Core Plug Removal System

Claremont, NC

PPSA – Safety Innovator

October 2021

WestRock | Performance Excellence

Project Overview

- A kaizen was held to look for opportunities to make removing core plugs from rolls safer

- Participants included:
  - Rollstand Operators – Donna Landis, Erin McCullough
  - Press Operator – Robert Bradley
  - Shipping Manager – Donna Huffman
  - Maintenance Techs – Jack Heavner, Larry Lackey
  - Harmax Rollcon – Rad Briley, Jake Unrau
  - Divisional Safety Manager – Patrick Lyon
  - Safety Manager – Kyle Mayberry

Project Background

- Initial problems started being introduced around May 2018 in Claremont Folding
  - An employee in Claremont had a soft tissue injury to their wrist from knocking core plugs out manually by hand using a 18lb bar that was approximately 5-6’ long
  - Across Westrock, many employees have reported injuries that were recordables due to removing the core plugs manually. Injury severities include fractured fingers

Goals

- Find a safer, more ergo friendly way to complete the needed tasks so we can reduce/eliminate any future injuries.
- Eliminate the task of removing core plugs

Business Case - Strain Index (Athletic Trainer)

Strain Index Scoring Sheet

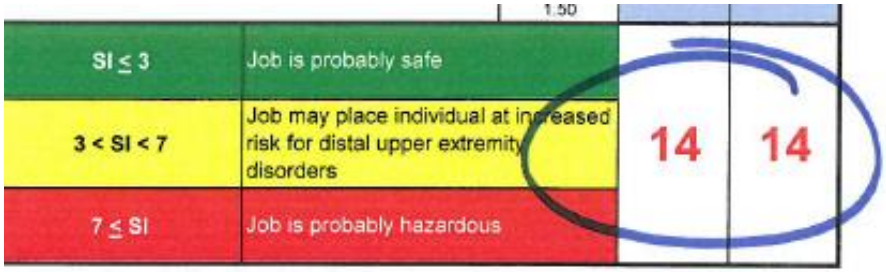
Date:	5/14/19	**Task:**	**Roll Tender-Core Plugs**
Company:	WestRock-Claremont	**Supervisor:**	
Dept:	Press-1243	**Evaluator:**	**Margaret Shreitah**

Risk Factor	Rating Criterion	Observation			Multiplier	Left	Right
Intensity of Exertion (Borg Scale - BS)	Light	Barely noticeable or relaxed effort (BS: 0-2)			1	6	6
	Somewhat Hard	Noticeable or definite effort (BS: 3)			3		
	Hard	Obvious effort; Unchanged facial expression (BS: 4-5)			6		
	Very Hard	Substantial effort; Changes expression (BS: 6-7)			9		
	Near Maximal	Uses shoulder or trunk for force (BS: 8-10)			13		
Duration of Exertion (% of Cycle)	< 10%	**Calculated Duration of Exertion** (from inputs below)			0.5	3	3
	10-29%	**User Inputs**	**Left**	**Right**	1.0		
	30-49%	Total observation time (sec.)	60	60	1.5		
	50-79%	Single exertion time (sec.)	4	4	2.0		
	≥ 80%	Number of exertions during observation time	12	12	3.0		
		Calculated Duration of Exertion (%)	**80.0 %**	**80.0 %**			
Efforts Per Minute	< 4	**Calculated Efforts Per Minute** (from inputs above)			0.5	1.5	1.5
	4 - 8		**Left**	**Right**	1.0		
	9 - 14		12.00	12.00	1.5		
	15 - 19				2.0		
	≥ 20				3.0		
Hand/Wrist Posture	Very Good	Perfectly Neutral			1.0	2	2
	Good	Near Neutral			1.0		
	Fair	Non-Neutral			1.5		
	Bad	Marked Deviation			2.0		
	Very Bad	Near Extreme			3.0		
Speed of Work	Very Slow	Extremely relaxed pace			1.0	1	1
	Slow	Taking one's own time			1.0		
	Fair	Normal speed of motion			1.0		
	Fast	Rushed, but able to keep up			1.5		
	Very Fast	Rushed and barely/unable to keep up			2.0		
Duration of Task Per Day (hours)	<1				0.25	0.25	0.25
	1 < 2				0.50		
	2 < 4				0.75		
	4 ≤ 8				1.00		
	> 8				1.50		
Results Key	**SI ≤ 3**	Job is probably safe				14	14
	3 < SI < 7	Job may place individual at increased risk for distal upper extremity disorders					
	7 ≤ SI	Job is probably hazardous					

Notes/ Comments

1243 Press: Every two hours employee knocks out 6 rolls = 12 core plugs. Over course of 12 hour shift, That equal approx. 36 rolls = 72 core plugs being popped out during each shift. Although the task is only performed during a small part of the day, the force require for grip, pushing and pulling places a maximum stress on the upper extremity. That combined with the wrist being deviated during the force movements places the hands and wrists in a very compromised position. Note: not taken into concideration the amount of time it takes to knock core plugs out that are stuck or hard to get out.

