Hozhoni Foundation Button Maker

Progress Presentation, ME 486C
Dr. Sarah Oman

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Sponsor and Client:

Current Sponsors:

- W. L. Gore and Associates

Client:

- Hozhoni foundation

Stakeholders:

- Hozhoni Clients who will use the button-maker to generate income

Project Description

- Modify Button Making Press at Hozhoni.
- Goal is to create more jobs for Hozhoni's clients.
- Objective is to design a product that's more accessible to Hozhoni's clients.
- Current design requires a lot of physical dexterity.
- Break down: Cutting, Alignment, and the Actuation Methods (Hand and Arm).

Abdulah Almerri

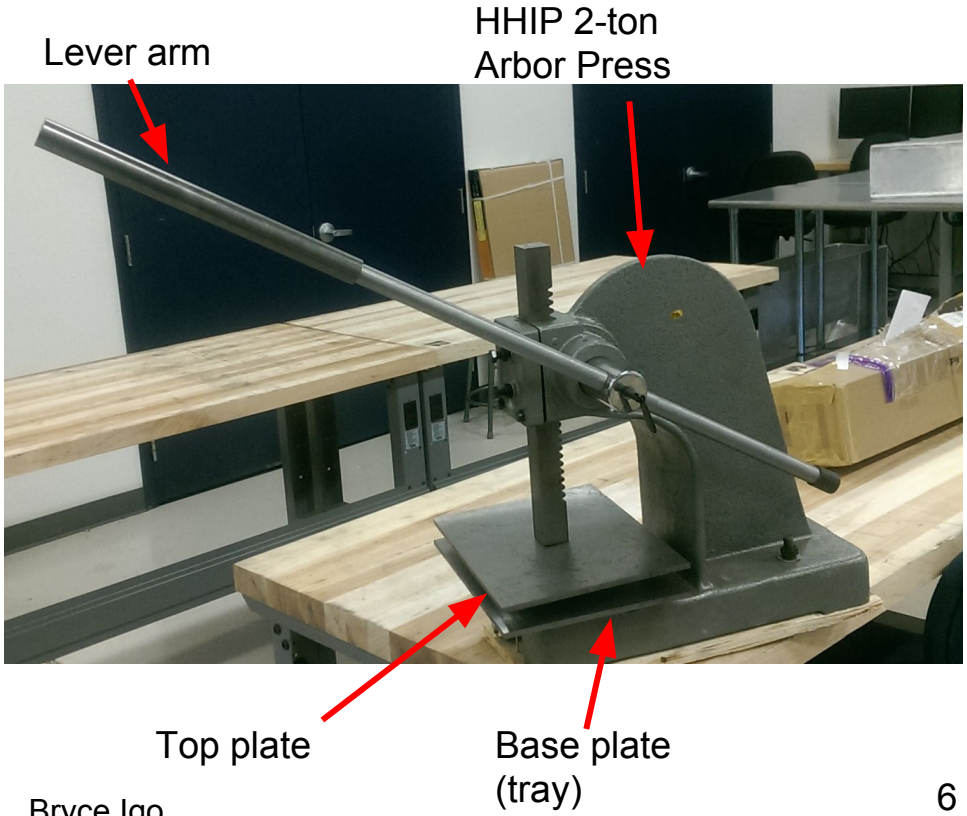
Project Description: Update and Changes

- The team is still pursuing the original goal of providing The Hozhoni Foundation with an improved button making process, including a mechanical cutting device, alignment aids for the button maker, and improved actuation mechanisms for the device.
- Customer Requirements have not changed
- Input from the customer has assisted the team in adding important features, such as enabling rotation of the button maker dies.

