

GRINDING MACHINE OPERATOR'S PLACE ORGANIZATION IMPROVEMENT

ПОДОБРЯВАНЕ НА ОРГАНИЗАЦИЯТА НА РАБОТНОТО МЯСТО ПРИ ШЛИФОВЪЧНА МАШИНА

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Abstract: This paper presents an experimental study on improving workplace organization at the teeth grinding machine. Through the study it is aimed: improvement of work space project, ensuring worker safety, optimizing the physical environment, reducing the physical and nervous demands of worker. To achieve the study were collected relevant data through observation which then were processed and analyzed using the L.E.S.T method. Based on the results of the initial data processing, we have identified the existence of critical points in the organization which it is now at workplace of the grinding machine. To eliminate the deficiencies in the current organization we identified a new procedure to improve the existing organization. New procedure for workplace organization was applied and analyzed separately using the same methods that which were used to analyze the initial organization. The final results obtained are compared with the initial for to highlight the efficiency of the new procedure.

KEYWORDS: WORKPLACE, ORGANIZATION, IMPROVING, METHODOLOGY, HISTOGRAMS.

1. Introduction

Workplace organization behind the organization of workshops, departments and enterprises because it depends largely on the consumption of working time each operation, part or product, its size has a role to organize the items in time and space production processes [6].

It is a dynamic activity that begins early in product design and continues during the production process, requiring the existing organizational standing agreement with the new conditions created by the latest achievements of science and technology [4].

2. General informations

Workplace organization is a living cell of production process and it aimed at aligning its elements to ensure the conditions in which the worker can perform his work for high productivity [5]. Workplace is the least productive section and is a part of a workshop area or of production department, which is assigned to a worker or a group of workers, equipped with production equipment and working tools necessary to performance the work assigned [7, 8]. Workplace organization shall be deemed reasonable if, for workers work conditions for high productivity, with the lowest consumption of work and effort, without unnecessary or awkward movements [3].

Processing the gears is one complex action and includes operations such as: turning, drilling, grinding. In this paper we focus on grinding operation. According to technical dictionary the grinding is defined as mechanical operation which are cutting a metal surface using abrasive tools. The grinding parameters are: peripheral speed of the grinding disc, the tangential speed and radial value trap, and two examples of grinding machines are presented in figure 1 and figure 2 .

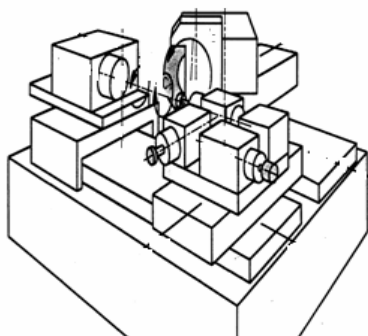


Fig.1. Grinding machine [2]

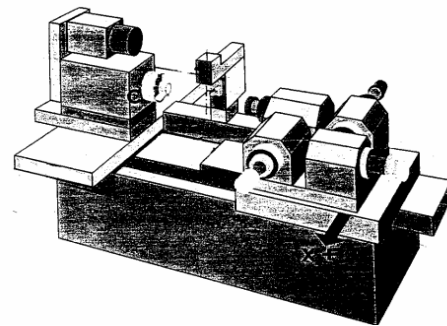


Fig.2. Grinding machine [2]

The operators who are working on these machines are called grinding workers and they must have a thorough training in this field.

The grinding worker has the following responsibilities:

- supervises the operations and if necessary stop the machines when the problems arise;
- the worker calculated rates, distances and angles of cutting tools and graduated scales;
- inspect and measure the pieces to ensure that the areas and dimensions are correct;
- he are preparing and handling grinding machines;
- the worker are removing finished pieces and put them in boxes, on shelves, set aside defective pieces;
- the worker applies knowledges from grinding procedures;
- he performs basic maintenance functions such as cleaning and lubricating machine parts.

3. Experimental researchs

3.1. Object of research

The work system which is investigated consists from the operator, grinding machine and working environments represented by the department grinding gears.

The worker ensures interior and front grinding.

For grinding the worker performs the following groups of activities: reading worksheet, study design, installation of adequate clamping jaws and centering, end switch positioning and centering, checking the correct grinding axis and grinding stone, preparing a processing program, the grinding of piece, the checking of piece.

To find problems in workplace organization at grinding machine, a detailed analysis was performed using the method LEST.

Based on identified issues we have proposed and implemented a set of measures to resolve them. After implementation of solutions was

again made an analysis using the same methods to highlight the effectiveness of the measures proposed.

