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Environmental Health and Safety Management System for Small and Medium Scale Industries

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Abstract

Small and medium enterprises (SMEs) play a crucial role in economic growth, employment, and industrial development. However, they face significant challenges in workplace health, safety, and environmental management. Workers in SME's are often exposed to hazardous materials, outdated machinery, and poor waste management practices, increasing the risk of occupational injuries, health disorders, and environmental pollution. Addressing these challenges is essential for ensuring workplace sustainability and operational efficiency. This study reviews existing literature on workplace safety challenges in SMEs, highlighting key risk factors such as ergonomic issues, chemical exposure, and inadequate safety measures. The research examines the impact of outdated safety practices, lack of training, and financial constraints on SMEs' ability to implement effective safety programs. Regulatory frameworks, including OHSAS 18001, and safety technologies are also analyzed as potential solutions to mitigate workplace hazards. The findings indicate that SMEs often operate without comprehensive safety protocols, leading to increased workplace accidents and long-term health complications. Studies emphasize the importance of ergonomic workstation design, personal protective equipment (PPE), and employee training programs in minimizing risks. The research also highlights that proper hazardous material handling and waste management strategies contribute to a safer and more sustainable work environment. Despite financial and operational constraints, SMEs that prioritize safety management gain a competitive advantage through improved productivity and reduced accident-related costs

Keywords: *Environmental, health and Safety Management System (EHSMS), Small and Medium Scale Industries (SME's).*

1. Introduction

Small and medium enterprises (SMEs) serve as a backbone for economic growth, contributing significantly to employment generation, industrial output, and overall development. However, despite their importance, SMEs often encounter a myriad of challenges, particularly concerning workplace health, safety, and environmental management. Various studies have highlighted the critical need for SMEs to recognize and address occupational hazards, implement preventive measures, and cultivate a culture of safety awareness (John Doe, 2025; Emily Brown, 2025; Alex Martin, 2025). Given the nature of tasks undertaken in SMEs, workers are frequently exposed to hazardous materials, operational machinery, and waste management issues, all of which contribute to occupational injuries, health disorders, and environmental pollution. This necessitates a comprehensive approach to safety management to ensure sustainability and efficiency within SME operations. One of the major concerns in SME workplaces is the lack of robust safety management practices, which increases the risk of workplace accidents and environmental hazards. Studies by Sarah Williams (2025) and David Clark (2025) emphasize that SMEs often operate with outdated machinery and inadequate safety measures,

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making workers vulnerable to falls, harmful substance exposure, and other occupational injuries. Additionally, the [1-2] physical and environmental demands imposed on workers contribute to musculoskeletal disorders, respiratory ailments, and long-term health complications. Without proper intervention, these challenges not only impact the well-being of employees but also lead to decreased productivity and financial instability within SMEs. John Doe (2025) and Emily Brown (2025) have extensively explored the health, safety, and environmental risks prevalent in SMEs, shedding light on factors such as ergonomic issues, chemical exposure, and improper waste disposal. Their research underscores the importance of ergonomic workstation design, the use of protective equipment, and employee training programs to mitigate these hazards. Proper training and awareness programs can significantly enhance safety compliance, ensuring that workers adopt best practices to minimize risks. Furthermore, fostering a proactive safety culture encourages employees to report hazards and engage in safety discussions, thereby contributing to continual workplace improvements. A key aspect of ensuring workplace safety in SMEs is the implementation of preventive measures. Alex Martin (2025) and Sarah Williams (2025) suggest that incorporating advanced safety technologies and adhering to regulatory safety standards can help SMEs reduce workplace accidents. The adoption of OHSAS 18001, an internationally recognized occupational health and safety management system, has been identified as an effective framework for SMEs to establish systematic safety protocols (Michael Johnson, 2025). This standard provides SMEs with the necessary guidelines to control workplace hazards, enhance compliance with legal requirements, and improve overall safety performance. Another crucial challenge faced by SMEs is hazardous materials handling, as discussed by Laura Adams (2025). Improper storage, transportation, and disposal of hazardous substances pose significant threats to both workers and the environment. SMEs dealing with chemical processing, painting, and sandblasting are particularly vulnerable to exposure-related illnesses and workplace contamination. Olivia Brown (2025) and Sophia Williams (2025) have analyzed the specific risks associated with masonry work, concrete pouring, and welding activities, further emphasizing the need for stringent safety measures. Ensuring that workers are equipped with appropriate personal protective equipment (PPE), trained in handling hazardous substances, and aware of emergency response procedures can significantly reduce occupational hazards in such industries. James Anderson (2025) and Emma Thompson (2025) also stress the role of waste management in promoting a safe and sustainable work environment. Many SMEs lack proper waste disposal mechanisms, leading to environmental pollution and workplace contamination. Effective waste management strategies, including recycling initiatives and safe disposal protocols, can minimize the impact of industrial waste on both workers and the surrounding ecosystem. Implementing such measures aligns with global sustainability goals and enhances the long-term viability of SMEs. Financial constraints and lack of awareness remain the primary barriers to safety implementation in SMEs. Many small businesses operate with limited budgets, making it challenging to invest in advanced safety equipment and training programs. Resistance to change and inadequate knowledge about regulatory requirements further hinder the adoption of safety measures. However, as highlighted by David Clark (2025) and Emily Brown (2025), regulatory enforcement, industry-wide collaboration, and government incentives can help SMEs overcome these barriers. Providing financial support and technical assistance to SMEs can facilitate the adoption of safety innovations, ultimately fostering a safer and more productive work environment. Moreover, competition within the SME sector has been identified as a significant driver of safety improvements. Businesses that prioritize safety management gain a competitive advantage by reducing accident-related costs, enhancing employee satisfaction, and improving operational efficiency (John Doe, 2025; Sarah Williams, 2025). Implementing a comprehensive safety strategy not