Design Descriptions: Cutting

Modified arbor press:

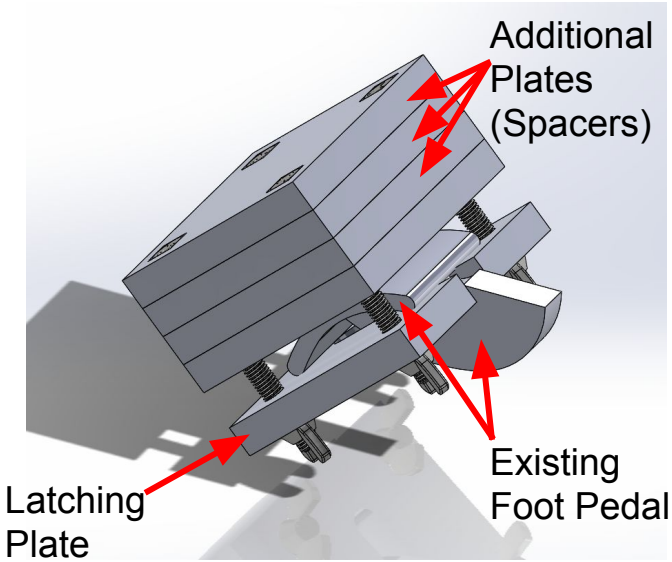
- Cut multiple pieces of paper
- Cut all 6 images at once
- New dies from Apple Dies



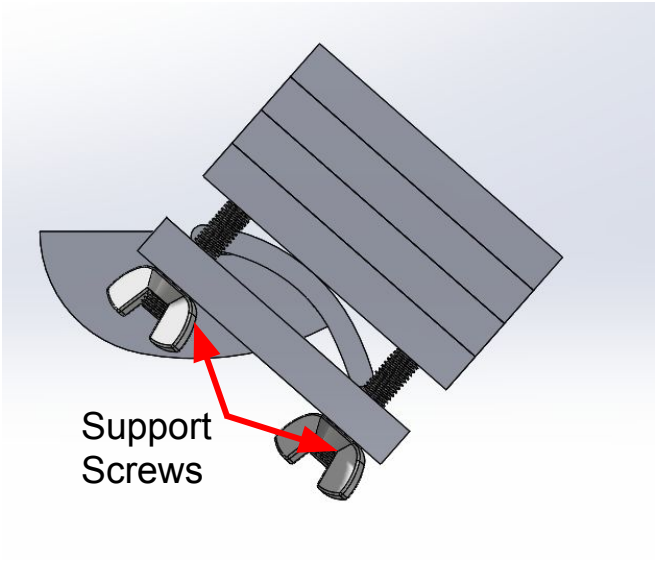
Design Description: Actuation of the Button Maker

For Foot Actuation:

