

## HEAT STRESS OR HEAT STRAIN - WHAT IS THE PROBLEM?

N.T.Thomas

The Polytechnic of Wales, Ergonomics Unit

Address for reprints

N.T.Thomas

Ergonomics Unit: Dept. of Mechanical & Production Engineering  
The Polytechnic of Wales, Pontypridd  
Near Cardiff, Wales, UK

At the first two environmental ergonomics conferences in England and Canada, the need to place more emphasis on heat strain was growing. The third conference in Finland highlights heat stress and strain, with heat strain receiving increasing attention internationally. In this paper, which examines the industrial emphasis on heat stress and heat strain, the two terms are used according to their engineering analogy - strain being the result of an imposed stress. The 1987 edition (Simon) of an international glossary of relevant terms has a similar meaning but fails to exploit the simple engineering insight which is available.

A preliminary examination of industrial and research guidelines reveals that the two fundamental approaches to thermal problems can be classified as either the cause or its effect. The cause - the thermal environment - has been measured in many ways and in great detail (eg. ISO 7243, 1982). The inaccuracies in techniques for measuring this heat stress, seem to be far outweighed by regularly ignoring the resulting heat strain.

However studies within industry (Ramsey et al, 1983) and current developments in the U.K. show that measures of heat strain are important and feasible. The industrial observations (over 17,000) found a significant increase in unsafe behaviour at WBGT (wet Bulb Globe Temperatures) above only 23°C. Actual work done and proposed guidance on asbestos stripping both show the necessity and feasibility of applying a heat strain approach. Medical asses—t and appropriate work organisation are specified at ambient air temperatures above 38°C; yet at far lower air temperatures fran 29°C (80% relative humidity), a limit of working efficiency is said to be reached.

Because of the above and the large individual differences between industrial workers, due to physical fitness, age, acclimation and other factors, heat strain should be monitored more often. Then ergonomists, hygienists and managers will be able to uphold their responsibility to protect all workers, especially those most at risk. Their problem of heat strain needs to be confronted to enhance health, safety and performance.

### References

- ISO 7243 (1982). Hot environments - estimation of heat stress on working man, based on the WBGT index.
- Ramsey, J.D., Burford, C.L., Beshir, M.Y. & Hensen, R.C. (1983). Effects of workplace thermal conditions on safe work behaviour. J. Safety Res., 14, 105-114.
- Simon, E. (1987). Glossary of terms for thermal physiology. IUPS Thermal Commission.