

Hazard Credentials & Safe Operational System in Paint Shop

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Abstract: - Paints are composed of an extensive variety of hazardous elements, such as carbon-based solvents and dense metals. The application of paint on a variety of fields that present in medical hazards. The repetitive work position involved in the paint shop leads to ergonomically problematic. The main objective of this study is to examine the ergonomically problems & exposure of organic solvents during paint spraying. In this various hazard credentials tools were involved in the process of hazard identification and designing safe working environment for stress free work.

Keyword: - Ergonomical, hazards, extensive, exposure, organic.

I. INTRODUCTION

Paint is a substance collected of solid skin tone matter put off in a liquefied medium and applied as a shielding or decorative layer to various surfaces, or to painting or other materials in manufacturing a work of painting. It is a mixture of a pigment and a suitable liquid to form a closely adherent coating when spread on a surface in a thin coat.

External surface of the car attracts the attention of people, it is the physical view that decides the hit or flaps of the car model in first look, then comes engine, safety and power. Paint on external surface of the car do the job of protection of the car's metal surface and most importantly its style. Topcoat colors painted on the surface are inspected by the micro spectrophotometer to maintain the consistency of shades caused by the pigments during painting operation. The paints are mainly depending on the coating technique applied like, Acrylic Coatings: It uses acrylic in the form of enamels and lacquer, for under coats and single stages. Polyurethane Coatings: Urethane form resin used for basecoats and midcoats. Water based Coating: Presently this method is used for painting new car models because a topcoat of water-based paint is safer than solvent-based paint.

Solvent-based acrylic paint has excellent weather resistance, high mechanical properties, is the rapid development of a class of coatings. Solvent-based acrylic paint can be divided from the dry acrylic paint (hot modeling) and cross linking acrylic paint (heat set), the former is non-conversion coatings, which are transformed paint. Since the coating is mainly used for dry-type acrylic architectural coatings, plastic coatings, electronic coatings, road marking paint, with a table dry quickly, easy construction, protection and decoration obvious advantages. A The disadvantage is not

easy to be too high solid content, hardness, elastic is not easy to balance, a construction cannot be very thick film, the film is not ideal fullness. Cross linking acrylic paints are acrylic amino paint, acrylic polyurethane paint, acrylic alkyd, radiation-curing acrylic paint and other varieties. Widely used in automotive coatings, electrical coatings, wood coatings, architectural coatings and so on. Cross linking acrylic coatings generally have a high solid content, a coating can be a very thick coating, and excellent mechanical properties, can be made of high durability, high fullness, high elasticity, high hardness of the coatings. A Drawback is that two-component coatings, the construction is too much trouble, and many species need to heat curing or radiation curing, high demand on the environmental conditions, generally requires better equipment, more skilled painting skills.

Paint contains chemicals, such as solvents and metals, which can harm the environment and endanger human health if disposed of improperly. Paint should never be poured down the drain; many of the chemicals in it can't be treated by sewage treatment or septic systems. If this occurs, the untreated chemicals could be discharged into lakes, streams or ground water and cause contamination. Liquid paint should never be thrown in the trash. Eventually, household trash is compacted, which will release paint from the can. In a landfill, the paint will be carried by water seeping through the garbage and could easily contaminate groundwater. As a general rule, liquids are not allowed in landfills. For this reason, fully or partially full cans of paint should not be placed in the trash and will not be accepted by most trash collectors. And, of course, paint should never be dumped on the ground.

There are two basic types of paint to choose from: water-based paints often referred to as emulsion paints, and solvent-based paints. High-quality water-based paints offer not just an excellent all-round performance profile; they are also a good choice from a health and environmental perspective. Solvent-based paints, the more traditional type of paint, require users to exercise a degree of caution to avoid risks relating to potential health hazards.

All solvents are potential health hazards, even if toxicity varies from solvent to solvent. Certain solvent properties, and their known effects are specific, others are common to a group. Solvents can penetrate into the human body by three paths:

In residential painting, roughly 80% of paints used today are water-based paints. At the same time regulations continue to drive the VOC's and resulting

emissions lower and lower. Prudent safety practices combining personal protecting equipment while minimizing prolonged exposure, significantly minimize any health risk. Care should be taken to avoid exposure to the usual vulnerable areas:

- The respiratory tract (by inhaling the vapors)
- The skin (through unprotected contact)
- The digestive system (if swallowed in liquid form)

Limited exposure to solvents can be free from harm if under certain thresholds, varying according to the individual solvent. However, the impact of solvents on health should not be underestimated. Manufacturing guidelines work to help support a healthier painting experience. Manufacturers must identify ingredients used in paint formulation. Manufacturers and suppliers must develop MSDS (Material Safety Data Sheets)

Back pain is one of the most common work-related injuries and is often caused by ordinary work activities such as sitting in an office chair or heavy lifting. Applying ergonomic principles - the study of the workplace as it relates to the worker - can help prevent work-related back pain and back injury and help maintain a healthy back.

