Alliant Energy's Ergonomic Improvement Tools

2018 EEI Spring Occupational S&H Conference
May 4th, 2018 11:15 am-12:00 pm
Behavior Change and Session Objectives

- The ergonomic report that is “Business Mind Effective”
- Demonstrate orthotic COG movement and stability against force samples
- Demonstrate posture behavior change training examples
- Demonstrate MVE Test and LOE comparison and conduct a personal effort/force calibration
Ergonomic Report Outline

- Scope (Agreement)
- Background
- Data and Video Task (Objective)
- Assessment of Data (Objective)
- Conclusion
- Recommendations (Plan)
Ergonomic Observation Report

Line Hose Inspection

Location: CROP. SOU

Evaluator: Jon Nettel, GEES (563-289-3389), Ross Koehler, CPE (319-766-7615)

Scope:
To assess all ergonomic related risk factors relating to manual inspection of rubber line hose. This was an observation of a general area ergonomic visit following a recent facility renovation.

Description:
Line hoses are used to cover energized lines to protect the line worker from accidental contact. They come in 1", 1 1/4", and 1 1/2" sizes (inside diameter) and are 6 ft long. Line hoses are inspected prior to each use in the field and are all delectively tested at our Electric Protective Equipment (EPE) lab on an annual basis. A component of the annual testing is a visual inspection (VI) where they are scanned for imperfections including but not limited to breakdown, scratches, cracks, and pitting according to ASTM F1315-06 (Standard Guide for Visual Inspection of Electrical Protective Rubber Products). VI is a manual process where the line hose is peeled open or inverted to visually inspect the interior surface. The maximum level of exertion for:

- **Manual Method - BEFORE**
  - Upper Extremity: 3.1
  - Lower Extremity: 1.7
  - Spine: 2.1

- **Line Hose Roller - AFTER**
  - Upper Extremity: 1.3
  - Lower Extremity: 0.9
  - Spine: 1.0

After implementing the line hose visual inspection roller, the following results were documented:
- Reduction of force from 45 lbs. to 12 lbs. (73%)
- Reduced labor cost of $31 per day or $9,125 per year. 10 day payback
- Reduced cycle time from 25 seconds to 13 seconds on the high end and 12 seconds (48% to 9%)
- Working height is fully adjustable to the worker for either sitting or standing
- ANSI Z-355 Job Survey: Highest risk in the grasp and single finger use categories (scored 1.30), followed by wrist deviation (scored 0.67) BEFORE. Grasp reduced to 0.85 (~50%) and wrist deviation reduced to 0.22 (~75%)
- ACGIH TLVs for Hand Activity: 1.87 (Above Threshold Limit Value) BEFORE and 0.67 (Between Action Limit and Threshold Limit Value) AFTER.
- Moro-Ogawa Strain Index: 0.1 (Significantly Above Threshold) BEFORE and 1.7 (Below Threshold) AFTER.
- Rapid Entire Body Assessment: 7 (Medium risk) BEFORE and 3 (Low risk) AFTER.
- Rapid Upper Limb Assessment: 8 (Investigate further and change soon) BEFORE and 4 (Investigate further) AFTER.
- Overall Ergonomic Risk Score: 3.1 (Moderate-High) BEFORE and 1.3 (Low-Moderate) AFTER.

1. At the start of the VI, the line hose is manually opened by separating the flaps.
2. VI of the line hose proceeds by keeping the line hose inversed and bending it in a downward direction.
3. The line hose is fed between two rollers, pushed forward and pulled back out with substantially less hand, arm, and shoulder force.
Ergonomic Observation Database
Definitions

- **Kinesiology:** Includes Biomechanics and is the scientific study of human movement and addresses physiological, mechanical and psychological mechanisms.

- **Practicing Ergonomics:** Task, tool and equipment evaluations, assigning risk, recommending action, fitting tasks to the human body and changing behavior by training employees.

