International Journal of Science and Technology (IJST)
ISSN: 3049-1118, Volume- 3, Issue- 2 (April - June 2026)

A Critical Analysis of Environmental Health and Safety Practices in the Modern Printing Industry

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Abstract

This research is intended to provide more detail and a more realistic view of what happens at a medium-sized company engaged in the digital printing process in terms of environmental health and safety practices. This research will evaluate different aspects of everyday life for production employees including producing printed materials that are done on a digital printing machine; cutting paper into pieces, laminating items, binding and finishing printed work, storing goods used in production, using cleaning supplies, and shipping goods out. All of these areas of study contain environmental and employee risk that are created by expected fast delivery of goods, being under pressure to keep production machinery operational, and being close to the powered or mechanical devices that run the machines, along with having direct contact with electronic devices and materials used to print, such as toner or ink, and dust from cutting sheets of paper. By identifying many of the circumstances listed above, this research aims to illustrate that a printing company can maintain a strong level of productivity and still require more attention to the safety, health, and environmental issues associated with that level of productivity.

Keywords: Digital Printing, Environmental Health and safety (EHS), Industrial safety, print facilities, employee risk etc.

Introduction

Printing has changed throughout its history, from using manual techniques to using digital systems which offer speedy production and allow instantaneous variations on job type or output. These changes are exhibited in the medium to large scale of digital printing companies through advancements in digital press technology, computer technology used for pre-press processes, finishing equipment and organizational methods of dispatching work completed that can be used in short-run commercial print work. These new technologies not only produce faster and more efficiently than manual systems do, but create a workplace environment in which it is necessary to actively manage safety procedures in order that quality, delivery and worker protection can all be successfully coordinated.

Printing has undergone profound changes in its entire history. From manual ways of printing to evolving into highly automated digital systems, printing is now capable of producing

Published: 18 June 2026
DOI: https://doi.org/10.70558/IJST.2026.v3.i2.241286

speedily, flexibly and in custom orders. In today's digital print facilities, success can be measured using various criteria such as print quality, speed of production, machine uptime and customer satisfaction. Each of these success indicators is potentially impacted by using digital print technologies, especially if the inherent pressures are not properly addressed from an environmental or workplace perspective. The report on which this paper is based discusses how a digital printing facility functions as a manufacturing operation, as well as an employee work environment where employees are exposed to ongoing daily interactions with machinery, electrical technology, chemicals, consumable products and finishing equipment, and the waste generated by those processes.

As a result of this combination of both technical accuracy and different hazards of everyday operation, digital printing & EHS are highly relevant industries to one another. Many risks exist for workers when working as a result of using toner dust, ink residue, cleaning agents, repetitive motion from all of their tasks, heat, noise, paper dust and all of the hazards presented by machinery particularly during set-up/maintenance, cutting, laminating, binding or clearing jamming of machines.

In addition, the study analyzed by the author provides more of a case study than just a general theory of how these issues are resolved within a particular organization through the use of questionnaires and observations as well as an examination of the workplace.

Objectives

In this research, the finding of possible environmental and occupational hazards for the printing industry such as Waste production, chemical exposure, ventilation, electrical hazards, machine safety, poor communication. And evaluation controls (like machine guarding, managing waste, emergency planning, use of PPE, and providing training) that shows how management support safety culture to actual EHS performance.

Methodology

The report is based on an analytic case study that focuses on one digital printing company. Therefore, primary data were collected using structured questionnaires, direct observations of employees working in their organizations, and reviewing their practical working conditions throughout different areas within each department of the company; such as production areas, finishing areas, storage areas, and locations where waste is to be disposed of.

Employees who were directly involved in all aspects of the printing process also provided feedback regarding the safe workplace practices related to this process, including print operators, finishers, helpers, supervisors, maintenance personnel, and management staff.

The methodology also assessed both the environmental and occupational components of EHS. On the Environmental side, the study evaluated the Paper Waste produced as a by-product of the printing process, how many Toner Cartridges are disposed of and the energy used to create and clean the Printed Products; how much waste was segregated into recyclable materials versus non-recyclable materials and how cleaning chemicals and consumables were disposed of.

