

Introduction

- First in First Out (FIFO) restocking is **time consuming and tedious** [1].
- Missed stock causes **financial loss** for employers and **increases food waste** [1].
- **13%** of the world's food waste comes from retail [2].

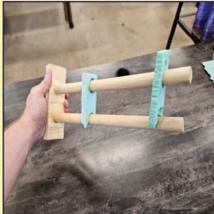
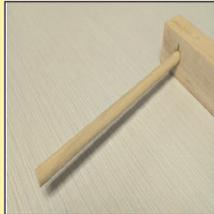
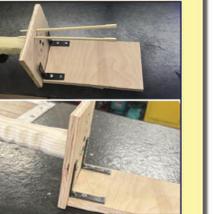
Stakeholders:

- **Businesses** selling perishable goods: Are somewhat impacted, but have **high influence**.
- **Retail customers** buying the products: Are **highly impacted**, some influence.
- **Retail employees** who perform restocking: Are **highly impacted**, low influence.

Problem Statement: How might we redesign retail display hooks to increase employee restocking efficiency while adhering to a first in first out restocking process.

Design Methods

- Idea generation:**
- Whole hook restocking
 - Detachable display hooks
 - Attachable organizers
 - Spring-loaded hooks
 - External stocking handle
 - Loading from the back
 - Clips to hang product
 - Moving Conveyor or track

Hanging Clip	C-Clip	Spring Mechanism	Latching Hook	Ice Scoop
				
Swiveling clips to hold up display hook to be stocked.	Detachable display hook with a quick connection.	Designed to push goods forward, stoppers for safety.	Detachable display hook with a locking mechanism.	Handled shelf tool with two rods to quickly remove stock from hook.
Decision Matrix Final Scores				
20	21	21	24	28

Design Results

Looks-Like Final Design



Ice Scoop v2

- Tray made into a secondary feature.
- Shaped rod for collecting product off hooks.
- Less expensive than changing every hook in stores.
- No fiddly multi-step pieces.
- Best feedback from stakeholders.

Find our full Decision Matrix and other data here:

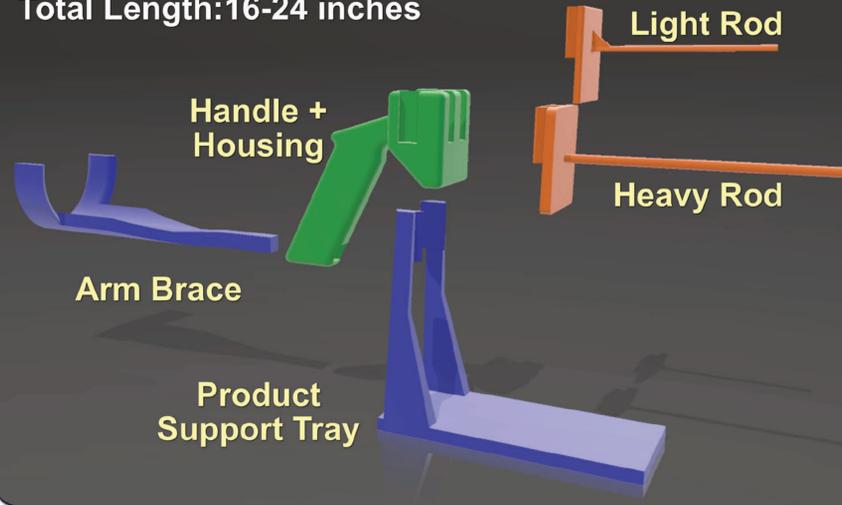


OFF THE HOOK: F.I.F.O. Restocking to Reduce Waste and Effort

Affiliations: Red Rocks Community College

Works-Like Subsystems

The "Lightening Rod"
Total Weight: 0.69-1.20 lbs
Total Length: 16-24 inches



- The improved device uses a front mounted rod attached to a handle and housing **to remove older stock from display hooks, allowing the user to add the new stock to the clean hook, and finally return the older stock back and in order.**
- This **maintains and continues proper FIFO stocking.**
- Other attachments aid in comfort and heavier loads.

Works-Like Costs	
PLA Filament	~\$10
ABS-Like Resin	~\$12
Metal Components	~\$4
Strip Spring	~\$4
Total	~\$30-35

Final Estimated Costs ea. [3,4]	
Labor	~\$2.50
Injection Molded ABS	~\$0.50
Metal Components	~\$15.35
Foam Padding	~\$0.40
Total	~\$19-25

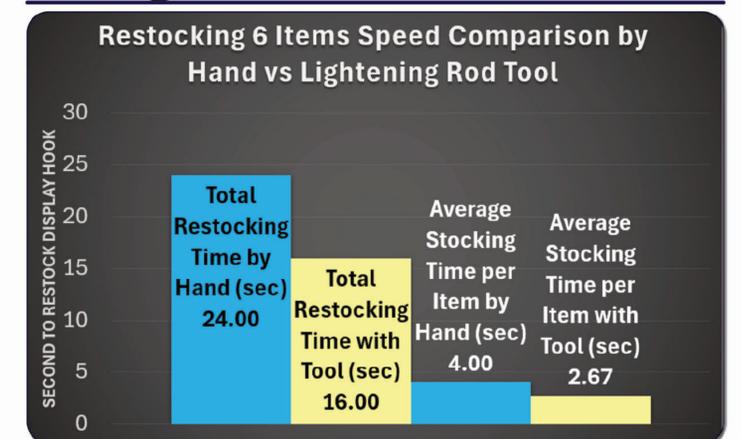
Design Validation Methods

- Restocking speed comparison versus by hand.
- Interviews after testing with retail employees and lay people.
- Drop testing and structural analyses.
- Stress and weighted load testing



- Device performance met expectations.
- Works-like demo rod had trouble with smaller bag holes and larger weights.
- Novel use to also restock shelves found.

Design Validation Results



These results show that using the Lightening Rod improves restocking speed at larger quantities of items by up to **33%**.

Discussion Conclusion

- The Lightening Rod scored **4 or better** on average (out of 5) on all categories of user experience.
- We received lots of feedback on rod design, additional securing mechanisms, and potential other attachments from our trials and surveys.
- This tool could help **save ~6 min of stocking time per day** for an employee, and as much as **\$2000+ per year in expired goods** from following FIFO [1].

References

[1] B. Eric, "Display Hook Interview w/ Eric Berg, Regional Retail Manager," Sept. 10, 2025.
 [2] N. Marchant, "The world's food waste problem is bigger than we thought - here's what we can do about it," World Economic Forum. Accessed: Oct. 01, 2025. [Online]. Available: <https://www.weforum.org/stories/2021/03/global-food-waste-solutions/#:~:text=Around%percent;20931%percent;20of,halve%20of,halve%20waste%20by%202030+>
 [3] McMaster-Carr, "McMaster-Carr," McMaster.com, 2015. <https://www.mcmaster.com/>
 [4] How, "How to Estimate Injection Molding Cost?," Formlabs, 2025. https://formlabs.com/blog/injection-molding-cost/?srsltid=AfmB0orT_GB7q-GBGxhDNgsY1JzygvEBV11Cq5_5pXieSqBDPrQ2_FbU (accessed Nov. 18, 2025).