



Assessment Of Risk Factors and Measures to Prevent Exposure to Harmful Substances and Physical Stress in The Production Of Mineral Fertilizers

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ABSTRACT	<p>This article discusses important aspects of safety and occupational health in the production of mineral fertilizers. Potential hazards posed by chemical substances, dust, gases, and physical strains at workstations in fertilizer manufacturing workshops are examined. The possible negative health consequences for employees, such as respiratory irritation, skin and eye irritation, allergic reactions, joint injuries, etc., are reviewed. Methods for preventing these hazards are outlined, including the use of personal protective equipment, training in safe work practices, organizing workspaces, and regularly monitoring levels of harmful substances. The importance of proper lifting and handling techniques, preventing repetitive motions, and caring for the spine to reduce the risk of injuries and joint wear is discussed. Key measures to ensure the safety and well-being of employees in fertilizer production are highlighted.</p>
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One of the discussed issues regarding the maintenance of professional health and longevity is the increasing frequency of occupational diseases (OD) on both a national scale and within key industry sectors. Workplace health protection is a multidisciplinary and intersectoral area that should be viewed in the context of economic development [1].

At present, one of the leading industries in the country is the chemical production sector, including the manufacturing of agricultural chemicals. Among the various types of facilities

involved in producing mineral fertilizers or raw materials for their production, the greatest interest from a hygiene perspective is held by enterprises that produce both specific and complex fertilizers. This is primarily due to the relatively high risk posed by the raw materials - phosphorus, nitric acid, apatites - as well as the complex array of technological processes and the formation of toxic ingredients during production, such as fluorine, ammonia, nitrogen oxides, and other compounds [2].

The **purpose** of this article is to conduct an analysis and assessment of potential hazards,

identify risk factors associated with the formation of dust, gas emissions, and physical strains in the workplaces of mineral fertilizer production. The **tasks** include analyzing the impact of toxic substances on workers' health, investigating possible mechanisms of injuries and illnesses, as well as identifying effective prevention measures to ensure the safety and well-being of personnel.

Materials and methods. A selection of articles from search results carried out in databases PubMed, ISI Web of Science.

The chemical production industry, including the manufacturing of agricultural chemicals, is a vital sector of the country's economy. In recent years, there has been a noticeable increase in the production of mineral fertilizers in our country, attributed to the implementation of new production mechanisms and innovative agricultural practices. The development of comprehensive and specialized mineral fertilizers has led to the expansion of agrochemical production, posing a significant challenge in maintaining the quality of health for both the population and workers in the industry, as well as the working environment and surrounding areas [3].

The production of mineral fertilizers can have a negative impact on the health of workers in the workshops manufacturing these fertilizers. Some potential problems that workers may encounter include:

1. **Exposure to chemical substances:** Various chemical substances are used in the production of mineral fertilizers, which can be hazardous to human health. Some of these chemicals can cause skin irritation, eye irritation, respiratory issues, and affect the functioning of various organs.

2. **Dust and gases:** The production of mineral fertilizers may result in the formation of dust and emission of gases, which can have a negative impact on the health of workers. Inhaling dust and gases can lead to lung problems, allergic reactions, and other illnesses.

3. **Physical strain:** Working in the fertilizer production industry often involves physical strain, such as lifting and moving heavy objects. Improper execution of such tasks can lead to injuries and joint wear [4, 5].

Chemical substances used in the production of mineral fertilizers can have a negative impact on the health of workers in fertilizer manufacturing plants. Some of these chemical substances can be hazardous and cause various illnesses and conditions [6, 7]. Here are some of the chemical substances that may be used in the production of mineral fertilizers and their potential effects on the health of workers [8].

Ammonia is widely used in fertilizer production due to its liquid and gaseous forms. Inhaling ammonia vapors can cause irritation of the respiratory tract, coughing, eye and skin irritation, and potentially lead to burns.

Phosphorus Compounds are used in the production of phosphate fertilizers. Exposure to phosphorus and its compounds can cause irritation to the skin, respiratory tract, and eyes, as well as lead to acute intoxication.

Sulfuric Acid is used in the production of superphosphate and other fertilizers. Contact with sulfuric acid can result in skin burns, irritation of mucous membranes, respiratory tract, and eyes.

Nitrogen Compounds, these include substances such as nitrates and nitric acid. Inhaling nitrogen vapors or coming into contact with nitrates can lead to irritation of mucous membranes, skin, and respiratory tract [5].

During the production of mineral fertilizers, dust formation and gas emissions may occur, posing a potential health risk to workers in fertilizer manufacturing plants [9]. Here are some possible sources of dust and gases in the production of mineral fertilizers and their negative impact on health.