Our ATC Strain Index easily shows that the tasks is hazardous



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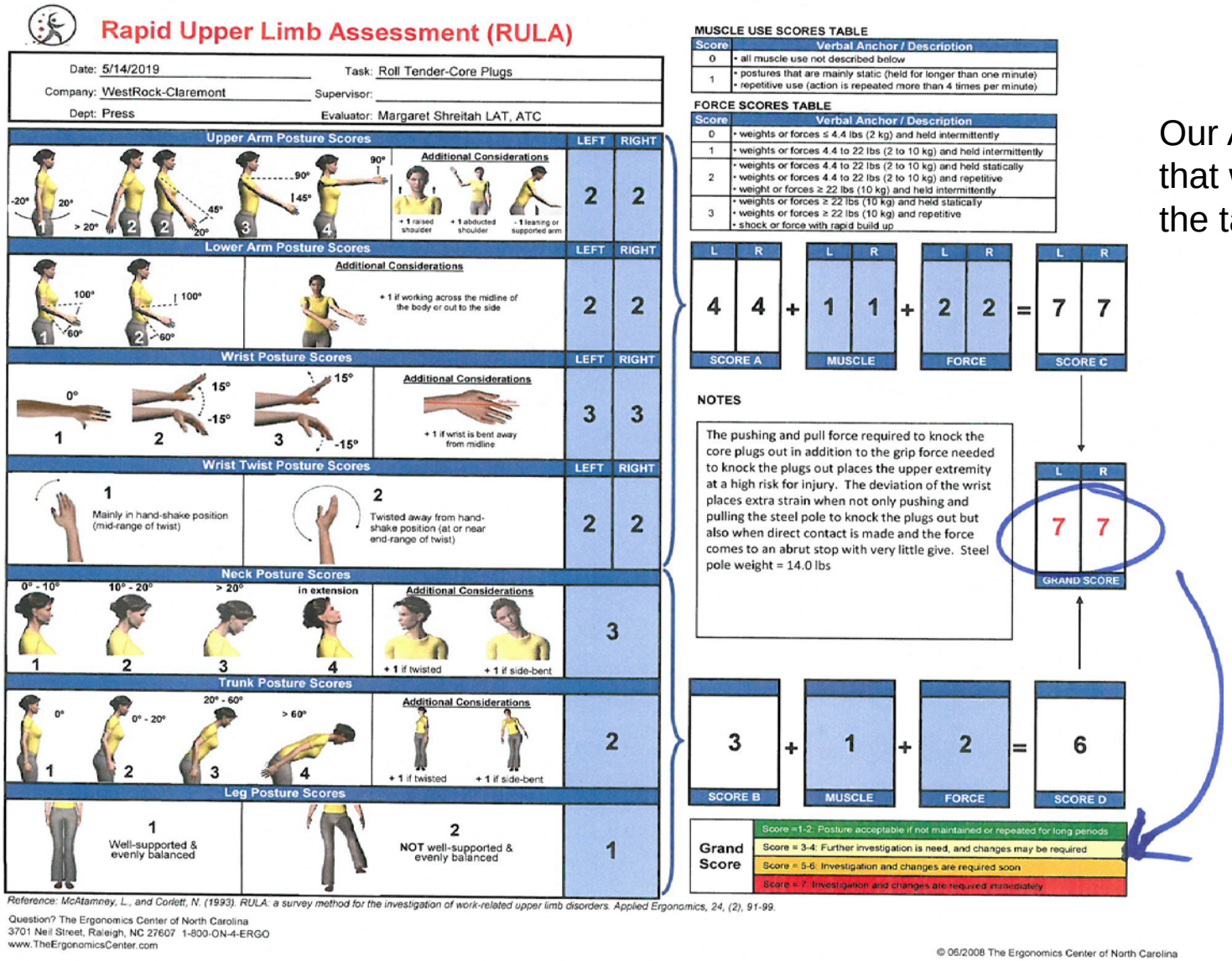
RULA (Athletic Trainer)



