Assessment of In-House Refurbishment of Auto-water Valves on Flood Incidence

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Background & Significance

Automatic watering systems provide many advantages over other methods, are less labor intensive, and provide unlimited fresh water on demand. However, water valve failures are known to occur causing significant morbidity and mortality to rodents within closed caging. Eight years after facility commissioning, cage flood frequencies in a 50,000 ft^2 vivarium with an average daily census of approximately 10,000 mouse cages began to noticeably increase. Due to the increased incidence of flood events, an investigation into the functioning of the valves deemed that it would be necessary to refurbish them. However, due to the high cost of facility wide valve refurbishment by the manufacturer, a pilot study was performed to assess the viability of in-house refurbishment of water valves. This was performed using manufacturer provided instructions, tools, and parts.

Materials & Methods

Two 70 cage Allentown mouse ventilated racks (Figure 1)

- One rack furnished with manufacturer refurbished valves
- One rack furnished with in-house refurbished valves
- 9 racks with non-refurbished values

Figure 1

- Edstrom Water valve replacement parts (*Figure 2)*
  - Shield
  - O-ring (external cap)
  - O-ring (internal)
  - Diaphragm

Flood incidence was assessed utilizing a log sheet *(Figure 3),* that was filled out by staff after a flood occurred.
Valves were refurbished using Edstrom replacement parts and tools (*Figures 4)* using the Edstrom Universal Drinking Valve Tool *(Figure 5).*

Valve Refurbishment Costs

Manufacturer refurbished valves:
$8.00/valve + shipping costs.

In-house refurbished valves:
4 replacement parts= $2.35/valve + shipping costs of materials + employee time

Edstrom Water Valve

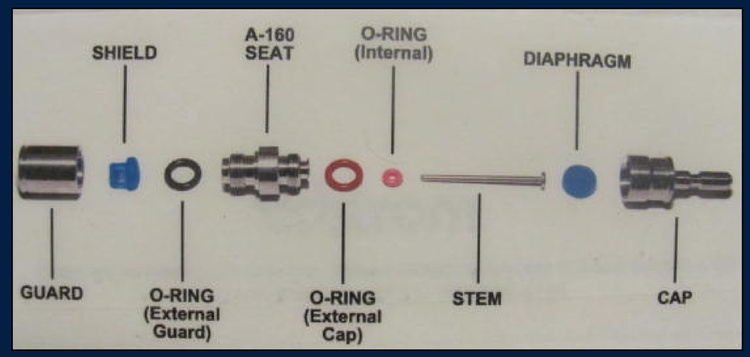


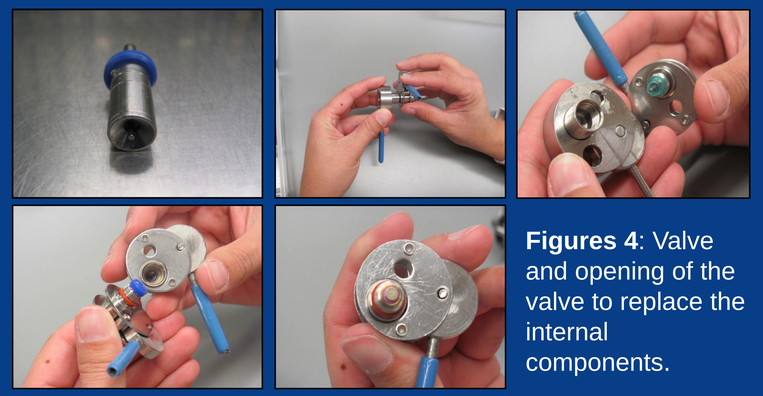
Figure 2: Interior components of a water valve

Room Number _____ Date Form Placed in Room _____

Cage Flood Reporting Log

Date/ Time	Rack ID	PI Name	Cagecard #	Strain Info	Animal Information	Initials	Action Taken
					# in cage ___ # bathed ___ # dead ___ Notes:		New Valve Cleaned Valve Cage Moved ___

Figure 3: Log sheet utilized by staff for documenting floods.

