

## Occupational Hygiene and Occupational Health Forecasting in Modern Polygraphic Enterprises

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**Abstract:** Unfavorable working conditions in modern polygraphy enterprises lead to the development of universal chronic diseases in the workers, and in our studies the relative danger (RR) was 2,0%.

**Key words:** modern printing enterprise, workers, working conditions, occupational danger, forecasting.

### INTRODUCTION

The development of scientific technical progress in modern polygraphic areas leads to the improvement of mechanization and automation, the introduction of new technological processes into the enterprise, a decrease in the physical tension of the work performed, a change in the organization of work, improvement of working conditions, a decrease in the incidence of workers. This in turn leads to an increase in the quality and quantity groundbreaking effect of the products produced [1, 3, 7]. Over the next 10 years, new progressive technological processes and techniques have been implemented in modern polygraphic enterprises, which positively affect the reduction of the impact of unfavorable factors on the human body and the improvement of working conditions. Among the positive consequences, the use of lead in the process of capitalizing in the printing industry was terminated. Taking into account the recommendation of new devices and technological processes, it is necessary to carry complex hygienic inspections aimed at maintaining the health of workers and improving working conditions in modern polygraphic enterprises [2, 8].

At present, in the field of hygiene, the study of the impact of unfavorable factors in the human body in the production environment occupies one of the important places. In the Republic, the normative, sanitary and hygienic conical documents for modern polygraphic enterprises are almost complete. Conditions of the development factors have not been fully studied. Taking into account of the hot climate, there is not enough data on the state of health, as well as assessing the functional state of the workers' organism in this sphere. Unfavorable working conditions, a decrease in working capacity, fall in production, rapid fatigue are the main causes of an increase in the number of diseases, which cause great damage to the health of workers and the state economy. [5, 6]. Therefore, the improvement of working conditions leads to the creation of a healthy environment in production, the strengthening of labor discipline, the interest in the work being done, the increase in the working capacity of workers. The main task of specialists in the field of hygiene is to develop preventive measures aimed at reducing the severity of labor processes and the incidence of general and occupational diseases that differ in the description of the work of workers in difficult industrial

conditions associated with an abundance of professional groups. The widespread use of new technologies in production, as well as the improvement of production and automation will lead to an increase in the efficiency of the quality and quantity of products produced, as well as the appearance of previously poorly studied or new production factors in the production environment. This, in turn, indicates the independence of the development of preventive measures aimed at studying and preventing the adverse effects of such on the body of workers [4, 9]. The above indicates the relevance of the topic and can serve as the basis for this scientific examination.

The aim of the work is to study the impact of environmental pollution on the health of employees of modern enterprises of the printing industry in the climatic conditions of Uzbekistan and to predict the occupational danger to the health of employees.

## METHODS

The object of the study is polygraphic enterprise "O'qituvchi" in Tashkent city (publishing and polygraphic creative house).

When studying the working conditions at modern polygraphic enterprises, it was found that the main characteristic of technological processes are taking into account the state of sanitary and technical devices, is the polluted and carbonated air of workplaces in the production environment, the sources and causes of noise in production, insufficient illumination in the workplace, the presence of forced labor during production.

The factors that are formed as a result of the operation of various machines and devices in production have various complex characteristics. To ensure a sanitary and hygienic assessment of harmful and dangerous factors that are generated at a high level in the production environment, we used the following methods in our own research. These are: sanitary-hygienic, laboratory-instrumental and statistical. When studying factors in production conditions at modern polygraphic enterprises, continuous survey methods were used, which, in turn, allow us to assess the level of factors in the warm and cold periods of the year and to hygienically characterize the dynamics of the working day, as well as to determine the maximum and minimum levels of exposure. Inspections to study working conditions at enterprises include, among other factors existing in production, pollution and gasification of air in the workplace. To study the pollution in the air of the working areas of the main workshops of polygraphic enterprises, the aspiration method was used. The concentration of dust in the workplace air at all objects of the studied enterprises was estimated in accordance with the state standard 12.1.005-88 "General sanitary and hygienic requirements for workplace air" and number 0294-11 "Permissible concentration of harmful factors in the workplace air". The concentration of chemical factors in the areas where harmful factors are formed in the workplace air was determined by photometry according to the methodical aid #1688 "Methodological guide for the detection of toxic substances in the workplace air", as well as by aspiration. Air sampling was used in the manual "Requirements for air sampling in industrial conditions and hygienic assessment of the air condition". Modern methods were used to study meteorological conditions during the working day. The air temperature and relative humidity were measured using an Assman aspiration psychrometer with an anemometer. The Meteorole indicators were measured at a distance of 1.25-

