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ENVIRONMENTAL HEALTH STUDY OF SPRAY PAINTING IN AUTOBODY WORKSHOP

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Spray painting,
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Health study of
painters,
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Abstract

Spray painting is a painting technique where a device sprays a coating (paint, ink, varnish, etc.) through the air onto a surface. Globally, Spray painting operation is the most common operation carried out in automobile body workshop for decorative and coating of vehicles body. The hazardous nature of spray painting is that emits voc in larger proportion causing destruction to both human health and environment. The voc emission rate is calculated thus ensuring safety to the environment. Threshold value for proposed or existing project should lay between the threshold limit as prescribed by EPA. (Under Title v permit- clean air act). when the emission rate is severe, it causes several health issues to the workers exposed to spray painting, the health study of workers along with economic and technical analysis is carried out in this project. A general feasibility study is carried out in the areas of Salem where 20 number of spray-painting shops were located. The waste manifestation of entire areas is to be analyzed thoroughly ensuring better environment and ensuring the workers a clear knowledge about personal protective equipment and other advanced coating operations.

1. INTRODUCTION

Volatile organic compounds (VOCs) are organic chemicals that have a high vapour pressure at ordinary room temperature. Their high vapour pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublime from the liquid or solid form of the



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compound and enter the surrounding air, a trait known as volatility. For example, formaldehyde, which evaporates from paint and releases from materials like quartz, has a boiling point of only -19°C (-2°F). VOCs are numerous, varied, and ubiquitous. They include both human-made and naturally occurring chemical compounds. Most scents or odors are of VOCs. VOCs play an important role in communication between plants and messages from plants to animals.

Some VOCs are dangerous to human health or cause harm to the environment. Anthropogenic VOCs are regulated by law, especially indoors, where concentrations are the highest. Harmful VOCs typically are not acutely toxic, but have compounding long term health effects. Because the concentrations are usually low and the symptoms slow to develop, research into VOCs and their effects is difficult.

The environmental health study of voc emissions from spray painting is very much studied in this project. The workers of Auto body workshop exposed to several diseases due to spray painting is very much studied in this project.

An individual working in the auto body and auto repair industry performs a variety of tasks throughout their day, many of which involve them coming into contact - either directly or indirectly - with harmful substances. These duties mainly include spray painting, sanding, welding, grinding, and cutting.

Auto body paint, along with primers, sealers, thinners, degreasers, and cleaners, are all categorized as organic solvents, which are used to dissolve substances that are insoluble in water. Organic solvents maintain paint in its liquid form. Once applied to a surface, however, they evaporate, allowing the paint to dry and form a coating. When organic solvents evaporate, they release what are known as volatile organic compounds (VOCs) into the atmosphere. These chemicals are easily inhaled and have the potential to harm to our health. Acute effects include eye, nose, and throat irritation, headaches, nausea and vomiting, dizziness, and the worsening of asthma symptoms. Long-term exposure has been associated with damage to the central nervous system, liver and kidneys, as well as with an increased risk of cancer. To study the behavioural effects of exposure to organic solvents, by conducting a series of tests that found that, when compared to a non-exposed group, automotive painters demonstrated marked differences in psychological performance, which included impairments in memory and reduced emotional reactivity. However, these health effects will vary depending on several factors, including the nature of the chemical (since each differs in their degree to cause harm), the length of time an individual was exposed, and how much of the chemical they were exposed to.

2. METHODOLOGY

Spray painting workshop Mamagam involves the process of shot blasting and spray painting. Spray painting in Mamangam is usually carried out in open space causing hazardous nature to both environment and health. There are other process carried out in this workshop with respect to



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manufacturing. The processes involved in the manufacturing are machining, heat treatment, welding, and painting.

A thorough analysis done indicated that the following chemicals are released from the autobody workshop in air:

- Particulate matter (PM)
- Volatile Organic Compounds (VOC)
- Xylene
- Cumene
- Nitrogen Oxides (NO_x)
- Sulphur Dioxides (SO_x)

The purpose of this case history is to explain various steps for performing emission rate calculations for the purpose of obtaining air permits. At the end of analysis, one will be able to say if an air permit is required for the facility. The emission rate calculations are conducted only for the above-mentioned chemicals during the study. Other chemicals have minimal impact on outdoor environment. A pre-inventory review should be carried out in workshop units which emits high amount of pollutants. There are 20 auto body workshops located in the areas of Mamanagam. The pre inventory step involved reviewing existing permits to install (PTI) and permit to operate (PTO), facility drawings, manufacturer's equipment specifications, equipment maintenance and record keeping logs, production rates and operating schedules, any stack testing data and Material Safety and Data Sheets (MSDS). A plant-wide comprehensive emission survey was conducted to fully characterize facility processes and other sources of regulated air pollutant emissions. Each process that emits pollutant was distinguished and emission sources were identified. A roof survey was performed and the stack locations and dimensions were recorded. The survey indicated that the following units were responsible for the emissions beyond de minima's value.