The goal of an ergonomics program in industry is to adapt the workplace to a specific worker, dependent on the job description, required tasks, and physical make up of the employee performing those tasks. Two types of situations typically cause people to begin having back pain or to sustain a back injury while on the job:

Non-accidental injury, where pain arises as a result of normal activities and requirements of the task. Poor body mechanics (such as slouching in an office chair), prolonged activity, repetitive motions, and fatigue are major contributors to these injuries. This may occur from sitting in an office chair or standing for too long in one position. Accidental injury results when an unexpected event triggers injury during the task. A load that slips or shifts as it is being lifted, and a slip and fall or hitting one's head on a cabinet door are typical examples. These accidents can jolt the neck, back, and other joints with resulting muscle strain or tearing of soft tissue in the back.

Pain in the fingers, wrists, or other parts of the body: may include a dull aching pain, a sharp stabbing pain, or even a burning sensation

- Tingling or numbness, particularly in the hands or fingers
- Swelling, inflammation, or joint stiffness
- Loss of muscle function or weakness
- Discomfort or pain in the shoulders, neck, or upper or lower back
- Extremities turning white or feeling unusually cold
- General feeling of muscle tightness, cramping, or discomfort
- Clumsiness or loss of coordination

- Range of motion loss
- Discomfort when making certain movements

1. *Seat Height*

- Most chairs are adjustable but for the main point is your feet should be firmly flat on the floor or a footrest. The angle for your knees and hips while sitting is 90 degrees or the hips slightly above the knees.

2. *Seat Depth*

- Sit all the way back in the chair with approximately 2-3 fingers width between the front of the chair and the back of your lower leg. Use a pillow or lumbar supports if a chair is too large.

3. *Back Support*

- Lumbar support should be comfortable and located in the small of the back. The height of a chair back is personal preference

4. *Armrests*

- When using armrests, the elbows should rest comfortably at an approximate angle 90-110 degrees. Additionally you want to feel relaxed in the shoulders and trapezius muscle so avoid shrugging.

5. *Keyboard and Mouse*

- Wrists should not be at angle when using mouse or keyboard. This can be improved with a wrist support pad. Entry devices should allow appropriate elbow angles to avoid unneeded stresses on the shoulders.

6. *Monitor Position*

- The top of your monitor is slightly below eye gaze with the center of the monitor about 15-20 degrees below eye level. Adjust the monitor for glares and avoid odd postures sometimes caused by bifocals or other eyewear. The distance of the monitor from your eyes can be easily approximated by holding your arm straight in front of you with the wrist pulled up as if you're signaling for someone to stop. This is a good distance for your eyes to work with the monitor.
- Since many of us spend a few hours per day sitting at our desks and in front of our computers we should do all we can to make ourselves comfortable. In the process of getting comfy you may very well be saving your back from further breakdown and physical ailments. A few simple modifications to working posture.

II. METHODOLOGY

2.1.1 Check List Preparation:

Generally, it carried out to identify hazards of the



paint shop (Annexure-A)

2.1.2 Safety Walk:



Figure: 2.1 – Hazards of painting car as bottom chase

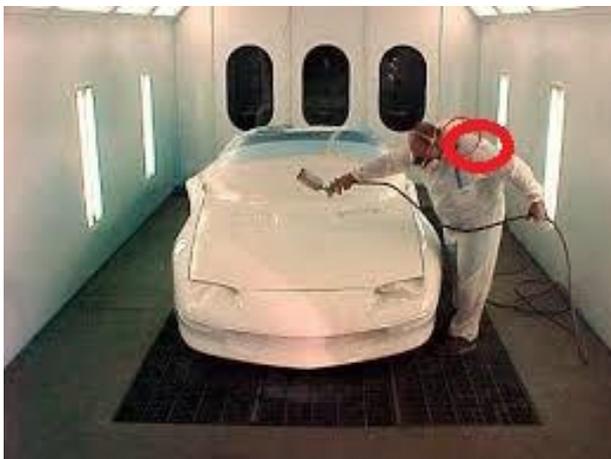


Figure: 2.2 – The man continuously spraying paint so, he is affected by neck pain.