Dust of various consistencies can be generated during the mixing, drying, and packaging of mineral fertilizers. Inhaling this dust can cause irritation of the respiratory tract, allergic reactions, and lead to the development of bronchitis, asthma, and other respiratory diseases.

Various **gases**, such as ammonia, hydrogen sulfide, nitrogen oxides, and others, may be released during the chemical processes involved in fertilizer production. Inhaling these gases can cause irritation in the respiratory

tract, headaches, nausea, and even acute reactions.

Prolonged exposure to dust and gases can lead to the development of pneumoconiosis, obstructive lung diseases, allergic reactions, and other respiratory conditions (**Impact on Lungs**).

In the production of fertilizers, physical exertion can play a significant role, especially in various stages of the process such as moving, lifting, and stacking heavy materials and equipment. Handling heavy objects and improper execution of physical tasks can lead to injuries and joint wear among workers.

Constantly **lifting and carrying heavy** fertilizer sacks or other materials can lead to various injuries such as sprains, muscle strains, and spinal damage. To prevent injuries, workers need to be trained in proper methods of lifting and moving heavy objects, and also be provided with assistance in using mechanized tools for lifting loads.

Many tasks in the fertilizer production industry may involve **monotonous and repetitive movements**, which can lead to musculoskeletal disorders such as carpal tunnel syndrome. To reduce the risks, regular breaks should be taken, tasks should be varied, and training on proper postures and movements should be organized.

Employees in the fertilizer industry may be required to stand for long periods, leading to fatigue in the legs and back, as well as spinal misalignment (**Prolonged Standing and Incorrect Posture**) [10, 15].

Preventive measures must be taken when handling chemical substances used in the production of mineral fertilizers in order to protect the health of workers. Exposure to chemical substances should be minimized through the use of personal protective equipment, providing training on safe handling of chemicals, regular monitoring of harmful substances levels in the work area, and ensuring adequate ventilation of working spaces [11].

To protect workers from the exposure to dust and gases in the production of mineral fertilizers, it is essential to adhere to the following measures:

Utilize personal protective equipment such as masks, respirators, gloves, and protective eyewear. Ensure workers have a well-organized work environment and ventilation system that minimizes the formation and dispersion of dust and gases. Conduct regular monitoring of dust and gas levels in the working area [10,19]. Provide training to employees on safe work practices and handling of toxic substances.

Adhere to all safety standards and regulations in the production facility. Adhering to these measures will help reduce the risk of negative impacts from the formation of dust and gas emissions on workers' health.

Here are some ways to prevent potential physical strain on workers in the production of mineral fertilizers. It is important to provide workers with the opportunity to take breaks for rest, offer them ergonomic workstations, and provide training on proper posture and back care [12, 16]. Ensuring safe methods for lifting and moving loads, a variety of tasks, conducting regular ergonomic training programs, and strictly adhering to occupational health and safety standards will help reduce the risk of physical injuries and joint wear for workers in the fertilizer production industry [13,16].

Therefore, high rates of morbidity and mortality can be attributed to inadequate monitoring of production technology, lack of early diagnostic methods, and ineffective disease prevention measures in this particular industry sector [14,17,18].

Based on the above information, the following **conclusion and recommendations** can be made. Preventing the negative impact of mineral fertilizer production on the health of workers includes a series of measures aimed at reducing risks and ensuring safe working conditions. Some possible preventive measures may include:

conducting medical examinations: Regular medical examinations of workers can help identify potential health problems related to working in fertilizer production;

training on safe work methods: Providing training programs on safety regulations, proper equipment operation, and

protective measures can help employees avoid injuries and accidents;

use of Personal Protective Equipment: Ensuring employees are provided with necessary personal protective equipment such as masks, gloves, goggles, and specialized clothing can help protect them from exposure to harmful substances;

monitoring Work Conditions: Regularly monitoring the air and water quality in the workplace, as well as adhering to sanitary norms and regulations for the storage and use of chemicals, can help minimize health risks for employees;

organizing Psychophysiological Support: For employees whose work involves high levels of stress and physical exertion, organizing psychological and physiotherapeutic support can be beneficial;

implementing general sanitary and hygiene measures, adhering to labor protection norms and standards, and conducting regular checks on work conditions and employee health can help mitigate the negative impact of mineral fertilizer production on employees' health.

