

System Validation Testing Report – Wearability Testing for Temperature

Team: P15001: Active Ankle Foot Orthotic

Engineers: Jared Green- Mechanical Engineer

Test Date: 03/2/2015, 03/6/2015, 03/7/2015, 03/8/2015

Related System: Secure Foot (AAA)

The test is being completed to help determine how much (if any) a test subjects skin temperature changes when wearing the AFO versus not wearing the AFO. This will determine if the average change in skin temperature will meet our engineering requirements.

Supplies:

- 1.) AFO brace
- 2.) Compression sleeve
- 3.) Two thermocouples with data loggers
- 4.) Data logger software
- 5.) Masking tape
- 6.) Convertible pants work best for this experiment so that it makes room for the wires to stick out

Setup:

- 1) Connect each data logger to the computer and set up the loggers using the USB-500 series software, then disconnect
- 2) Connect each data logger to a thermocouple and attach the ends of the thermocouple to the front of each lower leg using masking tape

- 3) On the left leg, place a compression sleeve over the wire on the bare skin and carefully weave the wire up through the leg



- 4) On the right leg, place the AFO over the pants so that the wire is covered by the pants



Test:

1. Once the system is all set up start walking or doing normal activities. During the test make sure that the wire does not slide out and that the data loggers do not come unplugged



2. When finished using the system, unplug the data loggers and reload them into the software to stop recording and start uploading data.
3. Remove the parts from yourself

Results:

There were multiple trials performed to help ensure that this would fulfil the engineering requirement. The first trial represented a worst case scenario of walking a mile in thick jeans.

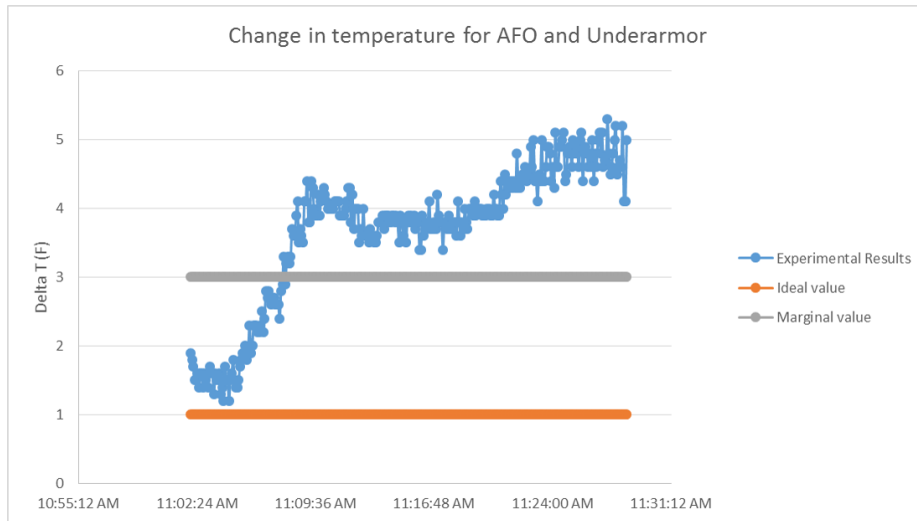


Figure 1: The following plot displays the change in raw data which represent the difference between a compression sleeve and the AFO for a one mile power walk

Initially, these results started out fine but then the temperature of the AFO started increasing more rapidly than temperature of the compression sleeve. This is most likely due to more sweat flowing through the AFO as opposed to the compression sleeve which is made out of spandex. Several trials after this involved wearing the setup while doing everyday activities for about a half hour to an hour. A few trials actually produced a negative change in temperature for the AFO and Underarmor. This is actually due to the loose wire inside the AFO. As a result of this, the wire was taped to the leg to ensure that both wires record skin temperature as shown below.

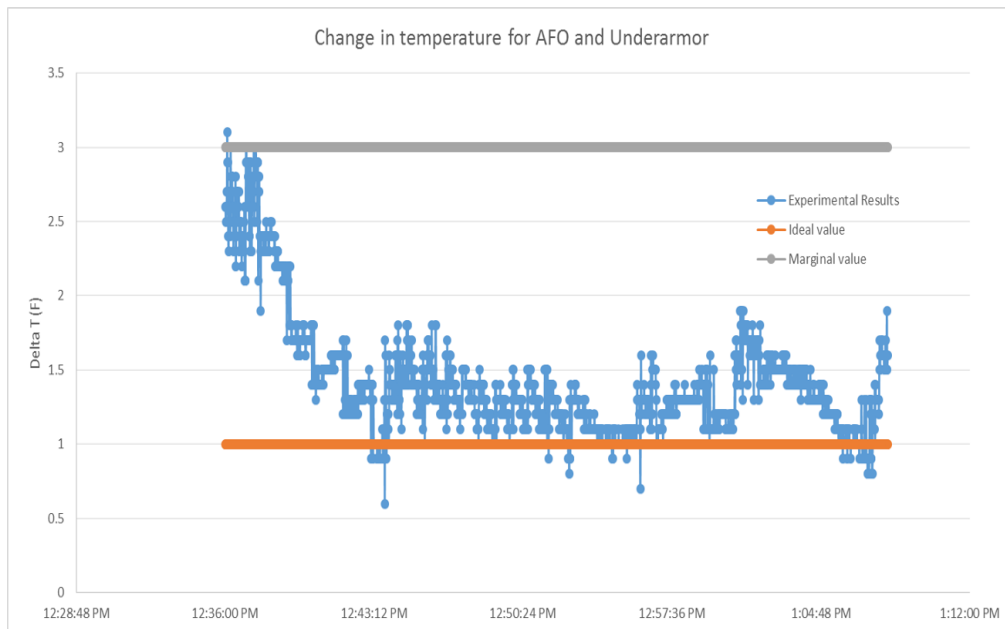


Figure 3: The following table displays the change in AFO and under armor temperature for a normal activity

Conclusion:

From doing several trials and altering the wiring to make sure that the thermocouples are recording temperature better, the changes in temperature for AFO and Underarmor fall within the marginal value of the engineering requirements, and close to the ideal value. The one mile power walk was just a worst case scenario which most likely would not happen when someone is wearing the AFO.