

Spring Brakers

MSD Meeting

10 April 2018 / 2:00-4:45 PM / MSD Lab

ATTENDEES

Full Team

Beginning of Meeting Checklist

-Review meeting minutes

-Review schedule

Accomplished This Class

- Reviewed our peer evaluations.
- Discussed this summer and our plans.
- Developed a list of issues that need to consider. (“Things That Keep Us Up At Night” in P4 folder)

Notes From Today’s Meeting

1. How are we going to tie in the sensors?
 - We don’t know yet.
 - We need to figure out what we need sensors for.
2. Buckling analysis. We need to talk SME asap. FEA (Finite Element Analysis)
 - Important part of FEA is knowing the external reactions, how it will be mounted, external pressures, etc.
 - Boedo is the SME
3. Finish Thursday POC.
 - Make Piston: Wednesday, 11:00ish. Evan will GroupMe. Machine Shop 2nd.
4. Goemes tomorrow at 12:30 April 11.

5. To test the actual system, we need hydraulic pump, hose, fluid, support equipment. What if we tact on a \$100 hydraulic cylinder to test.
 - o Lily will work on this testing.
6. We talked as a group and agree that our final design will go with spring disks.

Action Items

Carried Over from March 6

1. Lori to contact U of R on standards
Due Date: Week after spring break
 - a. Got them from Wallace Library
 - b. DONE
2. Add resources and percentage completion to MS Project.
Due Date: March 8 DONE
3. Meeting with Optimization
Due Date: First week back from Spring Break
 - a. March 22 DONE

From March 8

4. No new action items

From March 20

5. Double check with Meggitt that the first slope on the graph is due to the piston moving through air. DONE.

From March 22

6. Find out from Meggitt that we can share with Mark at Optimization.
 - a. After the Preliminary Detailed Design Review.
- 7. Lilly to see if we can obtain sensors**
 - a. Tony to pick up March 28. DONE.
8. Mike to send Mark Haboian at Optimization the flow specs for flow rate
 - a. We don't have that. DONE.
 - b. We need to clarify. We are only using an air pump.

From March 27

9. Tony to get budget worksheet BOM - DONE
10. Garrett/Sabrina started making a task list for edge - DONE
11. Elias and Tony to get o-ring from Home Depot - DONE

From March 29

7. Mike to talk to Dr. Gomes and we can borrow materials for the project
8. Weekend (March 30 and 31) four of six team members will finish POC for April 3. DONE
9. See the P3 chart for specifics on how to finish the POC

From April 3

1. Review Mike's and Evan's list of design variable. Do this April 10.
2. Will we buy the AS6235 Standard for O-rings?

From April 10

1. Who will talk about the FEA? When? See Boedo.
 - a. M 12-20-1:15 T: 1:15-2:10 Fri 11:15-12:10
2. Start now on lead time for the Meggitt Vendor - Tony

Plan for Next Meeting

1. Everyone, think about what we will test with the hydraulic cylinder setup
2. Brainstorm on our designs from this week.

Risks (additive each week)

- The analog solution needs a risk assessment. (New component)
- Time constraints
 - Lead time on ordering
- What if the we lose too much air that we can't get the piston to move.
 - Use the hydraulic press in the shop
 - How do we know how much force? Load cell?
- High pressure we are learning the elements of risk are higher than we thought.

Lessons Learned (additive each week)

- Pugh chart analysis. We learned that we needed to focus more on the datum we choose. (3/6)
- Because we are such a big team, some things are better when we split up and some are not. More concrete solution we can break out. Brainstorming we need to do with group. (3/6)
- In calculating Spring Constants, we discovered that they are significantly higher than we thought. Scale the pressure, not the displacement in the prototype. (3/8)
- Before we break for the summer, the team will create a report/document that summarizes where we are.
- Lead time on ordered items is longer than expected.
- Err on the side of caution when testing the PoC and the final product
- Don't subject PVC to high pressure air.

Spring Brakers

MSD Meeting

12 April 2018 / 2:00-4:45 PM / MSD Lab

ATTENDEES

Full Team

Beginning of Meeting Checklist

- Review meeting minutes
- Review schedule

Accomplished This Class

- Talked to Gomes - Sabrina and Lily
- Broke down Mike's CAD system
- Reviewed springs versus spring discs

Notes From Today's Meeting

- Gomes.

