Learning Objectives

• In this session you will:
  – Lean how to classify human errors
  – Be able to create an Ishikawa diagram for human errors
  – Describe the Swiss cheese model for human errors
Introduction to Human Error

• Quality failures happen
  – Human error may cause failure
  • Examples of human error:
    – Data entry errors
    – Skipped assembly operation
Error Investigations

- Consider human factors:
  - Biomedical considerations
  - Psychosocial considerations
  - Personnel selection
  - Training
  - Evaluation
  - Job aids
Traditional Ishikawa Diagrams

- Considers the 6Ms:
  - Man (people)
  - Measurements
  - Material
  - Milieu (environment)
  - Methods
  - Machine
- Uses “5 Whys” to investigate problem
Classifications of Human Errors

1. Performance information
2. Individual considerations
3. Physical situation
4. Error impact
5. Corrective action
Human Factors Based Diagram

- Use “5 Whys” to investigate problem

Performance Information
- Phase
  - Break time
  - Function
  - Attach Part A to Part B
  - Process
    - Procedure not sufficiently detailed
  - Task
    - Operation was not carried out properly

Individual Considerations
- Ability
  - Operator untrained
- Motivation
- Vision
  - Operator needs corrective lenses
- Speed
  - Line speed too quick for operator

Physical Situation
- Workspace
- Equipment
  - Fixture not used
  - Hand tools
  - Wrong tool used
  - Ambient environment
    - Frequent interruptions

Part not connected due to human error
Subsequent Action Plan

- Prioritize actions to investigate
- Track status of assigning actions
- Example:

<table>
<thead>
<tr>
<th>Category</th>
<th>Branch</th>
<th>Hypothesis</th>
<th>Action</th>
<th>Responsible</th>
<th>Due Date</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td>Phase</td>
<td>Failures occur around break time</td>
<td>Plot occurrences versus time of day</td>
<td>M.K. Hernandez</td>
<td>12 Nov.</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>Function</td>
<td>Poke Yoke for attaching Part A to Part B not used</td>
<td>Determine if operation could have been skipped if Poke Yoke is not used</td>
<td>D.P. Payton</td>
<td>15 Nov.</td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>Process</td>
<td>Procedure not sufficiently detailed</td>
<td>Assemble one unit exactly per instructions in the procedure</td>
<td>M.V. Bridgedes</td>
<td>14 Nov.</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Swiss Cheese Model for Human Error

- Aircraft accidents
  - Failures happen at multiple levels
  - Comparable to the holes in Swiss cheese lining up

- Medical error categories
  - Situation task – errors & violations
  - Local climate – producing conditions
  - Corporate - management decisions & organizational processes
## Swiss Cheese Model for Human Error

<table>
<thead>
<tr>
<th>Level</th>
<th>Investigative Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure-proofing</td>
<td>What could have prevented the possibility of failure? How could the failure have been immediately detected?</td>
</tr>
</tbody>
</table>
| Operational         | Is a procedure available?  
  Yes: Was it followed?  No: Was violation intentional?  
  Yes: Was procedure adequate for the situation?  
  No: Could a procedure have prevented the failure?  
  Was the failure due to lack of knowledge, inattention, inability, or distraction? |
| Local conditions    | What, if any, factors (e.g., work area too hot, cold, loud, cluttered) contributed to the failure?                                                    |
| Management          | What, if any, organizational decisions or expectations contributed to the failure?                                                                     |
Human Error Example

• Problem: Customer received wrong part
• 5 Whys investigation:
  – Why did customer receive wrong part?
    • Parts were mixed up on the production machine
  – Why were parts mixed up on the production machine?
    • The divider was not being used
  – Why was the divider not being used?
    • The machine operator removed the divider
  – Why did the machine operator remove the divider?
    • Because it slowed them down & there was a piece rate bonus
  – Why was there a piece rate bonus?
    • To increase the quantity of parts shipped
Human Error Example

• Contributing factors at multiple levels:
  – Divider removed
  – Operator ignored requirement to use a divider
  – Management used a piece rate bonus to motivate operators
  – Operator found the quickest way to work
Human Error Example

• Corrective action:
  – Piece rate bonus not discontinued
  – Permanent dividers were installed
  – Optimal divider height determined with operators’ input

• Result: Parts no longer mixed up & divider does not slow down operator
Typical Corrective Actions for Human Errors

- Retraining

- Updating procedures/work instructions

- Implementing checklists

- Poke Yoke
# Typical Corrective Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Description/Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retraining</td>
<td>Operators may forget &amp; new operators may not receive training; failure conditions will still exist</td>
</tr>
<tr>
<td>Updating procedures</td>
<td>Documents lessons learned &amp; supports implementation elsewhere</td>
</tr>
<tr>
<td>Implementing checklists</td>
<td>Ensures and/or verifies each step is/was taken</td>
</tr>
<tr>
<td>Poke Yoke</td>
<td>Prevents failure from occurring and/or moving to the next operation</td>
</tr>
</tbody>
</table>
Key Take-aways

• Considering human factors during root cause analysis can help finding the cause of the problem
  – Create an Ishikawa diagram based on human factors
  – Transfer Ishikawa diagram to a tracking list
  – Consider the Swiss cheese model
Summary

• In this session you should have learned how to:
  – Classify human errors
  – Create an Ishikawa diagram for human errors
  – Describe the Swiss cheese model for human errors
References


Questions?