International Journal of Psychosocial Rehabilitation, Vol. 24, Special Issue 1, 2020
ISSN: 1475-7192

Working Conditions, Efficiency and Psycho-Emotional Condition of Women Working in Modern Silk Spinning Factories in Uzbekistan

[1]Aziz Iskandarov

Abstract--*Working conditions of women in modern silk-spinning factories are characterized by a complex of unfavorable production factors: dustiness, noise, insufficient, uneven light, high temperature and relative humidity, the intense nature of the work process. In the dynamics of the working day, the working capacity of women in the main occupational groups decreases and the indicators of their psycho-emotional state deteriorate. The received data specify necessity of the further studying of dynamics of a functional condition of an organism of women silk-spinning manufactures and development and introduction of measures of preventive maintenance of adverse influence of industrial factors.*

Keywords--*silk-spinning manufactures, working conditions, women, working capacity, psycho-emotional condition.*

I. INTRODUCTION

The decision of the government of the Republic of Uzbekistan, other countries and international organizations on revival of the Great Silk Road entails expansion and intensification of the silk processing industry in Uzbekistan, where large capacities for production of natural silk are concentrated, large silk spinning mills are functioning, which are mainly working women.

In recent years, the silk spinning industry has seen the introduction of new technologies and technological re-equipment, which entails the mechanization of manual operations, intensification of production, increasing nervous and emotional stress, monotony, as well as deteriorating working conditions.

In the literature there is a sufficient number of works, which mainly describe the properties of dust formed during technological operations of silk production, which has anaphylactogenic and sensitizing properties, causes the disturbance of reactivity of the organism, adverse immune shifts and allergic diseases [1, 7, 10, 12, 17]. The data on development of professional respiratory and dermatological pathology at workers of silk production [8,15 , 18, 19], on risk of lung cancer development and other professional diseases [20, 21, 22] are given.

It has also been established that the morbidity rate of silk production workers located in conditions of hot desert climate is much higher than in other places [23].

[1]*Doctor of Philosophy (Ph.D.) in Medical Sciences, Senior Researcher at the Research Institute of Sanitation, Hygiene and Occupational Diseases of the Ministry of Health of the Republic of Uzbekistan, etc. - email: a.iskandarov@yahoo.com*

DOI: 10.37200/IJPR/V24SP1/PR201202
Received: 18 Jan 2020 | Revised: 07 Feb 2020 | Accepted: 27 Feb 2020

The results of the above works indicate the need to strengthen research aimed at scientific justification and development of special measures of occupational health and health protection for women working in silk industry enterprises.

To date, the issues of occupational health of women working at modern, modernized silk spinning enterprises of the republic remain poorly studied, the levels of harmful industrial factors formed in the course of the technological process have not been established, and no regularities of their impact on the psycho-emotional state of women, on their working capacity and productivity have not been identified. Normative and methodological documents on hygienic regulation of working conditions for the country's silk spinning industry have not been developed.

The high morbidity rate of women employed in the silk industry, frequently occurring gynecological pathology, the pathology of pregnancy and childbirth, premature aging of the body [13, 16] pose a challenge to Uzbek hygienists to address the issues of optimization of working conditions and regimes for workers in silk spinning industries, reducing the severity and tension of labor processes, which, ultimately, will serve to preserve the health of a huge contingent of women and their offspring.

To solve this problem, modern technological processes of silk spinning and working conditions of women employed in these industries were studied.

The purpose of the research is to identify adverse production factors in the silk spinning process and their impact on the work capacity and psycho-emotional condition of working women.

II. METHODS OF RESEARCH

Working conditions of women of the main professional groups of silk weaving were studied by traditional methods with the use of aspirator, psychrometer, anemometer, noise meter, luxury meter in accordance with the requirements of Sanitary Rules, norms and hygienic norms of the Republic of Uzbekistan №№ 0294-11 [3], 0325-16 [4], 0141-03 [5], 0324-16 [6], building norms and regulations 2.01.05-96 [14], as well as methods "Methods of assessment of working conditions and attestation of workplaces according to working conditions" [9].

The condition of working capacity was estimated by time going on liquidation of one break - the basic industrial operation of silkworming workers, by a stopwatch method. Psycho-emotional state was studied by the method of testing by the tables "SAS" [2,11].

III. RESEARCH RESULTS

The working conditions of women in the silk spinning industry have been studied at Namangan enterprises: the Uzbek-Japanese joint venture Silk Road and Atlas JSC.

The production of silk yarn for the subsequent production of silk fabrics is a complex technological process consisting in the gradual formation of yarn from silk production waste.

