Peristaltic Pump Project

Characterize peristaltic pump performance

**Background**
- Syringe pumps currently used are costly and have reliability issues
- Use of peristaltic pumps could reduce cost as well as user work-load

**Objectives**
1. Characterize pump performance
   - Dispense Performance
   - Possible Issues
   - Mixing Capability
2. Determine if peristaltic pumps are suitable for use in Gen-Probe products

**Results**
- **Dispense Volume per Revolution**
  - Average dispense value was 0.32 mL, which was within process specifications
- **Dispense Volume vs. Negative Pressure Head**
  - Working against a negative pressure head reduced the pump output volume

**Conclusion**
- Pump dispenses within process specification and can drive effective fluid mixing
- Pump is suitable for testing in prototype but is susceptible to external factors

Vacuum Pump Enclosure Project

Assemble and optimize a vacuum pump sound dampening enclosure

**Background**
For customer satisfaction, the vacuum pump noise output needs to be reduced

**Objectives**
1. Assemble sound dampening enclosure
2. Measure sound level reduction
3. Optimize enclosure for maximum sound dampening
4. Ensure enclosure allows sufficient ventilation

**Methods and Optimizations**
- Reduced contact points between pump and enclosure
- Found optimal vibration dampeners
- Gen-Probe is a leader in the development of nucleic acid tests used to diagnose human diseases and screen donated human blood
- Gen-Probe produces fully automated, high throughput systems for diagnostics and blood screening

**Results**
- **Dispense Volume vs. Negative Pressure Head**
  - Working against a negative pressure head reduced the pump output volume

**Conclusion**
- Enclosure reduces perceivable noise by half and lowers the pump temperature
- Enclosure is a good first step and will be implemented

Tiplet Detection Project

Develop an algorithm to detect presence of disposable tiplets

**Background**
- Aspirators remove excess media and wash buffer from samples
- Disposable “tiplets” cap the ends of aspirators
- As a process control, must verify that tiplets do not fall during cycles

**Objective**
1. Study and characterize tiplet-on and tiplet-off conditions
2. Develop an algorithm to distinguish between the conditions
3. Modify hardware and software to optimize algorithm success

**Characterization and Tiplet Detection Algorithm**
- The tiplet-on and tiplet-off conditions showed a difference in slope
- An algorithm was developed that took advantage of this difference

**Optimizations**
- Modified software script – controls speed, movement, sampling frequency
- Adjusted initial aspirator position with washers
- Designed and prototyped an optimized midplate

**Results**
- The developed algorithm is able to identify whether the tiplet is off or on with a nearly negligible probability of error
- The algorithm is a promising method for tiplet detection
- Further refinement of the algorithm may be necessary

**Conclusion and Future Work**
- The algorithm is a promising method for tiplet detection
- Further refinement of the algorithm may be necessary

Acknowledgements

Gen-Probe
UCSD Team Internship Program
- Wilbur Braulio
- David Opalsky
- Joe Ellis
- Brian Schroeter
- Norbert Hagen
- Todd Tuggle
- Melody Murphy
- George Walker

Paul Suarez, Robert Holmes, Rosanna Gan