



## Exposure assessment, a preventive process in managing workplace safety and health, challenges in Ghana



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### ARTICLE INFO

#### Article history:

Received 29 June 2015

Received in revised form 26 October 2015

Accepted 19 December 2015

#### Keywords:

Exposure assessment

Accident investigation

Risk

Occupational safety

Hazard assessment

### ABSTRACT

Exposure assessment is a strategy for anticipating, recognizing and evaluating employee exposures to physical, chemical, biological and ergonomic stresses at the workplace, so that effective and “sensible” controls can be put in place to mitigate the risk of occupational injury or occupational illness to the worker. It has been unveiled by this paper that this process is not applied adequately in Ghana and hence, hazards are not properly identified at workplaces. This leads to misapplication of controls or application of inadequate controls which tend not to reduce the risks at workplace. This outlines the various applicable exposure assessment strategies and also recommend controls and conditions that will make the process work in Ghana. It was outlined also that the process starts with the basic characterization which included area characterization, agent characterization and workforce characterization. This helps the industrial safety professional to understand the Similar Exposure Groupings (SEG's) and their corresponding exposure profiles. This makes use of the basic statistics of the sample sizes of the SEG's which get projected to the populations with 95% confidence interval so as to finalize tolerable risks. The modern engineer, the medic, and all relevant professionals must be conversant with this process and hence apply it at the workplace to ensure prevention of adverse exposures to employees, as well as prevention of accidents at the workplace.

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### 1. Introduction

Ghanaians working in different professions and industries are subjected to different work environment conditions and hence different agents to different levels. Due to personal differences in human physiology and health resistance, different people being exposed to the same agent would have different susceptibility hence different extents of health effect.

The study of job role requirements and the personnel's ability to perform such tasks is referred to as Job Capability Assessment (JCA). The exposure assessment and job capability assessment are conducted in parallel and this leads to the establishment of groups of workers whose job functions require similar physical effort, and are normally exposed to similar agents at similar levels under the same control. These groups are referred to as Similar Exposure

Groups (SEG's), and when conducting exposure assessments, a sample is selected from the SEG for the analysis and the results are projected onto the entire population of the SEG. Decisions made on the SEG's as a result of the exposure assessment are applicable to all persons in the group.

To be able to conduct a thorough exposure assessment, the workplace layout must be understood properly and this must encompass locations of all the types of the unit operations and tasks that take place in different environments. This assessment of the work area is considered area characterization.

The second important step required for an effective exposure assessment is identification of physical, chemical, biological and psychosocial stresses in the workplace, their existing controls, the extents to which they exist in the workplace and their nature. This exercise is known as agent characterization.

A third component of exposure assessment requires the understanding of the demography of the workforce, their strengths and weaknesses, job roles, the effort required for the specific tasks, medical history of the employees which is collected from pre-employment and periodic medicals. Collection of such information

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helps in grouping the workforce under a process called workforce characterization.

The three processes above (Workplace Characterization, Agent Characterization and Workforce Characterization) combined is referred to as Basic Characterization. The results of the basic characterization are used for risk assessment and this helps organizations to identify acceptable risks, unacceptable risks and uncertain risks. Acceptable risks get re-assessed only after a scheduled duration, but with unacceptable risks, appropriate controls are sought for and fixed to mitigate them to tolerable levels. With regards to uncertain risks, further information would have to be collected until there is adequate information, which will help understand the risk profile. In all the three possible outcomes, the results get looped back into Basic Characterization. The entire process of the exposure assessment can be summarized as shown in Fig. 1.

Once this process is completed properly, the outcome helps organizations to implement controls that mitigate risk exposure to workplace agents and hence ensuring the safety of the workforce.

Therefore, the main goal of this present paper is to outline the various applicable exposure assessment strategies and also recommend controls and conditions that will make the process work better in Ghana and further provide a detailed risk matrix with its corresponding analysis revealing the various acceptable and unacceptable risks.

## 2. Exposure assessment implementation and challenges in Ghana

As explained by Annan (2010), the Ghanaian employee's exposure to physical, chemical, biological and psychosocial workplace stress is in ascendancy due to the general trend in increasing rate of industrialization in the nation. Challenges inhibiting the progress of workforce characterization are associated with the availability of appropriate personal health information. As confidential as medical information can be, employee's medical history is critical in determining his/her capability of performing future functions.