On the Occupational side, this study assessed Machine Guarding and the accessibility of Emergency Stops, Electrical Safety, Fire Safety, Ventilation Issues, Ergonomic Strain, PPE (Personal Protective Equipment), Workplace Cleanliness, Spill Management Procedures and Employee Awareness of Hazards and Emergency Procedures.

The analysis primarily used descriptive interpretation, understanding percentages of data and comparing strengths and weaknesses of each component, rather than using advanced statistical analysis techniques.

Empirical section

To accomplish this project an industrial survey is taken in form of questionnaire and were carried out through printed form. The surveys responders list is shown below in form of table and pie chart:

Table 1: Survey responses of 30 responders (workers of digital printing industry)

Respondent	Does the company have machine guards on printing and finishing equipment?	Are emergency stop switches easily accessible on major machines?	How often is PPE used during work?	Is ventilation adequate in the production area?	Are inks, solvents, and cleaning materials stored safely?	How is waste paper managed in the company?	Are workers trained on EHS practices?	Does management give priority to safety along with production?	Are fire extinguishers available and maintained?	Have workers experienced near-miss incidents in the plant?
1	Partly	No	Partly	Partly	Partly	Partly	No	Partly	Yes	No
2	Yes	Yes	Yes	Partly	Yes	Yes	Yes	Yes	Yes	Partly
3	Yes	Yes	Yes	Partly	Yes	Yes	Yes	Yes	No	Yes
4	No	Partly	Partly	Yes	Partly	Yes	No	No	Yes	Yes
5	Yes	Yes	Partly	Yes	Yes	Partly	Yes	Yes	No	Partly
6	No	Yes	Yes	Yes	No	Yes	Yes	Partly	Yes	No
7	Yes	Partly	No	No	Yes	Yes	Partly	Partly	Yes	Partly
8	Yes	Yes	Yes	No	No	Partly	Partly	Partly	Partly	No
9	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Partly
10	Yes	Yes	Partly	Yes	Yes	No	Partly	Yes	Yes	Yes
11	No	No	Yes	No	Yes	Partly	Partly	Partly	Partly	No
12	Partly	Yes	Partly	No	Partly	Yes	Yes	No	Yes	Partly

13	No	Partly	No	Partly	Yes	No	Partly	Yes	Yes	No
14	Yes	Yes	Partly	Yes	Partly	Partly	Yes	Partly	Yes	No
15	Partly	Partly	No	Yes	Partly	Partly	Yes	No	Yes	Yes
16	Partly	Yes	Partly	Partly	No	Yes	Partly	Yes	No	No
17	Yes	Partly	Partly	No	Yes	No	No	No	Yes	No
18	Yes	Yes	No	Partly	Partly	Partly	Yes	Yes	Partly	No
19	Yes	Partly	No	Partly	No	Yes	No	Yes	Yes	Yes
20	Partly	Partly	Yes	Partly	Yes	Yes	Yes	Yes	Yes	Yes
21	Yes	Yes	No	Partly	Yes	No	Yes	Partly	Yes	Yes
22	Yes	Yes	Yes	No	Yes	Partly	Partly	No	Partly	No
23	Yes	Yes	Yes	Partly	Yes	Partly	Yes	Partly	Yes	No
24	Yes	Yes	Yes	Partly	Yes	Yes	Yes	No	Yes	Partly
25	Yes	No	Partly	Partly	Yes	No	Yes	No	Yes	Partly
26	Yes	Yes	No	No	Yes	Partly	No	Yes	Yes	No
27	Partly	Yes	Partly	Yes	Yes	Yes	Partly	Partly	Partly	No
28	Yes	Yes	Partly	Partly	Partly	Yes	Yes	No	Yes	Yes
29	Yes	No	Partly	Yes	Yes	Yes	Yes	Partly	No	Yes
30	Yes	Partly	No	Partly	Yes	Yes	Yes	Yes	Yes	Partly

