REDUCE INJURIES
- Decrease Muscle Effort
- Decrease Muscle Fatigue

IMPROVE SAFETY
- Increase Productivity
- Decrease Risk Factors of Injuries

SAVE MONEY
- Calculate ROI
- Validate Payback Period
- Data & statistics of injuries on the jobsites
- Step by step process to reduce and recognize ergonomic injuries.
- Preparing for tooling tasks to minimize risk for injury
- Identify tools that help you achieve that goal

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### Milwaukee Tool Ergonomics and Safety

#### Data and Statistics

- **2017 OSHA RD/LT Injuries**
  - Sprains, Strains: 80%
  - Concussions: 6%
  - Crushing: 2%
  - Electric Shock: 2%
  - Other: 16%

- **Hot Hands, 1%**
  - Sprains/Strains: 30%
  - Cuts/Lacerations: 12%
  - Fractures: 12%
  - Other: 22%
  - Multiple Injuries: 4%
• MSDs UP 12% from the latest data
• Over 20,500 total injuries
Ergonomics
The science of evaluating and designing products and work environments around the strengths and limitations of the human user in order to:

- Maximize occupational health
- Maximize ease of use
- Maintain productivity

*Marklin, 2012*

**Wrist Angle**
Reducing/Eliminating strain on the user’s wrist greatly enhances the degree of comfort. Strain and fatigue increase as the user’s wrist strays from its ideal position. The wrist in line with the forearm is the ideal position.
Musculoskeletal Disorders (MSDs) or Ergonomic Injuries on the Jobsite

- Common areas injured pictured below are due to:
  - Heavy lifting, bending, reaching overhead, pushing & pulling loads, working in awkward postures, repetitive tasks.

Tools designed to fit the hands of all workers for the application

- Decrease muscle effort and fatigue
- Increase safety and productivity
- Decrease risk factors of ergonomic injuries

How does it relate to tool users?

- Awkward posture
- Repetitive tasks
- High force tasks
Milwaukee Tool Ergonomics and Safety
Testing / Applied Results

Benefits
- Light Weight
- Compact
- Optimized for Driving Fasteners

User Frustrations
- Loud
- Vibration
- Lifetime

Benefits
- Light Weight
- Compact
- Optimized for Driving Fasteners

Milwaukee Solution
- 50% Quieter
- 3X Less Vibration
- Longer Life

• Reduced Noise Creates a Quieter Work Environment
• OSHA Requires Hearing Protection for Tools that Operate Above 80dBA
• SURGE™ operates at 75dBA, behind the required level
• Standard impact operate at 90dBA, silent while wearing hearing protection

3X LESS VIBRATION

• FLUID-DRIVE™ Hydraulic Powertrain Reduces Metal on Metal Contact Creating a Smooth Experience resulting in:
  - Less Cam out
  - Less fatigue
  - Less Strain

MEASURE THE MUSCLE EFFORT OF UP TO 108 MUSCLES

M18® FORCE LOGIC® 12T Utility Crimper
Middle Deltoid
Anterior Deltoid
Biceps Brachii
Brachioradialis
Flexor Carpi Ulnaris
Abductor Pollicis Brevis
Work Piece:

Work orientations are pictured below:

≈ 1 lb of Total Weight Reduced Decreases Muscle Effort By 11%

Milwaukee Tool Ergonomics and Safety
Current 12T Product Assessment

12T Crimper Evaluation
Carpal Tunnel Syndrome

Tip #1: Keep wrist straight (Neutral)

Trigger Finger Tendonitis

Tip #2: Use low force trigger engagements
**Tendonitis**

Tip #3: Use only the amount of force necessary for the task and Keep wrist straight (Neutral)

Lineman’s High Leverage Ratcheting Wrench

**Elbow Epicondylitis**

Tip #4: Use power tools when available and select the correct handle orientation

M18 FUEL™ 7/16” Hex Utility High Torque Impact Wrench
**Rotator Cuff Tear/ Bursitis**