Our ATC RULA indicates that we should stop doing the task immediately

Current Process

- Majority of plants use a metal bar ranging from 4-6 feet in length with a weight of 10-20 pounds
- The metal bars have approximately a 3 inch head on the end that is used to beat in/out on the plug
- Once the plug is loose in the core, the bar is used to pry the plug out of the core

WestRock *Nicholasville Folding One Point Lesson*	**Core Plug Removal**	
Issue Date:	Reference # / Revision:	TRN-00000/

1.0 **Equipment**

1.1 Core Plug Remover

1.2 Roll Stock

1.3 Core Plug

1.4 Core Plug Gaylord

2.0 Work Instruction

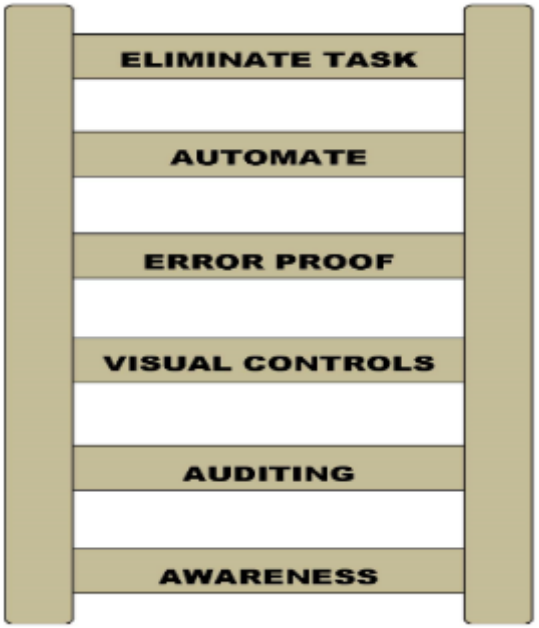
2.1 Insert the hooked end of the core plug remover through one side of the roll stock core plug.