1.5 m from the threshold level at the workplaces of workers of different professions. In order to compare the workshop of the studied enterprises with the microclimate in parallel, the state of the outdoor air was determined. The inspections were carried out during the warm and cold periods of the year for 2-3 weeks. The obtained results were hygienically evaluated in accordance with the "Sanitary norms of the microclimate in the workplace " SanN and R 0324-16.

Noise in the workplace was measured in accordance with the state standard 12.1.050-86 "Methods of measuring noise in the workplace". The noise level was determined at the workplace several times during the working week. To measure the intensity and spectral composition of noise in production, the devices "RFT" (Germany) and "SVAN" were used. The noise generated in the production workshops was measured at the workplaces of leading professions at enterprises and at the entrance to the workshops. The sound pressure level was determined in the frequency range up to 63-8000 Hz. The results of the noise measurement were evaluated in terms of the "Permissible noise level in the workplace" 0225-16-the San N and R. During inspections, some professional groups at polygraphic enterprises: operators and employees working with the displays of the video terminal of the printing press spend 80% of their working time observing and working with them per day. Therefore, the degree of intensity of electromagnetic fields in the workplace is measured by the state standard 12.1.006-88 "Radiation permissible levels of electromagnetic fields in the workplace and control requirements" using the NFM-1 device, which consists of parts that measure the electric field and permanent magnetic fields, and the results obtained are based on San N and R 0224-07- "Sanitary rules and regulations when working with a personal computer, video display terminals and office equipment". The natural and mixed and natural illumination coefficient in the production workshops was determined by the formula of the natural luminosity coefficient (CEO) and was estimated in ( % ). The level of illumination at workplaces was measured by luxmeter Y-116 and ARGUS-9 luxmeter on the basis of the state standard "Buildings and devices, methods of measuring illumination", and the results were analyzed on the basis of SanN and R 2.01.05-98 "Natural and artificial illumination". The severity and intensity evaluated according to methodical recommendations 0141-03-San N and R "Hygienic classification of working conditions according to the indicators of harmfulness and danger of factors of the production environment, the severity and intensity of the labor process", "Evaluation of the tension of labor processes in the attestation of workplaces" and "Assessment of the severity of labor processes in the certification of workplaces". To predict the occupational health risk of workers in the production of building materials, a methodology developed at the Research Institute of Sanitary, Hygiene and Occupational Diseases of the Ministry of Health of the Republic of Uzbekistan (2004) will be used, in which the level of occupational risk is determined taking into account the class of working conditions of workers according to the degree of harmfulness and danger. Occupational risk will be determined in accordance with the methodological recommendations "Hygienic forecasting of occupational risk to the health of employees depending on the class of working conditions according to the degree of harmfulness and danger (according to the generalized indicator of the class of working conditions) and the justification of the industrial conditionality of morbidity with temporary disability". The application of the methods listed above is adequate for a comprehensive and complete hygienic assessment of the harmful and dangerous

factors in the environment of the main workshops of the enterprises under study. These factors allow the workers to study the effect of the body and its systems on the functional state, to develop preventive measures aimed at their hygienic evaluation, improving the working capacity of the workers, maintaining their health.

## RESULTS

Polygraphic enterprises are among the sectors that are developing in our republic. One of the leading manifestations of such industries is the polygraphic publishing enterprise named after "O'qituvchi" in Tashkent city, which produces books, magazines, newspapers, invitations, labels and other types of printing products. The technological process of the enterprise under study consists of 3 stages. They are:

- 1) printing process
- 2) litho, printing stages
- 3) post-printing processes

Each process, in turn, includes a specific workshop and sections. The printing process is carried out in a rapidly developing art workshop, where the text is typed using computer systems, corrected with drawings, illustrations are inserted into the text, design work is performed and primary printed forms are prepared.

