



Heat Stress Monitor, Determination and Mitigation

Reprinted with permission from IST-Aim

Heat stress is defined as "a thermal environment which is stressful to humans" and is measured by using the Wet Bulb Globe Temperature Index. This index was developed by the Military and is modeled after the human subject.

The WBGT Index is comprised of three temperature values, each taken from a separate thermal sensor.

The first sensor is the Wet Bulb, which is a thermometer bearing a wetted wick, generally cotton. The purpose of the sensor, is to determine the amount of cooling provided to the human subject through evaporation. This evaporation is a function of air speed and humidity. The temperature of the Wet bulb is therefore a function of air temperature, humidity, and air speed. The temperature of this sensor becomes 70% of the Index.

The next sensor of importance is the Dry Bulb or standard air thermometer. It comprises 10% of the WBGT Index. It measures the effect of the convection and conduction, heating or cooling a human. The Dry Bulb is generally shielded from radiant heat.

The last sensor is a Globe Sensor. This is a thermometer inside a black sphere. This sensor provides an indication of the mean radiant temperature of the environment. The sun, radiation from hot pipes, furnaces and open process ovens, are all examples of radiant sources. The temperature of this sensor is then weighted at 20%. The sum of these values provide the Wet Bulb Globe Temperature Index. Any one sensor gives some information about the environment, but by combining the information a bigger picture of the stressful environment can be obtained.

General Situations to Consider

1. If there were no radiant energy in a given environment , the Globe Sensor would be the same temperature as the Dry Bulb Sensor.
2. If the Wet Bulb Sensor and the Dry Bulb Sensor provided the same temperature reading, two conditions could be in effect.
 - The wick has dried off
 - There is 100% humidity
3. The Wet Bulb will not be warmer than the Dry Bulb. It is generally true that the Globe will not be cooler than the Dry Bulb.

Reviewing the PHEL or TLV chart for human exposure to Heat Stress environments, there will be an eight hour work shift maximum temperature. This is typically 86°F on the WBGT Index. We can con-

clude that if there is no radiant source and the humidity is 100%, there would be a 86°F Dry Bulb environment. The chances of this occurring are slim. The general Heat Stress environment is one in which the Wet Bulb is between 65°F and 100°F and the Dry Bulb and/or Globe Sensors add to the heat stress. This is indicated by the WBGT Index.