DOI: 10.37200/IJPR/V24SP1/PR201202
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Processing of silk waste begins with disassembling and cutting of defective cocoons, cocoon scraper, unsealing, pelades, etc.; removal of stickiness by steam, washing with soda and soap, wringing on centrifuges, drying, storing. Primary raw materials are then weighed, sorted, mixed, loosened, chipped, paralleled and pulled, after which short fibres and weed impurities are removed on the combing machines. After the final carding, parallelization and pulling, the draw frames receive 1-2-3 passages, followed by a roving machine. The roving yarn is produced from the roving on spinning machines, which is then rewound on duplicating machines (yarn folding), twisted on twisting machines (obtaining twisted yarn), rewound on coiled machines, after which gas-flaking is carried out to remove lumps and bumps from the yarn and final rewinding to remove thin, thick and weak points of yarn.

The entire production process of the silk yarn is carried out by dryers, carding machines, bands, roving machines, twirlers, spinning machines, winders and gas burners.

The technological process of silk waste processing for the production of carding dust with the preliminary loosening on ripper, belt, combing and roving machines is accompanied by the release of silk dust into the air of the working zone, which is deposited on the surface of machines, walls, floors, working clothes, etc. The amount of dust in the breathing zone of these machines and units ranges from 7.2 to 8.8 milligrammes/metre^3 and the highest air dust content is found in the card zone (8.0 to 8.8 milligrammes/metre^3). Spinning, duplication, twisting, winding and rewinding processes are also accompanied by dust formation, but the amount of dust is negligible and does not exceed the maximum permissible concentrations. The highest concentrations of dust were observed in the area of gas firing, the average dust level was 9.6 milligrams/metre^3, in addition, in the area of gas firing breathing the carbon monoxide was determined in the range of 23.8-28.4 milligrams/metre^3 and the limiting hydrocarbons in the range of 320.0-330.0 milligrams/metre3 in recalculation on C.

The technological process of silk spinning is accompanied by noise, which is stable and refers to the average frequency. Equivalent noise levels at the workstations of 87 dBA dryers, 86 dBA chippers, 89 dBA ribbons, 86 dBA roving machines, 88 dBA spinners, 94 dBA winders, 86 dBA grinders, 93 dBA gas grinders.

Production shopfloors are equipped with conditioning and humidification systems to increase (according to technological necessity) air humidity in order to reduce breakage. Air temperature in the warm period of the year ranges from 29.4 to 33.8^0 C with relative humidity of 46-73%. The highest levels of temperature and relative air humidity were observed at the workplaces of spinner, coiler, twister and carding machines.

The burning process is carried out by gas burners, which are permanently installed on the worktables. In the process of working gas burners are exposed to infrared radiation, the level of which ranges from 140 to 350 WT/m^2.

Illumination of industrial premises is combined, artificial - by means of fluorescent lamps, natural - by means of side light apertures. A study of production room lighting has revealed uneven illumination of work surfaces. Workstations located near lighting apertures are sufficiently illuminated according to hygienic requirements. As we move away from the lighting openings, the illumination of work surfaces decreases. Especially

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low levels of illumination were observed at the workstations of spinners and spinners - 30-50 lux, with a coefficient of natural light - 0.07-0.1%.

The work of women silk spinning production of all professional groups is carried out standing up with frequent walking and bypassing around the equipment, associated with the tension of vision when detecting a break in the yarn, finding its ends and tying, as well as focus on monitoring the technological process, timely change of coils and reels.

In order to assess the impact of working conditions on the performance of women in the main occupational groups in the dynamics of work was carried out hourly timing of the time going to the elimination of one break. The data obtained are presented in Table 1.

Table 1 Changes in the rate of female workers of basic professional groups in silk spinning production in the dynamics of the working day

Specialties	**Break-up time (in seconds)**								
	1 hr	**2 hrs**	**3 hrs**	**4 hrs**	**5 hrs**	**6 hrs**	**7 hrs**	**8 hrs**	**Reliability**
	M ± m	**M ± m**	**M ± m**	**M± m**	**M± m**	**M± m**	**M± m**	**M± m**	**p<2-9**
1	2	3	4	5	6	7	8	9	10
Spinners	9,3± 0,1	8,3± 0,6	8,9± 0,5	10,2± 0,7	9,3± 0,7	8,3± 0,2	8,9± 0,2	10,8± 0,2	0,01
Winders	12,4± 0,2	10,8± 0,4	11,2± 0,5	12,0± 0,7	12,5± 0,6	12,8± 0,1	13,4± 0,1	14,3± 0,5	0,01
Twirlers	11,2± 0,4	11,0± 0,3	12,4± 0,6	13,0± 0,7	13,2± 0,6	14,4± 0,3	14,8± 0,1	15,8± 0,8	0,01

It can be seen from the table that in the dynamics of the working day, the time of elimination of the break in all professional groups increases significantly, which indicates a decrease in efficiency from the beginning to the end of the shift.

