

Organic Farmers Growing
in a Timeless Tradition



America's Only Gourmet Line
of Heirloom Organic Lentils
and Specialty Grains

LENTILS • CHICKPEAS • BARLEY

MONTANA POLLUTION PREVENTION PROGRAM

Prepared by: Sophia Seffrood

Advised by: Doug Roberts, Montana Manufacturing Extension

Dr. Wan-Yuan Kuo, Montana State University

EPA Pollution Prevention Program

- The MTP2 Program is dedicated to helping the state's small businesses, local governments and citizens use progressive, integrated pollution prevention (P2) strategies to increase productivity, while safeguarding our air, water, land and other natural resources by reducing pollution. MTP2 is funded by the U.S. Environmental Protection Agency.

MTP2



MONTANA POLLUTION PREVENTION PROGRAM

EMPOWERING BUSINESSES TO BE PART OF THE SOLUTION, NOT THE POLLUTION.



Twin Brooks, SD Bozeman, MT



2000-2021: NorSwiss

Dairy, Inc

Summit, SD

2020-2021: Valley Queen

Cheese Milbank, SD

2022: B.S. Mechanical

Engineering Montana

State University

Bozeman, MT

2022-present: Montana

State University Food

Product Development

Lab



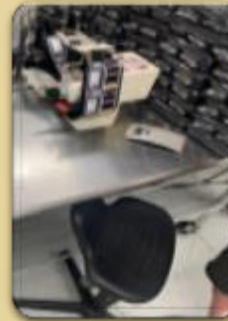
Support research that develops demand for regenerative agriculture and crop diversification.

Focus Roadmap



B-Corp

- Obtain access to past B-corp self-assessment
- Update assessment to current practices



Packaging

- Practice J.I.T. on retail pack line
- Redesign retail labels for optional preprinted film
- Research solutions for bulk bagging
 - Reduce labor from 2 to 1 persons
 - Reduce physical demand of process



Material Recycling

- Terracycle
 - Hair nets, beard nets, label backings, ear plugs



Distribution

- Connect Timeless with Such Grp INTL
 - Save on freight costs
 - Reduce freight damage
 - Free up labor
 - Reduce inventory spoilage / pest infestation
- Study freight damage reports

Focus Roadmap



Warehouse

- Perform psychometric analysis of building
- Investigate insulation, ventilation, and other passive heating/cooling options



Color Sorter Room

- Research required temperature range for equipment
- Insulate room to prevent temperature swings
- Reprogram air conditioner



Compressed Air

- Fix air leaks
- Create compressed air PM SOP
- Calculate energy savings before and after



Lighting

- Install occupancy sensors on 3 light switches
- Replace 2 halogens with LEDs

EXPANDING THE TIMELESS MISSION



- HOW?

- Pollution Prevention
- Community Engagement
- Education and mentorship

- B CORP CERTIFICATION

- Steps to achieve

1. Form B-Corp Team: Finance, HR, Operations
2. Review assessment
3. Implement “low-hanging fruit” practices
4. Retake assessment
5. Sustain practices – certification review every 3 years

- IMPACTS: Better serve the surrounding community, sustainable agriculture, Timeless Natural Food employees, and customers. Learn from global leaders in your industry. Increase visibility in the market.



Small Enterprise Guide

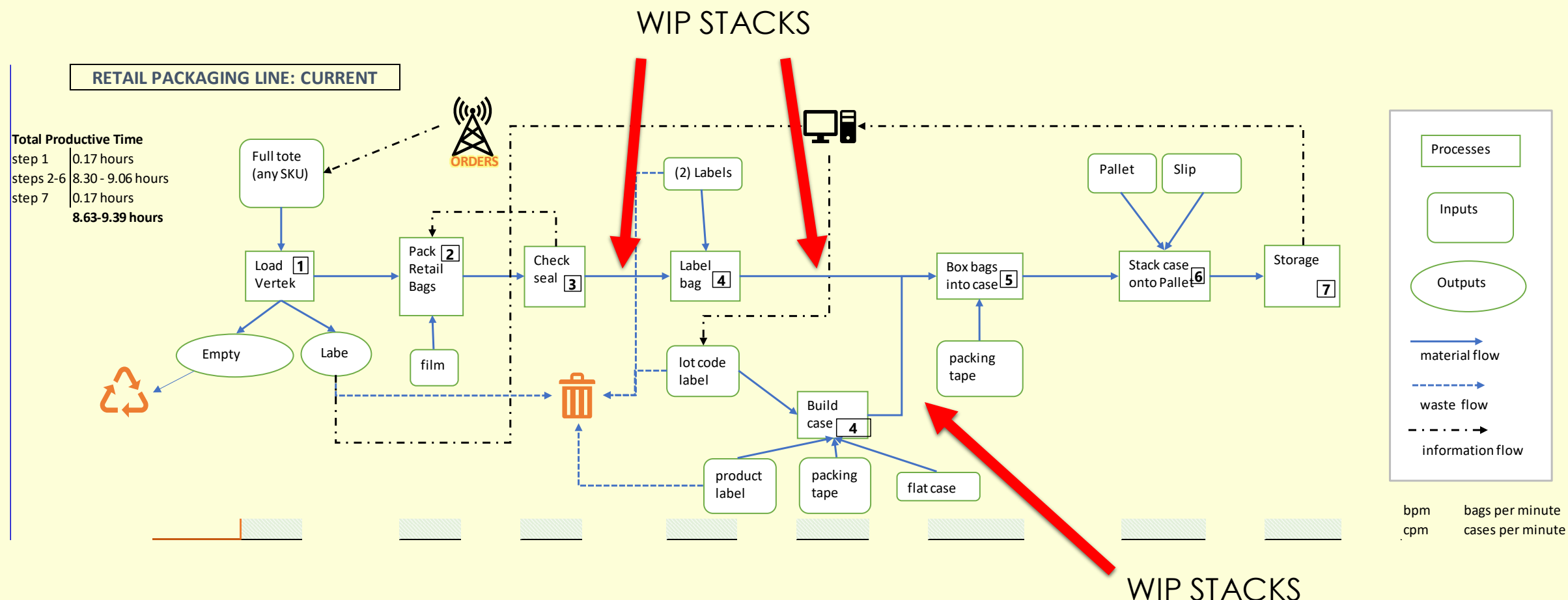
LEAN MANUFACTURING 8 WASTES

- **D**efects
Weak process control, bad or unknown information
- **O**verproduction
Making more earlier and faster than is required
- **W**aiting
Unbalanced work, unplanned maintenance
- **N**on-utilized Talent
Not using people's mental, creative, and physical abilities
- **T**ransportation
Poor layout
- **I**nventory
Poor forecasts, unbalanced workload
- **M**otion
Non-standard work, poor layout, poor organization
- **E**xcessive Processing
Doing more than required, just-in-case logic



