The main method of carrying out the repairs at present is the unit method. It is best organized at the Magnezit combine, the Bogdanovich, Vnukovsk, Semiluksk factories, and at the Borovich combine.

CONCLUSIONS

In order to carry out systematic comparative analyses of the efficiency of using equipment in the refractories industry, it is necessary to develop a standard policy on the definition of loading, establish control at the level of associations, and obtain data to be used for determining the production capacity of the enterprise and current plans for production.

An important factor for increasing the effectiveness of using equipment is to prolong the interrepair periods as a result of improving the technical servicing, timely and high-grade repairs, increasing the wear resistance of the parts and technical supplies.

LITERATURE CITED

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