Occupational Health and Safety Issues in the Marble Industry and their Potential Measures

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Abstract—The level of occupational health and safety management depends upon the scope of the industry as it varies according to the functions and scale. Designing the occupational health and safety management system for the small scale industries is more challenging due to their limited resources and other constraints. The basic groundwork for the proper implementation of occupational health and safety management system in any of the industry is based on hazard identification process in relation to the overall system. The process not only help to understand the severity of these hazards but also proper control measures can be suggested accordingly. In Pakistan, occupational health and safety issues of workers is among one of the main areas that are facing the negligence of government. This domain needs special focus particularly in small scale industries which are often unregistered and not part of social security system developed by government. This potential and observational study targeted the workers employed in the marble industries who havebeen exposed to different types of occupational hazards at the workplace. The study encompasses the identification of occupational health and safety hazards and implies potential measures to reduce the related risks. Based on the observation it is revealed that workers in the marble industries are not equipped with the personal protective equipments and are prone to various occupational health and safety hazards which needs to be mitigated.

Keywords—Marble indusry, Occupational Health and Safety, Strategic Mitigation Measures.

1 INTRODUCTION

One of the main areas that are facing the negligence of government is the workers employed in the marble industries who are deprived from the basic safety measures against occupational hazards. There is dire need to identify the occupational health and safety (OHS) hazards associated with this work and implement occupational health and safety measures in this sector. The level of OHS system depends upon the scope of the industry as it varies according to the functions and scale. Designing the occupational health and safety management systems (OHS MS) for the large scale industries and multi dimensional organizations is not much difficult as for the small scale organizations due to their limited resources and other constraints [1]. The basic groundwork for the proper implementation of OHS Management System in any of the industry is based on the process of hazard identification. Hazards in a workplace can be related to the persons, workplace, processes and management systems. The risk factors and issues associated with each hazard help to understand the severity of these hazards. Thus, hazards identification process is key to design proper control measures. If this step is not performed in a well manner then the entire process will contain deficiencies and the OHS MS will be unable to provide long term health and safety solutions [2].

2 METHODOLOGY

This is an observational study conducted with workers who have been exposed to different types of occupational hazards in the marble industry. In the study, the occupational hazards are identified on the basis of field survey and questionnaires. The hazard profile is made on the basis of analysis and checklists and strategies are developed accordingly.

The study presents the current scenario in the small scale marble industry, its related occupational health and safety hazards and suggestsOHS measures that need to be implemented.

3 HAZARD PROFILE RELATED TO MARBLE INDUSTRY

An entire analysis of the marble industry including all the potential hazards associated with the main elements helps to create a safe and healthy environment in the organization. These elements encompass:

The people to whom the role is assigned;

The physical workplace in which people work; and

The organizational management engaged to systematize and direct the transformation of resources into productivity.

Hazards may occur due to working conditions, people involve in working activities or the organizational management. The nature and scale of the organization have impacts on the elements that lie within the organization's environment. Hazards in the organization may appear from within the workplace or from changes to the workplace conditions or due to other elements.

By identifying these critical areas in the marble industry and dealing each of the main elements as a separate unit provides the hazard profile that is more accurate and precise. We can better demonstrate this perspective by considering the three main elements and associated hazards to these.

3.1 The potential hazards due to workplace

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These kinds of hazards occur due to the workplace conditions including all the machines and processes.

The potential physical hazards in the marble industry due to the workplace may appear from the mechanical, structural and processing plant failures, heavy machinery used for cutting and crushing especially unguarded machinery having exposed sharp edges or blades; manual handling of heavy slabs, hazardous chemicals used for polishing, excessive noise, dust particles, vibration, working on heights, electrical hazards, collisions during way in or way out of vehicles and equipments such as cranes and trucks to load the marble slabs. A serious occupational health hazard as well as an environmental issue is the dust emissions. The workers are exposed to intolerable level of dust by operating various machines and engaged in polishing of marble.Excessive marble dust generated due to the dry cutting of marble. The dust can spread in the vicinity and have an effect on the health of the community. However, the excessive use of water in wet processing is another environmental aspect. Similarly, the water polluted with marble dust when discharged untreated, pollutes waterways. Accidents or near misses like cuts and slips are more common at the workplace.

