

# **Sweat Analysis to Determine Dehydration**

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## **Abstract**

The project conducts research on flowmeters, analyzes and produces a prototype flowmeter to determine the sweat rate and hydration level of the user. Research on conceptual designs included turbine, magnetic, calorimetric, evaporation driven micro-pump and ultrasonic. Calorimetric flowmeter was determined the best for the purpose of our project due to its accuracy in measurement of sweat rate, ease of manufacture, and cost efficiency. The calorimetric sensor uses two heat sensors and one heat source. The sensors are positioned upstream and downstream of the heat source to determine the temperature difference with the change of flow rate. A large scale prototype was constructed to serve as testing model. Once the large scale prototype is constructed and satisfied, the process of downscaling the flowmeter into a wearable device began. The calorimetric flowmeter uses two heat sensors and one heat source. The sensors are set upstream and downstream of the heat source to measure the temperature difference with the change of flow rate. Sweat will be introduced to a polydimethylsiloxane (PDMS) channel using a sweat collector, which is also made of PDMS. Two K-type thermocouples will be used as the heat sensor and heated wire as the heat source. The user will use the device to track their sweat rate and use this information to coordinate workouts or keep the body hydrated. This type of device is not only valuable to people involved in the athletes/fitness field but will serve people in the military and people who work in extreme environments where dehydration occurs fairly quickly.