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Lung Ailments have been Related to Particles Inhaled from the Work Environment, such as Dust, Chemicals, and Proteins

Dr. Pramod Kumar , Government Degree College,Dept. of Chemistry Jaithra , Etah

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Abstract

Small and medium-sized enterprises play a critical role in the economies of many countries. Micro, small, and medium-sized businesses make up more than 75% of India's plastic industries; of these, 15% or so are in the packaging industry, one of the fastest-growing economic sectors. The workplace requires the integration of health and safety measures due to a number of factors, including low awareness, minor or major accidents, old or only partially automated machinery, and ergonomic concerns. This study examines the causes of accidents and offers recommendations for mitigating their possibility in the future. After industrial plan implementation, safety oversight is crucial to sustaining an efficient workplace safety and health system that protects employees' lives and well-being. Data was collected from a variety of professional contexts. The size and quantity of fibers deposited deep within the lungs determine the danger of inhalation. Lung cellular activity eliminates fibers shorter than 15 m. However, longer fibers may saturate the lung's self-clearance system, leading to pathogenic consequences. Research on the harmful effects of breathing in carbon and fibers produced during the machining and crushing of composite materials on animals has yielded inconsistent findings. This paper's main goal is to identify the most popular methods used by businesses to adopt behaviorally-based safety.

Keywords-Dust, Chemicals, Proteins Etc.

Introduction-

Everybody working in the plastics business comes into contact with potentially hazardous machinery and raw ingredients, which are frequently petrochemicals and extremely flammable [1]. The manufacturing of plastics is growing quickly to become a significant industry. Every producer, whether it be a piece of technology or equipment, is attempting to reduce prices for economic development by adding plastic into their product. The plastics business has grown into many other industries, including the automotive, aerospace, medical equipment, toy, and packaging sectors, from its modest beginnings of producing combs and buttons. Plant fiber/plastic composites, or PPCs, are inexpensive and simple to produce, which has led to their widespread application in the production of a wide variety of food-contact products.

They are frequently marketed as being better than conventional plastics derived from petrochemicals in terms of cost and environmental impact because of their renewable raw material source, plant fibers. Since the production process calls for other necessary chemicals in addition to plastic resins and plant fibers, concerns regarding food safety have been raised over the usage of PPCs. Given allegations of increased migration of hazardous compounds (like melamine) in some PPC-made items, more investigation is needed into the safety and use of PPCs for materials that come into contact with food. The technologies employed by the military is described in depth in this research study. The materials processed, production methods, tools, potential worker exposures, and other relevant safety and health information that might be found in contemporary composites processing facilities, as well as the ongoing advancement of this technology, will all be explained to field staff [2]. The manual is not intended to be a comprehensive guide for assessing whether or not standards are being followed, even if it must occasionally touch on subjects like industrial hygiene and safe working methods.

The potential costs of accidents if preventative measures aren't taken are balanced against the cost of adopting a safety program to safeguard the wellbeing of workers and other parties (such as machines). Over 25,000 distinct firms in India employ over 3 million people in the plastics industry. The downstream plastic processing industries are made up of a very wide range of micro, small, and medium-sized firms. Of the roughly 30,000 plastic processors listed in the government database, 75% are very small-scale operators. Information about the infrastructure for the production of plastics in India. However, only about 25% of global polymer use originates from these lower scale industries. For the Indian economy to function, small and medium-sized enterprises (SME) are essential. India's packaging industry is one of the fastest-growing in the world when compared to other industries.

Table-1: India's plastics manufacturing technology

S.No.	**Plastic Processing Technologies**	**Ratio**
1.	Injecting Molding Process (IMP)	58%
2.	Deformation	28%
3.	Blowing a Mould	9%
4.	Others	5%

Modern technology, cutting-edge equipment, and automation are being introduced to these industries at an increasing rate, with safety being given first priority. No matter how big or small, every company should follow health and safety regulations to shield its workers from potential risks from their environment, equipment, and coworkers [4].Hazards.Everything that could harm people's health, businesses by causing them to lose equipment or property, or the environment itself is referred to as a "hazard". Main categories of hazards

(i) **Resin:** Modern composite production techniques use low vapor pressure and high molecular weight (MW > 10,000) resins. In terms of molecules, reduced volatility is typically associated with a higher molecular weight. Because of their extremely low vapor pressures, the resin components of an epoxy system do not pose a risk to the air.

