A RISK MANAGEMENT APPROACH TO OCCUPATIONAL STRESS pdf

This article proposes a risk management methodology that might be used to identify hazards and assess the level of risk associated with those hazards, using well-validated stress audit instruments, for example the Occupational Stress Indicator.

Perhaps now more than ever before, job stress poses a threat to the health of workers and, in turn, to the health organizations. Through its research program in job stress and through educational materials such as this booklet, NIOSH is committed to providing organizations with knowledge to reduce this threat. This publication highlights knowledge about the causes of stress at work and outlines steps that can be taken to prevent job stress. For weeks he had been plagued by aching muscles, loss of appetite, restless sleep, and a complete sense of exhaustion. At first he tried to ignore these problems, but eventually he became so short-tempered and irritable that his wife insisted he get a checkup. Her gentle poke in the ribs brought him around, and within minutes they were talking and gossiping as if she had never left. It used to be that as long as you did your work, you had a job. They expect the same production rates even though two guys are now doing the work of three. I swear I hear those machines humming in my sleep. Guys are calling in sick just to get a break. In my new job, the computer routes the calls and they never stop. I even have to schedule my bathroom breaks. All I hear the whole day are complaints from unhappy customers. We all go to our own little cubicles and stay there until quitting time. If only I could use some of my sick time to look after her. A lot of the reps are seeing the employee assistance counselor and taking stress management classes, which seems to help. But sooner or later, someone will have to make some changes in the way the place is run. Job stress has become a common and costly problem in the American workplace, leaving few workers untouched. For example, studies report the following: One-fourth of employees view their jobs as the number one stressor in their lives. Paul Fire and Marine Innsuance Co. Fortunately, research on job stress has greatly expanded in recent years. But in spite of this attention, confusion remains about the causes, effects, and prevention of job stress. This booklet summarizes what is known about job stress and what can be done about it. What Is Job Stress? Job stress can be defined as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker. Job stress can lead to poor health and even injury. The concept of job stress is often confused with challenge, but these concepts are not the same. Challenge energizes us psychologically and physically, and it motivates us to learn new skills and master our jobs. When a challenge is met, we feel relaxed and satisfied. Thus, challenge is an important ingredient for healthy and productive work. But for David and Theresa, the situation is different-the challenge has turned into job demands that cannot be met, relaxation has turned to exhaustion, and a sense of satisfaction has turned into feelings of stress. In short, the stage is set for illness, injury, and job failure. What are the Causes of Job Stress? Nearly everyone agrees that job stress results from the interaction of the worker and the conditions of work. Views differ, however, on the importance of worker characteristics versus working conditions as the primary cause of job stress. These differing viewpoints are important because they suggest different ways to prevent stress at work. According to one school of thought, differences in individual characteristics such as personality and coping style are most important in predicting whether certain job conditions will result in stress-in other words, what is stressful for one person may not be a problem for someone else. This viewpoint leads to prevention strategies that focus on workers and ways to help them cope with demanding job conditions. Although the importance of individual differences cannot be ignored, scientific evidence suggests that certain working conditions are stressful to most people. Such evidence argues for a greater emphasis on working conditions as the key source of job stress, and for job redesign as a primary prevention strategy. In , a Michigan court upheld a compensation claim by an automotive assemblyline worker who had difficulty keeping up with the pressures of the production line. To avoid falling behind, he tried to work on several assemblies at the same time and often got parts mixed up. As a result, he was subjected to repeated criticism from the foreman. Eventually he suffered a psychological breakdown. By , nearly one-half of the States allowed worker compensation claims for emotional disorders and disability due to stress on the