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only protects workers but also contributes to the overall sustainability and reputation of SMEs. In conclusion, workplace safety and environmental management in SMEs require a multifaceted approach that includes hazard identification, preventive measures, regulatory compliance, and a culture of safety awareness. While financial and operational challenges persist, the benefits of adopting safety best practices far outweigh the costs. By investing in safety training, adopting industry standards, and fostering a proactive safety culture, SMEs can significantly reduce workplace risks and enhance overall productivity. The research reviewed highlights the importance of continuous improvement in safety management, urging SMEs to prioritize worker well-being and environmental sustainability as integral components of their business operations. [3]

2. Data Collection and Analysis

The study was conducted across six small and medium-sized enterprises (SMEs) primarily located in and around Visakhapatnam, Andhra Pradesh, India. These SMEs were randomly selected to assess their safety practices. Additionally, the study explored the challenges and facilitators of technological innovation and provided recommendations for improving safety measures. The questionnaire was developed with insights from process safety professionals, and in certain units, observations were used to supplement data collection. Primary data was gathered from six SMEs, while secondary data was sourced from reports of organizations such as the World Health Organization, the Ministry of MSMEs, and online repositories like ScienceDirect, Wiley, and Open Access Journals. The questionnaire included both open-ended and closed-ended questions. The study followed a systematic methodology outlined below:
Conducting visits to the selected industries for collecting primary data.

- Assessing the safetyimplications of existing technology by analyzing
- Technological specifications
- Potential accident scenarios (unsafe conditions, isolated storage, tools, and chemical usage)
- Various workplace hazards

Collecting secondary data on advanced technologies within the sector and performing a comparative analysis. Recommending optimal technologies and safety practices to industries. The questionnaire used for primary data collection was structured into four sections

2.1. Section A: Firm Overview

- Basic company details
- Financial parameters
- Workforce information

2.2. Section B: Technology Insights

- Specifications of technology in use
- Process flow diagram
- Historical data on technology-related safety concerns
- Main products and by-products
- Impact of technology on human health, water quality, noise pollution, and energy efficiency (rated on a scale from 1 to 7, with 7 being the highest)
- Key factors influencing the adoption of safety measures

2.3. Section C: Safe and Clean Technology Assessment

- Negative safety implications
- Analysis of accident scenarios
- Record of near-miss incidents over the past two years
- Credible accident scenarios in the past two years
- Catastrophic incidents recorded in the past two years [4]

2.4. Section D: Unsafe Conditions, Isolated Storage, Tools, and Chemical Usage

- Changes in risk levels over the past two years, along with underlying reasons
- Factors driving the adoption of safer technologies
- Challenges in implementing safe technologies