At spinners from the first to the eighth hours of shift the time of cliff elimination increases from 9.3±0.1 to 10.8±0.2 seconds (by 16.1 %), at winders - from 12.4±0.2 to 14.3±0.5 seconds (by 15.3 %), at twirlers - from 11.2±0.4 to 15.8±0.8 seconds (by 41.0 %). The time of cliff elimination in all professional groups by the 2nd and 3rd hours is reduced due to working.

The most expressed reduction of working capacity (increase of time of cliff elimination) is revealed at twirlers who work in worse conditions, than workers of other professional groups (higher noise level, low illumination, high relative humidity).

Table 2 shows the indicators of self-evaluation of psycho-emotional state of workers of the main professions of silk spinning production.

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From the presented table 2 it is visible, that in dynamics of working day the tendency of deterioration of indicators of self-esteem of a subjective psycho-emotional condition of the examined workers is observed. The assessment of the self-esteem of spinnerwoman as "excellent" decreases from 22 to 7% of respondents, and as "bad" increases from 14 to 22% of respondents. In winder woman, % of women with "bad" feelings increase from 17% to 27% by the end of the shift, and in spinnerwoman from 12% to 43%. The activity assessment revealed a decrease in all occupational groups. The percentage of low activity workers increases from 64 to 71 per cent for spinner weavers, from 64 to 75 per cent for coiler weavers and from 60 to 84 per cent for torsion weavers. In the dynamics of work, the mood of the surveyed worsens as well. While at the beginning of work, 7-14% of the surveyed women were in a bad mood, at the end of work, up to 64% of the surveyed women were in a bad mood.

Table 2 The percentage ratio of well-being, activity and mood indicators in female silk spinning mill employees in the dynamics of work

Speciality	**Well-being, %**		**Activity, %**		**Mood, %**	
	Atthe beginning of the shift	**At the end of the shift**	**At the beginning of the shift**	**At the end of the shift**	**At the beginning of the shift**	**At the end of the shift**
Spinners	Excell.-22	Excell.-7	High.-0	High.-0	Excell.-36	Excell.-36
	Good.-64	Good.-61	Aver.-36	Aver.-29	Good.-57	Good.-50
	Bad .-14	Bad .-22	Low.-64	Low.-71	Bad .7	Bad .-14
Winders	Excell.-8	Excell.-0	High.-0	High.-0	Excell.33	Excell.-41
	Good.-75	Good.-73	Aver.-36	Aver.-25	Good.-59	Good.-41
	Bad .-17	Bad .-27	Low.-64	Low.-75	Bad .-8	Bad .-18
Twirlers	Excell.-7	Excell.-0	High.-0	High.-0	Excell.-36	Excell.-0
	Good.-71	Good.-57	Aver.-40	Aver.-16	Good.-50	Good.-36
	Bad .-43	Bad .-43	Low.-60	Low.-84	Bad .-14	Bad .-64

Note. Abbreviations used:

Excell - Excellent, Good - good, Bad - bad, High, Aver. - Medium, Low. -low.

Consequently, in the course of the labour process, the workers of silk spinning mills worsened their psycho-emotional state, and these changes were accompanied by complaints about headaches, lethargy and fatigue.

Thus, working conditions at silk spinning factories have an adverse impact both on the working capacity of women of the main professional groups and on their psycho-emotional sphere.

The received data are used in development and implementation of recommendations on rehabilitation of working conditions at silk spinning plants of Uzbekistan, including measures on reduction of level of unfavorable production factors and rationalization of working and rest regimes.

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IV. CONCLUSIONS

1. Working conditions of women in modern silk spinning factories are characterized by a complex of unfavorable production factors: dustiness, noise, insufficient, uneven illumination, high level of temperature and relative air humidity, intense nature of the labor process.
2. In the dynamics of the working day, the working capacity of women in the main occupational groups decreases and the indicators of their psycho-emotional state deteriorate.
3. The received data specify necessity of the further studying of dynamics of a functional condition of an organism of women silk spinning manufactures and development and introduction of measures of preventive maintenance of adverse influence of industrial factors.

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DOI: 10.37200/IJPR/V24SP1/PR201202
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