Landscape Forms
Waste Tracking
Landscape Forms

• Already 98% of waste diverted from the Landfill. (only four 40 yd trash compactors this past calendar year)

• In waste assessment found high volumes of wire ties, welding rod, and grinding discs.

• Our first area of focus is the wire ties.
Problem Statement

• Excess waste (recyclable material) is going to the landfill

• We aim to reduce the amount used and recycle the rest
Wire Ties

- Made of Aluminum, Steel, or Stainless Steel
- 1,000 units per bundle
- 170 bundles used every year
- Total cost of $2,445
Background

• Wire ties are used to hold product down during transportation to and from e-coat

• Some problems have arisen
Logistics

• Baskets are loaded with product and tied into place using the wire ties
• This package is then sent out to get e-coated and returned when finished
• The product is unloaded from the baskets (wire ties are supposed to be removed)
• The basket returns to be loaded again
Current Issues

• Sometimes all of the wire ties are not removed
• Reports of these loose wire ties clogging the e-coater
• Every year Landscape Forms usually gets a call regarding this problem
Quality Issues

• Too many wire ties / Too tightly tied
  – Can cause defects because the powder coat (paint) will not stick

• Too few wire ties / Too loosely tied
  – Product is apt to shift in baskets during transport, this can cause scratches in the fresh e-coat

• Operators do try to tie product in less visible areas
Collection Points

- Associates have asked for additional buckets for wire tie scrap
  - Offloading area
  - Fabrication cells
  - Fork truck drivers
- Buckets on carts for easy placement
Standard Work

• Currently: Tribal knowledge
  – Best practices are passed down by senior associates.

• Problems:
  – Some parts have floated off during e-coat
  – These products now tend to get over tied

• Goal:
  – Standard work to be developed by the senior associate of the cell
  – Ties should be placed based on the class of surface (this will address quality defects)
Opportunities for $avings

• Time spent sanding products after e-coat
• Time spent re-painting products
• Time spent tying in and untying product
• Cost of additional wire ties
• Space taken up in the trash compactor
• Money obtained from recycling wire ties
Next Steps

• Develop standard work instructions
  – To reduce the amount of ties used
  – Ensure all products are tied in a way to minimize defects

• Recycle the used ties
Thank You!
Standard Work Instructions
For hanging operation at Powder Coat Line

Benedicto J. Hernández CE
Marylin N. Glass-Hedges IE EM
Michael E. Saldaña EM
Problem statement

• No standard work instructions (SWI) for all products

• Employees have *freedom* to choose how to hang parts

• Existing but outdated, not controlled & different formats
Paint process overview

- **E-Coat**
- **Hang on the line**
- **Assembly**
- **Customer**

Where the project is focusing
Some differences
Other Defects
Our Goal!
An SWI Must be:

- **Clear** (understandable for every employee that does the task)

- **Accessible** (available whenever the task must be done)

- **Credible** (employees trust the work instruction)

- **Consistent** (work instruction matches skillset of employees)
This is a basic instruction for hanging LX backless benches.

**Step 1:**
- **Materials:** Plexus chair hooks, 4 medium plugs.
- **Procedure:** Hang 2 T-bars on the line facing each other. The space between each hook is determined by the length of the support. On three seaters skip one hook, then place the T-bar. On four seaters skip two hooks, then place the T-bar. On five seaters skip three hooks, then place the T-bar. Hang a medium thick hook, one each hole of the T-bar that faces the booth. Plastic embedded, surface mount, and freestanding supports are hung the same way.

**Step 2:**
- **Front of support**
- **Procedure:**
  - Place a C-hook on the end of the support and hang it off of the T-bar. Have another team member place a C-hook in the second to last seat bracket hole and hang it on the T-bar. Repeat the process for the second support, but hang the C-hooks off of the medium hook instead of the T-bar. **Note:** The process for hanging radius supports isn’t standardized. The goal is to hang the support using the correct seat bracket holes to make the support level. If radius isn’t much, then hang it as supported.
  - **Spacing:** Hang one space in front of the support. Two spaces between the supports and the seats. One space before and after each seat.

**Step 3:**
- **Back of support**
- **Procedure:**
  - Skip two spaces and hang a plastic seat hanger on the line hook. Then hang a plastic seat on the hook using the seat bracket hole on the chair. Plexus slats are hung with two seaters every other chair. Using a C-hook, just hang the second seat off of the seat bracket on the top chair.