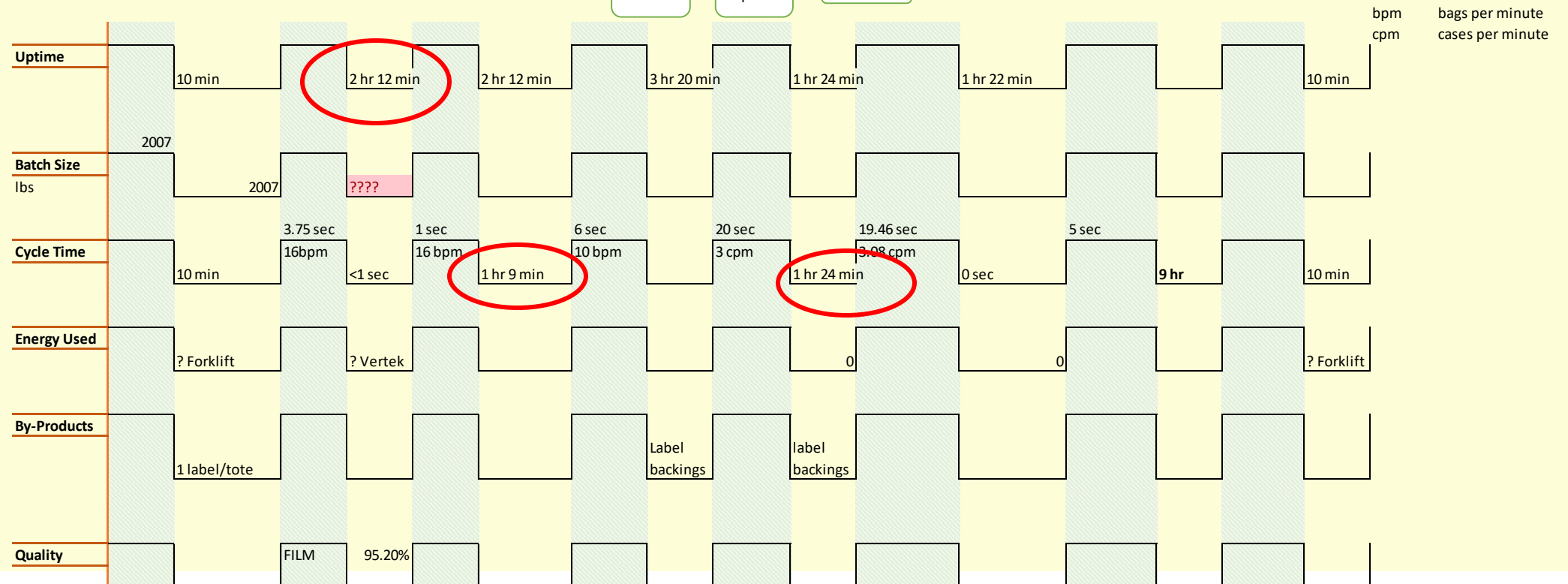
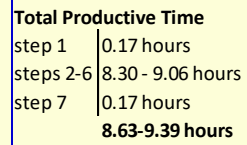
RETAIL PACKAGING

Current process is focused on completing one task at a time. This builds up inventory of WIP and additional time is spent handling unfinished product.



By running the vertek packer at 14-16 bpm, it takes at least a day to package a tote of product.

RETAIL PACKAGING LINE: CURRENT

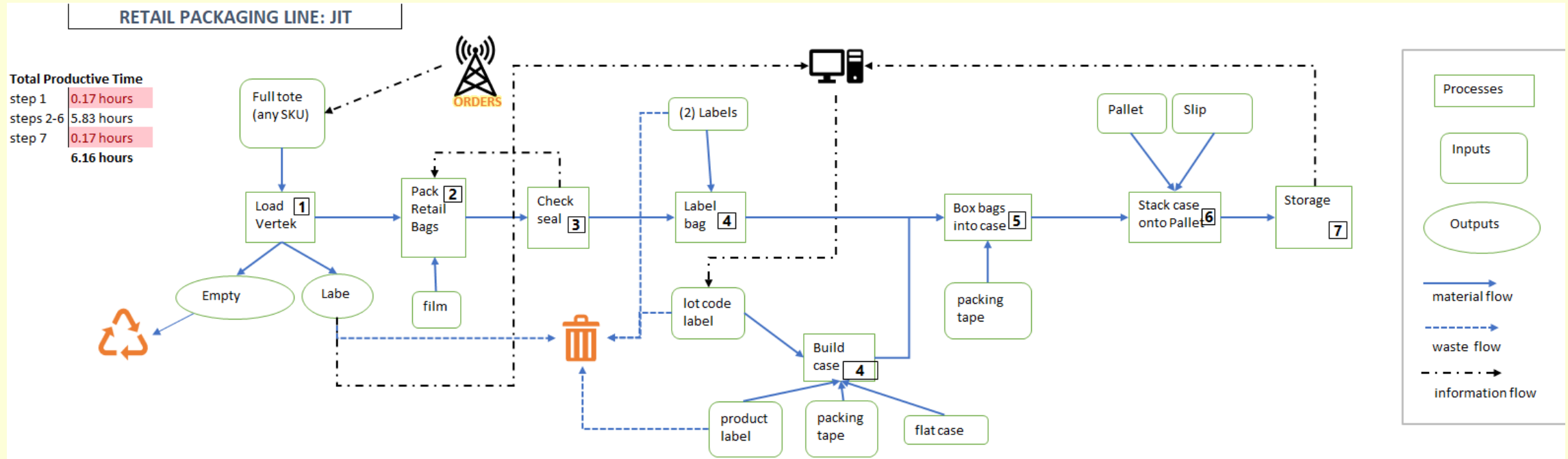


Just in time – receive goods as close as possible to when they are needed

Bags and cases should flow left to right

Information should flow right to left

Goal: once the step to the right is ready for the next bag/case, the step to the left should provide