(ii) **Curing Agent:** Curing agents, sometimes referred to as hardeners, are frequently amides, amines, or anhydrides used in epoxy resins. Dealing with curing solutions that contain mixtures of aromatic amines can cause skin discoloration even if gloves are worn. Furthermore, there have been allegations of orange and brown stains on walls and ceilings.

(iii) **Reinforcing Fiber:** The majority of the fibers used by the industry to reinforce structures are also mechanical irritants, which means they can irritate the skin, eyes, and respiratory system. The potential for synergy is not entirely clear. The chemical irritants in resins may intensify the mechanical irritants in fiber.

- Carbon/Graphite fibers
- Aramid fiber
- Glass fiber

Fiber Reinforced Plastic (FRP) dust:

High-tech composite techniques can produce a variety of dust particles. The most common tasks that produce dust are filing cured products, repairing broken parts, and machining them. A significant portion of the dust produced during such operations may be small enough to breathe in, depending on the details. In the graphite-epoxy finishing methods they have researched; researchers have found that respirable percentages can reach 100%. Owing to the nature of the activity, finishing and repair methods are more prone to generate dust. Both processes use similar techniques, such as routing, sanding, and grinding. Before the restoration process can start, any outdated paint or coatings may need to be removed using abrasive blasting and sanding. People frequently use artificial materials, such as plastic media blast, to blast. Lead and chromates, which can be present in paint and coating that is being removed, are potential risks.

Solvents:

High-tech composite processes need a large number of volatile and flammable solvents. Some could be absorbed via the skin, and most could irritate the respiratory system, eyes, and skin. When handling organic solvents, caution is advised as they have the potential to introduce toxic compounds into the body. Additionally, they could make resin systems more sensitive to skin. One group of compounds that can be used to remove fat from the skin is toxic substances, such methyl alcohol. When breathed in or skin-contact with chemicals and gasses occurs at work, it can be dangerous. Selecting the appropriate glove is essential for safety. Permeation statistics are readily available for a number of typical industrial chemicals, most notably solvents. However, there is a lack of knowledge regarding both resins and curing agents. The same holds true for solvent combinations, for which very little research has been done. It may take some trial and error to locate the perfect pair of gloves when shopping.

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Health effects-

Many industries include manual processing that can result in skin exposure. Extended contact with this may result in rashes, skin irritation, and ultimately dermatitis [5]. Workers may need to change jobs if they experience sensitivity to the resins due to the possibility of developing a reaction. Prolonged exposure to the vapor may cause irritation of the respiratory system and eyes. Breathing difficulties, inflammation of the lungs, and irritation of the nasal and pharyngeal passages can all result from respiratory system exposure to these amines. The adverse impacts of nanoparticles in nano-engineered materials can affect inflammation, interstitial fibrosis, mutagenesis, malignant lung tumors, and vascular repercussions.

Routes of exposure:

Absorption: protect your hands, eyes, and clothes againstspills.

Inhalation: Dust masks are recommended for use during inhalation.

Ingestion: never eat while processing, and always wash hands. Injection: Injectable splinters and fibres to seal out cuts and scrapes.

Related study-

The suggested research suggests that plant fiber/plastic composites (PPCs) have found significant employment in the construction of a broad range of food contact products due to their low manufacturing cost and ease of processing [6]. Their natural raw ingredients, plant fibers, make them less expensive and less hazardous to the environment than conventional plastics based on petrochemicals; for this reason, they are frequently hailed as an excellent substitute. Plastic resins and plant fibers are used to make PPCs, but a number of necessary chemicals are also used in the process that could be dangerous to consume.

A greater understanding of the safety and viability of PPCs as materials that come into contact with food is required because of reports of increased migration of hazardous substances (like melamine) in some PPC- made products. In this paper, we assess and contrast potential dangers, potential sources of risks, and current risk management measures across national boundaries using the key raw materials of PPCs used in food contact as a starting point. The findings suggest that PPCs used in food contact may now present a risk to public health. There hasn't been much systematic research on migration methodology and safety evaluation, which is necessary to better understand the main safety concerns and migration trends.

Te suggested a paper in which the subject of this exploratory investigation was occupational health and safety (OHS) performance in the workplace [7]. By utilizing a mixed-methods approach to search through a workers' compensation database, twelve companies in Ontario, Canada were found to have made deliberate and noteworthy improvements in their occupational health and safety performance between 1998 and 2008 (i.e., "breakthrough change" (BTC) instances). Four of these businesses—two manufacturers, a grocery store, and a social agency—are the subject of our case studies. With organizational learning at its core, a 12-part conceptual model was created using a mix of cross-case analysis and literature review. BTC was founded as a result of an external force, corporate pressure to improve occupational health and safety (OHS), fresh insights into OHS, and a knowledge transformation leader. BTC further depended on five other elements: awareness of occupational health and safety (OHS) issues, positive social dynamics, a pattern of continuous development, concurrent operational advancement, and a supportive internal environment.

