

## **Influence Of Indoor Environment On Health And Productivity**

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**ABSTRACT:** This paper presents a synopsis of the influence of indoor environment on workers' health, comfort and productivity, conducted at a beverage bottling facility in Ilorin, Nigeria. A three-step regimen method was used to achieve the desired solution. Evidence from the review of observed complaints, depicted that continual environmental stress drain physical and mental resources and ultimately affect human performance and decrease productivity. Available programs were recommended to improve and maintain good indoor environmental quality specifically through good indoor air quality. [New York Science Journal. 2009;2(4):46-49]. (ISSN: 1554-0200).

**Key words:** comfort, environmental stress, health, indoor air quality, indoor environment, productivity

## **INTRODUCTION**

Evidence from workplaces depicts various environmental conditions that are closely associated with the incidence of objectively measurable adverse health effects that is rapidly emerging. These indoor environmental problems can result in increased absences because of respiratory infections, allergic diseases from biological contaminants, or adverse reactions to chemicals used in industries. Building factors or pollution in buildings most frequently and consistently associated with respiratory health effects are the presence of moisture, water damage, and microbiological pollutants (Bornehag and Blomquist, 2001); animal and other biological allergens (Platts-Mills, 2000); and combustion products (Burr, 2000), including nitrogen dioxide (Pilotto et al., 1997; Norback et al., 2000). Other risk factors for respiratory health effects include: moisture or dirt in HVAC systems (Sieber et al., 1996); low ventilation rates (Menzies et al., 1993; Milton et al., 2000); formaldehyde (Pazdrack et al., 1993; Wantke et al., 1996; Garrett et al., 1999); chemicals in cleaning products (McCoach et al., 1999; Zock et al., 2001); and outdoor pollutants or vehicle exhaust (Wyller et al., 2000).

Exposures in indoor environments and health influences due to such exposures vary between regions of the world. In developing regions limited number of studies has been conducted regarding indoor air quality (IAQ) and health. Studies have dealt mainly with associations between indoor air pollution, due to unventilated burning of biomass, and health effects such as acute respiratory infections, chronic obstructive pulmonary disease and lung cancer. World health organization (WHO) has calculated that burning of solid fuel for cooking and heating in developing countries might be responsible for nearly 4% of the global burden of disease, i.e. approaching 2 million premature deaths per year (Smith, 2003). This is one of the main environmental health issues of the world, but so far little recognized.

The effects of IAQ on productivity became an issue only in the last decade, as a result of extensive research and an understanding of the strong connections between factors such as ventilation, pollution among others, and adverse effects on health and comfort. Evidence is increasing that health, comfort, and performance of adults improve at higher ventilation rates (Sundell et al., 1991; Sundell, 1994; Mendell, 1993; Seppanen et al., 1999; Apte et al., 2000). In addition, a recent controlled study in office buildings

found that short-term sick leave, often associated with respiratory illness, was significantly associated with low ventilation rates (Milton et al., 2000).

There is widespread concern that indoor environments affect occupants' health, comfort and performance (United States Environmental Protection Agency, 2001). Thus, office and industrial facilities should be designed, built, and maintained in ways to minimize and control sources of pollution, provide adequate exhaust and outdoor air ventilation by natural and mechanical means, maintain proper temperature and humidity conditions, and be responsive to workers with particular sensitivities such as allergies or asthma. Failure to deal adequately with any of these issues may go unnoticed, but can and often does take its toll on health, comfort, and performance of workers.

Many risk factors and outcomes in the area of this study are not well defined, conducting this research studies has been challenging and the interactions explored here are far-reaching. Nevertheless, this paper presents a comprehensive synopsis of the influence of indoor environment on workers health, comfort and productivity.

## **METHODS**

This research study area was Ilorin metropolis, Kwara state capital; an ancient city about 500km from Abuja, the federal capital; strategically located at the geographical and culture confluence of the Northern and Southern Nigeria. This study was conducted at a beverage bottling plant for an eight-week period. The study population was the 293 permanent workers in the facility; and these workers donned, at a minimum, long coats and anti-slip boots.

The following methods were devised to best serve this objective. These include

1. A critical review of the literature was made to identify comparable studies that had been performed by other researchers. The databases of Environmental, Health & Safety (EHS), PubMed, the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) among others were utilized and manually searching key relevant journals and conference proceedings to research comparable studies.
2. Afterward, a review of injury and illness records was performed to identify areas of concern, pattern and seriousness of injury and define opportunities for intervention.
3. The health symptom structured questionnaire was administered at the bottling facility for data collection, completed by high and low cadres of staff.

## **RESULTS AND DISCUSSION**

The literatures found were comprehensive though not exhaustive on indoor environmental issues couple with productivity, but the studies that were sited assisted in the recognition, evaluation and control of potential environmental stress hazards.

Medical records; that is, the industrial injuries registered provide a historic look at occurrences of allergic and asthmatic diseases among other health effects due to changes in environmental exposures rather than genetic changes. These illness rates and incidents yielded valuable information about the types of environmental stresses present and facilitated the prediction of potential future victims, stemming from the situation.

Evidence from the review of documented complaints, however, suggests that continued environmental stress can drain physical and mental resources and ultimately affect human performance and decrease productivity. For instance, evidence from office and the factory workers depicts that, when individuals experience just two symptoms of discomfort (e.g., dry eyes, itchy or watery eyes, dry throat, lethargy, headache, chest tightness); they begin to perceive a reduction in their own performance. Studies have suggested that the perception increases as the number of symptoms increases, averaging a 3-percent loss with three symptoms, and an 8-percent loss with five symptoms (Raw et al., 1990). This suggests that when large numbers of workers experience signs of discomfort related to the air inside their workstations, productivity will diminish over time. Productivity is certainly expected to suffer if conditions are serious enough for workers to complain. However, lack of complaints is not an indication that performance cannot be improved. This study for instance, symptoms were solicited through questionnaires (as opposed to complaints); that is, the reductions in performance were recorded under circumstances that easily could have gone unnoticed because of the absence of complaints.

A review of building investigation reports suggests significant benefits to health and performance from good HVAC maintenance (Sieber et al., 2001). Presumably, these benefits result because properly maintained HVAC systems can provide consistently good thermal and ventilation control while also reducing the risk of biological contamination.

### **RECOMMENDATIONS**

As a result of the poor IAQ identified from the conditions of this facility, the following was the list of recommendations.

1. Efforts are needed to be focused on reducing the humidity levels in the climate controlled areas. Humidity levels that exceed 60% are considered to be beyond the level of comfort for workers (Handy and Lafreniere, 2006). The installation of dehumidification equipment can help to alleviate this problem.
2. Temperature fluctuations should be controlled. Workers have shown stress when temperature deviations exceed 4 degrees C during the course of their work shifts (Handy and Lafreniere, 1999). In essence, if the process temperature required is 45 degrees F, keep it within a degree or two of 45 degrees F during the course of the production shift as well as throughout the work year. Further, it was recommended that, during seasonal changes in the temperature, evaluations should be made to eliminate major fluctuations in temperature. The possible installation of a modern environmental control system should be evaluated on cost and benefit merits.
3. For the conditions of the facility, it appeared that poor IAQ results from failure to follow practices that help create and maintain a healthy indoor environment, so it was recommended that good HVAC maintenance and being proactive in managing potential IAQ hazards will assist with maintaining the indoor environment of this facility.

However, industries should take advantage of available programs to improve and maintain good indoor environmental quality specifically through good indoor air quality in their facilities. Programs can be targeted to the maintenance of existing facilities and to new facility construction.

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