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STUDY OF THE INFLUENCE OF AIR IN THE WORKPLACE OF A PAINT AND VARNISH FACTORY ON THE HEALTH AND CONDITION OF EMPLOYEES

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Abstract
Air quality in industrial workplaces, especially paint factories, has long been a problem due to the presence of pollutants in the air, such as volatile organic compounds (VOCs), particulate matter and hazardous fumes. This study examines the relationship between workplace air quality and the health of paint factory workers. Through air quality measurements, health assessments, and surveys, we aim to identify the impact of air pollution on workers ' health and provide recommendations for reducing the adverse effects.

Keywords: Volatile organic compounds (VOCs), toluene, xylene, dichloromethane, benzene, formaldehyde, acetone, ventilation, carcinogenic substances.

Introduction

According to the United States Bureau of Labor Statistics, the lacquer industry employs more than 155,000 people, with an annual growth rate of approximately 7 percent. [2] Employees working in this industry are often exposed to hazardous fumes. Paint and varnish factory workers come into contact with various chemicals, such as solvents, pigments, and additives. These substances are released into the air during production and can cause health problems such as respiratory diseases, skin irritations, and neurological disorders. It is important to understand that paint and coating fumes can also pose a health hazard during construction. However, the most dangerous are the strong emissions generated during the application of paints and coatings [1].

A typical bucket of wet paint contains carcinogens and volatile organic compounds (VOCs) [6]. These chemicals cause side effects when inhaled through the lungs and include [3]:

- Toluene: This clear and colorless liquid turns to steam at room temperature. It is widely used in the pigmentation of paints and gasoline and can affect the nervous system.

- Xylene: According to the Centers for Disease Control and Prevention (CDCThis chemical irritates the eyes, nose, skin, and throat. Exposure can cause headaches, dizziness, confusion, and muscle inconsistency. Prolonged exposure can be fatal.
- Benzene: This dangerous chemical quickly evaporates when opening containers of paints and coatings. According to the Centers for Disease Control and Prevention (CDC), the vapors will settle in low-lying areas. Exposure can cause cardiac arrhythmias, headaches, tremors, and confusion. Overexposure can be fatal.
- Dichloromethane: Mainly used in paint cleaners, it causes fatigue, lethargy, headache and chest pain. Overexposure can be fatal [3].
- Formaldehyde: Often used in building materials such as pressed wood. This hazard can also cause adverse effects in contact with the skin. Formaldehyde is linked to cancer.
- Trichloroethylene: These chemicals, used in many industries, are associated with groundwater pollution and cancer. Inhalation of vapors causes lung damage, and direct contact can lead to the ingestion of carcinogens [10].
- Acetone: This chemical is used in solvents and nail polishes and is highly flammable. Inhaling it quickly irritates the nose, eyes, throat and lungs. Prolonged exposure can cause dizziness, cardiac arrhythmia, and confusion, and can also be fatal [9].

This short list includes some of the most dangerous chemicals that paint and varnish workers are regularly exposed to. Without adequate ventilation and air supply, employees are at risk of more serious illnesses and injuries when working indoors due to inhaling high-concentration fumes. Excessive exposure or contact with carcinogens can cause long-term health problems. For example, carcinogens such as benzene are associated with serious and fatal conditions such as cancer [5] and liver damage. The main reason for the increased risk associated with these additives to paints and coatings is that they are dangerous not only when inhaled [14], but also when they come into contact with the skin. It is very important to observe safety measures when using paint, including the use of special colorful clothing. People exposed to paint fumes usually experience initial discomfort, such as dizziness and nausea. In such cases, it is necessary to immediately provide fresh air supply and evacuation from the area of toxic paint vapors is necessary [7, 15-18]. The next step is to contact a toxicology resource and get medical help.

In case of contact with skin or eyes as a result of working without a protective suit, it is recommended to immediately flush the affected area with clean water. This process must be repeated to flush out the chemicals, and people affected by the chemicals should seek immediate medical attention [8].

Contact with paint fumes and chemicals can be prevented with adequate ventilation, fresh air, and personal protective equipment.

International Enviroguard manufactures and distributes high-quality, industry-standard protective clothing and accessories for painting and construction work [13]:

- Protective suits: Wear disposable protective suits that are resistant to chemicals during painting. Often employers or employees believe that paint and varnish products are harmless when they get on the skin, but this is not true.
- Foot protection: Indoor painters are advised to use special protective covers instead of regular shoes, which are discarded after work is completed.
- Gloves. When sprayed, painted, or brushed, the paint can get on employees ' hands. This is why protective gloves are so important.

Companies can take precautions to protect employees from inhaling fumes. Spraying should be carried out outdoors whenever possible, as this allows for more efficient use of fresh air and eliminates indoor hazards. In addition, it is recommended to consider using less toxic products and products that do not contain carcinogens [11,12].

Main research objectives:

- Measurement of levels of volatile organic compounds, particulate matter and other air pollutants in a paint factory.
- Employee health assessment based on exposure to air quality
- Recommend strategies to improve air quality and protect workers ' health.

The study was conducted at a paint and varnish factory located in an industrial area. The study included air quality monitoring, worker health checks, and surveys to determine workers ' experiences and opinions.

Air quality monitoring:

Air quality was assessed by the following parameters:

VOC: Measured using a portable gas analyzer.

Solid particles (PM2.5 andPM10): Monitoring is performed using real-time particle counters.

Carbon monoxide (CO) and other gases: Measured using multiple gas detectors. Sampling was carried out over a period of one month in various locations of the plant, including production lines, storage rooms and recreation rooms.

The medical examination included:

1.Respiratory function tests (spirometry)

2.Dermatological assessment

3.Identify neurological symptoms, such as headache and dizziness.

Data were collected from 100 workers, as well as 50 employees of a nearby non-industrial facility as a control group.
Employees were asked to provide the following information:
- Frequency of symptoms (e.g. cough, wheezing, headache).
- Recommendations for workplace air quality.
- Level of use of personal protective equipment (PPE).
Research results. The amount of volatile organic compounds (VOCs) exceeded the permissible exposure limits in 60 percent of the test sites. Concentration PMT he average dose was 45 mg / m3, which is higher than the World Health Organization (WHO) recommended 24-hour average of 25 mg / m3. High levels CO observed near paint mixing stations. These indicators will certainly have a negative impact on the health of the employees working here. In particular, 68% of the workers had reduced respiratory function, with symptoms such as chronic coughing and shortness of breath. 42% of workers reported skin damage related to exposure to volatile organic compounds (VOCs). 35% of the workers complained of frequent headaches due to chemical exposure. When analyzing opinions about workplace air quality, 75% of employees rated the air quality as poor. Only 40% regularly used personal protective equipment (PPE).

Conclusion

The results show a strong link between poor air quality and adverse health effects for paint factory workers. High levels of volatile organic compounds (VOCs)[11] and particulate matter pose a significant risk, especially to the respiratory system. Inadequate use of personal protective equipment (PPE) exacerbates the problem, highlighting the need to improve employee training and safety measures.

Recommendations:

- Engineering control: Install state-of-the-art ventilation and air filtration systems to reduce the number of pollutants in the air.
- Administrative control measures: Regular monitoring of air quality and development of safety protocols [12].
- Personal protective equipment (PPE): Provide high-quality respirators and ensure their use through training programs.
- Health monitoring: Regular medical checkups for early detection of occupational diseases.

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