

BME 400 - Silicone Oil Applicator

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Overview

- Background
- Problem Statement
- Existing Devices
- Design Specifications
- Designs
- Design Matrix
- Final Design
- Future Work

Background

- Silicone oil aerosol spray is widely used as a lubricant in medical industry.
- Used by anesthesiologists
- Lubricant applied to inside and outside of tubes during operations



Figure 1 – RUSCH silicone oil lubricant aerosol spray (“Rusch Silkospray”, 2011)

Some Devices Needing Lubrication

- Fiber optic bronchoscopes
- Single and double lumen endotracheal tubes
- Airway exchange catheters
- Aintree intubation catheters
- Laryngeal mask airways
- Bronchial blockers



Figure 2 – Bronchoscope

Problem Statement

- Current method of application causes:
 - Slippery work environment
 - Risk for cryogenic burns
 - Release of particles into air that can be inhaled
- A different effective method of applying the silicone oil lubricant is sought.



Existing Devices

- Do not work with lubricant UW hospital uses
- Expensive



Figure 3 – Brush applicator for silicone oil lubricant (Tool Shack, 2011)



Figure 4 – Syringe Lubricant Applicator (High Island Health, 2011)

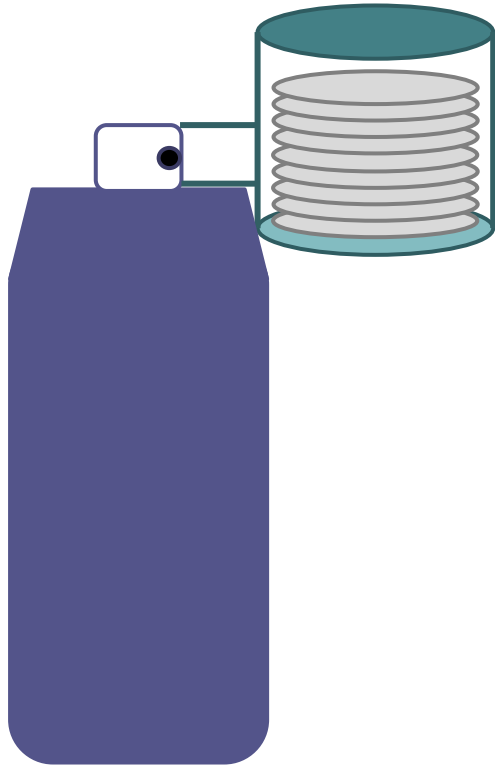


Figure 5 – Automatic silicone oil spray chamber (McClellan Automation System, 2011)

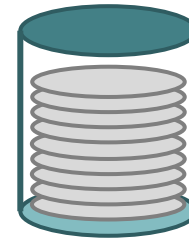
Motivation & Client Requirements

- Eliminate/reduce potential hazards in the OR
- Compatible with the current spray
- Coat inside and outside of a tube/scope
- Portable

Design I: Disposable Pads Design



The piece is mounted to the can with an adapter



Detachable piece with pre-made pads to lubricate the scope



A flexible rod with a hook to attach the pads to reach inside of a tube

Design I: Evaluation

- **Pros:**
 - Works with current spray
 - Can lubricate inside and outside
 - Minimizes overspray
- **Cons:**
 - Hard to use hook
 - Potential contamination concerns
 - Pressure concerns