Trials

Trials

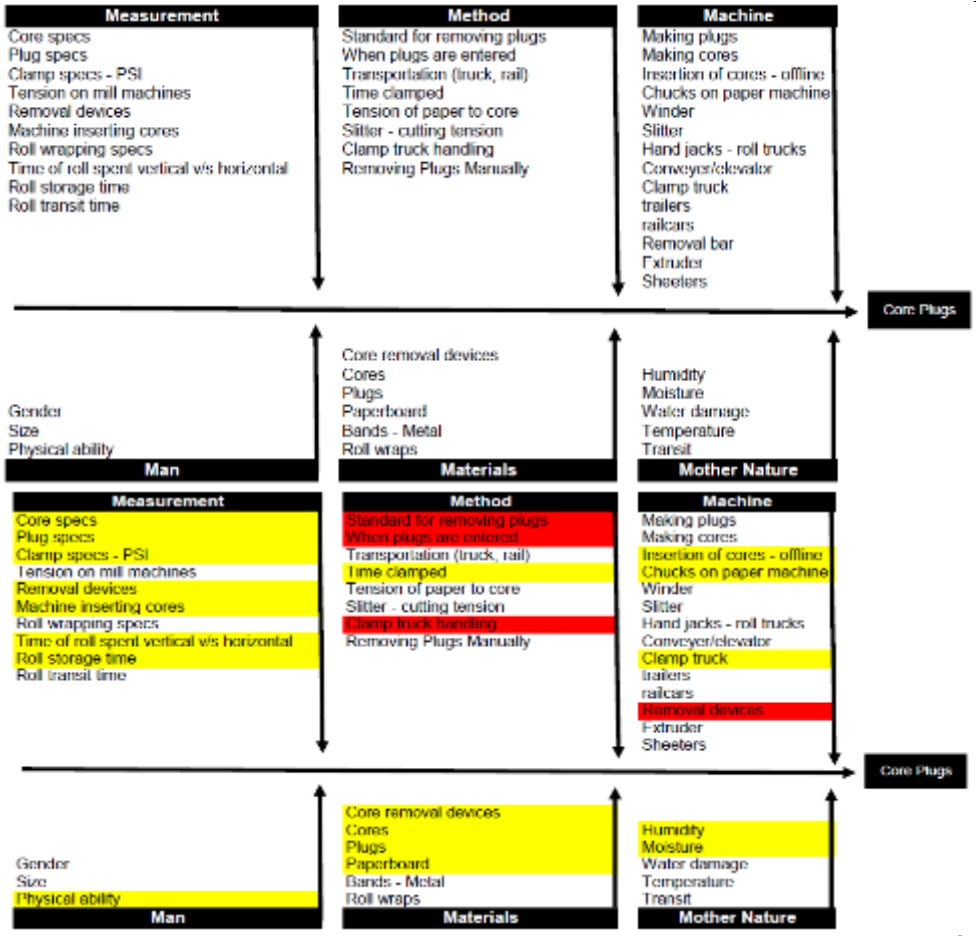
Kaizen Agenda

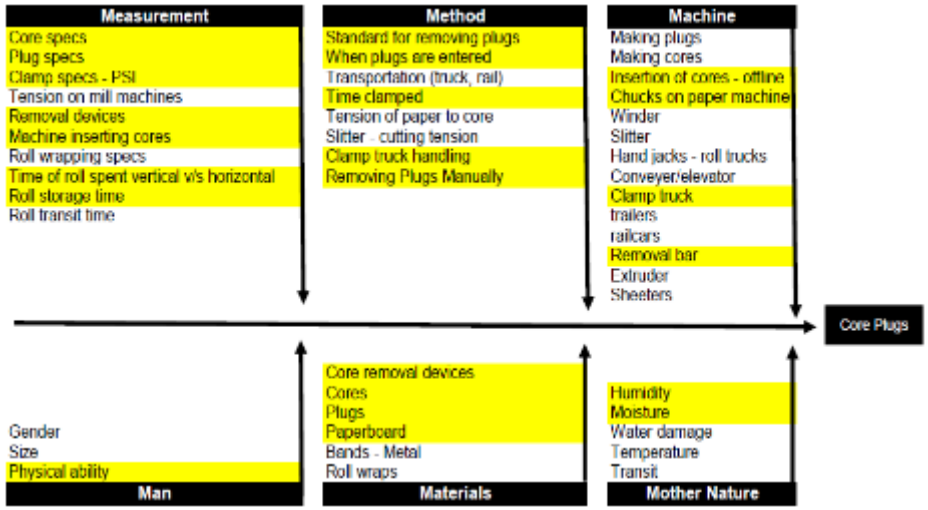
- Process flow map for making and handling of the rolls
  - Mills (Demopolis and Covington)
  - Claremont
- 6 M's (Man, Method, Machine, Materials, Mother Nature, Measurement)
- Improvements
  - Future State (brainstorming)
  - Hierarchy of Controls
    - Elimination
    - Engineering
    - Substitution
    - Administrative



6M's, Fishbone, Prioritizing, Multivoting

Variable	Measurement	Method	Machine	Man	Materials	Mother Nature
1	Core specs	Standard for removing plugs	Making plugs	Gender	Core removal devices	Humidity
2	Plug specs	When plugs are entered	Making cores	Size	Cores	Moisture
3	Clamp specs - PSI	Transportation (truck, rail, humped cars)	Insertion of cores - offline	Physical ability	Plugs	Water damage
4	Tension on mill machines	Time clamped	Chucks on paper machine		Paperboard	Temperature
5	Removal devices	Tension of paper to core	Winder		Bands - Metal	Transit
6	Machine inserting cores	Slitter - cutting tension	Slitter		Roll wraps	
7	Roll wrapping specs	clamp truck handling	Hand jacks - roll trucks			
8	Time of roll spent vertical v/s horizontal		Conveyer/elevator			
9	Roll storage time		Clamp truck			
10	Roll transit time		trailers			
11			railcars			
12			Removal bar			
13			Extruder			
14						