We don't need pressure. We only have to apply force and we can do that with weights instead of compressed air.

We could put a plate on top of it with a string to measure the displacement. We could dial-caliper it. Or we could use a 5gal bucket (47lbs)

Spring discs. Two concerns. They are not completely linear. Also if we put them in parallel series we must have the same number in series of them or it won't work. Applied force and K constant is not displacement. What they took away is that, as much as have talked about spring discs, we don't know a lot about how spring discs work. We may not have time to learn. Sabrina did more work on regular springs. If we have a smaller pistons, we can get the numbers we need with die sprints. Summary: We should be concerned making a large

pressure vessel. Lily would be more comfortable buying the best case pressure cell with the smallest hydraulic diameter and build the prototype around that. Mike agrees. Our biggest problem is the 5000 PSI. Lily, is it possible for them to run a test with our simulator at 0-500? Should we ask them? What is the difference between physically displacing 10 inches versus displacement scaled.

Question: Do they need just the graph or do they need exact displacement?

- Harold.

We should be getting ready to order. If we can't, be very mindful of lead-time. Next phase if building!

Final presentation and gate reviews are coming up. Maybe do the gate review right after the presentation. Gate review is like a post-mortem.

Get Parker to fabricate the case and piston. They can do it. When we call, get an account rep.

Questions:

-Warranty

-Testing

-Leadtime

-Can you put in other fixtures for us for example for the pressure transducer?

-Measurement of piston displacement

-Magnetic Sensor, how to measure

-Connect to toilet

SPRING Conversations

With Die springs: For $\frac{1}{2}$ " diameter, displacement for smallest is 1-3", biggest K constant is 800. Biggest displacement we have to get is up to 3 feet, so we'd have to scale.

We will test the POC

Action Items

Carried Over from March 6

1. Lori to contact U of R on standards
Due Date: Week after spring break
 - a. Got them from Wallace Library
 - b. DONE
2. Add resources and percentage completion to MS Project.
Due Date: March 8 DONE
3. Meeting with Optimization
Due Date: First week back from Spring Break
 - a. March 22 DONE

From March 8

4. No new action items

From March 20

5. Double check with Meggitt that the first slope on the graph is due to the piston moving through air. DONE.

From March 22

6. Find out from Meggitt that we can share with Mark at Optimization.
 - a. After the Preliminary Detailed Design Review.
- 7. Lilly to see if we can obtain sensors**
 - a. Tony to pick up March 28. DONE.
8. Mike to send Mark Haboian at Optimization the flow specs for flow rate
 - a. We don't have that. DONE.
 - b. We need to clarify. We are only using an air pump.

From March 27

9. Tony to get budget worksheet BOM - DONE
10. Garrett/Sabrina started making a task list for edge - DONE
11. Elias and Tony to get o-ring from Home Depot - DONE

From March 29

- Mike to talk to Dr. Gomes and we can borrow materials for the project
- Weekend (March 30 and 31) four of six team members will finish POC for April 3. DONE
- See the P3 chart for specifics on how to finish the POC

From April 3

1. Review Mike's and Evan's list of design variable. Do this April 10.
2. Will we buy the AS6235 Standard for O-rings?

From April 10

1. Who will talk about the FEA? When? See Boedo.
 - a. M 12-20-1:15 T: 1:15-2:10 Fri 11:15-12:10
2. Start now on lead time for the Meggitt Vendor - Tony

From April 12

1. Mike, Tony, Lori to form relationship and get Parker ready.
2. Double check where the restrictor will be applicable.
3. MeCes. April 13. Find Spring SME. How do spring discs work? How do we deal with displacement?
4. Tony to bring in weights. Lori to bring water container.
5. Contact Meggitt to talk with their "spring guy" -ALL

Plan for Next Meeting

1. Get time with Meggitt for final review.
2. Have the spring calculations completed BEFORE April 17.

Risks (additive each week)

- The analog solution needs a risk assessment. (New component)
- Time constraints
 - Lead time on ordering
- What if the we lose too much air that we can't get the piston to move.
 - Use the hydraulic press in the shop
 - How do we know how much force? Load cell?

- High pressure we are learning the elements of risk are higher than we thought.