- Add foot lever
- Removable



3D

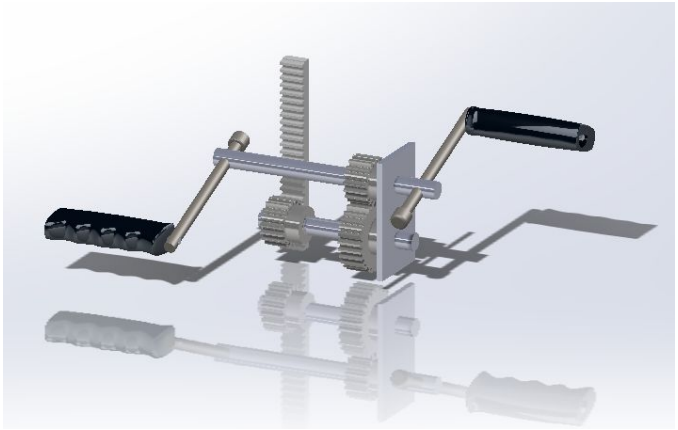


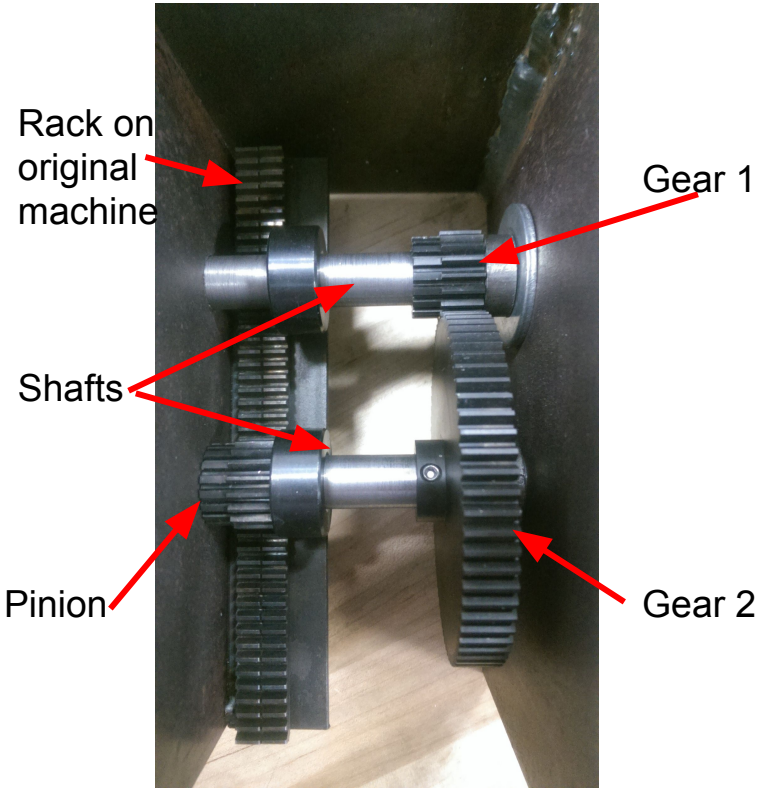
Side

Design Description: Actuation of the Button Maker

For Arm Operation:

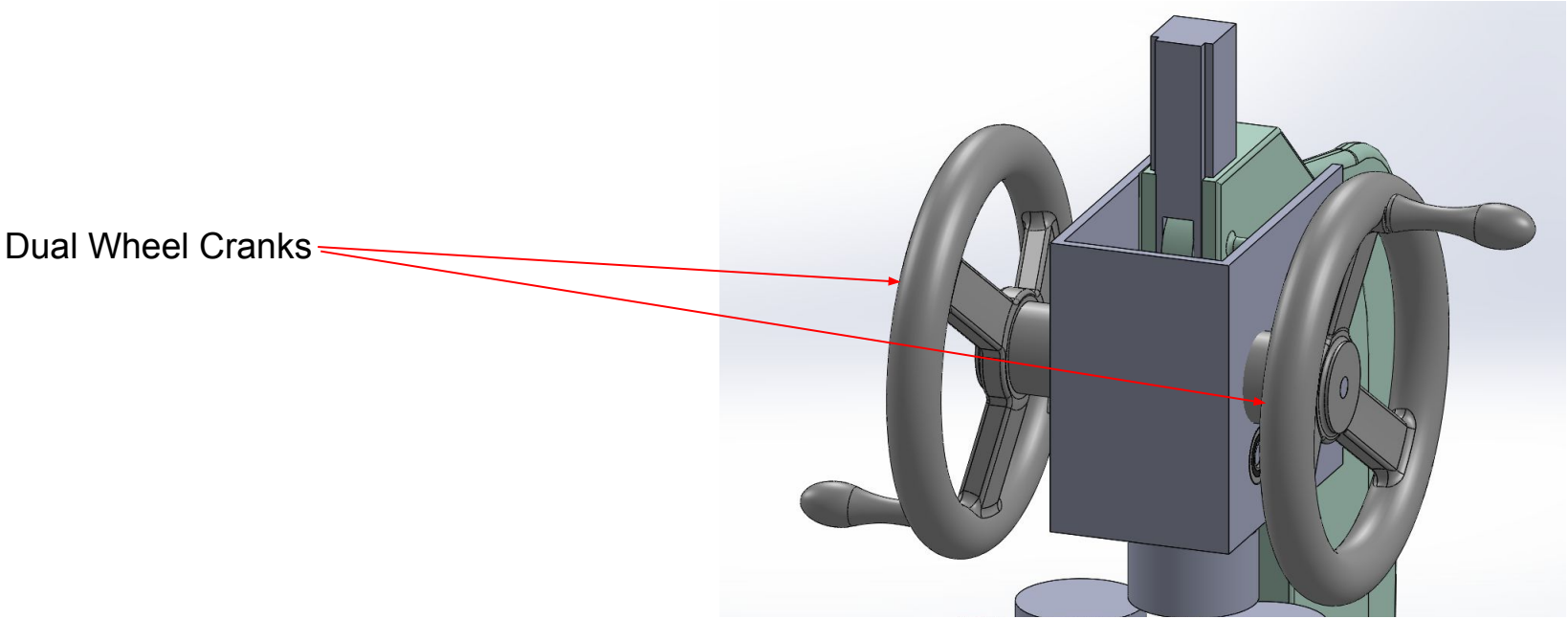
- Hand crank with front-mounted compound gear