job [note, however, that courts are reluctant to uphold claims for what can be considered ordinary working conditions or just hard work]. However, the role of individual factors is not ignored. According to the NIOSH view, exposure to stressful working conditions called job stressors can have a direct influence on worker safety and health. But as shown below, individual and other situational factors can intervene to strengthen or weaken this influence. Examples of individual and situational factors that can help to reduce the effects of stressful working conditions include the following: David works to the point of exhaustion. Theresa is tied to the computer, allowing little room for flexibility, self-initiative, or rest. Lack of participation by workers in decision- making, poor communication in the organization, lack of family-friendly policies. Poor social environment and lack of support or help from coworkers and supervisors. Job insecurity and lack of opportunity for growth, advancement, or promotion; rapid changes for which workers are unprepared. Unpleasant or dangerous physical conditions such as crowding, noise, air pollution, or ergonomic problems. David is exposed to constant noise at work. Job Stress and Health Stress sets off an alarm in the brain, which responds by preparing the body for defensive action. The nervous system is aroused and hormones are released to sharpen the senses, quicken the pulse, deepen respiration, and tense the muscles. This response sometimes called the fight or flight response is important because it helps us defend against threatening situations. The response is preprogrammed biologically. Everyone responds in much the same way, regardless of whether the stressful situation is at work or home. Short-lived or infrequent episodes of stress pose little risk. But when stressful situations go unresolved, the body is kept in a constant state of activation, which increases the rate of wear and tear to biological systems. Ultimately, fatigue or damage results, and the ability of the body to repair and defend itself can become seriously compromised. As a result, the risk of injury or disease escalates. In the past 20 years, many studies have looked at the relationship between job stress and a variety of ailments. Mood and sleep disturbances, upset stomach and headache, and disturbed relationships with family and friends are examples of stress-related problems that are quick to develop and are commonly seen in these studies. These early signs of job stress are usually easy to recognize. But the effects of job stress on chronic diseases are more difficult to see because chronic diseases take a long time to develop and can be influenced by many factors other than stress. Nonetheless, evidence is rapidly accumulating to suggest that stress plays an important role in several types of chronic health problems-especially cardiovascular disease, musculoskeletal disorders, and psychological disorders. What the Research Tells Us Cardiovascular Disease Many studies suggest that psychologically demanding jobs that allow employees little control over the work process increase the risk of cardiovascular disease. Musculoskeletal Disorders On the basis of research by NIOSH and many other organizations, it is widely believed that job stress increases the risk for development of back and upper- extremity musculoskeletal disorders. Psychological Disorders Several studies suggest that differences in rates of mental health problems such as depression and burnout for various occupations are due partly to differences in job stress levels. Economic and lifestyle differences between occupations may also contribute to some of these problems. Workplace Injury Although more study is needed, there is a growing concern that stressful working conditions interfere with safe work practices and set the stage for injuries at work. Suicide, Cancer, Ulcers, and Impaired Immune Function Some studies suggest a relationship between stressful working conditions and these health problems. However, more research is needed before firm conclusions can be drawn. But research findings challenge this belief. Studies show that stressful working conditions are actually associated with increased absenteeism, tardiness, and intentions by workers to quit their jobs-all of which have a negative effect on the bottom line. Recent studies of so-called healthy organizations suggest that policies benefiting worker health also benefit the bottom line. A healthy organization is defined as one that has low rates of illness, injury, and disability in its workforce and is also competitive in the marketplace. NIOSH research has identified organizational characteristics associated with both healthy, low-stress work and high levels of productivity. Examples of these characteristics include the following: Recognition of employees for good work performance Opportunities for career development An organizational culture that values the individual worker Management actions that are consistent with organizational values Stress Prevention and Job Performance St. Paul Fire and Marine Insurance Company conducted several studies on the effects of stress prevention programs in hospital settings. Program activities

included 1 employee and management education on job stress, 2 changes in hospital policies and procedures to reduce organizational sources of stress, and 3 establishment of employee assistance programs. In contrast, there was no reduction in claims in a matched group of 22 hospitals that did not implement stress prevention activities. The examples of Theresa and David illustrate two different approaches for dealing with stress at work. Nearly one-half of large companies in the United States provide some type of stress management training for their workforces. Stress management programs teach workers about the nature and sources of stress, the effects of stress on health, and personal skills to reduce stress-for example, time management or relaxation exercises. EAPs provide individual counseling for employees with both work and personal problems. Stress management training may rapidly reduce stress symptoms such as anxiety and sleep disturbances; it also has the advantage of being inexpensive and easy to implement. However, stress management programs have two major disadvantages: The beneficial effects on stress symptoms are often short-lived. They often ignore important root causes of stress because they focus on the worker and not the environment. This approach is the most direct way to reduce stress at work. It involves the identification of stressful aspects of work e. The advantage of this approach is that it deals directly with the root causes of stress at work.

The risk management of occupational stress. It is suggested that a risk management approach is both informative and cost-effective. High risks, which may require more expensive organisational.

