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Analysis and Evaluation of the Optimal Use of Productive Capacities in the Oil Engineering Companies of Azerbaijan

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ABSRTACT
Modern conditions made important and urgent tasks, such as the formation of regional industrial complexes, the expansion of international economic agreements, and the justification of the assessment of the results of the socio-economic development of production. Based under these conditions, intensification of direct economic links between enterprises in all sectors of the national economy and especially in the oil-and-gas industry, the efficient use of production capacities and ratio of potential stock yield (the average value of fixed assets) to the most important parameters of efficiency in modern times. Unlike the sciences, economic analysis requires the establishment of new principles. Maximum performance of work by machine-building industry and, in particular, by oil-and-gas industry enterprises with their main production capacities, characterizes the potential possibilities for the use of certain economic entities within the planned time and quality. At present, the potential capacity of machine-building enterprises for the commissioning of new facilities is assessed by calculating the level of production capacity. In the process of calculating and identifying existing production capacities, the degree of complete load and utilization of technological equipment, interdependence and interconnection between business entities, material, labor and financial resources requirements for mechanical engineering are disclosed and studied.
This proves that the structure, technical and technological level of industrial production by types of economic activity has not yet been adapted to the acute requirements of the free economy, and it expects a number of technical, technological and organizational-economic problems in these areas.
Today, one of the most important constituents of the industry is oil engineering. But after the collapse of the Soviet Union, the oil and gas industry, whose production capacities were calculated for the post-Soviet space, lost their traditional suppliers and began to operate at low power. Therefore, it is important for scientific engineering organizations to effectively organize and operate new market structures in oil-and-gas industry, to apply mathematical methods to fully utilize their production capacities and optimize their use in these areas.
The optimal use of production capacities in the modern conditions dictates the relevance of the research of scientific and methodological and practical problems of resources, the need for scientific justification of the development of the national economy, and in particular the determination of the optimal use of existing productive forces in the market economy.
Keywords: *free economy, mathematical method, vector matrix, optimal option, estimation.*

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I. INTRODUCTION

The modern stage of economic development of the Republic of Azerbaijan further enhanced the need for its economic management in the direction of public production intensification. Under these conditions, it is important to explore the possibility of optimum utilization of productive capacities in oil engineering enterprises and related businesses.

The transfer of the economy to a qualitatively new level of development necessitates the identification of forces and potential opportunities for their use in industrial enterprises, especially in oil engineering. In this process, the use of advanced technology and modern technical equipment, interdependence among business entities, and the need for material, labor and financial resources for oil-and-gas enterprises make the study of the situation an important necessity.

From this point of view, it is necessary to pay special attention to the use of production capacities in economic entities. Production capacity of a business entity is the ability to produce maximum output in a certain nomenclature, assortment and quality throughout the year. The production capacity of an industrial sector for a certain type of product is determined by the total capacity of enterprises and separate specialized workshops and factories.

The key elements that determine the productive capacity of an enterprise or business are: the number of machines, mechanisms and units installed in the enterprise; production area of enterprises and workshops; working hours, or rather, the number of shifts, hours and hours of an enterprise during the year; technical and economic norms of use of machines, mechanisms, units and apparatus, development of co-operation. Thus, in determining the production capacity of the economic entity as a whole, the increase in the capacity of individual enterprises as a result of the cooperative production must be taken into account.

The production capacity of an economic entity is a variable quantity. It is changing as a result of increased labor productivity based on good technical knowledge, improvement of technological processes, and implementation of organizational and technical measures. Therefore, the production capacity of the enterprise should be maximized. For this purpose it is necessary to improve the feasibility study of the main types of equipment, to make full use of the equipment and production areas. The production capacity of unique equipment (large machining machines, special machines with maximum processing parameters) should be taken into account (Rustamov andMammadova,2015).