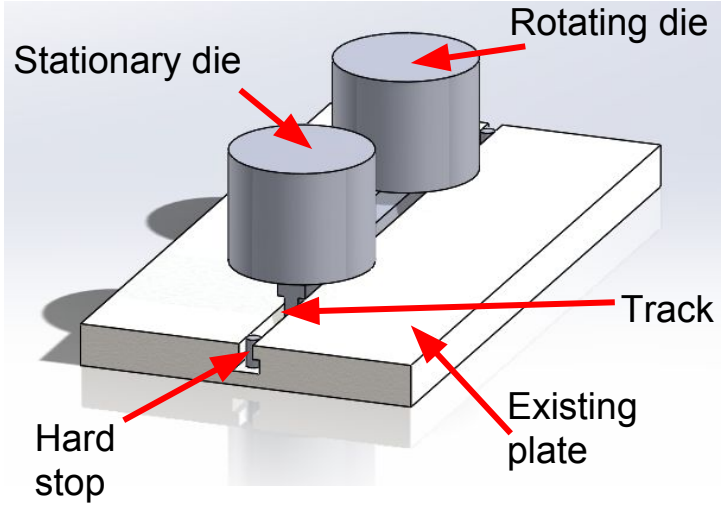
Design Description: Actuation of the Button Maker

Change Made to Gear Box: Cranks have been changed to “wheel” cranks:



Design Descriptions: Alignment of Components

- Dies will be at a fixed distance apart & move laterally with a guide.
- Right die will rotate in 6° increments. This is achieved by use of a spring-loaded bearing that will engage in between gear teeth.



