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# Improvement of Efficiency of Labor Capacity on the Example of Oil and Gas Processing Enterprise

***Lenar Nailevich Safiullin*[1] *and Albina Faridovna Mingazova*[2]**

[1]*Deputy Director for Research, Head University/Department of Management, Economics and Finance/IUEF Directorate, Kazan Federal University, Russia.*

[2]*Specialist in MRA 1st category, Department of Education/Center for the training of highly qualified, Kazan Federal University, Russia.*

*(Corresponding author : Lenar Nailevich Safiullin)*

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**ABSTRACT: Today, the role of health remains underestimated, especially for the able-bodied population, therefore, their potential is not used enough in an effort to gain social and economic benefits. Investing in programs to improve the health and well-being of workers can increase the organization's labor potential. Companies that implement workplace health management programs improve productivity, reduce costs associated with absenteeism, presentism, disability, and employee compensation. To increase labor potential, employers can use various strategies, for example, reducing the risks associated with mental health, strengthening physical stability. A healthy lifestyle of a person depends not only on his physical activity, correct work and rest regime but also largely on the quality of nutrition, which is the most important factor that determines people's health. The article provides research data on increasing the efficiency of the labor potential of the petrochemical complex by creating a health management program at the workplace using the example of the oil and gas processing complex of PJSC TATNEFT. The economic risks of the loss of labor potential related to health and the effectiveness of the 4-month use of a functional food product are assessed.**

**Keywords:** quality of life; health; health management program, investment; GDP labor potential; performance; vitamins.

## I. INTRODUCTION

According to a review from 2000 to 2016, six out of seven studies on workplace health improvement programs showed a positive economic effect [1].

To increase labor potential, employers can use various strategies, for example, reducing the risks associated with mental health, strengthening physical stability. The total loss of GDP in the UK from unemployment, absenteeism, presentism, from mental and physical health problems, is 7.5% (£ 1,445 billion) [2].

According to research in the United States, a return on investment of $ 3.48 per dollar invested in improving workplace health and $ 5.82 per dollar is due to lower medical costs and sick leave. Studies in the United States also showed 25% reductions in disability compensation costs [3].

Workplace health management programs should not be aimed at individuals but should form teamwork, involving management and line managers.

The study [4] proposed a wellness program for oil and gas industry employees: monitoring of blood pressure and detection of hyperglycemia. For many years, the traditional role of nursing has been to assist professional doctors and provide primary care. The sphere of health promotion in the workplace required a change in the professional skills of medical workers. Nurses have been trained in health coaching. Thus, employees have the opportunity to have a personal trainer to improve their quality of life. Professional nurses have become health promotion agents responsible for the implementation of the program. Workplace health coaching has been a powerful intervention in changing habits to reduce lifestyle-related risks. Thus, professional nurses proved to be a strategic group of medical workers for programs to strengthen and develop a workplace health culture.

An Australian study on self-assessment of labor productivity and absenteeism found that healthy workers are almost three times more effective than the least healthy, with healthy workers working about 143 working hours per month compared to 49 hours per month for the least healthy workers. Other Australian studies also show that work-related illness, injuries, and death entail high costs for the national economy [5]. Direct and indirect costs associated with injuries and incidence in the workplace amount to more than $ 60 billion a year, which is 4.8% of Australia's GDP [6].

The International Labor Organization estimated that the costs associated with death in the workplace, injuries, and morbidity account for approximately 4% of annual global GDP [7].

The Russian Federation is one of the leading countries with the highest mortality rate due to malnutrition, which leads to a decrease in the country's rating in the global competitiveness index. In 2016, 291 deaths per 100,000 people were reported in Russia, while, for example, in France, this figure was 46 deaths per 100,000 people [8].

The oil and gas refining company TATNEFT PJSC was proposed to implement a workplace health management program.

## II. METHODS

The study involved 110 people (43 men and 67 women) aged 19 to 65 years (median - 45 years) with a body mass index of 20.3 to 32.6 kg/m$^2$ (median - 25.3 kg/m$^2$) - employees of the "Tatneftegazpererabotka" management enterprise of Tatneft PJSC, which processes associated petroleum gas and large fractions of light hydrocarbons. All men were engaged in gas welding; the majority of women (88.4%) were employees of the sanatorium and health center; the remaining women were engaged in repair and painting work.