Prevention means anticipating and analysing the various aspects of work to identify short and long term risks, and then taking action to eliminate or mitigate those risks; that is identifying and addressing the source of the problem. The actions taken to eliminate or mitigate risks are referred to as interventions. This article presents the different levels of interventions that can be applied to manage psychosocial risks and work-related stress. It also describes the process of psychosocial risk management which outlines best practice on how to design, implement and evaluate interventions. The article primarily focuses on prevention, rather than on an extensive discussion on treatment or rehabilitation. On the other hand, distinction is also made between the stage of prevention i. Table 1 presents a taxonomy of interventions as proposed by Murphy and Sauter [1]. Primary interventions are proactive in nature; the aim is in attempts to prevent harmful effects or phenomena to emerge. Secondary interventions aim to reverse, reduce or slow the progression of ill-health or to increase individual resources, while tertiary interventions are rehabilitative in nature, aiming at reducing negative impacts and healing damages [3]. Often interventions appear to bridge prevention stages. The following sections aim to provide the reader with an informed commentary on each intervention level. The objective of these interventions is to target the problem at source. Primary interventions require changes in working practices. They are targeted at the group level, rather than the individual employee e. It is rare to find primary level interventions that do not involve employees in intervention design [6]. Primary interventions can take time to work, and evaluation periods tend to be long as employees often need to become accustomed to new working practices [7]. Murphy and Sauter [8] suggest that employees may also need training and support to adapt to new working practices and in order for this be effective this requires commitment and support from the organisation. Secondary level interventions Secondary level interventions involve taking steps to improve the perception and management of psychosocial risks for groups that may be at risk of exposure. It is important to note, secondary level interventions are not a substitute for primary prevention interventions. The common focus of these actions is on the provision of education and training. It is commonly believed that through training, employees can become more aware and knowledgeable about, work-related stress , harassment, bullying and third-party violence ; and, hence, better able to address these issues. Issues that can be covered through training include: Tertiary level interventions Tertiary level interventions have been described as reactive strategies [10]. Tertiary level initiatives are concerned with minimising the effects that result from exposure to psychosocial hazards; through the management and treatment of symptoms of occupational disease or illness. The consequences of exposure can be either [5] [11] [12]. Thus, people who are suffering from psychosocial complaints which can include burnout , depression or strain , can be provided with counselling and therapy; and those suffering from physical symptoms can benefit from occupational health services provision. When affected employees have been off work because of ill health, appropriate return-to-work and rehabilitation programmes should be implemented to support their effective re-integration in to the workforce. Within organisations, tertiary level interventions are most common, with secondary level interventions following and primary level interventions being the most uncommon form of intervention [13] [11]. Comprehensive multi-level interventions Developing continuous and sustainable initiatives to promote employee and organizational health and wellbeing, requires practitioners and organizations to move beyond uni-model interventions either individual or organizational approaches to multi-model intervention i. These approaches incorporate all three levels, and is evident in the healthy work programme of a Dutch hospital [15]. At the primary level, job rotation provided employees with a variety of work tasks; whilst the archiving system was redesigned to facilitate storage and retrieval of records, which reduced workload of employees. Support from colleagues was encouraged and managers were provided with supervisory training to be more supportive. At the secondary level, employees were provided with courses on stress management, while specific departments were targeted with additional training on dealing with death, violence, and aggression.