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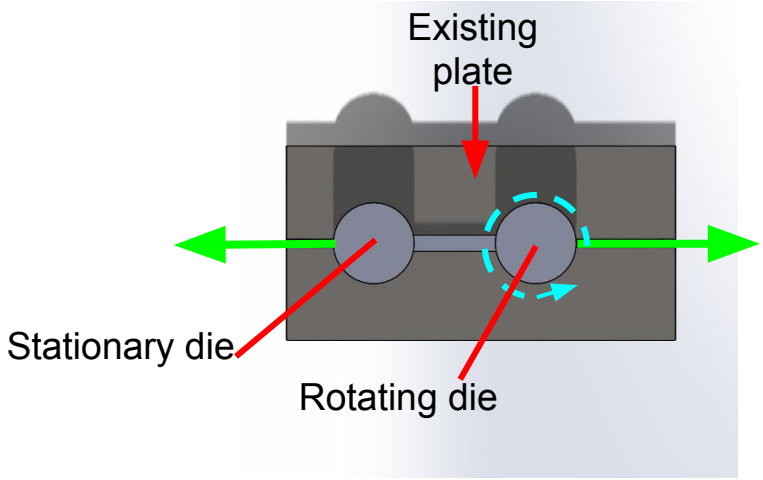
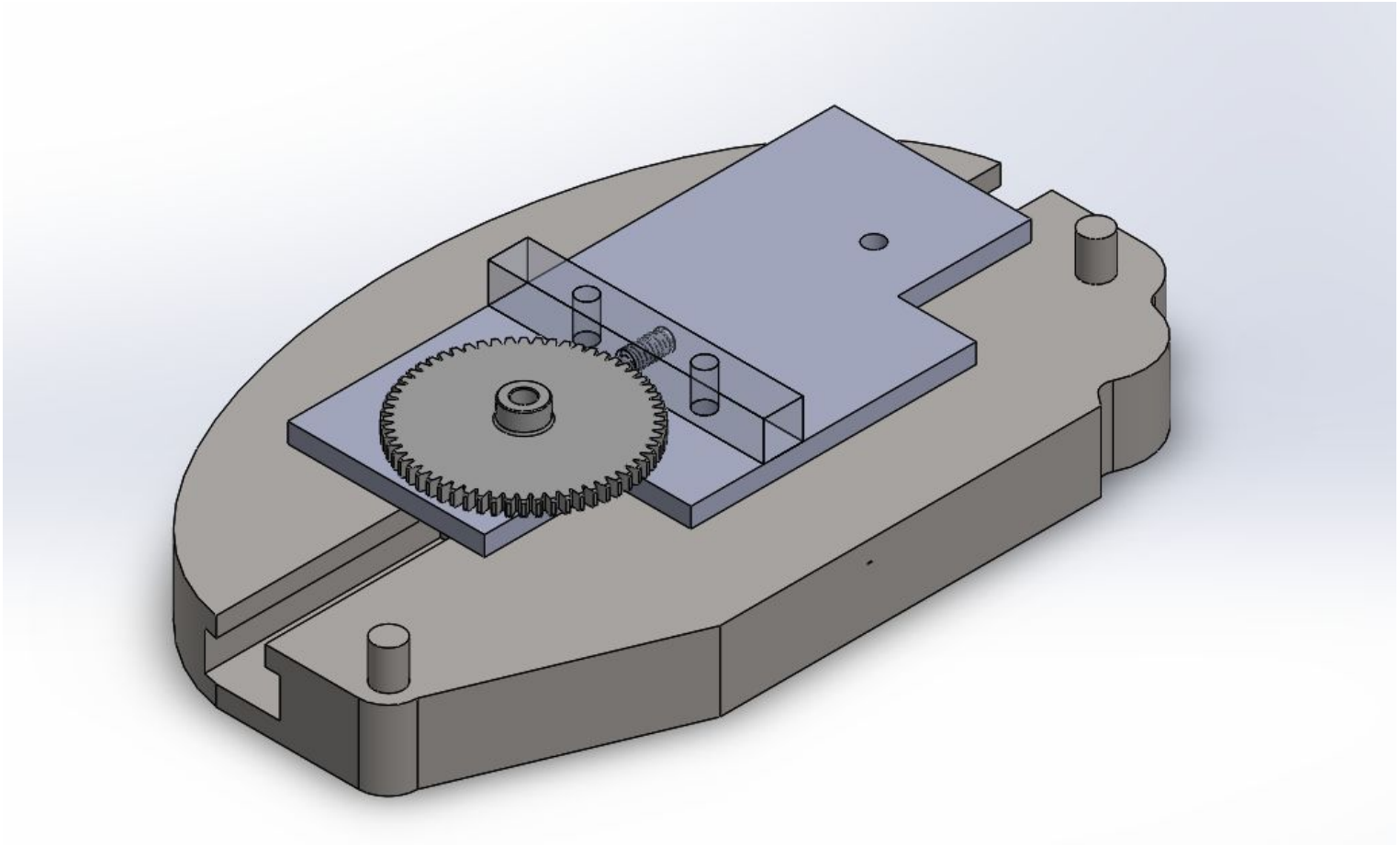


Top



Updates From Last Presentation:

1. Cutting dies that were ordered did not meet specifications and were returned.
2. Currently in process of ordering new dies.
3. Cranks on gear box are now wheel cranks
4. Gear box prototype for button press has been assembled.
5. Button maker from Hozhoni has been picked up.

