HPRT MEETING MINUTES

Staff Meeting

Tuesday, 24 October 2017
3:00pm to

Minutes recorded by: Myla Azofeifa

Meeting called by: Alex Rustaey

Attendees: Yi Tong Zhang, Jordan Loos, William McGinn, Dr. David Trevas, Amy Swartz

Table 1 - Record of Meeting

2:35pm	**HPRT team members only** ● Honeywell cancelled ● Determined next in-person team meeting (see below) ● Discussed viable solutions for redesign (what did we learn from individual analyses)	EGR 323
3:00pm	**Begin Meeting** ● Honeywell cancelled until next week ● Meeting called to order by Alex Rustaey ● We need to focus on concept generation from here on out ○ Have been focusing on research and understanding up to this point, which is important ● Dr. Trevas praised the website - probably the best of the 17 so far ● Topics ○ Individual Analyses ○ Concept generations	EGR 323
3:00pm	**Individual Analyses** ● Myla - Pinch valves ○ Not a viable option for pressure regulator because of material properties needed (specified max. Temperature of 1400˚F, but polymer needed for the pinch valve sleeve went up to a max of. 500˚F) ● Bill - mathematical paper ○ Found a force balance equation for pressure regulator ○ Found an equation to calculated hysteresis ○ Currently just a formula (not too complicated) that could be really easy to put into MATLAB) ○ Left it open ended for now - would rather get a	EGR 323

	real number from a real test rather than creating lots of hypotheticals ○ Guided where we go from here by helping us establishing a testing method ● Alex - Turbo expander ○ Idealized the turbo expander; analyzed as a turbine at steady state (even though our system will not be) ○ Neglected potential & kinetic energy ○ Turbine efficiency -- assumed 90% ○ Linear relationship between inlet temperature and work output ○ Exponential for inlet pressure and work pressure ○ To prove viability of Turbo Expanders ■ Precision parts within the volume that we are tasked with ■ Would increase the cost ■ Durability & integrity comes into play ■ A lot more that we need to look into before we go down this route ○ → look into turbo chargers used in cars ■ Pretty small ■ Go high speed ■ Fairly good precision, but mass produced part that they are not necessarily expensive ○ **What are realistic inlet temperatures? What are we using as our frame of reference?** ● Jordan - Pulse Width Modulation ○ Looked at the applications within the electronics scope ○ Looked into PWI with respect to pressure ○ Manufacturing applications are common (IE spray down, etc.) ○ Variable area nozzles ○ How we can control pressure drop based on changing the area of the inlet and outlets of nozzles ○ Needs to be electronic t be controlled ○ Brainstormed ways in which we can control the nozzle electronically ○ Honeywell has specified that we want a mechanical control ○ A variable area nozzle could work ○ Electronics prefer to be wide open or closed - nothing in between (mechanical parts can be partially open and closed) ○ From here on out - focus on variable area nozzles ● Yi Tong - flexible metal bellows	

	○ Did analysis of material due to not having a solidified design and dimensions ○ Analyzed seven materials ■ Tensile stress 40-150 ksi ■ Temperature range 300˚F ○ Best materials were bronze, copper, and nickel, stainless steel ○ Stiffness was not calculated, but can be ○ Calculated spring rate ○ Using metal bellows is a viable design option based on his research	
3:35pm	**Where do we go from here?** ● Collectively put in more effort in concept generation ● Where we are stuck is understanding where hysteresis actually comes from, and how do we minimize that → how do we design to minimize this ● **Concept generation** is our biggest goal right now ● Problem with hysteresis is that is reduces accuracy ○ Contaminates cause hysteresis ● Discussed the etymology of the work “GUNK”	
3:45pm	**Meeting adjourned.**	

Table 2 - Action Items (Tasks Assigned)

Tasks	**Person Assigned**	**Due Date**	**Date Complete**
Generate concept designs.		10/29/2017	
Questions to answer: ● What are realistic inlet temperatures? ● How much hysteresis is created by the contaminates?			
Research vehicle turbochargers. Focus on feedback looping. Regenerative braking (the torque on the wheels that is used to slow it down -- used predominantly in a Prius)	Alex Rustaey		
Continue looking into variable area nozzles.	Jordan Loos		
Continue researching flexible metal bellows → determine the dimensions	Yi Tong Zhang		

needed for metal bellows to be a viable design option.			
How would you drive the closure element to react to the change in pressures.	Mechanical - Bill McGinn Electronic - Myla Azofeifa		
Reschedule next semester Honeywell meetings, due to class interferences.			
Analyze the etymology of the word “gunk.”	Bill McGinn		
Complete shop safety training. Must be done on a weekday at 9:30am. Contact Kellan Rothfus for more information.	*Jordan Loos* *Bill McGinn* *Alex Rustaey* *Yi Tong Zhang*	*Spring 2018*	*Alex - 10/24/2017*
Complete Advanced Shop Training (following the completion of shop safety training). Available every other weekend beginning 9/9 & 9/10. Contact Kellan Rothfus for more information.	*Jordan Loos* *Bill McGinn* *Alex Rustaey* *Yi Tong Zhang*	*Spring 2018*	

Next formal meeting: Sunday, 29 October 2017, Engineering Bldg. (#69), Room 108 at 6:00 PM (client meeting)