Evaluation the effectiveness of control methods of radiant heat in workers exposed in a blast furnace steel industry

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Abstract

Background: Exposure to high temperatures is common among workers in hot environments and can lead to physiological adverse effects. Heat radiation from hot surfaces and inflamed ways to get the most important heat is the exposure ways of the workers. The aim of this study was to evaluate the effectiveness of control methods of radiant heat in workers exposed in a blast furnace steel industry.

Methods: In this study, two main solutions include reducing radiant heat to control the temperature of the hot surface of the design and installation of heat-absorbing water pipes in the body blast furnace and the control of emission radiation heat of the installation reflective shield in the work station were studied. WBGT index before and after implementation of the intervention based on standard methods for evaluating was measured the effectiveness of the interventions at the work station. Environmental radiation temperature distribution in the furnace area was drawn before and after the intervention. Environmental parameters were measured using the WBGT meter manufactured by Casella Co. Evaluation of the effectiveness of interventions based on physiological strain index to measure skin temperature, heart rate before and after the intervention was performed in 20 workers according to standard methods. Data analysis was performed using SPSS software.

Results: The effectiveness of interventions, use of thermal absorbents in the body of the furnace and reflective shield exposed in a straight exposure line, radiation temperature and work station WBGT index was decreased 20, 3.9°C and 18.6 and 2.5°C respectively. Combination of control measures radiation temperature and work station WBGT index was decreased respectively by 26.5 and 5.2°C.

After applying heat absorbing and reflective shield, mean skin temperature of workers and heart rate was declined 2.6°C and 3.6 bpm respectively.

Conclusion: Use of thermal absorbents in the body of blast furnace was more effective due to the intervention of the heat radiation source. However, the combination control measures have the best performance to reduce thermal stress and strain caused by thermal radiation in the blast furnace workers.

Key words: Heat stress, Radiant heat, Control interventions, Blast furnace, Steel

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