3.2. Research methodology

LEST method investigates and analyzes the influence factors of organizing jobs grouped on five areas.

Each area is characterized by a number of factors of influence and in turn are determined by a number of parameters.

Assessment influences and the degree of difficulty for each area and of the items is done using a rating scale of ten levels:

- 0-1-2 satisfactory
- 3-4-5 easy fatigue
- 6-7 average fatigue
- 8-9 significant fatigue
- 10 over request (overload).

Collection of information was done with a guide for observation. Based on investigation and analysis of each area and factor of influence, taking into account the parameters concerned, has carried out the assessment with the levels stipulated in the scale of assessment and have made the histogram of workplace organization (existing situation).

3.3. Partial results

Analyzing the histogram of workplace organizing the existing situation from figure we can observe figure. 3 :

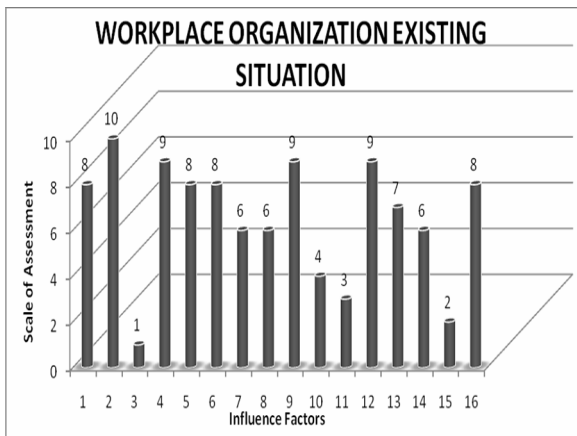


Fig.3. Workplace organization existing situation

The vertical axis has scale of assessment with ten levels. The horizontal axis covers the five areas of influence factors:

- Physical environment
 1. thermal environment
 2. noise
 3. lighting
 4. vibration
- Domain physical demands
 5. static requirements
 6. dynamic request
- The mental domain
 7. time constraints
 8. complex velocity
 9. attention
 10. fine
- Domain psychological aspects
 11. initiatives
 12. training
 13. communication
 14. cooperation
 15. product identification
- Domain of work time
 16. time work

Thermal environment is rated as level 8 in this way causes to the worker a strong fatigue. Noise is rated ten, so overwhelm the operator. Ambient sound is poor because the continuous and

intermittent noise bothers him a great extent on worker and determines a constant state of stress which turned into overload. As histogram lighting is satisfactory. Vibrations are listed ten, the worker is disturbed by vibrations in the workshop due to faulty machines or mounted unbalanced. These vibrations cause a restlessness that can lead to harmful effects on worker health.

Physical demands that the worker is exposed during his activity are generated by the worker's position and effort on the stages of product handling and processing.

Static requirements comprises the request generated by the main position during activity and the request generated by the unfavorable position during activity [1].

Dynamic request consists of the request generated by the effort of executing the processing stages that the product suffers and the request generated by the operator's position during exercise for the execution stages of processing [1].

These challenges demands to worker a strong fatigue, he was unhappy with the worst position during activities correlated with time on he stand in this position.

On attention, the tests have proven that is disturbed by the environmental factors.

Professional training refers to the level of knowledge required by the working task.

The workers are trained for their job only with retraining courses.

About working time it observed a high rate of delays in bigining the activities and to recover lost time the workers are required strongly.

3.4. Implemented actions

Following the analysis of parameters likely to improve, focusing on those factors with levels of 8, 9 and 10, we have applied one set of measures.

Thermal environment is weak in winter; situation is improved by installing radiators, which provide ambient temperature closer to thermal comfort of workers.

Ambient sound-general noise level is reduced by positioning he side walls and ceiling of the workshop some sound absorbing panels.

The vibration is reduced by locating certain props and some carpets anti vibratory under grinding machine.

Physical demands generated by handling tools are lower if the worker has a rotary and easily transportable stand for tools near the machine.

To improve attention the disturbing factors such as loud noises are reduced.

At professional training factor it was organized complete courses about the activities of workers at grinding machines.

To avoid delays at work the company decided to introduce a means of transportation to bring workers to the factory.

3.5. Final results

The final results of research proving the effectiveness of measures implemented. Following the measures outlined above was developed histogram with improved workplace organization at grinding machine figure 4.

