Motion is Money®

Helping increase productivity and reduce risk.

MANUFACTURING

CNA

We can show you more.
Wasted motion decreases your workers’ production and increases their risk of injury. This booklet will give you strategies, methods and ideas to enhance your workers’ productivity and reduce risk factors. For every one percent reduction in risk, you can gain one percent improvement in productivity.

- Spend 30 to 60 minutes observing your workers walking, bending, reaching and carrying.
- Remember, unnecessary movement affects productivity and efficiency.
- Don’t criticize during this time, but learn and then coach.
Key Questions to Ask Yourself

• How much walking do you see?
• How many bends are occurring?
• How much reaching is occurring?
• How many employees are walking to get parts and tools?
• What are the distances employees are walking?
• What percentage of parts/tools can be staged off the floor or ground?
• How do we get parts/tools off the floor or ground?
• Are the right type and orientation of hand tools used? (e.g., pistol grip vs. in-line)
• What is the distance from point of installation to the tool crib or inventory?
• Was the best type of material handling equipment used?
Observations

Key factors:
Number of trips, number of minutes, per observation.

Annualize all measurements:

- Treasure hunting (look for tools and materials)
- Distance walked (to and from tool room, inventory, staging point, warehouse and component bins)
- Frequency of trips
- Reaching into bins
- Carrying parts and sub-assemblies to production lines
- Bending over to the floor or ground, and lifting
- Working overhead, reaching
- Body posture while palletizing and depalletizing

Typical times it takes to:

Bend to the floor – 3 seconds
Walk 50 paces – 30 seconds
Put down and pick up tools – 5 seconds
Example #1
Bending Observation on Typical Job

Bending:

- Number of workdays per year = 250
- Number of bends performed in one hour = 50

\[
\begin{align*}
50 \text{ bends} \times 3 \text{ seconds} &= 150 \text{ seconds} \\
150 \text{ seconds} \times 8 \text{ hours} &= 1200 \text{ seconds} \\
&= 20 \text{ labor minutes}
\end{align*}
\]

\[
\begin{align*}
20 \text{ labor minutes} \times 250 \text{ days} &= 5000 \text{ labor minutes} \\
5000 \text{ /60 minutes} &= 83 \text{ labor hours}
\end{align*}
\]

- Total number of employees on the job = 100

\[
\begin{align*}
83 \text{ hours} \times 100 \text{ employees} &= 8300 \text{ labor hours per year}
\end{align*}
\]

- Hourly rate = $20

\[
\begin{align*}
8300 \text{ labor hours} \times 20 \text{ hourly rate} &= 166000 \text{ cost of bending}
\end{align*}
\]
Worksheet #1
Bending Observation on Typical Job

Bending:
Number of workdays per year = 
Number of bends performed in one hour = 

\[
\begin{align*}
&= \text{bends} \times 3 \text{ seconds} = \text{seconds} \\
&= \text{seconds} \times 8 \text{ hours} = \text{seconds} \\
&= \text{seconds} \times \frac{1}{60} \text{ minutes} = \text{labor minutes}
\end{align*}
\]

Total number of employees on the job = 
Total labor hours per year = 

Hourly rate = $
\text{labor hours} \times \$ \text{hourly rate} = \$ \text{cost of bending}$
Example #2
Walking Observation on Typical Job

Walking:

Number of workdays per year = 250
Number of minutes walking = 10

10 labor minutes x 250 workdays = 2,500 minutes/60
= 42 labor hours

Total number of employees performing job = 100

42 labor hours x 100 employees = 4,200 labor hours per year

Hourly rate = $20

4,200 labor hours x $20 hourly rate = $84,000 cost of walking
Worksheet #2
Walking Observation on Typical Job

Walking:
Number of workdays per year = □
Number of minutes walking = □

□ labor minutes x □ workdays
= □ minutes/60
= □ labor hours

Total number of employees performing job = □
labor hours x □ employees
= □ labor hours per year

Hourly rate = $ □
labor hours x $ □ hourly rate
= $ □ cost of walking
Example #3
Reaching in a Sitting Position

Reaching with Arm Extended to 15”:

Number of workdays per year = 280
Number of reaches performed in one hour = 125

125 x .66 of a second = 82.5 seconds x 8 hours = 660 seconds/60 = 11 labor minutes

11 labor minutes x 280 work days = 3,080 labor minutes/60 = 51.3 labor hours

Total number of employees reaching = 50
51.3 labor hours x 50 employees = 2,565 labor hours per year

Hourly rate = $25 per/hour
2,565 labor hours x $25 hourly rate = $64,125 cost of reaching in a sitting position
Worksheet #3
Reaching in a Sitting Position

Reaching with Arm Extended to 15”:

Number of workdays per year = 

Number of reaches performed in one hour = 

\[ \text{seconds} \times 8 \text{ hours} = \text{seconds/60} \]

\[ = \text{labor minutes} \]

\[ \text{labor minutes} \times \text{work days} = \text{labor minutes/60} \]

\[ = \text{labor hours} \]

Total number of employees reaching = 

\[ \text{labor hours} \times \text{employees} = \text{labor hours per year} \]

Hourly rate = $ \text{ per/hour} 

\[ \text{labor hours} \times \text{hourly rate} = \text{cost of reaching in a sitting position} \]
Example #4
Reaching in a Standing Position

Reaching with Arm Extended to 20"

Number of workdays per year = 280
Number of reaches performed in one hour = 100

\[
100 \times 0.78 \text{ of a second} = 78 \text{ seconds} \times 8 \text{ hours} = 624 \text{ seconds}/60 = 10.4 \text{ labor minutes}
\]

\[
10.4 \text{ labor minutes} \times 280 \text{ work days} = 2,912 \text{ labor minutes}/60 = 48.5 \text{ labor hours}
\]

Total number of employees reaching = 50

\[
48.5 \text{ labor hours} \times 50 \text{ employees} = 2,425 \text{ labor hours per year}
\]

Hourly rate = $25 per/hour

\[
2,425 \text{ labor hours} \times $25 \text{ hourly rate} = $60,625 \text{ cost of reaching in a standing position}
\]
Worksheet #4
Reaching in a Standing Position

Reaching with Arm Extended to 20”:

Number of workdays per year = 
Number of reaches performed in one hour = 

x .78 of a second = seconds x 8 hours = seconds/60 = labor minutes

labor minutes x work days = labor minutes/60 = labor hours

Total number of employees reaching = 
labor hours x employees = labor hours per year

Hourly rate = $ per/hour 
labor hours x $ hourly rate = $ cost of reaching in a standing position
Spaghetti Chart

A Spaghetti Chart is a method of focusing on the movement of your employees and determining if there is excess walking or movement. This is a visual method of showing wasted motion.

1. Assembly or Installation
2. Tool Crib
3. Inventory
4. Finished Goods
Spaghetti Chart

Use this space to observe workplace movement.
Spaghetti Chart

Use this space to observe workplace movement.
Key Points to Remember

• Remember to annualize all numbers.
• Pre-planning must include the human interface.
• Keep parts, materials, work in process a minimum of 18 inches off floor to reduce bending, reaching and awkward postures.
Common Conversions

60 seconds = 1 minute

3,600 seconds = 1 hour

28,800 seconds = 8-hour day

60 minutes = 1 hour

480 minutes = 8-hour day

19,200 minutes = 40-hour week

10 bends = 30 seconds

50 paces walking = 30 seconds