**Tip #5: Work near elbow height**

- **Problem**
  - Amount of handle force required to compress a 1/0-#2 wire pair is approximately 70 lbs. at the outer die location of the manual press
    - Only 1% capable of the general population has the peak force to make this connection
  - High shoulder force exertions working from a bucket of 45% Maximal Voluntary Contraction (MVC)
  - Peak forces of flexor muscle in forearm from working in a bucket of 100% MVC

- **Solution**
  - Nearly all workers are capable
    - A few lbs. of force to pull trigger
  - Reduced to less than 10% MVC (Over 80% relative reduction)
  - From 100% MVC to 60% MVC (a 40% relative decrease)

**Crimping Comparison**

$(Seeley, 2003)$
**Problem**

- High upper extremity force exertions to close cutter handles
  - Operating a cutter is similar to operating a manual press
- Arms raised above the shoulder level (shoulder abduction)
- Jarring action from quick drop in force when wire is cut
- Repetitive upper extremity exertions using the ratchet cutter

**Solution**

- Substantially reduced
- Substantially reduced
- Eliminated
- Eliminated

(Seeley, 2003)

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**Problem**

- WE Energy 2.5 Year Study
  - Medical and Workers' Compensations costs: Upper extremity only
  - Replacement worker
  - Retraining
  - Injury late reporting
  - Productivity Improvement

**Hypothesis**

**Results** (2013 – 2015)

**Manual Tools**

- 50% reduction and $198 per worker, annually*
- 50% reduction and $68 per worker, annually*
- 10% reduction and $123 per worker, annually*
- 2 case reduction and $108 per worker annually*
- 47 hours a year or $2,355 per worker annually*

**Battery Operated Tools**

- 61% reduction and $500 per worker, annually (OR)
- 100% reduction and $500 per worker annually (LWD)
- 13 hours saved or $2,750 per worker annually

**TOTAL**

- WE Energies saved $2,852 saved per worker annually
- At $50/labor hour

- $3,650 saved per worker, annually
- At $200/labor hour

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*Note: Values may vary depending on labor costs.*
## Milwaukee Tool Ergonomics and Safety

### Ergonomics Evaluation

<table>
<thead>
<tr>
<th>Feature</th>
<th>Milwaukee Tool 12T Crimper</th>
<th>Leading Competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>12.2 lbs.</td>
<td>15.85 lbs.</td>
</tr>
<tr>
<td>Speed</td>
<td>21.5 seconds</td>
<td>24 seconds</td>
</tr>
<tr>
<td>Balanced Center of Gravity</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Maneuverability</td>
<td>350°</td>
<td>350°</td>
</tr>
<tr>
<td>Length</td>
<td>15.9 inches</td>
<td>16.5 inches</td>
</tr>
<tr>
<td>Trigger Activation</td>
<td>Two</td>
<td>Two</td>
</tr>
<tr>
<td>Muscle Effort</td>
<td>23% MVC</td>
<td>37% MVC</td>
</tr>
</tbody>
</table>

### Raw uV/ % MVC

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Raw uV/ % MVC</th>
<th>Milwaukee Tool 12T Crimper</th>
<th>Leading Competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abductor Pollicis Brevis (Hand)</td>
<td>532.375 (38%)</td>
<td>1007.75 (71%)</td>
<td></td>
</tr>
<tr>
<td>Brachioradialis (Forearm)</td>
<td>127.5 (17%)</td>
<td>213.25 (28%)</td>
<td></td>
</tr>
<tr>
<td>Flexor carpi ulnaris (Forearm)</td>
<td>203 (27%)</td>
<td>292.667 (39%)</td>
<td></td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>225.4 (27%)</td>
<td>340.8 (40%)</td>
<td></td>
</tr>
<tr>
<td>Middle Deltoid (Shoulder)</td>
<td>64.75 (6 %)</td>
<td>109.5 (11%)</td>
<td></td>
</tr>
<tr>
<td>Anterior Deltoid (Shoulder)</td>
<td>163.2 (22%)</td>
<td>247.4 (32%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23% MVC</td>
<td>37% MVC</td>
<td></td>
</tr>
</tbody>
</table>
47% less muscle effort in the thumb* and improved wrist postures decrease risk for carpal tunnel syndrome.