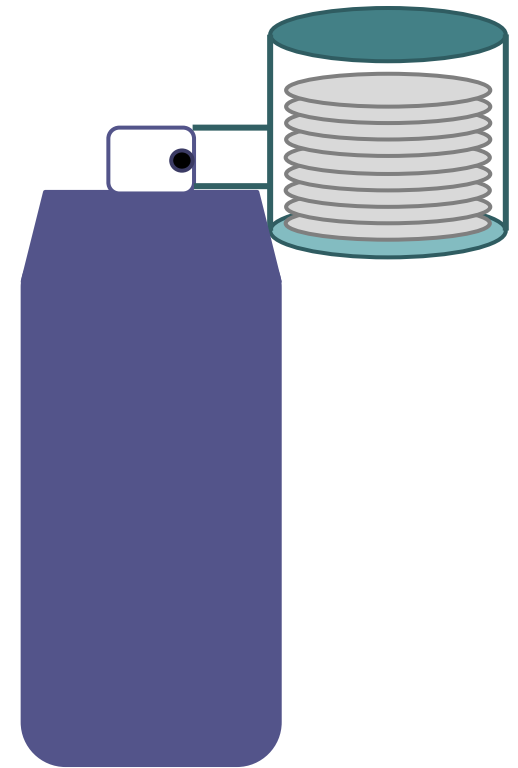
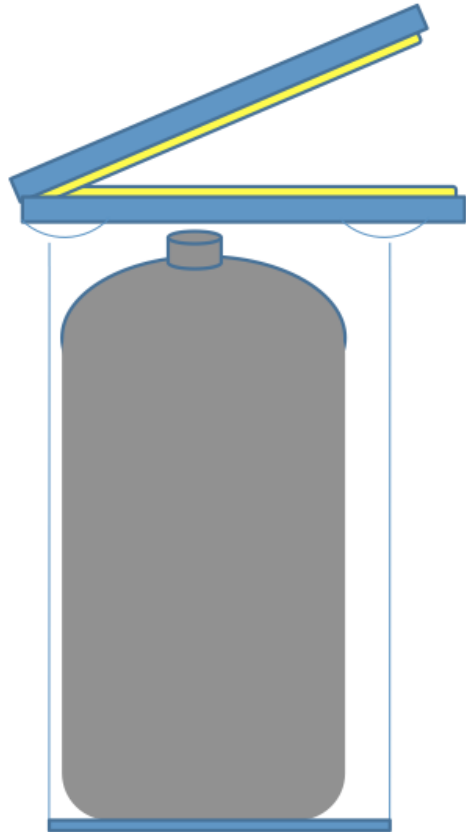
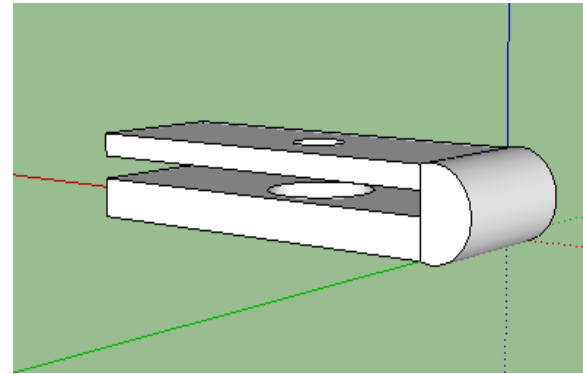


Figure 6 – The disposable pad design

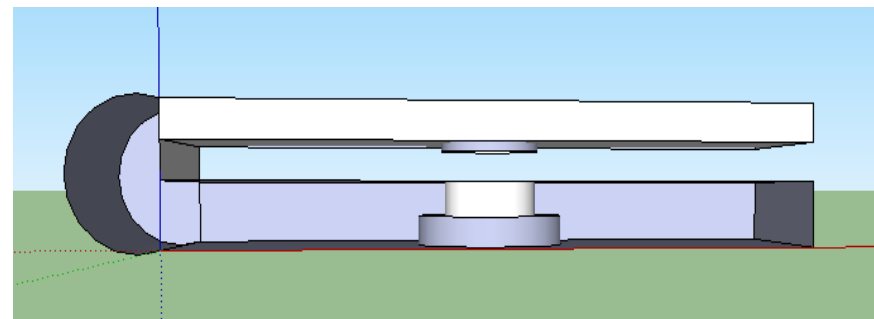
Design II: Clamp Design



A clamp adaptor with stripe to prevent tipping



3D image of the clamp adaptor: pads fit in the middle of the clamp



Side view of the clamp: the lubricant shoots out from the bottom of the clamp

Design II: Evaluation

- **Pros:**
 - Works with current spray
 - Adequately covers outside of tubes
 - Reduces/removes overspray
- **Cons:**
 - Need to replace sponges
 - Cap would need to be redesigned