**Step 4:**
- **Upper seat connection**
- **Procedure:**
  - When hanging surface mount and freestanding supports each leg of the support needs plugged like the pictures in Step 6.
Where are we now?

- Defined current state  
  **(64 out of 120ish)**  
  **+50%**

- Final design of SW instructions document

- Build Big Portion SWI samples
Moving forward

- Completed hooks inventory
- \textit{Run} samples by paint line team
- Train associates to new standards
- Build more samples, repeat process
- Build SW instructions for all products
Any Questions?
Dents on Edge-Bands
Handling Damage

Final Observations & Recommendations

Emilia Nunez, IE
Marylin Glass-Hedges, IE, EM
Michael Saldana, EM
Ryan Maibe, IE
Past Student:
Josef Imesch, E.M.
What’s the issue?
Other Defects

- In Line Vertical Dent
- Incomplete Edge Banding
- Chip Outs
- Too much glue!!
- Deep Scratch
**Project Overview**

**Action**
- Track all board defects

**Scope**
- Throughout the wood plant, from the fabrication cells to the trim operation

**Goal**
- Eliminate dents on edge-band at the source (s)
1. A3 Subject: Cabinet Edgeband

**F. Problem Statement/Frame**
During the flow of a component through the value stream, inline dents on edge band occur during the processing of the part. The components that have the highest vulnerability are end panels, tops, doors, and headbands. They can be fixed at the patch station, but it takes time to each unit going through causing that unit goes over line and slow down the flow of production.

**A. Scope**
- Cabinet, SWOH, farm, and Custom value streams which would process components for all value streams

**1. Objective/Scope**
- To eliminate inline dents on components edge band in all value streams

**2. Current Condition**
- Currently, there are approximately 80% of units going down the Trim line with one or more dents in the edge band that need to be fixed.

3. Team Members & Role: WWU team, Tom Tompa, Scott Hennell

4. Functional Approval:

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2. Owner: Mark Atchison
Which are the fabrication cells?

- Cabinets
- SMOH
- Peds
- Desks
- Custom
- Finish Line
Main issues per cell

Cabinets

• Bumping boards at the Second Edge Bander

• Highest defect rate
Main issues per cell

SMOH

- Space
- Edge-band riding off edge
- Chip outs more common vs. other cells
Main issues per cell

Peds

- Edge banders back to back
- Stacking
- Lowest defect occurrence
Main issues per cell

Desk

• Only 1 edge bander

• Spins boards to hand sand corners
Main issues per cell

Finish Line

- Critical operations: loading and unloading
- “Dropping” boards
- Boards in and out of racks
<table>
<thead>
<tr>
<th>Cell</th>
<th>Defect Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinets</td>
<td>22.50%</td>
</tr>
<tr>
<td>Desk</td>
<td>7.88%</td>
</tr>
<tr>
<td>SMOH</td>
<td>14.38%</td>
</tr>
<tr>
<td>Finish line</td>
<td>2.35%</td>
</tr>
</tbody>
</table>
Recommendation

The Handling Damage Visual Aid
To prevent...

- Boards hitting racks edges
- Corners hitting boards edges
- Boards jamming up with others
<table>
<thead>
<tr>
<th>Step #</th>
<th>Major Steps (What)</th>
<th>Work Elements</th>
<th>Key Points (How)</th>
<th>Reason (Why)</th>
<th>Job Aid Section (Pictures to Describe Work)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receiving panels</td>
<td>No not hit the panel below on edge (pic-1) and not panels Corner First in rack (pic-2).</td>
<td>Handling damage control to prevent dents, scratches or marring of panel edge.</td>
<td>Pic-2: Panels should not be dropped on corners.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Handling in line panels</td>
<td>Do not stack panels (pic-3), be aware of corners of conveyors or machines that might hit the panel (pic-4). Pull panel along the sides, not across the rollers (pic-5).</td>
<td>A few damage control to prevent dents, scratches or marring of panel face or back.</td>
<td>Pic-4: Panels should not contact each edge.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Storing panels</td>
<td>Send the panels so that contacting edges of consecutive panels are parallel. Manually guide panels to be flush with each other (pic-6). Panels are not hit by corner of adjacent panels (pic-7). No jamming up of panels (pic-8).</td>
<td>A few damage control to present dents in edgeland.</td>
<td>Pic-6: Panels should be guided to be flush.</td>
<td></td>
</tr>
</tbody>
</table>

**General Material Handling Guidelines**

- **Tools:** PPE
- **Safety Equipment:** Refer to workstation JSA

**Training Steps (JIT)**

1. Prepare the Worker
2. Present the Operation
3. Try Out Performance
4. Follow Up
After the “Handling Damage Visual Aid” implementation...