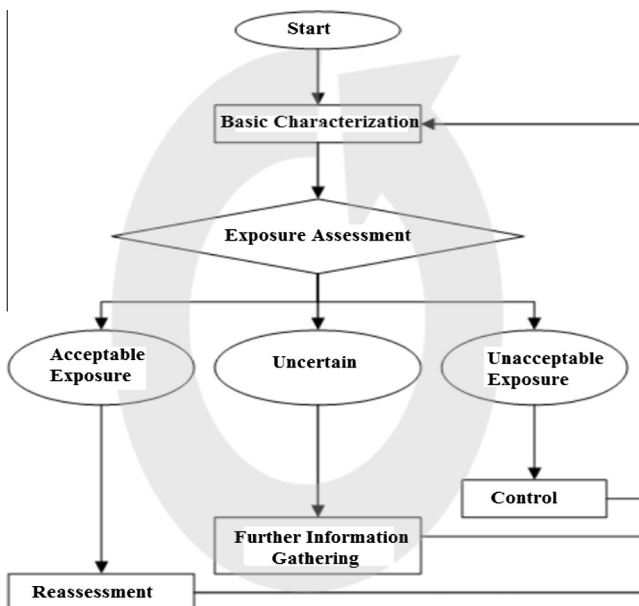


Fig. 1. Strategy for assessing and managing occupational exposures (AIHA, 2006).

Hardly do employers in Ghana refer to medical history from previous employers if they want to actually conduct pre-employment medicals in Ghana. Also, due to insufficient or lack of occupational health physicians in the country, the criteria for pre-employment medicals is subjective, and varies from practitioner to practitioner. Existence of occupational health services in the country is a question not yet answered (Clarke, 2005), hence the workforce characterization at work places is a challenge which is yet to be addressed in Ghana.

During “Agent Characterization”, employers are expected to anticipate, recognize, evaluate and control the physical, chemical and biological agents (Annan, 2010), the professionals (Occupational Hygienists or Industrial Hygienists) with the skill set to accomplish this step are less than five in the entire country. In addition, no educational institution in Ghana runs an accredited degree program in Safety Engineering or related courses. This challenge poses a lack of adequate skill required for the completion of a comprehensive exposure assessment and risk mitigation.

The nation has not got enough standards to serve as the basis for rating risks of employee exposures at the workplace. For instance, if we consider a typical Ghanaian mine worker at Assay Laboratory, there is a potential for exposure to lead fumes or dust. To understand the risk of such an exposure, the levels need to be known and evaluated as above acceptable limit or not, however, what we call acceptable or not acceptable is not known. Reference can be made to the American Industrial Hygienists Association Threshold limit value, or National Institute of Occupational Safety and Health recommended exposure levels or the OSHA permissible exposure levels or the British EH 40 just to mention a few, but these are different values for different purposes, but Ghana has not yet developed standards in this regard and this area still remains as a challenge.

During agent characterization, one of the most important sources of information is the material safety data sheet. In Ghana, a lot of the products do not have material safety data sheets (MSDS). The suppliers hardly request for the MSDS's when importing chemicals and hazardous materials. This leaves a significant gap in the information required to be able to understand risks associated with exposures to chemicals, hence the inability to determine appropriate controls to mitigate such risks.

For physical agents such as noise, vibration and heat, the nation has insufficient standards pertaining to Occupational Safety and Health. The Ghana Environmental Protection Agency (GEPA) (2007) has some environmental standards, but these cannot replace the required Occupational Safety and Health standards. For example, Ghana EPA has a requirement for noise exposure levels, but this is not defined by exchange rate, criterion level and response rate, which are parameters used in noise exposure assessment. Generally, due to the lack of sufficient standards, completing the exposure assessment in Ghana remains a challenge. This challenge affects the ability to conduct effective characterization of agents and hence risk assessment and control. Effective management of Occupational Safety and Health is therefore impeded under this circumstance.

As far as classification of risks is concerned, most occupational exposure risks remain uncertain, hence further information for gathering is required as presented in Fig. 1. This process is, however impeded by lack of resources. In this case, the groups with uncertain workplace exposures remain very significant in Ghana, hence the inability to spend effort ranking and prioritizing these exposures, hence the inability to fix appropriate controls.

Confusing application of health effects rating systems is a potential source of misclassification of occupational exposure risks, hence the inability to evaluate appropriate controls to mitigate them. For instance, according to the Council of European Communities, the European Union (EU) (GHS ST/SG/AC.10/30/Rev2, 2007) has

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