Clean Dream Team

Project Manager/Document Manager: Katie Hoffman
Budget Manager/Web Designer: Hannah Reed
Client Contact/Document Manager: Daniel Marquez

Project Description

- Our objective is to design and build a clean hood and a portable clean room.

- The clean hood is to be around 2’ x 4’ x 4’ it will be designed to fit over small equipment and induce a positive pressure flow of clean air within the hood.

- The portable clean room is to be 4’ x 6’ x 7’ it will be able to be disassembled and reassembled, be carried by 3 - 4 people, and output positive pressure creating a clean environment within.

Project Description Cont.

- Our client is Aneuvas Technologies Inc., overseen by Dr. Becker. His company researches and manufactures microcatheters used in the brain.

- The project is important because it benefits the client's research and products manufactured.

Background

- Earliest known clean room was made by watchmakers in the 1850's
- During WWI was when there were new leaps on Clean Rooms
  - A ball bearing company introducing air condition in the room where they manufactured
  - There was the discovery of High Efficiency Particulate Air (HEPA) which made air in the system Laminar.
- In 1961 Willis Whitfield introduced the standards of clean rooms
  - creating a clean room that would circulate air 10 times every minute.
- In 1962 clean room rules were established
  - Creating the ISO classifications

Benchmarking

- Clean rooms will vary with customer requirements and material used.
- These clean rooms can vary from having hardwall, softwall, and visibility
- They also have the option to portable, permanent, or modular

Figure 3: Portable Clean Room [6]

Figure 4: Hard Wall Clean Room [7]

Figure 5: Softwall Clean Room [8]

Benchmarking

Portable

- Product will be able to move to different locations of interest
- Will be versatile
- Less reliable than a permanent clean room
- Has moving parts that may break down over time

Non Portable

- Will stay in a given location
- Will have a higher reliability than the portable clean room
- Will be more durable than the portable product

Customer and Engineering Requirements

Customer Requirements

- Inexpensive
- Classification
- Portable
- Positive Pressure
- Clean
- Visibility
- Durability
- Reliability
- Noise

Engineering Requirements

- Dimensions
- Pressure
- Weight
- Cost
- Assembly Time
- Power
- Number of Particles
- Velocity
- Hood Material
- Room Material
- Stress
- Frequency

House of Quality/QFD

- The top rated results of the QFD the Number of Particles, Pressure, Cost, and Material.
- Our lowest rated was Weight, Power, and Stress.
- Overall, all the requirements are still important and are considered.

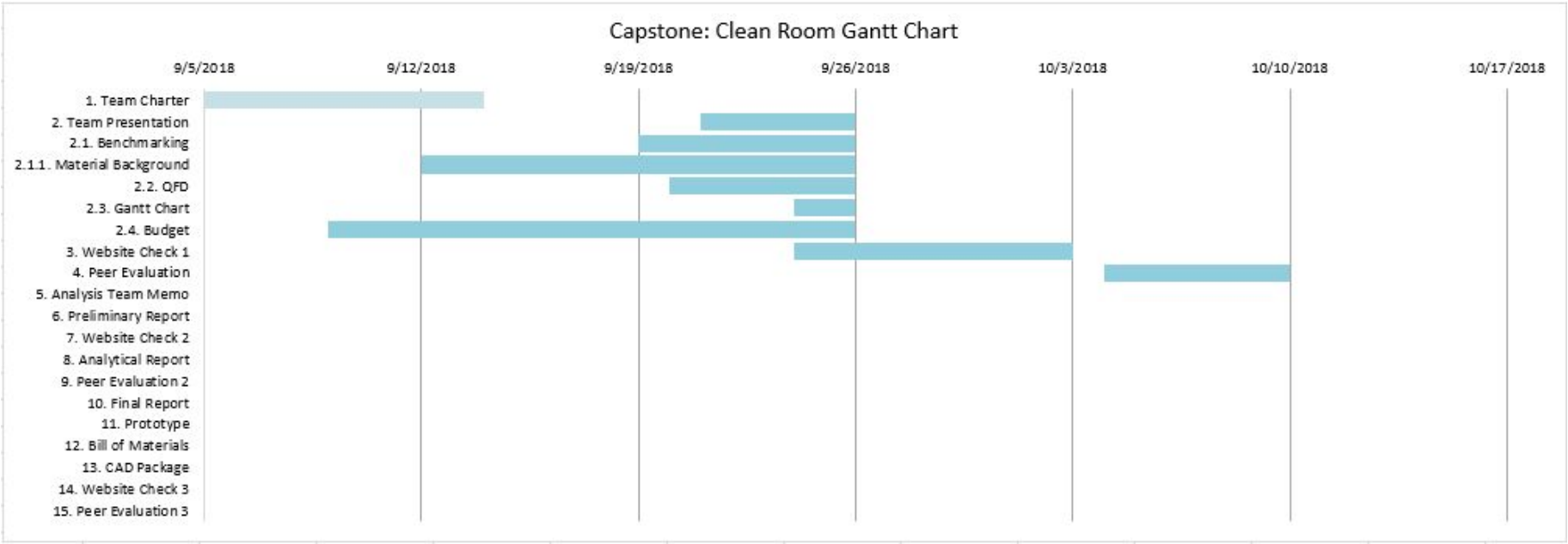
Customer Needs	Customer Weights	Dimensions -Area	Pressure	Weight	Cost	Assembly Time	Power	Number of Particles	Velocity	Hood Material	Room Material	Stress	Frequency - Sound
Inexpensive	5	3		3	9	3	1	1		9	9		1
Portable	3	9	1	3	3	9	3			1	1		
Positive Pressure	5		9		1		3	9	9			1	3
Visibility	3					3				9	9		
Clean	4	1	9		3		3	9	3	9	9		9
Reliability	3	3		1		1						9	
Durability	3	3				1				3	3	9	
Classification	5		9		9		3	9	1				9
Noise	4												9
Technical Requirement Units		m^2	Pa	kg	$$	min	W	m^3	m/s	n/a	n/a	Pa	Hz
Technical Requirement Raw Score		64	129	27	116	57	56	131	62	120	120	59	12
Relative Wieght %		6.801	13.70	2.869	12.32	6.0573	5.951	13.92	6.5887	12.752	12.75	6.269925	1.349
Target ER Values Hood		0.7432		45.36	1500	1	576	02,00	0.5	-	-		500
Target ER Values Room		2.23		54.43	1500	15	576	02,00	0.5	-	-		500
Rank Order		6	2	11	5	9	10	1	7	3	4	8	12