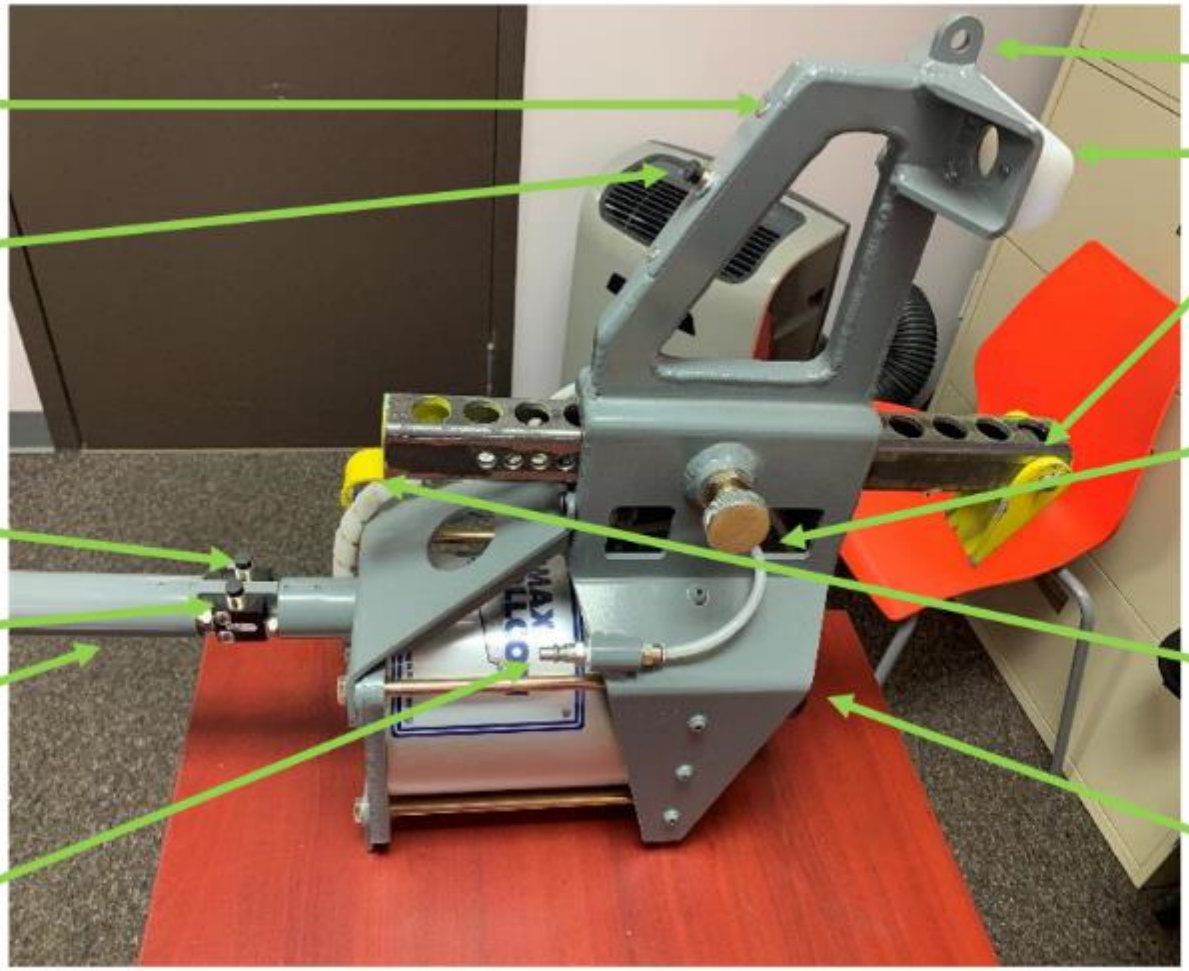
Conclusion

- After a lot of work, it was determined that we could not eliminate the task
- All our current efforts led to us still manual tools to beat or pry the plugs from the rolls

Opportunity Knocks

- During a visit to Claremont from Harmax, Rad Briley came in to help us find a more effective solution for handling rolls
- During our conversation, I was allowed to share my passion with Rad on how we were trying to find a safer way to remove the core plugs
- Current kaizen information including tools and methods used and failures and successes was shared with Rad and Harmax
- Immediately Rad and his team became engaged with Claremont and our desire to find a way to engineer out the task

Core Plug Tool Overview



Handle

Activate Button – Must be pressed and held in for in/out cylinder to work

Cylinder Out

Cylinder In

Handle

Pneumatic Hook Up

Tool Balancer Attachment Point

Rolls Stop - Presses up against the roll

Core Puller Flap – Inserts into core, flips down and pulls core out

Core Plug Depth Adjustment – Pull out to allow for adjustment

Once pulled out, move bar to desired depth. You want the depth to be set just deep enough for the yellow core puller flap to fall to the down position

Cylinder – Moves out and in to retract cores by pressing the in/out buttons

Insert Tool Into Core

Insert device into core. Ensure the yellow core puller flap enters far enough to drop down.