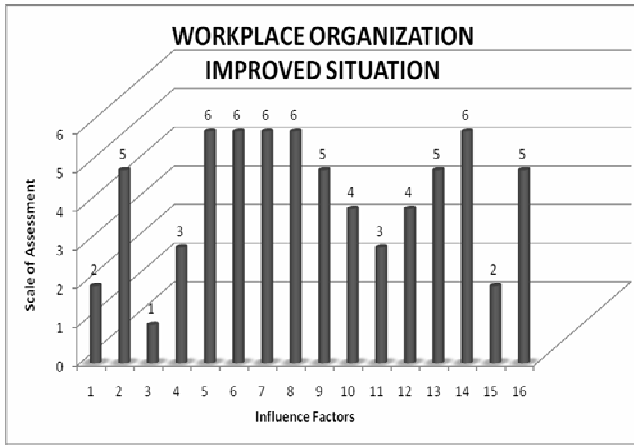


Fig.4. Workplace organization improved situation

Analyzing this new histogram observes that the measures implemented led to better organization of the workplace to grinding machine. The figure 5 and figure 6 is shown that the physical environment before and after implementation of measures to improve the organization of the workplace to grinding machine.

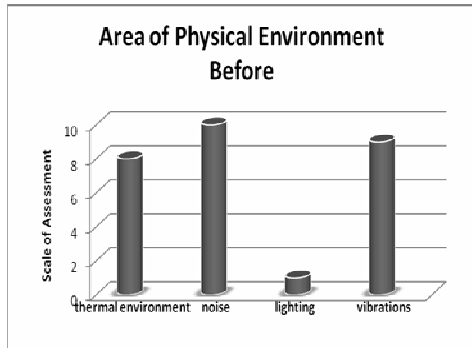


Fig.5. Area of physical environment before

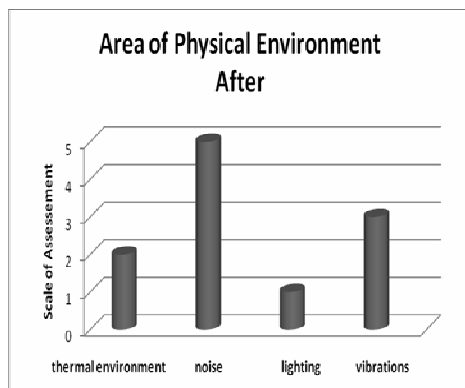


Fig.6. Area of physical environment after

The figure 7 and figure 8 is shown that the physical demands before and after implementation of measures to improve the organization of the workplace to grinding machine.

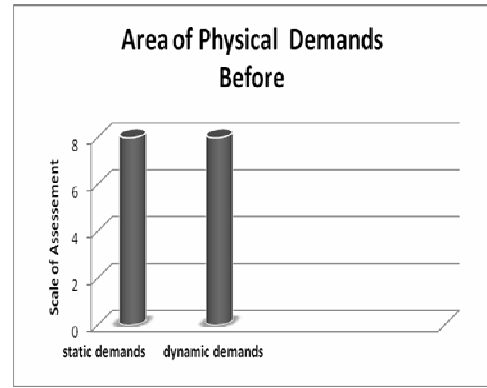


Fig. 7. Area of physical demands before

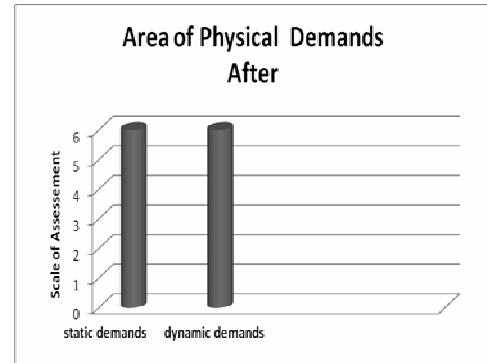


Fig.8. Area of physical demands after

The figure 9 and figure 10 is shown that the mental domain before and after implementation of measures to improve the organization of the workplace to grinding machine.