Lessons Learned (additive each week)

-Pugh chart analysis. We learned that we needed to focus more on the datum we choose. (3/6)

-Because we are such a big team, some things are better when we split up and some are not. More concrete solution we can break out. Brainstorming we need to do with group. (3/6)

-In calculating Spring Constants, we discovered that they are significantly higher than we thought. Scale the pressure, not the displacement in the prototype. (3/8)

-Before we break for the summer, the team will create a report/document that summarizes where we are.

-Lead time on ordered items is longer than expected.

-Err on the side of caution when testing the PoC and the final product

-Don't subject PVC to high pressure air.

-We didn't need to make a piston for the POC. But added risk of breaking the string. We did increase safety of not using pressures.

Spring Brakers

MSD Meeting

17 April 2018 / 2:00-4:45 PM / MSD Lab

ATTENDEES

Full Team

Beginning of Meeting Checklist

-Review meeting minutes

-Review schedule

Accomplished This Class

- Talked to Meggitt for one hour and got major design questions answered.
- Reviewed our schedule with group.
- Team broke off and began work on spring calculations, based on call to Meggitt.
- Team talked about the criteria to achieve an A in class.

Notes From Today's Meeting

- CALL WITH MEGGITT

Can we scale down our numbers then scale it back up manually.

Kyle-Combined volume of all pistons of all brakes that was. So that was for all six pistons together.

Does it need to make the exact curve or do we need the exact feedback for another system?

If the simulator matches the pressure ver displacement curve and ????, that should give us the same dynamic performance. If we meet the PD curve and if the ??? is there rto control flow, then we should see the same behavior. We shouldn't have to do anything extra.

Can we create a scaled down curve and then manipulate those numbers afterwards?

I would mimic the smallest curve and the largest and if we can those, then we can do everything in between. For a starting point, pick a curve in the middle. More generally, if we can do the smallest then we can scale it to the largest.

With our setup we are getting either large displacement or spring constant.

It is less common for us to do the large breaks. The brakes are very different. It's almost like we are building two simulators. So, calculate how much of the range we can cover with the brake simulator. See what that gives you. If we can go to the second biggest, we may be able to reduce the range. The preliminary design we presented should be flexible enough to cover both.

It needs to act equivalent to the brake. Our scaling is not an option.

We will see out costs go up tremendously ,but we may consider designing one for 50% of the largest size but not 100% of the largest size there, then we may consider building two brake simulators to mimic the fill break.

So, we have one piston. A break may have several pistons. Ours should have output of all six/seven pistons.

Correct.

If our piston is running over that longer distance, our seals wear out pretty quickly. They do the same thing. Use the available o-ring sizes, then you work backwards. Then we can put in our actuator diameter, then figure out, for that given diameter, figure out the spring constants and actuation length would be. If something seems unachievable, then we make another gap. The UBS, we are playing with one more variable--the thing we are trying to output. That's the task we've been given.

The UBS design they did many years ago: That design required changing springs in and out, similar to the cartridge idea we had. He was purely designed to change the springs but nothing else. Same concept we had. He also incorporated some relief valves to correspond to different displacements on the curves. He did not see it in ours, but it does give us a lot more flexibility. He was also limited in size. It could only go up to a certain size.

If we have difficulty matching the full range of curves, then we should add a mechanism to control the pressure at which each spring is activated.

With the old system they designed: It's one brake simulator with two pistons. So, they got two programs out of it because one the brake was smaller. To mimic one brake they only sent pressure to the one piston. For the second program, they sent pressure to both pistons at once. They actuate the same simultaneously. This gave them more flexibility. To mimic the larger break with one piston, they would have had to double the size of the piston, etc.

We should consider mimicking for a piston which, when working together gets the volume we need.

Concern is then cost.

Our numbers have been for the die spring, but we want to look into spring discs. Do you have someone?

Yes, UK team. He co-designed the old system. James Downton.

SCHNORR Handbook for Disc Springs.

He showed us a spreadsheet from the old design. They used spring discs and their data were in line with the SCHNORR Handbook for Disc Springs.

We tested our prototype. We got data.

We corrected the second slope with a Y intercept. So, does your stuff do something similar? Is ours OK with the flat point in the middle?

