

Team Spirometer Progress Report
June 25, 2009 – July 1, 2009

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Goals for the past week

- Meet with additional interns currently at University of Minnesota
- Gather enough input to make informed decision on Lilly vs Fleisch type spirometer
 - Will hopefully get feedback from blog postings, e-mails, personal queries and laminar flow testing
 - Refine design matrix to encompass new input and evaluate results
- Investigate software development options
- Develop another newsletter
- Continue to test alternate pressure sensors
- Validate our fluid mechanics calculations with testing to ensure that the prototype resistance is indeed within ATS standards

Accomplishments

- Performed spirometer body testing on the new Fleisch and Lilly models
 - Lilly had poor responsiveness, but Fleisch generated linear relationship between flow and pressure
 - Preliminary decision to pursue Fleisch spirometer model in future prototypes
 - Hope to get feedback from spirometry community regarding this decision
- Attempted to correlate voltage to percent outputs with MPX2010 sensor
 - Used LabView, see “Testing Results June 25” document for full report
 - Summary: Output signal was very small, hard to get usable data over the noise
- Successfully related pressure and output percent of new Honeywell sensor
 - See “Voltage to Percent Testing” for full testing report
 - Larger output signal of Honeywell sensor produced more usable data.
- Met with another intern (Naresh) assisting our project
 - His focus is on regulatory affairs and he will be assisting us in writing the documentation necessary to meet India regulatory boards requirements
- Met with two electrical engineers to begin laying out PCB design
- Received source code for some of the ZMD software

- The interns are using this code to develop our own program to acquire data from a USB port
- Began to develop another newsletter
 - The first one had a 50% open rate. Hopefully, this can be a good source of feedback on our spirometer design.

Goals for the upcoming week

- Complete and distribute newsletter
- Create detailed physical design specifications for a Fleisch spirometer
 - We will analyze the model to ensure it produces laminar flow and meets ATS flow resistance specifications
 - Manufacturing materials and part sources will also be described in the design
 - If possible, we can model the design in SolidWorks and run flow simulations
- Draft preliminary PCB layout
 - After meeting with some ECE students, we have a better idea about layout. We will hopefully develop a draft in the next week that can be reviewed by someone more skilled than ourselves in PCB design
- Acquire new Honeywell sensor with same specs as PCB-capable model
 - No sensor we currently possess has the same specs as the PCB model we want to use.
- Start creating regulatory documentation as recommended by Naresh

Difficulties

- The Honeywell sensor we used in our testing is not available in a surface mount configuration.
 - A similar model is available, but it has a slightly lower sensitivity
 - This model is still more sensitive than the MPX2010, so we are pursuing using it
- The resistance values we calculated experimentally from $R = \text{Pressure}/\text{Flow}$ are extremely low and probably incorrect
 - This method still requires a lot of conversions and reliance on experimentally determined trendlines.
 - We need to figure out how to determine resistance experimentally because the proper calculations cannot be found. Also, it would be good to verify any calculations with actual test data.
- David was out of town this week so we were unable to have our usual weekly meeting. We have kept in touch via e-mail
- The contacts to which we submitted our software specifications have not yet replied with any feedback

Areas we would like assistance/feedback

- Discuss accrual of hours under the Tong R&D grant