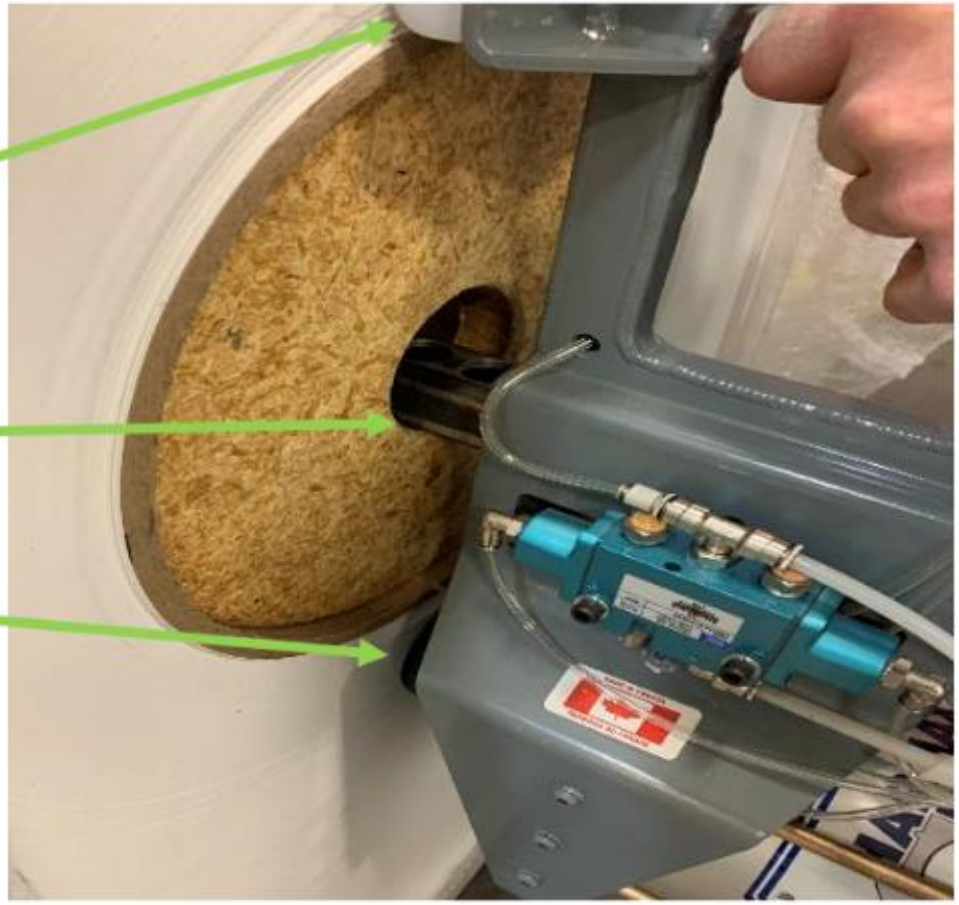
Once Inside Core Plug

Once inserted fully:

Roll stop is against roll.

Ensure the device is down on the bottom side of the core plug hole.

Cylinder shaft foot is against roll.



Removing The Plug

To remove plug, hold the activate button and either the cylinder in or out button.

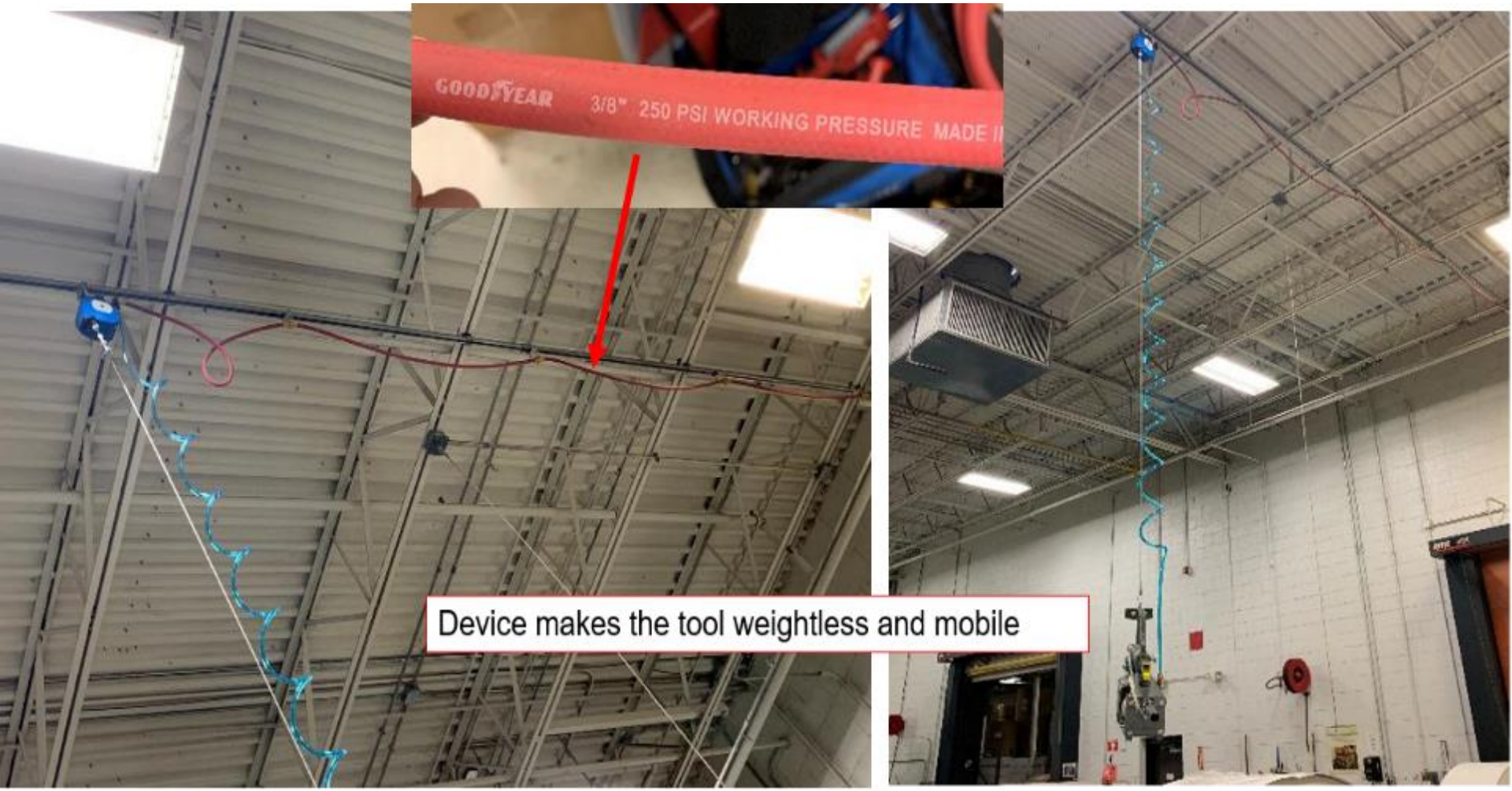
Always stand to the side and NEVER directly behind the device.