See policy interventions on psychosocial risks for more information on policies with regard to psychosocial risks at work. Psychosocial risk management As discussed previously, prevention is the cornerstone of managing occupational safety and health in Europe. The focus of European legislation on health and safety is on primary risk prevention targeted at the workplace; where the organisation is viewed as the generator of risk [3]. The risk management approach to dealing with health and safety problems is clearly advocated by European Legislation and is described in some detail in supporting guidance. It is also implicit in official European, national and international guidance on health and safety management. This section aims to provide a concise summary and discussion of psychosocial risk management; in terms, of its development, key elements and process. Development of the European framework psychosocial risk management The use of risk management in occupational safety and health OSH has a substantive history [18] [19]. Risk management in OSH is a systematic, evidence-based, problem solving strategy. The risk management approach begins with the identification of problems and an assessment of the risk that these problems pose; and subsequently, uses this information to suggest interventions for reducing the identified risk s at the source. The developed and implemented risk management actions or interventions informed by the risk assessment are evaluated. Over the last two decades a number of approaches incorporating the risk management paradigm to prevent and manage psychosocial risks, and issues such as work-related stress , have been developed and implemented [20] [21] [22]. One of the first models using the risk management paradigm to prevent and manage and work-related stress was proposed in the UK in the early s [23]. The proposed approach was based on a general summary of systematic problem-solving processes, commonly used in both applied psychology and in management science. The premise was that the risk management paradigm was already understood by managers, and one that had been widely in operation in many countries for some years with respect to the management of chemicals and other substances known to be hazardous to health [24]. The starting point for the development of the risk management approach for psychosocial risks was based on the changing nature of work and of [23]. To promote a unified approach, the European Commission funded the development of the Psychosocial Risk Management European Framework PRIMA-EF , which incorporates best practice principles and methods of all existing and validated psychosocial risk management approaches across Europe [21]. Managing psychosocial hazards is not a one-off activity but part of the on-going cycle of good management of work and the effective management of health and safety. As such it demands a long-term orientation and commitment on the part of management and leadership. As with the management of many other occupational risks, psychosocial risk management should be conducted often, ideally on a yearly basis. Key elements for psychosocial risk management Psychosocial risk management should incorporate five important elements: PRIMA-EF model for the management of psychosocial risks â€" enterprise level [2] The process of psychosocial risk management There are five main steps in the psychosocial risk management process. Risk assessment and audit The model underpinning risk management for psychosocial hazards is relatively simple. Before a problem can be addressed, it must be analysed and understood; and an assessment made of the risk that it presents. Much harm can be done, and resources squandered, if abrupt action is taken on the assumption that the problem is obvious. The risk assessment provides information on the nature of the problem, the psychosocial hazards and the way they might affect the health of those exposed to them and the healthiness of their organisation. The risk assessment should focus on organisational level issues that have the potential to impact on group and possibly large numbers of employees, rather than individual employees. Useful risk assessment and management tools such as the British Health and Safety Executive Management Standards, Istas21 CoPsoQ Method, the SOBANE strategy applied to the management of psychosocial risks, and QPSNordic Questionnaire are used widely and focus on organisational issues such as demands, control , support , role, relationships and change see further resources for links to tools. Translation and development of action plan Adequately completed, the risk assessment allows the key features of the problem to be identified - these have been called likely risk factors - and some priority given to them in terms of the nature and size of their possible effects or the number of people exposed. For example, there might be problems in relation to issues such as workload and work patterns which may be placing unreasonable demands on employees. The data from the risk assessment and other organisational data related to sickness absence, productivity , staff

turnover etc. Usually, the discussion and exploration of the problems and likely risk, facilitates the discovery of any major problems that may be hidden but give rise to those problems and likely risk factors. This often makes intervention easier as the underlying problems can be targeted and not only its symptoms. For example, the Management Standards approach recommends that the outputs and conclusions from the data collection and analysis should be discussed with a representative sample of employees , involved also in identifying a preliminary action plan, containing suggestions and recommendations for action at different levels of the organisation. If properly handled, planning to reduce risk in relation to psychosocial hazards is no different from any other management activity. The interventions are implemented as planned and its progress monitored and reviewed, and the processes involved and their outcomes eventually evaluated. It is important to work in partnership with employees and their representatives to not only develop actions to take but also to implement them. Evaluation of interventions It is essential for any intervention to be evaluated to determine how well and in what respects it has worked. Instead of solely examining whether the intervention worked, i. Evaluation should consider a variety of types of information and draw it from a number of relevant perspectives e. A mixture of approaches may be used to gather these perspectives. For example, by setting up specific meetings with managers to review progress on major actions, by setting up regular sessions with staff to talk about sources of work-related pressure as part of team meetings or through informal meetings. The results of the evaluation should allow the strengths and weaknesses of both the action plan and the implementation process to be assessed. This information should not be treated as an issue of success or failure, praise or blame, instead should inform a reassessment of the original problem and of the overall risk management process, as well as providing feedback on the outcomes. Organisational Learning Evaluation not only tells the organisation how well something has worked in reducing psychosocial risks and the associated harm but also allows the reassessment of the whole situation, providing a basis for organisational learning and development. Essentially, it establishes a continual process for improvement that should be repeated within an established time frame in the organisational context. Lessons learned from the evaluation should be explicitly identified and used as the basis for organisational development. What is in it for organisations? Evidence of effectiveness of the interventions Knowledge on the outcomes of the risk management process is an important input for the continuous risk management and improvement process. A healthy organisation is defined as one with values and practices facilitating good employee health and well-being; as well as, improved organisational productivity and performance [26]. Managing psychosocial risks and workplace health relates to managing the corporate image of organisations [27] [28]. It can lead to a reduction of the cost of absence or errors , and accidents ; and hence associated production [29]. In addition, it can reduce the cost of medical treatment and associated insurance premiums and liabilities. It can contribute to the attractiveness of the organisation as being a good employer and one that is highly valued by its staff and its customers. It can lead to improvements of work processes and communication, and promote work effectiveness and efficiency. As such, best practice in relation to psychosocial risk management essentially reflects best practice in terms of organisational management, learning and development, social responsibility ; and the promotion of quality of working life and good work. Bond, Flaxman and Loivette [30] in a review of the evidence on work related-stress in relation to beneficial business outcomes found improvements in relation to several dimensions of the psychosocial working environment e. Although there is a growing and strong utilisation of interventions for the management of psychosocial risks in practice [10] , the majority of these programmes are not systematically assessed or evaluated [23] [31] [32] [33]. The limited amount of scientifically rigorous evaluation data has resulted in a restricted evidence-base and limited knowledge on the effectiveness of prevention-orientated interventions. Many of the reviews conducted in this area are limited by the small number of studies that can be included: Additionally, the varied focus of such studies e. Despite the restricted evidence-base in this area, some general conclusions can be formulated; namely, that stress management programmes seem to be effective in improving the quality of working life for workers and their immediate psychological health as derived from self-report data [26]. In a review of 90 interventions 43 of which were individual-orientated interventions , approaches with an individual-level focus were demonstrated to be effective at the individual-level on a range of individual-level outcomes , while of the 47 organisational-level