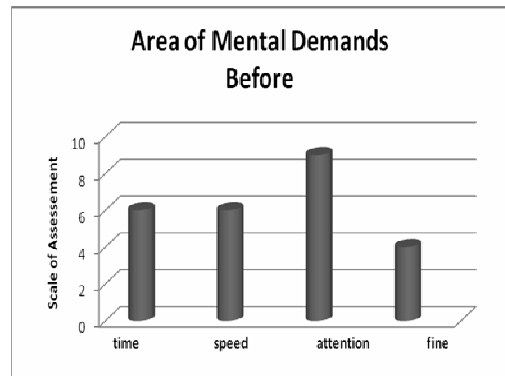


Fig. 9. Area of mental demands before

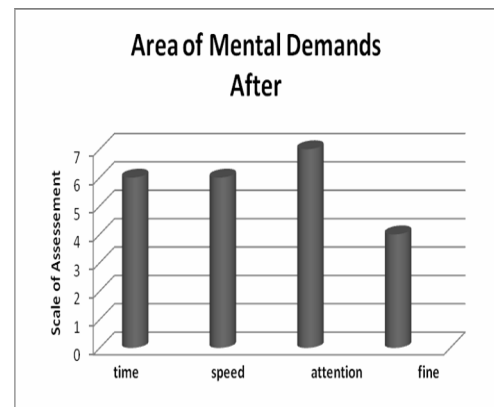


Fig.10. Area of mental demands after

The figure 11 and figure 12 is shown that the domain psychological aspects before and after implementation of measures to improve the organization of the workplace to grinding machine.

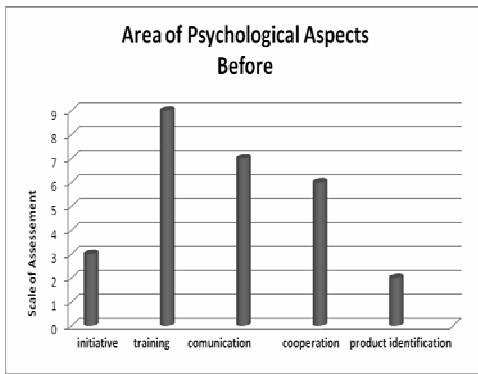


Fig.11. Area of psychological aspects before

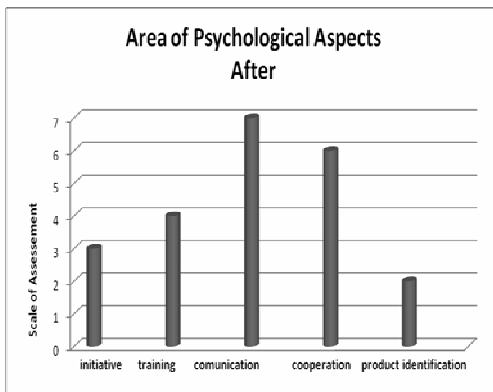


Fig.12. Area of psychological aspects after

The figure 13 and figure 14 is shown that the domain of work time before and after implementation of measures to improve the organization of the workplace to grinding machine.

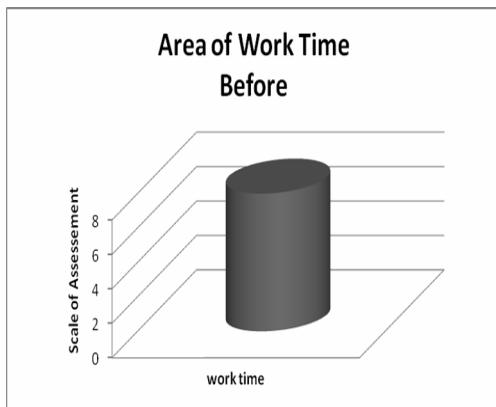


Fig.13. Area of work time before

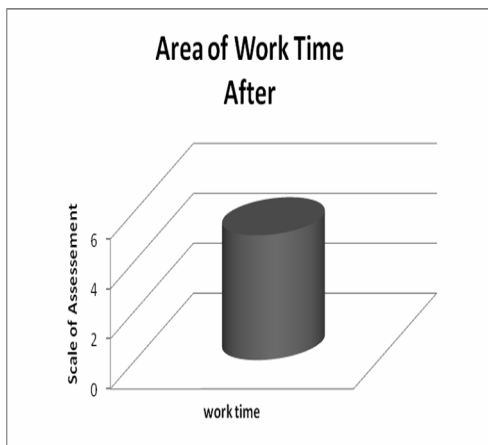


Fig.14. Area of work time after

4. Directions for future researchs

For better organization of the workplace can use other methods of complex analysis to identify problems and other parameters. and it can also implement other measures that could bring even better results.

5. Conclusions

The workplace is endowed with the means to work and organized to achieve an operation by a worker in specified working conditions.

The grinding is defined as mechanical operation which are cutting a metal surface using abrasive tools.

The method used to analyze the organization of the workplace at grinding machine is the LEST method.

We identified a set of problem noise, vibration, attention, training and working time.

We have implemented a set of measures to eliminate the problems identified.

The final results of research proving the effectiveness of measures implemented.

The results are plotted with the histograms.

6. Acknoldgements

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