WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Control Measures for Chemical Hazards Involved in the Molding Process of Lamination and Infusion

Dr. R. Sasikumar [a], Mr. S. Karthikeyan [b], Mr. Ram Mohan K G [a,b,*]

[a] *Associate Professor, Erode Sengunthar Engineering College, Perundurai, Tamil Nadu, India*
[b] *Assistant Professor, Erode Sengunthar Engineering College, Perundurai, Tamil Nadu, India*
[a,b,*] *P G Student, Erode Sengunthar Engineering College, Perundurai, Tamil Nadu, India*

A B S T R A C T

The aim of the project is to carry out a study of the various critical processes, making a risk assessment of critical work locations and recommend actions to eliminate or minimize the effect of hazards inside the industries through special personal protections.A hazard analysis is used as the first step in a process used to assess risk. The result of a hazard analysis is the identification of different type of hazards. Checklist, Safety audits are the techniques to identify hazards and eliminate or minimize/reduce the risk of injury /illness to workers and damage to property, equipment, and the environment. We must identify hazards and update the checklist in the workplace in order to be able to take action to control them.

This is a step-by-step process to guide responsible persons to an effective hazard identification, assessment, and due time to control the hazard. The steps include: Hazard control - controlling the hazards and the risks associated with the hazard. First try to eliminate the risk. If this is not possible, the risk should be minimized using substitution, modifications, isolation or engineering controls. Back-up controls such as personal protective equipment should only be used as a last option. Providing information, education, training and supervision on the hazards, risks and controls for employees affected by the hazards. Review of the hazard assessment and control process. This project deals with the evaluation of the potential hazards related to the mankind. This project also deals with the hazardous management of the work process. Recommendations shall be made to eliminate or control it for all the hazards identified during the hazard assessment. The recommendations should include the specific actions required to correct the problem.

Keywords: *Chemical Hazard, Lamination & Molding Process.*

1. INTRODUCTION

Since 2001, the company, which was established in 1968, has been offering composite wind blades. With nearly $1.7 billion in net sales and more than 10,600 wind blades produced this year, they are the only independent wind blade manufacturer with a global footprint. They assist in mitigating climate change, significantly reduce greenhouse gas (GHG) emissions, and support the decarbonization of energy production. Their breeze cutting edges can possibly diminish more than 1.2 billion metric lots of CO2 over their normal 20-year life range.

Since 2001, the company, which was established in 1968, has been offering composite wind blades. They sell 32% of all onshore wind blades sold worldwide, excluding China, making them the only independent wind blade manufacturer with a global presence. In order to cater to the expanding global wind market, they have expanded their global presence to include domestic and international facilities. TPI gives remarkable, high-strength, lightweight and solid composite item answers for the transportation market. Over the course of their average lifespan of twenty years, their wind blades have the potential to cut down on more than 1.2 billion metric tons of CO2. With advanced engineering centers and manufacturing facilities totaling over 6 million square feet and 14,000 employees, TPI has a substantial global presence.

2. METHODOLOGY

The primary objectives of a worksite audit or inspection are to ensure a safe work system, safe plant and equipment, safe work environment, best industrial safety practices, measurement of key performance indicators, identification of potential hazards, evaluation of worksite conditions, and identification of worker complaints and feedback.

3. DESCRIPTION OF THE WORKPLACE AND ITS ACTIVITIES

The ongoing working environment comprises of an imbuement status of shape, hose associations, pitch blend machine framework, and cover on the outer layer of the cutting edge in the wake of demolding. Operators prepare for the infusion process, which involves injecting a mixture of resin and hardener into the mold, following layup. Inner lamination is performed manually with a glass layer, resin, hardener, and roller following manufacturing..

INFUSION PROCESS:

The infusion system injects resin and hardener mixture through resin hoses, with operators checking the mold for free flow. However, back pressure can cause resin to splash over the operator and surrounding area, potentially damaging their skin and eyes.

LAMINATION PROCESS:

The lamination process involves manual application of chemicals, which can cause allergic reactions. The curing process takes half an hour to 45 minutes, and the chemical may flash into operators' eyes and on their bodies. Few teams of operators may work at the same location, increasing the risk of flashing the chemical.

4. HAZARD IDENTIFICATION

Anything that has the potential to harm must be controlled when it comes to hazards in the workplace. Risks to employees' health and safety at work are referred to as occupational health hazards. A walk-through and site inspection were carried out to evaluate the activities that are being carried out on a regular basis and the numerous dangers that are present. Both coal and fly ash units posed risks, according to the findings.

Chemicals : Exposure to various types of chemicals used in the blade manufacturing - Infusion, Blade lamination and other locations - The chemicals contain ethylenediami ne which can cause skin allergic reaction and cause irritation on eyes as it is toxic.

Working at energy sources : Operators are working at some mechanical energy sources which may cause splashes of the chemical on the operator’s body - Lamination & Infusion - Chemical splashes can create allergic reaction and irritation to eye and very danger to the eye.

Working near hot mold : Operators working near hot mold to cool the temperature of the chemical exothermic reaction - Infusion process - During the mold heat, body may get expose to hot surface and may cause body irritation.

5. RISK ASSESSMENT

To ensure a safe workplace, employers must conduct a risk assessment of their premises and associated risks. Employers are obligated by the Management of Health and Safety at Work Regulations of 1999 to provide a safe working environment.