Manufacturing

Currently, the team has four devices/assemblies to construct. The components for these have been bought off-the-shelf and machined by Bryce.

Off-The-Shelf components:

- CUTTING: Arbor Press, Cutting Dies
- ALIGNMENT: spring plunger, pins, dies (existing), gear
- FOOT EXTENSION: threaded bolts, nuts, and traction tape
- HAND ACTUATION: all gears, handle grip

Manufacturing Plan: Machining

The Following Components will be manufactured by machining the raw materials (as indicated in the BOM):

- Cutting:
  - The table plate will be cut from nylon sheet
- Alignment
  - the base plate will be cut from nylon block
- Foot Extension
  - the extension will be made by stacking cut, 0.75” thick plywood blocks
- Hand Crank
  - All shafts and the arm crank have been cut from 0.75” diameter, 304 plain carbon steel rods
  - Box plate cut from 0.25” thick plain carbon steel

Moving Forward: Remaining Assembly

Cutting:

- Top plate needs to be fixed on arbor press shaft.
- Base plate needs to be fixed to base of arbor press.

Alignment:

- T-groove needs to be filed and cleaned out on button press.
- Ratchet gears need to be attached to dies.
- Assembly of the sliding dies.

Continue...Moving Forward: Remaining Assembly

Hand Crank:

- Attach gear box to button press.

Foot Press:

- Assemble a base plate and “extender” attachments.

Design Testing/Design of Experiments:

Design of Experiments (DOE): Cutting

Determine how many images the arbor press can cut with all 6 dies attached to them for each lever pull.

- Vary lever arm length, number of sheets in tray, and thickness of cutting dies

Other Testing: Hand crank

- Determine if crank can fully press a button using multiple persons of different strength, height, and dexterity.

Responsibilities left:

Abdul: Maintaining the website, assembling the foot extension.

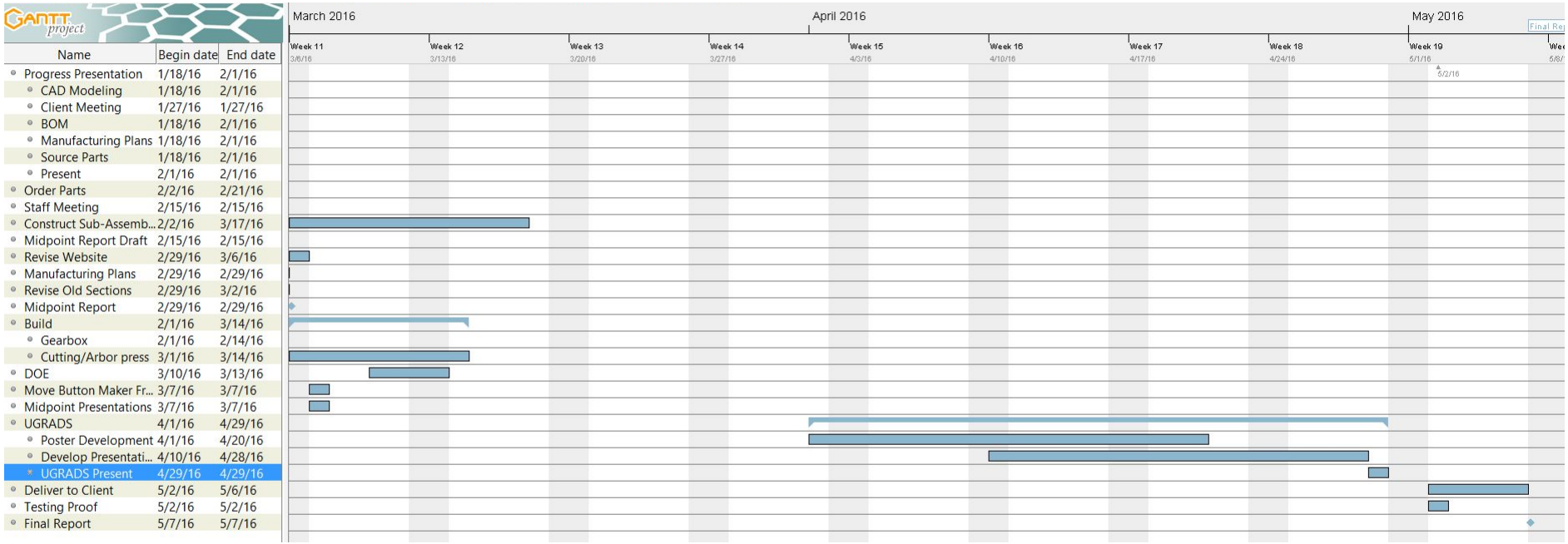
Bryce: Attach gear box to button press shaft.

