

BME 400 - Silicone Oil Applicator

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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)

Frequency of Use

- Within the UW-Hospital alone:
 - 15 times per week

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

Dimensions of Tubes

- Devices needing inside coated with spray
 - Longest length=35cm
 - Internal diameters from 2.5-9mm
- Devices needing outside coated with spray
 - Outer diameters from 3-14mm
 - Range of lengths

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



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

- Do not work with lubricant UW hospital uses
- Expensive



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

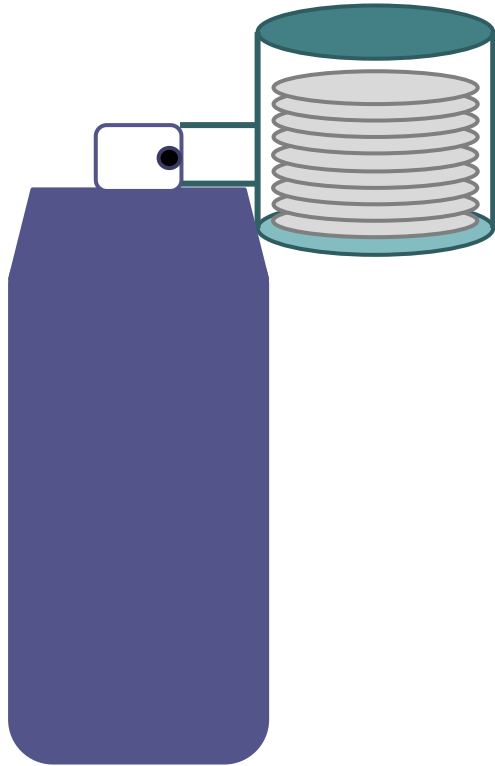


Figure 5 – Automatic silicone oil spray chamber (McClellan Automation System, 2011)

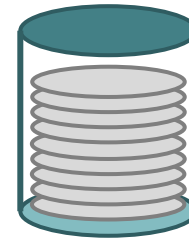
Motivation & Client Requirements

- Eliminate/reduce hazards in the OR
- Compatible with the current spray
- Coat inside and outside of various devices
- 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

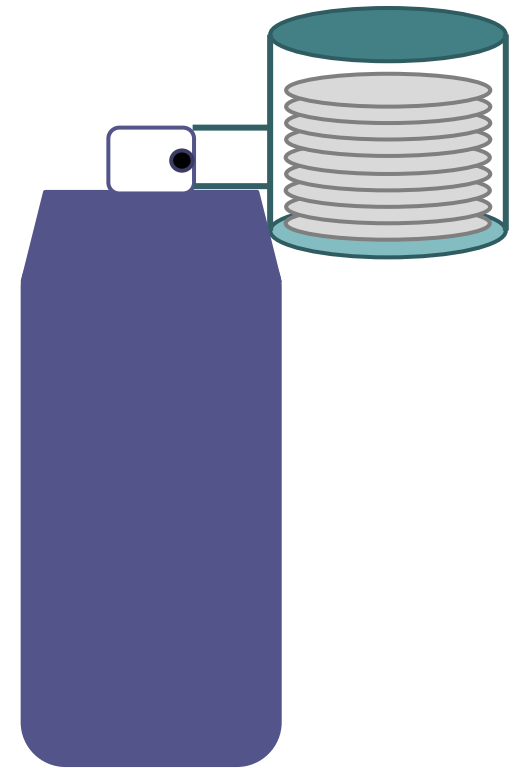
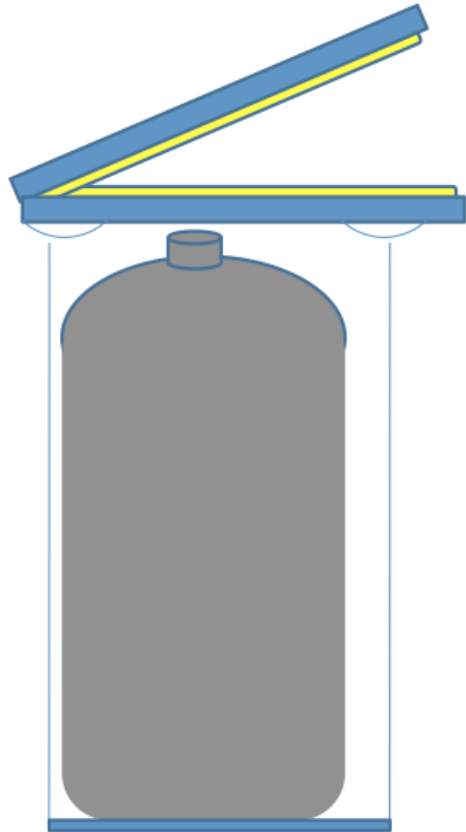
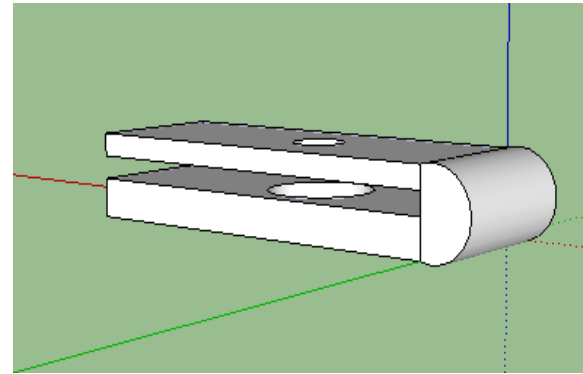