The workers perform their jobs in the workplace equipped with heavy machines. The work is divided into three main sections: cutting, polishing and finishing. Three heavy machines subjected to cutting and polishing are equipped with a water jet cutting system. It was observed that the workers operating the water jet cutting system machines are only provided with the simple leather aprons to avoid water, while the remaining workers, carrying out the slabs and finishing products which often require manual cutting and polishingwere without any Personal Protective Equipment (PPE). Excluded from the study is the management of the industry that had no direct contact with the material (office workers).

The ergonomic hazards including the noise, workplace design, uneven and slippery surfaces and manual handling issues also contribute to workplace hazards that are further contributed by the poor decisions concerning the operational procedures of equipments, for example working without using PPE and failure to provide any protective equipment, no safety signs displayed and emergency alarms are not installed.

It is observed that workers used to take unsafe shortcuts to increase their output especially theworkers on daily wages as their salaries based on their performance. If the whole infrastructure is not designed appropriately the workers are exposed to climatic conditions.

The enforcement of regulations can affect the type of machinery installed and the standard according to which the physical workplace has been designed. But the small scale organizations do not follow these standards and not willing to comply with any such legislation. As an economic crisis from the external environment apart from other pressures also impacted the overall organization scenario like the choice of equipment, advance mode machinery with less hazard potential, the rate of maintenance and the capacity to acquire adequate protective equipment, high electricity prices and fuel costs.

3.2 The potential hazards related to people

These hazards are generally caused by the "people" themselves and also from the way in which people behave and due to the interactions between people and the physical workplace, administration or the outside environment. The impairments caused by the people occurred due to the biological, psychological or socio-cultural factors. One of the main reasons behind this is the illiteracy of the workers. Workers are usually unaware of their basic rights of safe and healthy working conditions. Due to inadequate resources and lack of awareness about use of Personal Protective Equipment (PPE) aslo exacerbate the severity and frequency of hazards. There is a strong need to analyze the existing practices in marble industries of Pakistan and their health effects on workers for the safety and better efficiency of workers.

The workers engaged in the handling of different products that are frequently used to produce quartz surfaces in the marble industry are at the high risk of developing silicosis. It is an interstitial pulmonary disease secondary to the inhalation of crystalline silica, usually in the form of quartz. Chronic silicosis is the most frequent clinical form and it is related with exposures of at least 10 years [3].

Limestone although consists predominantly of calcium carbonate, but varying proportions of impurities including magnesium oxide, silicon dioxide and aluminum oxide makes this industry hazardous. Silicosis has been reported in six out of 11 limestone miners, who have been exposed to different types of quartz surfaces without any personal protective equipment [3]. No proper dust extraction system is installed and most of the work is done under shelter that is nearly permanently open. Up until the time of the survey in 2012, no specific respiratory protection apparatuses were used. It is essential to take extreme care in using adequate respiratory protection measures when handling such materials, especially in the polishing of the products.

Workers who are employed in cutting, grinding and polishing marble for various purposes experience several other health related issues like eye, skin and respiratory problems. They are exposed to several health risks. For example, solar radiation heightens by the reflection from the furnished white marble effect the workers eyesight. These may cause temporary blindness with major risk of accidents, photoconjunctivitis and photokeratitis, dermatitis. Macroclimatic conditions also influence the working of employees due to heat stress in summer and cold in winter [4].

Other health risks are associated with certain physical occupational hazards like deafening industrial noise resulting in the hearing loss is the most common problem, whole body vibration along with prolonged standing causes nausea and hypertension, excessive dust with variable marble content induces the asthma and intense muscle strain with back stress as work is highly physical. They usually suffer from continuous headaches and especially the respiratory problems. Skin becomes rough and hard as they didn't use gloves for handling the slabs. There are major risks of body part loss during the loading and cutting of heavy slabs. There is a need for improve-

ment in cutting and polishing machines for the safetyof marble industry workers. However, in Pakistan unsafe physical working conditions and exposure to dust particles due to non compliance of Occupational safety and Health Administration (OSHA) rules is a cause behind the existing health and safety issues which remain unreported [5]. These techniques are employed with limited knowledge of quarrying with major consequences to worker's health & safety.