Dylan: Assembling alignment mechanism: file T-grove, attach dies to gears.

Kristen: Implementing testing for the arbor press and hand crank, statistical analysis of cutting process testing

Ryan: Assembling the cutting mechanism on the arbor press.

Schedule: Gantt Chart



Name	Begin date	End date
Progress Presentation	1/18/16	2/1/16
CAD Modeling	1/18/16	2/1/16
Client Meeting	1/27/16	1/27/16
BOM	1/18/16	2/1/16
Manufacturing Plans	1/18/16	2/1/16
Source Parts	1/18/16	2/1/16
Present	2/1/16	2/1/16
Order Parts	2/2/16	2/21/16
Staff Meeting	2/15/16	2/15/16
Construct Sub-Assemb...	2/2/16	3/17/16
Midpoint Report Draft	2/15/16	2/15/16
Revise Website	2/29/16	3/6/16
Manufacturing Plans	2/29/16	2/29/16
Revise Old Sections	2/29/16	3/2/16
Midpoint Report	2/29/16	2/29/16
Build	2/1/16	3/14/16
Gearbox	2/1/16	2/14/16
Cutting/Arbor press	3/1/16	3/14/16
DOE	3/10/16	3/13/16
Move Button Maker Fr...	3/7/16	3/7/16
Midpoint Presentations	3/7/16	3/7/16
UGRADS	4/1/16	4/29/16
Poster Development	4/1/16	4/20/16
Develop Presentati...	4/10/16	4/28/16
UGRADS Present	4/29/16	4/29/16
Deliver to Client	5/2/16	5/6/16
Testing Proof	5/2/16	5/2/16
Final Report	5/7/16	5/7/16

- The team is slightly behind schedule: once the proper blades have been received, Design of Experiments can be completed. Manufacturing is otherwise on schedule.
- Manufacturing and Design of Experiments to be finished by the end of March to begin preparation for UGRADS

Budget: Bills Of Materials: Cutting

Cutting

Drawing Part #	Description	Supplier	Item Description	Item #	Lead Time	Units	Cost per unit	# needed	Total
	Arbor Press, Cast Frame	HHIP	Arbor Press 2 ton HHIP	8600-0033			$175.09	1	175.09
	Arbor Press, Shaft Pinion	HHIP	Arbor Press 2 ton HHIP	8600-0034					
	Arbor Press, Shaft Pinion	HHIP	Arbor Press 2 ton HHIP	8600-0034					
	Arbor Press, Face plate								
	Lever Arm								
	Collar								
	Handle Cap								
	Jib Plate								
	Screw, Thumb								
	Arbor Press, Ram	Midwest Metal Warehouse	Carbons Steel Grade 50			ea	$1.00	25.43	$25.43
	Table Plate	McMaster-Carr	Wear-Resistant Black Nylon Sheet, 7/64" Thick, 12" x 12"	8540K125		ea	$12.47	1	$12.47
	Blade	Joanns	TO BE RETURNED	2412914		ea	-$12.59	5	-$62.95
	Steel Dies/Blades	Apple Central				ea	$30.00	6	180
								Total Cost	**330.04**

