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PRACA DOKTORSKA

Temat pracy:

*Wpływ stosowania kamizelek chłodzących na klimatyczne warunki
pracy górników.*

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SUMMARY

The impact of the use of cooling vests on the climatic working conditions of miners

The subject of the PhD thesis concerns one of the most important issues related to safety engineering and the mining production process aimed at solving problems and counteracting threats which occur especially at underground workplaces. One of these, the scale of which has been increasing in recent years, is the climate threat.

Assessment of microclimate conditions and effective measures to eliminate thermal discomfort due to exploitation at greater depths becomes a priority for the activities of not only scientists and enthusiasts, but also of entrepreneurs, trade union organizations and miners. Improper assessment of microclimate conditions in the work environment and ineffective preventive measures in this area may lead to dangerous situations that may result in dehydration, overheating of the body, or even a threat to the employee's life. Therefore, scientists and researchers have been looking for solutions that would allow for better forecasting of this phenomenon for years.

In this dissertation, contrary to the widely accepted literature on the problem so far, it was decided not to consider new methods for assessing microclimate conditions in the mining environment. The focus was on the practical possibility of reducing the body temperature of people working in difficult climatic conditions thanks to the use of cooling vests already available on the market, which enable the reduction of skin temperature and metabolic processes taking place in the human body.

The research process carried out as part of this dissertation began with measuring the actual environmental parameters of air and climatic conditions occurring in the G-1 mining section of the X mine operating longwall 146 in seam 414/2 and assessing the climatic hazard at the workplaces of this department based on known heat load indicators such as: effective American temperature ATE, equivalent climate temperature T_{zk} , WBGT index, temperature and thermal discomfort index δ . The determination of these indicators allowed the identification of mining excavations and workplaces with the most difficult climatic conditions, including wall 146 with an average air temperature exceeding 28.8°C and surface 14/7a with an air temperature above 29°C and humidity of 95.6%. These parameters of the working environment have a destructive impact on the physiological parameters of the miners employed, therefore, in a further stage of research, based on the guidelines of the PN-EN ISO 9886 standard, physiological measurements of 25 employees employed in the area of longwall 146 were carried out.

The results of these studies showed that the work of, among others, a shearer operator, a section worker, a miner employed in the upper wall cavity or an overwall conveyor operator is extremely hard, which leads to a significant loss of body weight of up to 5 kg and an increase in all vital parameters indicating significant physical exhaustion of the workers and large energy expenditure in carrying out production tasks. Additionally, as a result of the checklist and direct conversation, employees did not evaluate the mine's activities in combating the climate threat very well. Pointing out that the biggest problem that occurs at their workplaces is the inability to release excess heat from the body in the existing climatic conditions, which affects the process of their physical fatigue. To meet expectations, as part of the main research goal of this PhD dissertation, laboratory and environmental tests were carried out to assess the impact of cooling vests on improving the working conditions and performance parameters of miners wearing them. Tests using vests were carried out in the laboratory of the Central Mining Rescue Station S.A. in Bytom and the mining excavations of the Y mine. 14 rescuers and miners took part in the performance tests. The obtained results demonstrated the usefulness of cooling vests in everyday work despite the need to replace cooling inserts during the work shift. The use of cooling vests at workstations also allowed for the improvement of the physical efficiency of employees using them and the improvement of work comfort while reducing the climatic threat. The main goal of the research was achieved, and the accepted thesis was confirmed and proven.