In accordance with the requirements of the market economy, each enterprise seeks to equalize the capacity of its workshop and industries. However, this is not always achieved. Then it is necessary to calculate the production capacity of enterprises and economic entities based on the production capacities of leading sex groups. The collection of workshop, which form the leading group for various areas of mechanical engineering, is different. As the range of products, their scale and production technology can be changed, the bureaucracy, volume and technology of production should be chosen in such a way as to maximize the unit and maximize production capacity, so that domestic and foreign market needs to be maximized. There is a method of linear mathematical programming and mass service theory based on the optimal linear search for solving problems in this area.

COOPERATION PROCESS

The optimal option is to solve any production, technical, economic and organizational issues in a number of ways (many variants), which are differentiated by different amounts of live and labor costs, and choose the most economically viable (most cost-effective) option. . The economic comparison of the majority of these options requires a qualitative analysis of each option. This, in the end, allows us to properly understand the nature, essence and nature of economic events and to choose the most effective and expedient of them. Thus, the economic optimum is reflected in the quality ratio of the benefits and costs that condition it. Let us analyze the optimal use of production capacity in economic entities by applying this method (Urubkov andFedotov 2009)

Let us clarify the issue by taking Baku oil machine plant as an object. Various assortments of products are produced at the plant's economic entity, and eight workshop of the business entity produce the necessary nodes and details. Each range contains the minimum and maximum output required. Each workshop is known for its capacity to produce a set of nodes and a complete set of details as well as the operating time fund of the most loaded equipment.

For simplicity, we accept that the cost and profit are proportional to the stated machine capacity. Under these conditions, the maximum load on the equipment, namely, the output of the product (by cost) and the maximum profitability criterion, should be determined by the average of machines of each type (Table 1).

Table 1

Primary data for calculation of mathematical methods and optimal production capacity

Indications	Manufacturing, piece			Proper capacity of workworkworkshops, days								Optimal manufactured piece
	Minimal	Maximal	More than maximal	1	2	3	4	5	6	7	8	
Fountainfittings	20	188	168	28	28		20	132	80		8	97
Undergroundpumps	100	184	84	8		8	40	50	10	8		117
Cuttingmachines	30	156	126	18		27		72		21	8	38

Detergents	90	132	42	5	23			20	18.6		12	118
Annualworkingtimefund				3190	3470	2030	5240	14540	5530	1850	5280	
Time fund required for minimum release				2350	2630	1610	4400	11600	4270	1430	1160	
Free time fund for more than one release				840	840	420	840	2940	1260	420	420	

II. METHODOLOGY

The plan is not to leave less than the minimum, so it is important to set the working time of the equipment to implement the minimum program in each workshop. The free time fund of equipment should be used to maximize machine production.

This problem is expressed by linear programming terms: Let us find the maximum of the linear form L (x) = s1x1 + s2x2 + s3x3 + s4x4 under the following conditions. First, let's define what s1x1 + s2x2 + s3x3 + s4x4 shows, as well as L (x). (Yusifov MY (Baku 2015) Since maximum load factor is the maximum load limit for all eight (L) cylinder units, the first, second, third, and fourth names of the machine will be manufactured with minimum x1, x2, x3, x4. Required quantity: s1, s2, s3, s4 the following terms are given to limit the free time resources of all equipment with the development of a set of nodes and details of the appropriate name:

28x1+8x2+18x3+5x4≤840
28x1+23x4≤840
8x2+27x3≤420
20x1+40x2≤840

132x1+50x2+72x3+20x4≤2940
80x1+10x2+18.6x4≤1260
8x2+21x3≤420
8x2+12x3≤420

The condition for the maximum amount of annual releases of the assortments is expressed as follows:

x1≤168 x2≤84 x3≤126 x4≤42

This means that information in any name should be prepared more than it needs to be. Then there are additional non-negative variables to transform the first group of conditions into equations:

28x1+8x2+18x3+5x4+x5≤840
28x1+23x4+x6≤840
8x2+27x3+x7≤420
20x1+40x2+x8≤840

132x1+50x2+72x3+20x4+x9≤2940
80x1+10x2+18.6x4+x10≤1260
8x2+21x3+x11≤420
8x2+12x3+x12≤420

here x5, x6, x7, x12 represent the incomplete loading of workshop within the quarter. If we refer to the maximum number of relevant assortments, x13, x14, x15, x16, then the inequalities in the second group are:
x1 + x2 = 168
x3 + x15 = 126
x2 + x14 = 84
x4 + x15 = 42

Thus, a total of 16 equations comprising a 16-bit system are obtained. It can be written as Table 2.
In general, this system of equations can be written as follows:
R0 = R1x1 + R2x2 + ... + R16x16

or in a general form

$$Ro= \sum_{i=1}^{16} R1x1$$

Here R1.R16 is a vector derived from the corresponding coefficients, and Ro is a free bound vector in the system of equations.