Question: We used air? No. We used weights. That's good. As long as we saw a distinct transition between the two slopes (we get a flat line between the first transition). It's hard to say why. Our highest weight was 50 lbs. If we saw two distinct slopes then we proved our concept. Good design practice: Put preload on the springs. We need to compress them a little bit—that will give us data that will make more sense. So preload springs. Hard to describe why. As the point at which you transition from deeper to shallow slope, if the preload on the spring for the shallow slope, the preload has to match the force that was on the spring on the steeper slope, those two must match to have a smoother transition slope.

He would like to see the results when we think we are happy with it.

If we could reach a bigger stack, would that be a way to reach the viable limits. If we have a large enough parallel stacks in series with each other, if that distance is big enough, would that be an acceptable version or way to approach it.

With Spring Discs, there are more than one possible solution to achieve the the same result. It's finding the ideal arrangement. Once we find A solution, he's not sure how to find out if it's the "best" solution. If we have enough springs (stack within linear region) but if get into the nonlinear region, then we will have a lot more difficulty sticking to a linear output on our pressure displacement curves. So we need to have enough springs where we can stay within the linear range. However, we were not sure where the nonlinear region is with spring discs. We want to make use of the linear region.

Look at the concept they used, then apply it. Don't limit ourselves. Keep an open mind.

This die springs are a lower spring rate than we can achieve from spring discs. Maybe we can come up with a combination of both.

Flow Restrictor. Where should we use it in the design?

Kyle sent us four suggestions.

SUMMARY

1. We can't scale stuff.

Action Items

Carried Over from March 6

1. Lori to contact U of R on standards
Due Date: Week after spring break
 - a. Got them from Wallace Library
 - b. DONE
2. Add resources and percentage completion to MS Project.
Due Date: March 8 DONE
3. Meeting with Optimization
Due Date: First week back from Spring Break
 - a. March 22 DONE

From March 8

4. No new action items

From March 20

5. Double check with Meggitt that the first slope on the graph is due to the piston moving through air. DONE.

From March 22

6. Find out from Meggitt that we can share with Mark at Optimization.
 - a. After the Preliminary Detailed Design Review.
- 7. Lilly to see if we can obtain sensors**
 - a. Tony to pick up March 28. DONE.
8. Mike to send Mark Haboian at Optimization the flow specs for flow rate
 - a. We don't have that. DONE.
 - b. We need to clarify. We are only using an air pump.

From March 27

9. Tony to get budget worksheet BOM - DONE
10. Garrett/Sabrina started making a task list for edge - DONE
11. Elias and Tony to get o-ring from Home Depot - DONE

From March 29

- Mike to talk to Dr. Gomes and we can borrow materials for the project
- Weekend (March 30 and 31) four of six team members will finish POC for April 3. DONE
- See the P3 chart for specifics on how to finish the POC

From April 3

1. Review Mike's and Evan's list of design variable. Do this April 10.
2. Will we buy the AS6235 Standard for O-rings?

From April 10

1. Who will talk about the FEA? When? See Boedo.
 - a. M 12-20-1:15 T: 1:15-2:10 Fri 11:15-12:10

2. Start now on lead time for the Meggitt Vendor - Tony

From April 12

1. Mike, Tony, Lori to form relationship and get Parker ready.
2. Double check where the restrictor will be applicable. DONE
3. MeCes. April 13. Find Spring SME. How do spring discs work? How do we deal with displacement?
 - a. Lack of knowledge on this in RIT.
 - b. We can't teach ourselves in the time we have.
4. Tony to bring in weights. Lori to bring water container. DONE
5. Contact Meggitt to talk with their "spring guy" JOHN DOWNTON. DONE.

From April 17

6. Sent Meggitt our results from POC today, April 17-MIKE/SABRINA
7. MeCes will go off and figure numbers for spring discs then come back and compare.

Plan for Next Meeting

1. Spring disc: Put together a valid stack set up.
2. Talk with Parker more:
 - a. Pros versus cons on make versus buy on piston/hydraulic cylinder

Risks (additive each week)

- The analog solution needs a risk assessment. (New component)
- Time constraints
 - Lead time on ordering
- What if the we lose too much air that we can't get the piston to move.
 - Use the hydraulic press in the shop
 - How do we know how much force? Load cell?
- High pressure we are learning the elements of risk are higher than we thought.
- Running out of design time. Remember, we can still work over the summer.
- We can't change the piston when we get it.