Then it is prepared for the transition of the product to the next stage. The next stage of the technological process is the printing shop, which includes the printing of products. The work at this workshop is carried out using various computer systems and special video terminal devices connected to a central printer and an optical reader of the "OCR-100" type. Text and fast information processing, data entered into the text information system should be corrected by editors. The texts processed (revised) by the editors are typed by the operator on the computer using the keyboard (1-application). The data prepared for printing on the computer will be transferred to the printout. The formation of printed products occurs as a result of working in a state of dialogue with the computer operator in the computer output station. The main content of such a dialogue is that the operator gives the computer the desired task, the computer performs the task and displays the results through the monitor.

The operator visually evaluates the execution of the task on the computer, depending on the monitor or output, and makes the necessary decision for further production of the product. The primary forms of printed products made on a computer are removed from the photoplastics using a Heidelberg Duostter machine.

After it is read by the editor and errors and omissions are corrected, it is glued to the astrolong on the assembly table and assembled. The collected astrolones are unloaded using the "Contact Vacuum Frame" device into metal plastic using a photonuclear machine, then they are removed using a "Kodak Polychome Graphics" printer. The metal plates that come out of the printer are cleaned by the printing plate carrier with a solution of alcohol and gasoline in a ratio of 1:1. Therefore, the first stage ends, and the second stage begins, that is, the pressing process. The received printed forms are sent to the printing house. It is equipped with workshop digital printing machines ("Heidelberg GTO-DI", "STARLINE 530", "DF Rapidra 105").

The speed of copying printed products in them reaches 15600 in 1 hour. The printer visually checks the output product on a special table and evaluates the print quality. After that, the printed sheets will be transferred to the Horizon machine (straightening and folding the listed pages). This machine bends and folds the sheets according to the specified size. The lines along the edges of the paper are marked according to the scheme specified by the operator. The production speed of the pager-stacker machine is from 5000 to 10000 sheets per hour.

Then the next stage begins, that is, the process after printing. Other work is required to be included in the coverage index. Here the book is locked and the covers are prepared. For the final work on the production of the book, the "CLOBUS" line is installed at workshop. This line includes the device "DS mini HF". In it, books are automatically packed and sewn either with the help of f paper clip (gaskets), or with the help of sewing machines on a thread ("Aster"), the above line includes glue and a device for stitching books with metal hooks. Also, books are covered with a hot-melt adhesive of the "Henkel or Horizon" type (Germany). Coated books are laid out on special paper pressing machines (UPN-3) to give the desired shape. Such books stand for 24 hours. The paper waste coming out of the cutting machines ends up in the paper collection bin.

Then it is compressed and compacted. Finished books are packed in 5 and 10 pieces and sent to the finished product storage room. Books from there will be sold by agreement. Taking into account the above conditions, you can come to the following conclusion. The production environment of modern printing enterprises is associated with a complex of harmful factors. These include: aerated and polluted workplace air, insufficient lighting, forced working conditions, a high degree of cross-section of the labor process and monotony of work.

## DISCUSSION

The leading factors of production at modern printing enterprises are noise, pollution and gasification of workplaces, insufficient lighting, monotony of work and cases of forced labor. A high level of production noise is observed in the printing and capping shop, the driver of the printing machine for gaskets has 86 dB at work, the drivers of sheet and paper cutting machines have 83 dB at work, 85 dB at work and 82 dB in the front of the paper compression hopper.

According to the composition of the spectrum, an increase of 1-7 dB was detected in the frequency range from 500 to 4000 Hz. Despite the fact that the noise coefficient is not very high than the permissible norm, the fact that it affects in combination with other factors in production can lead to changes in the functional state and health of workers.