Pulsing the cylinder out button by presses and releases multiple times is recommended over just holding the button. You are more likely to break a jammed core by holding the button the whole time. Press and release, press and release, etc.

Core Breaking – Kick Back Countermeasure

To help fail safe, we have added an aluminum piece that requires the operator to stand to the side of the device to ensure they are out of the line of fire.

Over Head Trolly and Tool Balancer



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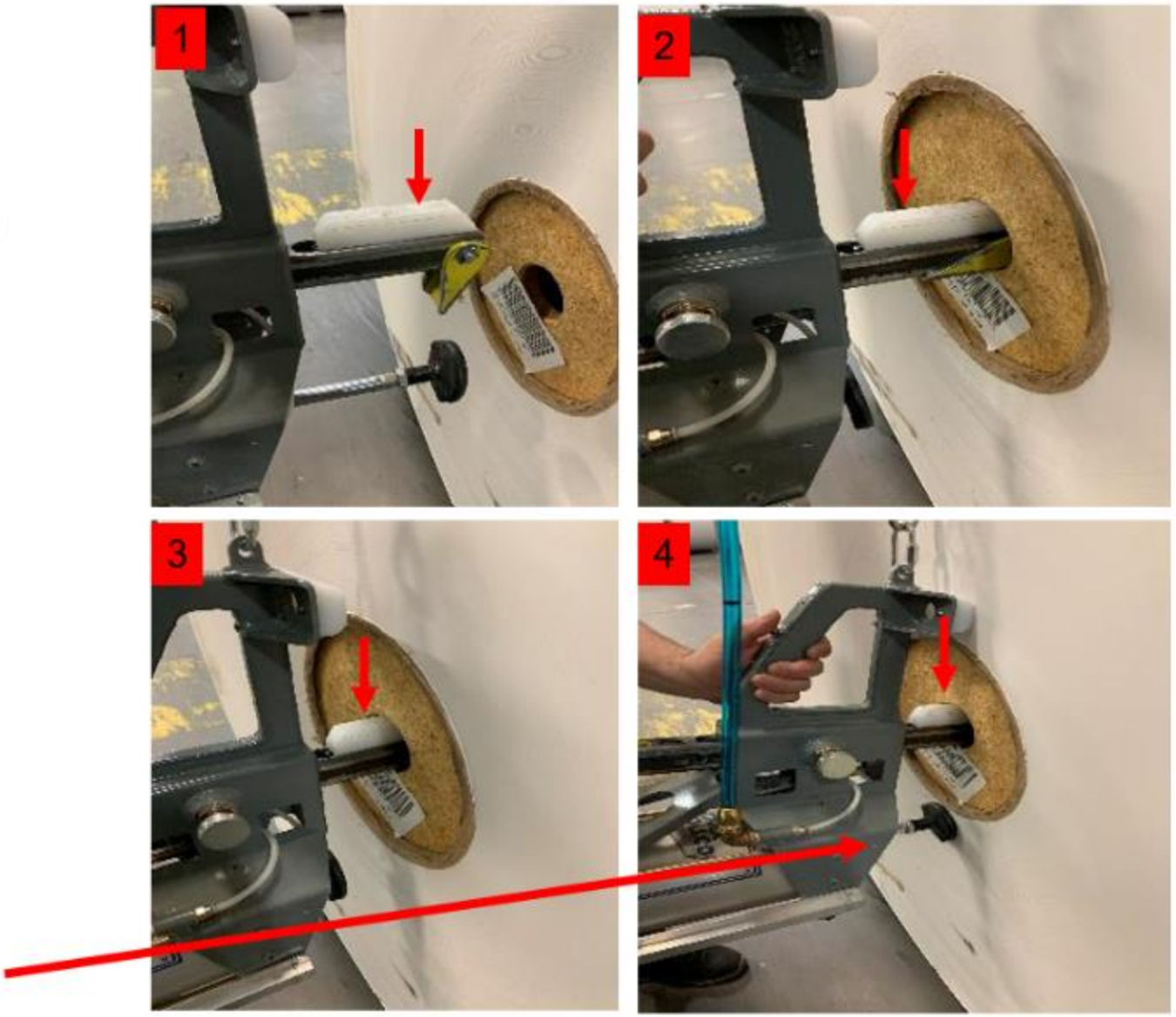
Error Proof the Design