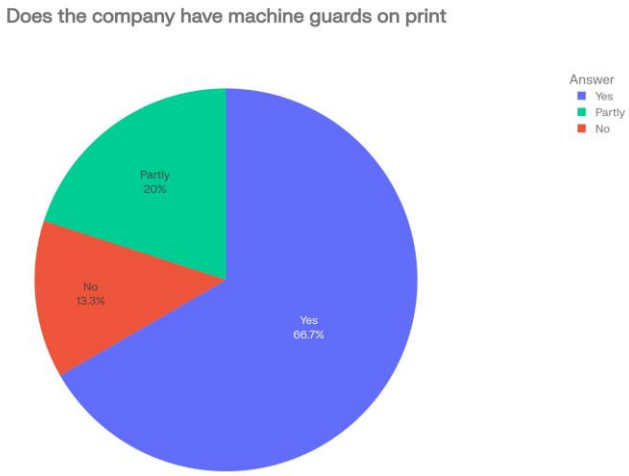

Figure 1: The company have machine guards on printing and finishing equipment?

As per the above chart (Figure 1) and table information the company have machine guards on printing and finishing equipment according to 66.7 percent responders, but on the other hand 13.3 responded no, meanwhile 20 percent responded partly. So, according to this chart the company has proper machine guard and safer workplace.

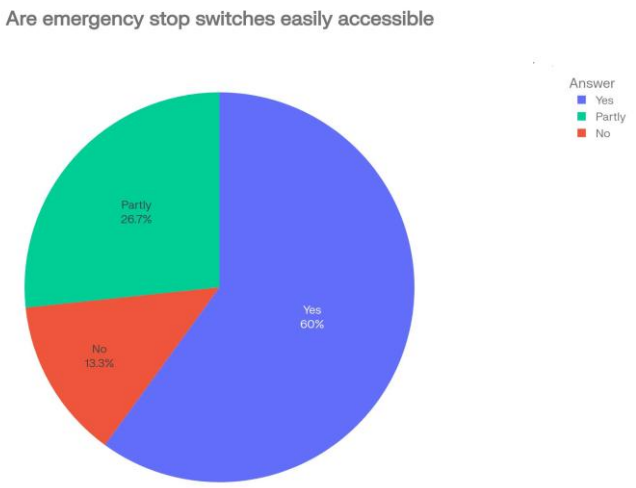

Figure 2: Are emergency stop switches easily accessible on major machines?

As per the above chart (Figure 2) and table information emergency stop switches are easily accessible on major machines according to 60 percent of responders, but on the other hand 13.3 percent responded no, meanwhile 26.7 percent have responded partly. According to this chart the industry had implemented emergency stop switches but some of them are not accessible.

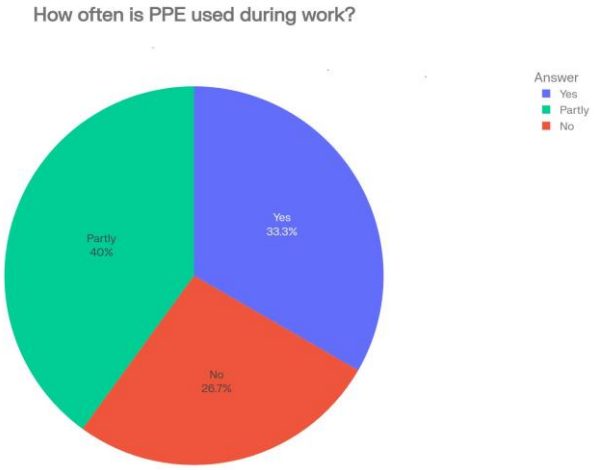

Figure 3: use of personal protective equipment

As per the above chart (Figure 3) and table information workers use of personal protective equipment (PPE) according to 33.3 percent of responders, but on the other hand 26.7 percent responded no, meanwhile 40 percent have responded partly. So, this part shows the careless behaviors of workers towards Personal Safety