Figure: 2.3 - The man continuously spraying paint, so he is affected by knee pain.



Figure: 2.4- The man continuously spraying paint, so he is affected by knee pain



Figure: 2.5 - The man continuously spraying paint, so he is affected by back pain.

2.1.3 Safety Walk Report:

In the paint booth, the man continuously sprays paint in the car body. So that the man will affect by shoulder and neck pain, when they painting the car silencer at downward position. They are affected by back pain. When they paint a door in sitting position. They will affected by knee pain and also painting the cars quarter panel above fuel housing, that man also affect by knee pain, because they also in the sitting position and they are all affected by chemical exposure which leads to the ergonomomical and health issues.

2.2. Design:

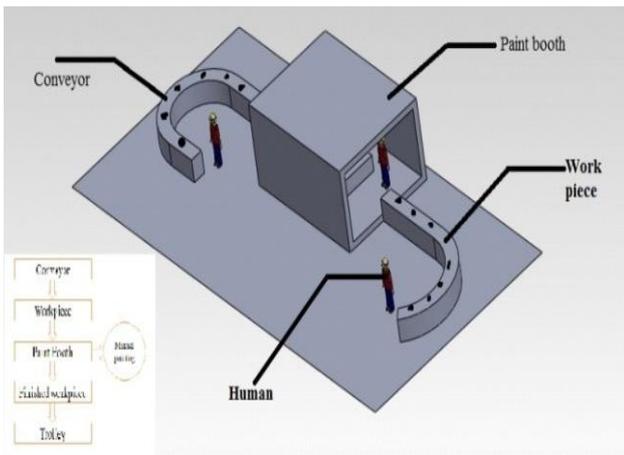


Figure: 2.6- This is the design that how man working in paint shop.

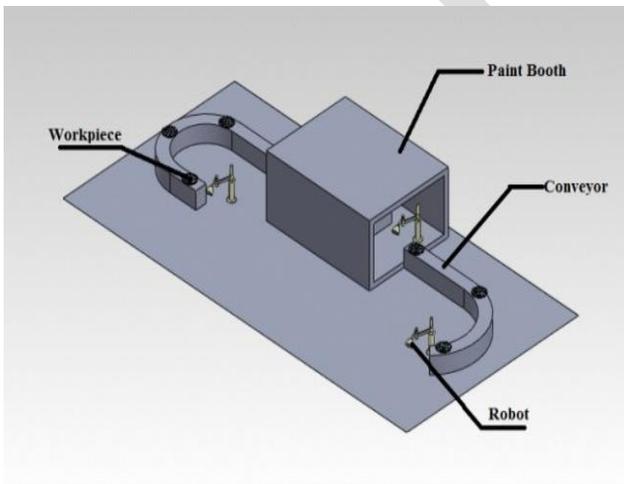


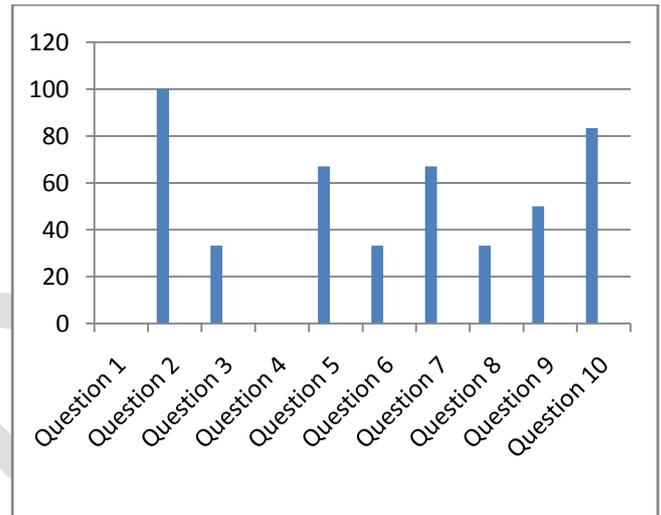
Figure: 2.7- This is the design that how Robot working in paint shop.