interventions reviewed, favourable effects were observed at both the individual and organisational level [12]. Similar results have been observed in earlier reviews [34] [35]. There is growing evidence of the economic argument and, moreover, cost effectiveness of interventions in the workplace aimed at psychosocial risk management. For example, a report published in [36] examined the cost-effectiveness of different types of interventions aimed at mental health promotion and mental disorder prevention. It is important to note, these figures are based on selected European countries and, therefore, caution used be exercised in over generalising these findings.

This book takes the risk management approach to stress evaluation in the workplace, offering practical guidelines for the audit, assessment and mitigation of workplace stressors. Based on research and case studies, this book provides a comprehensive source of theoretical and practical information for students and practitioners alike.

Dealing with particular issues Introduction In Australia, the work of Cotton and Hart distinguishes operational demands and the context in which work is conducted, and recognises that contextual factors such as leadership and managerial practices, climate and culture strongly influence how employees cope with and manage their operational demands. Cotton and Hart have found that contextual factors tend to exert a stronger influence on staff wellbeing outcomes when directly compared with a wide range of operational stress risk factors. This means the University through its managers and supervisors, is required to prevent and address workplace stress using a risk management framework. In applying a risk management framework it is important to appreciate that both organisational and individual level interventions to address the causes of psychological injury are generally more effective than approaches that solely focus on the staff member. Staff member-focussed approaches such as counselling, relaxation training, time management skills and stress management training can assist staff to develop greater resilience to work-related stress or help them better deal with personal stressors. Stress management programs teach workers about the nature and sources of stress, the effects of stress on health, and personal skills to reduce stress. This training may rapidly reduce stress symptoms such as anxiety and sleep disturbances; it also has the advantage of being inexpensive and easy to implement. However these approaches do little to address the organisational sources of work-related stress. As such they are less likely to produce sustainable prevention outcomes, address the root causes of stress or result in improvements in organisational performance. Organisational Stress Management focuses improve working conditions or climate. This approach is the most direct way to reduce stress at work. It involves the identification of stressful aspects of work and the design of strategies to reduce or eliminate the identified stressors. The advantage of this approach is that it deals directly with the root causes of stress at work and produces the best results. However, managers are sometimes uncomfortable with this approach because it can involve changes in work routines or production schedules, or changes in the organisational structure. Approaches developed within a framework for continuous improvement, rather than with an expectation of dramatic and uniformly positive impact, are also recommended. Prevention of workplace stress The expectation under the OHS Act is that managers will do everything practicable to prevent injury through workplace stress. This should occur when a new process or job is introduced. As well as considering the physical hazards such as manual handling or ergonomics, the psychological hazards should be considered. Work demands are the easiest to identify. Work demand risk factors such as pace of work and work variety are more easily recognised compared to more esoteric support risk factors such as respect and management culture. It may be similarly difficult to see how drivers such as difficult clients are offset positively or negatively by support from managers and other team members. Nevertheless experienced, competent managers will have an understanding of the work climate interacts with the organisation of the work. The recommended preventative approach to risk management of stress involves four steps: Identifying the sources of potential harm to staff health and wellbeing Systematically assessing the risk of staff being harmed Developing and implementing actions to: For more information on workplace stressors see risk factors for workplace stress. The job stress identification checklist DOCX, When to act Faced with an awkward or difficult dilemma at work line managers react in various ways. If you are a line manager do you: A common response that can work if you have decided it is not time to intervene - problems do sometimes go away or resolve themselves. But do keep an eye on things. Sometimes managers want to say something but lose their nerve and end up sending out coded messages in the form of jokes or quips which make things worse. Focus on the issues involved rather than reacting to the personalities. FORCE matters to a head? Talking about problems in an open but honest way can be the hardest route to take but is often the most productive. You may have to use your disciplinary procedure to resolve a problem, but you may also be able to reach a consensus