Finally, three outcomes of BTC are lower OHS risk, less OHS knowledge integration, and fewer illnesses and injuries. The concepts discussed here might guide further research on improving OHS performance at work.

Extrusion is a fundamental industrial method in the polymer processing sector that is used in the production of a wide range of goods for a wide range of industries [8]. Since manufacturing is an energy-intensive process, finding the most economical processing conditions and optimizing process energy efficiency are critical. Energy is needed to run a conventional extruder's driving motor, barrel heaters, cooling fans, cooling water pumps, gear pumps, etc. The extruder's drive motor is the component that uses the most electricity, followed by the barrel/die heaters. Examining an extrusion plant's overall energy needs under various processing conditions and identifying the most effective approaches to boost the facility's energy efficiency are the goals of this research [8]. The first step is to perform a literature review [8] on energy modeling and monitoring in polymer extrusion. The study also included the intricacies of determining the power factor, energy consumption, and losses for an extrusion facility. The mass throughput, total energy consumption, and power factor of an extruder across a range of processing settings are also empirically assessed and used in a commercially available extrusion simulation program to estimate the overall energy requirement of the extruder. The experimental data shows that the energy requirements for extruders and the variables related to materials, equipment, and processes are closely related. There is a trailing offset when comparing the total power predicted by the modeling program to the actual data. Empirical models can be utilized to get insight into the energy behavior of the process and identify areas for efficiency improvements because they closely align with real-world observations.

rheological, thermal, and frictional characteristics is essential to the extrusion process. While it makes sense in theory, it is rarely carried out in practice to modify the extruder screw's form and extrusion parameters to suit the characteristics of various polymers. Here, we have analyzed the temperature dynamics of the extrusion process with the use of process monitoring equipment. With the use of infrared thermometers, real-time energy monitoring, and a novel thermocouple grid sensor, researchers have seen melt temperature fields within flowing polymer melts directly at the entrance of an extruder die. Three distinct extruder screw shapes have been tested using a commercial grade of polyethylene in a range of extrusion operating circumstances. We discovered that energy usage and melt temperature uniformity were significantly impacted by the extruder's screw shape, screw rotation speed, and set temperature.

The suggested study makes the argument that knowledge of the existing safety culture in organizations like shipping companies and on-board ships is necessary to maintain and grow safety culture as well as safety in a maritime business [10]. Questionnaires designed with that objective are frequently used to assess safety culture. This study suggests a method for handling questionnaire data in order to analyze and explain relationships between safety culture components. A crucial step in the process is the use of variable cluster analysis, where cluster solutions are displayed as dendrograms. They were found to be an excellent tool for explaining the safety culture concept and helping to make sense of the numerous links found in quantitative data. The results of applying the statistical technique to safety culture data from six Swedish ships involved in international trade are presented. The safety and safety culture improvement procedures may benefit from the useful feedback that the safety culture outcomes visualization offers, as well as conversations about safety at different organizational levels.

Methodlogy-

A thorough and well-researched risk assessment program can be very beneficial to the health and safety of workers in any industrial facility or workplace. Accident rates may be considerably reduced by implementing safe behavior training and reinforcement that is based on research on risk assessment. It is imperative that those in authority cultivate a safety-first mindset and create and implement a thorough safety improvement plan. The importance of the organization's safety culture will be determined by how interested or informed staff members are of safety policies and initiatives. Employees are more inclined to notice and appreciate safety programs and laws when managers set an example of good and supportive behavior for their team. It is the duty of higher management to motivate employees to actively think through and deliberate over ways to raise interest in and understanding of safety. It is your responsibility as a leader to oversee the safety performance of your team, since this will motivate them to work more and more efficiently.

It has been demonstrated that the effectiveness of industrial safety measures, such as the monitoring of safety standards and procedures, is increased by the presence of a health and safety executive or other senior managers. Enforcing appropriate workplace measures is necessary to minimize exposure to processed materials. A number of the ingredients, including the fibers, resins, and curing processes, may be dangerous if they came into contact with skin. Some of the solvents and some of the curing chemicals have the potential to be harmful when inhaled. One can breathe in or absorb toxic toxins through the skin. However, ingesting the exposure is rare and usually happens as a consequence of either poor personal hygiene or contaminated food establishments [11]. Modern complex composite workplaces often have multiple versions of the following types of workplace controls. There are four primary types of management in the workplace:

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- Engineering and Work practice control
- Personal Protective Equipment (PPE) and AdministrativeControl.