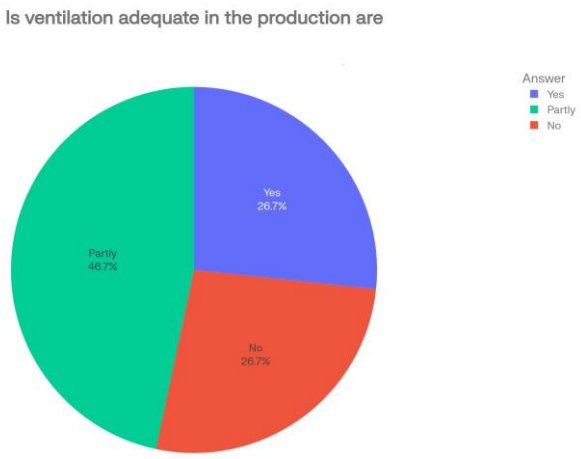

Figure 4: Is ventilation adequate in the production area?

As per the above chart (Figure 4) and table information ventilation facility in the industry is proper according to 46.7 percent of responders, but on the other hand 26.7 percent responded no, meanwhile 26.7 percent have responded partly. So, this chart shows that some departments of the industry are not properly ventilated or had poor ventilation in some area.

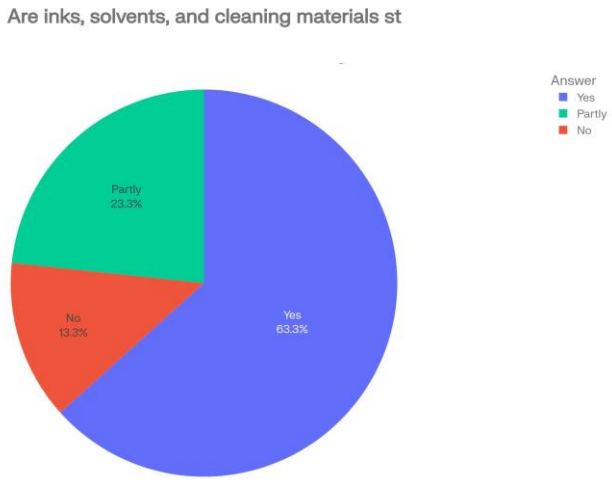

Figure 5: Are inks, solvents, and cleaning materials stored safely?

As per the above chart (Figure 5) and table information ink, solvents, and cleaning chemicals are stored at safe place according to 63.3 percent of responders, but on the other hand 13.3 percent responded no, meanwhile 23.3 percent have responded partly. So, this chart shows the storage of ink, solvent and cleaning chemicals are stored properly in majority of cases.

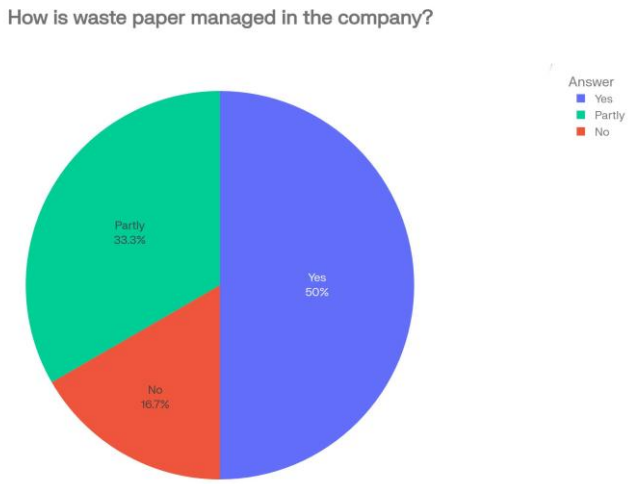

Figure 6: How is waste paper managed in the company?

As per the above chart (Figure 6) and table information industry had proper waste paper management according to 50 percent of responders, but on the other hand 16.7 percent responded no, meanwhile 33.3 percent have responded partly. So, this chart shows the industry had good waste paper management except for finishing action like trimming.