* Average peak microvolt reduction of the Abductor Pollicis Brevis (APB) from Burndy PAT 750 to Milwaukee 12T Utility Crimper.
# Milwaukee Tool Ergonomics and Safety

## Progression of Safety

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>DUST</th>
<th>VIBRATION/NOISE</th>
<th>ERGONOMICS</th>
<th>CONTROL</th>
<th>VISIBILITY</th>
<th>PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INJURY</td>
<td>SILICOSIS</td>
<td>VWF/EARDRUM DAMAGE</td>
<td>MSDs</td>
<td>ACUTE INJURIES</td>
<td>TRIPS</td>
<td>ACUTE INJURIES</td>
</tr>
</tbody>
</table>

## SAFETY STAND DOWN

- **OSHA's Fatal Four**
  1. Falls
  2. Electrocutions
  3. Struck by object (includes dropped objects)
  4. Caught in or between

**Regulation**

OSHA requires that tools and materials be secured to prevent drops. Toe boards and safety nets are commonly used to catch dropped objects but tool lanyards can prevent drops before they occur.

**OSHA's General Duty Clause** mandates that employers provide a job site that is "free of recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." -OSHA Act of 1970

**Tool Lanyards**

Tool lanyards are used to prevent dropped objects. They are most commonly used when working at height, near open edges, or around sensitive equipment. Tool lanyards can be used by any trade working in these situations.
LANYARDS RATED FOR TOOLS UP TO 35 POUNDS

10lb Max
15lb Max
35lb Max

STAY SAFE, STAY PRODUCTIVE.

BEST SHOCK ABSORPTION

Force (lbs.) Generated by a Dropped 10lb Tool

<table>
<thead>
<tr>
<th>Force</th>
<th>Milwaukee Lanyard</th>
<th>Employee Lanyard</th>
<th>Employee Lanyard</th>
</tr>
</thead>
<tbody>
<tr>
<td>395</td>
<td></td>
<td>191</td>
<td>119</td>
</tr>
</tbody>
</table>

Shock absorption is critical for tool lanyards. If a tool is dropped, Milwaukee® Tool Lanyards will gently slow the tool, reducing the amount of force on both the user and anchor point.

Milwaukee Tool Ergonomics and Safety
Lanyards

103,000+ lost-time hand injuries occurred in the construction industry in 2015**
70% of hand injuries occur when the user was not wearing gloves**
Average hand injury claim cost*:
- Average loss per claim: $22,384
- Median cost of a laceration: $6,000
- Stitches: $2,000
- Butterfly: $300
- Severed Tendon: > $70,000
- Average Extremity Trauma: $730,000

Median days away from work** - 5

*Information provided by the nation safety council
**Information provided by the U.S. Bureau of Labor Statistics

Hand Injuries Cost Companies Millions Yet are Easy Avoidable
2.3 million workers are exposed to silica hazards.

**WORK IN CONSTRUCTION**

- **OSHA**
  - Regulation enforcement begins
  - Silica increases 2016-2019: from $2,000 to $12,934
  - Repeat violations increase to $126K

- **U-HAUL**
  - Unlimited fines for silica-related overexposure during renovations

**BREAKING THE RULES IS DANGEROUS AND COSTLY**

- **Lanford Brothers** fined over $300K for 5 violations between February and May 2018
- **OSHA** increases daily fines from $7,000 to $12,934
- Repeat violations increase to $126K

- **U-HAUL** facility fined over $108K for silica-related exposure during renovations

January 2018 – July 2018 produced 116 silica fines
“Fall injuries can also be prevented through design features, such as slip-resistant flooring, planned pedestrian routes that are separated from moving machinery, and adequate lighting. ~CPWR

45a. Number of nonfatal injuries due to falls, slips, and trips involving days away from work in construction, by cause, 2011-2015

45b. Distribution of nonfatal injuries due to falls, slips, and trips on the same level resulting in days away from work in construction, 2015
Slips, Trips, and Falls from Inadequate Lighting

1926.56(a) “Construction area, ramps, runways, corridors, offices, shops, and storage areas shall be lighted not less than the minimum illumination intensities listed in Table D-3 while any work is in progress.”