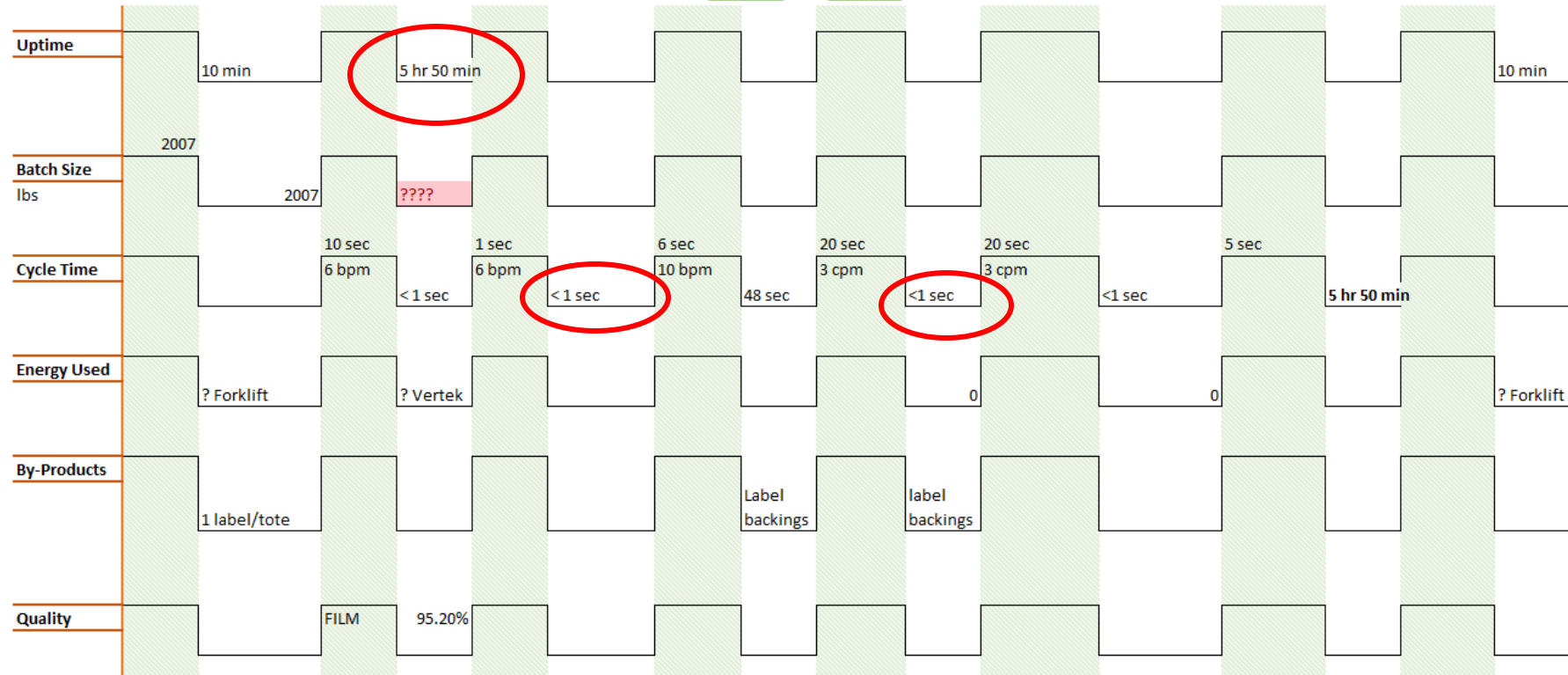
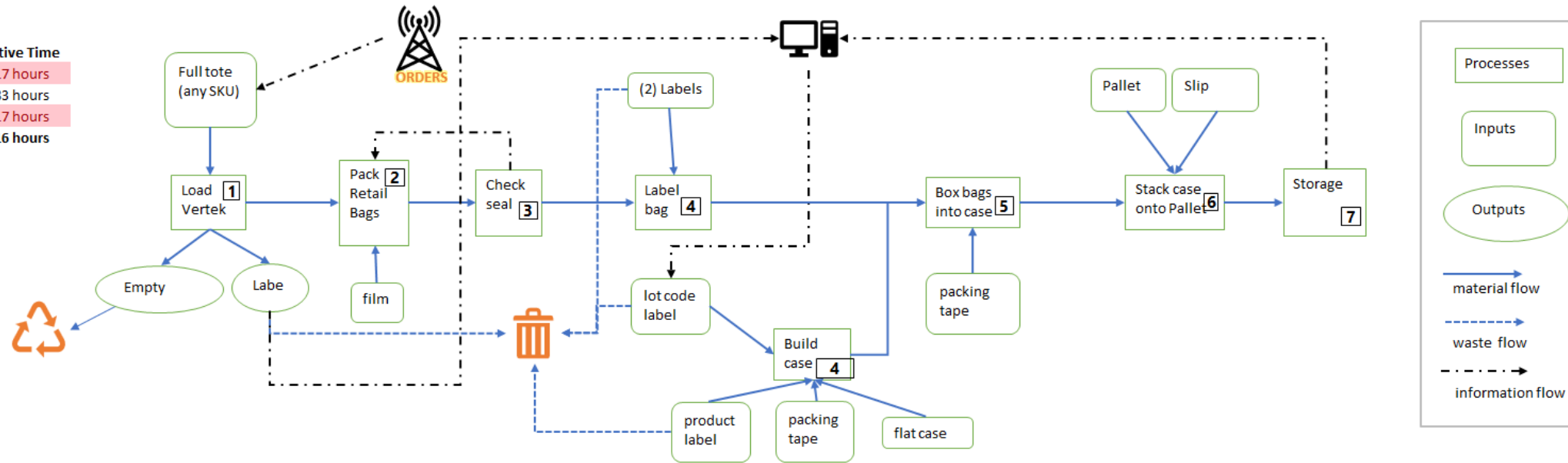
Slowing the Vertek packer to 6 bpm balances the flow of product such that single piece flow is achieved.

Even with reducing the speed of the Vertek, the time to package 1 tote is reduced by **3.23 hours** or 36%.

Does reducing the speed also increase the quality of seal on the package in turn reducing wasted film and product.

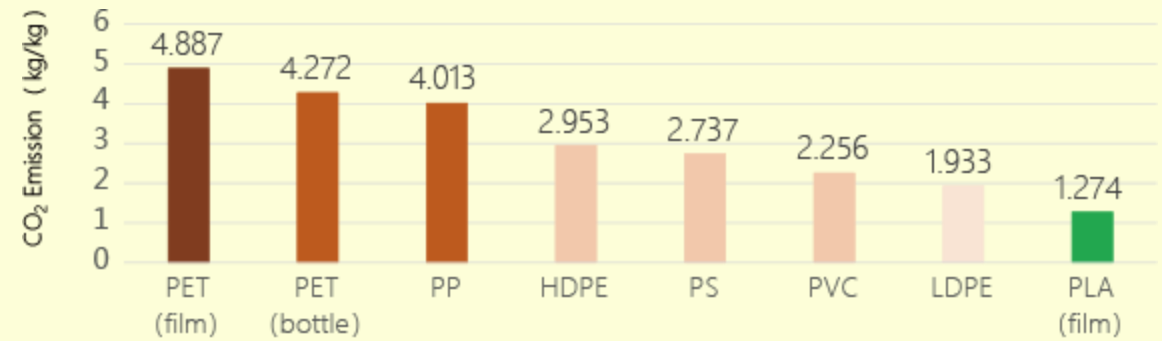
RETAIL PACKAGING LINE: JIT

Total Productive Time
 step 1 0.17 hours
 steps 2-6 5.83 hours
 step 7 0.17 hours
 6.16 hours



Preprinted Film

- Current PP film
 - PROS: universal
 - CONS: requires label application, prone to zippering, nonrecyclable
- Proposed preprinted LDPE
 - PROS: no label application, familiar to customers, lower CO2 emissions in production
 - CONS: nonrecyclable, more appropriate for flat stacking instead of vertical (doesn't stand up), product specific
- Proposed preprinted PET
 - PROS: no label application, good clarity, good tensile strength
 - CONS: product specific, higher CO2 emissions in production
- Proposed preprinted PLA
 - PROS: no label application, lower CO2 emissions in production, biodegradable
 - CONS: product specific, cost



But preprinted film MOQs are too high

- Wide Web vs. Narrow Web
- Narrow Web allows for order to be split in SKU specific labels
- Cost = number of labels * number of colors * \$175 + film cost
- Lead time = 7-14 days
- 9 SKUS * 3 colors * \$175 = \$4,725
- But each product has a different density i.e. bag length
 - SKU specific bag design
 - Use bag design to your advantage

- By eliminating the need for label application, labor and supplies costs decrease