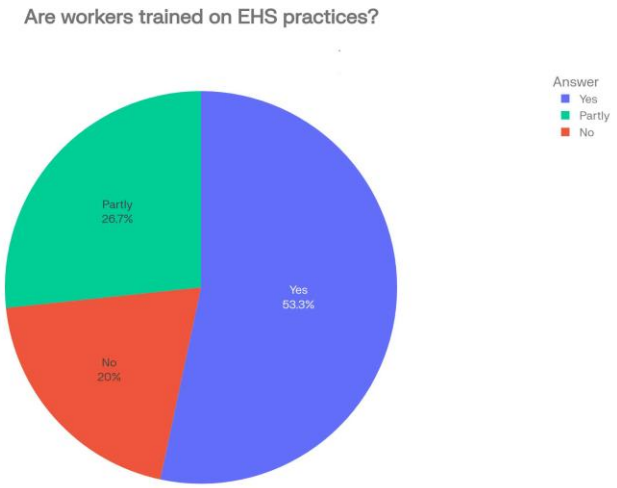

Figure 7: Are workers trained on EHS practices?

As per the above chart (Figure 7) and table information industry provide training on EHS practices to worker according to 53.3 percent of responders, but on the other hand 20 percent responded no, meanwhile 26.7 percent have responded partly. So, this chart shows the industry had not provided training to every employee that shows the carelessness of management towards the safety.

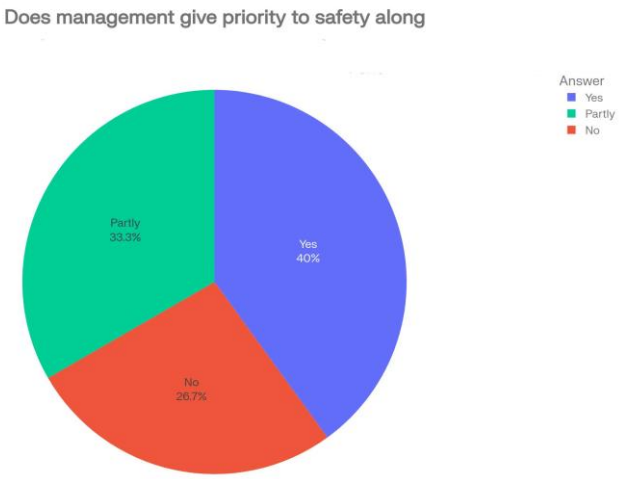

Figure 8: Does management give priority to safety along with production?

As per the above chart (Figure 8) and table information industry provide priority to safety along with production according to only 40 percent of responders, but on the other hand 26.7 percent responded no, meanwhile 33.3 percent have responded partly. So, this chart shows the industry had not given equal priority to safety in comparison with production that also shows the carelessness of management towards the safety.

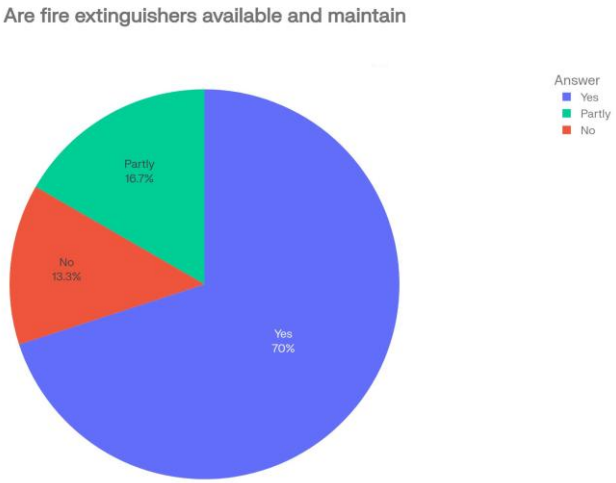

Figure 9: Are fire extinguishers available and maintained?

As per the above chart (Figure 9) and table information industry had maintained fire extinguisher according to only 70 percent of responders, but on the other hand 13.3 percent responded no, meanwhile 16.7 percent have responded partly. So, this chart shows the industry had provided fire extinguisher that are at accessible location.

