

Industrial Ergonomic Assessment Report: 1090/9925 DI Water Movement Process

Performed by: Thomas Armijo and Cynthia Rivera (Ergonomics Program)

Date: 11/30/2017

Project Objective: Perform an industrial ergonomic assessment to evaluate the new procedures for filling, lifting, and delivering high purity de-ionized water to building 9925. The goal was to improve on the previous method by minimizing/eliminating as much lifting and bending as possible to reduce the potential for overexertion-related injuries.

Attendees: Corey White (631), Thomas Goodman (631), Doug Perry (631), Cynthia Rivera (622), Thomas Armijo (622)

Observations:

All new containers/bottles are now 3 gallons, as opposed to the 5 gallon bottles that were used before. If a container that has a capacity of greater than 3 gallons is used, they will only be filled to a maximum weight of 30 lbs. All containers are barcoded and have a unique ID number. Each bottle is scanned into Excel spreadsheet after getting filled.

Empty bottles are placed onto height adjustable scissor lift and carted over to the water dispensing station to be filled (Figure 1). After getting filled, MOWs will slide the bottle off the dispenser onto the cart and then capped (Figure 3). No more than six bottles are filled and placed on the scissor lift at one time. ***This process should be noted as a best practice as it is ergonomically sound and proactive in preventing overexertion/lifting-related injuries.**

The scissor lift is then lowered to the level of the storage rack, where the filled bottles are then stored (Figure 4). Up to 3 storage racks can be filled for delivery. After storage racks are filled, an electric pallet jack is used to load the bottles onto a truck for delivery to ERFO (Figure 5). This is always a 2-man operation: one-person controls pallet jack while the other leads. ***Use of a scissor lift helps to reduce the strain/stress on the employee's back while moving the filled bottles onto the storage racks. The use of pallet jack eliminates overexertion/lifting-related injuries while moving and loading the bottles onto a truck for delivery.**

Once loaded onto the truck, the pallets are secured using truck bed straps. SMO will contact ERFO staff to ensure a qualified forklift operator is available to off-load the palletized water after being delivered. The amount of DI water 1090 provides to ERFO has been reduced significantly by incorporating Culligan Water Company into an efficient work process. ***Partnership with Culligan and 1090 operations for DI water to ERFO has greatly reduced the amount of bottles and time required to fill bottles for work activities while still maintaining good water quality for sampling and decontamination processes.**

A single entry/exit door existed previously for access to the loading area for the delivery truck. New double-doors have been installed to allow access and proper clearance for the pallet jack and operations (figure 6). ***The installation of new double-doors is an engineered ergonomic approach to eliminate movement of the water bottles by hand to the delivery truck.**

Identification of Ergonomic Risk Factors: Results from BRIEF Survey and BEST Assessment

Hand/Wrist		Elbow		Shoulder		Neck	Back	Legs	Job Hazard Score
Left	Right	Left	Right	Left	Right				
Low	Low	Medium	Medium	Medium	Medium	Low	Medium	Low	Low

The primary risk factors that contribute to the development of work-related musculoskeletal disorders (WMSDs) are awkward postures, excessive force, and extreme frequencies and/or duration of movement. A brief exposure to these agents most often does not cause harm, but prolonged exposure results in reduced ability to function. The same risk factors that contribute to WMSDs are also barriers to industrial performance.

- MOWs may use repeated, elevated reaches to access bottles on top levels of storage rack.
- MOWs may also be reaching for extended periods when holding button to fill water containers (Figure 2).

Recommendations:

To make the task safer for all team members, while considering time and budget constraints, here are the recommendations to mitigate the ergonomic risks associated with the process:

- **Incorporate a 5-10 Minute Stretch Break.** Conducting a stretching activity in the morning before work or the before the activity helps to improve flexibility and range of motion throughout the day. Specific stretching techniques can be incorporated into the routine that are target areas for employees.
 - Contact: [Jon Pier](#) to schedule an overview of stretching techniques.
 - Contact: [Matthew Thomas](#) to go over Dynamic Stretch Break techniques.
- **Consider attending HBE back/lifting class at least once a year.** Reiterate the basics of body biomechanics and the importance of maintaining the back in an ergonomically neutral position when lifting. Attending HBE back/lifting classes can help to prevent back pain or injury. Learn and maintain techniques overtime for proper back/lifting activities.
 - ["We've Got Your Back"](#) – 1-hr Activity-based session to learn proper lifting, stretching, and muscle building exercises to prevent back pain.
 - ["Back Clinic \(3 sessions\)"](#) – 1-hr Learn stretches and exercises to manage low back pain. Instructors will emphasize proper form and technique.