about the best way forward. There are a number of reasons why managers may fail to deal adequately with staff who experience work-related stress. Managers may find it useful to get training or coaching in communication skills, in having difficult conversation or in basic mediation to manage conflict. How do I recognise stress in individuals? Many of the outward signs of stress in individuals will frequently be noticeable to managers and colleagues. Individual personality will influence how people respond to negative work experiences and work pressures. Some individuals have vulnerabilities or characteristics that contribute to the stress process such as negative thinking patterns, the perception of being controlled by their circumstances, poor coping skills or past experience of stressors. In addition, there are staff who already have a psychological condition or develop one during their work life. These psychological conditions may be severe or virtually unrecognised, temporary, permanent or periodic. The most successful interventions give priority to work-related or organisational measures that tackle the causes of workplace stress, in combination with worker-directed measures. How can managers deal with workplace stress? The standard OHS risk management methodology of "find, assess and fix" can be applied to workplace stress. The five basic steps are: Look The first step is about paying attention to your staff, noticing any changes in their usual behaviour or relationships. It may be also worthwhile reviewing leave use, both recreation and sick leave as well as over-time or time in lieu. Listen Listen to what staff are saying: Has the level of conflict or sensitivity increased? How much impact is the stress having? Think Think about what you have observed and how that relates to the factors that typically lead to workplace stress. Focus on the obvious causes but do not ignore the full range of possibilities. Be honest with yourself: If you believe the stress is not work related, how is work aggravating the situation? If you need assistance, talk to your Human Resources Partner first Act Put into place a plan to reduce, offset, rebalance, or better manage the stress. This is preferably done in consultation with staff. If you practice management competencies outlined in the Manager Competency Framework , you will have already built up the trust and relationships that will allow you to intervene early and effectively deal with workplace stress. Management actions that can make a difference include: The local manager plays a pivotal role in demonstrating support to the injured worker. Before you say no, ask why? It involves an understanding that all requests or behaviours are actually an attempt to meet a need. Managing Mental Health Matters is a Canadian program focused on helping managers, supervisors and other leaders learn how to effectively recognize and manage mental health related issues including stress in the workplace. The program uses a story-based approach, portraying realistic episodes of workplace "characters" dealing with situations common to everyday work life. The user engages in the process, rather than simply being given information.

4: Managers role in workplace stress risk management

For an organization to prevent occupational stress problems, it is necessary to correctly diagnose the characteristics of the work and employment conditions that are perceived as risks by.