Observations and Re-counts
Cabinets

Crashes between corners and edges
Cabinets

They’re stacking although there’s plenty space to not do so!

Still stacking!
Cabinets

- Boards falling from the conveyor
- Operators should be more conscious
- Big and small boards one after the other
Cabinets

Stacking and colliding

More pushing than pulling
Desks

Crashes between corners and edges
Desks
Desks

Racks need maintenance!
Desks

Exposed veneer
Finish line

Too many boards to be handled at the next station

Colliding or overlapping
No dents were observed

Operators were following the “Handling Damage Visual Aid”

Some stacking
## Defect Rates Comparison

<table>
<thead>
<tr>
<th>Cell</th>
<th>Rate (before)</th>
<th>Rate (after)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinets</td>
<td>22.5%</td>
<td>11.25%</td>
</tr>
<tr>
<td>Desk</td>
<td>7.88%</td>
<td>10.00%</td>
</tr>
<tr>
<td>SMOH</td>
<td>14.38%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Finish line</td>
<td>2.35%</td>
<td>3.06%</td>
</tr>
</tbody>
</table>
Comments & Recommendations

- Positive changes!!
- Improvement opportunities to be achieved...
- Stacking is still a common practice
- The corners of the boards are still hitting the edges
- Operators need to be re-trained
- Racks need maintenance
Thank you for your attention!
Questions.....?
Loose Veneer
Caused by Flow Interrupters

Marylin N. Glass-Hedges, IE, EM
Ryan J. Mabie, IE
Emilia M. Núñez, IE
Remember what veneer is?
Steelcase’s wood furniture
What does loose veneer look like?
We also focused on...
Pressing process

Clean, glue particle board → Apply backer material → Apply face material → Heat press backer and face onto particle board

The 4-minute rule

Boards need to make it from gluing to pressing in less than 4 minutes, or the glue dries and a loose veneer defect is created.
Pressing process
Small Hot Press (SHP)
The problem

Glue dries after 4 minutes
Flow interrupters elongate process time
Highest defect rate, cost
Approaching the problem

Objectives
Determine if loose veneer happens at the hot presses
Conduct a root-cause analysis
Recommend improvement plan

Action plan
Audit operators’ compliance to standard work
Track flow interrupters
Identify ‘big hitters’
Re-audit process and document progress

If anything else comes up, let us know!
--- Steelcase.
### Station: Press Coordinator Wem 109

#### Job Breakdown Sheet

<table>
<thead>
<tr>
<th>Parts/Materials:</th>
<th>Tools:</th>
<th>Safety Equipment:</th>
<th>Date: 1/12/2015</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Major Steps (What)</th>
<th>Work Elements</th>
<th>Key Points (How)</th>
<th>Reason (Why)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stage veneer, gator ply, laminate and HPL in area.</td>
<td>Bring tables with appropriate blocks to the press.</td>
<td>Prepares to set up the next block.</td>
<td>Moves load into the 2 feeder lanes in numerical order as numbered on the paperwork. Puts next load in order and position to be run.</td>
</tr>
<tr>
<td>2</td>
<td>Obtain vendor stack list</td>
<td>use the list provided for the daily schedule</td>
<td>maintain the correct order to set up the block.</td>
<td>Move loads into the 2 feeder lanes in numerical order as numbered on the paperwork. Puts next load in order and position to be run.</td>
</tr>
<tr>
<td>3</td>
<td>Set up the backs for the next block to be run on the platform at the backer station.</td>
<td>using vendor stacks list; stack the back material on the platform for the operator</td>
<td>Puts the material in order and in user position of the backer station.</td>
<td>Adjust machine setting when there is a change in core thickness. Can be done.</td>
</tr>
<tr>
<td>4</td>
<td>Set up the face for the next block to be run on the platform at the face lay up station.</td>
<td>using vendor stacks list; stack the face material on the platform for the operator</td>
<td>Puts the material in order and in user position of the backer station.</td>
<td>Moves priority parts through the process in a speedy manner.</td>
</tr>
<tr>
<td>5</td>
<td>Set Up Hots, shorts, reworks &amp; remakes when available</td>
<td>Repeat the same process as above</td>
<td>Moves priority parts through the process in a speedy manner.</td>
<td>Move loads into the 2 feeder lanes in numerical order as numbered on the paperwork. Puts next load in order and position to be run.</td>
</tr>
</tbody>
</table>