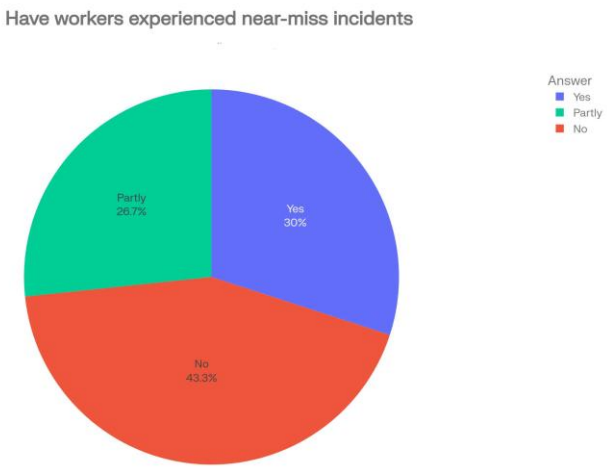

Figure 10: Have workers experienced near-miss incidents in the plant?

As per the above chart (Figure 10) and table information worker's experienced a near miss incident according to only 30 percent of responders, but on the other hand 43.3 percent responded no, meanwhile 26.7 percent have responded partly. So, this chart shows the almost second worker had faced a near missed accident that show the poor guidance of the management.

Findings

The findings of this study indicate that visible safety and environmental controls are present within the organization. Areas where such controls can be found include machine guarding, emergency stop switches, general housekeeping, segregation of waste papers, basic fire protection, and EHS structure. The presence of these elements indicates that this organization has not neglected their safety/environmental responsibilities to employees and has undertaken steps toward reducing basic workplace hazards.

However, it is readily evident from these findings that there are several areas where the EHS system has not been fully developed. Areas where development of the EHS system is limited include employee occupational health awareness, consistent use of EHS-related personal protective equipment (PPE) by employees, some areas with poor quality circulation of venting within workspaces, poor knowledge of spill response, practical understanding of emergency preparedness in the workplace, and limited employee confidence that safety is as high a priority as production. In summary, the organization provides evidence that visible and routine safety and environmental controls are in place, while more in-depth skills and behaviors that would provide for reliability within the persons working in these areas of the workplace are less evident.

Another key issue raised in the report involving digital printing is how each process independently presents its own environmental, health, and safety (EHS) concern(s). While digital print is often marketed as being "cleaner," "efficient," and less wasteful than other print production processes because it eliminates the waste of plates that result from the plate-making process, and some printing processes use an excessive amount of solvent-based inks, this report

indicates that many of the traditional EHS risks associated with facilities that utilize the production of digital prints are still present, just in a modified form. Thus, while digital printing should not be simply viewed as a process that is "risk-free," the associated risks exist in a modified form.

Discussion

An important element that was touched on repeatedly through the study is seeing EHS as an integrated system rather than simply a collection of separate, unrelated items. From the findings of this report, it is clear that there are significant inter-relationships among all components of EHS, including the environmental controls in place, the degree to which employees are protected from illness or injury, the safety of the equipment they are using, and the way employees are aware of potential hazards and how to respond to them. For example, inadequate ventilation does not simply create an environmental or health issue; it creates a negative impact on overall comfort, attention, and assurance in the workplace. Similarly, if there is not clear and concise communication around safety, there will likely be negative impacts to the way employees behave in response to hazards, the way they use their PPE equipment, and the extent to which they report near-misses prior to becoming accidents.

The report also identifies the competing pressures between production pressures and the importance of following safety procedures within a digital printing operation. In this case, because the company operates in a fast-paced, production-oriented business where quality, delivery speed, and equipment uptime are very important, the employees operate under pressure to produce goods more quickly than they would if they were in a more leisurely environment. This pressure is often present even though it may not always be visible, resulting in risky behaviors such as skipping PPE to save time, delaying housekeeping to allow for more production, ignoring ergonomic discomfort to improve productivity, or treating emergency procedures as a formality rather than an established process of responding to an emergency situation.

