Monitor Lift and Paint Cap Remover

Daniel Zachs

Weekly Progress Report
8/31-9/14

Work Completed
Revising the Monitor Lift

One of the main components for our design for the monitor lift was the dashpot-spring systems. In order for our monitor lift to operate, we relied on a set of springs and dashpots. In the requirements for the project the monitor had to lift at least 12 inches. For this to be possible, we would require dashpots that had at least a 12 inch stroke. See Figure 1:

In Figure 1 on the right you can see the black dashpots on both sides of the monitor lift. They help provide much of the resistance in both directions of movement and are essential in lifting the heavy monitor. Without the dashpots, the monitor would be way too heavy to lift and would never stay at the top or bottom state.

During the summer we emailed our representative at the Airpot Corp. in Connecticut. They specialize in dashpots and they originally gave us quotes to make custom dashpots (the dashpots we needed were longer than the ones they stocked). Although the dashpots were going to be expensive, they fit in our budget so we were going ahead with the project as planned. We showed the representative our full final design for the project to make sure he thought it would work. He replied back with bad news. He said that the
design of our project relied way too much on the dashpots and that dashpots with such a long stroke length stopped working well at all. He recommended we take a different path.

We decided that we could use a similar device with a monitor lift, but instead of using springs and dashpots, we would use an alternative form of motion. We researched many alternatives, and one that seemed very practical was a Linear Actuator.

A linear actuator generally works like a metal rod attached to a motor. As the motor spins, it twists a gear that pushes the actuator up or down. This is what one looks like when its compact.

Image 2: The compact linear actuator is nearly as small as the stroke length itself. The motor section is on the right side and allows for the stroke to seamlessly move up and down. The action of moving up and down is simply controlled by the direction of the current. This is excellent for our design because we can move the monitor up and down by simply reversing the polarity.

There were a few spare linear actuators in the back room of the design lab. We were able to test them out and see what we liked and didn’t like about them. The actuators below provided very smooth motion but not enough force. We tested different currents and
voltages. At higher currents the stroke extends faster and with more available force. This means that force is directly proportional to the current supplied.

The company which makes many linear actuators that we may choose to purchase from is called [www.Firgelliauto.com](http://www.Firgelliauto.com). Some of the advantages of a 18” actuator:

- Low noise design
- Enhanced corrosion resistance
- Aluminum outer and inner tube
- Zinc alloy housing
- Powder metal gears
- Lubrication for longer life
- Small compact Design
- Lowest Price on the planet

The Specifications are:

1. 12vdc nominal voltage
2. 110lbs push/pull force
3. 100lbs max static force
4. 3amp current draw at full load
5. 3/4" Sec speed
6. IP54 Rating (splash and dust resistant)
7. 2-wire harness, reverse polarity to change direction
8. Built in limit switches, not movable

110 lbs of push/pull force is ample for our situation. As stated previously we simply reverse the polarity to change the direction. It has built-in limit switches which entirely essential to prevent the monitor from extending or contracting too far.

**Working on the Paint Cap Remover**

This week we spent a majority of the time working on the paint cap remover. Pat and I brought the long rod of high density polyethylene to the machine shop. We used a vertical saw to cut the rod into small workable pieces. We made 12 total, 8 were ¾” thick and 4 were 1 ½” thick. Now we were left with small sections as seen below:
These small sections of the plastic will be used to insert the Paint Cap into. It will be attached to the motor and fit right over the paint cap.

The next step was to drill a hole for the motor to fit into. We experimented with different sized bits and finally found one that was slightly smaller than the motor head. We drilled a hole into one of the plastic sections and squeezed it onto the motor. When we create our final project we will use epoxy to secure the paint cap remover head permanently to the motor.

![Figure 3: Paint cap remover head mounted on the motor](image)

**Project Overview**

The monitor lift hit an early snag but we were able to find alternative methods of lifting it. We had good teamwork by having online meetings during the summer and sat down right away when we came back from summer break to deal with the issues.

We have decided to get a stronger motor for the paint cap remover. We want one that has a great deal of torque. We’re still shopping around currently to find a model that has just what we want, high torque and low speed. This is a hard combination to shoot for because most motors with high torque have a high speed as well.
Future Work

We need to purchase a very strong linear actuator that has at least a 12 inch stroke and hopefully be able to withstand more than 200 lbs.

We need to begin constructing the frame for the monitor lift.

We need to buy a new, stronger motor for the paint cap remover.

We need to begin shaping the paint cap remover head to fit over the paint cap.

Total Work Hours

8 Hours