MAN-MACHINE INTERFACE RISK ASSESSMENT

Presented By: Bayless Kilgore, CIH, CSP, CHMM
WHAT IS MMI?

- Interaction between man and machine
- High Severity
- Usually fatal
High Severity

OSHA Stats (fork trucks):

- 85 fatalities per year
- 34,900 serious injuries per year
- 36% of fork truck fatalities involved a pedestrian
MMI Objective

- Evaluate / identify MMI hazards
- Document existing controls
  - Risk rank hazards
- Recommend additional controls
  - Risk rank hazards
- Establish a consistent process to assess and control MMI risk.
MMI Benefits

Engineering Controls
- Improve segregation between man and machine
- Physical barriers
- Consistency in physical standards

Administrative Controls / Warning
- Improve alert/awareness of mobile equipment
- Training and communication
- Warning signs, lights, alarms, etc.

PPE
- Improve visibility of pedestrians
What EnSafe can provide

- Customize client specific MMI form
- Conduct MMI Risk Assessment Leader Training
- Lead MMI Risk Assessments
MMI Risk Assessment Form

- Tool to assist / document assessments
- Identify existing controls
  - Risk rank
- Recommend additional controls
  - Risk rank
## Recommended Control Measures

<table>
<thead>
<tr>
<th>Control Methods and Reliability</th>
<th>Recommended Additional Control Measures</th>
</tr>
</thead>
</table>
| A. Engineering Controls         | A.1 Redesign process or task to eliminate MM interface  
A.2 Use alternative material-handling methods (i.e. conveyors, robots)  
A.3 Reroute mobile equipment and pedestrian paths to eliminate MM interface  
A.4 Relocate or install pedestrian or equipment doors  
A.5 Govern speed of mobile equipment to \(\leq 5\) mph  
A.6 Install physical barriers to segregate pedestrians from mobile equipment  
A.7 Install one-way spring-loaded gates at pedestrian crossings  
A.8 Equip mobile equipment with interlocked seat belts or audible alarms |
| B. Administrative Controls      | B.1 Establish and mark safe traffic control patterns  
B.2 Install mirrors at blind spots and intersections  
B.3 Install front and back mounted cameras on mobile equipment  
B.4 Install laser light on mast of lift trucks to guide forks  
B.5 Establish a “halo rule” that requires mobile equipment to be shut off when within 5 feet of unprotected pedestrians |
| C. Warning Systems and Work Practices | C.1 Install PSDI warning lights prior to pedestrians entering the path of travel  
C.2 Equip mobile equipment with audible alarms, lights, beacons, strobes  
C.3 Establish rule to sound horn at intersections and blind spots  
C.4 Install blue lights on mobile equipment (front and back)  
C.5 Install signs at blind spots and intersections |
| D. Training and/or PPE           | D.1 Provide mobile equipment operator training  
D.2 Develop and implement a pedestrian training package (onboarding and routine)  
D.3 Follow up training regarding use of impact sensors  
D.4 Establish a rule to differentiate the status of pedestrians by hard-hat color  
D.5 Procure and implement the use of reflective/high-visibility garments on all personnel |
Safety and Health Risk Definitions

- **Severity**: How bad will someone get hurt

- **Probability (or frequency)**: How often does activity occur

- **Control Modifier (or likelihood)**: How effective are existing controls
  - Considering controls: engineering, administrative and PPE

- **Risk Rate**: The numerical value of risk determined by multiplying Severity $\times$ Probability $\times$ Control Modifier.
  - Different risk matrix can be used
  - Rank before and after assessment
# Safety Risk Grid

Customized to your standard

## SEVERITY

<table>
<thead>
<tr>
<th></th>
<th>Death, disability, and work loss</th>
<th>Loss of work (LTA)</th>
<th>Medical treatment restricted work</th>
<th>First aid supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe property damage +250 K</td>
<td>High property damage $50K-$250K</td>
<td>Moderate property damage &lt;$50K</td>
<td>Low property damage</td>
<td></td>
</tr>
<tr>
<td>Severe environmental impact release into community</td>
<td>High environmental impact contained within property boundaries</td>
<td>Moderate environmental impact contained within immediate area</td>
<td>Low environmental impact</td>
<td></td>
</tr>
</tbody>
</table>

## PROBABILITY

<table>
<thead>
<tr>
<th>Probability</th>
<th>SEVERITY</th>
<th>PROBABILITY</th>
<th>PROBABILITY</th>
<th>PROBABILITY</th>
<th>PROBABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high, very probable, constant exposure</td>
<td>10</td>
<td>100</td>
<td>70</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Conceivable, probable, frequent exposure</td>
<td>7</td>
<td>70</td>
<td>49</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>Moderate occasional exposure</td>
<td>4</td>
<td>40</td>
<td>28</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Low infrequent exposure</td>
<td>1</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
MMI Recommendations

Before

• After
MMI Recommendations

Before

After
MMI Recommendations

Before

After
Deliverable

- Report including:
  - MMI risk assessment overview, findings, conclusions
  - Risk assessment forms including before/after rankings following recommended measures

- Training

2- Bayless MMI Assessments - Example.xlsx
Bayless Kilgore, CIH, CSP, CHMM

*EnSafe Inc.*

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