3. DISCUSSION

SIGNIFICANCE OF THE STUDY

The study results are beneficial in formulation of policies on health promotion, preventive measures and safe painting procedures, which can be adopted by regulatory authorities and operators of small-scale motor garages in the country. The study results are of great help to spray painters in small scale and large auto motive enterprises for making informed decisions in selection and use of protective devises. The spray painters in small scale garages are expected to change their health seeking behaviours, if the relevant authorities use these findings to create health awareness among them. Spray painters in Salem mamangam area.

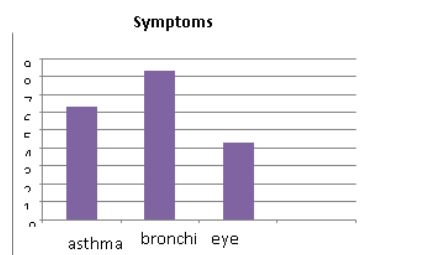
Paint type	Frequency
Filler only	24
Filler and undercoat	18
Auto refinishing and clear varnish	30
Total	60



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Variable	Type of paint	Response				chi square statistics
		Yes		No		
		Frequency	percentage	Frequency	percentage	
Asthmatic	Filler	10	43.4	13	56.5	$\chi^2 = 7.594$; df = 2; p=0.0049
	Auto refinishing	29	78.37	8	21.62	
Bronchitis	Filler	13	54.16	11	45.83	$\chi^2 = 2.812$; df = 2 p=0.00 9
	Auto refinishing	27	75	9	25	
Eye problems	Filler	12	50	12	50	$\chi^2 = 5.0$; df = 2; p=0.025
	Auto refinishing	28	77.77	8	22.22	

Relationship between different amounts of paint used by spray painters and various health hazards were studied. According to the study results, there was no significant relationship observed between health hazards associated with spray painting and various amounts of both filler and auto-refinishing paints.



4. CONCLUSION AND RECOMMENDATIONS

The study came up with conclusions based on the objectives of the research in the study area. They were as follows:

The population at risk of ill health effects of spray paint exposure were young people (34% of the spray painters were below 25 years).

a) Only one type of spray gun, compressed air type was in use in the small scale auto garages in the study area, which according to the study has a very low paint deposition efficiency and highest potential for exposure due to paint over spray it creates.

(b) It was observed that spray painters in the study were using little or no form of protection while engaged in spray painting activities and concluded that, this lack of protection was increasing exposure time (actual time in contact with auto paint), which increased the likelihood of contracting disease symptoms associated with spray painting. The increase in the amounts and types of paints used in the study contributed to overall exposure and subsequent development of various diseases



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symptoms associated with spray painting. This concluded that different types and amounts of paints used had a negative health effects on the spray painters.

(C)The study confirmed the presence, and association between spray painting activities and, asthmatic symptoms, bronchitis symptoms, eye problems and dermatitis. It was therefore concluded that the high proportion of spray painters suffering from various disease symptoms associated with spray painting was due to presence of health hazards associated with spray painting occupation.

Change of type of spray gun used, that is, compressed air type to other types such as high volume low pressure (HVLP) or electro-deposition spray gun which have less overspray.

Reduce exposure time by using interventions such as personal protective equipment properly and consistently, and also use of safe work procedures. The reduction of exposure time and amount of paint used will also reduce the burden of diseases associated with spray painting.

Reduce the amount of paint used by using methods with high paint deposition efficiency such high volume low pressure (HVLP) and electro-deposition methods that use less paint for the same work.

Spray painters to seek medical interventions immediately they see signs and/or symptoms of diseases associated with spray painting and follow health professional's advice, and avoid self-medication.

Public awareness and preventive programs to be carried out in the workplaces where spray painting is done. Development of training manuals and programmers for spray painters and garages operators in small scale informal garages, to ensure some competence in the industry.

5. AUTHOR(S) CONTRIBUTION

The writers affirm that they have no connections to, or engagement with, any group or body that provides financial or non-financial assistance for the topics or resources covered in this manuscript.

6. CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

7. PLAGIARISM POLICY

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