***It should be noted that many changes have been implemented since the initial evaluation in 2016 that has greatly reduced ergonomic risk.**

Pictures:


Figure 1: DI water dispenser + scissor lift.



Figure 2: Filling water bottles.



Figure 3: Sealing filled bottles.



Figure 4: Transferring water to storage rack.



Figure 5: Loading pallet onto truck.



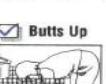
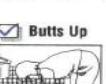
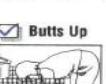
Figure 6: Double-doors.

Attachments:

Ergonomics Action Form
 BRIEF Survey
 BEST Assessment

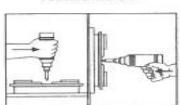
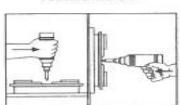
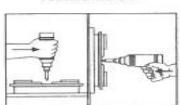
Ergonomics Action Form™
Improvement Accelerated

Version 3.0

Step 1 Complete job information. Job Name: <u>Die Water Movement</u> Station: _____ Date: <u>11/30/17</u> Shift: _____ Site: <u>10901/170</u> Product: _____ Dept: <u>C31</u>	Step 3 Check the box for each Hit List item observed. For these items, write the task number (from Step 2) and root cause of the ergonomic issue in the space provided. <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; text-align: center;"> <input type="checkbox"/> Wash Rag </td> <td style="width: 80%; vertical-align: top;">  2. Need to apply force to make sure bottle is sealed properly </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Twist and Shout </td> <td style="vertical-align: top;">  1. Reaching to push button to fill bottle </td> </tr> <tr> <td style="text-align: center;"> <input checked="" type="checkbox"/> Elbows Out </td> <td style="vertical-align: top;">  2. Need to apply force to make sure bottle is sealed properly </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Shoulder Too High/Too Low </td> <td style="vertical-align: top;">  1. Reaching to push button to fill bottle </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Hungry Head </td> <td style="vertical-align: top;">  3. Some bending at torso to load filled bottles. </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Butts Up </td> <td style="vertical-align: top;">  1. Reaching to push button to fill bottle </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Sit vs. Stand </td> <td style="vertical-align: top;">  1. Reaching to push button to fill bottle </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Bad Vibes </td> <td style="vertical-align: top;">  1. Reaching to push button to fill bottle </td> </tr> <tr> <td style="text-align: center;"> <input type="checkbox"/> Contact </td> <td style="vertical-align: top;">  1. Reaching to push button to fill bottle </td> </tr> </table>	<input type="checkbox"/> Wash Rag	 2. Need to apply force to make sure bottle is sealed properly	<input type="checkbox"/> Twist and Shout	 1. Reaching to push button to fill bottle	<input checked="" type="checkbox"/> Elbows Out	 2. Need to apply force to make sure bottle is sealed properly	<input type="checkbox"/> Shoulder Too High/Too Low	 1. Reaching to push button to fill bottle	<input type="checkbox"/> Hungry Head	 3. Some bending at torso to load filled bottles.	<input type="checkbox"/> Butts Up	 1. Reaching to push button to fill bottle	<input type="checkbox"/> Sit vs. Stand	 1. Reaching to push button to fill bottle	<input type="checkbox"/> Bad Vibes	 1. Reaching to push button to fill bottle	<input type="checkbox"/> Contact	 1. Reaching to push button to fill bottle
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Step 2 List all major tasks observed. <ol style="list-style-type: none"> 1. <u>Filling 3-gallon bottles</u> 2. <u>Sealing filled bottles</u> 3. <u>Loading bottles on pallet rack</u> 4. <u>Loading pallet rack onto truck</u> 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ 																			
Step 4 Record any comments or notes. <p>- Minimal bending over at the torso to load bottles into storage rack.</p> <p>- Some reaching observed w/filling bottles</p>																			

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Ergonomics Action Form™	<i>Improvement Accelerated</i>																																																																																																																																															
																																																																																																																																																