Lessons Learned (additive each week)

- Pugh chart analysis. We learned that we needed to focus more on the datum we choose. (3/6)
- Because we are such a big team, some things are better when we split up and some are not. More concrete solution we can break out. Brainstorming we need to do with group. (3/6)
- In calculating Spring Constants, we discovered that they are significantly higher than we thought. Scale the pressure, not the displacement in the prototype. (3/8)
- Before we break for the summer, the team will create a report/document that summarizes where we are.
- Lead time on ordered items is longer than expected.
- Err on the side of caution when testing the PoC and the final product
- Don't subject PVC to high pressure air.
- We didn't need to make a piston for the POC. But added risk of breaking the string. We did increase safety of not using pressures.
- We need to be concerned about lead time on piston, components.

Spring Brakers

MSD Meeting

19 April 2018 / 2:00-4:45 PM / MSD Lab

ATTENDEES

Full Team

Beginning of Meeting Checklist

- Review meeting minutes
- Review schedule

Accomplished This Class

- Talked with Harold about what we need to do.
- Analyzed spring discs for final design. Garrett, Evan, Mike
- Complete POC. Lily, Tony, Sabrina
- Developed critical path analysis. Elias, Lori

Notes From Today's Meeting

1. Our POC works!
2. Spring disc calculations remain a challenge.
3. POC works and data and curve completed.
4. Critical path shows 40.43 days. We will do more analysis to break out resources and compress the schedule.

Action Items

Carried Over from March 6

1. Lori to contact U of R on standards
Due Date: Week after spring break
 - a. Got them from Wallace Library
 - b. DONE

2. Add resources and percentage completion to MS Project.

Due Date: March 8 DONE

3. Meeting with Optimization

Due Date: First week back from Spring Break

- a. March 22 DONE

From March 8

4. No new action items

From March 20

5. Double check with Meggitt that the first slope on the graph is due to the piston moving through air. DONE.

From March 22

6. Find out from Meggitt that we can share with Mark at Optimization.
 - a. After the Preliminary Detailed Design Review.

7. Lilly to see if we can obtain sensors

- a. Tony to pick up March 28. DONE.

8. Mike to send Mark Haboian at Optimization the flow specs for flow rate
 - a. We don't have that. DONE.
 - b. We need to clarify. We are only using an air pump.

From March 27

9. Tony to get budget worksheet BOM - DONE
10. Garrett/Sabrina started making a task list for edge - DONE
11. Elias and Tony to get o-ring from Home Depot - DONE

From March 29

- Mike to talk to Dr. Gomes and we can borrow materials for the project
- Weekend (March 30 and 31) four of six team members will finish POC for April 3. DONE
- See the P3 chart for specifics on how to finish the POC

From April 3

1. Review Mike's and Evan's list of design variable. Do this April 10.
2. Will we buy the AS6235 Standard for O-rings?

From April 10

1. Who will talk about the FEA? When? See Boedo.
 - a. M 12-20-1:15 T: 1:15-2:10 Fri 11:15-12:10
2. Start now on lead time for the Meggitt Vendor - Tony

From April 12

1. Mike, Tony, Lori to form relationship and get Parker ready.
2. Double check where the restrictor will be applicable. DONE
3. MeCes. April 13. Find Spring SME. How do spring discs work? How do we deal with displacement?
 - a. Lack of knowledge on this in RIT.
 - b. We can't teach ourselves in the time we have.
4. Tony to bring in weights. Lori to bring water container. DONE
5. Contact Meggitt to talk with their "spring guy" JOHN DOWNTON. DONE.

From April 17

6. Sent Meggitt our results from POC today, April 17-MIKE/SABRINA
7. MeCes will go off and figure numbers for spring discs then come back and compare.

Plan for Next Meeting

1. Spring disc: Put together a valid stack set up.
2. Talk with Parker more:
 - a. Pros versus cons on make versus buy on piston/hydraulic cylinder

Risks (additive each week)

- The analog solution needs a risk assessment. (New component)
- Time constraints
 - Lead time on ordering
- What if the we lose too much air that we can't get the piston to move.
 - Use the hydraulic press in the shop
 - How do we know how much force? Load cell?
- High pressure we are learning the elements of risk are higher than we thought.