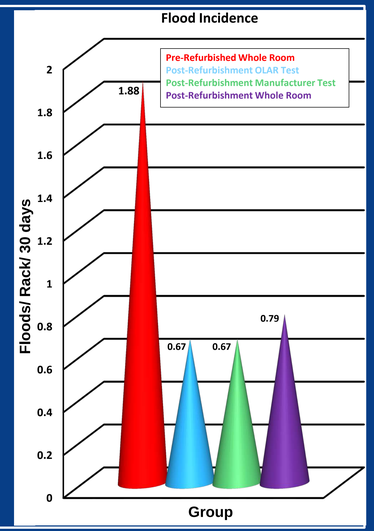


Figures 4: Valve and opening of the valve to replace the internal components.

Figure 5: Edstrom Universal Drinking Valve Tools

Results

The two racks have been running with their respective refurbished valves for 402 days with a flood incidence of 0.67 floods/rack/30d (n=1 rack/ treatment). In comparison, racks with non-refurbished valves had a flood incidence of 1.88 floods/rack/30d (n=9, 252.9±57 days) over an equivalent period of time. Post-refurbishment the room has a flood incidence of 0.78 floods/rack/30d (n=9, 259.1 ±3 days).



Conclusions

With increased proficiency, on average staff were able to refurbish a valve every 2 minutes. This totals 30-40 valves refurbished every hour. With our staffing costs this = a savings of $5.35/valve.
For a facility that has an average census of 10,000 this would equate to a savings of around $53,500

In-house refurbishment of valves worked well for our facility because:

1. Large number of valves in service (~10,000 daily census).
2. Staff available to do the refurbishment in their spare time.

Additional considerations should be made for constant repetitive motion, and thus would not be feasible for a staff person performing this task for an 8 hour stretch of time. Staff proficiency at refurbishment may affect the quality of the water valve.

Acknowledgements

Edstrom water valve picture courtesy of Edstrom replacement parts kit.

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ABSTRACT

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Automatic watering systems provide many advantages over other methods, are less labor intensive, and provide unlimited water on demand. However, water valve failures are known to occur causing significant morbidity and mortality to rodents within closed caging. Eight years after facility commissioning, cage flood frequencies in a vivarium with an average daily census of approximately 9,000 mouse cages began to noticeably increase. Due to the increased incidence of flood events, an investigation into current valve function concluded the need for diffuse valve refurbishment. However, the cost of facility wide valve refurbishment by the manufacturer was high. A pilot study was performed to assess the viability of in-house refurbishment of water valves using manufacturer provided instructions, tools, and parts as compared to manufacturer refurbished valves. In a single housing room containing 11 racks, water values of 2 randomly selected, 70 cage racks were either provided in-house refurbished valves or valves refurbished by the manufacturer. The racks were then monitored for floods. The valves on the remaining racks remained un-refurbished as controls during the study. Our results demonstrated an equal number of cage floods on racks with in-house and manufacturer refurbished valves equal to 0.89 floods/rack/30 d (n = 1 rack/treatment, 269 days). In comparison, racks with non-refurbished valves had a flood incidence of 1.94 floods/rack/30 d (n = 9, 222.9 ± 57 days) over an equivalent period of time. This was a greater than 2 fold reduction in floods with valve refurbishment independent of refurbishment source. A cost analysis concluded that in-house refurbishment resulted in a savings of $5.35 per valve, including an average of 2 min in staff time for service and materials. Based on the results of this pilot study with limited sample size, we concluded that in-house refurbishment was less expensive and equally effective as manufacturer based refurbishment. Thus, the decision was made to continue with in-house refurbishment of water values using manufacturer provided materials. Additional analysis will continue as valve refurbishment occurs to ensure that in-house replacement continues to be as cost effective both in costs and cage flooding incidences.

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