Schedule: Gantt Chart

CAPSTONE: CLEAN ROOM
Team Members
Katie Hoffman
Daniel Marquez
Hannah Reed

TASK NAME	ASSIGNED TO	START DATE	DUE DATE	DURATION	% DONE	DESCRIPTION	SPRINT/MILESTONE
1. Team Charter	Team	9/5/2018	9/14/2018	9	100	Document contains team guidelines	Phase 1
2. Team Presentation	Team	9/21/2018	9/26/2018	5		Presentation of Current Research	Phase 2
2.1. Benchmarking	Daniel	9/19/2018	9/26/2018	7		Compare concept ideas to actual products	Phase 2
2.1.1. Material Background	Team	9/12/2018	9/26/2018	14		Research materials for construction	Phase 2
2.2. QFD	Katie	9/20/2018	9/26/2018	6		Compares CR's and ER's	Phase 2
2.3. Gantt Chart	Hannah	9/24/2018	9/26/2018	2		Organizes task to be completed	Phase 2
2.4. Budget	Hannah	9/9/2018	9/26/2018	17		Proposes how to spend allotted money	Phase 2
3. Website Check 1	Hannah	9/24/2018	10/3/2018	9		Check for web creation	Phase 2
4. Peer Evaluation	Team	10/4/2018	10/10/2018	6		Evaluate peer performance	Phase 2
5. Analysis Team Memo	Team	TBD	TBD	#VALUE!			Phase 3
6. Preliminary Report	Team	TBD	TBD	#VALUE!			Phase 3
7. Website Check 2	Hannah	TBD	TBD	#VALUE!		Check for web creation	Phase 3
8. Analytical Report	Team	TBD	TBD	#VALUE!			Phase 3
9. Peer Evaluation 2	Team	TBD	TBD	#VALUE!		Evaluate peer performance	Phase 3
10. Final Report	Team	TBD	TBD	#VALUE!			Phase 4
11. Prototype	Team	TBD	TBD	#VALUE!		Working Prototype of design	Phase 4
12. Bill of Materials	Team	TBD	TBD	#VALUE!			Phase 4
13. CAD Package	Team	TBD	TBD	#VALUE!		CAD drawing and 3D design	Phase 4
14. Website Check 3	Hannah	TBD	12/13/2018	#VALUE!		Check for web creation	Phase 4
15. Peer Evaluation 3	Team	TBD	12/13/2018	#VALUE!		Evaluate peer performance	Phase 4

Gantt Chart


Capstone: Clean Room Gantt Chart
9/5/2018
9/12/2018
9/19/2018
9/26/2018
10/3/2018
10/10/2018
10/17/2018
1. Team Charter
2. Team Presentation
2.1. Benchmarking
2.1.1. Material Background
2.2. QFD
2.3. Gantt Chart
2.4. Budget
3. Website Check 1
4. Peer Evaluation
5. Analysis Team Memo
6. Preliminary Report
7. Website Check 2
8. Analytical Report
9. Peer Evaluation 2
10. Final Report
11. Prototype
12. Bill of Materials
13. CAD Package
14. Website Check 3
15. Peer Evaluation 3

Budget

Clean Room Team

2x3 Portable Hood Expense Budget

Brief Description	Quantity	Price Per	Total Price
Fan Filter Unit, HEPA, 120VAC/60Hz, 2' x 4', WhisperFlow	1	$ 776.00	$ 776.00
Polycarbonate 48x144x0.125	1	133.5	$ 133.50
External Fan Structure Aluminum Struts	1	75.42	$ 75.42
Plastic Sheet Cutting	1	20	$ 20.00
Aluminum Jointers	4	8	$ 32.00