When we studied the field of contamination with gases, it was determined that they are in work places of printingplate carriers and printers. The maximum amount of gasoline vapor in the air of the workplace of the printing plate carrier is  $111.2 \text{ mg/m}^3$ , which exceeds the REM of  $11.2 \text{ mg/m}^3$ . The amount of kerosene vapor in the air of the working area of the compressors is  $303.6 \pm 4.4 \text{ mg/m}^3$ , the amount of acetone vapor is  $325.1 \pm 40.4 \text{ mg/m}^3$  and exceeds the norm 1-1, 05 and 1.1-2.2. Thus, a high concentration of the chemical factor is contained in the workshops printing dressing, which is present in its composition when processing printing products with various component dyes. One of the leading factors in the studied enterprises is the dustiness of workplaces, which is fine-grained paper

dust. A high concentration of dust is observed at the workplaces of machinists of cutting machines ( $5.8-7.2 \text{ mg/m}^3$ ) and paper compressors ( $6.2-7.5 \text{ mg/m}^3$ ), state standard 12.1.005-88 "General sanitary and hygienic requirements for the air of the working area" and SanN and R No. 00294-11 "Hygienic standards. The permissible concentration of harmful substances in the workplace air" is 1.2 times higher than its norm. It was noted that the rate of disinfection and pressing of workshops is at the level of hygienic standards for the amount of dust at the main workplaces. It is shown that the amount of dust in the warm period of the year is  $1-2.2 \text{ mg/m}^3$  more than in the cold period of the year. This indicator in the cold period of the year is associated with the relative humidity of the air. The dust factor in production has a negative connotation, together with other factors in production, the effect of dustiness can negatively affect the health of employees. The meteorological conditions of the production environment of printing enterprises were evaluated taking into account the technological process, the period of the year and other indicators. According to the results of the study, in the cold period of the year, the air temperature was determined to be  $2.5-3.0^\circ \text{C}$  lower than in the warm period of the year. Other indicators of the microclimate, that is, the behavior and relative humidity of the air, are at the level of sanitary standards.

One of the most important factors in the hygienic aspect of production needs is illumination. Polygraphic enterprises are a kind of performing work on light vision at various workplaces. According to the results of the examination, it was found that the mixed illumination at the workplaces of the operator of the set of letters, the clamping machine, machinists and seamstresses is 50-100% and the mixed illumination is  $0.2-0.3 \text{ lux}$  less than the norm. It is established that the use of video display devices and other modern devices leads to an increase in electromagnetic fields at some workplaces. According to the results of inspections, printing enterprises showed that the indicators of electromagnetic fields in the workplace do not exceed the limits of the current norms. According to the results of the study on the hygienic assessment of working conditions, it made it possible to include the degree of harmfulness in group 3 of class 1 in accordance with the hygienic classification of working conditions of employees of modern printing enterprises. It was determined that the training time of the main professional groups workers at modern polygraphic enterprises was 80% for operators, 84% for editors and designers, 82% for loaders of printed forms, 80% for presses, 75% for machinists, 80% for covers, 66% for paper compressors and 78% for tailors, which allowed us to determine the indicators of print quality. The increase in working weight from harmful and dangerous factors in the working environment was estimated based on indicators of tension, intellectual, sensory and tactile loads, working order and monotony of work.

According to the hygienic classification, the work of employees of polygraphy enterprises was classified into the categories of 3rd class 1st degree (editor, designer), 3rd class 2nd degree (operator, copier, printer, bookbinder, typists, brochure manufacturer and tailor), 3 class 3rd degree (paper presses).

**TABLE 1.** Classes of working conditions of employees of a polygraphyc enterprise

<b>Production environment factors</b>	<b>The operator of the set of letters</b>	<b>Editor designer</b>	<b>Conv carrier</b>	<b>Letter press</b>	<b>Sheet machine</b>	<b>Cutting machine</b>	<b>Brochure maker</b>	<b>Bookbinder</b>	<b>Paner Presser</b>	<b>Book stanler</b>
Dust	2	2	3.1	3.1	2		2	3.1	3.1	2
Noise	2	2	2	3.1	3.1	3.1	2	2	3.1	3.1
Vibration	-	-	-	-	-	-	-	-	-	-
Microclimate	2	2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Illumination	3.1	-	2	3.1	2	2	2	2	2	2
Intensity of the working process	3.1	3.1	3.2	3.1	3.1	2	3.1	2	3.1	2
Sharpness of working process	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.2	3.2
General class of working conditions	3.2	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.3	3.2

It is known that the special dangerous factors on the long day worker's body at work, leads to the emergence and development of occupational diseases. In order to show the connection of health disorders with the profession and to predict the development of diseases related to the profession, an assessment of the safety of workers at the studied enterprises was carried out on the basis of the working conditions studied by us and the classes of the established levels of safety and harm, as well as the level of occupational diseases. Due to the classes of working conditions, the labor risk level of employees of polygraphic enterprises was introduced to "medium", and only editors and designers were introduced to "low" and pressers of paper compressors to "medium-high" levels.. They are associated with unfavorable factors of the production environment and the work performed (Table 2).