- Running out of design time. Remember, we can still work over the summer.
- We can't change the piston when we get it.
- Critical path needs to be shortened.

Lessons Learned (additive each week)

-Pugh chart analysis. We learned that we needed to focus more on the datum we choose. (3/6)

-Because we are such a big team, some things are better when we split up and some are not. More concrete solution we can break out. Brainstorming we need to do with group. (3/6)

-In calculating Spring Constants, we discovered that they are significantly higher than we thought. Scale the pressure, not the displacement in the prototype. (3/8)

-Before we break for the summer, the team will create a report/document that summarizes where we are.

-Lead time on ordered items is longer than expected.

-Err on the side of caution when testing the PoC and the final product

-Don't subject PVC to high pressure air.

-We didn't need to make a piston for the POC. But added risk of breaking the string. We did increase safety of not using pressures.

-We need to be concerned about lead time on piston, components.

Spring Brakers

MSD Meeting

24 April 2018 / 2:00-4:45 PM / MSD Lab

ATTENDEES

Full Team

Beginning of Meeting Checklist

- Review meeting minutes
- Review schedule

Accomplished This Class

- EEs looked up sensors. Cheap and easy to come by. We may have some voltage issues with the linear potentiometer. They will continue to research this. Made a benchmark Excel spreadsheet of this.
- Lily and Tony got an idea of how we will do the cartridge stop off idea. Don't know how we can do it off the shelf.
- Mike and Evan and Sabrina diagnosed the issue with Matlab code. Mike and Evan finished spring disc calculations for all six of the aircraft brake types.
- Got the schedule into MS project. Got a drawing of Critical Path. Took a deep dive into features of MS Project.

Notes From Today's Meeting

1. What we have left to do
 - a. Spring Discs calculation finals - Evan and Mike
 - i. We will use series A.
 - b. Cartridge design final - Figure the stop offs
 - c. Budget finals -
 - i. What we can order.

2. Broke into teams and each worked for entire class on our respective areas.

Action Items

Carried Over from March 6

1. Lori to contact U of R on standards
Due Date: Week after spring break
 - a. Got them from Wallace Library
 - b. DONE
2. Add resources and percentage completion to MS Project.
Due Date: March 8 DONE
3. Meeting with Optimization
Due Date: First week back from Spring Break
 - a. March 22 DONE

From March 8

4. No new action items

From March 20

5. Double check with Meggitt that the first slope on the graph is due to the piston moving through air. DONE.

From March 22

6. Find out from Meggitt that we can share with Mark at Optimization.
 - a. After the Preliminary Detailed Design Review.
7. **Lilly to see if we can obtain sensors**
 - a. Tony to pick up March 28. DONE.
8. Mike to send Mark Haboian at Optimization the flow specs for flow rate
 - a. We don't have that. DONE.
 - b. We need to clarify. We are only using an air pump.

From March 27

9. Tony to get budget worksheet BOM - DONE
10. Garrett/Sabrina started making a task list for edge - DONE
11. Elias and Tony to get o-ring from Home Depot - DONE

From March 29

- Mike to talk to Dr. Gomes and we can borrow materials for the project
- Weekend (March 30 and 31) four of six team members will finish POC for April 3. DONE
- See the P3 chart for specifics on how to finish the POC

From April 3

1. Review Mike's and Evan's list of design variable. Do this April 10.
2. Will we buy the AS6235 Standard for O-rings?

From April 10

1. Who will talk about the FEA? When? See Boedo.
 - a. M 12-20-1:15 T: 1:15-2:10 Fri 11:15-12:10
2. Start now on lead time for the Meggitt Vendor - Tony

From April 12

1. Mike, Tony, Lori to form relationship and get Parker ready.
2. Double check where the restrictor will be applicable. DONE
3. MeCes. April 13. Find Spring SME. How do spring discs work? How do we deal with displacement?
 - a. Lack of knowledge on this in RIT.
 - b. We can't teach ourselves in the time we have.
4. Tony to bring in weights. Lori to bring water container. DONE
5. Contact Meggitt to talk with their "spring guy" JOHN DOWNTON. DONE.

