Volume 3, Issue 12, December 2025 ISSN (E): 2938-3765

THE ROLE OF NOISE AS A HARMFUL FACTOR IN THE PRODUCTION OF SOLID DOSAGE FORMS

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Abstract
This article examines the noise levels present in the production environment at key workplaces during the manufacturing of solid dosage forms and evaluates noise as a harmful occupational factor. The research findings demonstrate the detrimental effects of noise on workers’ health and emphasize the need to develop scientifically grounded and effective preventive measures to mitigate these impacts. The article also proposes innovative approaches aimed at reducing noise levels in accordance with occupational safety and sanitary-hygienic requirements. This analysis is of significant importance for improving working conditions and preventing occupational diseases in pharmaceutical manufacturing enterprises.

Keywords: Pharmaceutical enterprise, solid dosage forms, technological process, harmful factors, industrial noise, preventive measures.

Introduction

Relevance of the Problem. In pharmaceutical enterprises, various categories of workers are regularly exposed to harmful and unfavorable occupational factors, such as noise, during their professional activities. These factors can significantly affect employees’ physiological state and work efficiency, thereby increasing the risk of occupational diseases. In the pharmaceutical industry, noise is one of the most significant harmful factors in the production environment, particularly during the manufacturing of solid dosage forms such as tablets. High levels of noise exposure can negatively impact workers’ physiological condition, reduce work capacity, and contribute to the development of occupational illnesses. Therefore, identifying and assessing sources of noise in the production environment is of critical practical importance [5, 7, 8].

The production of tablet dosage forms involves several stages, including raw material preparation, dosing, mixing, granulation, tableting, coating, and packaging. At each stage, various types of equipment are utilized, and their operation generates a certain level of noise [1, 4, 6, 11].

In the studied enterprise, the following equipment was identified as the main sources of noise:

•Tableting equipment – these machines, operating under high pressure, generate noise continuously and cyclically during their operation;

•Granulators – the rotating components of these machines, used for converting raw materials into granules, serve as a primary source of noise;

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• Mixers – the high-speed rotating drums used to achieve uniformity of the product act as significant sources of noise;

•Vibroseparators and dust separation equipment – these machines can generate high levels of noise during the sorting of the product and the separation of fine fractions;

•Coating equipment (film-coating machines) – noise is generated as a result of the operation of the machine mechanism during the film-coating process of tablets.

Among the factors influencing noise levels, the design characteristics of equipment, its technical condition, the number of machines operating simultaneously, and their spatial arrangement play a significant role. In addition, the acoustic properties of the walls, floors, and surface installations in the production area also affect noise propagation [2, 3, 9, 10].

Objective

To identify the sources of noise in the production process of tablet dosage forms and to develop preventive measures to mitigate its impact.

Research tasks. To achieve the stated objective, it is necessary to conduct a hygienic assessment of noise in the production process and to develop scientifically grounded preventive measures to mitigate its harmful effects.

Object and Method of the Study

The study was conducted in the tablet dosage form production department of a pharmaceutical enterprise located in Tashkent.

During the study, the overall noise intensity and its spectral composition were determined. Measurements were conducted directly at the main workplaces where the production process takes place, that is, at points where employees are continuously active, as well as at the entrances to the production departments. Noise levels were assessed by measuring sound pressure levels across a wide range of octave-band frequencies from 63 Gs to 8000 Gs. This approach allowed for the identification of the characteristics of noise sources and for evaluating their impact on the human body.

The obtained measurement results were analyzed and evaluated in accordance with the requirements of Sanitary Rules and Norms No. 0325-16, “Permissible Levels of Noise in the Workplace,” approved by the Ministry of Health of the Republic of Uzbekistan. This regulatory document establishes threshold values to ensure that acoustic exposure in the workplace does not have a harmful effect on employees’ health. Based on these standards, the noise levels were assessed to determine their compliance with hygienic norms or whether they exceeded the permissible limits.

Results

The results of the study indicated that the enterprise under investigation employs numerous mechanisms and automated production lines during the tablet manufacturing process. However, due to high noise levels generated by the rotating components used to convert raw materials into granules, the equivalent noise level at the granulator workstation reached an average of 84,2 ± 0,58 dBA, exceeding the permissible exposure limit permissible level by 4 dBA according to Sanitary

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Rules and Norms No. 0325-16, “Permissible Levels of Noise in the Workplace.” In the remaining workstations, noise levels did not exceed the allowable limit of 80 dBA (Table 1).

Table 1 Equivalent noise levels in the solid dosage form production department (M±m), dBA

№	Sampling Location (Department / Section)	Permissible level	**Result**
1.	Preparation of raw materials	80	**80**±0,52
2.	Mixture preparation	80	84,2±0,58
3.	Sieving of the tablet mixture	80	79,9±0,94
4.	Drying of the tablet mass	80	75,4±1,72
5.	Tableting	80	76,7±0,84
6.	Tablet Packaging	80	68,2±2,23

Conclusion

The noise levels generated during the production process are closely related not only to the design shortcomings of technological equipment but also to the technical condition of the machines and mechanisms in use. When the dynamic balance of the mechanical components connecting the parts is disrupted, their vibrations intensify, resulting in an increase in noise intensity.

In addition, poor-quality installation of technological equipment in the production area, non-compliance with operating rules, and untimely or substandard maintenance and repair work also contribute to an increase in noise levels. High-capacity ventilation systems, internal workshop transport, and various auxiliary devices used in the solid dosage form production departments of pharmaceutical enterprises further act as additional sources of industrial noise.

In conclusion, it should be emphasized that noise in the production process constitutes a harmful factor for workers’ health. Acting together with the main sources of noise and other physical factors present in the production environment, it can lead to functional changes in the employees’ bodies. Therefore, monitoring and reducing noise levels, as well as implementing preventive measures, are among the urgent tasks of occupational hygiene.

Practical Recommendation

To reduce the acoustic intensity of equipment generating noise, it is necessary to equip them with special acoustic enclosures and install sound-absorbing functional coatings. In addition, treating the walls and ceiling surfaces of production rooms where such noise sources are located with acoustic materials, i.e., covering them with sound-absorbing materials, can significantly reduce noise levels.

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