

Presentation code:

M8

The AirCirc: Design and Development of a Thermal Management Prototype Device for Below-knee Prosthesis Leg Socket

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Abstract. This study describes a developed prosthetic leg socket design for a below-knee amputation. Excessive heat and the resulted perspiration within a prosthetic socket were the most common causes for reporting a reduced quality of life for prosthetic users. The product namely AirCirc means air circulation and it has been designed by approach of medical device design process in providing the amputees to maintain the skin temperature inside the socket, ultimate comfort and breathable. In order to design the device, the small hole was made in prosthetic socket surface since it has a function as air circulation. Four types of proposed sockets and a control socket were compared on a single patient. The result successfully reveals that the design can be maintain the temperature inside prosthetic socket. In addition to the eco-friendly material, the woven kenaf was used as material that provides good strength as compared to glass fibre and offer sustainable and biodegradable product. The objective of this paper is to provide the airflow prosthetic socket design and optimize the use of natural fiber in prostheses field. Thus, with the use of the environmental friendly material, functionality device and heat removal capability make the device suitable for maintaining a comfortable and healthy environment for prosthesis.

Keywords: prosthetic leg socket; medical device; skin temperature; air circulation; eco-friendly product