Portable Sanitization Chamber

Concept Generation and Selection

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Overview

- Introduction
- Concepts
 - o Autoclave
 - $_{\circ}$ Chemical
 - o Lasers
 - o Infrared
 - \circ UV Lights
- Decision Matrix
- Conclusion

Introduction

- W.L. Gore
- Develop a portable sanitization process that disinfects bioburden amounts past acceptable levels.
- Constraints
 - \circ Portable
 - o Safe
- Cost is under \$3,000
- Design Completion date: December 4, 2013

Autoclave Sanitization

- More penetrative power than dry air
- Above 121° C for at least 15 mins
- Above 135° C for at least 3 mins

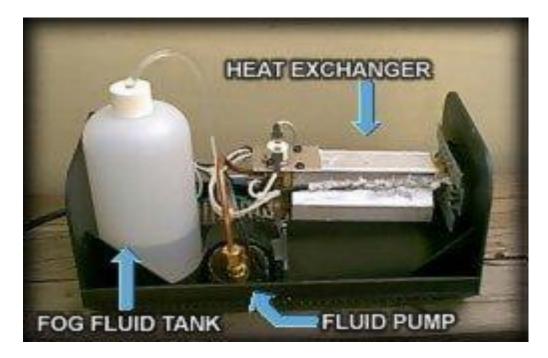
Autoclave Sanitization

- Economically inefficient
- Meet heat tolerant requirement
- Scale deposition

Chemical Processes

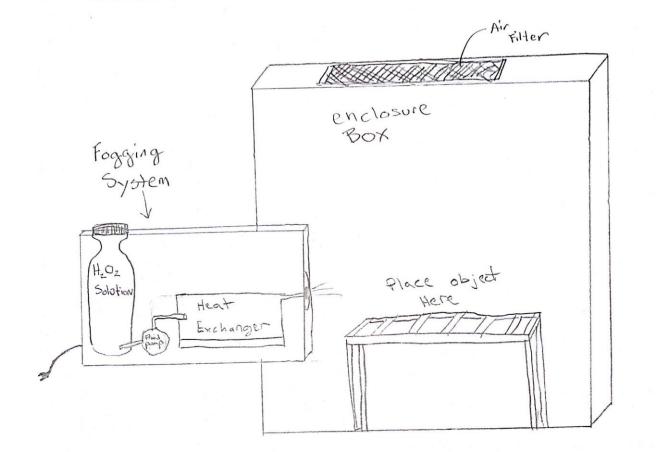
- Most chemicals can kill 99% of bacteria
- Dry fog chemical sanitization
- Hydrogen Peroxide is the safest chemical
- Entire rooms can be cleaned in 15-30 minutes

