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RESULTS OF THERMAL COMFORT EVALUATION WITH DIFFERENT CRITERIA

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ABSTRACT

In order to guarantee the reliability of the results, the methodology used along the recollection of data is not indifferent. This research work aims at verifying if, in closed spaces inside a paper plant, there are significant variations of the thermal environment due to the criteria variation of the gathering data. With this purpose in mind, measurements were made during a work shift in various places, and we arrived at the conclusion that even in apparently stable atmospheres there may be significant variations in thermal comfort.

Keywords: thermal comfort evaluation, controlled environments, measurements, method.

INTRODUCTION

The maintenance of thermal comfort conditions over time is one of the key elements to ensure not only good work conditions but also high levels of productivity (Axelsson, 1974; Enander, 1989; Hancock, 1998; Parsons, 2003; Taylor, 2006; Tord, 2009), and consequently the good performance of the industrial activity.

When it is not possible to change thermal work conditions, comfort may be achieved through the use of appropriate clothing. Thus, upon the question of whether different results can be obtained according to the measuring methodology used for the evaluation of thermal environment, and considering the hypothesis that, that possibility does really exist, it was decided as main objective, to verify, in a paper plant, up to what extent such differences were significant when reported during the same shift.

Measurements were performed with the use of a certified equipment (BABUC A), that registered the necessary values of temperature, humidity, and air speed through an entire shift in various working places, strategically chosen.

RESULTS AND CONCLUSIONS

In spite of plant equipment being a significant source of homogenisation of environmental conditions during the shift, the temperature variations that occur outside, end up by causing significant changes in thermal comfort perception, measured according to ISO-7730:2005. As shown in Figure 1, specially between the shifts that take place during daytime and night time or vice-versa, noticeable changes in comfort conditions inside the factory might be observed. So, under these conditions, a measurement made for a limited period performed at the beginning, in the middle, or at the end of the shift, or even the use of a mean value from the data recorded, would lead to maladjusted conclusions to reality. Thereby, in order to maintain the best working conditions and consequently productivity (Ismail, 2010), it is important to

use different protective clothing during the shift. These should also bear in mind the different working places which allows for the optimisation of comfort conditions and, as a result, a better level of production.

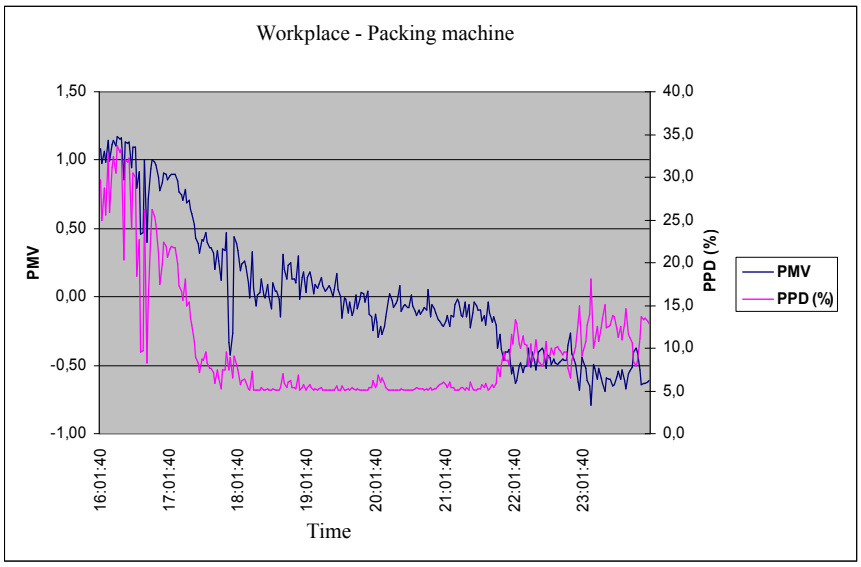

Fig. 1 - PPD/PMV changes (*Icl*= 1 Clo; *M*= 1,2 Met)

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REFERENCES

[1]-Axelsson. Influence of heat exposure on productivity. Work Environ Health 1974; 11:94_9.

[2]-Enander, A. E. (). "Effects of thermal-stress on human-performance." Scandinavian journal of work, environment & health, 1989, 15: 27-33.

[3]-Hancock, P. A. and I. Vasmatzidis. Human occupational and performance limits under stress: The thermal environment as a prototypical. Ergonomics. 41(8), 1998, p. 1169.

[4]-Ismail, A. R., Yusof, M.Y.M., Makhtar, N.K., Deros, B.M. and M.R.A. Rani. "Optimization of Temperature Level to Enhance Worker Performance in Automative Industry." American Journal of Applied Sciences. 2010, 7(3): 360-365.

[5]-Parsons, Ken. Human Thermal environments: the effects of hot, moderate, and cold environments on human health, comfort and performance. 2nd ed. London: Taylor & Francis. ISBN0-415-23793-0(pbk). 2003, p.527.

[6]-Taylor, N. A. S. "Challenges to temperature regulation when working in hot environments." Industrial Health. 44(3). 2006, p.331-344.

[7]-Tord Kjellstrom, Ingvar Holmer and Bruno Lemke - Workplace heat stress, health and productivity _ an increasing challenge for low and middle-income countries during climate change. Global Health Action. 2009. DOI:103402/gha.v2i0.2047.