School of Fashion and Textiles

RMIT -CSIRO Masters by Research projects

RMIT-CSIRO Masters - Design of a Cooling Vest with Semi-Rigid Pouches

CSIRO and the Defence Science Technology Group (DSTG) has developed a metabolic cooling vest that is comprised of semi-rigid heat pipe cooling pouches, which do not conform well to the contours of a torso (chest/back) to allow intimate contact. The cooling effect is significantly affected by the degree of area coverage and body contact. Therefore, it is important that flexibility or conformity is introduced into the rigid pouch structure/ensemble. This project is to develop technology and innovative solutions through design, which takes into account the technical requirements of the pouches.
The aim of this project is to:

- Design and generate a concept vest that provides intimate contact and mobility from semi-rigid materials (similar to the cooling pouch).
- Apply the design principles to produce a prototype vest design for the heat pipe cooling vest with improved surface contact between vest and body/torso without impeding on physiological movement during bending, kneeling, twisting, etc.

Design constraints: The semi-rigid pouch material thickness is 5mm with minimum size of each cooling cell/pouch being 10 x 30 cm. The stretchability of each cooling pouch is less than 1%. The maximum body twisting angle is 40°, and maximum body bending is 90°. Given the limited stretchability of the cooling pouch material, the geometric design and placement of the semi-rigid segments on the vest become vital for ensuring maximum intimate skin contact and flexibility. Physical accommodation and anthropometry should be determined in referencing US DoD MIL-STD-1472 G Human Engineering [1], and UK military standard DEF STAN 00.25 Human Factors for Design of Equipment [2].

References

1. Department Of Defence (2012). Department Of defence Design Criteria Standard: Human Engineering. MIL-STD-1472G. Washington DC: Author.
2. Defence Standard. 00-25(Part 12)/Issue 1. 15 JULY 1989. HUMAN FACTORS. FOR DESIGNERS OF EQUIPMENT. PART 12: SYSTEMS

Supervisors
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RMIT-CSIRO Masters - Oxidation and carbonisation of Polyacrylonitrile fibres

Polyacrylonitrile (PAN) fibre, known as precursor or white fibre, is oxidised in air and then carbonised in inert gas to produce a carbon fibre with high strength and modulus that are suitable for use as reinforcement for high-performance composite materials. The production of carbon fibre is a multi-step process with many parameters that need to be optimised to achieve desirable properties. Student in this project will study the evolution of the PAN fibre from precursor to final carbon fibre and the associated changes in physical, chemical and mechanical properties.
The student should have a solid background in materials science or in chemical engineering. Trainings will be provided to the use of laboratory furnaces and testing instruments. By participation in the project, the student will acquire skills in design and conduct of experiments, operation of scientific instruments, analysis of data, and reporting of results.

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