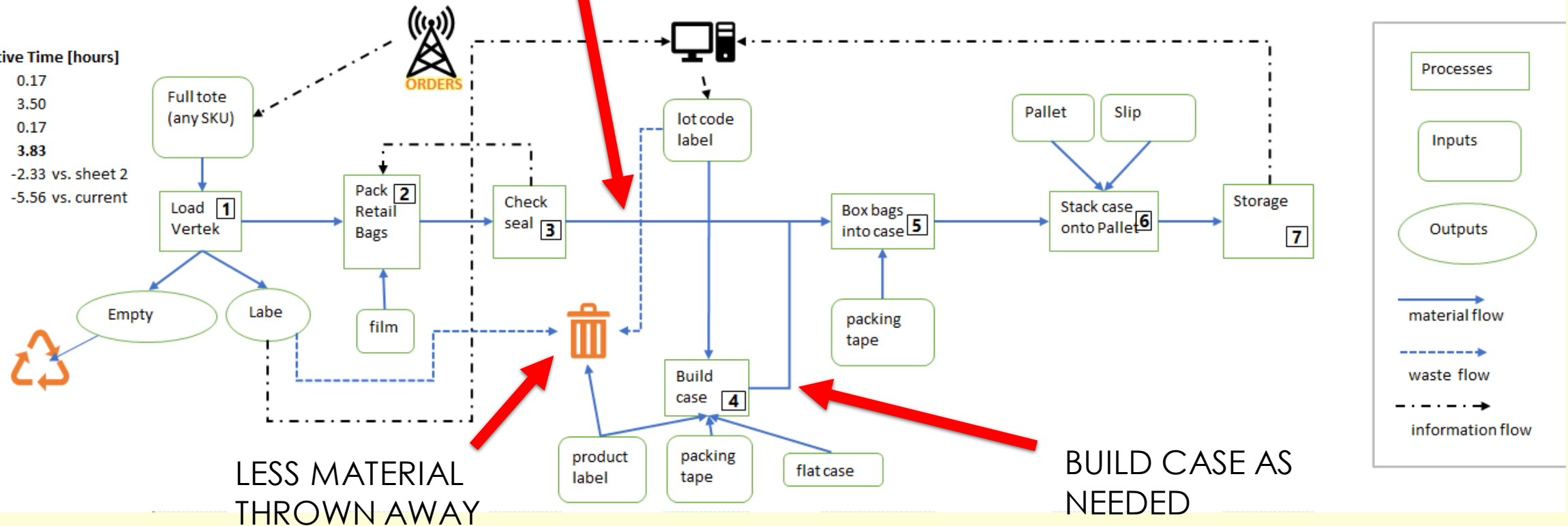
	PP film	labels	Preprint		cost of plates
quality	95.20%	99.00%			\$ 4,725.00
cost					
feet	5070				
impressions	5678	3500			
labor cost	\$ 40.00		\$ 40.00		
labor hours	5.83		3.5		
total cost	\$ 233.20		0 #DIV/0!		
weight					

BAG LABEL STEP ELIMINATED

RETAIL PACKAGING LINE: PREPRINT

Total Productive Time [hours]

step 1	0.17
steps 2-6	3.50
step 7	0.17
	3.83
Δt [hours]	-2.33 vs. sheet 2
Δt [hours]	-5.56 vs. current



By eliminating the labeling step, and running the Vertek at 10 bpm, the time to package 1 tote of product is reduced **2.33 hours** or 40%. The rate of fill of the Vertek can be adjusted to balance rate of building and packing cases.

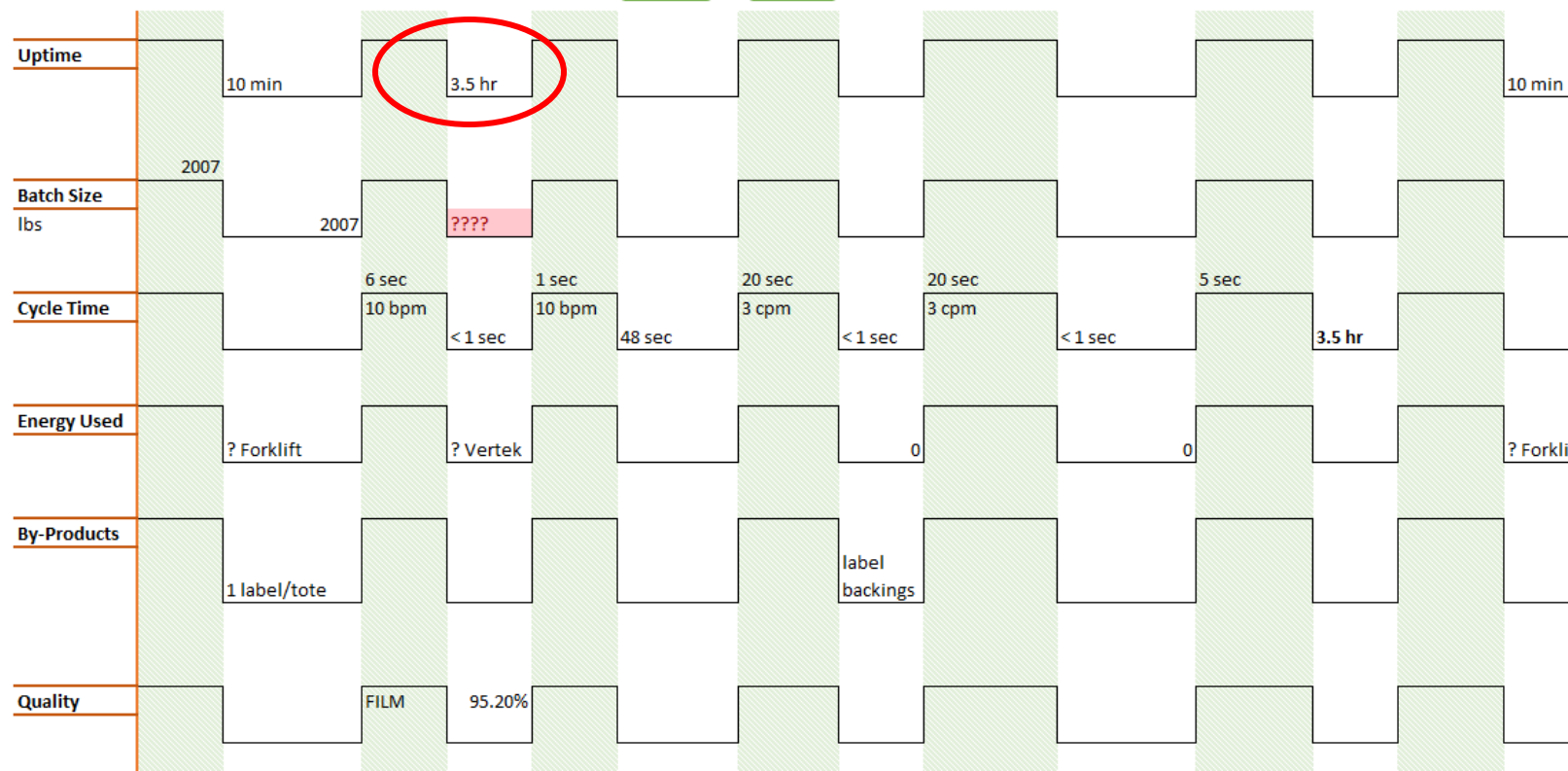
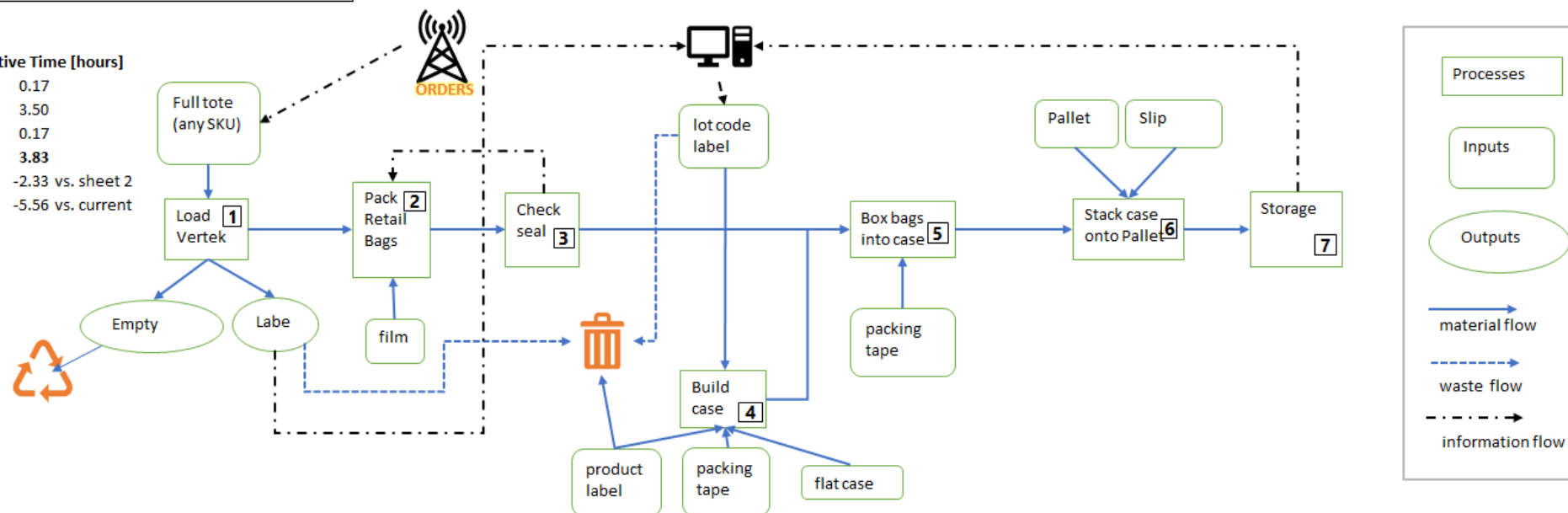
RETAIL PACKAGING LINE: PREPRINT