From April 17

6. Sent Meggitt our results from POC today, April 17-MIKE/SABRINA DONE
7. MeCes will go off and figure numbers for spring discs then come back and compare. DONE

From April 24

1. Get email to Phil Mallard in UK Meggitt with request for call/issues we need help with. CC Kyle.
2. Call Schnorr. Email Parker. Email Kyle
3. Tony to order: Purchase by this weekend.

- a. Red Oil
 - b. Fittings
 - c. Hoses
 - d. Valves
 - e. Restrictor
 - f. Hand Pump
 - g. Cart with drawers
 - h. Stock for Safety Shield (Use cart to figure how much)
4. Total Cost and Budget Update: Tony
 5. More budget needed? Tony

Plan for Next Meeting

1. Spring Discs calculations will be done Evan and Mike
2. Tony to draw a more technical version of the cartridge stop off idea.
3. Update log for last prototype test. Sabrina
4. Finish the plan and start working on MSD II plans Elias and Lori
5. Write up test plans for next semester - Lily
6. Download Excel - Lori

Risks (additive each week)

- The analog solution needs a risk assessment. (New component)
- Time constraints
 - Lead time on ordering
- What if the we lose too much air that we can't get the piston to move.
 - Use the hydraulic press in the shop
 - How do we know how much force? Load cell?
- High pressure we are learning the elements of risk are higher than we thought.
- Running out of design time. Remember, we can still work over the summer.
- We can't change the piston when we get it.
- Critical path needs to be shortened.

Lessons Learned (additive each week)

- Pugh chart analysis. We learned that we needed to focus more on the datum we choose. (3/6)
- Because we are such a big team, some things are better when we split up and some are not. More concrete solution we can break out. Brainstorming we need to do with group. (3/6)
- In calculating Spring Constants, we discovered that they are significantly higher than we thought. Scale the pressure, not the displacement in the prototype. (3/8)
- Before we break for the summer, the team will create a report/document that summarizes where we are.
- Lead time on ordered items is longer than expected.
- Err on the side of caution when testing the PoC and the final product
- Don't subject PVC to high pressure air.
- We didn't need to make a piston for the POC. But added risk of breaking the string. We did increase safety of not using pressures.
- We need to be concerned about lead time on piston, components.
- Always double-check your equations.

Spring Brakers

MSD Meeting

26 April 2018 / 2:00-4:45 PM / MSD Lab

ATTENDEES

Full Team

Beginning of Meeting Checklist

-Review meeting minutes

-Review schedule

Accomplished This Class

- Reviewed status with Harold
- Finished CAD on cartridge
- Reworked and still working on spring disc calculations
- Started test plans
- Completed schedule and did some “what if” scenarios to pull in the schedule
- Updated test log
- Converting spring test to MatLab

Notes From Today's Meeting

None. Groups are working independently on all action items.

Action Items

Outstanding

- See the P3 chart for specifics on how to finish the POC
- Will we buy the AS6235 Standard for O-rings?
- Tony to order: Purchase by this weekend.
 - Red Oil

- Fittings
- Hoses
- Valves
- Restrictor
- Hand Pump
- Cart with drawers
- Stock for Safety Shield (Use cart to figure how much)

We will meet on reading day.

Risks (additive each week)

- The analog solution needs a risk assessment. (New component)
- Time constraints
 - Lead time on ordering
- What if the we lose too much air that we can't get the piston to move.
 - Use the hydraulic press in the shop
 - How do we know how much force? Load cell?
- High pressure we are learning the elements of risk are higher than we thought.
- Running out of design time. Remember, we can still work over the summer.
- We can't change the piston when we get it.
- Critical path needs to be shortened.
- We need to do break calculations

Lessons Learned (additive each week)

-Pugh chart analysis. We learned that we needed to focus more on the datum we choose. (3/6)

-Because we are such a big team, some things are better when we split up and some are not. More concrete solution we can break out. Brainstorming we need to do with group. (3/6)

-In calculating Spring Constants, we discovered that they are significantly higher than we thought. Scale the pressure, not the displacement in the prototype. (3/8)

-Before we break for the summer, the team will create a report/document that summarizes where we are.

- Lead time on ordered items is longer than expected.
- Err on the side of caution when testing the PoC and the final product
- Don't subject PVC to high pressure air.
- We didn't need to make a piston for the POC. But added risk of breaking the string. We did increase safety of not using pressures.
- We need to be concerned about lead time on piston, components.
- Always double-check your equations.