- **Design Ergonomics:** Designing the material tool or equipment to accommodate the largest population possible.
Progressive Ergo Process Description

- Sprain and strain reduction project
- Functional movement screening (FMS)
- Posture training – Alliant Energy ErgoFit Field Guide Access
- MVE, LOE – Testing and Calibration
- Orthotic Intervention
- Certified Ergonomists – The evaluation of work and data driven risk to internal and external customers
Orthotic Intervention Improves COG

- Orthotics will improve center of gravity within the entire skeletal system if properly sized
- Foot adaptation causes orthotic size change, and resizing may be needed
- Increased stability and gate improvements are expected outcomes
- Upper extremity strength and stability increases by up to 30% (demo)
Pre/Post Wearing – 3 Minutes

Before Wearing

After Wearing – 3 Minutes
Center of Force Movement
Posture Training Sample

- Strongest Three
- Finger Thumb
- Thumb Up
- 20° Spine
- 30/10 Repetition
- Power Zone Identification
- Acceleration
MVE and LOE Examples

- Step #1 – Establish the Maximum Voluntary Exertion on any employee grip strength
- Step #2 – Create tasks that can be performed by the population the job requires
- Step #3 – Compare the MVE to the Level of Exertion or LOE and determine risk to that employee
- Step #4 – Take action at 7.0 and above and improve/alter the posture, material, tooling or equipment to allow the LOE to drop below 7.0
Ergonomic Discovery Lab

Cutting Tools

Directions:

1. Step 1: Using the hand dynamometer, squeeze it with 10/10 level of exertion rating. Read the inside scale for pounds.
2. Record your grip strength on the worksheet. Repeat with opposite hand.
3. Step 2: Using the side cutters, cut 1" of the cable provided. Guess the amount of force (pounds) it took to cut and record your level of exertion rating.
# Level of Exertion (LOE)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Level of Exertion</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No motion</td>
<td>Sleeping</td>
</tr>
<tr>
<td>1</td>
<td>Extremely Light</td>
<td>Anything other than sleeping.</td>
</tr>
<tr>
<td>2</td>
<td>Very Light</td>
<td>Comfortable; Relaxed posture.</td>
</tr>
<tr>
<td>3</td>
<td>Light</td>
<td>Comfortable; Slight increase in breathing.</td>
</tr>
<tr>
<td>4</td>
<td>Moderate</td>
<td>Breaking a sweat; Able to hold a conversation.</td>
</tr>
<tr>
<td>5</td>
<td>Somewhat Hard</td>
<td>Light sweating, speaking becoming more difficult.</td>
</tr>
<tr>
<td>6</td>
<td>Hard</td>
<td>Sweating; Increasing difficulty to speak; Change in facial expression.</td>
</tr>
<tr>
<td>7</td>
<td>Very Hard</td>
<td>Heavy sweating; Difficulty speaking; Facial muscles tighten up.</td>
</tr>
<tr>
<td>8</td>
<td>Extremely Hard</td>
<td>Rapid breathing; Unable to speak; Body posture changes; Teeth clinched.</td>
</tr>
<tr>
<td>9</td>
<td>Near Maximum</td>
<td>Muscles shake; Extreme fatigue.</td>
</tr>
<tr>
<td>10</td>
<td>Maximum</td>
<td>Unable to move; End point.</td>
</tr>
</tbody>
</table>

⚠️ Everyone’s rating will be different.
Testing Total Actual Force
Ergonomic Discovery Lab Results

Cutting Tools

• Average force required to cut #4 copper is 85 lbs. (+/- 6 lbs.)

<table>
<thead>
<tr>
<th>Grip Strength</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>95</th>
<th>100</th>
<th>105</th>
<th>110</th>
<th>115</th>
<th>120</th>
<th>125</th>
</tr>
</thead>
<tbody>
<tr>
<td>%MVE</td>
<td>170%</td>
<td>155%</td>
<td>142%</td>
<td>131%</td>
<td>121%</td>
<td>113%</td>
<td>106%</td>
<td>100%</td>
<td>94%</td>
<td>89%</td>
<td>85%</td>
<td>81%</td>
<td>77%</td>
<td>74%</td>
<td>71%</td>
<td>68%</td>
</tr>
</tbody>
</table>

| Grip Strength | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| %MVE          | 65% | 63% | 61% | 59% | 57% | 55% | 53% | 52% | 50% | 49% | 47% | 46% | 45% | 44% | 43% |

At 70% of MVE we must take action and provide direction as to what tool will reduce this effort to the lowest feasible force needed to perform the job.
Ergonomic Discovery Lab Results

Lifting

- Actual Weight of an object may be 20 lbs.
- “Real” Weight of that same object can be in access of 60 lbs. Why?

ACCELERATION

The newest ergonomic hazard we should begin a control strategy. Training and reprogramming the brain is the only method available.
Questions and Contact Information

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