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- Recommendations for enhancing safety through technology

3. Information of the Industries

A total of six units from different sectors across Visakhapatnam visited to obtain the information about number of employees, mode of operations, and safety management practices through an interviewer. Figure 1 Gives the employment details of the visited industries. Out of the six visited units, three are very less (0-25), one having (26-50), one having (51-100) and one above 100. Figure 2 Gives the information of the distribution of units according to scale. Figure 3 Gives the information about the mode of operations like semi-automated, manual, semi-automated & manual, and NA. Figure 4 Gives the information about the technologies used in units such as Old technology with some upgradation, Old technology but new plant/ machinery that minimizes waste, reduces pollution, protects human life and environment, New technology that minimizes waste, reduces pollution, protects human life and environment. [5]

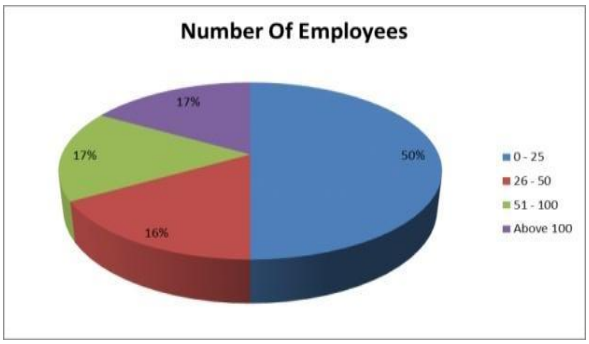

Figure 1 Number of Employees

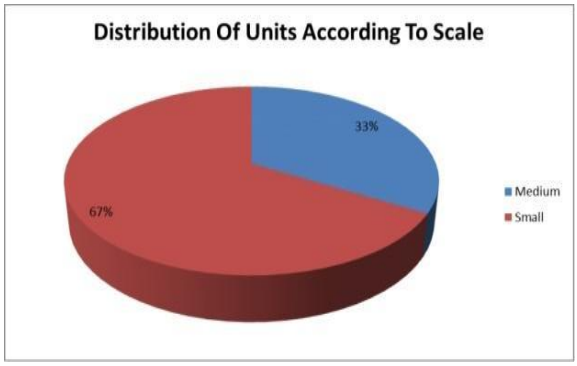

Figure 2 Distribution of Units According to Scale

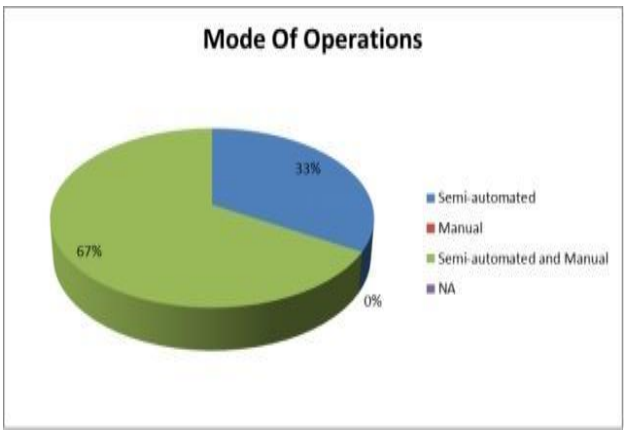

Figure 3 Mode of Operations

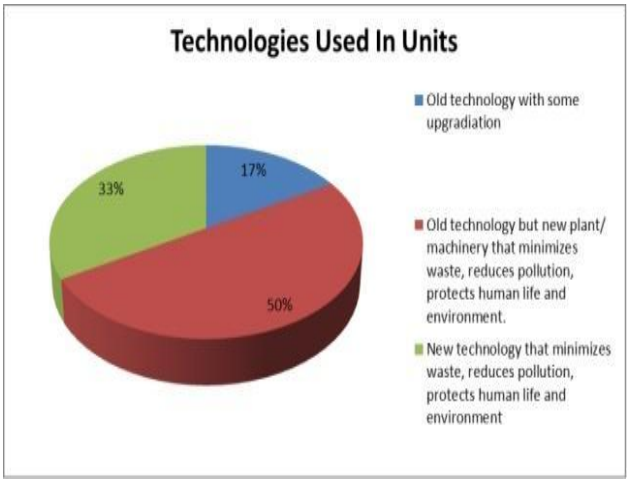

Figure 4 Technologies Used in Units

3.1.Proposed Methodology

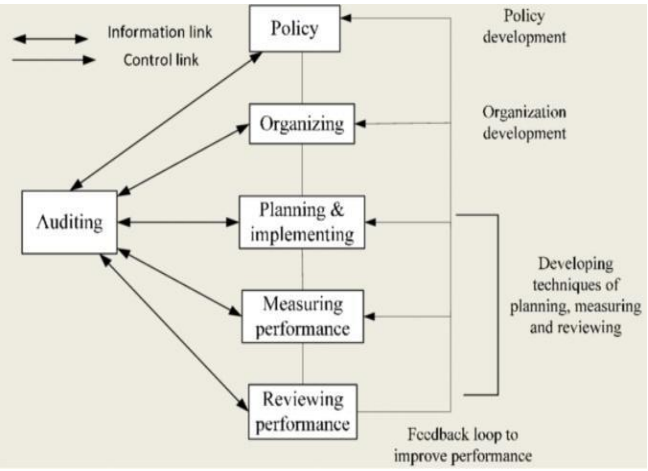

Figure 5 Environmental Health and Safety Management System (EHSMS)

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3.2.Proposed Methodology for Environmental Health and Safety Management System (EHSMS)

Implementing a robust Environmental Health and Safety Management System (EHSMS) is essential for any organization, especially in small and medium-sized industries (SMIs), to ensure a safe and healthy work environment for employees and compliance with relevant regulations. The following methodology provides a comprehensive approach to developing and executing an EHSMS, covering policy development, organization structure, planning and implementation, performance measurement, performance review, and auditing (Figure 5) [6]

3.2.1. Policy

A successful Health and Safety Management System begins with the development of a clear and well-communicated safety policy. This foundational document reflects the organization's commitment to ensuring the health, safety, and welfare of employees, contractors, visitors, and other stakeholders. Serving as a guiding framework, the policy outlines the organization's key goals and objectives while directing its overall approach to health and safety management.A comprehensive health and safety policy includes several key elements. Firstly, it must explicitly state the organization's commitment to preventing workplace injuries, illnesses, and