**Table 1: The number of examined, provided with all the studied vitamins (B2, D, A, E) and the frequency of combined deficiency of several vitamins (groups 1 and 2).**

| The surveyed group, (number of people, n) | The number of surveyed | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Secured by all 4 vitamins | | with a deficit | | | | | |
| | | | 1 vitamin | | 2 vitamins | | 3 vitamins | |
| | n | % | n | % | n | % | n | % |
| All surveyed (105) | 20 | 19.2% | 56 | 53.4% | 24 | 22.9% | 5 | 4.5% |
| Female (66) | 13 | 19.7% | 35 | 53.0% | 14 | 21.2% | 4 | 6.1% |
| Male (39) | 7 | 18.0% | 21 | 53.8 | 10 | 25.6% | 1 | 2.6% |

**Table 2: Providing with vitamins B2, D of the employees before and after research at department Tatneftegazpererabotka of PJSC Tatneft (the second group, takes a drink with vitamins).**

| Vitamins | Providing of vitamins for employees before the research at department Tatneftegazpererabotka of PJSC Tatneft | | Providing of vitamins for the employees after the research at department Tatneftegazpererabotka of PJSC Tatneft | |
|---|---|---|---|---|
| | An adequate supply of vitamin | Vitamin deficiency | An adequate supply of vitamin | Vitamin deficiency |
| $B_2$ | 57.4% | 42.6% | 83.3%* | 16.7% |
| Vitamin D | 0 | 100% | 27%* | 73% |

* statistically significant difference from the indicator at the initial examination before taking the vitamin drink.

Inclusion criteria: age - 19-65 years; lack of special dietary restrictions; signed voluntary informed consent. Exclusion criteria: the presence of acute or exacerbation of chronic disease at the time of examination; taking multivitamins.

The production workers had constant contact with harmful production factors: increased noise, vibration, the severity of the labor process, chemical factor. Class of working conditions by chemical factor: 3.1. Medical workers are faced with pathogenic microorganisms. Classes of working conditions by a biological factor - 3.1, 3.2, 3.3.

Awareness-raising work was conducted with the study participants. Workers attended lectures on good nutrition and the role of vitamins in maintaining health. A survey of employees was conducted. The availability of vitamins A, E, D, B2 was evaluated by their concentration in the blood serum. Sick leaves were monitored.

Before the start of the study, workers were divided into two groups comparable in gender composition; body mass index and age in the subgroups of men and women of each group did not have statistically significant differences. The first group (comparison group or control), in addition to the diet, received a devitaminized drink for four months. The second group (main) during the same period received a functional food product - a specialized food product (SFP) of dietary (prophylactic) nutrition under harmful working conditions - a vitaminized drink (vitamins A, D3, E, K1, C, B1, B2, B6, B12, PP, pantothenic acid, folic acid, biotin. The content of 11 vitamins in 1 serving of kissel is 82-125% of the recommended daily intake of vitamin K and biotin - 30-48%.

## III. RESULTS AND DISCUSSION

Micronutrients are vitamins and minerals that are essential nutrients. Their role and importance in the diet led to the enrichment of food, as an important achievement of twentieth-century public health. Despite successful development in the field of nutrition, more than 30% of the world's population experiences micronutrient deficiencies or “hidden hunger”, which leads to an increase in morbidity and mortality. Micronutrient deficiencies become the cause or exacerbation of mental and physical diseases, cause mental retardation, depression, dementia, disability, chronic fatigue, blurred vision, loss of bone and muscle strength. All this directly affects the health of workers; only iron deficiency anemia affects hundreds of millions of workers, which reduces physical performance, productivity, and quality of life [9].

According to sample surveys, 57.5% of the adult working population in the Russian Federation suffers from vitamin deficiency [10].

At the beginning of the study, before the use of the vitamin-rich drink, only 19.2% of the examined employees of Tatneft PJSC received enough vitamins in compliance with the norm. Nearly 80% of the employees surveyed had a vitamin deficiency. 22.9% of them had a combined deficiency of two vitamins and almost five percent of employees had a combined deficiency of three vitamins (Table 1).

All examined employees, regardless of profession, had a deficiency in vitamin D. Most often, a deficiency of vitamin B2 was found in doctors and nurses, followed by ward attendants, painters, gas cutters. Combined (simultaneous) vitamin deficiencies (polyhypovitaminosis) were observed in painters, ward attendants, gas cutters, and gas welders.

Persons aged 19 to 30 years more often than other age groups experienced a deficiency of vitamins, in second place - a group of people from 51 to 65 years old.

The lack of vitamin D remained in individuals who did not receive this vitamin as part of the drink. In the middle of winter, there was no person in this group who was normally provided with this vitamin.

Re-examination revealed increased individual concentrations of vitamin D in the group that drank the drink. A severe vitamin deficiency was completely eradicated. There was no single person with severe vitamin D deficiency.