Bills of Materials: Alignment and Foot Extension

Alignment

Drawing Part #	Description	Supplier	Item Description	Item #	Lead Time	Units	Cost per uni	# needed	Total
	Dies	Existing							
	Spring plunger	McMaster-Carr	Spring Plunger	3408A73		ea	$3.62	2	$7.24
	Base plate	McMaster-Carr	Nylon Block	8539K171		ea	$33.26	1	$33.26
	Pins	McMaster-Carr	Alloy Steel Dowel Pin, 1/4" Diameter, 3/4" Length	98381A540		25 pk	$5.40	1	$5.40
	T slot nut	McMaster-Carr		94750A584		ea	$3.17	2	$6.34
	Ratchet Gear	McMaster-Carr		6832K66		ea	$33.65	1	$33.65
								Total Cos	**$85.89**

Foot Extension

Drawing Part #	Description	Supplier	Item Description	Item #	Lead Time	Units	Cost per uni	# needed	Total
1	Foot Pad	Existing		NA	NA	NA	$0.00		$0.00
2	Bottom Plate	Home Depot	3/4 in. x 4 ft. x 4 ft. BC Sanded Pine Plywood	205999854	1 day	4x4 ft	$24.98	1	$24.98
3	Middle Plate								
4	Top Plate								
5	Threaded Bolt	McMaster-Carr	ade 5 Steel Square Head Bolt, 1/2"-13 Thread, 5" Long, Fully Thread	92327A317			$7.17	4	$28.68
6	Wing nut	McMaster-Carr	316 Stainless Steel Wing Nut, 1/2"-13 Thread Size	93575A035			$5.60	4	$22.40
7	Traction Tape	McMaster-Carr	Abrasive Antislip Tape, 4" Width x 30' Length Roll, Black	6970T151		30ft roll	$26.40	1	$26.40
								Total Cos	102.46

Bills of Materials: Hand Actuation

Hand Actuation										
Drawing Part #	Description	Supplier	Item Description	Item #	Lead Time	Units	Cost per uni	# needed	Total	
	Box Plate	Midwest Metal Warehous	1/4" plain carbon steel			ea	$25.43	1	$25.43	
	Output Shaft	Midwest Metal Warehous	3/4"Carbon Steel	3/4 rd 304 annealed		ea	$7.39	1	$0.00	donated
	Input Shaft	Midwest Metal Warehous	3/4"Carbon Steel	3/4 rd 304 annealed		ea	$7.39	1	$0.00	donated
	Smaller Gear	Rush Gear	18 tooth small gear	S10C9Z-024H018		ea	$39.27	2	$78.54	
	Larger Gear	Rush Gear	28 tooth large gear	S10C9Z-024H072		ea	$69.26	1	$69.26	
	Rack Gear	SDP	8" rack gear	A1C12-Y242		ea	$35.44	1	$35.44	
	Handle Cap	McMaster-Carr	Ribbed Finishing Plug for Tubing, Fits 3/4" Tube OD and 0.59"-0.7" T	9283K12		100 pk	$11.69	1	$0.00	
	Lever Arm	Midwest Metal Warehous	24" lever arm plain carbon steel	3/4 rd 304 annealed		ea	$29.56	1	$29.56	
	1045 Steel Rod 1' 3/4"	McMaster-Carr		8924K1		ea	$23.00	1	$23.00	
	Steel Plate	McMaster-Carr	0.25"*12"*3' A34	1388K177		ea	$168.42	1	168.42	
	Handle Crank	McMaster-Carr		6026K158		ea	$134.98	2	269.96	
								Total Cos	699.61	

Budget

The Project Budget is still $1500.00, provided by W.L. Gore and Associates.

The cutting process cost at right reflects the refund on the wrong blades and the cost for six new steel blades.

Not included in the budget is incidental hardware.

COST SOURCE	TOTAL COST TO DATE
Prototyping	$21.37
Cutting Process	$330.04
Alignment	$85.89
Actuation	$699.61
TOTAL COST	$1136.91
REMAINING FUNDS	$281.00

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Thank you for your time! We welcome your questions