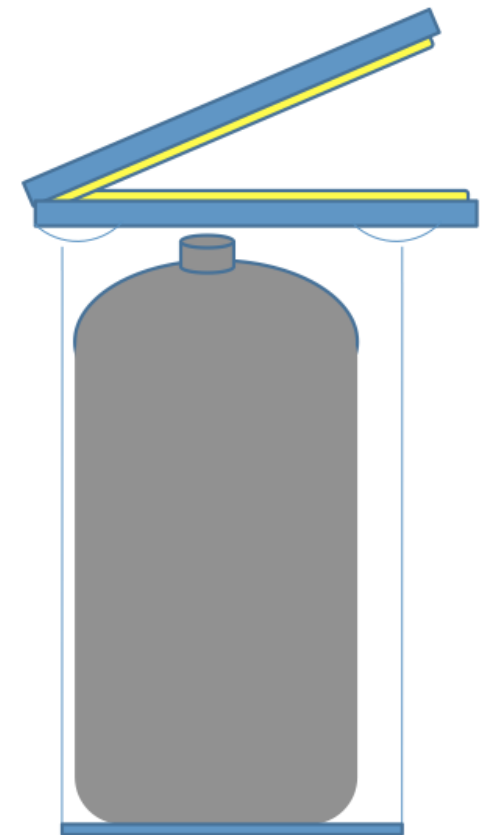
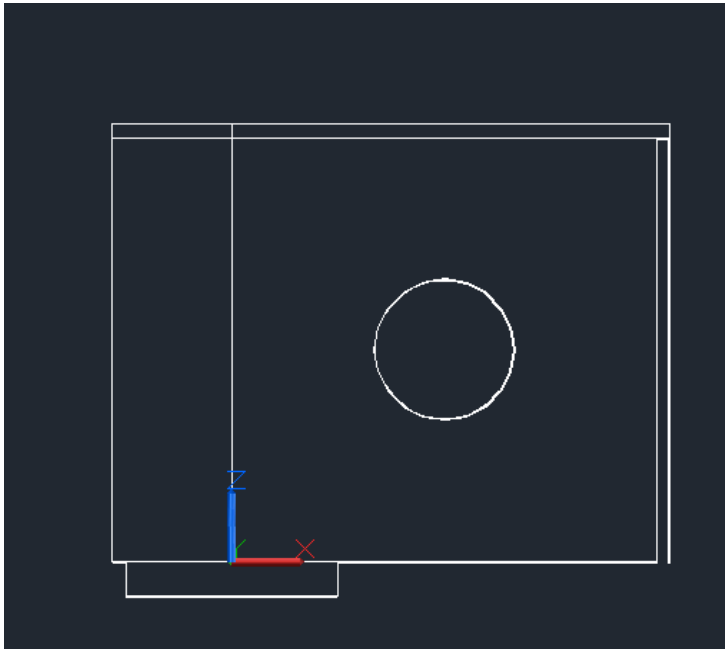
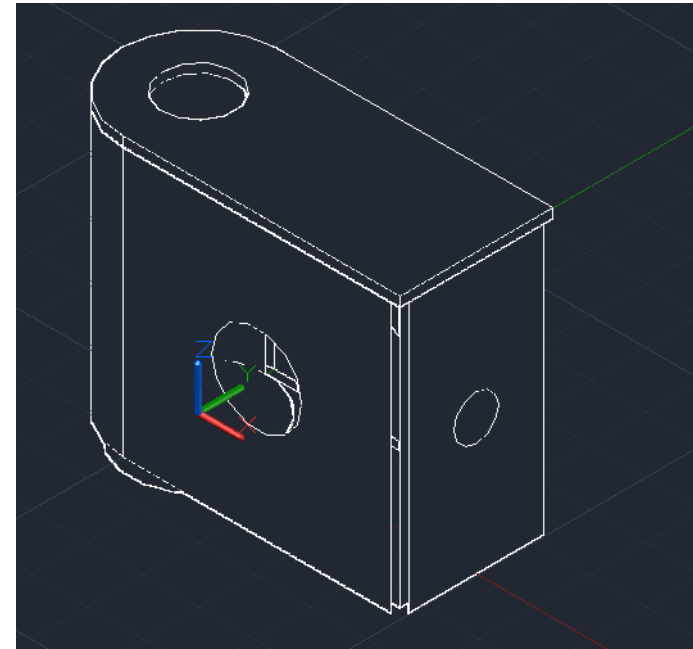