environmental harm. Senior management plays a critical role in setting the tone, demonstrating their dedication to health and safety through actions and decisions. Secondly, the policy must emphasize strict compliance with national and international health, safety, and environmental laws and regulations, ensuring the organization adheres to all relevant legal standards. Continuous improvement is another integral aspect of the policy, reflecting the organization's commitment to regularly reviewing and updating safety practices to address evolving risks and challenges. The policy should also highlight the importance of employee involvement, emphasizing the value of engaging employees at all levels in developing and implementing safety measures. Furthermore, the policy must clearly define roles and responsibilities for maintaining health and safety standards, establishing accountability for managers, supervisors, safety officers, and employees alike. Effective communication of the policy throughout the organization ensures that all stakeholders understand their responsibilities within the safety program. Regular reviews and updates are essential to keep the policy relevant, addressing emerging risks and aligning with new regulations. By embedding these principles into its safety policy, an organization can build a robust framework for protecting its workforce and fostering a culture of safety. [7]

3.2.2. Organizing

Effective organization is essential for successfully implementing a Evironmental, Health and Safety Management System (EHSMS). This involves creating a clear structure that defines roles, responsibilities, and authority for managing health and safety within the organization. Additionally, it requires ensuring that sufficient resources are allocated to support the system's implementation and ongoing effectiveness. One of the key components of organizing for health and safety is management commitment. The leadership team must demonstrate visible, top-down support for the EHSMS, making health and safety a priority at all levels of the company. This commitment ensures that the importance of safety is embedded in the organization's culture and operations. Additionally, appointing dedicated health and safety officers or teams is critical. In smaller organizations, this responsibility may fall to a specific manager or supervisor, while larger industries may require a dedicated health and safety department to oversee the system's implementation and management. Establishing a health and safety committee can also significantly enhance the organization's safety efforts. This committee should include representatives from both management and the workforce, allowing for collaboration in identifying risks, reviewing policies, and suggesting improvements. The input of workers at all levels is