**Helps apply Larger faces to prevent Smearing Glue**

**Assists with staging parts for the hot press.**

**Assists with cleaning debris from tops and backs with the air gun.**

**May need to support operator laying down backs more, as he spends more of his time helping with the tops. The Operator doing the backs seemed to be struggling to keep up.**

### Station: Backer Lay Up Wem 109 Press

#### Job Breakdown Sheet

<table>
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<tr>
<th>Parts/Materials:</th>
<th>Tools:</th>
<th>Safety Equipment:</th>
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<th>Major Steps (What)</th>
<th>Work Elements</th>
<th>Key Points (How)</th>
<th>Reason (Why)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Move Core loads into Staging lanes in order</td>
<td>Move loads into the 2 feeder lanes in numerical order as numbered on the paperwork.</td>
<td>Moves load into the 2 feeder lanes in numerical order as numbered on the paperwork. Puts next load in order and position to be run.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Position core load into auto destacker and activate</td>
<td>Make sure core load is centered on lift conveyor.</td>
<td>Efficiency-never let destacker be empty.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Set Thickness on Panel Cleaner &amp; Gluer Spreader</td>
<td>Adjust machine setting when there is a change in core thickness.</td>
<td>To obtain a clean core and proper glue millage.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Obtain backer from stack</td>
<td>Use a carrier under the front end of cross grain veneer to prevent damage to veneer. Which carrier?</td>
<td>Prevents veneer from folding under on the rollers to next operation.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Position material to index station</td>
<td>Make sure laminate backs are placed color side down.</td>
<td>Moves priority parts through the process in a speedy manner.</td>
<td></td>
</tr>
</tbody>
</table>

**Helps apply Larger faces to prevent Smearing Glue**

**Assists with staging parts for the hot press.**

**Assists with cleaning debris from tops and backs with the air gun.**

**May need to support operator laying down backs more, as he spends more of his time helping with the tops. The Operator doing the backs seemed to be struggling to keep up.**

**Push send button**

**Check glue spreader for proper glue application**
Summary
Missing steps
Incomplete steps
Shortened terms, initials not defined
Different words use to define the same term
Some descriptions were too wordy
Significantly different compliance between experienced and newer operators

Recommendations
Revise overall verbiage
Add visual aids
Re-train all operators to new/revised standards
Flow interrupters

Detailed observations

Observer(s)? Large, small press? Shift, hours? Observations: hourly, general, trends?
### Incidents / Reason Total

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<th>Incident / Reason</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<td>3</td>
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<td>5+</td>
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<td>Remake Missing/Wrong Veneer</td>
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<td>Press belt discharge problem</td>
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<td>Wrong press time</td>
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<td>9</td>
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<td>Laminate surface defect</td>
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</table>

### Tally

- **Wrong pressing time**
  - Veneer: 60 seconds
  - Laminate: 50 seconds

- **Missing material:** poor material coordination

- **Exposed core:** boards stuck on press

- **Over 4 minutes:** 4% of the time
### Flow interrupters
#### Trends by press

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80 84 164
What does exposed core look like?
Possible cause for exposed core
What now?!  
Review meeting on 3/23/2015

**Steelcase**

- Revise standard work
- Re-train operators
- Press time set at 60 seconds for both veneer and laminate
- Adjust misters and conveyor speed (small press)

**GMIC**

- Focus on small press, second shift
  - Newer, less experienced operators
  - Reactive approach
SHP observations
3/25, 3/26 and 3/30

Misters: high pressure, more air than water
  Risk of exposed core, loose veneer
Careless material placement
  Risk of cracking material, exposed core
Sliding long parts onto backer
  Risk of glue removal, loose veneer
Handling glued cored
  Risk on glue removal, glue transference
Material coordination issues
  “Bubble” defects

We shared our findings with the zone leader...
Don’t tell me... Show me!
Moving forward...