The fact that epoxy resin and hardener are the identified hazards and that the affected working classes must be identified are the most crucial details in this text. The mold and small part mold infusion, paint preparation, putty, lamination of the inner and outer blade, and the transfer of the resin and hardener flow into the mold machine for the free flow are the high chemical-prone areas. This includes operators and workers associated with lamination and infusion of chemical added with hardener. When compared to the rest, other areas, such as paint preparation, putty operation, inner and outer lamination, final finishing, and painting activities units, present about the same amount of chemical risk. Workers in the unloading and storage yards, conveyor systems, unloading areas, and storage silos are more likely than workers in other locations to be continuously exposed to this chemical. The assessment needs to be done in great detail, looking at the current risk, the possibility of people being exposed to the dust, the control measures that are in place, and the next steps.

The assessment of the present work location is as below:

Type of Hazard: chemical splash

Locations where hazard exist: Inner lamination, outer lamination, final finishing, small parts infusion, Mold infusion, main mold bonding

Exposed people: Operators, workers, supervisors, Engineers, helpers Probability of Exposure: Medium

Severity: High

Risk Rating: High

6. CONTROL MEASURES

The process of determining whether or not epoxy resin and hardener are present is known as "hazard identification." The affected working classes and high-priority locations where the chemical is present must be identified. Mold and small part mold infusion, paint preparation, putty, inner and outer

blade lamination, resin and hardener flow transfer into the mold machine, paint preparation, putty operation, inner and outer blade lamination, final finishing and painting activities units, unloading and storage yards, conveyor systems, unloading areas, and storage silos are all high chemical prone areas.

ADDITIONAL CONTROL MEASURES REQUIRED

By automating processes, introducing water spray systems, providing enclosures, and introducing sealing systems, OPG must implement a better defense against the health risk. Also, they need to confine working hours and further develop their defensive hardware level to decrease openness to clean.

BROAD ANALYSIS OF COSTS RELATED TO THE ADDITIONAL CONTROL MEASURES:

Incorporation of engineering changes - 2 Lakh INR

Anti-splash goggles- 170 /- Rs per piece

Full Body Chemical suits- 900/- Rs per piece Health surveillance program- 8 Lakh INR

The total expenditure is expected which, majority can be compensated on coordination with relevant clients. Allotted time duration for execution of overall action strategy for effective control of the health hazard.

SUCCESS MONITORING:

The proposed risk control measures include reducing chemical exposure, training work crews, monitoring air quality, limiting working duration and multi-shift work, and providing adequate Personal Protective Equipment. Health surveillance programs are also being undertaken, including spirometry for employees.

IMPLEMENTED RECOMMENDED PPE'S AND CONTROL MEASURES:

The production team purchased recommended PPE for use in lamination, infusion, inner lamination, all small part infusion, and painting application processes. The production and EHS directors approved the budget, and engineering control was recommended for lamination and infusion activities.

7. CONCLUSION

In my undertakings, there are not many exercises that implied high gamble. activities like infusion, inner and outer lamination, paint preparation, and adhesive paste bonding application; has a higher-than-acceptable level of residual risk that must be stopped and corrected immediately, and additional improved control measures are required to bring the risk level down to an acceptable level. These projects can begin once the improved risk level has been obtained.

We experienced operational issues within the blade lamination works despite the above-mentioned controls and precautions. We discovered through extensive research that the blade's interior temperature and humidity are not suitable for splash goggles. As a result, we have chosen to use a half-face cartridge and a helmet, as wearing a helmet while working with a blade is required. The feedback from associates after the trail was positive. As a result, we included a helmet and face shield in the blade fir lamination process. The manufacturing process, which includes the lamination and infusion processes, has taken all of the aforementioned precautions into account. Change management was also approved by the directors of processes and EHS. Spending plan additionally endorsed for least stock upkeep by the creation.

References

"NIOSH Pocket Guide to Chemical Hazards – Centers for Disease Control and Prevention,

U.S. Department of Health and Human Services. 2013.

□□□ "Occupational Safety and Health Guideline for Coal Dust (Less than 5 percent SiO(2))".

Occupational Safety & Health Administration, U.S. Department of Labor. 2008.

□□□ Fatal and Nonfatal Injuries, and Selected Illnesses: Respiratory Diseases: Pneumoconiosis: Silicosis". Worker Health Chartbook 2004. National Institute for Occupational Safety and Health (NIOSH). 2004

□□□ Adverse effects of chemical exposure. American Thoracic Society Committee of the Scientific Assembly on Environmental and Occupational Health". Am. J. Respir. Crit. Care Med. 1997

□□□ Hubbard R, Cooper M, Antoniak M, et al. (2000). "Risk of cryptogenic fibrosing alveolitis in metal workers

□□□ Raghu G, Weycker D, Edelsberg J, Bradford WZ, Oster G. Incidence and Prevalence of Idiopathic Pulmonary Fibrosis. Am J Respir Crit Care Med. 2006.

□□□ ^Fernandez Perez ER, Daniels CE, Schroeder DR, St Sauver J, Hartman TE, Bartholmai BJ, Yi ES, Ryu JH. Incidence, Prevalence, and Clinical Course of Idiopathic Pulmonary Fibrosis: A Population-Based Study. Jan 2010