

## **Team Spirometer Progress Report** **July 9, 2009 – July 16, 2009**

**Team:** Jeremy Glynn and Andrew Dias

**Client:** David Van Sickle, PhD  
Dept. of Population Health Sciences  
UW School of Medicine and Public Health  
Phone: (608) 719-9531  
e-mail: [vansickle@wisc.edu](mailto:vansickle@wisc.edu)

**Advisor:** Mitch Tyler  
2156 Engineering Centers Building  
Phone: (608) 262-5112  
e-mail: metyler1@wisc.edu

### **Goals for the past week**

- Complete documentation for testing done on 7/8
- Test sensitivity of Honeywell 24PC01SMT sensor
- Redesign Fleisch spirometer to ensure laminar flow
- Work with Amit to develop a usable PCB layout
- Try to obtain pressure and flow meters from Prof. Chesler's contacts

### **Accomplishments**

- Met with Tom Fleming to discuss microcontroller (MCU) selection and programming
  - Has some experience in programming this MCU and using USB but not I<sup>2</sup>C.
  - Andrew and I took responsibility for developing I<sup>2</sup>C code for MCU
  - Have found header files to set ports for communications, now need to develop commands to read/write data.
- Tested Honeywell 24PC01SMT sensor
  - More sensitive than original Freescale sensor, less sensitive than non-surface mount Honeywell sensor
  - Will still work fine for our spirometer
- Redesigned Fleisch spirometer that meets laminar flow criteria
  - Have hematocrit tubes on order that we will use to make capillary system
  - See [http://www.globescientific.com/capillary-tubes-microhematocrit-capillary-tubes-plastic-c-25\\_241.html](http://www.globescientific.com/capillary-tubes-microhematocrit-capillary-tubes-plastic-c-25_241.html) for example. Ours are less expensive
  - Also received capillary tubing that we will cut and make a prototype with.
- PIC (MCU model abbrev.) development
  - Performed considerable research into I<sup>2</sup>C, both physical hardware and programming requirements
  - Experimented using the MPLAB programming software for the PIC
  - Ordered development board to test future programming.
- Set up meeting with Alejandro (Prof. Chesler's grad student) to acquire flow and pressure meters

- Obtained the ISO document that specifies additional standards our spirometer must meet as well as some protocol for how to validate our design.
  - Additional standards are more specific regarding durability, labeling, and other mechanical features as well as some functional characteristics.

### **Goals for the upcoming week**

- Construct new Fleisch spirometer with hematocrit tubes
  - Will also need to find a new way to connect our spirometer body to the sensor. The previous spirometer ports are too large of a diameter to match with the sensor's ports.
- Learn how to access all the data in the SQL files
- Run tests on the new prototypes
  - Need to ensure laminar flow and linear flow-pressure relationship
  - If we can obtain flow and pressure meters, we can also measure resistance
  - Can also test the effects of capillary length on both the flow-pressure relationship and the magnitude of the pressure differential
- Continue I<sup>2</sup>C code development
- Continue PCB development with Amit
- Improve software specifications to include GUI illustrations and flow diagrams

### **Difficulties**

- One of David's contacts gave us some spirometer data in the form of an SQL table. Neither of us was familiar with SQL prior to this point. We were able to load a majority of the data from the table, but not the flow-volume and volume-time graph data. These are stored as binary large object and we could not decode it. David has asked his contact for assistance with this task.
- Neither of us has ever done any MCU programming before. There will be a bit of a learning curve before we get the program running smoothly. We will also be looking to get assistance from electrical engineering contacts, as well as some of the interns.

### **Areas we would like assistance/feedback**

- We need your approval to gain access to an actual SQL server via CAE. We can discuss this at our meeting.