**TABLE 2.** Determination of labor safety by class indicators of working conditions

<b>Name of workshop</b>	<b>Professional groups of workers</b>	<b>Class of labour condition</b>	<b>Degree of professional risk</b>
	The operator of the set of letters on the computer	3.2	medium

Fast Art Workshop	Editor, disagner	3.1	low
Pressing workshop	Letter press printer, Sheet machine, Cutting machine operator	3.2	medium
	Brochure maker, bookbinder, sewing machine operator	3.2	low
Binding workshop	Paper Presser	3.3	medium-high

The impact of unfavorable working conditions on the health of employees leads not only to the emergence of occupational diseases, but also to the development of universal chronic diseases. In this case, one of the indicators that informative high and economic importance is the relative risk (RR). It accounted for 2.0% of our studies. The results obtained showed that the working conditions fully corresponded to the indicators in Table 3 (RR) in accordance with the safety and harm classes.

**TABLE 3.** Determination of the relative risk (RR) of health disorders of employees of printing enterprises, taking into account the degree of dependence on the profession and classes of working conditions

Number of workshop	Professional groups of workers	Class of labour condition	Relative danger(RR)	Degree of belonging to the profession
Fast Art Workshop	The operator of the set of letters on the computer	3.2	2,0-2,7 ( $2 < RR \leq 3,2$ )	high **
	Editor, disagner	3.1		
Pressing workshop	Letter press printer, Sheet machine, Cutting machine operator	3.2	2,0-3,0 ( $2 < RR \leq 3,2$ )	
Binding workshop	Brochure maker, bookbinder, sewing machine operator	3.2	3,0 ( $2 < RR \leq 3,2$ )	
	Paper Presser	3.3		

Explanation: \* \* -  $P < 0.05$

All of the above will become the basis for the development of a set of preventive measures aimed at preserving the health of employees at the studied enterprises and optimizing working conditions.



## CONCLUSION

1. Modern polygraphic enterprises are characterized by a complex of physical (air pollution of workplaces, noise at workplaces, low temperature in the cold period of the year, insufficient illumination), chemical (aeration of the air of workplaces) and psychophysiological (mandatory working conditions, a high degree of intersection and monotony of work) factors that depend on the peculiarities of the organization of technological and labor processes at enterprises.
2. The assessment of working conditions at the studied enterprises made it possible to determine the class of harmfulness and safety based on the unfavorable On SanN and R 01 0141-03 number of employees in the production environment, as well as a methodological manual. From the point of view of the harmful working conditions of employees at these enterprises, the following indicators are taken into account: the average value of maximum permissible concentration dust is 1.25 times, the chemical factor is 1.1-2.25 times, the noise level is higher from red to 7 dB and the frequency is 3-5 dB, Natural light coefficient is less by 0.83 times, as well as the noise level from red to 7 dB and the frequency is 3-5 dB.
3. From the point of view of the severity of labor processes at modern polygraphic enterprises, the work performed by the operator of the set of letters on the computer, letter press printer and cutting machine operator was assigned to the 3rd class of the 2nd level of the acute type of labor in accordance with the hygienic description. This leads to an early manifestation of the increased intensity of the upcoming work and due to the early depletion of production.
4. Due to the classes of working conditions, the labor risk level of employees of polygraphic enterprises was introduced to "medium", and only editors and designers were introduced to "low" and pressers of paper compressors to "medium-high" levels. They are associated with unfavorable factors of the production environment and the work performed
5. The impact of unfavorable working conditions on the health of employees leads not only to the emergence of occupational diseases, but also to the development of universal chronic diseases. In this case, one of the indicators that informative high and economic importance is the relative risk (RR). It accounted from 2.0 to 3.0 in our study.

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