Assess for progress
  Following standard work revisions, training
Further explore
  Exposed core issue, material coordination
Determine if loose veneer happens outside the hot press
  Apparent later in the process, when glue has cooled down?
  Cause by another process?
Thank you for your attention!

QUESTIONS?!
Root Cause Analysis on Cups Sealing Surface

By: Michael Saldana
Problem Statement

- Dips on sealing surface of yogurt cups
- Leaking once cups are filled
- Off center punches
- Potential Lawsuits
- Not good for business
What is a dip?
Other
Goal

Find cause of dips and fix it!
Methods

- Conduct Design of Experiment to determine factors affecting the problem
  - Determine mold cavity location of most dips
  - Conduct cause and effect diagram
Thermoforming Process

Thermoforming tool; Top half is in position, Bottom is lifting or "Plugging"

Form Station

Parts formed in web

Thermoformer Oven

Feeder Rolls

Form Station Control Panel
Closer Look at The Mold
Cavity Map

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First Sample
First sample Pareto

Pareto Chart of Dips based on Cavity No

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Frequency

Cum %
Cavity Map

54 Up Illig Tool

Sheet Direction

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24 25 26 27
28 29 30 31 55 33 34 35 36
37 38 39 40 41 42 43 59 45
46 47 60 49 50 51 52 53 54

Sheet Direction
Next Steps

- Create Cause and Effect Diagram
- Validate
- Conduct DOE
Questions
Thermoforming & The Factors That Impact Product Stability

For Fabri Kal Corporation

Presented by Tim Krueger
Thermoforming:

- The process of heating and stretching plastic materials over a mold until the desired form is set.
- The plastic is either pulled over a mold or pulled into a mold.
- Could be assisted by plugs, halos, positive, or negative pressure.
- Part is cut or trimmed to create the final product.
Thermoforming

Watch Thermoforming Movie:

http://thermoformingdivision.com/resources/thermoforming-video/-
Thermoforming

Advantages:

1. Low Machine Costs
2. Low Temperature Requirements
3. Low Mold Costs
4. Low Pressure Requirements
5. Can Form Large Parts
6. Fast cycle times
7. High Volume
Thermoforming

- Disadvantages:
  1. High Cost of Raw Material
  2. High Scrap
  3. Limited Part Shapes
  4. Only One Side of the Part Defined by the Mold
  5. Inherent Wall Thickness Variations
  6. Internal Stresses Common
Basis for Research:

- Dimensional instability of containers which cause reduce finish product output and an increase in process cycle times.
Research Questions:

- Can we improve heat signatures across pre-molded sheet?

- Once formed how do we improve heat transfer from the thermoformed plastic sheet to the mold to reduce product instability?
Factors that affect product stability:

- Study and identify critical process parameters “Factors” that affect product stability of thermoformed plastic. These include:
  - Material Thickness
  - Material Flexibility
  - Material Heating
  - Sheet Indexing
  - Number of Cavities “Ups”
  - Temperature Stratification
  - Cooling Medium
  - Regrind Percentage
  - Mold Contact
  - Mold Temperature
  - Trimming
  - Material Shrinkage
  - Tool Design & Material
  - Others?
Material Type (Polypropylene):

- Stiffness
- Abrasion Resistant
- Higher Processing Temperatures
- Higher Melting Point
- Higher Service Temperatures
- Resistant to Cracking from Material Stresses
- Can be Used With Reinforcements or Fillers to Improve Strength & Reduce Costs
Current Research:

- The Role of Plug Design in Determining Wall Thickness Distribution in Thermoforming – (Duncan 2007)

- A solution for warpage in polymeric products by plug-assisted thermoforming – (Hosseini 2007)

- Shrinkage and Warpage Detailed Analysis and Optimization for the Injection Molding Process Using Multistage Experimental Design - (Barghhash 2014)

- Current research has been on plug design and speed of the plug
Methodology:

- Systematic analysis of parameters observed in the Extrusion, and Heating processes (pre-molding)
- Determine if there is a correlation between pre-molding parameters and “warpage”
- Analyze the parameters of the tooling process but considering the inertial effects of the pre-molding processes.
Extrusion:

- Extrusion analysis:
  1. Documented thickness measurement
  2. Thermo-imaging of the plastic sheet
Sheet Thickness & Temperature:

- **Thickness** - used video camera to record sheet thickness as it exited the rolls as reported from IR scanner.

