

Noise and Light Intensity Measurements in Machine and Automotive Workshops: The Case of Karaman

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Abstract—Via the industrialization, the dangers posed by risks increase in business life. It is observed that occupational accidents and occupational diseases increase in developing countries. Since the working environments in the sectors such as machinery manufacturing and automotive are different from other sectors, they bring different health problems and safety hazards. These hazards lead to occupational diseases and occupational accidents that may directly affect the health of working people. In this study, noise and lighting measurements from physical risk factors were performed at different points in the machinery and automotive workshop used for education at Karamanoğlu Mehmetbey University. As a result of this research, in order to provide a healthy and safe working environment for students and trainers in these fields for educational purposes, the necessity of whether or not there is a working environment in accordance with the standards determined by law has emerged. It was evaluated that the results obtained were at a level in accordance with standards and regulations.

Keywords—occupational health; safety; noise; lighting

I. INTRODUCTION

When the working conditions in our country are examined, it is tried to be paid attention to reveal the sensitivity and importance required for the creation of healthy and safe work environments. In spite of all kinds of precautions, it is seen that a large number of employees who are not envisaged every year are exposed to occupational accidents and diseases. Many workers become incapacitated or face work situations in different business lines due to occupational accidents and diseases caused by unfavorable negative factors and personal errors brought about by working life. The loss of life and property and labor losses caused by this situation affect the national economy to a great extent. Losses and losses also cause economic, social and family problems for the employees who become incapacitated [1]. In order to avoid such undesirable events, it is of great importance to improve working

conditions, to comply with current legislation and to contribute to the training of all personnel. When the machinery and automotive manufacturing sectors have occurred in the occupational accident are examined, most metal goods manufacturing work-related accidents in European Union countries and Turkey, the manufacture of non-metallic mineral products, machinery manufacture and repair are known to occur in the basic metal industry. All workplaces may present a variety of health and safety hazards. These hazards first pose a risk to the workers in the workplace. The risks posed by these hazards are not limited to those working in the workplace. At the same time, these hazards pose a risk to the health and safety of living organisms and the community. This is the main purpose of the occupational health and safety law. To protect the health and safety of both employees and the environment by identifying hazards in the workplace in advance [2]. Physical risk factors are physical factors that are likely to affect employee health. Temperature, humidity, lighting, noise, vibration, pressure, etc. physical properties significantly affect the health of the individual. In terms of employees, especially those working in heavy and dangerous jobs are at great risk. Each workplace has different characteristics in terms of physical environmental conditions. Physical environment conditions may not be the same even in two similar production companies. What is important in these areas is the elimination of physical negativities that may occur in every enterprise at the source. It makes business life enjoyable by protecting employees in this way [3]. Physical risk factors are mainly; Noise, Vibration, Lighting, Thermal Comfort Conditions, Radiation, Pressure Changes. In this study, only noise and lighting, which is one of the physical risk factors, were studied.

Lighting; Vision is the most important and important sensation in the workplace. With lighting, the environment is provided with sufficient light and vivid and well visible objects. Sometimes they are provided by the installation in the environment; sometimes they provide it with the employees' own lighting. Many lighting units are available. These; luminous flux, luminous intensity, luminous intensity, glows. The light requirement is determined by the characteristics of the work to be performed. The amount of enlightenment in

the general study area depends on the individual's vision and competence. Objective light measurements during the design and project phase of the workplaces are the main criteria. The location and placement of a workbench in the workshops is based on the amount of light. Measurement of light is called photometry. The intensity of illumination defines the power of the light source or light emitting sphere. The measure of the intensity of illumination is the lux type. This value represents the sum of the light fluxes per unit area.

Noise; is one of the most important industrial and environmental problems of our time. Unless adequate precautions are taken, it is one of the physical factors that have harmful effects on people. Noise is often described as unwanted and disturbing sounds. Physiological and psychological disorders are seen in individuals who are exposed to noise in the working groups in industrial life. Noise is measured in decibel (dB), the logarithmic expression of the ratio of pressure generated by the human ear to the reference pressure. The first level of adaptation of the human ear is 0 dB and is called the "hearing threshold". At sound levels above 140 dB, permanent damage to the ear occurs.

In a study, 6 different points of a machine manufacturing company made measurements of noise and lighting from physical risk factors. In line with these researches, in order to provide a healthy and safe working environment for the employees of the company, it has been shown that a working environment in compliance with the standards is needed. They determined that the light flux at 6 points in lighting was sufficient in 3 compartments and inadequate in 3 compartments. In these insufficient sections, the necessity of lighting with natural or light sources is revealed. Again these 6 points [4].

II. MATERIAL METHOD

Noise and lighting measurements were carried out in Karamanoğlu Mehmetbey University Technical Sciences Vocational School Machine and Automotive workshops in Karaman. Machinery and Automotive Programs have a total of 4 workshops. Each of them measures 12.21 m X 12.87 m and has a height of approximately 6.52 m. There are 4 different directions according to the settlement types. Machining workshop is east-north, welding and chipless workshop is east-south, CNC Laboratory is north. The Motor Workshop of the Automotive Program is in the south-west direction and the Automotive Maintenance and Adjustment Workshop is in the North-west direction. There is no high structure near the workshops to reduce light intensity. Each of the workshops has 64 fluorescent lamps. Care was taken to ensure that all lamps were switched on. The values obtained in indoor intensity measurements depend on many factors. The window areas of these spaces, the direction of the windows, the height and cleanliness of the lighting equipment, the weather, the distance of the measurement places to the lighting equipment and windows, etc. factors are effective. Since the measurements were made in different time periods,

the time periods where the weather was clear and sunny were preferred. No measurements were made in the evening. Only one machine was operated when performing noise measurements. Doors and windows are kept closed and external factors are minimized. Measurements were made at different points of the workshop within the framework of Occupational Health and Safety Risk Assessment Regulation. Noise and lighting measurements in the workshop were made within the scope of Occupational Health and Safety Risk Assessment Regulation [5]. According to this regulation, the points at which the measurements will be made are predetermined. For noise and illumination measurements, sound level meter with OMKA calibration center was used. Noise measurement, light intensity measurement, humidity measurement and temperature measurement can be performed easily. It can be used in many areas thanks to its practical use feature. The visualization of the device is given in Figure 1 and some technical features are given in Table 1.