3.3 The potential hazards due to management

There are certain decisions that are made by the management of industry which incur potential hazards to the workers. One of the major issues is the provision of Personal Protective Equipment (PPE) to the workers and the choice of machinery and equipment installed. Similarly, the training imparted to the employees for their safe working operations is also not sufficent. Results of the survey revealed that training werenot arranged for the workers for emergency response, accident/incident reporting mechanisms were absent and in case of emergency, coordination mechanism was unknown to workers. No fire safety alarms, emergency exists were displayed at the workplace. It was observed that management only focus on the production of their industry rather than factors on which production depends i.e. safetyof the workers.
Due to the lack of headship, dedication and competency, hazards generated from within management [7]. The management failure to notify the workers with their legal obligations or keep updated of modifications in the system also expose workers to greater risk of hazards. The culture of the organization may also contribute to hazards occurring like, if reporting of incidents is not encouraged.
The management strategies and methodology can be influenced by the external environment where opponent relationships developed between the local regulatory authority and the organization which may hold down the readiness to file the workplace hazards and the consultation process. Instability within the workforce and too much flux (downsizing) also increases the chances of hazards.

4 Incident Data Analysis

Accidents experience statisticsfrom the past also provide useful information. It includes first aid records and medical leaves. Table 1 shows the following accidents in terms of injury with their associated risks were reported.

No specific guidelines for occupational health and safety of marble industry workers exist in Pakistan however, guidelines provided for IEE/EIA of Marble units in Khyber Pakhtunkhawa (KPK), covers some of the areas like dust, wastewater, and PPE as main risk factors for workers in marble units and also suggest mitigation options as provided in Table 2.

TABLE 1
Accidents in terms of injury

Hazards	Associated Risk	Significance
Slips/trips/falls	Fall/ slip of worker due to imbalance, uneven and slippery surface.	The data shows that slips, trips and falls are the most common source of minor and major injuries reported.
Manual Handling	Muscle stress, back strains, cuts, injury to joints.	These occurred due to the loading and transferring of heavy marble slabs.
Machinery/ Hand tools	Loss of body part, minor and major cuts are associated with the cutting and polishing of marble.	Statistically these occurred mostly for which the all dangerous parts of the machinery should be guarded and workers should be provided with PPE.

TABLE 2
Impact Assessment and Mitigation Options

Potential Impacts	Mitigation Measures
Dust	Dust containment enclosures should be provided. Workers should be provided with the Respirators. Proper ventilation system.
Noise	Noise wall should be built. workers should be provided with ear muffs.
Waste water	Liquid effluent should be treated by sedimentation or coagulation process before discharge.
Occupational safety	Workers should be provided with PPE.

Source: Environmental Assessment Checklist and Guidelines for Marble Units, KPK EPA [6].

5 Strategies For OHS Risks

The hazard outline of an organization help to devise the prevention and control strategies that needs to be applied in the

system for the safe working. For dealing with the associated hazards three main approaches can be used: safe workplace, safe working behaviours and safety management. A summary of some of the options available within each strategy has been provided in Table 3. As the table shows that there should be balance between strategic elements and avoidance of lack of direction and focus while managing the key OHS hazards.

6 Conclusion

TABLE 3
OHS Management System Components

Safe Workplace	Training, defining job description, provision of PPE, ergonomic assessments, guarding of machines, electrical safety, noise reduction by proper maintenance of machinery, emergency preparedness, accident/incident reporting, monitoring and evaluation.
Safe Workers	Programs for increasing awareness about the potential hazards associated with the job and their right for safe and healthy workplace, defined job description, use of PPE, employee support programs, training, behavior modification, Health inspection, emergency preparedness and response, communication and reporting of hazards, etc.
Safe System	Pre-employment screening, provision of PPE, training and job description, health facilities and administrative controls.

An effective safety program with provision of all safety equipments and trainings will reduce the chances of personal injury/disease/death and help to improve workers productivity. It will help the workers to work in effective and safe workplaces with less chance to property damage. The Occupational Health and Safety management plan of an industry makes the management responsible for the good health and safety of its workers. In general, the employers must provide its workers with workplace conditions according to the applicable standards that should be free from the hazards that are supposed to cause severe injury. The workers on their behalf are also responsible for their safety and health. Workers should be aware of their rights and responsibilities. They are obliged to understand and follow the guidelines that reduce the chances of hazards. If they did not follow the suggestive measures they will be exposed to the health and safety accidents and losses.

OHS Management System in the marble industries if properly implemented will help to identify the hazards at earlier. Thus, preventive measures can be adopted which reduces the occupational risks to the workers and optimize the overall coordination of prevention measures by utilizing an integrated approach as compared to the traditional options of control; elimination, substitution, administrative controls, isolation and personal protective equipment [8]. It is much more important to handle the OHS issues in an appropriate manner along their identification on a broader, organizational context. Solutions need to be devised for the occupational health and safety issues and their results should be assessed timely so that modifications can be done according to the situation for the best results to be gained.

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