Figure 6 – The disposable pad design

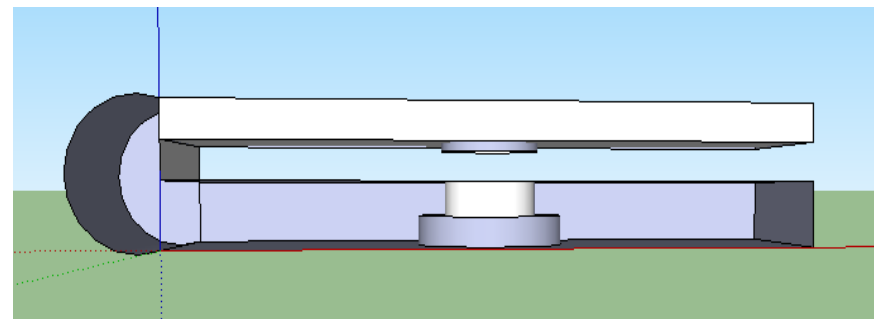
Design II: Clamp Design



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

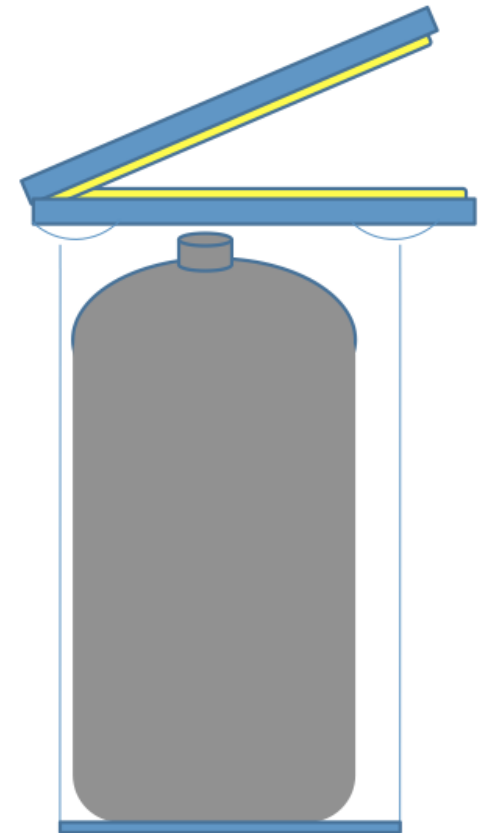
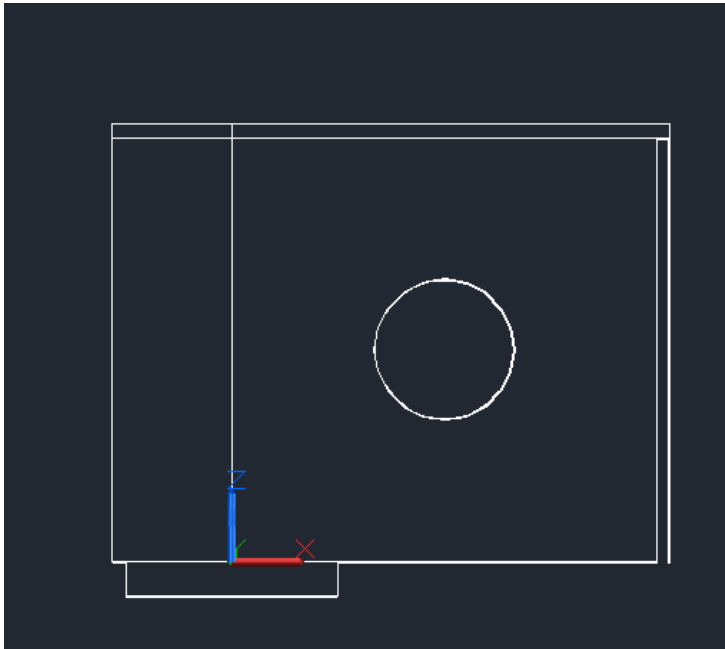
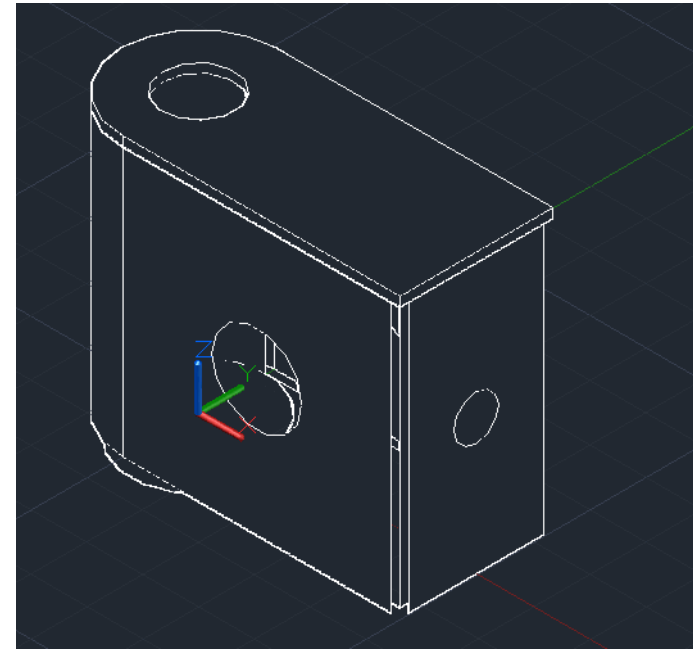


Figure 7 – The clamp design