Slips, Trips, and Falls from Extension Cords

1910.305(g)(1)(iv) “Flexible cords and cables may not be used through holes in walls, ceilings, or floors or in doorways, windows, or similar openings.”

Milwaukee Tool Ergonomics and Safety
Lighting and Cords

TEMPORARY SITE LIGHT
Obtain 5FC with more floor coverage and less lights

JOB SITE LIGHTING
Cut the cord with the industry's only full offering of cordless lighting solutions

Milwaukee Tool Ergonomics and Safety
Lighting Solutions

Confidential Document
Property of MILWAUKEE TOOL Brookfield, Wisconsin 53005
SDS MAX ROTARY HAMMER
- Electromagnetic Clutch that prevents over rotation in case of lock up
- Competitive Tools will Rotate 360 Degrees

BANDSAW DUAL ACTUATION TRIGGERS WITH BLADE GUARDING
- For enhanced control and productivity
- Proprietary composite material and Crush Zone Barriers absorb impacts and protect the tool

SURGE IMPACT DRIVER
- REDUCES VIBRATION by up to 3X
- REDUCES dB output by 50%

SMALL ANGLE GRINDER
- Rapid stop break in under 3 seconds
- Slimmest grip on the market for increased user comfort and control
- Guards, side handles, dual actuation switch, & Clutch

PIPE THREADER
- Industry 1st: Auto-Stop Kickback Control
- Side-Grip Thread Starts
  - Eliminates Need to Contact Spinning Die Head

THREADED ROD CUTTER
- No Chips, No Sparks, No Vibration: Safer solution than a grinder, cut-off saw, and reciprocating saw
- One-handed centered grip allows for easier overhead reach
MAG DRILL
- Delivers the strongest magnetic hold on 1/4" steel providing a safer drilling environment
- Auto-Stop lift-off detection, power to the motor is automatically cut if excess rotational motion is detected while drilling

12T CRIMPER
- Decreases muscle effort by up to 44%
- Reduces the risk factors of common ergonomic injuries
- Designed to reduce weight and improve balance, it is the lightest and only fully balanced 12T crimper, with a 350° rotating head

3" UG CUTTER
- Delivers a safer way to cut remotely.
- Removes the physical connection to the tool allowing Linemen to cut up to 1500MCM Copper 15kV WIRELESSLY

M12 RIVET TOOL
- Decreases muscle effort by up to 60%
- Reduces force to engage tool by 72.8 lbs

1/2" DRILL/DRIVER W/ ONE-KEY
- Anti-Kickback technology increases your control in bind-up situations

M12 CROWN STAPLER
- Easy to squeeze trigger design significantly reduces fatigue associated with traditional hand staplers.
- Reduces muscle effort over 80%
STAY SAFE. STAY PRODUCTIVE.

**LANYARDS**
- Rated for tools up to 35 pounds
- 10lb Max
- 15lb Max
- 35lb Max

**GLOVES**
- 143,000+ hand injuries prevented in 2019
- 70% NOT wearing gloves
- Safety Glasses
- Hard Hats
- High Vis Vests
- Hearing Protection
- Expanded Gloves and Lanyards
- Dust Masks

**WHAT'S NEXT**
- Safety Glasses
- Hard Hats
- High Vis Vests
- Hearing Protection
- Expanded Gloves and Lanyards
- Dust Masks

---

**REDUCE INJURIES**
- Decrease Muscle Effort
- Decrease Muscle Fatigue

**IMPROVE SAFETY**
- Increase Productivity
- Decrease Risk Factors of Injuries

**SAVE MONEY**
- Calculate ROI
- Validate Payback Period
Thank You!
Q&A