Total Productive Time [hours]

step 1	0.17
steps 2-6	3.50
step 7	0.17
	3.83

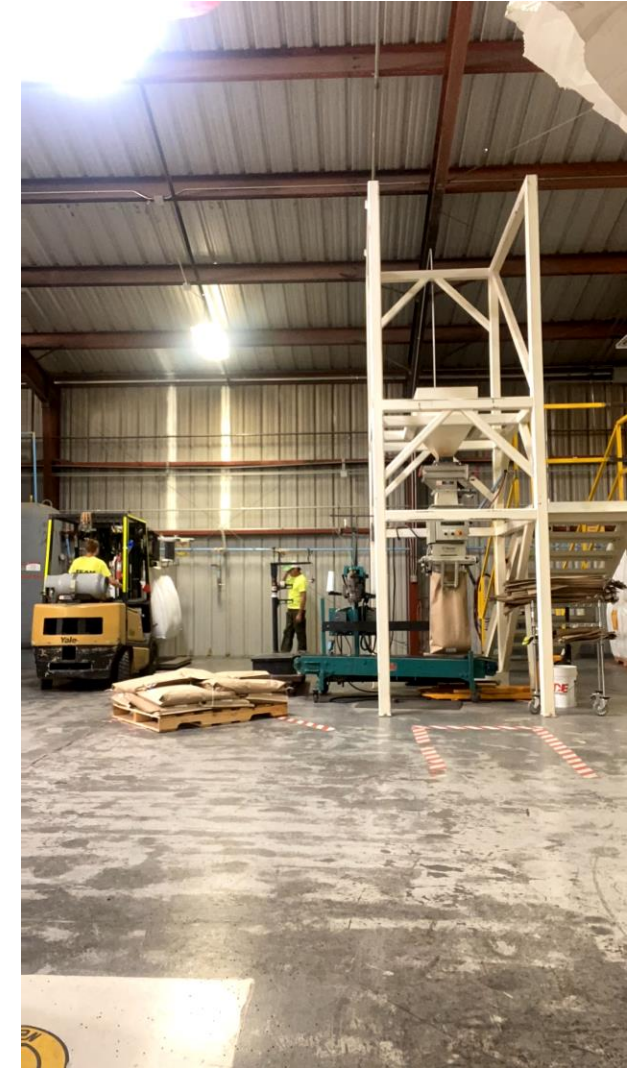
Δt [hours] -2.33 vs. sheet 2

Δt [hours] -5.56 vs. current

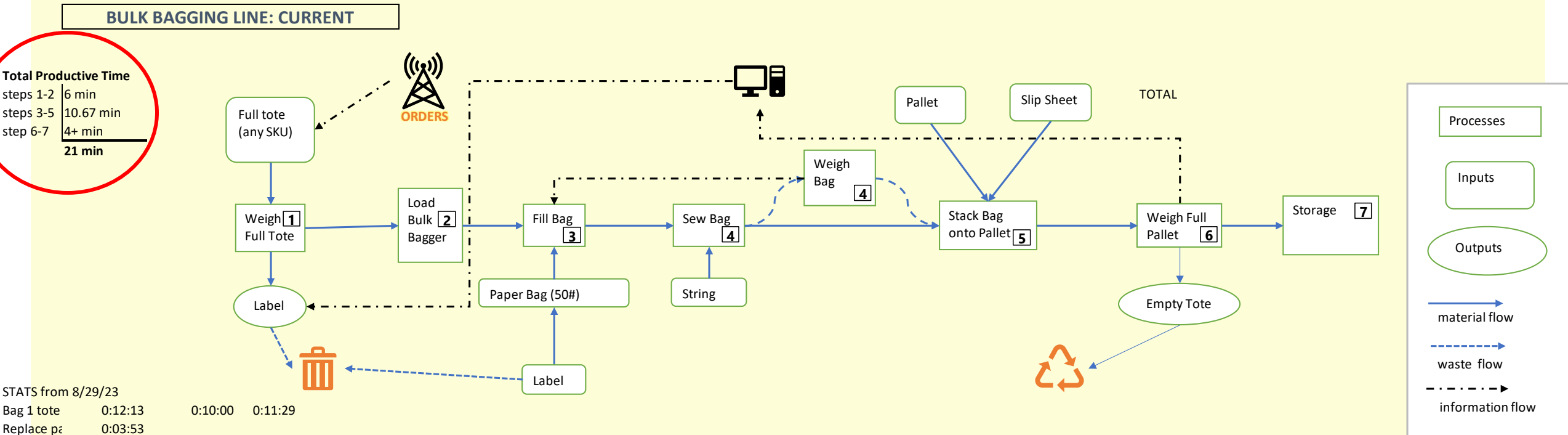


BULK BAG PACKAGING

- Pain points:
 - Physically demanding
 - Time intensive
 - Bottleneck on sales
- Solutions are expensive?
 - Palletizer
 - Fully automated
- Zero cost solutions
 - Organization
 - Process layout



50% of bagging time is spent loading and unloading (NOT VALUE ADDED TIME)

