# Hemodynamic Simulator II (P09026)

## Project/Product Risk Review (Rev. 3)

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| Date | 10/10/2008 |
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| Summary | Likelihood (1-5) | Severity (1-5) | RPN Total |
|---|---|---|---|
| Number of 5's | | | 92 |
| Number of 4's | 1 | 4 | |

| # | Category / Tag | Risk | Description/Comment | Likelihood (1-5) | Severity (1-5) | Risk Priority Number | Mitigation Activity |
|---|---|---|---|---|---|---|---|
| 1 | Cost | Actuator Cost | | 2 | 3 | 6 | 6K budget, |
| 2 | Design | Large volume of air in pnuematic actuation may add lag to system | Compression of air volume may create lag in the reaction between the fluid and air interface and demand too long of a stroke for the frequency require dof the cylinder | 3 | 4 | 8 | Design system with the air volume in mind and limit the air volume to eliminate risk of lag and overstroke |
| 3 | | Actuator creates a negative pressure | Negative pressure created during retraction/filling | 2 | 2 | 4 | Control system or adding relief valve to system |
| 4 | | Water Column Inertia | During reversing water column will have inertia causing non-idealization | 3 | 4 | 12 | Build factor of safety and flexibility into system |
| 5 | Materials | Tank/Tubing Leak | Water leaks from the heart, tank, or tubing | 2 | 3 | 6 | Tight fittings, check to make sure all connections are sealed |
| 6 | | Tank Pressue | Tank pressure does not meet the specs | 1 | 3 | 8 | Adjust the tank or water level to adjust the pressure |
| 7 | | Actuator/Pump Innacuracies | Actuator does not pump water at the desired rate | 2 | 2 | 4 | Adjust the programming until the desired waveform is reached |
| 8 | Measuremen | Inaccurate measurements | inaccuracy of measurements improperly placed flow meters | 1 | 2 | 2 | Place the sensors where they will record the desired measurements |
| 9 | Methods | Assembly error | Connections not tight, tubes not connected to the correct ports | 1 | 3 | 3 | Check all connections before turning on power and testing the simulator |
| 10 | | Labview errors | Trouble communicating between computer and sensors, not reading desired values | 2 | 3 | 6 | Debug software to ensure desired results |
| 11 | | Overload Actuator | Put to much pressure on the actuator | 1 | 4 | 4 | Review actuator data sheet to make sure we do not use inputs that are too large |
| 12 | People | Water Spill | Caused by user error, loose connections, incorrect filling or draining | 1 | 2 | 2 | User must be careful when filling the tank and assembling the tubing |
| 13 | Scheduling | Lead time for actuator | Actuator takea long time to receive | 3 | 3 | 9 | Specify and order by week 6 |
| 14 | Simulations | Losses in System cause inaccuracies | Viscous fluid losses non-idealization | 4 | 4 | 16 | Build factor of safety and flexibility into system |
| 15 | | Air column resonance | Air may resonate during pulsation | 1 | 2 | 2 | Analyze system for resonance (Helmholtz resonance theory) |