- **Temperature** – was measured at three locations on the sheet: the left edge, the middle, and the right edge using a FLIR thermo camera.

- **What we were looking for** – thickness and temperature consistency
Sheet Thickness:

Sheet Thickness

MILs

Avg
Temperature

Plastic Sheet Temperature

Degrees F

1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97 101 105 109 113 117 121

Left Temp
Middle Temp
Right Temp
What We Found:

- No wide swings of temperature or thickness – which was what we had hoped for – it would indicate that the extrusion process wasn’t a major source of variability.

Caveats:

1. Do see an upward trend of sheet thickness
2. Striations in the plastic sheet
Temperature Profiles:

Left Side

Middle

Right Side
Left Side Temperature Video:
Center Temperature Video:
Currently:

- Developing an initial measurement system for part distortion

- Look for correlations between current measurement systems which may include - product weight, product location in the tool, sheet temperatures, etc.
Collaboration needs:

1. Pull samples at a yet to be determined rate
2. Schedule best times for observations
3. Access to measuring tools or techniques used to measure warpage
4. Record data and look for correlations
Goal:

- Design, implement, and analyze DOE to determine critical factors (Pre-Molding)
- Develop effective solutions
- Check validity of recommendations to make system as robust as possible
- Begin tooling analysis
Conclusion:

- Initial results are spotty at best - material is hard to measure and the high production speeds only compound this fact.

- Very little research on thermoforming - specifically tooling and processing

- Focus will be on measurable and controllable factors
Thanks:

- Fabri-Kal – Tom Bush, Mandip Ghai, Mike Saunders, Dan Maciag, & Dennis Martin

- WMU – Dr. Engelmann, Dr. Meade, & Dr. Prieto

- KCC – Tom Longman, & Kevin Barnes
Questions?
Buildings Layouts
Digital Layouts & Emergency Guides/Routes
Creating Safer and Manageable Warehouses

Benedicto J. Hernández, CE (Speaker)
Advantages Of Digital Layouts

- Easy storage, Easy sharing
- See it before you build it
- Improve the quality of the design
- Creating the database for manufacturing
- Detail Level
From the First Stage Of Warehouse Optimization Project
Detailed Measurements taking
Digital Layouts
Next Step....

**Emergency Guides/Routes**
Advantages Of Emergency Guides/Routes

• Improve detection
• Faster decisions
• Better reactions
• Fluent Movement
Needed Some Guidance...
Visit Findings

Proper Exits

Signaling

Excellent Fire Extinguisher locations & signaling

WELL Equipped

Bad Emergency Guidance

Didn't find any
1) **In case Of...**

**Sheet**

### IN CASE OF TORNADO

An underground area, such as a basement or storm cellar, provides the best protection from a tornado. If an underground shelter is unavailable, consider the following:

- Seek a small interior room or hallway on the lowest floor possible.
- Stay away from doors, windows, and outside walls.
- Stay in the center of the room, and avoid corners because they attract debris.
- Rooms constructed with reinforced concrete, brick or block with no windows and a heavy concrete floor or roof system overhead.
- Avoid auditoriums, cafeterias and gymnasiums that have flat, wide-span roofs.

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### IN CASE OF FIRE

The following steps should be followed when responding to incipient stage fire:

- Sound the fire alarm and call the fire department, if appropriate.
- Identify a safe evacuation path before approaching the fire. Do not allow the fire, heat, or smoke to come between you and your evacuation path.
- Select the appropriate type of fire extinguisher.
- Discharge the extinguisher within its effective range using the P.A.S.S. technique (pull, aim, squeeze, sweep).
- Back away from an extinguished fire in case it flares up again.
- Evacuate immediately if the extinguisher is empty and the fire is not out.
- Evacuate immediately if the fire progresses beyond the incipient stage.

Most fire extinguishers operate using the following P.A.S.S technique:

1. **PULL**... Pull the pin. This will also break the tamper seal.
2. **AIM**... Aim low, pointing the extinguisher nozzle (or its horn or hose) at the base of the fire.
3. **SQUEEZE**... Squeeze the handle to release the extinguishing agent.
4. **SWEEP**... Sweep from side to side at the base of the fire until it appears to be out. Watch the area. If the fire re-ignites, repeat steps 2-4.