Allotted Money	$ 1,500.00
Total Expenses	$ 1,036.92
Remaining Funds	$ 463.08

Clean Room Team

2x4 Portable Hood Expense Budget

Brief Description	Quantity	Price Per	Total Price
Fan Filter Unit, HEPA, 120VAC/60Hz, 2' x 4', WhisperFlow	1	$776.00	$776.00
Polycarbonate 48inx144inx0.125in	1	133.5	$133.50
External Fan Structure Aluminum Struts	1	81.92	$ 81.92
Plastic Sheet Cutting	1	20	$ 20.00
Aluminum Jointers	4	8.5	$ 34.00

Allotted Money	$ 1,500.00
Total Expenses	$ 1,045.42
Remaining Funds	$ 454.58

Budget

Clean Room Team

Portable Room Expense Budget

Brief Description	Quantity	Price Per	Total Price
Fan Filter Unit, HEPA, 120VAC/60Hz, 2' x 4', WhisperFlow	2	$776.00	$ 1,552.00
Clean Room Framing, Aluminum struts	1	436	$ 436.00
Plastic screening	5	16	$ 80.00
24inx48inx0.25	1	69.08	$ 69.08
Plexyglass 48inx120inx0.125in	1	159.5	$ 159.50
External Fan Structure Aluminum Struts	1	75.42	$ 75.42
Plastic Sheet Cutting	1	20	$ 20.00
Aluminum Jointers	16	8.5	$ 136.00

Allotted Money	$ 2,500.00
Total Expenses	$ 2,528.00
Remaining Funds	$ (28.00)

2’ X 3’ Fan Filter Unit

- Terra Universal
- 3 - speed blow motor
- Power: 60Hz
- Weight 53lbs
- CFM (m^3/hr) ~ 600
- FPM (m/s) ~120
- Amps 4.8
- HEPA - 99.99% efficient
- Rated at particles 0.3 micrometers diameter

Figure 1: 2X3 Fan Filter Unit [4]

2x4 Fan Filter Unit

- Clean Pro
- N310 blow motor
- Power: 60Hz
- Weight 60lbs
- CFM - 400 - 750
- FPM ~ 90
- HEPA - 99.99% efficient
- Rated at particles 0.3 micron

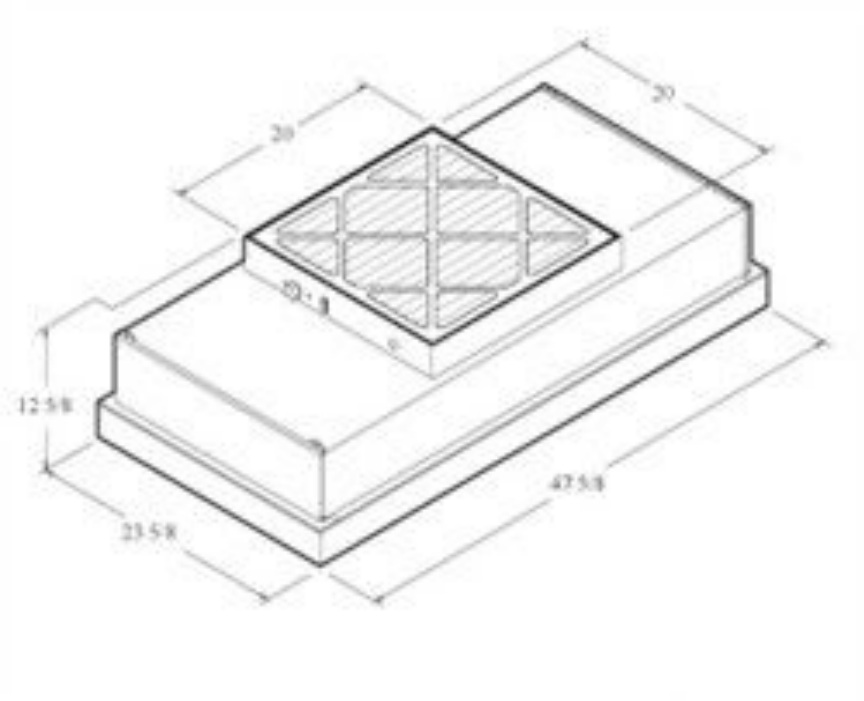


Figure 2: 2X4 Fan Filter Unit [3]

Continued Work

- Meeting client on 10/05/2018 at Dr. Becker's lab
- Obtain measurements of equipment and room
- Finalize Concept generations

References

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[4] “Fan Filter Unit, HEPA, 120VAC/60Hz, 2' x 4', WhisperFlow, w/o Power Cord,” s. [Online]. Available: https://www.terrauniversal.com/product/6601-24-H-NC. [Accessed: 26-Sep-2018].

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[7] “Home,” *s*. [Online]. Available: https://www.terrauniversal.com/cleanrooms/valuline-softwall-cleanroom.php. [Accessed: 26-Sep-2018].

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