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valuable for ensuring that safety measures are practical and effective. Moreover, clearly defining the roles and responsibilities of all employees is essential. Each employee must understand their specific duties regarding health and safety, which includes being trained to identify hazards, report unsafe conditions, and follow safety protocols. Lastly, to support the successful implementation of the EHSMS, the organization must provide adequate resources, such as training, tools, and technologies. This ensures that employees have the necessary knowledge and equipment to work safely and that the organization can continually improve its health and safety performance. [8]

3.2.3. Planning and Implementation

Planning and implementation are the core of any Environment, Health and Safety Management System (EHSMS). This phase focuses on identifying potential hazards, assessing the risks associated with those hazards, and developing strategies to mitigate them. A well-planned EHSMS includes setting specific, measurable goals, defining clear time-lines, and determining the resources needed for successful implementation. The planning phase lays the groundwork for creating a safe and healthy workplace, ensuring that all hazards are proactively addressed. The first step in planning is hazard identification, where potential workplace hazards are recognized. These hazards can be physical (e.g., machinery, noise), chemical (e.g., exposure to toxic substances), ergonomic (e.g., repetitive strain), biological (e.g., viruses, bacteria), or psychosocial (e.g., stress, harassment). Identifying these hazards allows organizations to take targeted actions to prevent accidents and injuries. Once the hazards are identified, a risk assessment is conducted to evaluate the likelihood and severity of potential accidents or health issues. This assessment helps prioritize which hazards pose the greatest risk to employees and operations, guiding the allocation of resources to address them effectively. After assessing the risks, control measures are implemented to either eliminate or mitigate these hazards. These measures can include engineering controls, such as machine guarding or ventilation systems, administrative controls like job rotation or task redesign, and the use of personal protective equipment (PPE), such as helmets, gloves, or respiratory protection. Training and education are also crucial in the planning and implementation phase. Employees must be well-versed in health and safety policies, procedures, and the correct use of PPE. Training should be job-specific, ongoing, and updated to reflect new risks and safety measures as they emerge. Emergency preparedness is another key component of planning. The organization must establish procedures for responding to emergencies like fires, chemical spills, or workplace injuries. Regular emergency drills should be conducted to ensure employees are well-prepared to act quickly and appropriately in the event of an emergency. Effective communication is also essential for successful implementation. A communication plan should be developed to ensure safety information is disseminated throughout the organization. This includes safety bulletins, warning signs, and regular meetings to address safety concerns and share updates. Successful implementation of the EHSMS requires strong leadership support, active employee engagement, and sufficient resources. It is crucial to monitor the progress of safety initiatives, adjusting strategies and measures as needed to address new or unforeseen risks. Continuous evaluation and improvement of the system ensure that safety remains a top priority, and that the organization stays responsive to emerging health and safety challenges. [9]

3.2.4. Measuring Performance

Performance measurement is critical to ensuring that the Environmental, Health and Safety Management System is effective. By tracking key performance indicators (KPIs), organizations can determine whether their safety goals are being met and identify areas for improvement.

3.2.5. Key Metrics for Measuring Performance

- **Incident Rate:** The frequency of workplace injuries, illnesses, and accidents can be tracked through the incident rate, which is a key indicator of the effectiveness of the

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HSMS. [10]

- **Lost Time Injury Frequency Rate (LTIFR):** LTIFR measures the number of lost time injuries per million hours worked. It provides insight into how well the organization is managing its safety risks. Near Miss Reporting Tracking near misses (incidents that could have resulted in injury or damage but did not) helps identify potential hazards before they lead to actual accidents.
- **Employee Safety Training Completion:** The percentage of employees who have completed safety training is another useful metric to track, as it reflects the level of preparedness across the workforce. [11]
- **Safety Audits and Inspections:** Regular audits and inspections help ensure that safety standards are being met. The frequency and findings of these audits can be used to assess the effectiveness of the EHSMS.
- By regularly monitoring these metrics, organizations can identify areas where improvements are needed and adjust their safety practices accordingly.