*If you have the slightest doubt about your ability to fight a fire... EVACUATE IMMEDIATELY!*
2) Emergency Guides
3) Emergency Routes

[Diagram of recommended exit routes for building #3 and building #6]
Before & After
At the moment & Next Steps

Emergency Guides/Routes

- Optimal Locations in which to place them
- Train the Staff How to use
- Create a report with all the Safety hazards founds
At the moment & Next Steps

Digital Layouts

• Creating a Complex layout
  ✓ Interactive
  ✓ User Friendly
  ✓ Water Pipes
  ✓ Electrical Line
Any Questions?
Warehouse Optimization

Improving Inventory Management with Capacity Assessments

Marylin N. Glass-Hedges, IE, EM
Johan M. Mejia Tejeda, IE

Past Students
Lorena S. Pena, IE
Suresh Kumar, IE
Problem statement

How much should Poly-Wood expand their warehouse to accommodate for all quick ship products?
Background

- **Inventory:** Quick-Ship Products (MTS, 3-day lead time)
  - Other products: MTO, 10-day lead time
- **Rapid growth**
  - Sales increase more than expected per year
- **Evident concern:** LIMITED WAREHOUSE CAPACITY

*MTS: Made to stock, MTO: Made to order.*
Objectives

Approach to problem

- Determine current warehouse capacity
- Assess for wasted space
- Review quick-ship lists
- Review inventory calculations
- Assess for over-production waste
- Determine capacity requirements with product information (inventory quantity, dimensions)
- Assess for the need of additional space
Why a warehouse assessment?

An assessment gives you the ability to maximize the use of existing facilities before spending money and effort to add resources…

...so that any future justifications for expenditures will be valid and generate an accurate Return on Investment.

- Curt Barry (Fulfillment Consultant)
Data collection

- Sales History
- Warehouse’s Full Drawing
  - SKUs
  - Batches
- Product Dimensions (Boxed)
- Racks’ Dimensions, Capacity, Utilization
  - Costs
Current capacity: 339,520 ft³
Required capacity: 1,447,429 ft³
• **Inventory calculations**
  
  – **Formula:**
  
  \[
  \text{Max. Stock Level} = \text{Re-Order Level} + \text{Re-Order Qty.} - (\text{Min. Consumption} \times \text{Min. Delivery})
  \]
  
  – **Compared our calculations to Poly-Wood’s**

• **Capacity requirements**
  
  – Using quick ship lists, product dimensions, inventory calculations
  
  – Developed various lists: as listed, eliminating least sold products
  
  – **Compared ours to Poly-Wood’s**
Quick Ship lists

The created lists removed products that fell into any of the following categories:

- 0 total qty.
- Overall total < skid qty.
- Yearly total < skid qty.
Capacity requirements

The following are the space requirements calculated for the different quick ship lists in 2014 (cubic feet):

<table>
<thead>
<tr>
<th></th>
<th>PW</th>
<th>GMIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1,447,429</td>
<td>1,065,798</td>
</tr>
<tr>
<td>w/o 0 sales items</td>
<td>1,206,234</td>
<td>992,248</td>
</tr>
<tr>
<td>w/o &lt; skid qty. overall</td>
<td>1,110,734</td>
<td>913,676</td>
</tr>
<tr>
<td>w/o &lt; skid qty. yearly</td>
<td>634,953</td>
<td>534,048</td>
</tr>
</tbody>
</table>
Potential savings

• **Eliminating the 70 products with 0 sales** for 4 years...
  
  – **Cost savings** from these products = $130,087
  
  – **Space savings** from these products = 241,195 ft$^3$
  
  – **Other considerations**: improved...
    
    • Purchasing management
    
    • Inventory management
    
    • Production scheduling
Conclusions

Recommendations

• **Assess for wasted space**
  – Definitely NO wasted space!

• **Assess for over-production waste**
  – DO need to control for over-production
  – Review sales history when creating new quick ship lists

• **Assess for the need of additional space**
  – Extra space IS needed, but...
  – Revise inventory requirements
Next steps

Design: New Shipping Pick List based on product dimensions and weights

To: Eliminate unnecessary material handling, re-arranging and staging orders

By...

- Reviewing current pick list
- Analyzing order patterns and their frequencies
- Focusing on top 30% of items that make for most sales
- Matching products with their dimensions/weight
- Grouping products by similar characteristics, if possible
- Proposing new pick list
Thank you for listening!

QUESTIONS, COMMENTS???