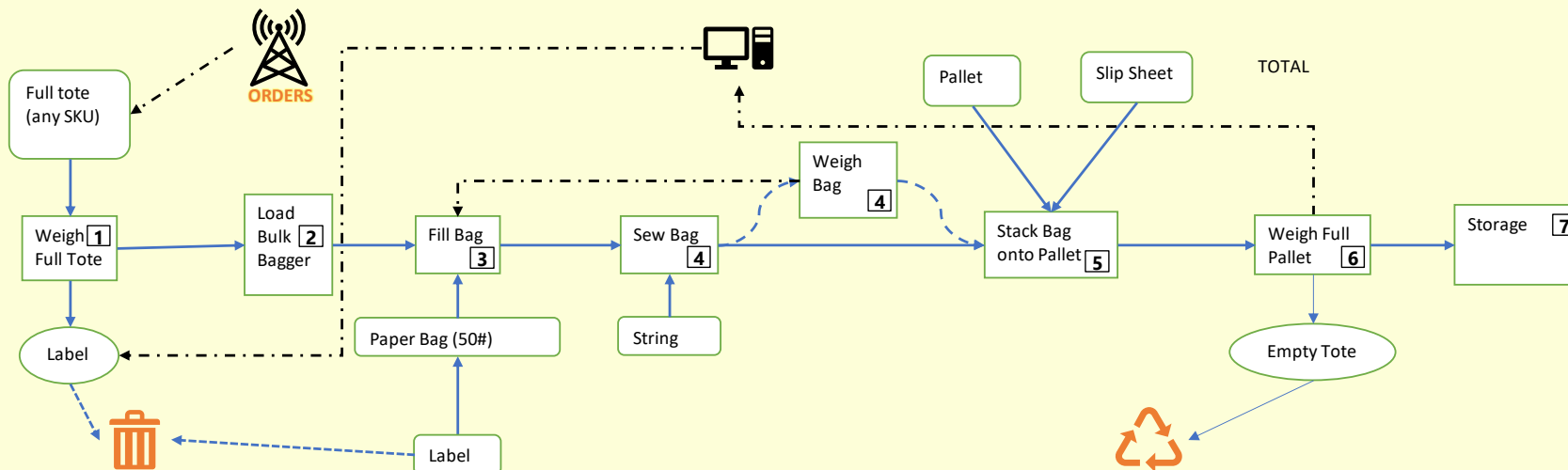


Additionally, tote unloading doesn't always align with full pallets. This causes the 10 minutes of start up/shut down time to increase because the forklift is being utilized as a pallet jack

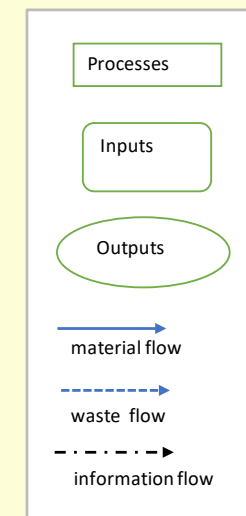
*Tote unloading and loading is used as time to recover from heat/cold stress and physicality of bagging

BULK BAGGING LINE: CURRENT

steps 1-2	6 min
steps 3-5	10.67 min
step 6-7	4+ min
	21 min



Bag 1 tote	0:12:13	0:10:00	0:11:29
Replace p...	0:03:53		

[illegible]

CURRENT

SCALE

PRODUCT ON HOLD

UP

BAG
GER

SEWING

BAGS

PALLETS

WIP

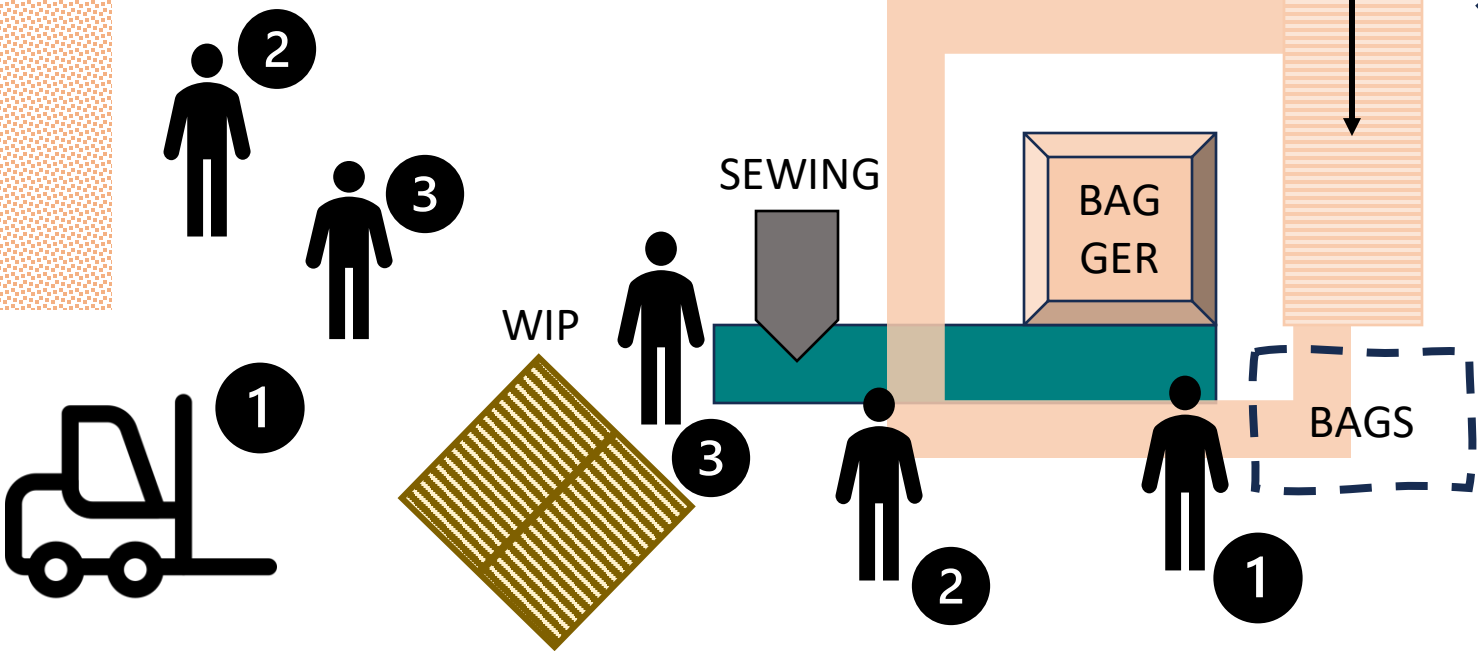
TO GMP
ENTRANCE

SUPER SACKS
TO BE CLEANED

TO
CLEANING
HOUSE

TO
WAREHOUSE

AIR COMPRESSOR ROOM



CURRENT PERSONNEL

1. DURING TOTE CHANGE / PALLET CHANGE

1. FORKLIFT OPERATOR
2. REMOVES OLD TOTE, HOOKS UP NEW TOTE, UNTIES NEW TOTE
3. REMOVES OLD TOTE, STORES OLD TOTE, HOOKS UP NEW TOTE

2. DURING BAGGING

1. GRABS EMPTY BAG, SITUATES UNDER BAGGER, HITS LEVER, MONITORS BAGGING SCALE
2. OPERATES CONVEYOR FOOT PEDAL, SEWS BAG SHUT
3. STACKS BAG ONTO PALLET, WEIGHS EVERY 10TH BAG