Calculation free time fund in all workshop of economic entities: 840 + 840 + 420 + 840 + 2940 + 1260 + 420 + 420 = 7980
Hence (taking into account the overall machine capacity of the product)
s1 = 288.0 / 7980 = 3.6%
s2 = 132/7980 = 1.65%
s3 = 150/7980 = 1.9%
s4 = 66.6 / 7980 = 0.84%

Table 2
The vector matrix for calculation of the optimal production power

840	28	8	18	5	1	0	0
840	28	0	0	23	0	1	0
420	0	8	27	0	0	0	0
840	20	40	0	0	0	0	0
2940	132	50	72	20	0	0	0
1260	80	10	0	18.6	0	0	0
Ro=	R1=	R2=	R3=	R4=	R5=	R6=	R7R8=
420	0	8	21	0	0	0	0
420	0	8	12	0	0	0	0
168	1	0	0	0	0	0	0
84	0	1	0	0	0	0	0
126	0	0	1	0	0	0	0
42	0	0	0	1	0	0	1

Table 3 is made to calculate the optimal plan. The first support plan is as follows:
X= (0; 0; 0; 0; 840; 840; 420; 840; 2940; 1260; 420; 420; 168; 84; 126; 42)

Table 3

Sc→	Vector	R0	3.6	1.65	1.9	0.84
			R1	R2	R3	R4
	R5	840	28	8	18	5
	R6	840	28	0	0	$23^{36.5}$
	R7	420	0	8	$27^{15.6}$	0
	R8	840	20	40^{21}	0	0
	R9	2940	132	50	72	20
	R10	1260	$80^{15.8}$	10	0	18.6
	R11	420	0	8	21	0
	R12	420	0	8	12	0
	R13	168	1	0	0	0
	R14	84	0	1	0	0
	R15	126	0	0	1	0
	R16	42	0	0	0	1
Z_c-S_c (Z_c-S_c)ϴc			-3.6 -56.8	-1.65 -34.6	-1.9 -29.6	-0.84 -30.6

If ϴ=15.8 the biggest minus price is -56.8

The startup base vectors respond to additional variables that enter the linear form with zero coefficients. Therefore, the last column of the table is not filled: all z1 = 0 and so:

$$\Delta_c=Z_c-S_c=-S_c$$

The value of linear form is Lo = 0. Columns R5-R16 are not displayed to reduce space. You need to get a new support plan, in which case one of the first base vectors will be replaced with a new vector so that the load factor is L1 >L0.

Table 4
Specific Vector Matrix II

Sc→	Vector	R_0	3.6	1.65	1.9	0.84
			R_1	R_2	R_3	R_4
	R_5	398	0	4.5	18	-1.55
	R_6	398	0	-3.5	0	16.4
	R_7	420	0	8	27	0
	R_8	524	0	37.5	0	-4.66
	R_9	840	0	33.4	$72^{11.8}$	-11
-3.6	R_{10}	15.8	1	0.125	0	0.233
	R_{11}	420	0	8	21	0
	R_{12}	420	0	8	12	0
	R_{13}	152.2	0	-0.125	0	-0.233
	R_{14}	84	0	1	0	0
	R_{15}	126	0	0	1	0
	R_{16}	42	0	0	0	1
Z_c-S_c (Z_c-S_c) ϴC				-1.2 -16.8	-1.9 -22.4	0 0

The following artificial tricks are used for this purpose. The value of ϴ is the smallest negative value. It consists of the ratio of one of the R0 vector elements to the corresponding positive number of the column Rc = min (c = 1, 2, 3, 4).