Vaporized Hydrogen Peroxide

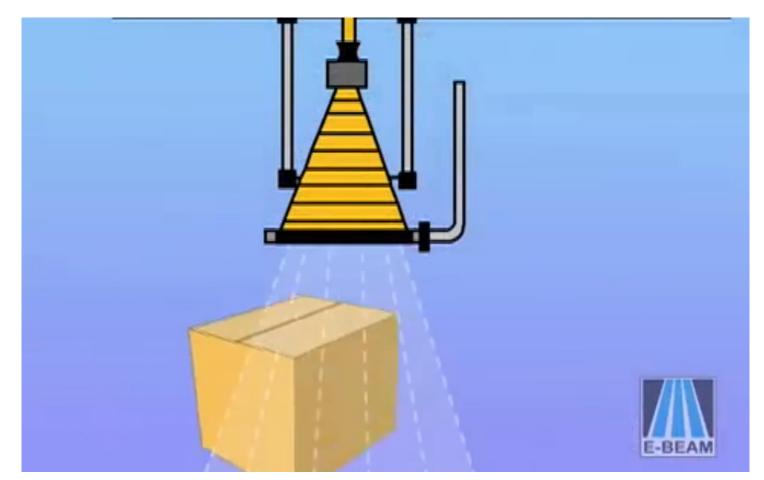


Courtesy of http://www.gotfog.com

Hydrogen Peroxide Process



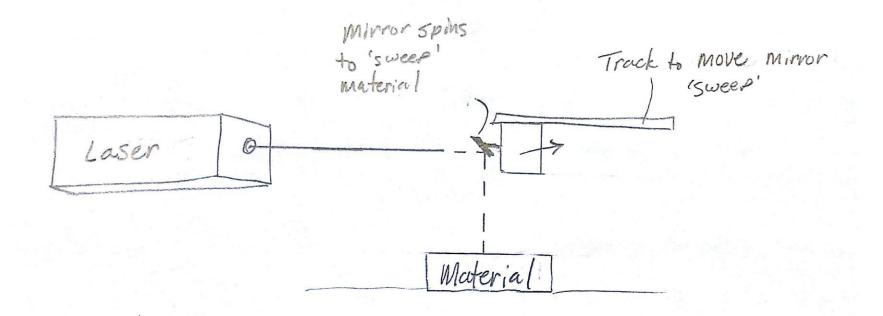
Electron Beam and Laser



Coutesy of www.ebeamservices.com

Bobby Beauchamp

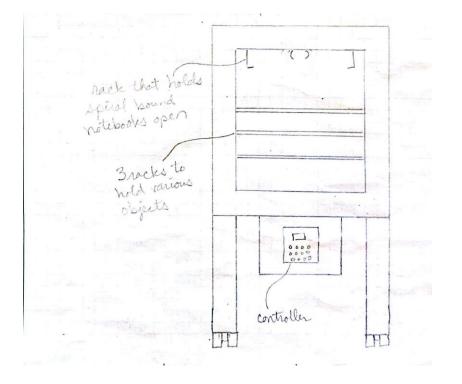
Electron Beam and Laser



Electron Beam and Laser

	Electron Beam	Laser					
	- sanitizes through items	- relatively low power					
Pros	- very fast	- quick					
Pros	- does a large variety of materials	- does various materials					
	- Zero prep is needed for materials	- Already used by dentists					
	-May not be able to produce on a small scale	-May be cost prohibitive					
Cons	- Complicated control systems	- Power requirements are different for various lasers/wavelengths					
	- Cost	- Doing large items may take too much time					
	- Safety to the user	- only surface sanitized					

Infrared Radiation



 Utilizes specific wavelength

 Sanitizes through heat application

Infrared Radiation

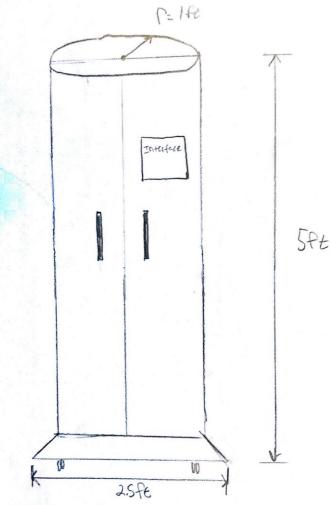
• Advantages:

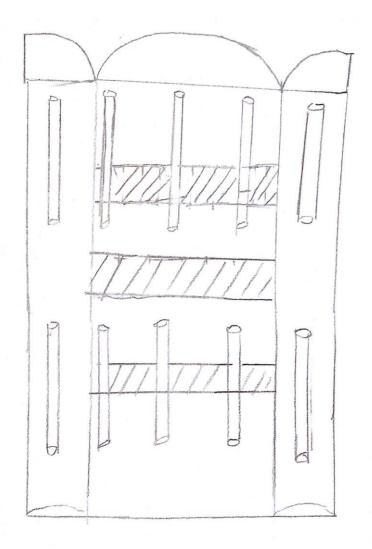
- $_{\circ}$ Low cycle time
- \circ Compact
- Minimum maintenance
- Ease of use
- Disadvantages:
 - Cost to produce
 - $_{\circ}$ Power required
 - Material incompatibility

Ultraviolet Light

Advantages	Disadvantages
Maximum kill potential occurs within 2-15 minutes depending on virus or microorganism	Over exposure of UV rays will cause damage to humans
Can adjust light sensitivity to produce better results	Effectiveness of UV light lessens over time
Cost effective	May damage rubber, paper and plastic over time
Sanitize all surfaces	Must clean UV light bulbs regularly

Ultraviolet Light





Decision Matrix

	Safety	Material Compatibility	Maintenance	Cycle Time	Cost	Power Required	Total
Autoclave	0	-1	1	1	1	-1	0.14
Chemical Process	0	1	0	1	1	1	0.57
Lasers	1	1	1	0	-1	1	0.62
Infrared Radiation	0	-1	1	1	0	-1	0.05
UV Light	1	1	0	0	1	1	0.67
Weights	29%	24%	14%	19%	10%	5%	

Project Plan

	GANTT project		2013	2013 Concept Selection									
ut.	Name	Begin	End date week 37	Week 38 9/15/12	Week 39 9/22/13	Week 40 9/29/13	Week 41 10/6/10	Week 42 10/13/13	Week 43 10/20/13	Week 44	Week 45	Week 48	Week 47
9	Preliminary Design	9/11/13	and the second sec	80.0014	arease 14	Rentz	Terw Iv	19710012	Tercearr 14	Imaticle	Therie	1 M Bey Se	
1	9 • Research	9/11/13	CONTRACTOR OF THE OWNER		-	_	-	_	-	•			
.1.1	 Sanitization Method 	is 9/11/13	10/25/13					_		-			
1.2	Existing Designs	9/11/13	10/25/13										
1.3	Programming	10/10/13	10/25/13				-						
1.4	e Electical Systems	10/10/13	10/25/13				-						
1.5	Medical Environme	e10/10/13	10/25/13				-						
2	9 • Needs & Specification	s 9/25/13	10/8/13		_								
2.1	Client Needs	9/25/13	10/8/13		-								
22	Objectives	9/25/13	10/8/13		-								
2.3	Constraints	9/25/13	10/8/13		=								
3	9 Concept Generation	10/28/13	10/29/13							i i i i i i i i i i i i i i i i i i i			
3.1	 Brainstorm 	10/28/13	10/29/13										
3.2	 Concept Selection 	10/29/13	10/29/13							٠			
.4	9 • Engineering Analysis	10/30/13	11/18/13							-	Const.		_
.4.1	 Solid Works 	10/30/13	11/18/13										
.4.2	 System Analysis 	10/30/13	11/18/13										
5	Cost	11/6/13	11/18/13										
	 Build Prototype 	1/8/14	3/10/14										
	 Test Prototype 	3/11/14	4/8/14										
	Final Prototype	4/14/14	5/1/14										

Conclusion

Through research and decisive reasoning we were able to narrow down our process to a chemical and UV light process.

This is so we could effectively sanitize materials that are porous and require penetrative sanitization.

References

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