Fig. 1. Light, sound, temperature and humidity meter CEM 4 (DT-8820).

TABLE I. SOME TECHNICAL SPECIFICATIONS OF THE METER

Value	Measuring Range	Resolution	Accuracy
Temperature	-20 °C - 200 °C	0.1 °C	±(3.0%+2 °C)
Light intensity	20, 200, 2000, 20000 (2000 x 10 Lux)	0.01, 0.1, 1	±(5.0%+10d)
Moisture	35%-95%	1% RH	±5.0% RH at 25°C
Noise level	35dB-100 dB	0.1 dB	±3.5%dB(A) 94dB(A)
Dimensions (H x W x D):	251mm x 63.8mm x 40mm		
Weight	250 gr		

III. RESEARCH FINDINGS

The results related to Lighting intensity from the measurements are given in Table 2 and the results related to the noise level are given in Table 3.

TABLE II. LIGHTING MEASUREMENT RESULTS

Nu.	Place of Measurement	EN 12464-1:2011 Standard	Measured Value (lux)	Enough / Insufficient
1	Machining workshop	300	540-690	enough
2	Chipless Manufacturing Workshop	300	650-770	enough
3	Welding section	300	740-780	enough
4	Engine Workshop	300	500-750	enough
5	Automotive Maintenance and Adjustment Workshop	300	520-690	enough
6	Corridor and circulation area	100	320-450	enough
7	CNC Laboratory	500	540-780	enough
8	Workshop Entrance	300	150-280	insufficient

As can be seen from Table 2, light is sufficient according to standards throughout the workshops, while light is not sufficient at the entrances of the workshops. Since the students did not stay here for a long time or because the educational activities were not carried out in these parts, the insufficient light was not considered. If necessary, lighting with natural light sources or lighting lamps is required.

TABLE III. NOISE MEASUREMENT RESULTS

Nu.	Place of Measurement	Noise Regulation Upper Limit	Measured Value (dB)A	Appropriate /Inappropriate
1	Machining workshop	85	78	Appropriate
2	Chipless Manufacturing Workshop	85	72	Appropriate
3	Welding section	85	87	Inappropriate
4	Engine Workshop	85	84	Appropriate
5	Automotive Maintenance and Adjustment Workshop	85	82	Appropriate
6	Corridor and circulation area	85	56	Appropriate
7	CNC Laboratory	85	66	Appropriate
8	Workshop Entrance	85	48	Appropriate

In the measurements made according to Table 3, the noise level measured in the welding workshop exceeded 85 dB (A). When welding works are carried out, it is thought that the operation of the ventilation system leads to high noise levels measured in this section. The noise levels in other workshops were determined to be below 85 dB (A).

IV. CONCLUSION

Employers and people responsible for training areas, where noisy work is done; Measure the noise

level in the working environment, hearing levels (audiogram) at regular intervals, Have workers measure their hearing levels (audiogram), train them on the damages and protection of noise, and periodically repeat these trainings, prevent the noise from reaching the employees' ear. Rearrangement and follow-up should be ensured. In terms of Occupational Health and Safety, dosimetric, local measurements should be made and noise levels of all looms, machines and units should be determined and noise map should be prepared on the workplace layout plan using noise level curves or grid map methods [4].

Lighting systems should be measured according to Occupational Health and Safety Regulation and international standards. It provides good lighting in industrial areas, a healthy working environment, good visual activity and a safe working environment. It affects fatigue, nervous system, eye fatigue, visual efficiency with inappropriate or inadequate lighting. It affects the productivity, quality, the performance of the work and economic losses and may cause accidents.

Good lighting prevents accurate and fast vision and therefore wastes time and thus increases work efficiency and work quality. Inadequate lighting can lead to negative effects on worker's morale and physical health as well as decrease in productivity and quality.

As seen in Table 3, noise levels in the welding sections were found to be above 85 dB (A). In order to reduce the noise level in these sections, first priority measures should be taken at the source and the personnel working in this section should be provided with ear protection and personal protective equipment until the source is taken. If the necessary precautions are not taken, hearing and vision loss may occur in working personnel due to occupational diseases.

REFERENCES

- [1] Bilgin, M. B., Safety and Health Problems in Welding Works , Master Thesis, Pamukkale University, Institute of Science and Technology, 2001, Denizli.
- [2] Güler Ç, Akin L., "Public Health Basic Information". Knows N, Star AN. Work health. Ankara. Hacettepe University Publication. 2006.
- [3] Ede Y., "Physical Risk Factors", Atatürk University Open Education Faculty, 2012.
- [4] Yıldız, M., "Investigation and Evaluation of Noise and Lighting Measurements of Physical Risk Factors of a Machinery Manufacturing Company". 4th International Symposium on Development of KOP Region Karaman - Turkey / October 21-23, 2016
- [5] Anonymous, Regulation on the Protection of Employees from Risks Related to Noise Form" <http://www.resmigazete.gov.tr/eskiler/2013/07/20130728-11.htm> Access Date: 06.08.2019