The availability of vitamin E of almost all the employees participating in the study was at a fairly good level both during the first and second examinations. The effect of taking a vitamin drink was observed in male gas welders, electric gas welders, and gas cutters of the second group, who had vitamin E deficiencies detected during the first study. After taking a vitamin drink, their level of vitamin E (total tocopherols) increased to normal. Whereas in the first group that did not take vitamins, this indicator did not change. A slight increase in the level of vitamin A supply to normal was observed in the second group, which received a drink with vitamins during a second study.

The initial supply of vitamin B2 in the first and second groups was different. In the first group, receiving a drink without vitamins, 39.2% had a good vitamin B2 supply, in the second group receiving a vitamin drink - 57.4%.

The second group that took vitamins showed a significant increase in the content of vitamin B2 to normal in 83.3% of the examined employees. Moreover, in 15% of those with this vitamin deficiency, its level increased by 1.5–4 times.

It is interesting to note that 29% of the examined employees of the first group who did not take vitamins, on the contrary, had a decrease in the blood level of vitamin B2 from the initial low level.

In the second group, who took vitamins, after conducting the study, the normal supply of vitamin B2 reached the norm in more than 95% of men. In women, this indicator was lower by 20% compared with men and amounted to 75.8%.

Analytical studies conducted at the end of the drinking therapy (four months later) showed that the second group (the group that received the vitamin drink) compared with the initial data had a significant increase in the blood level of vitamin B2 and D (Table 2).

## IV. SUMMARY

The World Health Organization and the International Labor Organization highlight proper nutrition and physical activity as an important condition for improving health and preventing noncommunicable diseases in the workplace. This joint report concluded that programs to promote workplace health, such as physical activity and proper nutrition, are effective in improving the quality of life of workers (lowering blood pressure) and reducing productivity loss (loss of working time due to illness) [9].

Malnutrition is directly related to the development of noncommunicable diseases (NCDs). The predicted total economic losses from 2011–2025 caused by non-prevented NCDs in low- and middle-income countries, amount to $ 11.2 billion a year, which far exceeds the annual cost of highly effective measures aimed at reducing the burden of NCDs [11].

According to the World Economic Forum, global losses by 2030 from NCDs will amount to 30 trillion US dollars, of which 16 trillion US dollars account for mental illness [12].

One of the elements of labor potential is psychophysiological, which includes the state of health of workers.

The management of organizations can actively influence the labor behavior of subordinates. Awareness-raising work was carried out with research participants at the oil and gas refining enterprise of Tatenft PJSC. Workers attended lectures on good nutrition and the role of vitamins in maintaining health. A repeated survey showed that workers have become more responsible for their health.

It should be noted that a deficiency of vitamin A and E was detected among workers employed in more difficult working conditions (male gas welders and electric gas welders, gas cutters, painters, nurses). This confirms that the need for vitamin E increases significantly under the influence of a number of factors: under exposure to dangerous to humans man-made factors, excessive physical and mental stress, work in confined spaces, etc. [13].

The risk group included people aged 19 to 30 years, who more often than other experienced vitamin deficiencies or “hidden hunger”. This, in turn, may lead in the future to a drop in production potential as a result of increased morbidity and disability, a slowdown in intellectual development and a decrease in learning ability. The second place is occupied by a group of people aged 51 to 65 years, which, therefore, can lead to premature mortality and loss of human capital.

In addition to improving vitamin status in the group that took the vitamins, a survey of the examined employees revealed an improvement in their well-being. Over the course of four months, the group that took vitamins showed no increase in absenteeism for illnesses associated with respiratory diseases in the autumn-winter period, which reduced the organization’s costs for paying specialists for doing work of temporarily absent workers. Thus, the organization saves costs by improving the management of the labor potential of its workers.

The economic effect of the proposed measures to improve the management of labor potential of workers based on the use of vitamins is defined as the difference between the costs before the events and the costs of improving the management of labor potential. The organization saves costs through improving the management of labor potential of employees and boosts its profitability.

The study showed that the implementation of a workplace health management program (training in proper nutrition and the use of functional products) can increase the effectiveness of labor potential.

## V. CONCLUSIONS

The economic reasons for investing in workplace health management programs increase labor productivity, improve the mental state of the workplace, reduce the period of sick leave, reduce occupational injuries and medical expenses, and improve corporate image and employee involvement. They also serve as a long-term strategy for the formation of promising socio-economic development, thereby positively affecting the quality of life of the population and the country's competitiveness.


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