References

1. Ахмедова Д. Б. Изучение действие биологических активных добавок" бронхонорм" и «хилоборонх» на клинические и инструментальные показатели у лиц с патологией бронхологочной системы профессиональной этиологии //Евразийский журнал медицинских и естественных наук. – 2023. – Т. 3. – №. 2. – С. 67-72.
2. Jamshid A. Kutliev, Uktamjon R. Davronov, Abbos A. Rustamov, Akram S. Khushvaktov, Dilafruz, F. Aripova, & Shuxrat SH. Sodikov. (2024). HYGIENIC ANALYSIS OF THE DAILY ROUTINE OF CADETS OF HIGHER MILITARY EDUCATIONAL INSTITUTIONS. *Proceedings of International Conference on Educational Discoveries and Humanities*, 3(4), 259–260. Retrieved from <https://econferenceseries.com/index.php/icedh/article/view/4301>.
3. Искандаров Т. И., Романова Л. Х. Гигиенические Аспекты Охраны Окружающей Среды И Здоровья Населения При Применении Минерального Удобрения «Uni-Agro» //Amaliy va tibbiyot fanlari ilmiy jurnali. – 2022. – с. 170-173.
4. Эрматов, Н. Ж., Алимухамедов, Д. Ш., Рустамов, А. А., Кутлиев, Ж. А., & Хажиев, Д. Б. (2022). Гигиенический анализ заболеваний работников предприятий по производству полимерных изделий (Doctoraldissertation).
5. Eshnazarovich T. B., Norbuvaevna A. R., Nurmuminovna G. G. Research of ecological and hygiene aspects of agrofaktors affecting human health //Web of Scientist: International Scientific Research Journal. – 2021. – Т. 2. – №. 08. – С. 7-11.
6. Горбанев С. А. и др. Гигиеническая оценка качества атмосферного воздуха в районе расположения предприятия по производству минеральных удобрений //Гигиена и санитария. – 2021. – Т. 100. – №. 8. – С. 755-761.
7. Можарова И. П., Мухина М. Т. Аналитический обзор о конференции «проблемы и пути их решения при проведении испытаний агрохимикатов и регуляторов роста растений для государственной регистрации на территории российской федерации» //Плодородие. – 2021. – №. 4 (121). – С. 73-77.
8. Фиापшев А. Г., Кильчукова О. Х., Хамоков М. М. Альтернативные энергоресурсы для фермерских хозяйств //Актуальные проблемы природообустройства, водопользования, агрохимии, почвоведения и экологии. Материалы Всероссийской (национальной) конференции, посвященная 90-летию гидромелиоративного факультета ОмСХИ (факультета

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9. Azizova F. L. et al. Current state of health and functional capabilities of military personnel (Literaturj reyiew). – 2022.
10. Кутлиев Жамшид Амонбайевич, Тургунбоев Достонбек Давлатбек Угли ПЕРСПЕКТИВЫ ЦИФРОВИЗАЦИИ ВОЕННОЙ МЕДИЦИНЫ В УЗБЕКИСТАНЕ // SAI. 2023. №Special Issue 3. URL: <https://cyberleninka.ru/article/n/per-spektivy-tsifrovizatsii-voennoy-meditsiny-v-uzbekistane> (дата обращения: 11.10.2024).
11. Кочкаров Б. У. Улучшение промышленных устройств для очистки пыли и газа //Scientific progress. – 2021. – Т. 2. – №. 1. – С. 1714-1717.
12. Jamshid A Kutliev, Abbas A Rustamov, Akram S Khushvaktov, & Dilafruz, F Aripova. (2024). Hygienic Assessment Of The Class Of Working Conditions According To The Chemical Factor In The Production Of Polyethylene Products. *Texas Journal of Medical Science*, 30, 66–70. <https://doi.org/10.62480/tjms.2024.vol30.pp66-70>
13. Jamshid A Kutliev, Abbas A Rustamov, & Akram S Khushvaktov. (2024). Hygienic Analysis Of Microclimate Indicators At Polymer Production Enterprises. *Texas Journal of Medical Science*, 29, 81–84. <https://doi.org/10.62480/tjms.2024.vol29.pp81-84>.
14. Вахадировна А. Д. Стандарты, критерии и методы диагностики пневмокониоза //Journal of biomedicine and practice. – 2022. – Т. 7. – №. 3.
15. Kosimov K. O., Nazarov Z. S. E. Problems of agricultural labour hygiene //Новый день в медицине. – 2021. – №. 1. – С. 71-78.
16. Kosimov H. O. et al. Problems of agricultural hygiene //Journal of pharmaceutical negative results. – 2022. – С. 1-7.
17. Kominko H., Gorazda K., Wzorek Z. Formulation and evaluation of organo-mineral fertilizers based on sewage sludge optimized for maize and sunflower crops //Waste Management. – 2021. – Т. 136. – С. 57-66.