A-**Engineering control**

Local exhaust ventilation and isolation (e.g., separate process rooms, enclosures, closed systems, segregated storage) are important engineering controls in modern composites processes. These settings may be found in:

- Places for blending resin and Autoclaves and other types of heated curing chambers,

B-Restoring and completing structures, and Managing the byproducts of exothermic Work practice control

Work practices, as opposed to technical protections, concentrate on how a process is really carried out. To minimize exposures when working with advanced composites, there are a few simple, easily followed work methods that can be used.

- Safe handling, storage, and upkeep of protective gear;
- Maintaining a regular routine of personal hygiene;
- Effective management.
- Training and education programmes that help workersexcel;
- Using correct techniques for manufacturing, processing,and control devices;

Personal protective equipment-

Wearing protective gear, including gloves and garments, is sometimes necessary while working with solvents, curing agents, and resins. The appropriate protective materials should be selected with the assistance of any relevant permeation data.

Such data is frequently available for the solvents that are employed, but it is uncommon to get such data for the resins and curing agents combined. To protect the eyes, one can utilize goggles, a face shield, and standard safety glasses with side shields. Respiratory protection is frequently superfluous due to the low vapor pressure of the materials used in many modern composites processes. Nonetheless, breathing apparatus may be requiredwhen:

- The concentration of solvent in the air is quite high;
- An abundance of dust is present.
- There is a lot of surface area, and most of the labour is done by hand; and Exotherms are experienced

Administrative control-

Scheduling processes with the greatest exposures at times when the fewest workers are present is another way to limit employee exposures.

Discussions-

Based on current knowledge, the research project suggests some straightforward and useful health and safety management measures (technological, personal protective equipment, training, maintenance, application of safety procedures, and life cycle metrics of products) for lab facilities and industries that use nanomaterials in their operations. Updating these should not be hampered by new scientific information. It is imperative that current safety measures be monitored, adjusted, and reviewed.

. In general, proactive measures that are overly protective but will likely become less so as knowledge increases are favored to insufficient protections; this context plays a major role in attempting to inform the public about the dangers of carbon nanotubes and micrographene. Therefore, additional research and collaborative efforts on nano safety are required in order to prevent, reduce, and solve the existing gaps. In the end, by following the right procedures and going above and beyond the standard in unknown situations, the hazards to one's health and safety posed by carbon nanotubes and graphite materials can be reduced. The manufacturing of carbon nanotubes and nano-structured products should not have a detrimental impact on the health and safety of employees, customers, or the environment. This will enable businesses to get closer to a truly safe and environmentally friendly control system. Above all, industries involved in product development should implement Structure Integrating Protection, Sustainability, and Salubrity as soon as possible.

The results show that the risk of accidents happening and the safety behavior among factory workers' health increases daily when industries implement safety standards. Market competition and process improvement at every stage seem to be effective tools. Research has indicated that seeking to regulate workplace safety was more successful when senior management is on board. Employees are now participating in more activities and adhering to the company's safety regulations since upper management has encouraged them to do so. Security is increased by the adoption of risk-free and clean technologies. Using state-of-the-art safety precautions decreased risk. Ergonomics-related events have significantly decreased as a result of increased machine automation, the creation of safety committees, protective barriers surrounding machinery, etc. The application of creative methods during the production stage seems to have raised productivity.

The following specifications provide an example of how the various industries' operations have changed as a result of these safety criteria being implemented.

- Using overhead cranes reduces potential dangers during mould servicing.
- Productivity enhancement through the use of novel approaches.
- After updating the fire extinguisher types in the manufacturing zones and giving enough training, the risk level dropped.
- Machine safeguarding for valves, gadgets, etc., reduced the potential for injury.
- Frequent inspection of electrical components reduced danger.

Conclusion-

Occupational lung ailments have been related to particles inhaled from the work environment, such as dust, chemicals, and proteins. Their efforts improve the health and economics of the entire world. The prevention and treatment of occupational lung ailments require cooperation between employers, workers, pulmonary physicians, industrial hygienists, occupational doctors, and other disciplines. The new methods were explored and put into action in an effort to boost an industrial efficiency

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