Step 5 Mark each Hit List item you observed (from front). <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Wash Rag</th> <th>Elbows Out</th> <th>Shoulder Too High/Too Low</th> <th>Hungry Head</th> <th>Butts Up</th> <th>Twist and Shout</th> <th>Horizontal Distance</th> <th>Sit vs. Stand</th> <th>Bad Vibes</th> <th>Contact</th> <th>Initials</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>1. Stretching</td> <td>✓</td> <td></td> <td></td> <td>✓</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Body Biomechanics Class</td> <td>✓</td> <td></td> <td></td> <td>✓</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3.</td> <td></td> </tr> <tr> <td>4.</td> <td></td> </tr> <tr> <td>5.</td> <td></td> </tr> <tr> <td>6.</td> <td></td> </tr> <tr> <td>7.</td> <td></td> </tr> <tr> <td>8.</td> <td></td> </tr> <tr> <td>9.</td> <td></td> </tr> <tr> <td>10.</td> <td></td> </tr> </tbody> </table>			Wash Rag	Elbows Out	Shoulder Too High/Too Low	Hungry Head	Butts Up	Twist and Shout	Horizontal Distance	Sit vs. Stand	Bad Vibes	Contact	Initials	Date	1. Stretching	✓			✓		✓							2. Body Biomechanics Class	✓			✓		✓							3.													4.													5.													6.													7.													8.													9.													10.												
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Step 6 Brainstorm and record potential improvements below. For each improvement, mark the Hit List item(s) addressed. To approve an item for implementation, write your initials and date approved. <ol style="list-style-type: none"> 1. <u>Stretching</u> 2. <u>Body Biomechanics Class</u> 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ 																																																																																																																																																
Step 7 List the top three improvements: <ol style="list-style-type: none"> 1. <u>Stretching</u> 2. <u>Body Biomechanics Class</u> 3. _____ 																																																																																																																																																
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Step 8 Sign-off/Follow-up: Submitted to _____ Scheduled follow-up date _____																																																																																																																																																

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BRIEF™ Survey – Baseline Risk Identification of Ergonomic Factors

humanTech®

Date: 11/30/17

Step 1. Complete Job Information.									
Job Name:	DI Water Movement Process		Shift:			Station:			
Product:			Dept:	631		Site:	1090/170		
Step 2. Circle Posture and Force pictures when risk factors are observed. Mark Posture and Force boxes for each body area when thresholds are exceeded.									
Posture	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Hands and Wrists		Elbows		Shoulders		Neck	Back	Legs
	Left	Right	Left	Right	Left	Right			
Force	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A. Pinch Grip B. Finger Press C. Power Grip									
Step 3. For body parts with Posture or Force marked, mark Duration and/or Frequency box(es) when limits are exceeded.									
Duration	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Frequency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 4. Add Posture, Force, Duration and Frequency check marks (0-4) and circle Risk Rating (Low = 0 or 1, Medium = 2, High = 3 or 4).									
Score (0-4)	0	0	2	2	2	2	0	2	0
Risk Rating	L	M	H	L	M	H	L	M	H
Step 5. Identify Physical Stressors.									
Mark Physical Stressors observed. Use the corresponding letters to show location of stressors on body image.									
<input type="checkbox"/> Vibration (V) <input checked="" type="checkbox"/> Low Temperatures (L) <input type="checkbox"/> Soft Tissue Compression (S)					<input type="checkbox"/> Impact Stress (I) <input type="checkbox"/> Glove Issues (G)				

BEST™ – BRIEF™ Exposure Scoring Technique

humantech®

Date: 11/30/17

Step 1. Complete Job Information.

Job Name: **DI Water Movement Process** Shift: _____ Station: _____
Product: _____ Dept: **631** Site: **1090/170**

Step 2. Transfer BRIEF Scores.

Transfer scores (0-4) from a completed BRIEF Survey.

Hands and Wrists		Elbows		Shoulders		Neck	Back	Legs
Left	Right	Left	Right	Left	Right	0	2	0
0	0	2	2	2	2	0	2	0

Step 3. Determine Conversion Factors.

Find each BRIEF Score in the table to the right and determine the Conversion Factor for each body part. Add the Conversion Factors together and enter the total.

0	0	3	3	3	3	0	3	0
BRIEF Score	Conversion Factor							
4	10							
3	5							
2	3							
1	1							
0	0							

15
+
Step 4. Summarize Physical Stressors.

Place a 2 in the box for each physical stressor marked on the BRIEF, and a 0 for each physical stressor not marked. Add the Physical Stressors together and enter the total.

Vibration	Low Temperatures	Soft Tissue Compression	Impact Stress	Glove Issues	2
0	2	0	0	0	2

=
17
X
Step 5. Calculate Job Risk Factor Score.

Add Conversion Factors and the Physical Stressor Scores together and enter the total.

Step 6. Determine Time Exposure Multiplier.

Use the table to the right to determine the appropriate multiplier.

Time on Task Per Week	Multiplier
> 40 hours	1.25
20 - 40 hours	1.0
4 - 19 hours	0.8
< 4 hours	0.4

0.4
=
Step 7. Calculate Job Hazard Score.

Multiply the Job Risk Factor Score by the Time Exposure Multiplier.

Job Hazard Score	Priority
0 - 9	Low
10 - 29	Medium
30 - 49	High
50+	Very High

6.80