A piece was added to the top of the rail that forces the tool to rest on the bottom side of the core plug opening. This will ensure the tool is properly positioned

Notice the piece forces the tool to be positioned on the bottom of the plug opening. This ensures the black foot does not impeded the plug from coming out.



Lower Air Pressure – Reduces/Eliminates Kickback Failures

A Pneumatic Regulator Valve was added to reduce the air pressure from 120psi to 50psi. So far, the device is working well at the lower psi setting.

Final Design

Using the Tool

Using the Tool

Employee Testimimonial

Westrock's Values

Values

- **Integrity**. We never one time tried to cut any corners or hide any of the challenges we faced,
- **Respec**t – With showing respect to our fellow workers across multiple departments, Westrock Plants and Harmax, we were able to assemble a team of multi-talented individuals to find solutions to engineer out a very high ergo risk task
- **Accountability** –All parties involved pulled their weight and ensured we never gave up until a solution was achieved
- **Excellence** – We have not only made the task safer but easier was well. Carts were added to place the plugs on after being removed. This eliminated the trip hazards and ergo risks of bending over to pick up the plugs

Westrock's Behaviors

Behaviors

- **Communicate The Why** – When involving Harmax, this behavior was so effective that the solution was even better than anyone could have imagined.
- **Align Goals** – This was a cross functional team and the final design was created by people who would possibly never have to complete the task of removing cores, but they did it because of the importance of the safety.
- **Empower** – Our employees were empowered to design, manufacture and commission the equipment with no involvement of the management team.
- **Recognize and Reward** – We have been rewarded in that we have found a way to make a needed task safer. This continues to boost our safety culture. "Claremont really does care about my safety"

Special Thanks

- Jack Heavner and Larry Lackey – Helping in anyway needed to make the process happen and with the install of the equipment and tracking system.
- Gerry O'Hanlon, Jeff Henderson, Patrick Lyon – 110% support from day 1 with our issues of removing core plugs
- Covington Mill – Mike Wade and Team have attended kaizens, allowed visits and set up calls to help with the issues we were dealing with.
- Joplin – Wes Gamble and the Joplin team have been working with the tool as well. The team has provided feedback on the pros and cons to help us make adjustments to our system.
- Harmax Rollcon – Rad Briley, Evan Hodgkinson, and Jake Unrau. This team had designed exactly what we needed and provided great support along the way. **I would highly recommend this company to everyone…**

Removing core plugs has been an issue for Claremont Folding for quite some time. This proves that dedication, teamwork, and commitment will pave the way to yes!

Conclusion

- The core pulling device is now being installed in many Westrock sites.
- The success of the tool has not only been shared within our division, but Westrock in its entirety.
- We want to continue to share the tool with others, even our competitors to keep them safe as well.
- No matter what the challenge, commitment, dedication, and care for your employee will help you to “Pave the way to yes”.