ϴ=840/28=30; 840/28=30;……..; 840/20= 42
2940/132=22; 1260/80=15.8;…….; 168;…

Similarly, all those are calculated. (Zc-Sc) shows the percentage of loading of machines with the ϴc number, whose numerical value is the c. Table 3 shows that when $ϴ_1$ = 15.8, Zc-Sc) ϴc = 56.8, which is the largest negative value. This means that instead of the R10 vector, the base column R1 is inserted into the base. We get a Schedule 4 that reflects the new support plan. If it is included in a new table for a number of columns Δ_c<0, then the plan can be improved. This process is shown in Tables 5, 6 and 7.
As a result, we get an optimal support plan:
x=(7,8; 17.5; 8.1; 28; 217.3; 0; 61; 0; 0; 0; 115.7; 182.5; 161; 65.5; 117.7; 21.5

III. CONCLUSION OF THE ANALYSIS

So, the output of the minimum program is: Fantasy fittings - 7 pieces; underground pumps - 17 pieces; cutting machines-8 pieces; detergents - 28 pieces (rounded to full numbers P1, P2, P3, P4).
Thus, in a cooperative setting, the economic entity determines the maximum production capacity (according to the given criteria).

Table 5
Specific Vector Matrix III

Sc→	Vector	R_0	3.6	1.65	1.9	0.84
			R_1	R_2	R_3	R_4
1.9	R_5	186	0	-3.7	0	1.2
	R_6	398	0	-3.5	0	24.3
	R_7	102	0	-4.3	0	4.14
	R_8	524	0	37.5	0	-4.66
	R_9	11.8	0	0.456	1	-0.153
3.6	R_{10}	15.8	1	0.125	0	0.233
	R_{11}	178	0	-1.6	0	3.22
	R_{12}	278	0	2.5	0	1.84
	R_{13}	152.2	0	-0.125	0	-0.233
	R_{14}	84	0	1	0	0
	R_{15}	114	0	-0.456	0	0.153
Z_c-S_c (Z_c-S_c) ϴC	R_{16}	42	0	0 -0.785 -11	0	1 -1.13 -27.5

Table 6
Specific Vector Matrix IV

Sc→	Vector	R_0	3.6	1.65	1.9	0.84
			R_1	R_2	R_3	R_4
0.84	R_5	156.8	0	-3.44	0	0
	R_4	24.3	0	-0.214	0	1
	R_7	1.5	0	-3.4	0	0
1.9	R_8	637	0	$36.5^{17.5}$	0	0
3.6	R_3	15.52	0	0.423	1	0
	R_1	10.14	1	0.175	0	0
	R_{11}	100	0	-0.9	0	0
	R_{12}	233.3	0	2.9	0	0
	R_{13}	157.9	0	-0.175	0	0
	R_{14}	84	0	1	0	0
	R_{15}	110.3	0	-0.423	0	0
	R_{16}	17.7	0	-0.214	0	0
Z_c-S_c (Z_c-S_c) ϴC				-4.5 -7.9		

Table 7
Specific Vector Matrix IV

Sc→	Vector	R_0	3.6	1.65	1.9	0.84
			R_1	R_2	R_3	R_4
0.84	R_5	217.3	0	0	0	0
	R_4	28	0	0	0	1
	R_7	61	0	0	0	0
1.65	R_8	17.5	0	1	0	0
1.9	R_3	8.1	0	0	1	0
	R_1	7.8	1	0	0	0
3.6	R_{11}	116.7	0	0	0	0
	R_{12}	182.5	0	0	0	0
	R_{13}	161	0	0	0	0
	R_{14}	66.5	0	0	0	0
	R_{15}	117.7	0	0	0	0
	R_{16}	21.5	0	0	0	0

IV. CONCLUSION

If there is no co-operation (or it is insignificant), the issue of linear programming can be greatly simplified. At present, the existing production capacity is not sufficient to fulfill the orders and obligations of economic entities, thus it is necessary to create additional production capacity through investment. In this case, particular attention should be given to the optimal allocation of investment between new construction and modernization of the existing plant.

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