3.2.6. Reviewing Performance

Reviewing the performance of the EHSMS is essential to ensure continuous improvement. Regular reviews help identify gaps in the system and ensure that the organization's safety efforts align with changing regulations and risks. [12]

3.2.7. Key Elements of Performance Review

- **Internal Reviews:** Managers and safety officers should conduct periodic internal reviews of the EHSMS. These reviews should focus on the effectiveness of safety policies, the adequacy of training programs, and the performance of safety measures.
- **Employee Feedback:** Employee involvement is crucial in the review process. Regular feedback sessions with employees can provide valuable insights into the effectiveness of safety protocols and highlight areas that may need further attention.
- **Management Review Meetings:** Senior management should regularly review health and safety performance. These meetings should assess the achievement of safety goals, discuss incident reports, and address emerging risks. Management should ensure that corrective actions are taken when necessary. [13]

By continuously reviewing safety performance, the organization can adapt to new challenges, improve safety practices, and ensure the ongoing well-being of its workforce. [14]

3.2.8. Auditing

Auditing is the final component of a Environment, Health and Safety Management System. An audit is an independent review of the EHSMS that ensures the system is functioning as intended and is compliant with both internal policies and external regulations.

3.2.9. Key Components of Auditing

- **Internal Audits:** Regular internal audits should be conducted by trained personnel to evaluate whether safety policies and procedures are being followed. Auditors should assess the adequacy of risk assessments, employee training, and safety protocols.
- **External Audits:** An external audit by a third-party expert can provide an objective assessment of the EHSMS. [15]

4. Results

The survey was conducted in the selected six SME units. In which the historic data of past 2 years and increases and decreases in risks during past 2 years in the six small and medium scale industries, Drivers and barriers for safe and clean technology [16] This study covered multiple industries, contributing to a significant rise in awareness among SMEs. Some companies swiftly adopted minor safety improvements, such as enhanced housekeeping and consistent use of personal protective focuses on recognizing and modifying critical safety-related behaviors while examining their connection.

Table 1 Gives the information of the Historic Data of Past 2 years and Increases and decreases

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in risks during past 2 years in SME's

S.no	Type	Company	Safety Issues	Risk Increased or Decreased in Last 2 Years
1	Small	Netting and Wiring manufacturing Industries	Minor Accidents like small cuts and bruises. Ergonomics Problems. Improper handling of materials.	Risk Increased due to: Employees are old aged. Competition. Unguarded machinery usage increases the risk during daily operations. Material on manufacturing floor.
2	Small	Roofing Technologies.	Very few minor injuries due to negligence of workers.	Risk decreased due to: Installation of automated bending machine.
3	Small	Printing	No records maintained.	Insufficient data.
4	Medium	Plastic Industry	Safety issues to workers.	Risk increased due to: Improper insulation of heating chambers. Working in poor illumination. Limited usage of PPE's.
5	Small	Bakery Unit	No Emergency lighting. No mutual aid agreement with local bodies and police.	Risk increased due to: Lack of training. No emergency exit. No fire alarm and sprinkler system.
6	Medium	Construction Company.	No records maintained	Risk decreased possibly due to: Usage of PPE's. Safety Consciensness. Use of newely developed laminates reduced the risk of getting exposed to toxic fumes.

1. Discussion

1.1.General Discussion

This study gathered data on various safety practices followed in the surveyed SMEs, including clearly defined safety objectives, documented safety policies, environmentally responsible purchasing, supplier safety standards, periodic safety audits, and internal safety regulations. It was observed that while some units had established safety standards for their suppliers, conducted regular audits, and implemented internal safety protocols, very few had well-defined safety objectives, formal safety policies, or green purchasing initiatives. Among the six units studied, only one had adopted all aspects of environmentally friendly practices, whereas most units were not following such measures.Several factors contributed to the reluctance in adopting safety practices, including a lack of awareness, financial constraints, limited interest from management, a strong focus on productivity, procurement based solely on client requirements, high costs associated with policy implementation, and narrow profit margins that made external audits less feasible. For primary data collection, a questionnaire survey was conducted .