Box , Alexandria, Egypt. Abstract The chief goal of an occupational health and safety program, OHS, in a facility is to prevent occupational injury and illness by anticipating, recognizing, evaluating, and controlling occupational health and safety hazards. The underlying study presented a systematic approach for the evaluation of OHS risks and proposed a new procedure based on the number of risk factors identified and their relative significance in an Electrical Power Station, Alexandria, Egypt. Qualitative and quantitative risk assessment was utilized as a systematic approach. A risk factor concentration along with weighting of risk factor categories as contributors to undesirable events of different hazards were used in the analytical hierarchy process multi-criteria comparison model. A case study is used to illustrate the various steps of the risk evaluation approach and the quick and simple integration of OHS at an early stage of a project. The approach allows continual reassessment of criteria over the course of the project or when new data are acquired. It was thus possible to differentiate the OHS risks from the risk of drop in quality over the different project activities. Introduction Excluding occupational health and safety OHS from project management is no longer acceptable. Numerous industrial accidents have exposed the ineffectiveness of conventional risk evaluation methods as well as negligence of risk factors having major impact on the health and safety of workers and nearby residents. Lack of reliable and complete evaluations from the beginning of a project generates bad decisions that could end up threatening the very existence of an organization. Industrial accidents continue to cause human suffering, capital losses, environmental destruction and social problems [1]. In recent years, accidents in construction and industry have occurred in spite of rigorous management of projects and robust occupational health and safety OHS management systems in all phases of project lifecycle [2]. The explosion of a power plant in the start-up phase while testing a gas line in a populated region 43, inhabitants of Connecticut USA on February 7, was reminiscent of a series of similar industrial accidents over the decades in terms of gravity and consequences [3]. In most cases, investigation into causes of accidents revealed failure in identification and evaluation of impending risks. In general, risk is evaluated in terms of its consequences with respect to project performance and rarely in terms of human suffering. Smallwood, , confirmed that quality, planning and costs are the parameters given the greatest consideration [4]. Industrial work is risky in many economic sectors, in particular the construction industry [4,5], chemical plants [6],nuclear power plants [7] and the mining industry [8]. Safety and health problems can result from any of several groups of causes, which disparity from one industry to another. The high level of risk in the construction industry is explained by the nature and characteristics of building work, low educational level of workers, lack of safety culture and communication problems [4,5]. In the mining sector, increasing numbers of subcontractors working in mines, the emergence of new mining ventures and recognition of small-scale mining pose new confrontation to the practice of risk control [8]. The most effective way to improve OHS performance is to identify and eliminate hazards at the source [9]. Risk identification and assessment thus become primary tasks that are part of hazard prevention. Risk analysis is the foundation of the risk management process and presents several challenges [10,11]. OHS has not always been a preoccupation of process engineers. Incentives for integrating OHS risk management into engineering have been discussed recently. These include enactment, awareness of the importance of protecting workers and in some cases tangible potential to increase profitability and remain competitive []. It will be run in such a way that health and safety are promoted for all employees, a safe and helpful working environment is provided, and the environment and property are protected. The company started its activity in by steam plant. It consists of two units; the capacity of each is MW. It represents the most important company in producing electrical power in Alexandria. The company is operated by workers. The aim of the underlying study is to present a new systematic approach for the evaluation of OHS risks and proposes a new procedure based on the number of risk factors identified and their relative significance in Sidi Krir Power Station. Study design and local ethical