Figure 7 – The clamp design

Design III: Enclosed Box Design



Side view of the box: the lubricant aerosol spray is enclosed inside of the box



3D image of the box: 2 holes on the sides for lubricating the outside of a scope; and 1 hole in front of the aerosol spray for lubricating the inside of a tube.

Design III: Evaluation

- **Pros:**
 - Works with current spray
 - Minimizes overspray
 - Can lubricate inside and outside

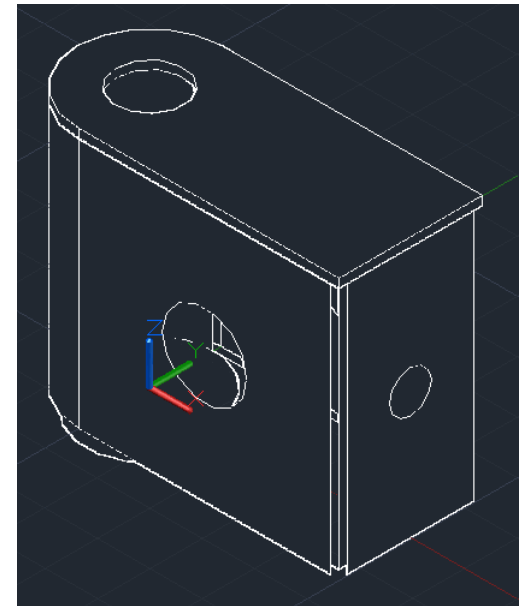


Figure 8 – The enclosed box design

- **Cons:**
 - Spray might not coat inside of a tube adequately

Design Matrix

Criteria		Possible Designs		
Considerations	Weight	Disposable Pads	Clamp	Enclosed Box
Compatibility with container	20	14	14	20
Contain spray	20	20	16	18
Ease of use	10	8	7	9
Portability	10	7	9	9
Ability to coat inside of a tube	20	15	10	18
Ability to coat outside of a tube	20	20	20	20
Total	100	84	76	94

Final Design - The Enclosed Box

- Connects to can using same mechanism as cap
- Allows coating of inside and outside of tubes
- Removes overspray

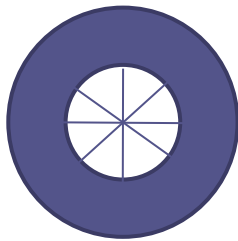


Figure 9 – Gasket to cover hole

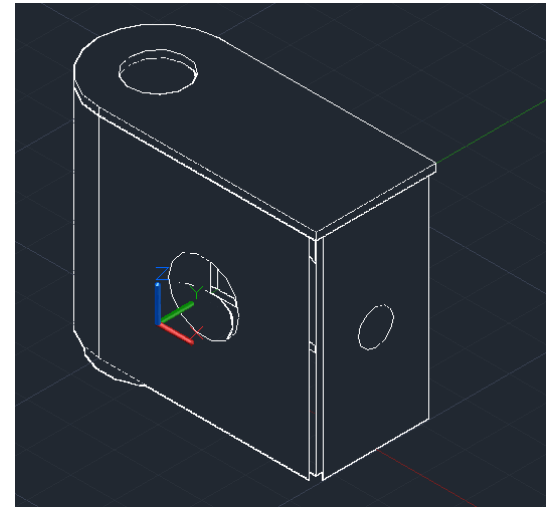


Figure 10 – The box design (a different side view)

Future work

- Determine materials for final product
- Finalize 3D AutoCAD drawing
- Manufacture prototype
- Testing device

References

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Questions?