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
 - Connects using same mechanism as cap
 - Minimizes overspray
 - Can lubricate inside and outside

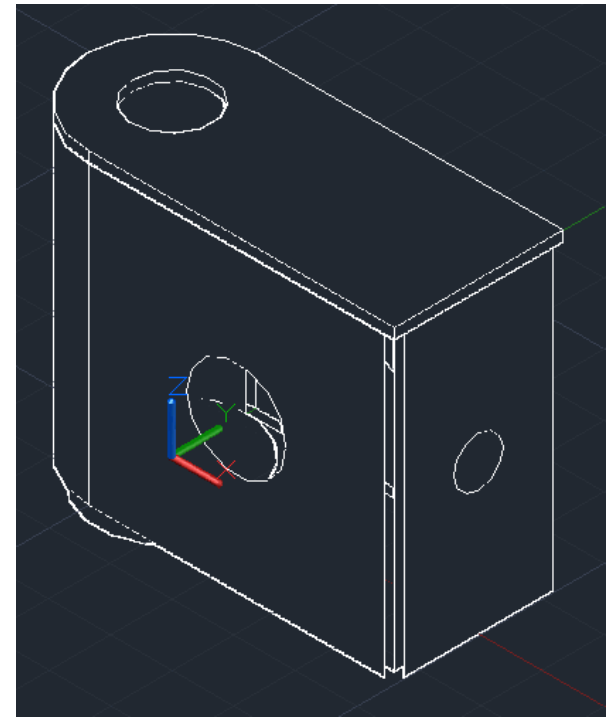


Figure 8 – The enclosed box design

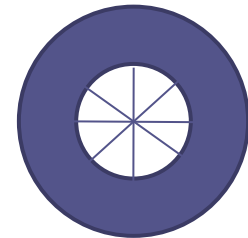


Figure 9 – Gasket to cover hole

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