A second point that has been raised is the importance of management commitment. The research found that having safety infrastructure visible is not sufficient; employees also want to see management discussing, monitoring and reinforcing safety regularly. When workers think their production goals are valued more than their health and safety, they are less likely to comply with safety requirements and culture surrounding reporting becomes very weak. Thus, this finding indicates a need for greater emphasis on developing a strong culture of safety by addressing issues such as EHS professionalism through commitment at all levels of the organization. As such, these findings demonstrate the importance of the study to mid-range size printing companies, because while they face significant financial strain due to production delivery demands, these companies often do not allocate sufficient time/space to having a comprehensive EHS program unless management clearly identifies and communicates those to their employees as their priority.

Recommendations

In terms of occupational health management, areas of particular concern include ventilation, PPE (personal protective equipment) discipline, chemical awareness and ergonomics. The

recommendations for improving the company's occupational health management include reviewing section-by-section ventilation conditions; improving air circulation; accurately placing machines; providing guidance to workers on specific tasks relating to the proper usage of gloves, masks, etc.; and creating awareness among employees of the importance of health protection in day-to-day activities.

Another recommendation is to move from having equipment available in case of an emergency to being prepared in case of an emergency. While the company currently has some basic emergency response equipment available (fire extinguishers, emergency stop devices, etc.), this study suggests that conducting drill exercises on a regular basis, holding group safety briefings and meetings (for example, to review emergency phone numbers and what their responsibilities and roles are in the event of an evacuation, fire, etc.) would make the emergency response system more effective and reliable. This is because emergency response systems are only as effective as the people who use them, and workers must feel confident that they can successfully utilize those systems in stressful situations.

The report also calls for increased frequency of EHS inspections, improvements in the way corrective actions are tracked, and closer coordination between environmental performance and productivity targets. An example of this coordination could be through the establishment of annual or quarterly inspection schedules to identify patterns related to housekeeping, waste management, guarding devices, signage, ventilation, and PPE usage where problems may arise prior to incidents. Additionally, linking the reduction of waste with process efficiencies such as better job planning, reduced waste, and improved handling of materials would provide the business with a stronger incentive to build sustainability into their day-to-day operations.

The main takeaway of the study is that on the surface a digital printing company may seem fairly well organized, there are still likely to be many deficiencies in the overall EHS system. While having fundamental controls (guards, extinguishers, waste segregation, housekeeping, etc.) is essential; they do not inherently produce a high level of safety culture. Another crucial factor in establishing a solid safety culture is to educate all workers regarding the hazards of the job to ensure supervisors are reinforcing safe practices, and management applying safety to a normal operation versus viewing safety as an additional task.

Conclusion

The author describes the chosen digital printing firm as having an effective EHS system that is partially finished. Through the use of visible control mechanisms (the establishment of effective housekeeping programs, waste separation programs and the existence of machine guarding, along with other effective emergency stoppages and basic fire protection systems) the firm has created a substantial foundation for further development. However, in the area of occupational health management, the ability to prepare for emergencies, enable greater employee participation, and create a more defined safety-first culture, the EHS system requires additional development in these or other areas. Accordingly, the firm is identified as currently operating at an intermediate level of EHS maturity, as its current structural components are strong but its behavioral component and overall culture require improvement to achieve a consistent EHS system.

By showing that there are risks associated with indoor air quality, hazardous chemical exposure, waste generation, repetitive stress, electrical hazards, and finishing hazards, this study emphasizes that even though digital printing is a modern and improved means for producing printed materials, it will still not completely eliminate these risks through its use alone. Printing companies that operate within a framework of an EHS integrated approach will be able to effectively manage these risks. Finally, this report promotes the concept of a more humane and realistic approach to industrial safety. A printing company is considered responsible for employee safety only when safety equipment has been installed; however, a company is deemed responsible when a workplace culture exists that includes environmental stewardship, employee health and safety, and quality production as part of a single integrated system.

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