approval; 2. Risk identification and qualitative risk assessment; 2. Quantitative risk assessment; 2. Measurement of time weighted average of physical hazards 2. Characterization of the assessed risks and evaluation of their probability and severity to calculate the probable risk factors for the measured physical hazards in order to evaluate the level of practicability of each risk. Risk identification and qualitative risk assessment 2. The questions were designed to cover the following sections; general information to include personal data; Workers awareness for different topics of pollution; the impacts of pollutants such as noise, heat stress, dust, gas vapors, etcâ€¦. The study involved workers from the company whom were selected randomly for two purposes. Walk through observational survey Hazard identification was performed through walk through exhaustive safety checklist in order to accomplish the fore mentioned objectives. The checklist was predesigned, pre-tested and finalized before data collection. Almost, all sections were close-response ones pertaining to assess the opinion and perception towards environmental protection measures and regulations, to identify the impacts of regular monitoring of work environment, drinking and waste waters, in addition to traffic control measures, and periodic waste treatment on occupational health and safety. Quantitative risk assessment Quantitative risk assessment was performed through reviewing reported accident and measuring time-weighted averages of physical hazards; noise, heat stress and illumination in different work places with different activities to determine the levels of exposure and quantify the risk factors for each depending on severity and probability of hazards [16,17]. It was dependent on transfer of sound energy to electrical energy and this energy measured by decibel dbA. The noise type may be continuous noise machinery and equipment , intermittent hammers or white noise at the start of the steam boilers. The levels were analyzed and compared to documented permissible levels either locally or internationally. It was calculated by temperature radiation, the degree of wet thermometer and the degree of dry thermometer. Heat stress in workplace can be recognized by the human sense of heat and humidity, which increase the sense of heat together Humidex. It was transferred by plug, convection currents and radiation. Results were compared to documented permissible levels. Light was measured, using Lux Meter. It depends on theory called photoelectric cell that can be transformed by the light falling on the cell to electric currents which differs in severity depending on the intensity of the light falling on them. It is natural energy spread in all direction in straight lines in the form of waves. It may be direct, semi direct or indirect light. Levels of light were compared to documented permissible levels. The-quantitative risk assessment comprised measurement of time weighted averages of frequent physical hazards. Levels of occupational noise A-weighted equivalent noise levels during one month of normal work activities were measured with a total of 24 measurements daily. The measurements were conducted so that they covered all workplaces turbine, boiler, pump house, metal, and electrical workshops. Data entry and analysis was performed using Microsoft Excel software. Table 1 shows the measured noise levels. The levels of noise varied from 75 to 92 dbA in different compartments of the company. Therefore, this variable did not follow normal distribution non-parametric. The time-weighted noise levels at turbine and boiler were equal [They were higher than pump house [Table 1 illustrates the noise risk factors at each work area. These locations required remedial actions as advising engineers and techniques of the code of practice for the safe use of turbine in the power plant, in addition to the application of the site inspection program to ensure compliance. The risk factor of three and four acceptable low was recorded at dB in turbine, boiler, pump house, and metal workshop. It needs corrective actions like doing a pre-event assessment of what could generate noise and the development of a Noise Management Plan that is compliant with the Environmental Protection Act, and the plan must be provided to the site manager. Risk factors of five to nine unacceptable medium were reported in pump house, metal and electrical workshops. It needs the substitution of noisy equipment by engaging a licensed electrician to make changes to the existing power supply. The simulation illustrates the use of the proposed approach, which ranks risks as a function of their impact in terms of undesirable events as noise. In the example studied, the calculation allowed us to differentiate the OHS risks from the risk of drop in quality. For the paired comparisons of the identified risk factors, levels of noise can be controlled by: Levels of occupational heat Stress Table 2 illustates the heat stress risk factors in each work area. These locations required remedial actions as advising engineers and techniques of the code practice for the safe use of heater turbine in the power plant. In addition, site inspection program must be applied to ensure

compliance. The lowest acceptable risk factor one was observed at the four work areas. The risk factor of three and four acceptable low was recorded at , The heat stress at heater turbine I and heater turbine II were equal [They were higher than that at turbine and boiler [27 1], Figure 2. In addition, monitoring the weather as related to the work plan should be conducted in the early or late hours of the day. The risk factor of five to six needs corrective actions of ensuring the presence of a responsible person for heat stress services on site. Moreover, ordering a drinking water fountain or arranging to give bottled water away to the workers for free is necessary [20]. Nature of risk factor to most of these locations considers low risk factor and few it considers medium risk factor. Comparing the results of the current study with permissible levels documented by classes of probability of heat stress, as shown in Table 2. So cautions should be taken to control levels of heat stress and its health impacts; levels of heat stress can be controlled by: Each worker shall be given a minimum of 2 liters of potable water in which 0. There were five high unacceptable risk factors, two of which were within the metal workshop, two in the electrical workshop, and one in the water-treatment unit. So, the proposed corrective actions must be doing a pre-event assessment of what could generate light intensity and the development of a Light intensity management plan that is compliant with the Environmental Protection Act, and the plan must be provided to the site manager. It is required to take appropriate precautions to avoid diffusion of glare and reflected light. There were five medium unacceptable risk factors, of which two in the instrumental workshop, two in the pump house, and one in the water-treatment unit. In addition, there were fifteen low acceptable risk factors distributed all over the work areas. The table declares that the light intensity had one high unacceptable risk factor in control room that needs corrective actions of wear personal protective equipment such as special glasses for welding and cutting and avoid the great disparity in the distribution of light in places converged. Eliminate this risk by checking that the different lightings in the site with the structures safety management plan; administer this control by doing a pre event assessment of the lighting available on or close to the site. It had seven medium unacceptable risk factors, three at each of financial and management affaires, which requires remedial actions of proper lighting for the type of work that is being practiced, whether natural or artificial lighting and allow to homogenous distribution of light in the workplace. It had also seven low acceptable risk factors distributed among the three work areas. Furthermore the light intensity at financial affairs was equal [23].

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