TOTES = 2000#, SKIDS/PALLETS = 2500#

PROPOSED

PALLETS

PALLETS

PALLETS

PRODUCT ON HOLD

UP

*Build skid on scale.
Pneumatic raise / lower*

WIP

SEWING

BAG
GER

BAGS +
LABELS

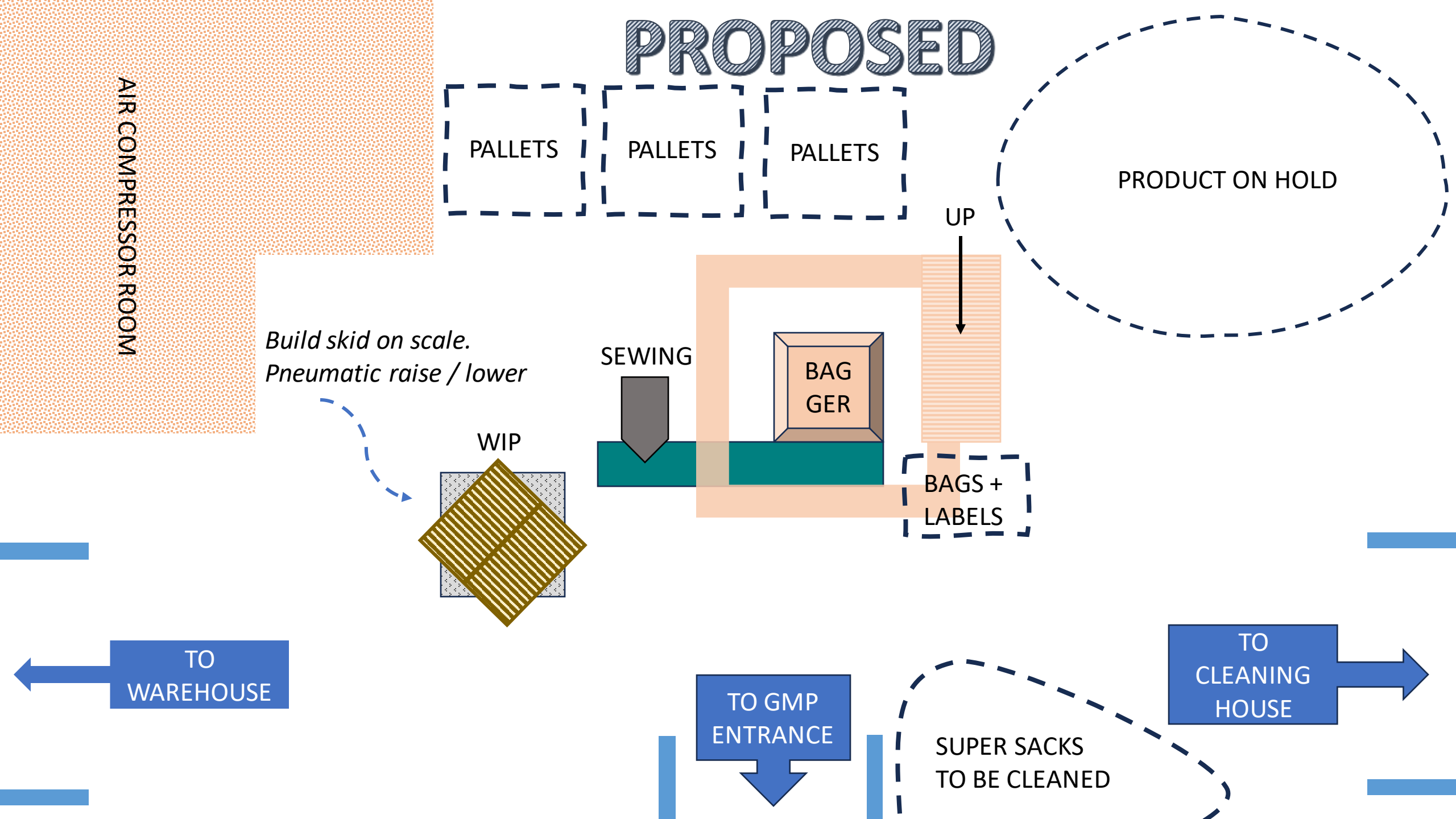
TO
WAREHOUSE

TO GMP
ENTRANCE

TO
CLEANING
HOUSE

SUPER SACKS
TO BE CLEANED

AIR COMPRESSOR ROOM



PROPOSED PERSONNEL

- 1 FORKLIFT OPERATOR
 - FOCUSED ON STAGING AND MOVING WHEN REQUIRED. CAN DO WAREHOUSE TASKS IN DOWNTIME
- 1 BAGGER
 - APPLY LABEL TO BAG, THEN FILL BAG, OPERATE CONVEYOR BELT
- 1 STACKER
 - SEW BAG, THEN STACK BAG, OPERATE SCALE, CHECK WEIGH EVERY 10TH BAG

TOTES = 2000#, PALLETS = 2000#.

ELIMINATE DOWNTIME TO CHANGE PALLET MID-TOTE

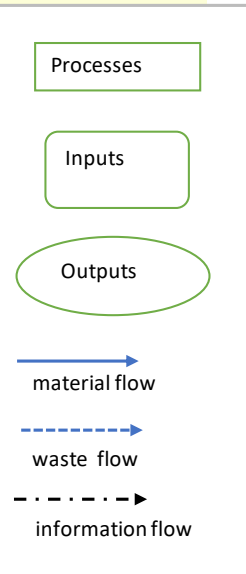
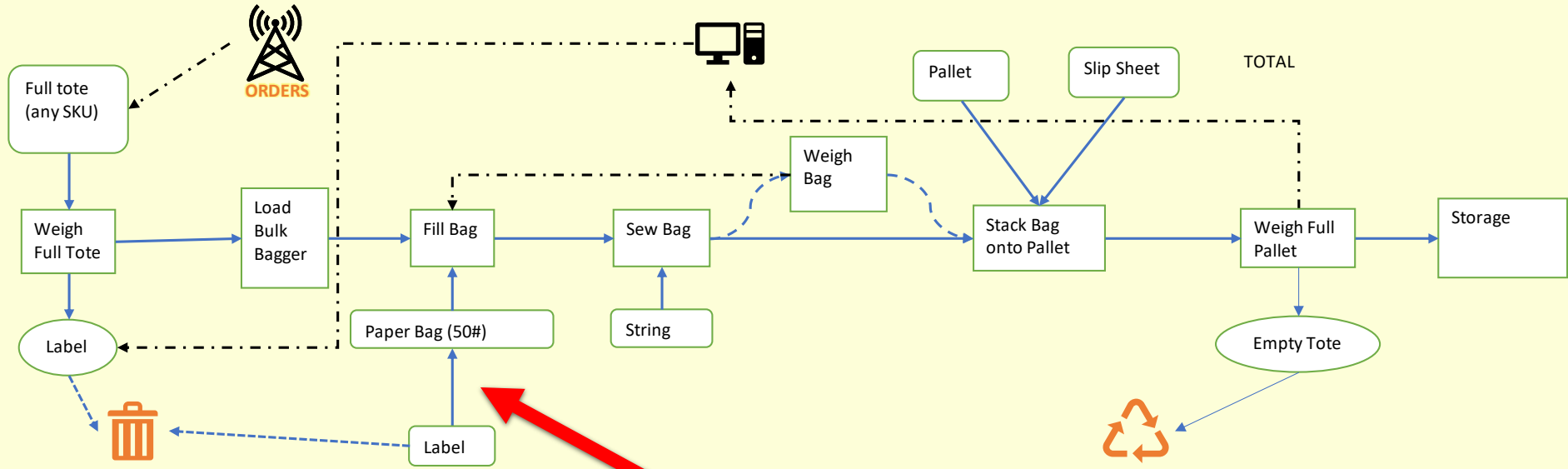
POSSIBLY IMPROVE FREIGHT OF PALLET