In this there are four men is working in paint shop. Two mans working in paint booth and another two man stayed in outside. One man is taking door from the trolley to conveyer and inside of the booth one man's work is painting the door and another man work is finished painting he will take the door from the table to outside conveyer and then the conveyer goes to the final stage. Another man takes the door from conveyer to trolley. This is the process of four mans regular work. So the four men because many ergonomomical pain and affected by paint smell [chemical]. So we overcome

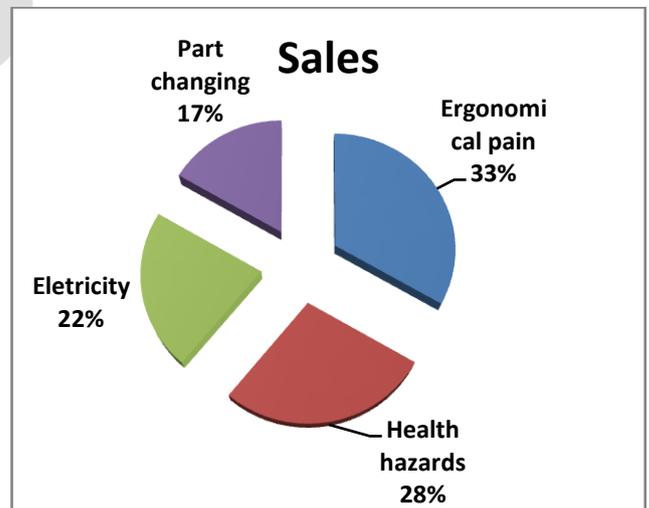
that problem. We will replace the four men as four robots. The first robot work is taking the door from trolley to conveyer belt. Then the belt goes inside of the paint booth. After that we will stop the conveyer belt and there is a robot is rotating with 360 rotations after finishing the paint process. We will start the conveyer belt. The door goes to the final stage through the conveyer belt. The last robot will takes the door from conveyer belt to trolley.

III .RESULT AND DICUSSION

3.1 Survey report



3.1.1 Hazards Identification



From the pie chart top 4 hazards of paint shop are identified by through check list survey method among 10 questionnaires top 4 hazards are identified.

3.2 Safety Walk Report:

Generally, it involves hazard identified by through safety walk (Annexure-B)

IV. CONCLUSION & S-UCCESSION

In the paint shop, there are many safety problems. The man is doing a cyclic process which results in health hazards like body pain, back pain, knee pain (ergonomical pain), after that if the man is painting without respirator so he will also be affected by wising problem and also by asthma. So we will fix the robot in the manual working area for painting a work piece or placing a heavy work piece from one place to another place. On that time we will reduce health hazards and also ergonomical pain.

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ANNEXURE-A

HAZARD IDENTIFICATION CHECKLIST				
DATE:		EMPLOYEE NAME:		
LOCATION:		ASSESSED BY:		
TASK:		APPROVED BY:		
DESCRIPTION OF JOB:				
S.no	Description	Priority		
		High Priority	Medium Priority	Low Priority
1	Are you feeling comfortable with safety measure in your paint shop?			
2	Does continuous work in paint shop cause ergonomical pain?			
3	Do you have any health hazards due to heat radiation?			
4	Do you have enough carbon dioxide in your paint shop?			
5	Is there any electricity leakage during processing?			
6	Is air cooler on working state?			
7	Do you have any ergonomical pain on placing workpiece on conveyor?			
8	Is there any problem in paint refilling process?			
9	Do you have any ergonomical pain in part changing process?			
10	Do you have any health hazards due to chemicals?			
SIGNATURE				
	EMPLOYEE	ASSESSOR	SUPERVISOR	

ANNEXURE-B

SAFETY WALK REPORT

S.NO	OBSERVATION	EFFECTS	SUGGESTION
1.	Worker is painting a full door.	Affected by body pain and Inhalation of aerosols	Use of safe operating procedure(SOP)
2.	Employee is painting a sill panel at sitting position.	Ergonomically problems	Reduce of Working time.
3.	There is no safe operating procedure in paint refilling process	paint spillage	Housekeeping with good supervision is needed
4.	Worker is lifting paint by his shoulder	Because of inadequate number of transporting vehicle	Appropriate number of vehicles should be used
5.	The person is working at improper posture.	Affected by work-related musculo-skeletal disorder(neck pain, back problems)	Reduce of Working time.
6.	Inside the paint booth there is no appropriate absorber.	Aerosol particulates concentration is higher.	Absorber should be instead as recommended
7.	workers working without hand gloves	Hand injuries	Training and proper suitable PPE should be recommended.
8.	The man is working without PPE while painting.	Affected by health hazards	ATraining of usage and maintenance of PPE and a sound supervision is needed.
9.	Many persons don't wear safety shoes	Safety problem	Supervision is advisable
10.	Many persons using mobile phones inside the paint booth	Radiation problem	Signboards shouldpace wherever required.