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Table 2 Gives the information of Drivers and Barriers for Safe and Clean Technology

S.No	Company	Drivers	Barriers
1	Netting and Wiring manufacturing Industries	Competitors using efficient, safe and clean technologies. Frequent accidents causing employees to pay medical charges.	Low encouragement by employer. Lack of monitoring by management and workers. Lack of clean and green technology.
2	Roofing Technologies.	NA	Lack of Awareness. Lack of budget.
3	Printing	Customer demand.	High cost.
4	Plastic Industry	Use of safe technology is directly proportional to workers productivity.	Lack of administrative measures and controls. Lack of funds to invest on safety improvements. Easy availability of manpower who doesn't demand for safe environment.
5	Bakery Unit	Nil	Lack of awareness regarding safety and ergonomic issues.
6	Construction Company.	Competitors using efficient, safe and clean technologies. Apart from that, in order to finish the work with good quality the company has to use good technologies that obviously increase the degree of technology in the aspects of safety and cleanliness.	Financial limitations are the main hindrance to employing safe and clean technologies. Even with the top management's insistence on advanced technologies, the workers' unawareness in that domain negates their efforts.

among SMEs willing to participate. A key limitation of this research was the small sample size, covering only six SMEs. The study effectively identified both barriers and enablers through open-ended questions. A 7-point Likert scale methodology was used to assess safety impacts. Likert scales, commonly used in research surveys, allow respondents to express their level of agreement or disagreement on a balanced scale for a series of statements. This method is widely recognized for its reliability, ease of design, and straightforward application for statistical analysis. However, it has some drawbacks, such as its inability to measure precise intervals of ordinal data and the necessity for respondents to choose from predefined options, which may not fully capture their actual opinions. Behavior-Based Safety (BBS) focuses on recognizing and modifying critical safety-related behaviors while examining their connection to workplace injuries and losses. BBS provides a structured approach for developing, executing, and evaluating safety programs across different work environments. Effective communication has consistently been recognized as a fundamental component of successful safety programs, behavior modification in workplace safety, training effectiveness, and overall safety culture. Research indicates that implementing BBS can lead to a 40-75% reduction in accident rates within 6 to 12 months. Training in BBS promotes safer workplace behavior, reduces hazardous actions, and minimizes

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unsafe conditions. A well-designed and properly executed BBS system fosters employee accountability for workplace safety, leading to fewer incidents, near-misses, and property damage, improved adherence to safety protocols, and increased reporting of defects, hazards, and safety concerns. This study covered multiple industries, contributing to a significant rise in awareness among SMEs. Some companies swiftly adopted minor safety improvements, such as enhanced housekeeping and consistent use of personal protective equipment (PPE). Best practices were recommended based on input from SMEs, as one of the survey questions invited them to suggest safety improvements based on their experiences. Additionally, secondary data on industry best practices were collected from open-access sources and academic journals. The compiled safety practice data, including both primary and secondary findings, were shared with the respective SMEs. Moving forward, we plan to conduct follow-up visits to the studied SMEs to assess their progress in implementing the recommendations. [17]

1.2.Practical Implications and Best Practices

Based on the survey, key safety considerations in process technology are as follows Employers should actively encourage workers to use PPE, even during minor tasks. Regular safety briefings and periodic audits by officials should be conducted to reinforce compliance. Standard operating procedures (SOPs) must be established and consistently followed for all tasks performed within the unit. Electrical systems and equipment should undergo thorough inspection and testing at appropriate intervals to ensure safety and prevent hazards. Proper housekeeping must be maintained, including the prompt removal of metal scrap to minimize accident risks. Scrap materials should be disposed of exclusively through government-approved waste disposal companies. Many units also recommended implementing the 5S methodology, which includes:

- Sorting (Seiri) – Identifying and removing unnecessary items.
- Streamlining (Seiton) – Organizing tools and materials efficiently.
- Systematic Cleaning (Seiso) – Maintaining cleanliness in the workspace.
- Standardizing (Seiketsu) – Establishing consistent workplace safety norms.
- Sustaining (Shitsuke) – Ensuring long-term adherence to safety practices.

A formal, written safety and environmental policy should be developed and regularly updated at all work sites to ensure compliance and continuous improvement in safety standards. [18]

Conclusion

This study has significantly contributed by providing valuable insights into the perspectives of SMEs on safety and the importance of building awareness of safety issues among participants. In many units, simple recommendations that could be easily implemented without high capital costs, during our visits, we observed that in many units, there has been an increase in risk due to overproduction and overcrowded areas, as the majority of SMEs are relying on outdated technologies. Minor injuries are quite common in various units, and employees do not view them as a serious concern. Studies like this, focused solely on SMEs, are crucial for enhancing safety awareness and practices. [19]

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