Reduction in bagging time by 29%

Data collected using 3 laborers

BULK BAGGING LINE: PROPOSED

Total Productive Time
steps 1-2 3 min
steps 3-5 10.67 min
step 6-7 <1 min
15 min



Label bags as needed.
Eliminates the 30 minutes used to
prelabel the bags

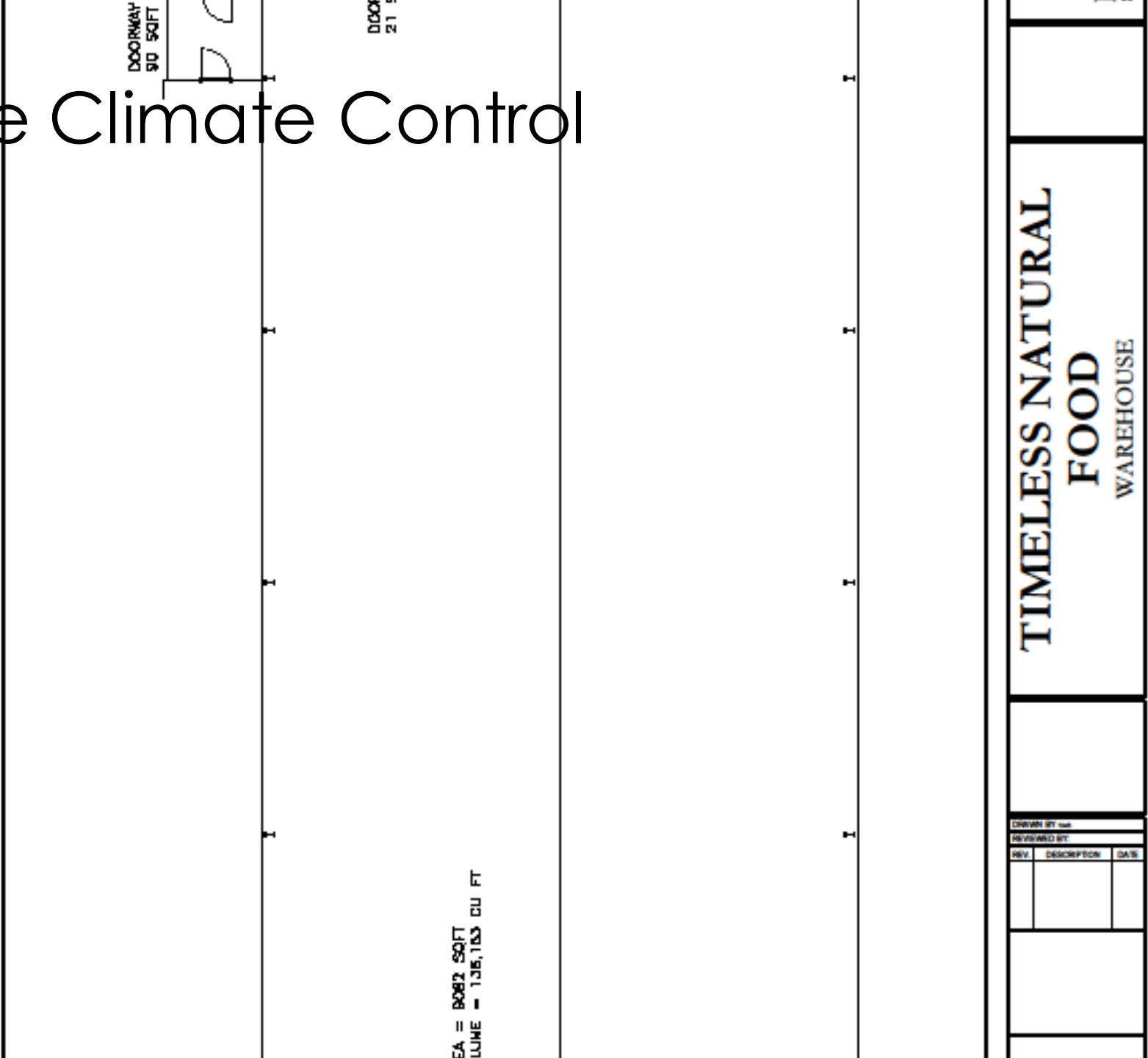
Does stacking pallets to 50, 50# bags actually save time and money?
Time=no, money=?, fewer pallets, less floor space on freight....more freight damage?

Warehouse Passive Climate Control

- Pressure Louvers
 - increase airflow without compromising security
- Insulation
- Cool Roof / Shading

In order to make most energy efficient decision, air temperature and humidity measurements will need to be taken through the seasons

Ultimate goals: improve product quality and worker productivity



Minor pollution prevention opportunities

- Lighting
 - Occupancy sensors in parts rooms, and color sort room
 - Reduce lighting from 10hours/day to 30 min/day
 - Replace T8 bulbs in parts rooms and bulk bagging area?
- Recycling
 - Terracycle
 - Packaging materials / label backings
 - PPE: hair nets, beard nets, ear plugs
 - Cigarettes
- Active Climate Control
 - Clextral Color Sorter environmental conditions
 - 5-35 *C = 41-95°F
 - Cost Risk analysis of running air conditioner continuously

Description	material	weight / year [lbs]
White 2x4 Labels	Silicon coated PP	82.56
Kraft 2x4 Labels	Silicon coated PP	0
Kraft 2x4 Labels	Silicon coated PP	0
Pink 2x4 Labels	Silicon coated PP	81.28
Lot Code Labels	Silicon coated PP	59.52
Retail Labels	Silicon coated PP	169.04
Retail Case Labels	Silicon coated PP	23.96
Hairnets	PP	5.85
Bearnets (black)	Nylon	4.14
Earplugs	PE foam, brass gro	2.67
Total		429.02

Thank you

- Land Acknowledgement

- Montana State University is located upon the homelands of indigenous peoples: people with proud heritage, a vibrant present, and a bright future. We acknowledge the Assiniboiné, Blackfeet, Chippewa Cree, Crow, Gros Ventre, Kootenai, Little Shell, Northern Cheyenne, Pend d'Oreille, Plains Cree, Salish, Sioux, Hidatsa, Mandan, Arikara, and the other indigenous nations of this region in the past, present, and future. We recognize that this rich human tapestry is central to our institutional mission of learning, discovery, and engagement.

- Montana Pollution Prevention (MTP2)

- This project was funded by the Environmental Protection Agency (EPA) Pollution Prevention grant (EPA-HQ-OPPT-2022-001; 66.708). It has not been formally reviewed by EPA. The views expressed in this publication are solely those of the authors and do not necessarily reflect those of the Agency. EPA does not endorse any products or commercial services mentioned in this publication.

- Montana Department of Agriculture Specialty Crop Block Grant (MDA SCBG)

- Funding for this project was made possible by the Montana Department of Agriculture's Specialty Crop Block Grant Program through grant 21SC07016. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Montana Department of Agriculture.